

ARROW 1 SERVICE DATA

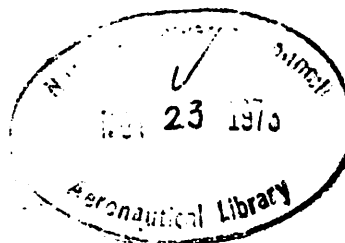
SECTION 1

GENERAL INFORMATION

Classification cancelled/changed to.....
by authority of.....(date).....
Signature.....Rank.....

(This data supersedes previous issue dated 15 Jan 58)

269137



#186

1 AUG 58

CONFIDENTIAL
UNCLASSIFIED

ARROW 1 SERVICE DATA

LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA**FOREWORD**

This Service Data provides a description and preliminary servicing instructions for the Arrow 1 aircraft.

The Data is issued in sections, each covering an aircraft system or major component. The sections are issued separately under the following titles:

TITLE	SECTION NO.
General Information	1
Structure	2
Lubrication	3
Main Landing Gear	4
Nose Landing Gear	5
Landing Gear - Hydraulics	6
Wheel Brakes - Hydraulics	7
Nose Wheel Steering - Hydraulics	8
Landing Gear - Electrics	9
Parachute Brake	10
Flying Controls - Mechanical	11
Flying Controls - Hydraulics	12
Flying Controls - Electrics	13
Speed Brakes - Hydraulics	14
Fuel System	15
Fuel System - Electrics	16
Air Conditioning and Pressurization	17
Air Conditioning - Electrics	18
Low Pressure Air System	19
Utility Hydraulics - Power Circuit	20
Pitot Static System	21
Oxygen System	22

UNCLASSIFIED**ARROW 1 SERVICE DATA**

TITLE	SECTION NO.
Power Plant	23
Engine Controls	24
Engine Services - Electrics	25
Fire Protection System	26
Fire Protection - Electrics	27
Engine Intake and Ramp De-icing System	28
Engine Intake and Ramp De-icing - Electrics	29
Accessories Drives and Gearboxes	30
Ejection Seat Mk C5	31
Canopies	32
Canopies - Electrics	33
Windshield and Canopy De-icing	34
Instruments	35
Electrical System - General Information	36
Electrical System - Power Supplies	37
Electrical System - Master Warning	38
Electrical System - Internal and External Lighting	39
Electronics - Power Distribution	40
Electronics - Radio Compass AN/ARN-6	41
Electronics - X-Band Beacon	42
Electronics - UHF Homer Adaptor AN/ARA-25	43
Electronics - UHF Command Radio AN/ARC-34	44
Electronics - IFF AN/APX-6A	45
Electronics - Interphone AN/AIC-10	46
Electronics - J4 Gyrosyn Compass	47
Instrument Pack	48
Radome De-icing System (To be deleted)	49
Radome De-icing - Electrical System (To be deleted)	50
Electronics - Tacan AN/ARN-21 (To be deleted)	51
Electronics - R-Theta Navigation Computer (To be deleted)	52

GENERAL INFORMATION

TABLE OF CONTENTS

TITLE	PAGE
GENERAL DESCRIPTION	1
GROUND HANDLING	
Locking of Flying Controls	5
Landing Gear Locks	6
Towing	6
Towing Under Adverse Conditions	8
Parking	8
Covers	9
Jacking Provisions	9
Jacking Requirements	11
Jacking the Aircraft	13
Jacking for a Wheel Change	13
Levelling the Aircraft	13
Access Equipment	13
Aircraft Slings	14
LEADING PARTICULARS	21
PRINCIPAL DIMENSIONS	24

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Three-view General Assembly	2
2	Exploded View	3
3	Structure Cutaway	4
4	Aileron and Elevator Support	6
5	Landing Gear Locks	7
6	Tow Bar	8
7	Towing Forward Under Adverse Conditions	9
8	Towing Rearward Under Adverse Conditions	10
9	Covers	11
10	Jacking	12
11	Aircraft Alignment Fixture	14
12	Access Equipment	15
13	Slings the Complete Aircraft	16
14	Nose Slings	17
15	Access Panels Upper Surface and LH Side	19
16	Access Panels Undersurface and RH Side	20

ARROW 1 SERVICE DATA

GENERAL DESCRIPTION

1 The Avro ARROW 1 is a delta wing supersonic, high altitude, all weather interceptor. The first aircraft is powered by two Pratt & Whitney J75 P3 gas turbine engines which are of the twin spool compressor type with afterburners. Subsequent aircraft will be powered by two J75 P5 series engines. Each engine of both series develops a military rated thrust of 15,500 pounds and a maximum thrust of 23,500 pounds.

2 The crew of two, a pilot and a navigator, are accommodated in separate cockpits arranged in tandem. Each cockpit is enclosed by a clam-shell type canopy which is normally opened and closed electrically. An explosive cartridge system is employed to open the canopies in an emergency. The cockpits are equipped with Martin-Baker C5 ejection seats to enable the crew to abandon the aircraft. Firing of the emergency canopy system and seat ejection are interconnected and require only one operation.

3 The airframe is of all metal stressed skin construction. The structure is an integral assembly with centre and inner wing torsion boxes forming the basis of the structure. The vertical stabilizer is secured to the centre torsion box. The inner wing torsion box skins are machined from the solid and the outer wing skins are taper rolled. The engines, duct bay, engine bay and rear fuselage are suspended from the inner wing to provide flexibility to the structure.

4 The aileron, elevator and rudder flying control surfaces are operated by a duplicated hydraulic system which powers control surface actuators. A damping system stabilizes the aircraft in all three axes, and also provides automatic rudder co-ordination. Provision is made for three modes of control, Normal, Automatic and Emergency. Hydraulic power is required for all three modes.

5 In the normal mode of control, forces applied to the control column by the pilot are converted to electrical signals which control electro-hydraulic servos. The movement

of these servos is transmitted through the mechanical system to control the aileron and elevator hydraulic actuators.

6 In the automatic mode control signals to operate the electro-hydraulic servos can be originated by a ground station, or from the aircraft fire control or automatic navigation systems.

7 In the emergency mode, movement of the control column is boost assisted and transmitted by the cables to control the aileron and elevator actuators. Yaw damping and automatic rudder co-ordination only are retained in this mode.

8 The air conditioning system uses air tapped from the engine compressors. The air is cooled by air-to-air, and air-to-water heat exchangers, and by an air turbine and fan unit. The system supplies conditioned air to pressurize the cockpits. It also supplies conditioned air to the electronic equipment and the armament bay to maintain them at an operational working temperature. An emergency ram air supply provides cooling air to the essential equipment in the event of failure of the main system.

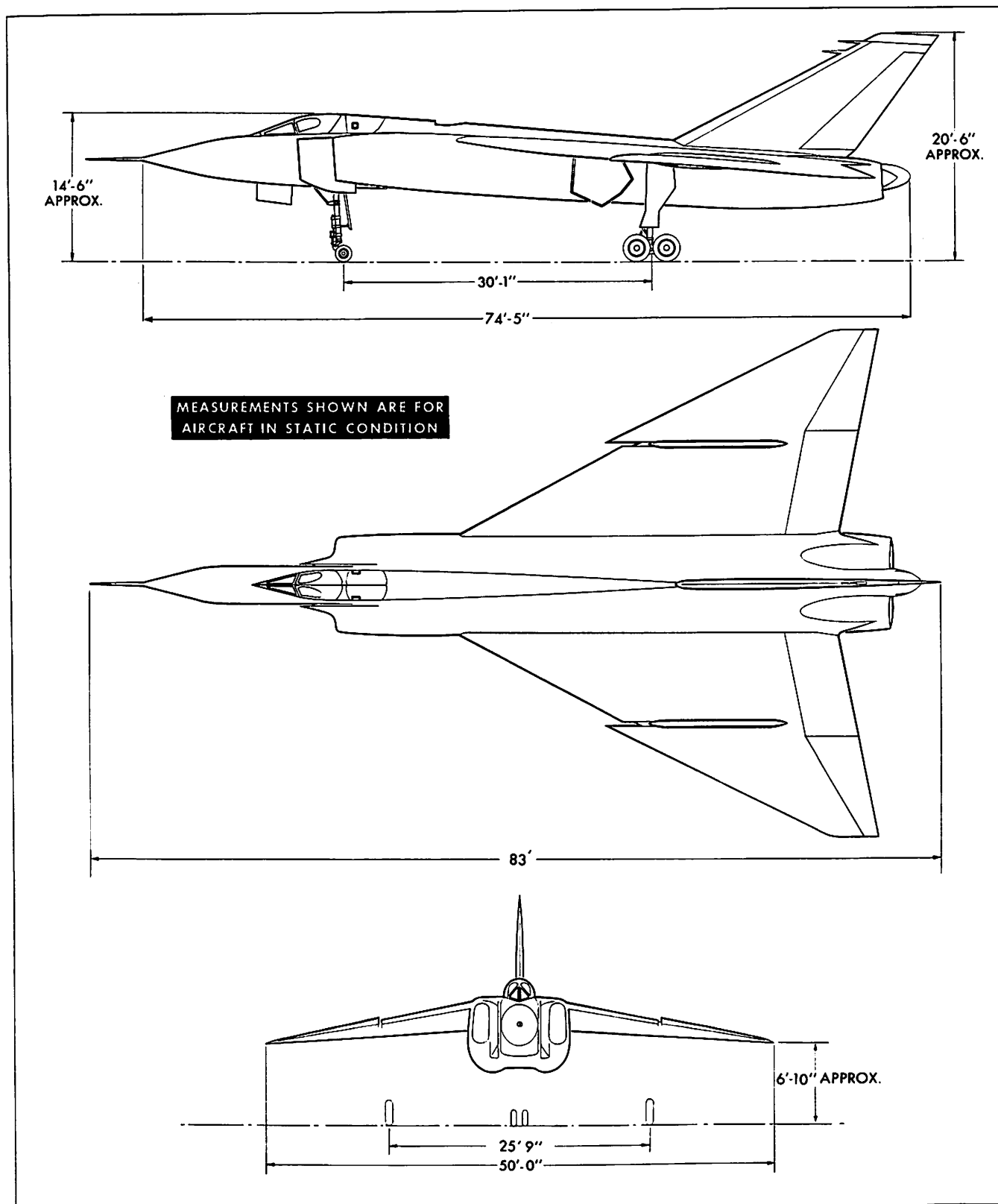
9 A low pressure air system supplied by air from the air conditioning system provides air pressure for the inflation of canopy seals, the instrument pack seals and the pilot and navigators anti-'g' suits.

10 Fuel is carried in twelve integral wing tanks and in two rubber cell type tanks in the fuselage. One of the tanks in each wing acts as a collector tank and fuel is pumped to the engine by a mechanically driven booster pump mounted in each collector tank. Fuel is transferred to each collector tank through a flow proportioner unit, from the wing tanks by air pressure, and from the fuselage tanks by a combination of air pressure and electrically driven transfer pumps.

11 The tanks in the RH wing and the front fuselage tank normally feed the RH engine, and the tanks in the LH wing and the rear fuselage tank, the LH engine. Provision is made for crossfeeding.

UNCLASSIFIED

ARROW 1 SERVICE DATA



7M1-1004-2

FIG. 1 THREE-VIEW GENERAL ASSEMBLY

ARROW 1 SERVICE DATA **UNCLASSIFIED**

12 The tanks are pressure refuelled and defuelled through an adaptor fitted in each main wheel bay.

13 A utility hydraulic system supplies hydraulic power to operate the landing gear, speed brakes, wheel brakes and nose wheel steering. This hydraulic system also provides the power to operate the emergency alternator. A high pressure nitrogen system is provided to release the landing gear in the event of hydraulic power failure.

14 The power supplies for the aircraft electrical and electronic systems are provided by two alternators, one driven by each engine. The aircraft power supplies consist of a main AC supply, a non-essential services AC supply, an emergency AC supply, a normal DC supply and an emergency DC supply. The AC supply operates at 400 cycle 115/200 volts and the DC supply operates normally at 28.5 volts, and at 24 volts in an emergency.

15 The RH alternator normally supplies the main AC services and the LH alternator the non-essential services. The LH alternator automatically takes over the main AC services and sheds the non-essential services should the RH alternator supply fail. In the event of a complete loss of AC supply, a hydraulically driven emergency alternator supplies power to operate the aircraft instruments and the essential aircraft stabilizing circuits.

16 The aircraft DC supply is derived from the output of both alternators and is converted to the regulated DC voltage by two transformer rectifier units. The emergency DC supply is provided by the aircraft battery.

17 The tricycle landing gear is equipped with twin wheels on each leg, the main wheels being arranged in tandem. The twin hydraulically steered nose wheels are controlled by the rudder pedals and, when selected, provide a degree of steering proportional to rudder pedal movement.

18 Liquid spring type shock absorbers are employed on the landing gear. Each main leg unit is fitted with a recuperator system which

automatically charges the shock absorber when the aircraft leaves the ground. Disc type triple spot brakes are fitted to each main wheel.

19 Thermal de-icing is used on the pilot's windshield and side panels. The engine intake and ramps are both equipped with electrically heated rubber boots. Engine bleed hot air is used for engine de-icing. The engine and the intake and ramps de-icing is automatically controlled by electrical sensors.

20 An oxygen system converts stored liquid oxygen to a gaseous supply for the crew members pressure masks and pressure suits. An emergency oxygen system provides a limited supply of oxygen for breathing, and also to pressurize the pressure suits, after the seat has been ejected.

21 A fist ribbon type parachute brake is fitted in the rear fuselage and is streamed on touchdown to assist in reducing the landing run.

22 A detachable instrument pack installed in the armament bay provides a means of carrying flight test equipment.

GROUND HANDLING

LOCKING OF FLYING CONTROLS (Fig 4)

23 When parking the aircraft, the control column must be centralized during engine run down and an aileron and elevator support must be fitted immediately following the engine run down. This supports the weight of the control surfaces and prevents damage to the mechanical controls. The support arm for each surface is adjustable to bring its pad into contact with the control surface. Each arm is retained by a shear pin which will shear and allow the arm to pivot should the controls be inadvertently operated when the supports are fitted.

CAUTION

The aileron and elevator support must be removed before the engines are started or before the hydraulic test machine trailer is connected for ground testing.

ARROW 1 SERVICE DATA

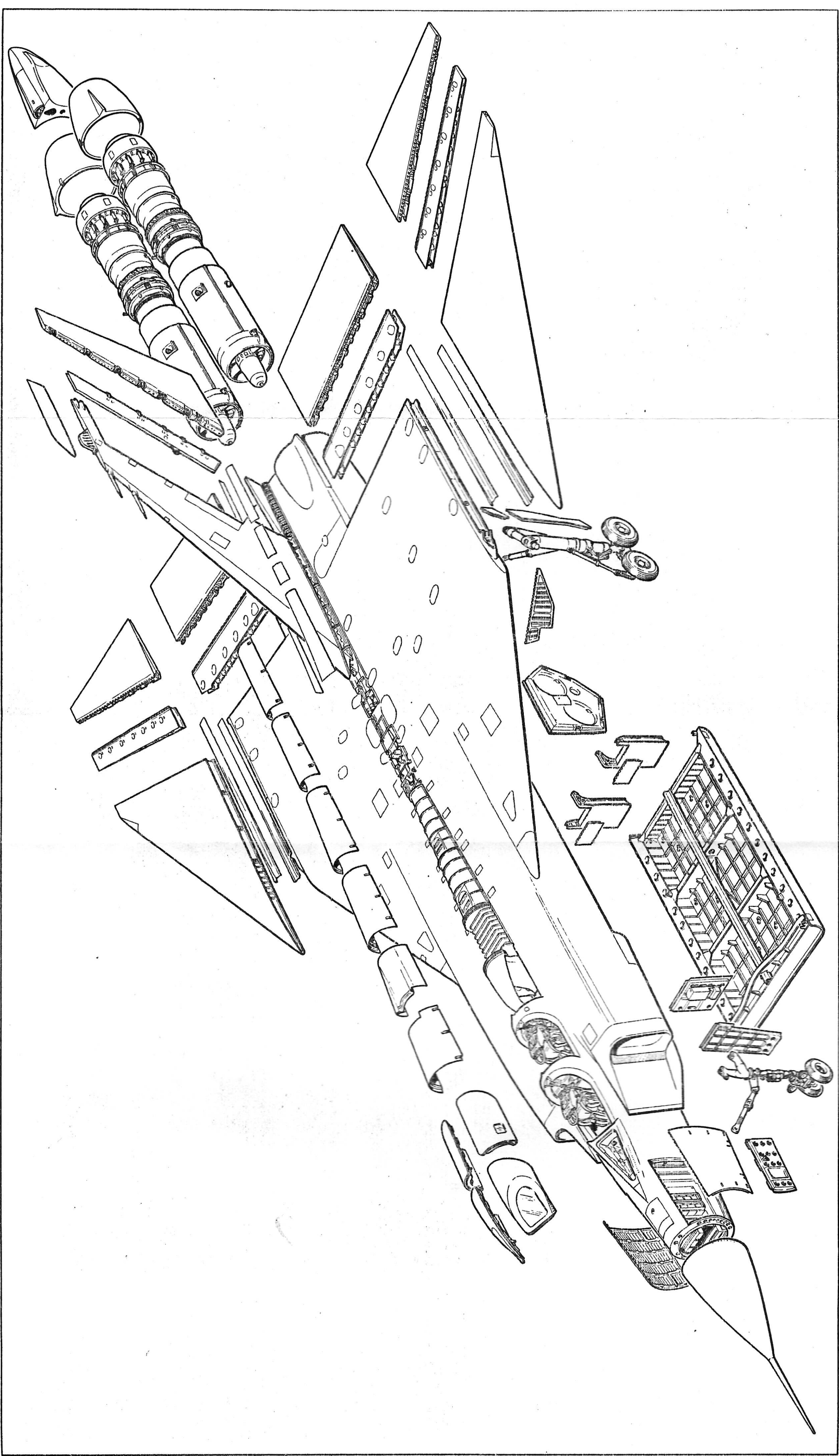


FIG. 2 EXPLODED VIEW

7M1-1002-1

CONFIDENTIAL

UNCLASSIFIED

ARROW 1 SERVICE DATA

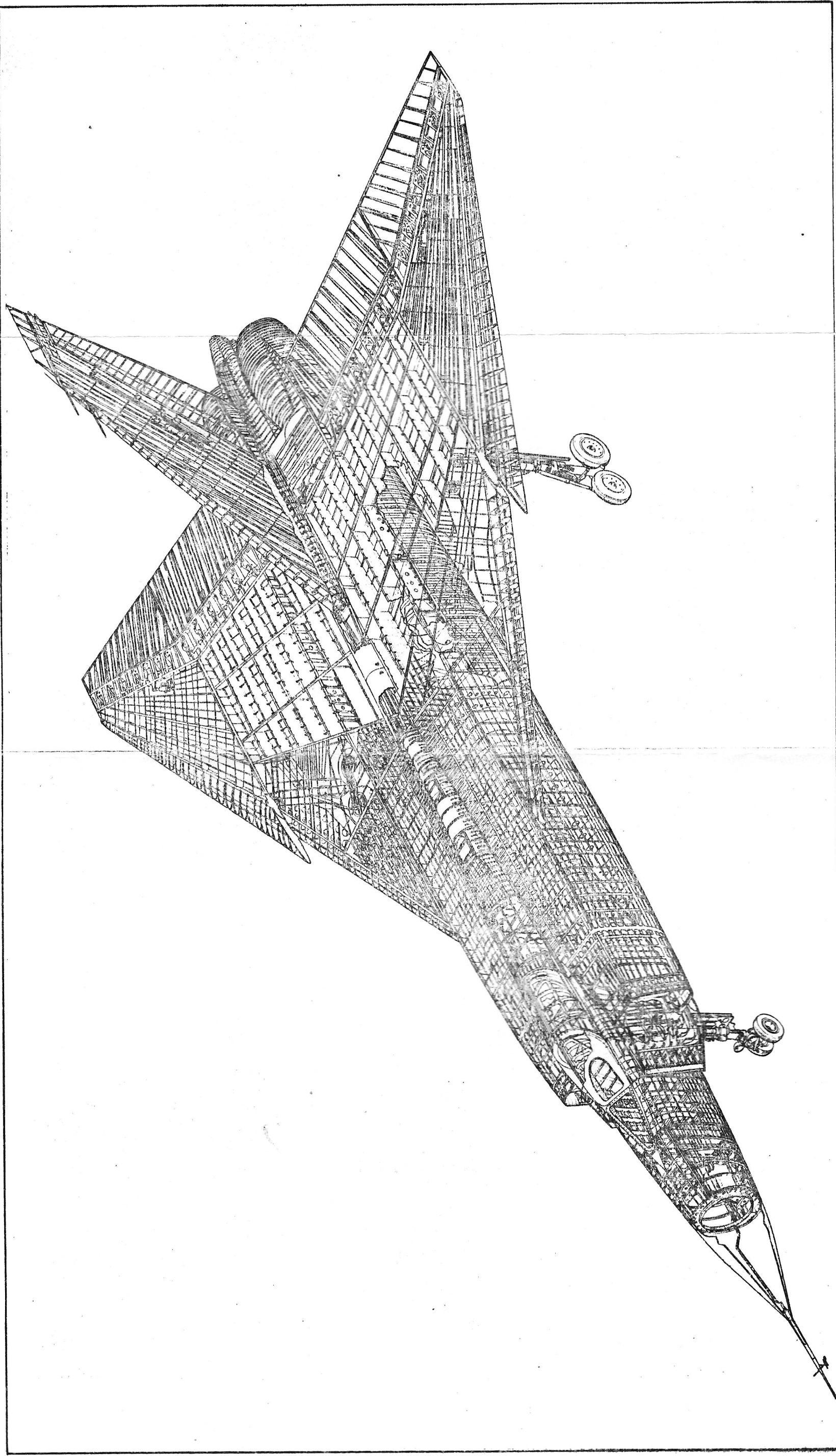
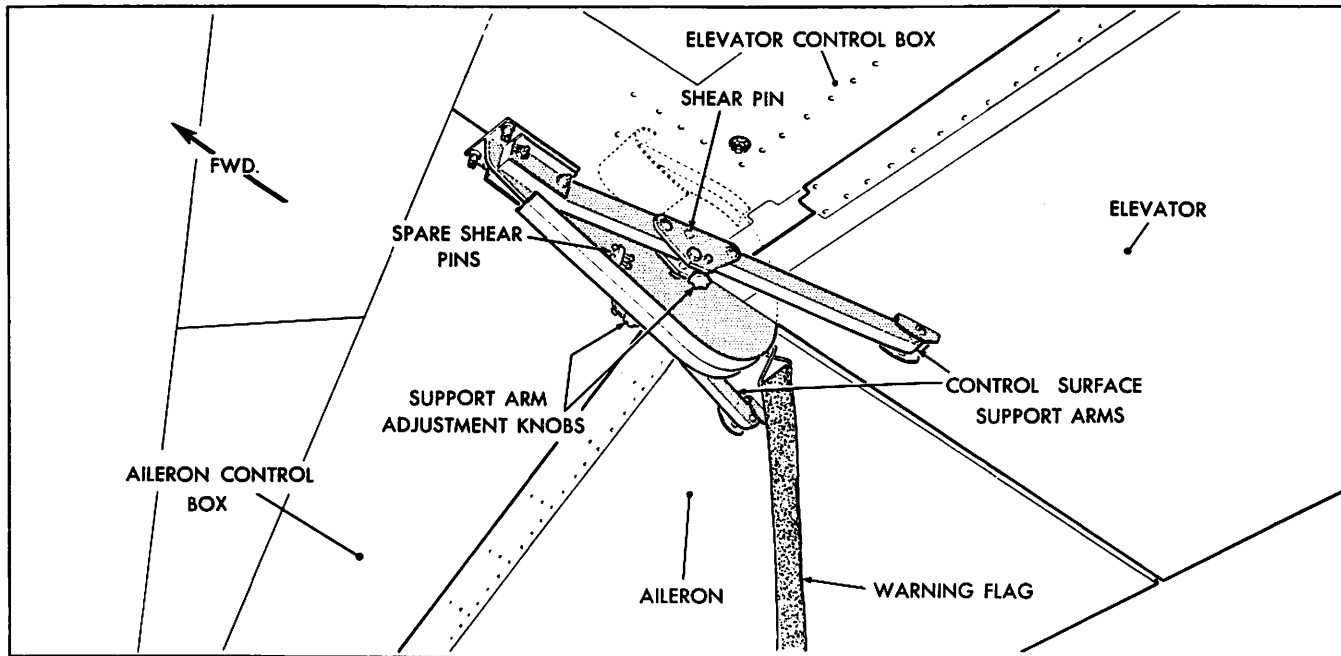


FIG. 3 STRUCTURE CUTAWAY

741-1325-1

ARROW 1 SERVICE DATA



741-1104-2

FIG. 4 AILERON AND ELEVATOR SUPPORT

LANDING GEAR LOCKS (Fig 5)

24 The landing gear locks must be installed as a safety precaution when the aircraft is on the ground. The nose landing gear is locked by inserting the locking pin in the locking pin hole in the drag strut. The main landing gear is locked by fitting the hinged tubular locks over the side stay sliding members. The warning flags must be hanging down.

TOWING (Fig 6)

25 The aircraft must be towed with the tractor and tow bar provided, and towing procedures must be observed in accordance with EO 00-50-19. Provision is made for intercom between the pilot's cockpit and the tractor during towing. The tow bar is fitted with two electrical plugs, one of which connects to an electrical receptacle in the rear of the tractor, and the other to an electrical receptacle at the base of the nose leg, to complete the intercom circuit.

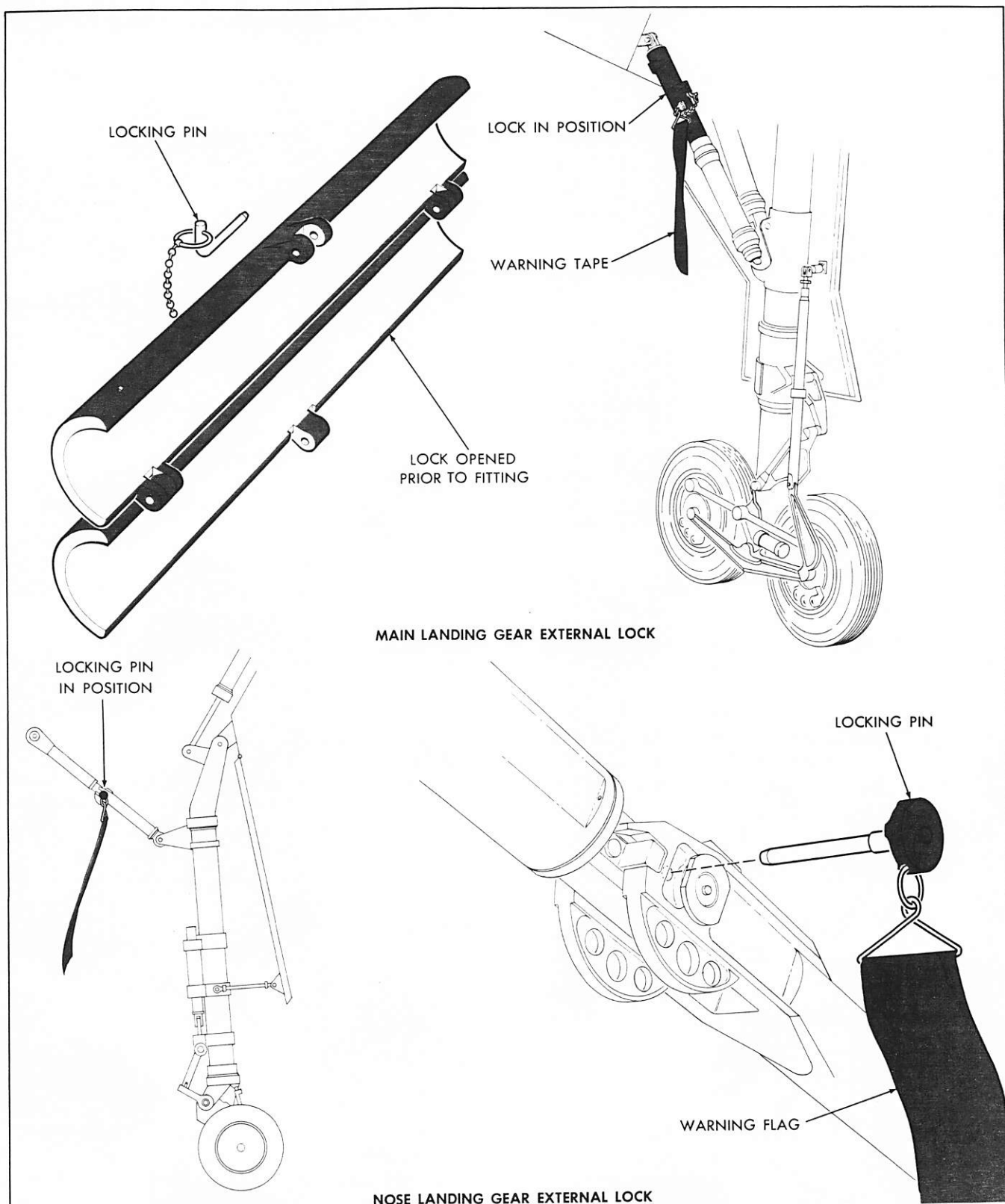
26 To prevent damage to the nose landing gear and the surrounding structure, a towing shear pin and a turn shear pin are fitted to the tow bar. The towing shear pin, located at the

forward end of the tow bar, is designed to shear at 9,600 lb. An internal shock cord absorbs the shock should the towing shear pin shear and a pulley mechanism allows for a six foot extension of the intercom cable. The pulley bracket contacts a stop to prevent any further extension of the tow bar when the cable is at full extension.

27 The turn shear pin, located at the aft end of the tow bar is designed to shear at 14,000 lb. The nose wheel can be turned 55° each way from centre at a maximum rate of turn of 19° per second. Any attempt to turn in excess of this angle or rate of turn, will cause the turn shear pin to shear. This will occur when the torque loading on the nose leg reaches 45,000 pounds-inches.

28 Three micro-switches fitted in the tow bar provide audio warning signals through the intercom. One is the turn warning micro-switch, which is contacted should the angle of turn exceed 45° in either direction. This causes a loud audio buzz to be transmitted to the tractor only. The other two micro-switches provide shear warning, and are fitted one adjacent to each shear pin. Should either shear pin shear, its micro-switch is contacted,

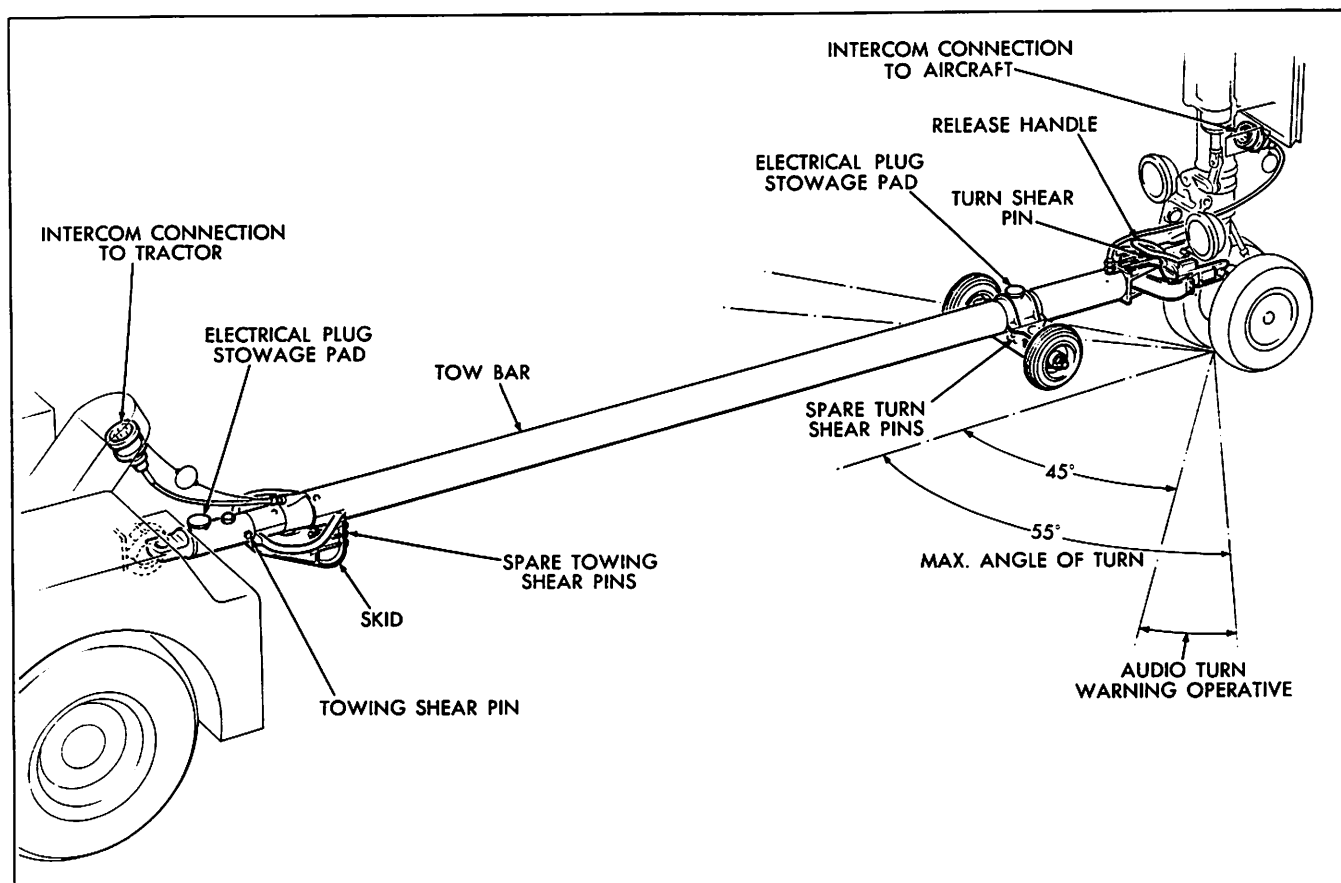
ARROW 1 SERVICE DATA



7M1-1101-1

FIG. 5 LANDING GEAR LOCKS

ARROW 1 SERVICE DATA



7MI-1105-1

FIG. 6 TOW BAR

causing a loud audio buzz to be transmitted to both the tractor and the pilot's cockpit. This shear warning buzz may be eliminated to allow normal inter-communication to be resumed by depressing a SHEAR PIN SIGNAL OFF push button on the control panel in the tractor.

29 Before the aircraft is moved, the emergency brake accumulators must be checked for a minimum pressure of 2750 psi. This will be indicated on the emergency brake accumulator combined nitrogen charging valve and gauge located in the hydraulic bay. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

TOWING UNDER ADVERSE CONDITIONS (Figs 7 and 8)

30 For towing under adverse conditions, such as through deep snow or over uneven

ground, a towing bridle must be used. The aircraft may be towed forward or rearward with the towing bridle. During forward towing, the aircraft must not be towed at an angle of more than 5° from straight ahead.

31 The towing bridle is secured to a towing eye in the bogie beam on each main leg by a shackle and a ball pin, and to the tractor by the bridle pulley block for both forward and rearward towing. To prevent damage to the main landing gear or its surrounding structure, the pulley is secured to the pulley block by a shear pin which is designed to shear at 17,600 lb.

PARKING

32 The aircraft should be parked clear of obstructions, headed into wind, and clear of other aircraft movements. The following

ARROW 1 SERVICE DATA

procedure must be adopted after parking the aircraft:

- (a) Ensure that the ejection seat and canopy safety pins are fitted. See Arrow 1 Service Data - Ejection Seats.
- (b) Lock the flying controls. See para 23.
- (c) Apply the parking brake.
- (d) Close the canopies.
- (e) Fit the landing gear locks.
- (f) Chock the main wheels fore and aft.

- (g) Fit the covers. See para 33.

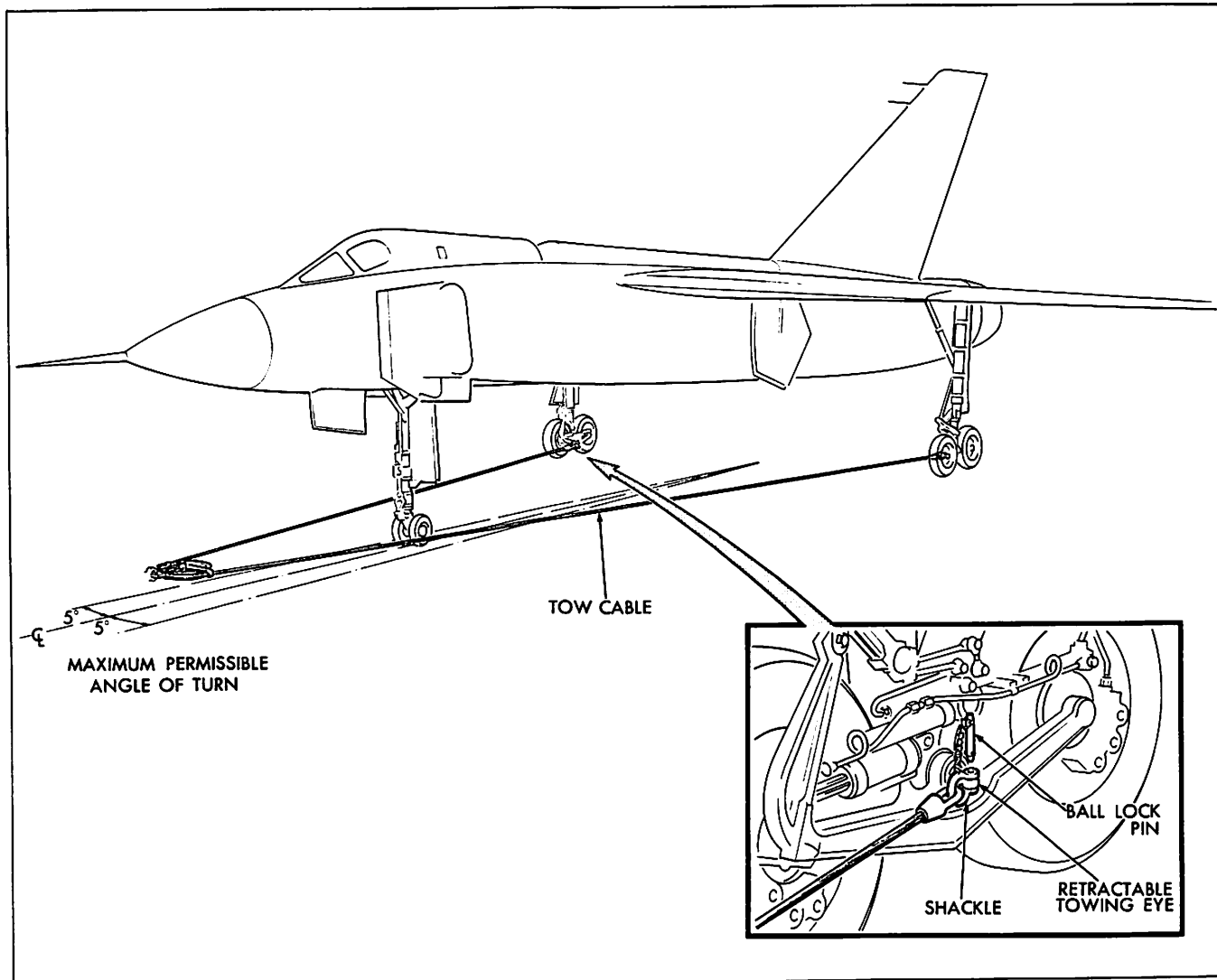
COVERS (Fig 9)

33 A set of covers provides weather protection for the radome, the canopies, the engine intakes, the engine exhausts, the air conditioning ram inlet, the air conditioning outlet and the pitot heads.

34 The radome cover has a built-in sling for radome removal.

JACKING PROVISIONS (Fig 10)

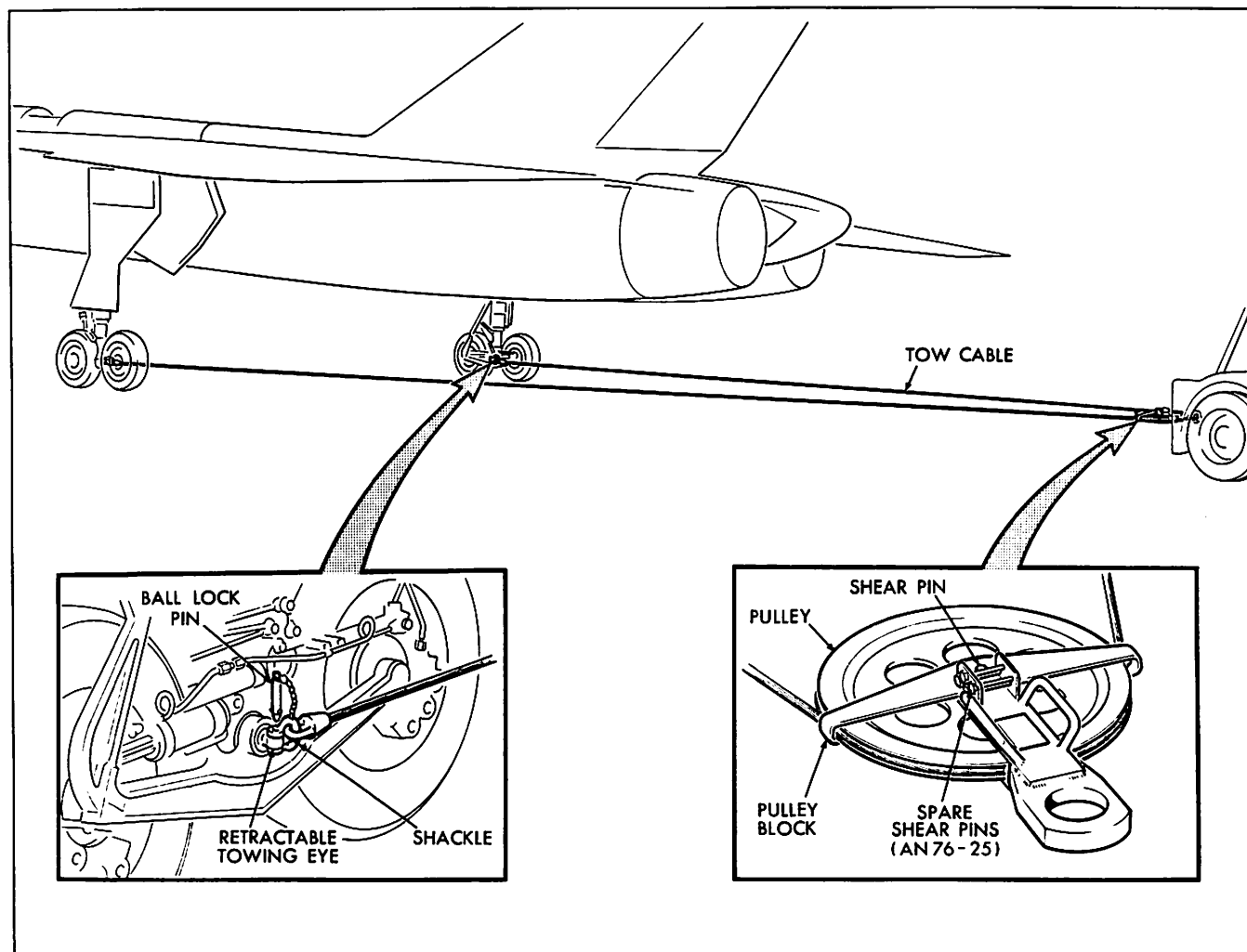
35 There are three jacking points on the



7M1-1106-1

FIG. 7 TOWING FORWARD UNDER ADVERSE CONDITIONS

ARROW 1 SERVICE DATA



7M1-1107-1

FIG. 8 TOWING REARWARD UNDER ADVERSE CONDITIONS

aircraft, one on the undersurface of each inner wing, and one on the undersurface of the fuselage between the air conditioning access panel and the electronics bay centre access panel. Each jacking point must be fitted with a special jacking pad.

36 Each wing jacking pad comprises a threaded locating pin which engages with an internally threaded fitting at the wing jacking point, and an adaptor upon which the jack seats. To prevent the weight of the aircraft from being totally or partially supported by the threads, the locating pin is retained within the adaptor by a roll pin which is secured to the adaptor and passes through a slot in the locating pin. This permits the adaptor to slide on the

locating pin and make all round contact with the inner wing lower skin when the aircraft weight is taken by the jack.

37 The fuselage jacking pad is located on the jack by a ball pin and is retained in position to the fuselage lower skin by three attachment bolts. The jack seats on the ball portion of the ball pin.

38 The wing and fuselage jacks must each be capable of lifting 20 tons.

39 The aircraft must not be jacked with more than 11,000 lb of fuel aboard (1400 gal Imperial - 1680 gal U.S.).

ARROW 1 SERVICE DATA

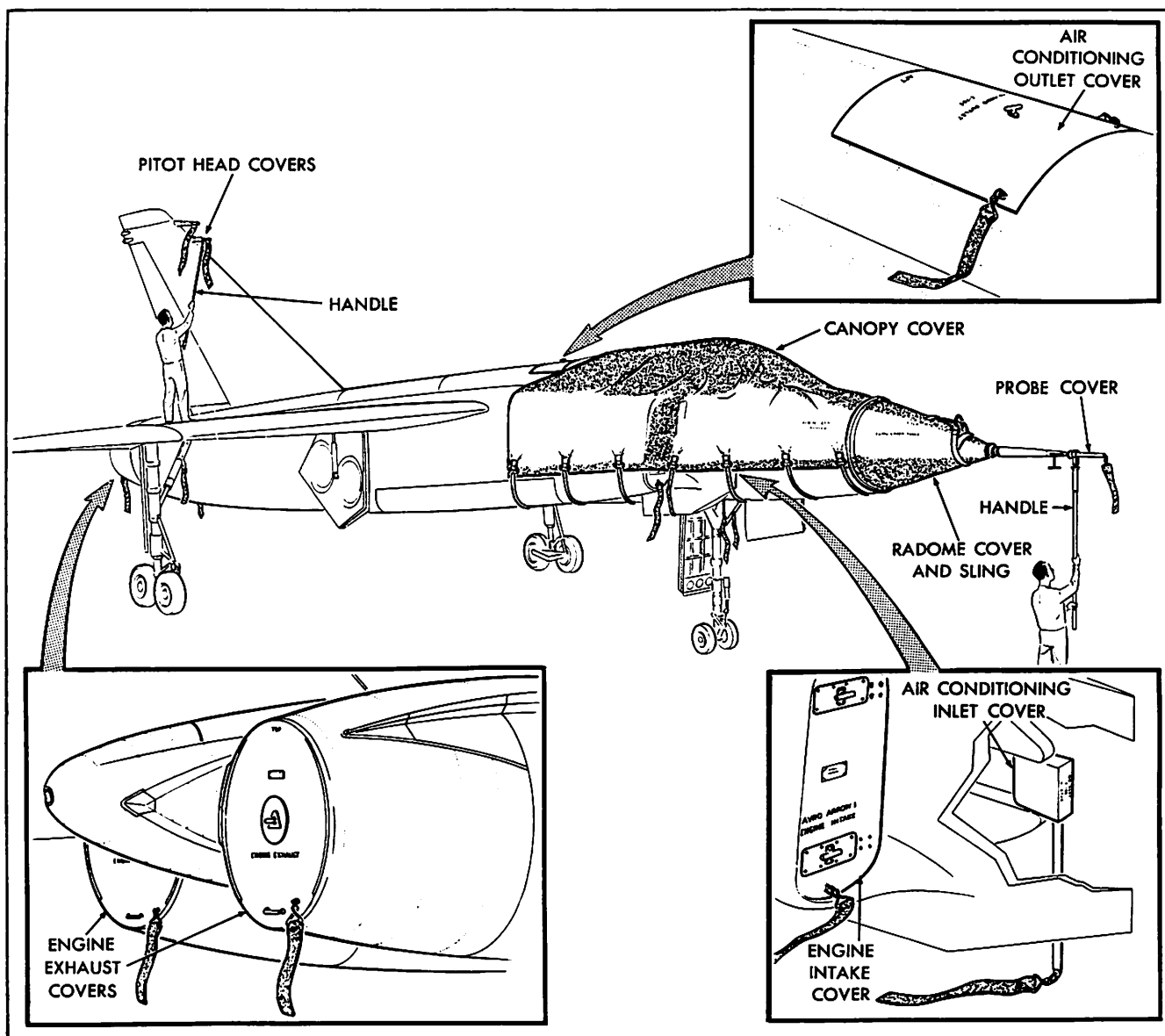
JACKING REQUIREMENTS

40 Due to the relative positions of the C of G and the aircraft wheels it is possible, if certain components are removed, that the C of G might move backwards to a point where the nose wheels would lift off the ground.

41 Before removing components, the decision as to whether the aircraft should be jacked should be governed by the following general rules:

(a) When the aircraft is fully refuelled and the instrument pack is fitted, the aircraft is stable on its wheels when any components which would be removed during normal maintenance operations are removed.

(b) When the aircraft is fully refuelled and the instrument pack is removed, the aircraft is stable on its wheels except when the radome and radar nose equipment is removed, or when a considerable number of components forward of the main landing gear are removed. In these cases the instrument pack must be refitted or

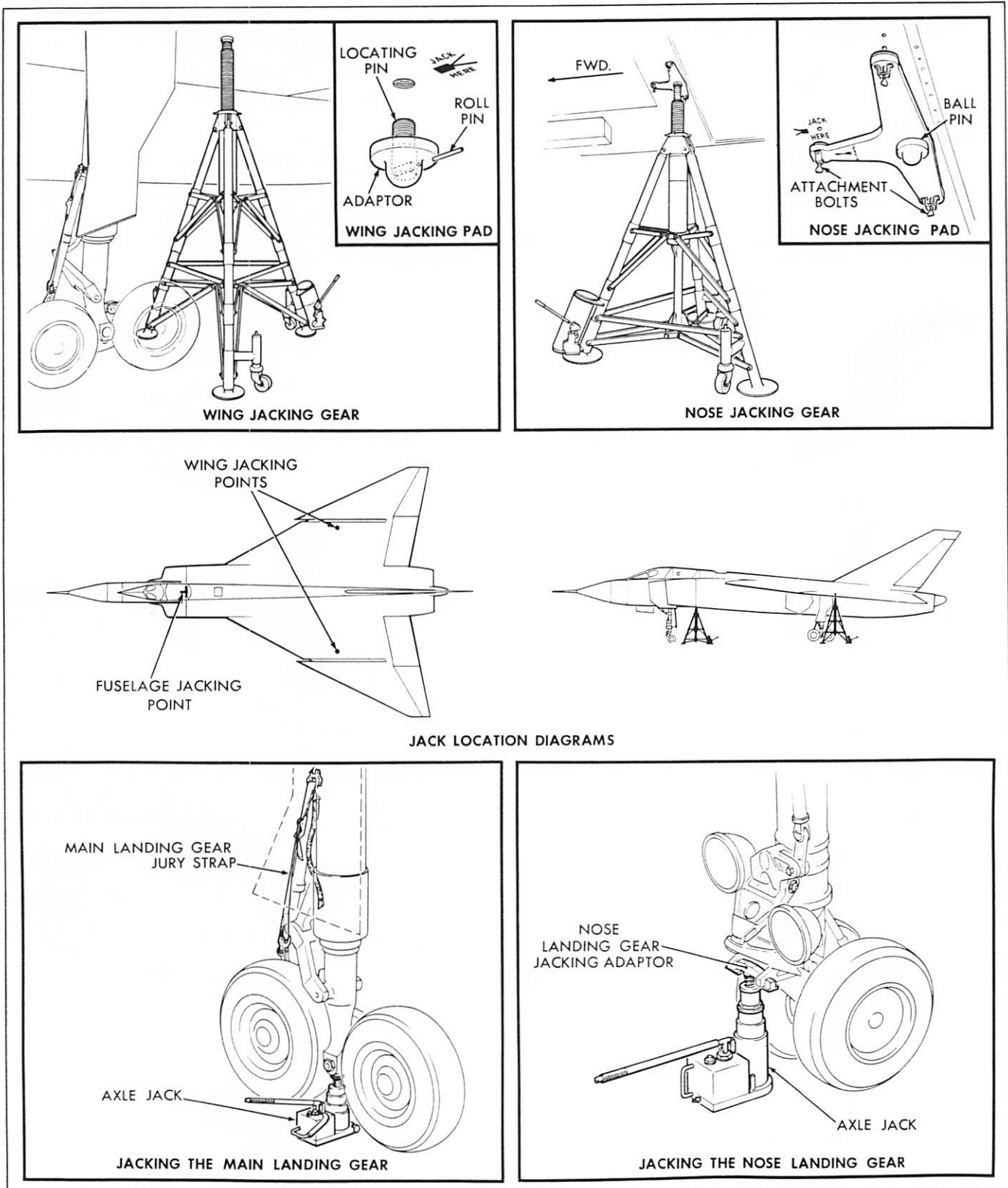


VI-1108-2

FIG. 9 COVERS

UNCLASSIFIED

ARROW 1 SERVICE DATA



7M1-1102-1

FIG. 10 JACKING

ARROW 1 SERVICE DATA

the aircraft defuelled to less than 11,000 lb and jacked.

(c) When the aircraft is defuelled, and whether or not the instrument pack is fitted, it should be jacked before any major components forward of the main landing gear are removed.

JACKING THE AIRCRAFT (Fig 10)

42 Before jacking ensure that the aircraft is on level surface and that there is ample clearance above the aircraft.

43 To jack the aircraft proceed as follows:

(a) Fit the wing and fuselage jacking pads.

(b) Position the jacks to the jacking pads and simultaneously raise all three jacks until the weight of the aircraft is just supported by the jacks. Check each jack foot for correct contact with the ground.

(c) Raise the jacks until the desired height is reached and lock the jacks.

JACKING FOR A WHEEL CHANGE (Fig 10)

44 When changing a nose or main wheel, it is not necessary to jack the entire aircraft. The appropriate landing gear may be jacked individually by means of an axle jack. The axle jack used for jacking the nose landing gear must be capable of lifting seven tons, and the axle jack used for jacking the main landing gear must be capable of lifting 15 tons.

45 To jack the nose landing gear proceed as follows:

(a) Chock the main wheels fore and aft.

(b) Fit the nose landing gear jacking adaptor and jack the nose landing gear as shown in fig 10.

46 To jack a main landing gear proceed as follows:

(a) Chock the wheels on the nose landing gear and the opposite main landing gear, fore and aft.

(b) Fit the main landing gear jury strap to the landing gear to be jacked by inserting

the strap ball-lock pins, one to the tie rod upper attachment fitting, and one to the tie rod lower attachment fitting. This prevents tilting of the bogie beam when the landing gear is raised.

(c) Jack the main landing gear as shown in fig 10.

LEVELLING THE AIRCRAFT (Fig 11)

47 There is provision to level the aircraft laterally, but due to the height to which the wing jacks would have to be raised to position the fuselage datum line level, the aircraft is not normally levelled longitudinally.

48 To level the aircraft laterally proceed as follows:

(a) Jack the aircraft. See para 42.

(b) Fit the alignment fixture to the top of the nose landing gear. See fig 11.

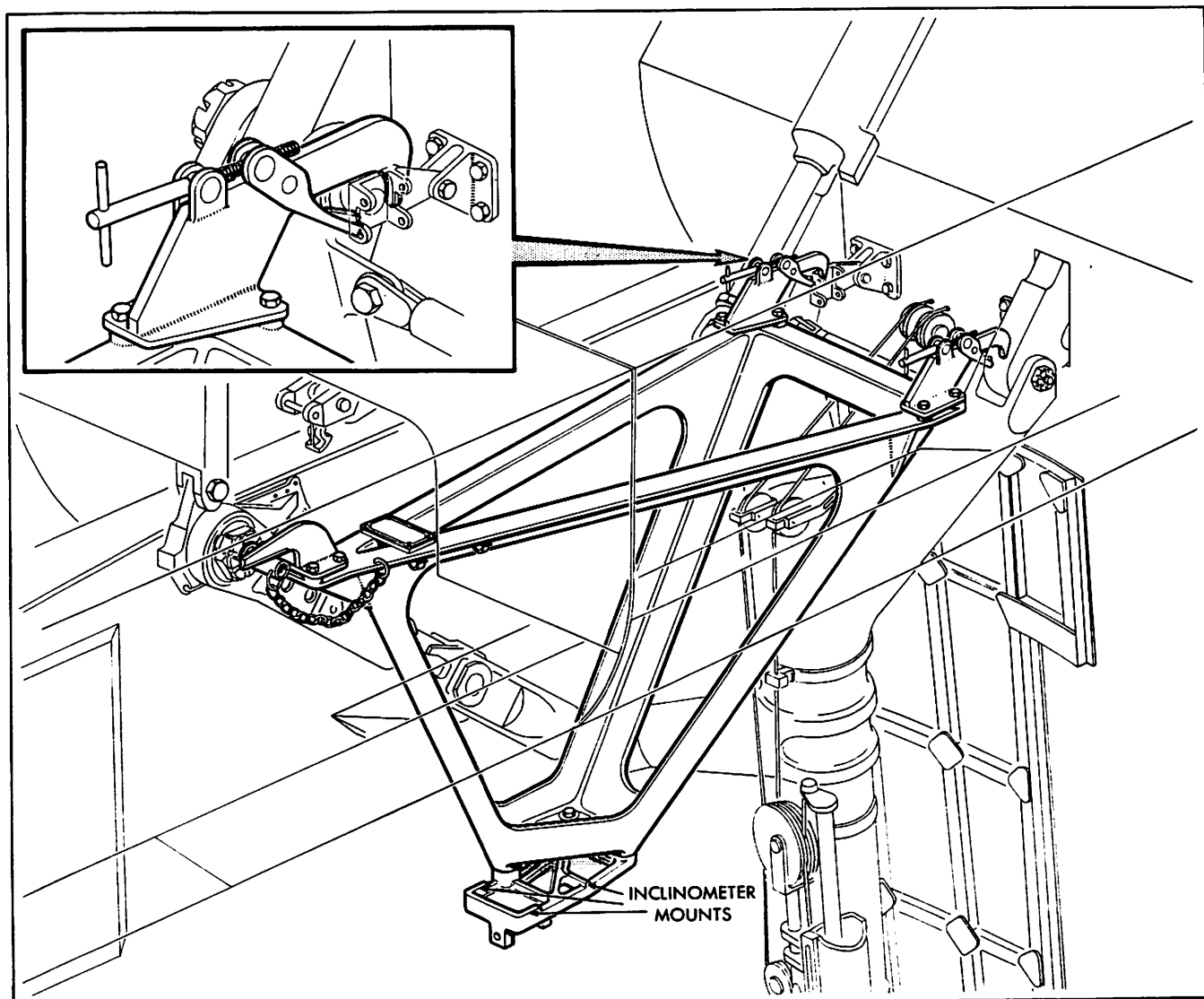
(c) Adjust the height of the wing jacks until the lateral inclinometer mounts on the alignment fixture are level. This may be determined by means of a spirit level.

ACCESS EQUIPMENT (Fig 12)

49 To protect the high speed finish of the aircraft surfaces, ten rubber wing mats, and two sets of intake duct walkways are provided. When in position, six of the rubber mats form a walkway along each side of the dorsal fairings and the vertical stabilizer. The other four wing mats may be positioned on the wing top skin as required during servicing. Rubber soled shoes must be worn by servicing personnel when it is necessary to walk along the top of the wings.

50 A cockpit access ladder is provided to gain access to the pilot's and navigator's cockpits and to gain access to the top of the wings during ground servicing. The ladder is retractable by a hydraulically operated mechanism, and a towing arm is provided to facilitate transportation. The ladder must be lowered before towing.

51 Four adjustable maintenance platforms are required for normal servicing. These are:



7M1-1730-1

FIG. 11 AIRCRAFT ALIGNMENT FIXTURE

(a) Fuselage maintenance stand, which is adjustable from 13 inches to 49 inches.

(b) B4 stand, Ref 4G/1596, which is adjustable from three feet to seven feet.

(c) B5 stand, Ref 4G/2614, which is adjustable from seven feet to 12 feet.

(d) B2 stand, Ref 4G/1230, which is adjustable from 13 feet to 20 feet. See EO 65A-65C-2.

AIRCRAFT SLINGS (Figs 13 and 14)

52 Two aircraft slings are provided, one

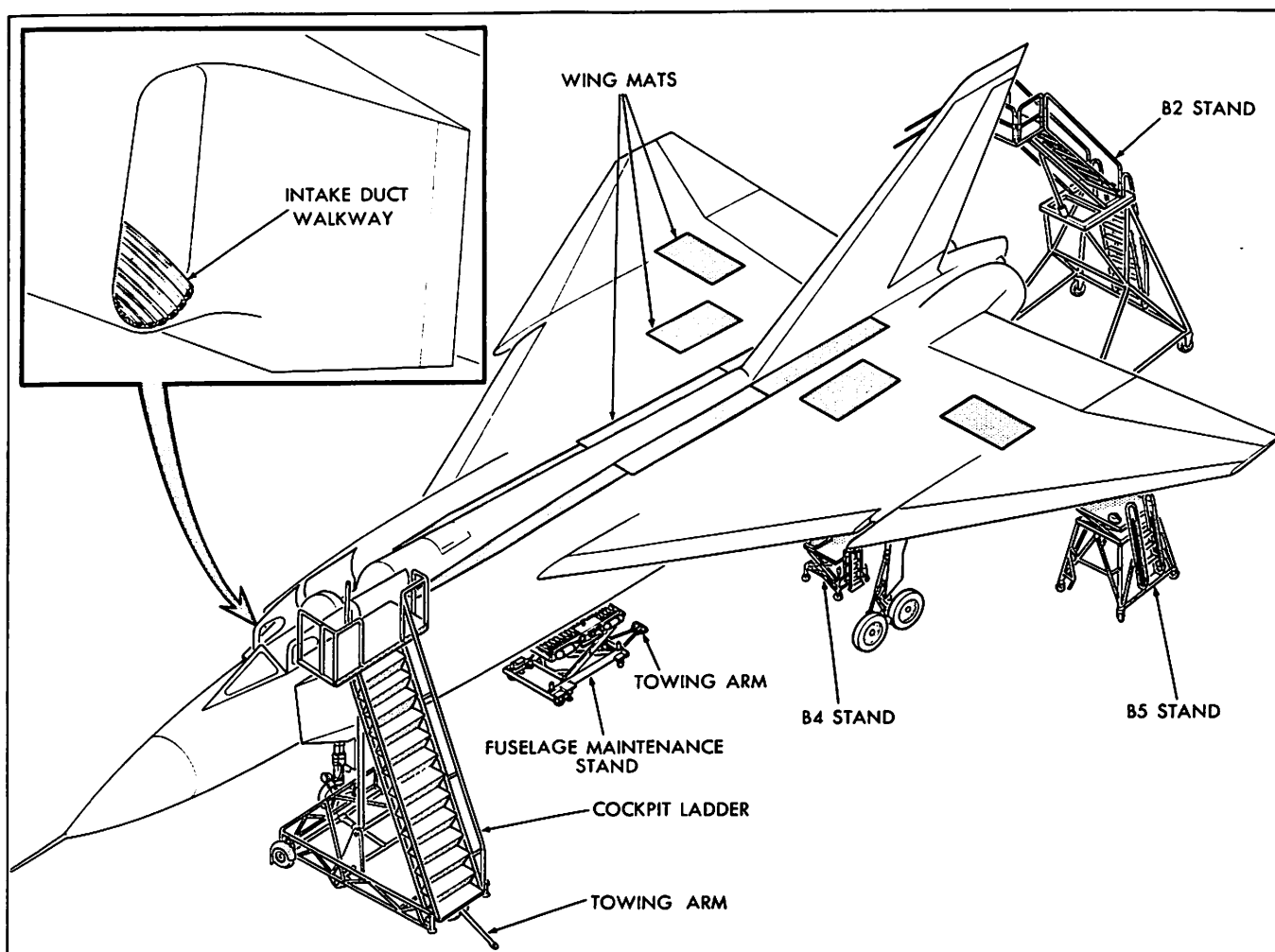
for slinging the complete aircraft (see fig 13) and one for slinging the nose (see fig 14).

53 The only occasion when it is necessary to sling the complete aircraft is during a salvage operation. The sling is designed to support the aircraft in an all-up load condition so that quick removal of a crashed aircraft from the runway is possible, regardless of the aircraft loading. In order to attach the sling, a small area of each inner wing skin must be cut out.

54 The nose sling is designed to support the nose when the aircraft is in its fully loaded condition.

ARROW 1 SERVICE DATA

UNCLASSIFIED



TM1-11C9-2

FIG. 12 ACCESS EQUIPMENT

ARROW 1 SERVICE DATA

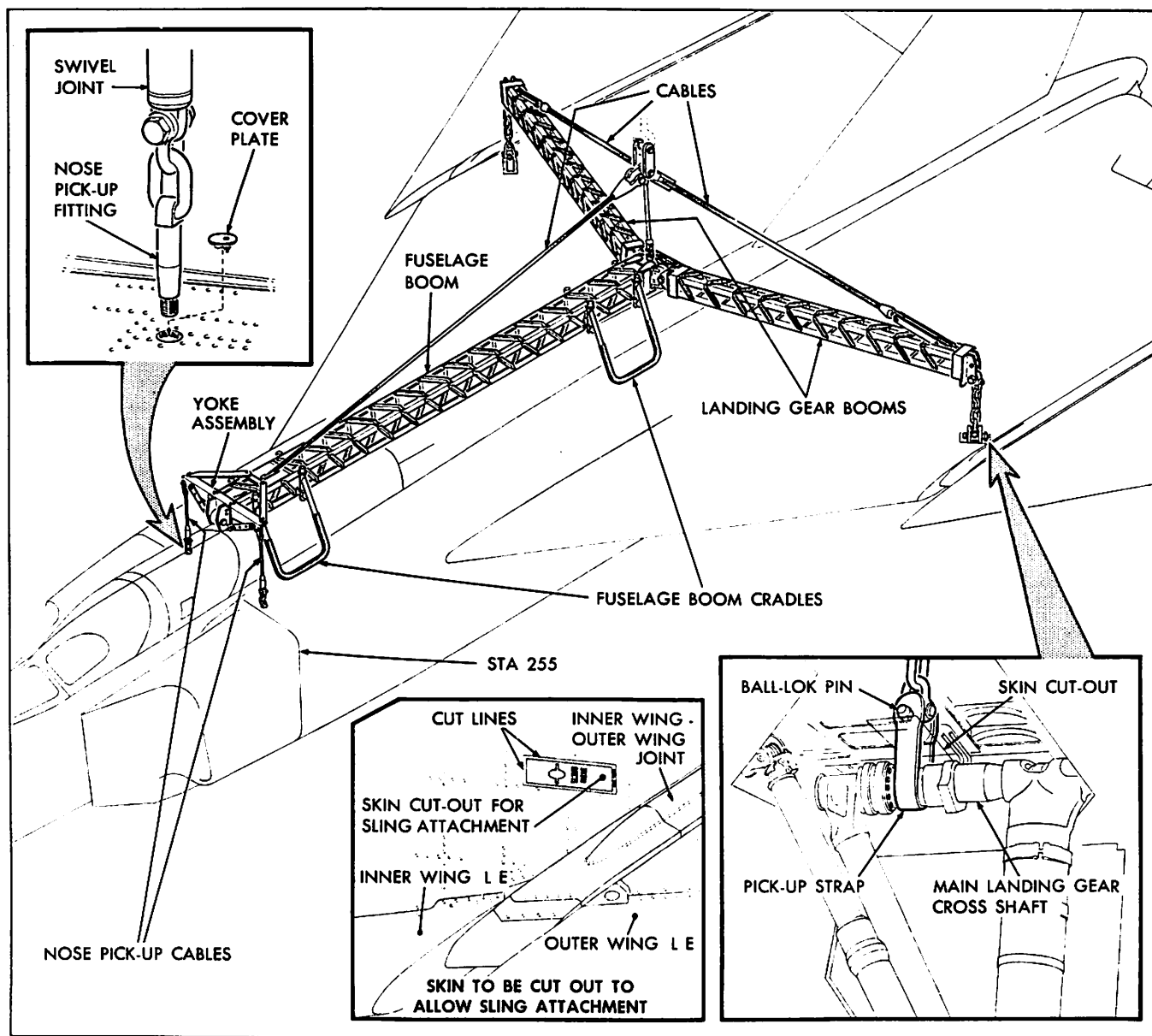
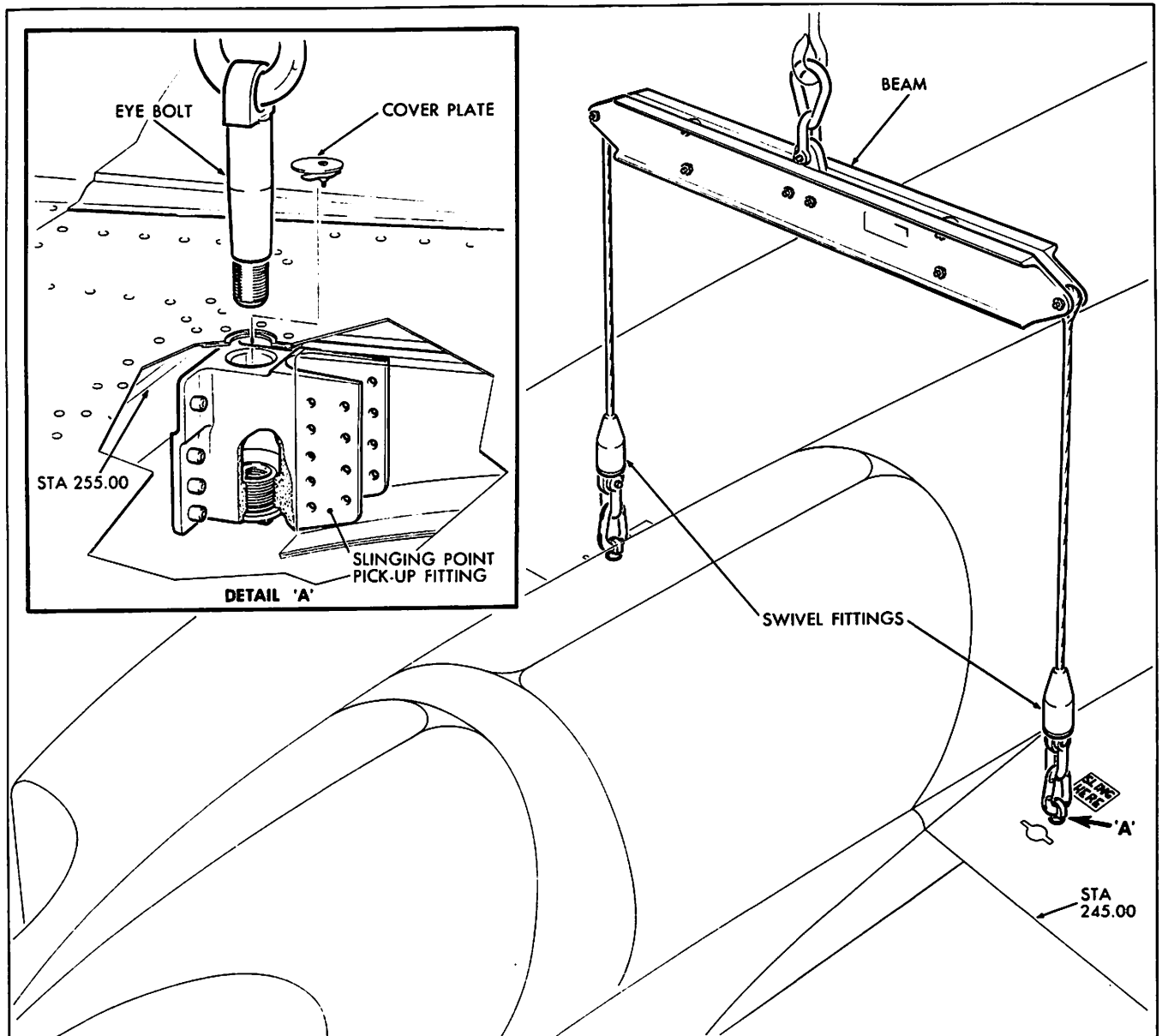


FIG. 13 SLINGING THE COMPLETE AIRCRAFT

ARROW 1 SERVICE DATA



7W1-1111-1

FIG. 14 NOSE SLINGING

ARROW 1 SERVICE DATA

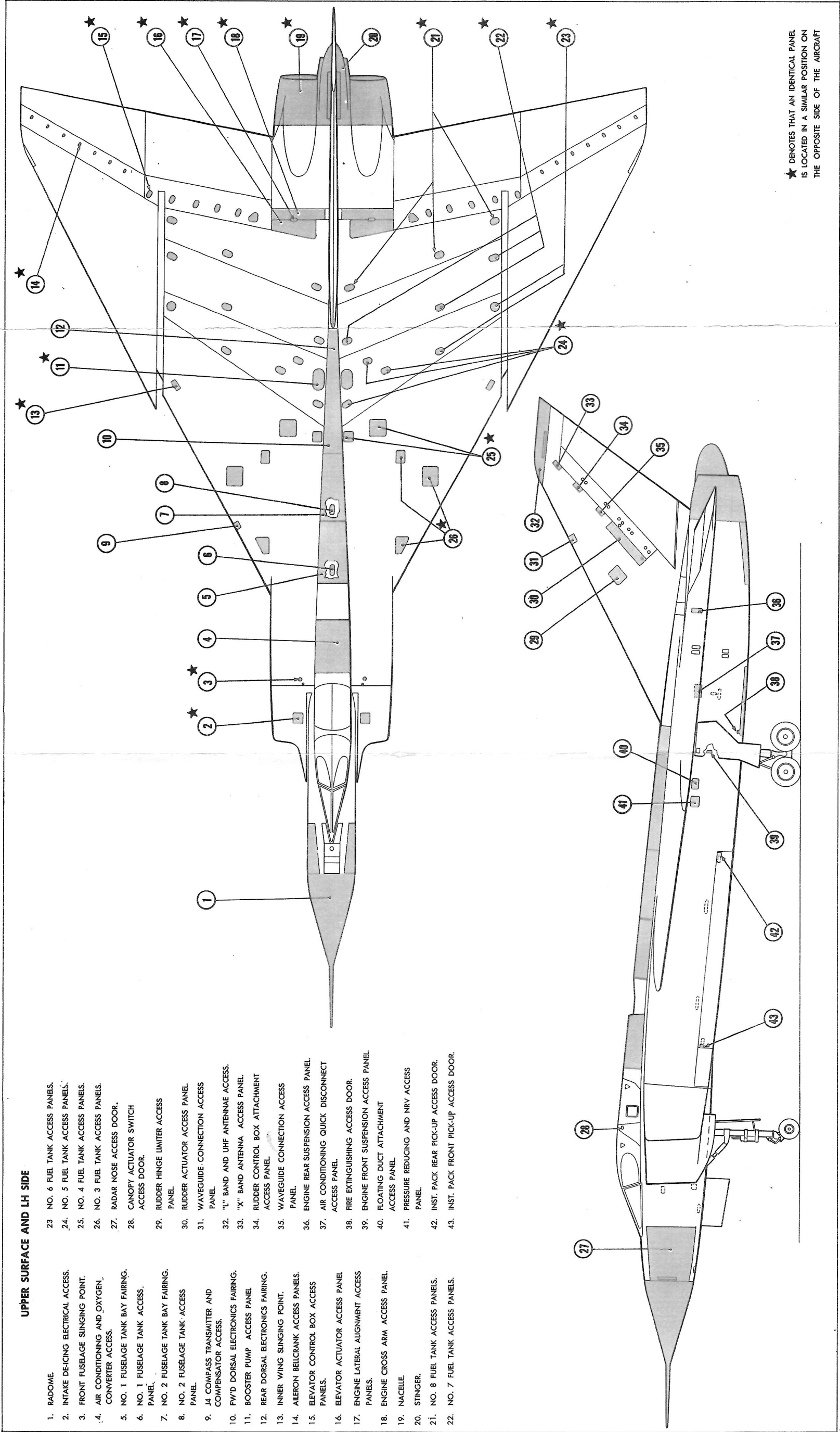


FIG. 15 ACCESS PANELS UPPER SURFACE AND LH SIDE

ARROW 1 SERVICE DATA

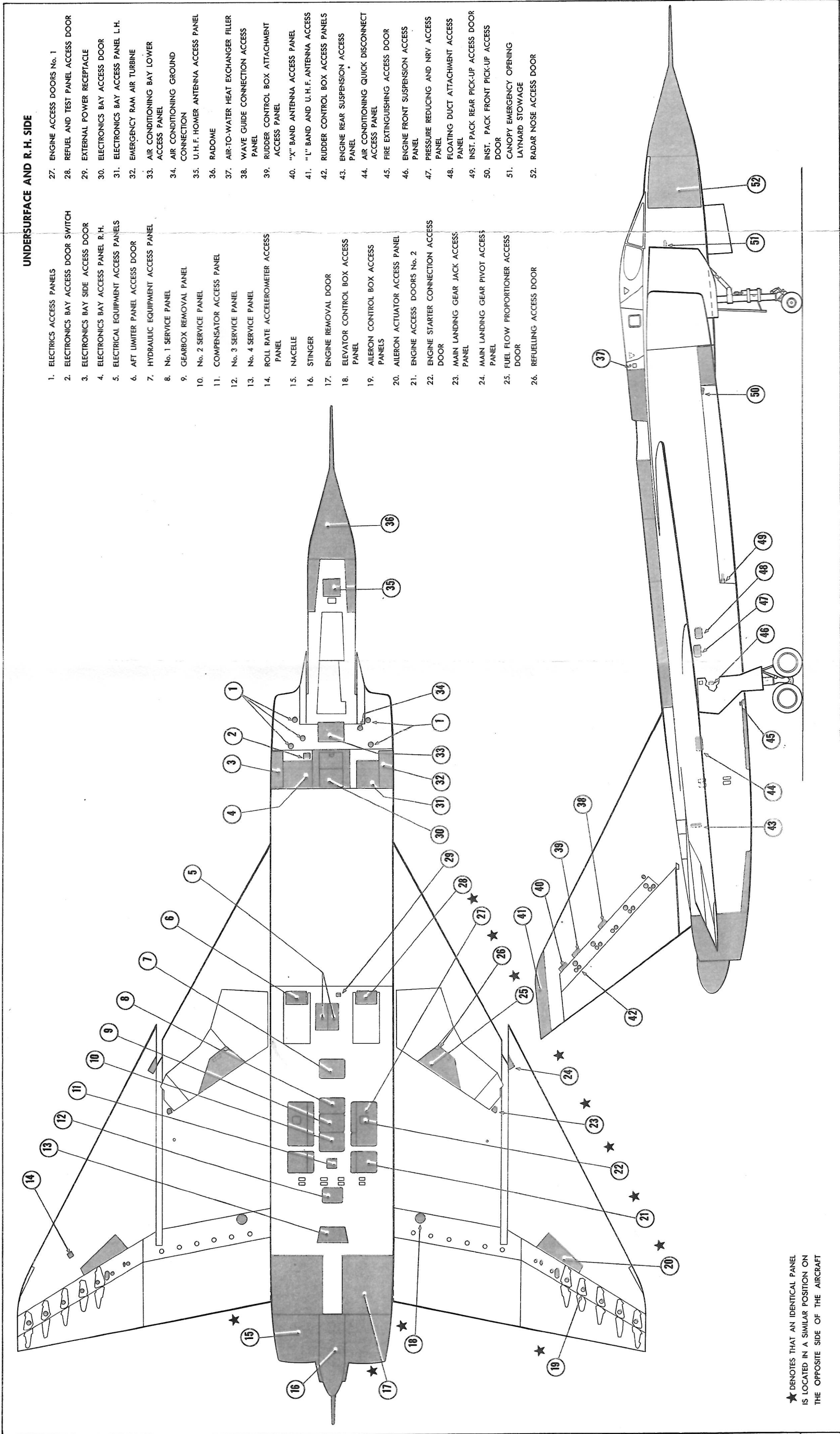


FIG. 16 ACCESS PANELS UNDERSURFACE AND RH SIDE

ARROW 1 SERVICE DATA

LEADING PARTICULARS

FUEL SYSTEM

Tank Capacities

TANK NO.	NO. OF TANKS	CAPACITY OF EACH TANK		TOTAL VOLUME OF USABLE FUEL	
1 Fuselage	1	308 imp	370 US gal	263 imp	316 US gal
2 Fuselage	1	307 imp	371 US gal	259 imp	311 US gal
3 Wing	2	165 imp	198 US gal	302 imp	362 US gal
4 Wing	2	101 imp	121 US gal	180 imp	216 US gal
5 Collector	2	170 imp	204 US gal	292 imp	350 US gal
6 Wing	2	176 imp	211 US gal	308 imp	370 US gal
7 Wing	2	322 imp	386 US gal	558 imp	670 US gal
8 Wing	2	207 imp	248 US gal	346 imp	415 US gal
TOTAL FUEL CAPACITY		2,508 imp	3,010 US gal	19,562 lb.	

Tank Pressure - Wings

25 psia (initial flights 1st aircraft)

19 psia (subsequently)

- Fuselage

10 psi differential (initial flights 1st aircraft)

7.5 psi differential (subsequently)

Pressure Refuelling

One point in each wing

ENGINES

Designation

Pratt and Whitney J75 P3 (1st aircraft)

J75 P5 (subsequently)

Twin spool axial flow gas turbine with afterburner

Fuel specification

3GP-22B-1 Ref 34A/159

MIL-F-5624 Grade JP4 (U.S.)

D. Eng R.D. 2486 (U.K.)

F. 40 (NATO Symbol)

Oil specification

MIL-L-7808C Ref 34A/226

C-148 (NATO Symbol)

Oil tank capacity

5.5 gal U.S.

Usable Oil

3.5 gal U.S.

CONFIDENTIAL
UNCLASSIFIED

ARROW 1 SERVICE DATA

ACCESSORIES GEARBOX

Manufacturer	Sargeant Engineering
Accessories gearbox to engine ratio	0.823:1
Engine starter to engine ratio	0.823:1
Oil specification	As for engines
Gearbox oil capacity	1 gal. imp

MAIN LANDING GEAR

Type	Hydraulically retracted with twin wheels in tandem
Manufacturer and model	Dowty - XV 1283-1A LH XV 1283-1B RH
Track	25 feet 9 inches static 25 feet 7.6 inches touchdown
Shock absorber	Dowty liquid spring with recuperator
Fluid specification	Dowcan 200 silicone fluid
Recuperator	Dowty - V 1283-6A LH V 1283-6B RH
Wheels	Goodyear
Tires	Goodyear 29 x 7.7 Type VII tubeless
Inflation pressure	255 psi
Brakes	Goodyear hydraulically operated

NOSE LANDING GEAR

Type	Hydraulically retracted, steerable twin wheeled unit
Manufacturer and model	Jarry Hydraulics 1500
Shock absorber	Dowty liquid spring
Fluid specification	Dowcan 200 silicon fluid
Wheels	Dunlop
Tires	Dunlop 18 x 5.5 Type VII tubeless
Inflation pressure	170 psi

UTILITY HYDRAULICS

Fluid specification	3GP-26A Ref 34A/100 MIL-H-5606A (U.S.) D.T.D. 585 (U.K.) H-515 (NATO Symbol) Vickers constant delivery
Pumps (2)	4200-4250 psi
Pressure regulator setting	1500 psi
Reduced pressure	200 cu. in.
Accumulators System (1)	110 cu. in.
Emergency brakes (2)	60 cu. in.
Return surge damping (1)	Loud
Compensator (1)	5 gal. imp.
Compensator capacity	
Emergency Nitrogen System	
Manufacturer	Walter Kidde
Charging pressure	5000 psi
Bottle capacity (1)	300 cu. in.

ARROW 1 SERVICE DATA

FLYING CONTROL HYDRAULICS

Fluid specification	As for utility hydraulics
Pumps (2 each system)	Vickers variable delivery
Pump pressure	4000 psi
Reduced pressure	1250 psi
Accumulators System (1 each system)	Self displacing 100 cu. in.
Return surge damping	60 cu. in.
(1 each system)	
Booster circuit	25 cu. in.
(1 each system)	
Compensators (1 each system)	Loud dual pressurized
Compensator capacity	5 gal. imp.

EJECTION SEATS - 2

Manufacturer and type	Martin-Baker Mk C5
-----------------------	--------------------

OXYGEN SYSTEM

Liquid oxygen converter (1)	Aro Equipment Corp.
Converter capacity	5.0 litres
Regulators (2)	Firewell F 2400 - 11C
Supply pressure to regulators	70 psi
Emergency Oxygen System	
Bottles (2) gaseous	Walter Kidde
Bottle capacity	50 cu. in.
Charging pressure	1800 psi

FIRE EXTINGUISHER SYSTEM

Bottles (2)	Walter Kidde
Extinguishant	Freon 12B2
Capacity of each bottle	12 lb
Nitrogen pressure	400 psi at 70°F

ENGINE DE-ICING

Type	Hot air bleed from compressor
------	-------------------------------

AIRFRAME DE-ICING

Pilot's windshield and side panels	Electro-thermal
Engine intake and ramp	Electro-thermal

ELECTRICAL SYSTEM AC

Constant speed unit	General Electric
Alternators	Lucas Rotax
	115/200 volts AC. 400 cycles 3 phase

ARROW 1 SERVICE DATA

ELECTRICAL SYSTEM DC

Transformer rectifier unit
Battery

Lucas Rotax 28 volts
Societe Des Accumulateurs Fixes et
de Traction
24 volts 15 amp/hr nickel cadmium

AIR CONDITIONING SYSTEM

Cooling turbine and fan unit
Air-to-air heat exchanger
Air-to-water heat exchanger

Airesearch 201970
Airesearch 83940
Surface Combustion SK 6424

PRINCIPAL DIMENSIONS

AIRCRAFT DIMENSIONS

Wing span
Length of fuselage (not including probe)
Overall length of aircraft
Height to top of canopy (static)
Height to top of vertical stabilizer (static)
Height to wing tip (static)
Angle of datum line to ground (static)

50 ft.
74 ft. 5 in.
83 ft.
14 ft. 6 in. (approx.)
20 ft. 6 in. (approx.)
6 ft. 10 in. (approx.)
4° 33'

WEIGHT

Operational weight empty (no fuel)
Maximum A.U.W.
Maximum landing weight

49,040 lb.
68,602 lb. (ballasted to 31% of M.A.C.)
55,000 lb.

WINGS

```
Type
Aerofoil section inner wing - Profile
                                - Camber
Aerofoil section outer wing - Profile
                                - Camber
```

Delta
NACA .0003.5-6-3.7 (Mod)
.0075 (Mod)
NACA .0003.5-6-3.7 (Mod)
.0003.8-6-3.7 (Mod)
As for inner wing

Chord at root
Incidence at root
Incidence at tip
Anhedral
Sweepback at leading edge inner wing
Sweepback at leading edge outer wing
Sweepback at trailing edge
Mean aerodynamic chord

45 ft.
0°
0°
4°
61°28'
63°23'
11°12'
30 ft. 2.6 in.

ARROW 1 SERVICE DATA

VERTICAL STABILIZER

Aerofoil section	NACA 0004-6-3.7 (Mod)
Chord at root	19 ft.
Chord at tip	5 ft. 8 in.
Mean aerodynamic chord	13 ft. 6 in.
Sweepback at leading edge	59° 20'
Sweepback at trailing edge	33° 5'

FUSELAGE

Width	9 ft. 9 in.
-------	-------------

AREAS

Wings including ailerons, elevators and 390 sq. feet of fuselage	1225 sq. ft.
Ailerons (two)	66.55 sq. ft.
Elevators (two)	106.9 sq. ft.
Vertical stabilizer including rudder	158.79 sq. ft.
Rudder	38.17 sq. ft.
Speed brakes (two)	14.367 sq. ft.

C OF G LIMITS

Forward limit	28% of M.A.C. Station 537.35
Aft limit	31% of M.A.C. Station 548.23

ARROW 1 SERVICE DATA

SECTION 2

STRUCTURE

15 FEB 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Adhesives	2
Inner Wing	2
Elevators	5
Outer Wing	5
Ailerons	6
Vertical Stabilizer	7
Rudder	8
Radome	11
Radar Nose	11
Front Fuselage	11
Centre Fuselage	11
Duct Bay	15
Engine Bay	17
Rear Fuselage	18
INSPECTION (To be issued later)	
COMPONENT SERVICE DATA	
Radome	21
Panel - Access - De-icing Equipment	23
Panel - Access - De-icing Equipment	25
Panel - Access - De-icing Tank	27
Panel - Access - UHF Homer Antenna	29
Door - Radar Access	31
Panel - Access - Air Conditioning Bay	33
Windshield	35
Panel - Access - Pilot's RH Front Console	37
Panel - Access - Pilot's LH Front Console	39
Panel - Access - Pilot's RH Rear Console	41
Panel - Access - Pilot's LH Rear Console	43
Panel - Access - Navigator's Rear Console	45
Panel - Access - Navigator's Rear Console	47
Door - Canopy Emergency Opening	49
Fairing - Dorsal - Air Conditioning Access	51
Door - Electronic Equipment Lower Access	53
Door - Electronic Equipment Side Access RH	55
Panel - Access - Air Conditioning Bay	57
Fairings - Dorsal - Fuselage Fuel Tanks	59
Panel - Access - Electronics Bay LH	61
Panel - Access - Electronics Bay RH	63
Door - Access - Electronics Bay Panel Actuator Switch	65
Panels - Access - Fuselage Fuel Tanks	67
Panels - Access - De-icing Distributors	69
Panels - Access - Electrics	71
Panel - Access - Hydraulic Equipment	73
Panel - Access - Electrical Equipment	75

UNCLASSIFIED

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
Panel - Access - Electrical Equipment	77
Panel - Access - Pressure Reducing and NRV	79
Panels - Access - Floating Duct Attachment	81
Panels - Access - Engine Upper Forward Suspension Struts	83
Panels - Access - Engine Lower Forward Suspension Struts	85
Panels - Access - Refuelling and Limiter	87
Panel - Access - External Power Supply	89
Panel - Service - No. 1	91
Panel - Service - No. 2	93
Panel - Service - No. 3	95
Panel - Service - No. 4	97
Doors - Engine Access No. 1	99
Doors - Engine Access No. 2	101
Doors - Access - Engine Starting	103
Panels - Access - Gearbox	105
Panels - Access - Gearbox Drain	107
Panel - Compensator Removal	109
Panels - Access - Air Conditioning Manifold	111
Panels - Access - Engine Rear Inboard Suspension Strut	113
Panels - Access - Inner - Engine Rear Outboard Suspension Strut	115
Panels - Access - Outer - Engine Rear Outboard Suspension Strut	117
Doors - Fire Extinguishing	119
Blanket - Insulation - Top, Sta. 663-685	121
Blanket - Insulation - Top, Sta. 685-707	123
Blanket - Insulation - Top, Sta. 707-722	125
Blanket - Insulation - Top, Sta. 722-742.50	127
Blanket - Insulation - Inboard, Sta. 663-742.50	129
Blanket - Insulation - Bottom, Sta. 687-717	131
Blanket - Insulation - Bottom, Sta. 717-742	133
Blanket - Insulation - Bottom, Sta. 742-753	135
Blanket - Insulation - Top, Sta. 742-753	137
Blanket - Insulation - Inboard, Sta. 753-803	139
Blanket - Insulation - Top, Sta. 753-778	141
Blanket - Insulation - Top, Sta. 778-803	143
Blanket - Insulation - Lower Inboard, Sta. 753-803	145
Blanket - Insulation - Engine Removal Door	147
Blanket - Insulation - Engine Removal Door	149
Blanket - Insulation - Engine Removal Door	151
Blanket - Insulation - Engine Rail Guides	153
Blanket - Insulation - Stinger, Sta. 803-820	155
Blanket - Insulation - Stinger, Sta. 820-842	157
Doors - Engine Removal	159
Doors - Refuelling	161
Panels - Access - Elevator Actuator	163
Panels - Access - Fuel Tank No. 3	165
Panels - Access - Fuel Tank No. 4	167
Panels - Access - Fuel Tank No. 5	169
Panels - Access - Fuel Tank No. 6	171
Panels - Access - Fuel Tank No. 7	173

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
Panels - Access - Fuel Tank No. 8	175
Panels - Access - Elevator Control Box	177
Panels - Access - Elevator Control Box	179
Panels - Access - Engine Lateral Alignment	181
Panels - Access - Engine Rear Suspension Struts	183
Panel - Access - J4 Compass Transmitter and Compensator	185
Panels - Access - Main Landing Gear Jack	187
Fairings - Dorsal - Electronic Equipment	189
Boxes - Elevator Control	191
Panel - Access - Dorsal Fairing	193
Panels - Access - Aileron Actuator	195
Fairings - Aileron Control Links	197
Panels - Access - Aileron Bellcranks	199
Boxes - Aileron Control	201
Panel - Access - Main Landing Gear Pivot	203
Speed Brakes	205
Ailerons	207
Elevators	209
Vertical Stabilizer	211
Panel - Access - Rudder Hinge Moment Limiter	213
Panel - Access - Rudder Actuator	215
Panels - Access - Rudder Control Box Attachment	217
Panels - Access - Waveguide Connection	219
Panels - Access - Waveguide Connection	221
Panels - Access - "X" Band Antenna	223
Box- Rudder Control	225
Rudder	227

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Symmetry Diagram	1
2	Station Diagram	3
3	Inner Wing	4
4	Elevator	6
5	Outer Wing	7
6	Aileron	8
7	Vertical Stabilizer	9
8	Rudder	10
9	Radome and Radar Nose	12
10	Front Fuselage	13
11	Centre Fuselage	14
12	Duct Bay	15

ARROW 1 SERVICE DATA

LIST OF ILLUSTRATIONS (Cont'd)

FIGURE	TITLE	PAGE
13	Speed Brake Attachment	16
14	Engine Bay Cooling Gills	16
15	Engine Bay	17
16	Engine Access Door Locking	18
17	Rear Fuselage	19

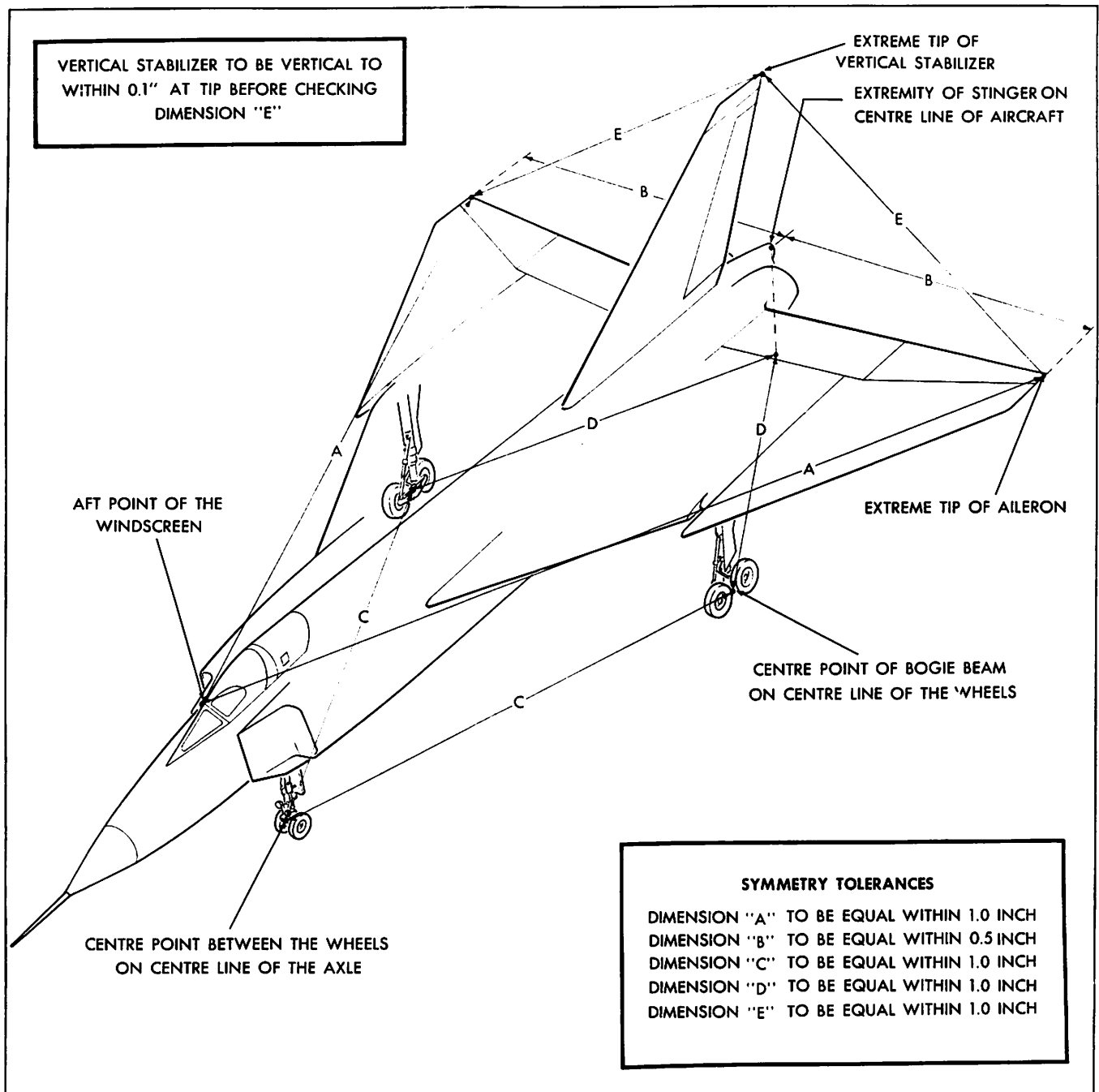
ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The aircraft structure is one integral assembly with the centre and torsion boxes of

the inner wing forming the basis of the structure. The fuselage and engines are suspended from the inner wing with bearings and hinges to provide a degree of flexibility. The outer wing is attached to the inner wing at a trans-port joint to form an aerodynamic step at the



7M1-1005-2

FIG. 1 SYMMETRY DIAGRAM

ARROW 1 SERVICE DATA

leading edge. The vertical stabilizer is attached to the inner wing centre box.

2 Access panels and service doors are incorporated to facilitate the removal, replacement and servicing of the aircraft systems and components.

3 For station referencing, the fuselage is measured along the longitudinal datum line from the radar nose datum point in inches. Forward of the radar nose datum point, minus station numbers are used. Wing station referencing is measured from the wing datum point at fuselage station 237.

ADHESIVES

4 Doublers are attached to various sections of the structure by the Narmco Metlbond 4021 synthetic resin adhesive process. This is carried out during manufacture using pressure and heat to cure the synthetic resin adhesive.

5 Honeycomb sandwich construction is used on various panels and fairings. The aluminum honeycomb is attached to the inner and outer skins using Shell Epon 422 adhesive and the tie in of the two skins is by Narmco Metlbond 4021 adhesive.

6 Glass cloth honeycomb sandwich construction is used in the fabrication of the two rear dorsal fairings. The adhesive used is Narmco Conolon 302 with Narmco Metlbond 4021 for the attachment of the metal edges.

7 The cabin pressure sealing is achieved with EC 1291 sealing compound, the sealing compound is diluted for use on faying surfaces. External gaps are filled with EPON 828 Filler compound.

INNER WING (Fig 3)

8 A centre box forms the joint between the LH and RH inner wing torsion boxes. It extends from station 571.25 to station 742.50 and is built in the form of a rectangular box. Forward of station 571.25 the box tapers to an 'I'-sectioned centre rib. Fitted to the upper surface of the centre box are the vertical stabilizer

attachment and shear fittings. On the under-surface of the centre box are fittings for the attachment of engine bay support struts, engine thrust beam, front support struts and miscellaneous fairleads and mounting brackets. The inner wing torsion boxes are each attached to the centre box and rib by shear fittings and double lap joints to form an integral assembly.

9 The LH and RH inner wing torsion boxes each consists of spars, ribs and outer skins. The spars and ribs 1 and 10 are milled from solid billets of aluminum alloy. Rib 4 is also milled from the solid, but is formed in three sections to fit between the spars. The intermediate ribs are of built-up construction and are each fitted in three sections. The upper and lower skins are manufactured in sections, with the skin joints along the spars. The sections are contour milled from solid billets to form integral stringers and provide increased skin thickness at access panel and attachment areas.

10 Each torsion box is sealed to form four integral fuel cells. For the sealing and layout of the fuel tanks see Arrow 1 Service Data - Fuel System.

11 Provision is made for fitting a jacking adaptor on rib 9 just aft of the centre forward spar.

12 The inner wing is extended forward from the torsion box main spar to the wing leading edge, to form the inner wing forward section. It houses two integral fuel tanks, the main landing gear bay and a bay for fuel system components.

13 The main structural members of the forward section are an auxiliary spar, a front spar and a fuselage rib which are all milled from solid billets. The auxiliary spar is a straight transverse spar extending from the aircraft centre line at station 485 to the front spar. The front spar forms the main member of the leading edge and extends from the forward end of rib 10 to join with the forward end of the fuselage rib. The fuselage rib is in two sections

ARROW 1 SERVICE DATA

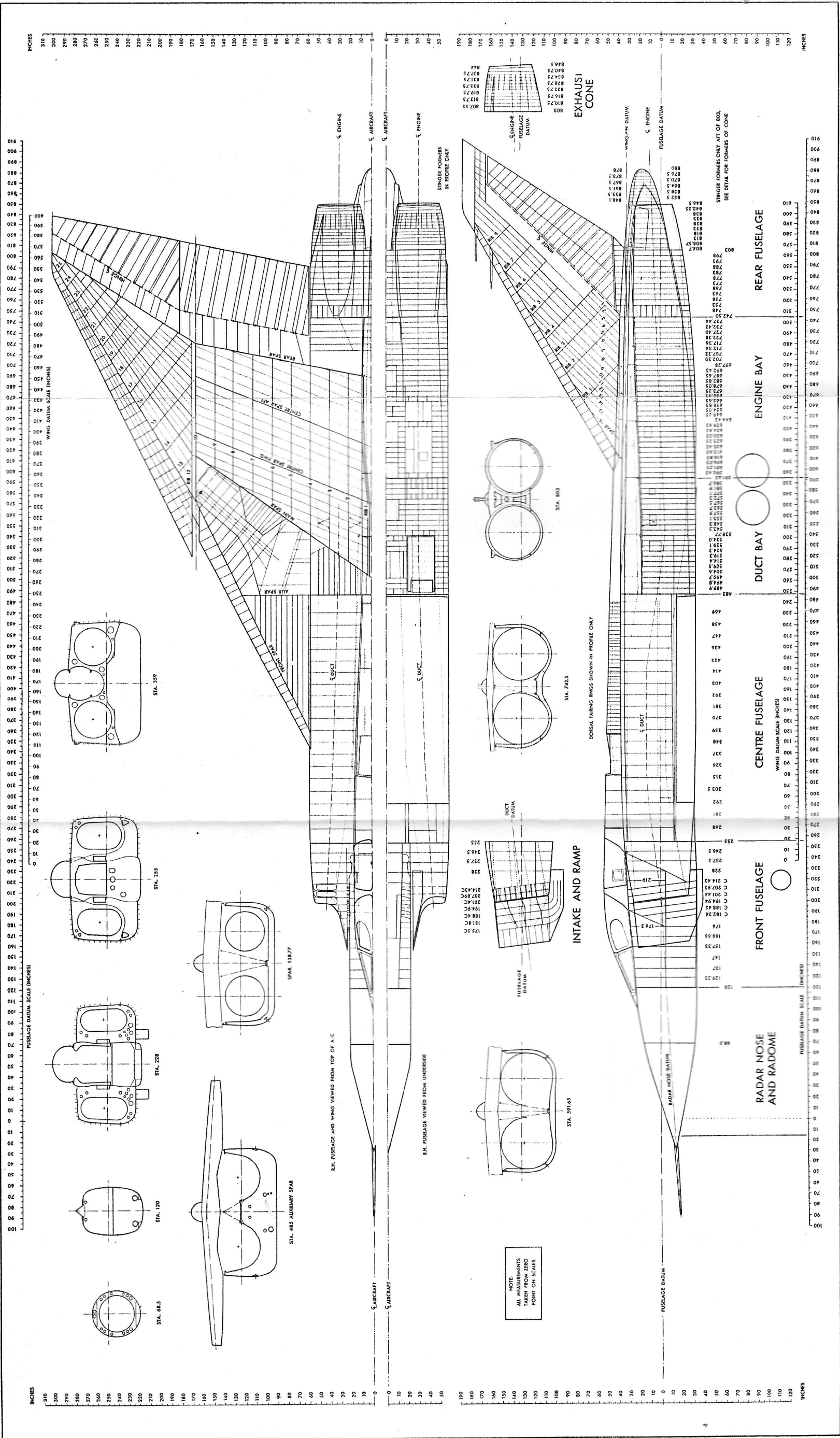


FIG. 2 STATION DIAGRAM

7M1-1001-1

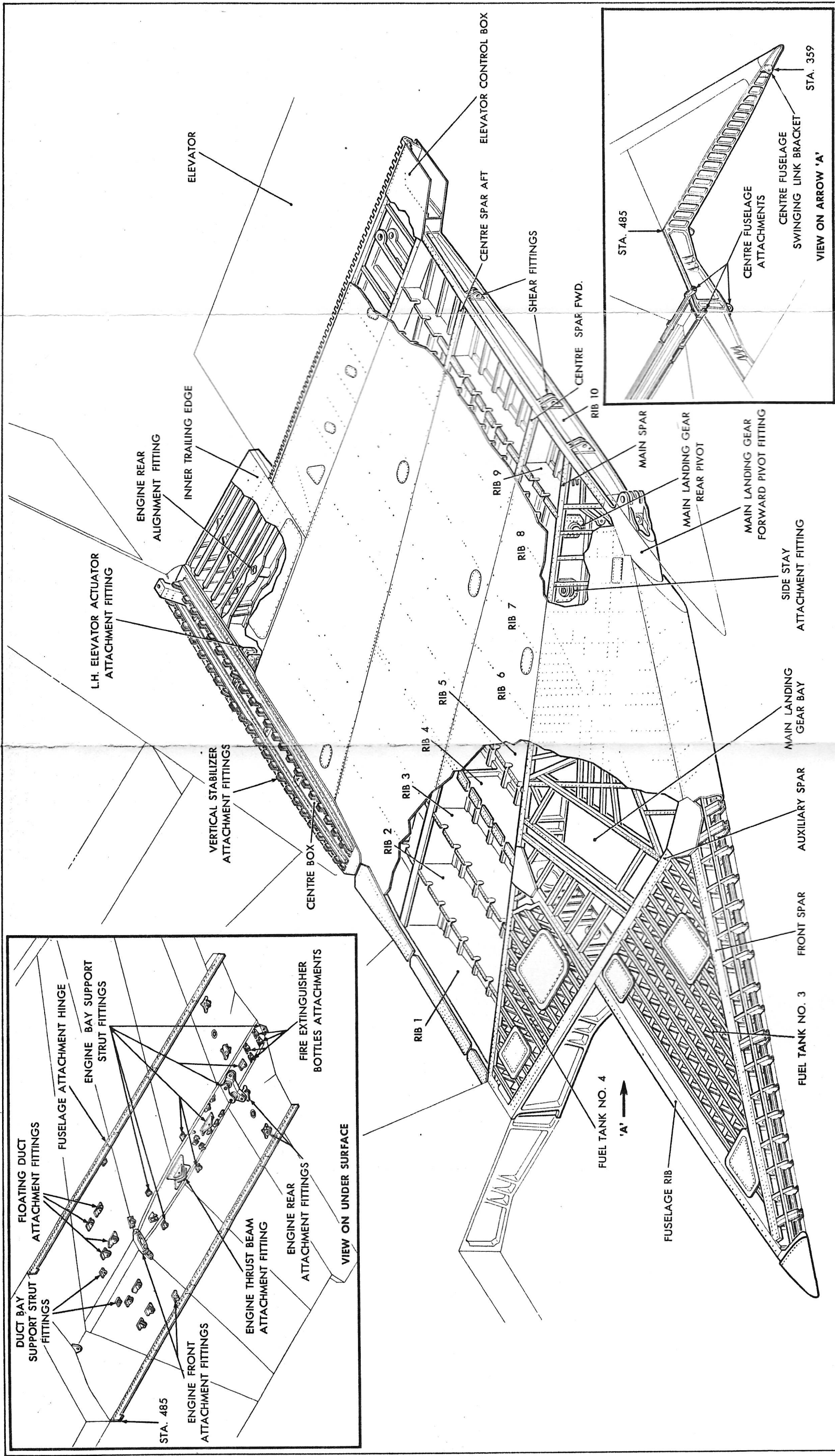
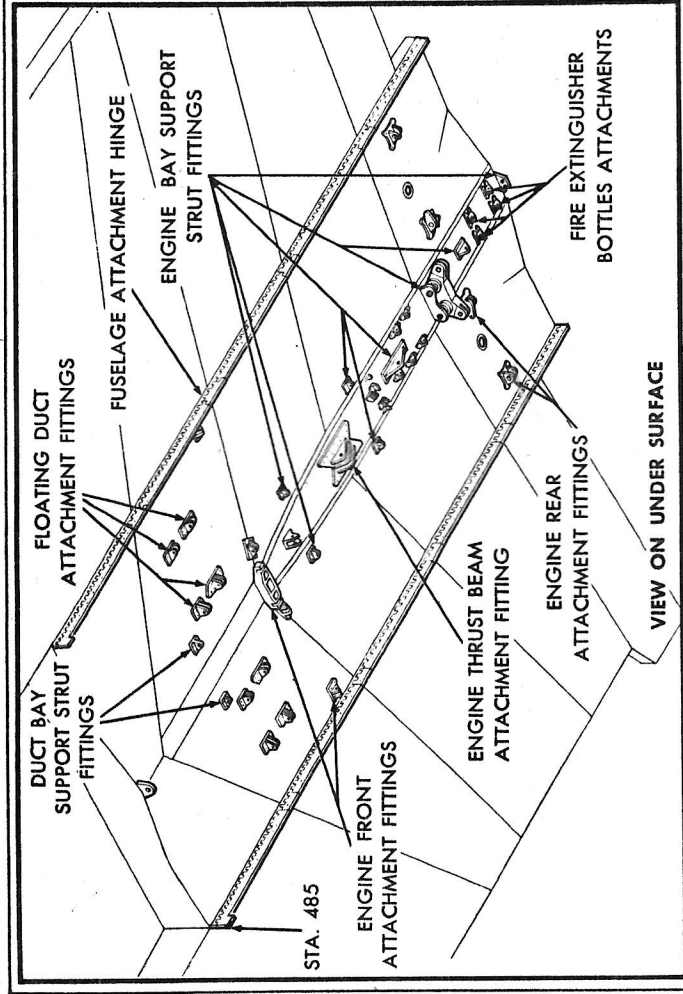
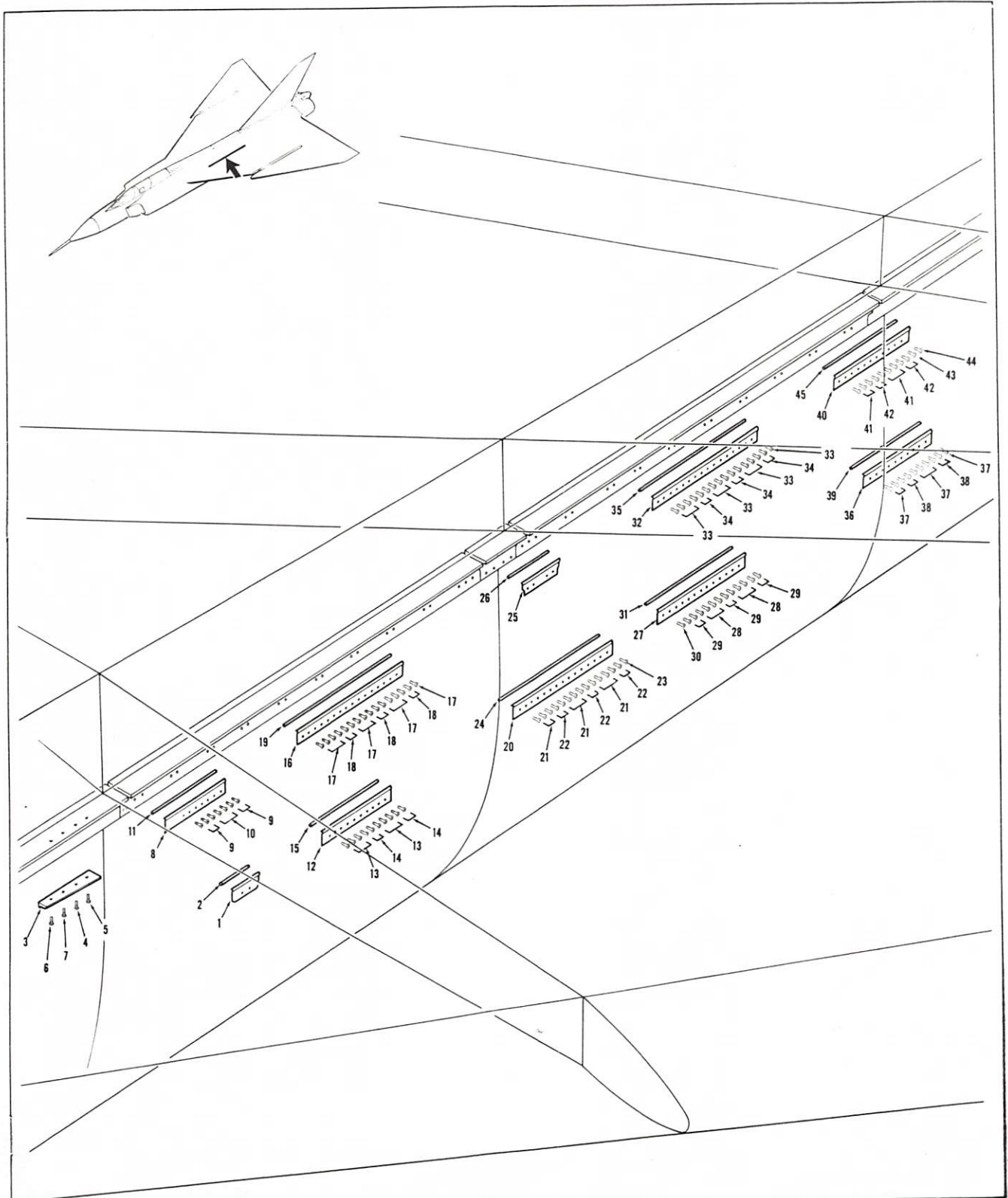


FIG. 3 INNER WING



ARROW Mk 2

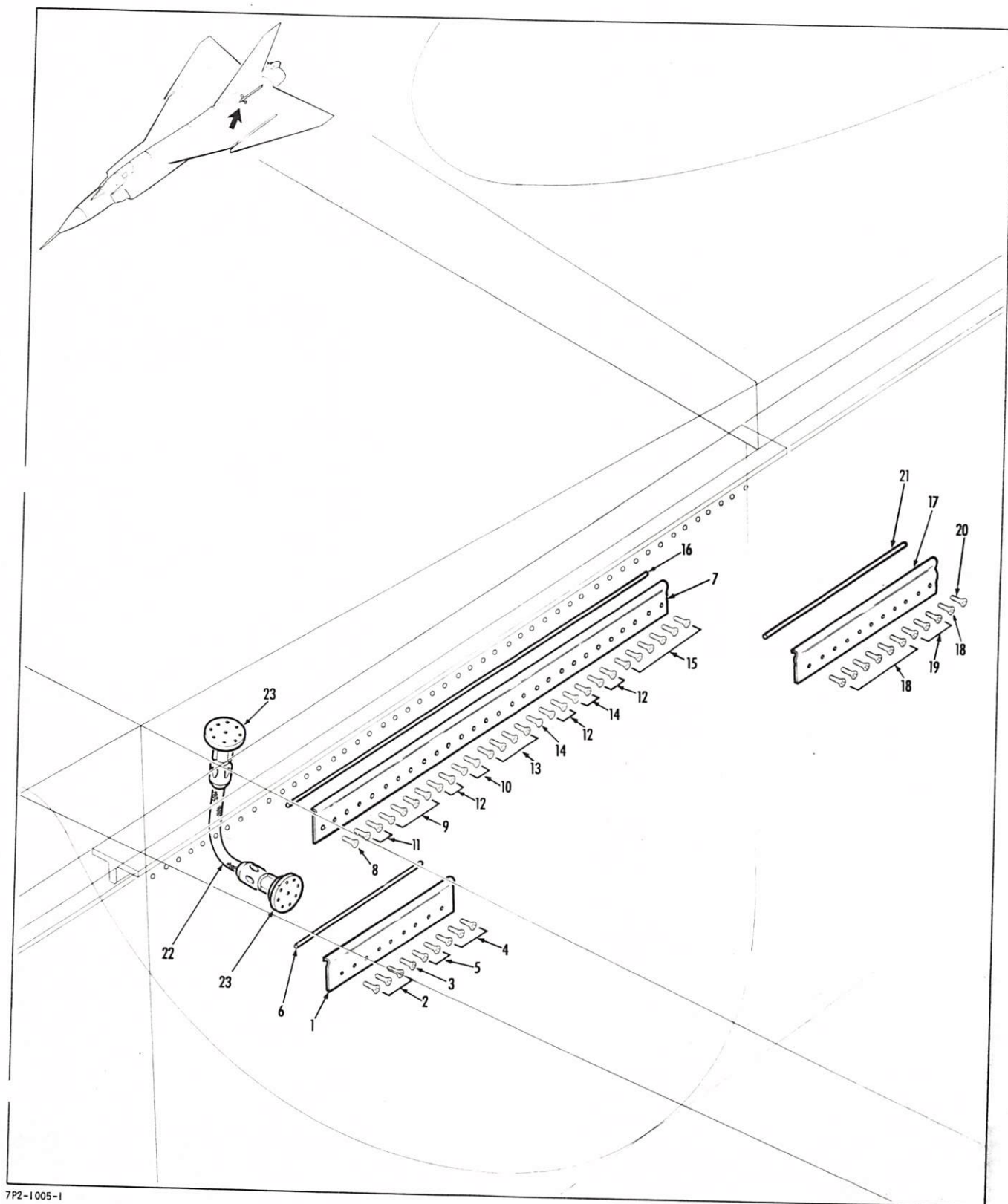


7P2-1003-1

WING-FUSELAGE ATTACHMENT HINGE



ARROW Mk 2



7P2-1005-1

WING-FUSELAGE ATTACHMENT HINGE

ARROW 1 SERVICE DATA

which are joined at the auxiliary spar, the rear section forming an extension of rib 4.

14 The centre fuselage is joined to the inner wing along the auxiliary spar and by a swinging link to the fuselage rib at station 359. A flexible stainless steel seal is fitted between the centre fuselage and the inner wing fuselage rib.

15 The inner wing leading edge is built up on the front spar and comprises ribs and stringers with an outer skin. The leading edge of the aerodynamic step is formed by the main landing gear forward pivot fitting.

16 The main landing gear forward pivot fitting is attached to the forward end of rib 10 and to the outboard end of the front spar. It is the attachment point for the outer wing front spar and carries the main landing gear front pivot bearing. The rear pivot bearing and the side stay bearing for the main landing gear are mounted in the main spar of the torsion box.

17 The landing gear bay upper skin is reinforced by stringers and a built-up beam at the landing gear 'up' position stops. For the description of the main landing gear doors and fairings see Arrow 1 Service Data - Main Landing Gear.

18 An integral fuel cell is formed between the fuselage rib, the auxiliary spar and the front spar and another between the auxiliary spar, the torsion box and the fuselage rib. Both fuel cells are internally braced by diagonal trusses and are sealed during manufacture. For the sealing and layout of the fuel cells see Arrow 1 Service Data - Fuel System. A small bay located at the rear of the landing gear bay is fitted with an access door and houses fuel system components.

19 The inner wing trailing edge is divided into two sections at an extension of rib 4 of the torsion box. The inboard section consists of six milled transverse beams, diagonally braced, and connected between an extension of rib 4 and the centre box. The two forward transverse beams carry the engine rear support and locating attachments. The bay between the forward transverse beam and the main torsion box houses the elevator actuator. The lower

skin is contour milled and the upper skin houses the elevator actuator access panels.

20 The inner wing outboard trailing edge forms the elevator control box. It consists of six main and five intermediate ribs, a trailing edge spar, an upper and a lower skin. The control box is attached to the inner and outer wing rear spars. The main ribs house the bearings for the elevator control linkage bell-crank pivot bolts. The upper skin houses access panels and the lower skin is removable as a complete unit to facilitate servicing of the control linkages. The trailing edge spar supports a piano type hinge for the elevator.

ELEVATORS (Fig 4)

21 The elevators are mounted on piano type hinges on the elevator control box trailing edge and extend from the fuselage side to the inboard end of the aileron. Each elevator is of stressed skin construction and consists of a hinge spar, fifteen ribs, a trailing edge member and an upper and a lower skin. Six ribs are reinforced to support the control link fittings and the skins are reinforced by doublers attached by the Narmco Metlbond 4021 process. A shroud fitted in sections along the bottom of the leading edge is detachable and provides access to the control link assemblies. Below each control link fitting an arm is fitted for locking the control link eccentric bearing locking plate.

OUTER WING (Fig 5)

22 Each outer wing consists of a torsion box, a leading edge assembly and an aileron control box. The outer wing is attached to the inner wing at a transport joint. The joint is attached by a split tapered sleeve and bolt at the front spar, four attachment bolts at the rear spar, double butt straps bolted to the upper and lower skins and three shear fittings.

23 The torsion box consists of the five spars interposed with ribs, and an upper and a lower skin reinforced by stringers. The skin sections are taper rolled, decreasing in thickness towards the tip and reinforced by the stringers which are interconnected by vertical compression struts. A bay with an access panel in the

ARROW 1 SERVICE DATA

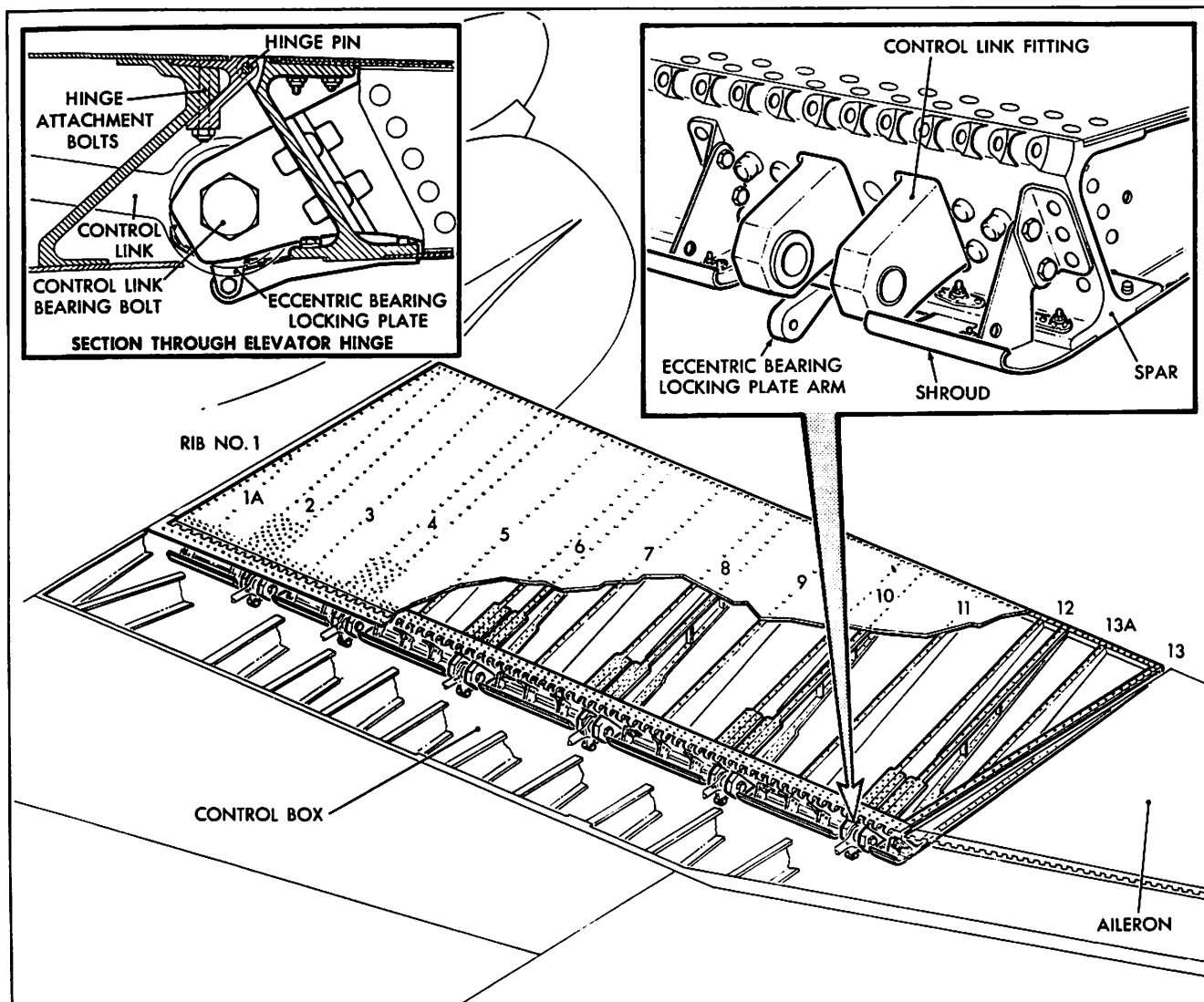


FIG. 4 ELEVATOR

lower skin is formed forward of the rear spar to house the aileron actuator.

24 A detachable control box aft of the rear spar houses the aileron control mechanism. It consists of seven main and ten intermediate ribs and a trailing edge spar covered by an upper and a lower skin. The seven main ribs support the aileron control linkage bellcrank levers. The upper and lower skins are taper rolled and reinforced by doublers.

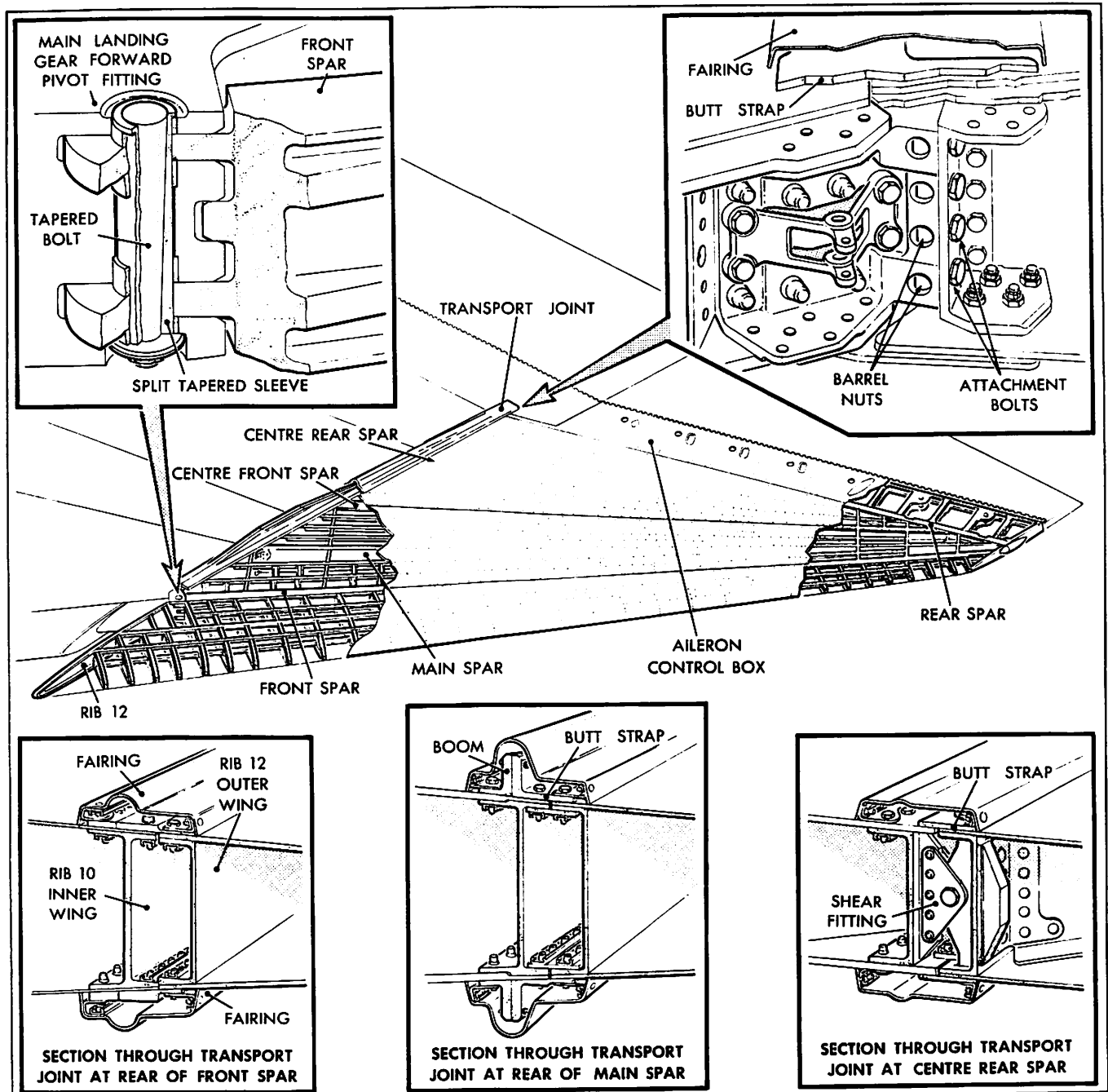
25 Bolts attach the control box to the torsion box rear spar and the outboard end of the elevator control box. Access panels in the upper

and lower skins facilitate the lubrication and adjustment of the control linkage.

AILERONS (Fig 6)

26 The ailerons extend from the outboard end of the elevators to the wing tip and are attached by piano type hinges to the top edge of each control box spar. Each aileron consists of a spar at the leading edge to which are attached seven main and nine intermediate ribs and an upper and a lower skin. The main ribs are reinforced to carry the control link fittings while the upper and lower skins are reinforced by doublers. A detachable shroud is fitted in sections along the lower leading

ARROW 1 SERVICE DATA



7W1-1528-1

FIG. 5 OUTER WING

edge. The five outboard control link assemblies are faired in by detachable fairings.

VERTICAL STABILIZER (Fig 7)

27 The vertical stabilizer is attached to the inner wing centre box upper surface by four

shear fittings and attachment fittings on each side of the fin skin. A detachable control box fitted to the trailing edge houses the rudder control linkage and supports the rudder hinge fittings.

28 The vertical stabilizer consists of seventeen spars, eight ribs normal to the rudder

ARROW 1 SERVICE DATA

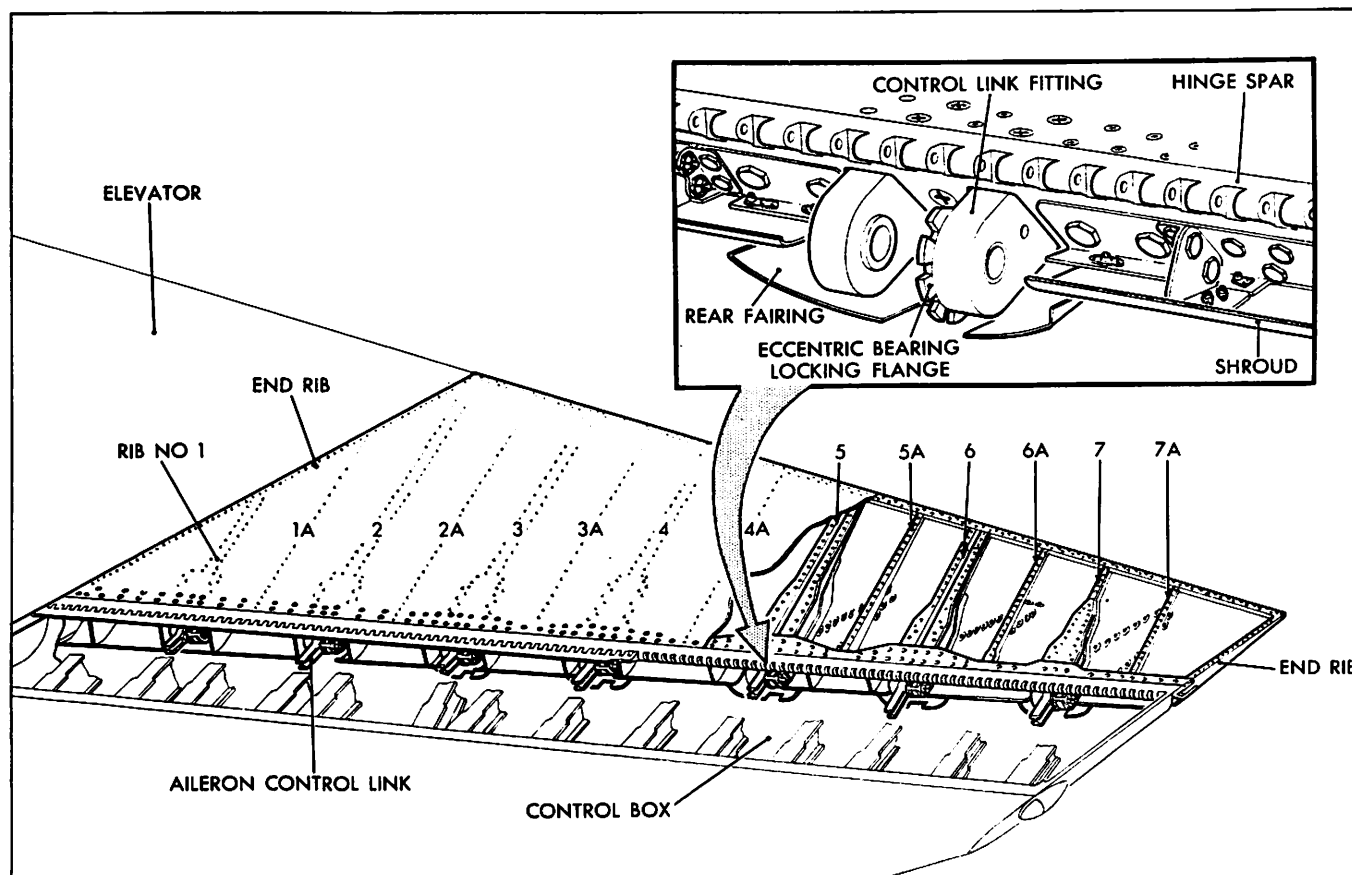


FIG. 6 AILERON

hinge line, the outer skin sections and the rudder control box. The spars are parallel to the rudder hinge line with the exception of the front spar which forms the main member of the leading edge. The spars are numbered from rear to front. The main spars are numbered 3, 7, 10 and 14 and these with the front spar carry the outer skin joints. Intermediate spars consisting of 'L'-section stringers interconnected by compression struts support the outer skin between the main spars. The eight ribs are fitted normal to the rudder hinge centre line and the short ribs of the leading edge are fitted normal to the front spar. A detachable fibre glass tip is fitted to the top of the vertical stabilizer.

29 The taper rolled outer skin is fitted in sections butt jointed at the main spars. Two detachable panels are fitted to the LH skin to provide access to the rudder actuator and hinge moment limiter.

30 The rudder control box is attached by bolts and shear pins to the rear of spar No. 3. It consists of two outer skins each milled from solid billets to form integral stringers with milled ribs at the hinge fittings and reinforcing plates at the control linkage pivots. Small access panels are fitted to facilitate servicing of the control linkage.

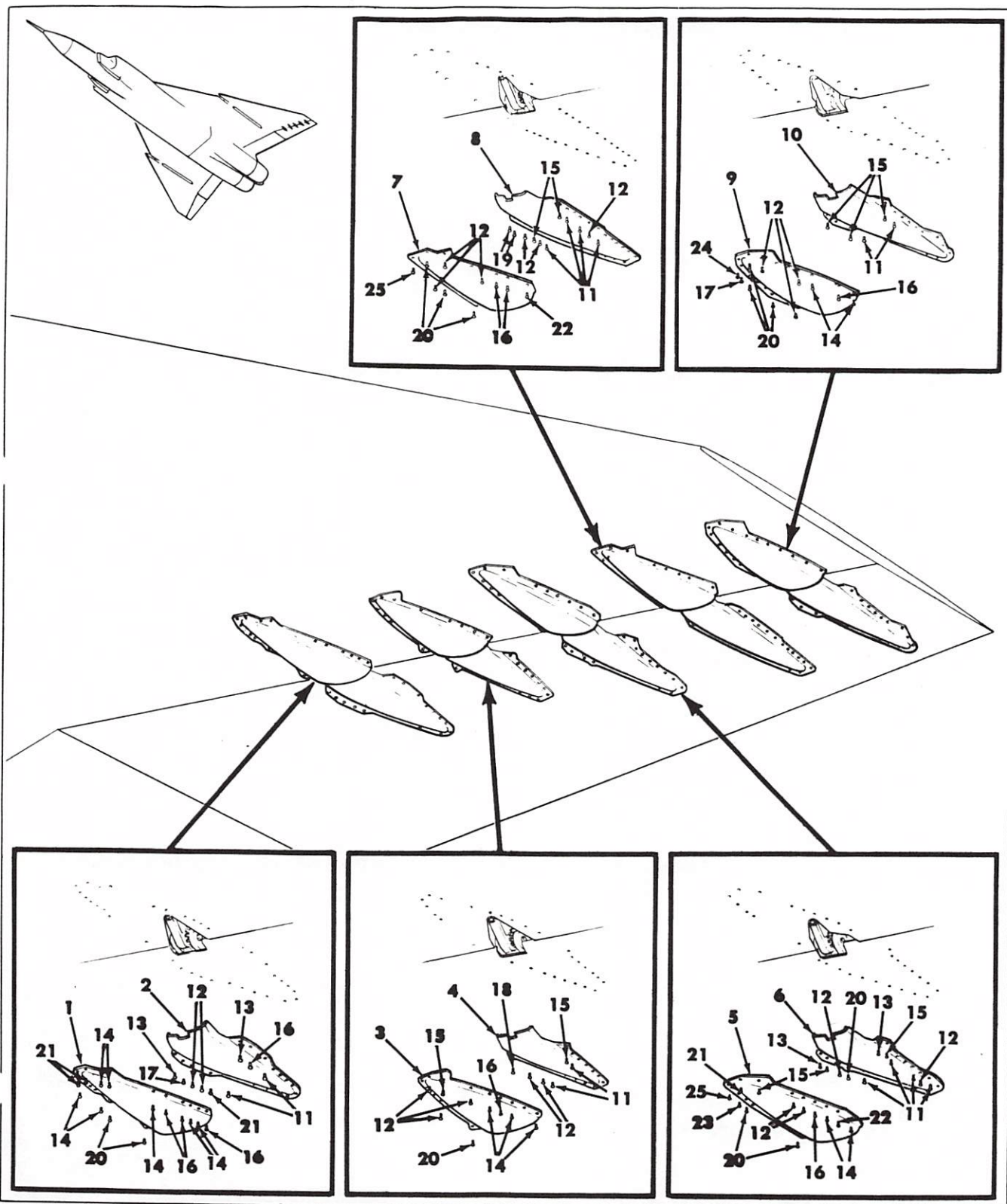
RUDDER (Fig 8)

31 The rudder is mounted on seven bearings on the RH trailing edge of the rudder control box. It consists of a front and a centre spar, twenty-six ribs normal to the rudder hinge line and outer skins reinforced by doublers.

32 Fourteen of the ribs are reinforced in pairs to carry the hinge and control link fittings. The rudder is located by the upper and lower locating hinges which are shimmed on assembly to take the vertical loads. The remaining five fittings contain roller hinge bearings and also



ARROW Mk 2

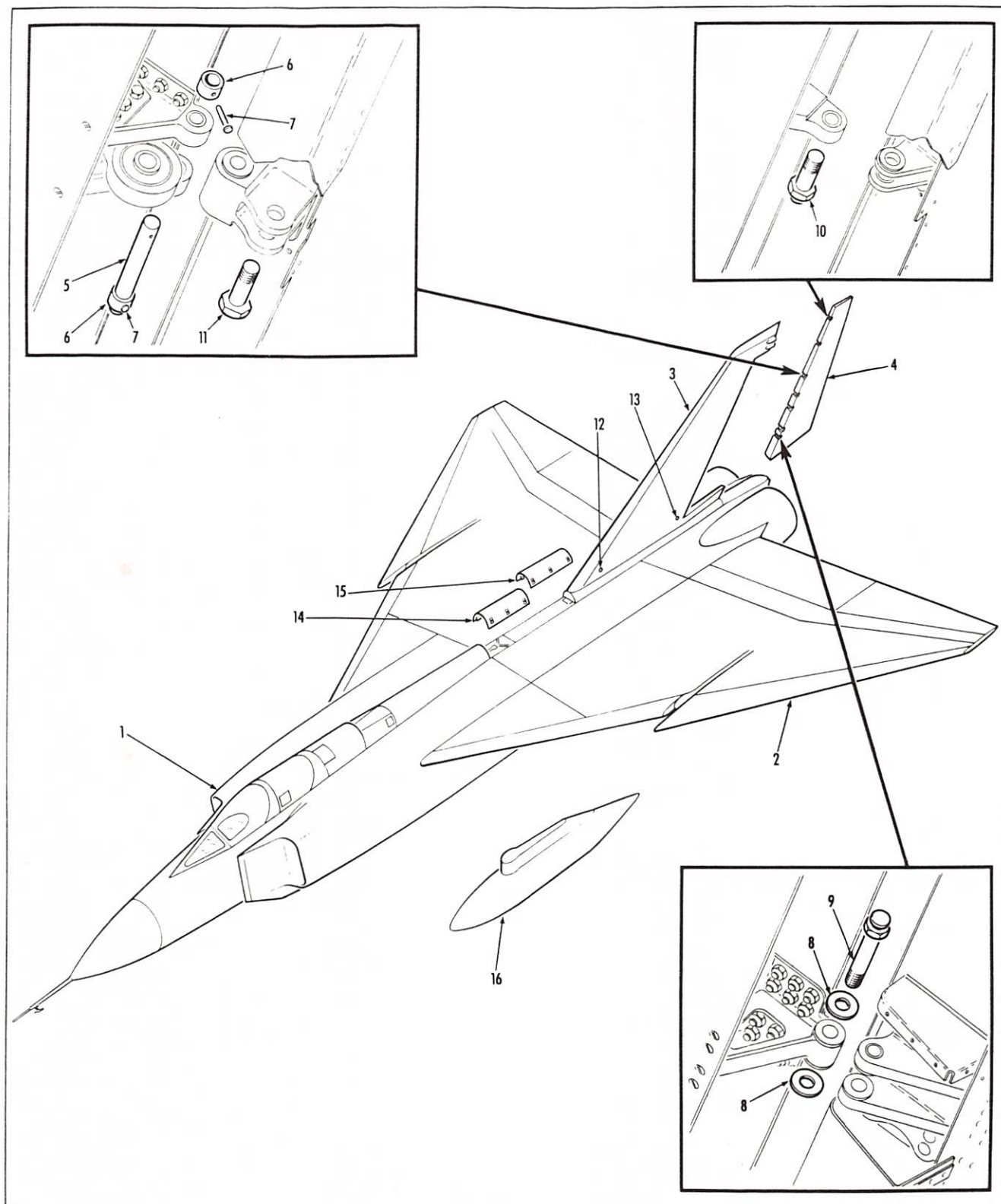


7P2-1008-1

FAIRINGS-AILERON CONTROL LINKS

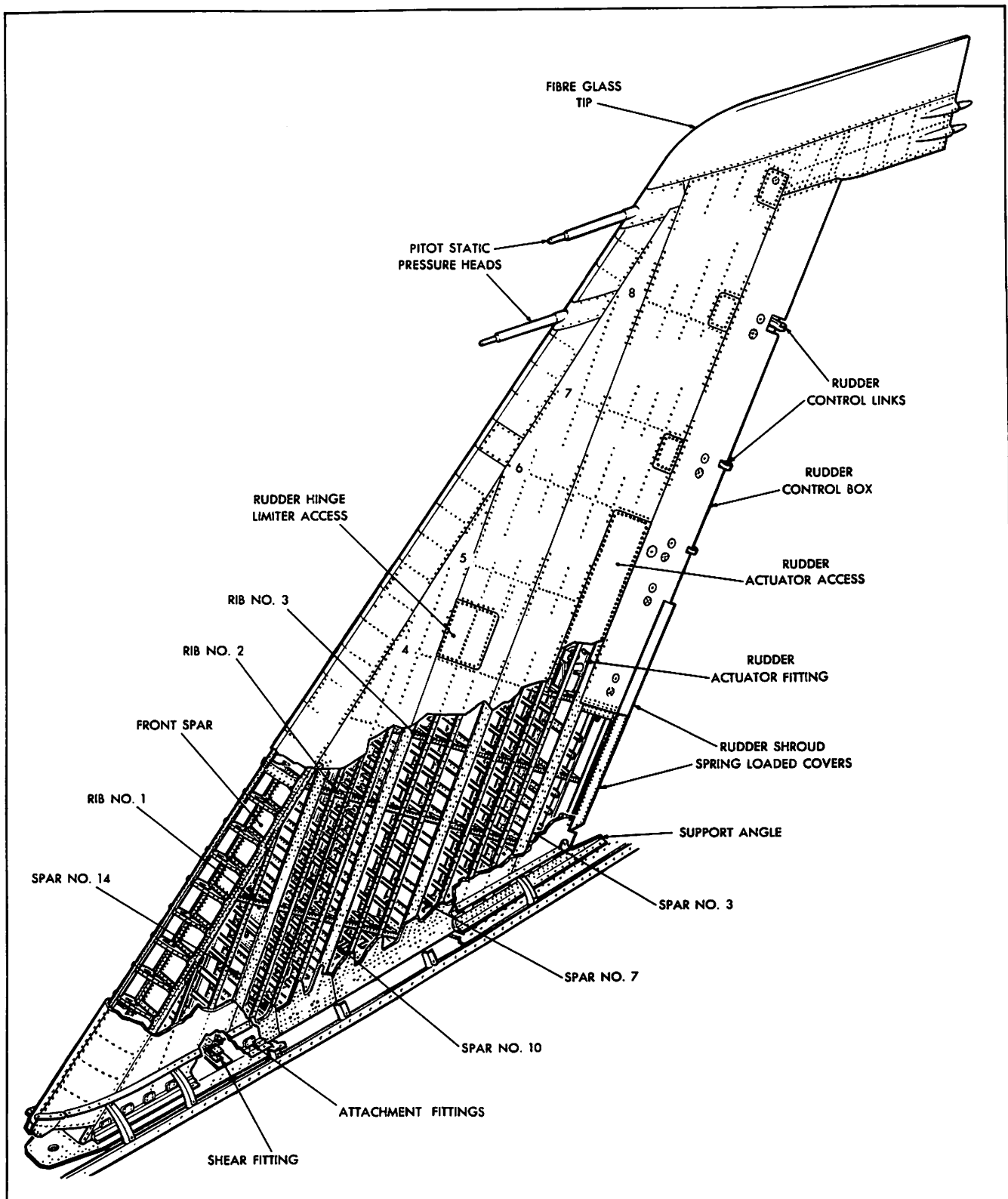


ARROW Mk 2



RUDDER HINGES

ARROW 1 SERVICE DATA



7M1-1502-1

FIG. 7 VERTICAL STABILIZER

ARROW 1 SERVICE DATA

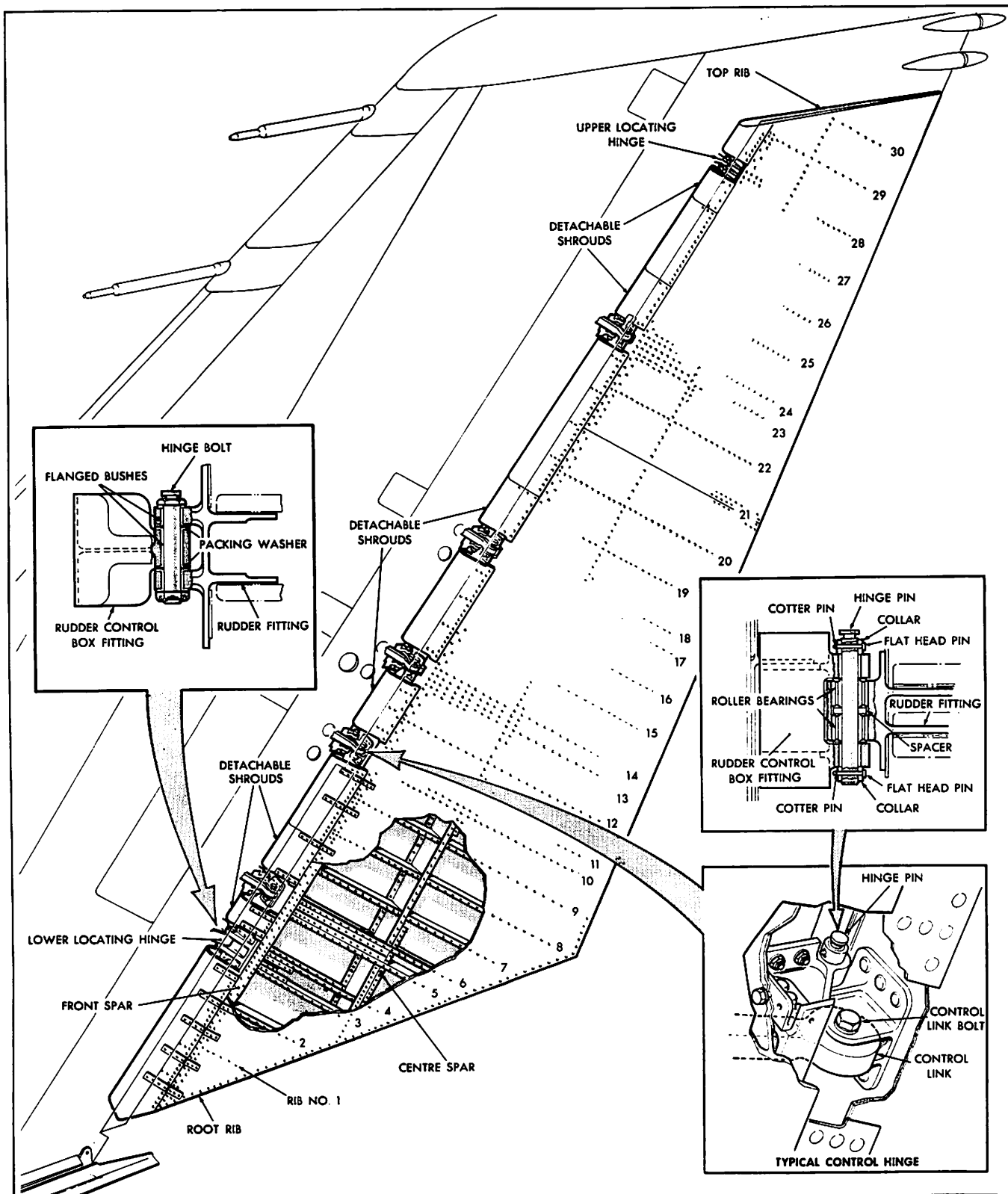
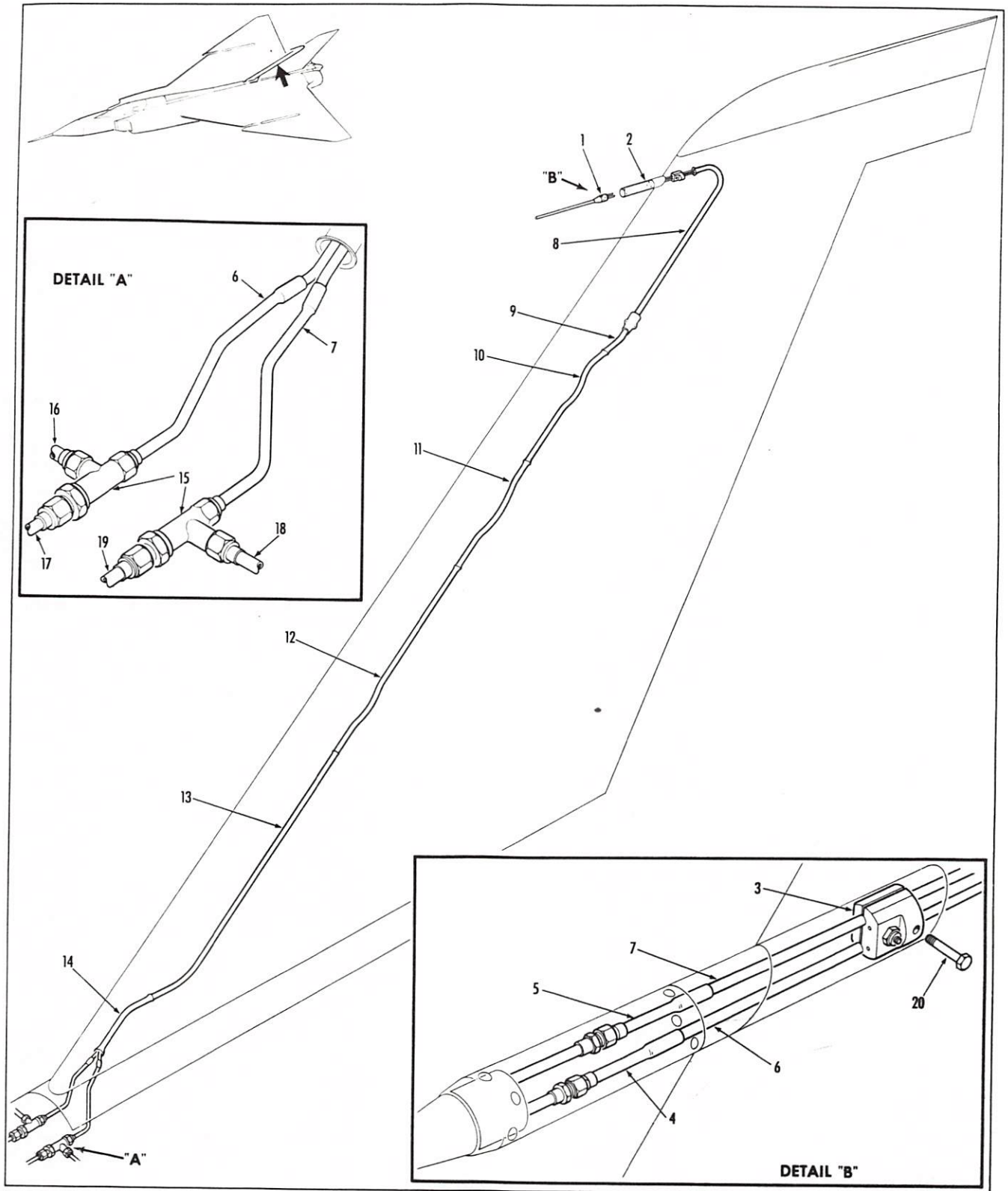


FIG.8 RUDDER



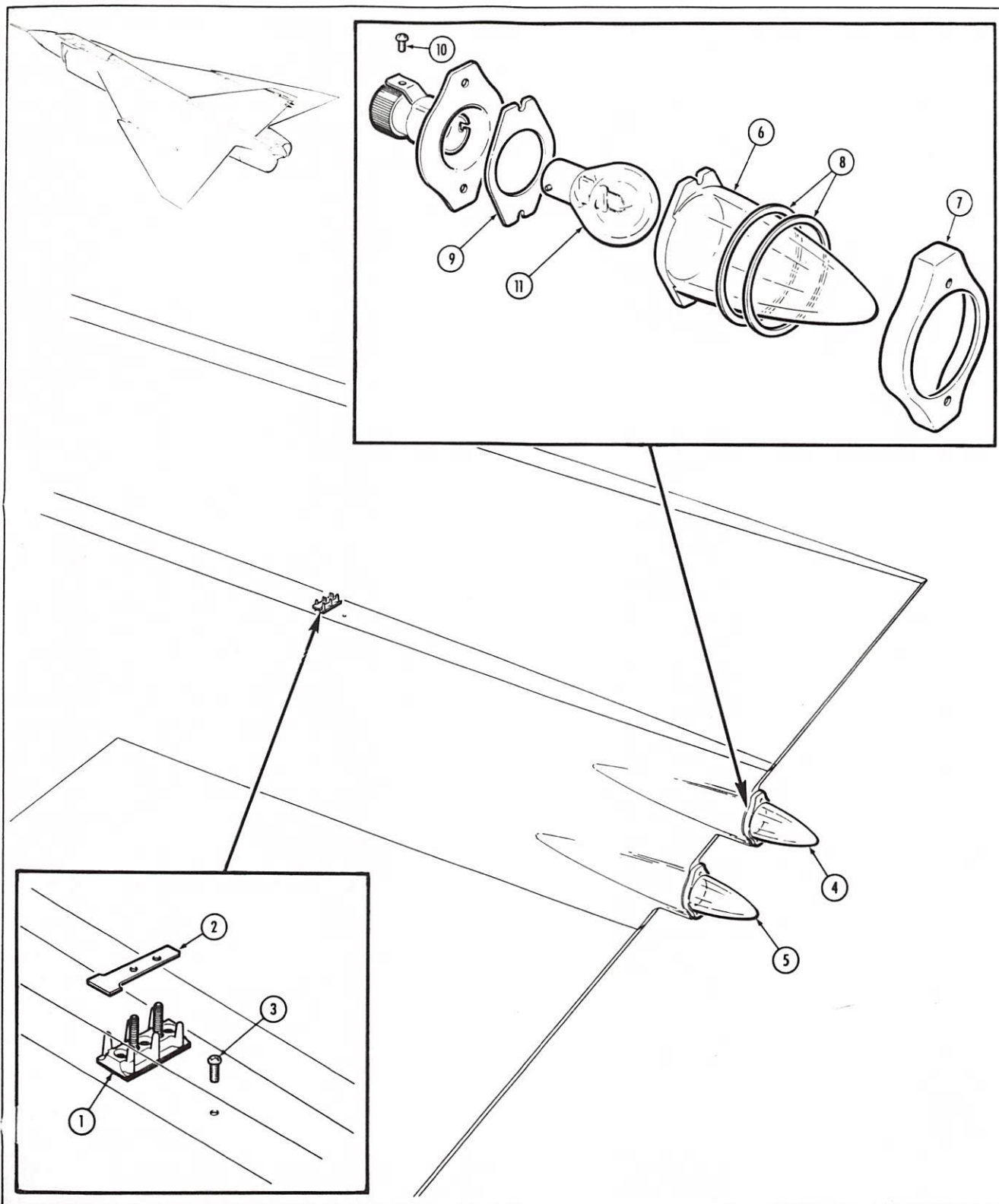
ARROW Mk 2



FIN PITOT TUBE



ARROW Mk 2



7P2-1109-1

FIN NAVIGATION LIGHTS

ARROW 1 SERVICE DATA

provide the attachment points for the rudder control linkage. Detachable shrouds at the leading edge facilitate servicing.

RADOME (Fig 9)

33 The radome is a synthetic resin bonded fibre glass shell attached to the radar nose by shear pins and four toggle latches. At the forward end an air data probe is fitted to support air data components.

RADAR NOSE (Fig 9)

34 The radar nose consists of two upper and two lower longerons joining a frame at station 68.5 to the front fuselage bulkhead at station 120. A vertical shear web braces and divides the radar nose which is attached to the front fuselage by shear pins on the vertical shear web and riveted joints at the longerons. The longerons are interconnected by frames, and skinned both internally and externally.

35 Detachable ballast weights are fitted to the vertical shear web and to two plates on the frame at station 68.5. Access doors, fitted to both sides of the radar nose, are attached to the top longerons by piano type hinges and held closed by both toggle and shear pin latches.

FRONT FUSELAGE (Fig 10)

36 For the purposes of description the front fuselage is divided into the fuselage section between station 120 and station 255 and the engine air intakes up to station 255.

37 The fuselage section is formed by four longerons, two vertical bulkheads and a canted bulkhead at the rear of each cockpit. The bulkhead at station 255 is common to both the fuselage section and the engine air intakes. Sixteen frames interconnected by stringers are fitted between the bulkheads and support the fuselage skin which is continued up to station 255 to form the cabin sides. The cabin floor is reinforced by frames and stringers and extends from the bulkhead at station 120 to the navigator's rear bulkhead.

38 The two upper longerons form the edges of the cockpits and support the windshield, the canopies and two sealing arches. The windshield frame is fitted with two laminated glass panels and is mounted on the forward end of

the longerons. The four sections of the canopy are attached by piano type hinges bolted to the longerons. The space between the front and rear canopies is sealed by the centre arch. A transparent access panel fitted in the arch provides access between the two cockpits. The rear arch completes the seal at the rear of the navigator's canopy.

39 Sealing of the cabin structure is effected on assembly with sealing compound EC 1291 on the inside of all joints and diluted EC 1291 sealing compound on all faying surfaces. Insulation is fitted on the insides of the cabin to limit the transfer of skin friction heat to the cabin.

40 The two lower longerons form the side members of the nose landing gear bay. The RH longeron provides the attachment for the nose landing gear drag strut and the nose wheel door. A torque box fitting at the intersection of the navigator's bulkhead and the longerons provides the attachment point for the nose landing gear pivots.

41 The two engine air intakes each consist of an upper and a lower longeron, frames, stringers, an air intake duct and an outer skin. The intakes are attached to the fuselage by splice joints at the bulkheads and frames.

42 An aerodynamic ramp is formed forward of the intake lips. A gap between the ramp and the fuselage provides an air bleed off to ensure a clean flow of air over the ramp to the intake. A duct is formed in the leading edge structure between the ramp and the fuselage and supplies ram air to the air conditioning system.

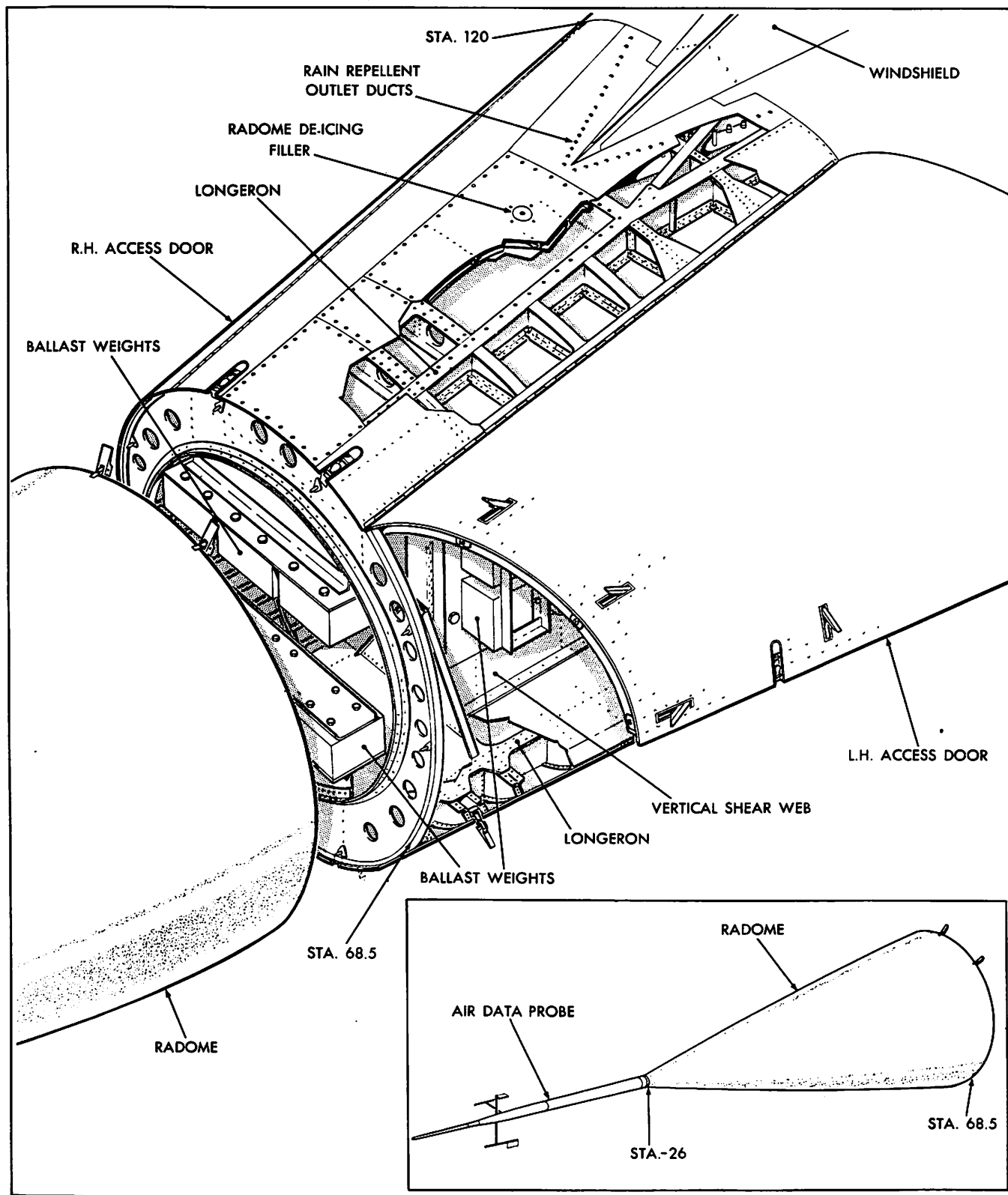
43 A series of boundary layer bleed holes are formed on the outer face of the ramp just forward of the intake lips. Boundary layer air is bled through the holes into a plenum chamber in the ramp. The plenum chamber is connected to a rearward facing square section outlet duct below the intake leading edge. Airflow over the outlet duct produces a depression which draws boundary layer air through the bleed holes, into the plenum chamber and overboard.

CENTRE FUSELAGE (Fig 11)

44 The centre fuselage extends from the front fuselage bulkhead at station 255 to the duct bay and inner wing joint at station 485. It consists

UNCLASSIFIED

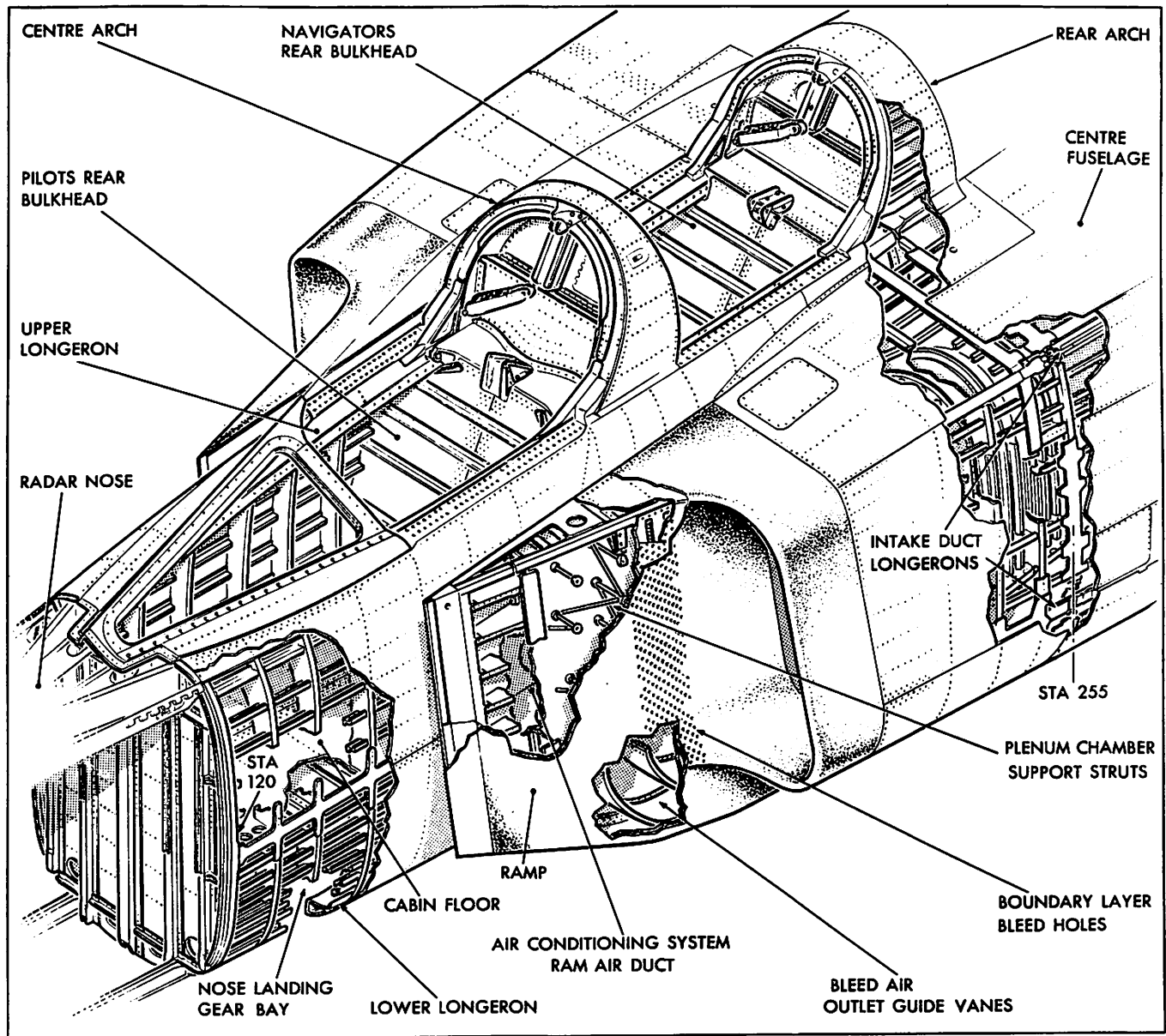
ARROW 1 SERVICE DATA



7M1-1305-1

FIG. 9 RADOME AND RADAR NOSE

ARROW 1 SERVICE DATA



7M1-1306-2

FIG.10 FRONT FUSELAGE

of two intake ducts with a fuel tank bay and an air conditioning bay formed on the aircraft centre line between the ducts. The duct shape changes from approximately elliptical to circular in the length of the centre fuselage. Between stations 292 and 483 and extending the full width of the underside of the fuselage is the armament bay, which is used on the Arrow 1 to house a detachable instrument pack. For details and installation of the instrument pack see Arrow 1 Service Data - Instrument Pack. Forward of the armament bay between stations 255

and 292 is the electronics equipment bay.

45 Six longerons extend the full length of the centre fuselage. The four upper longerons connect with the upper fuselage and intake duct longerons of the front fuselage and with the auxiliary spar of the inner wing. The two lower longerons connect with the intake duct lower longerons of the front fuselage and the upper longerons of the duct bay. Eighteen frames interconnected by stringers support the intake ducts, the outer skin, the fuel tank bay skin and

ARROW 1 SERVICE DATA

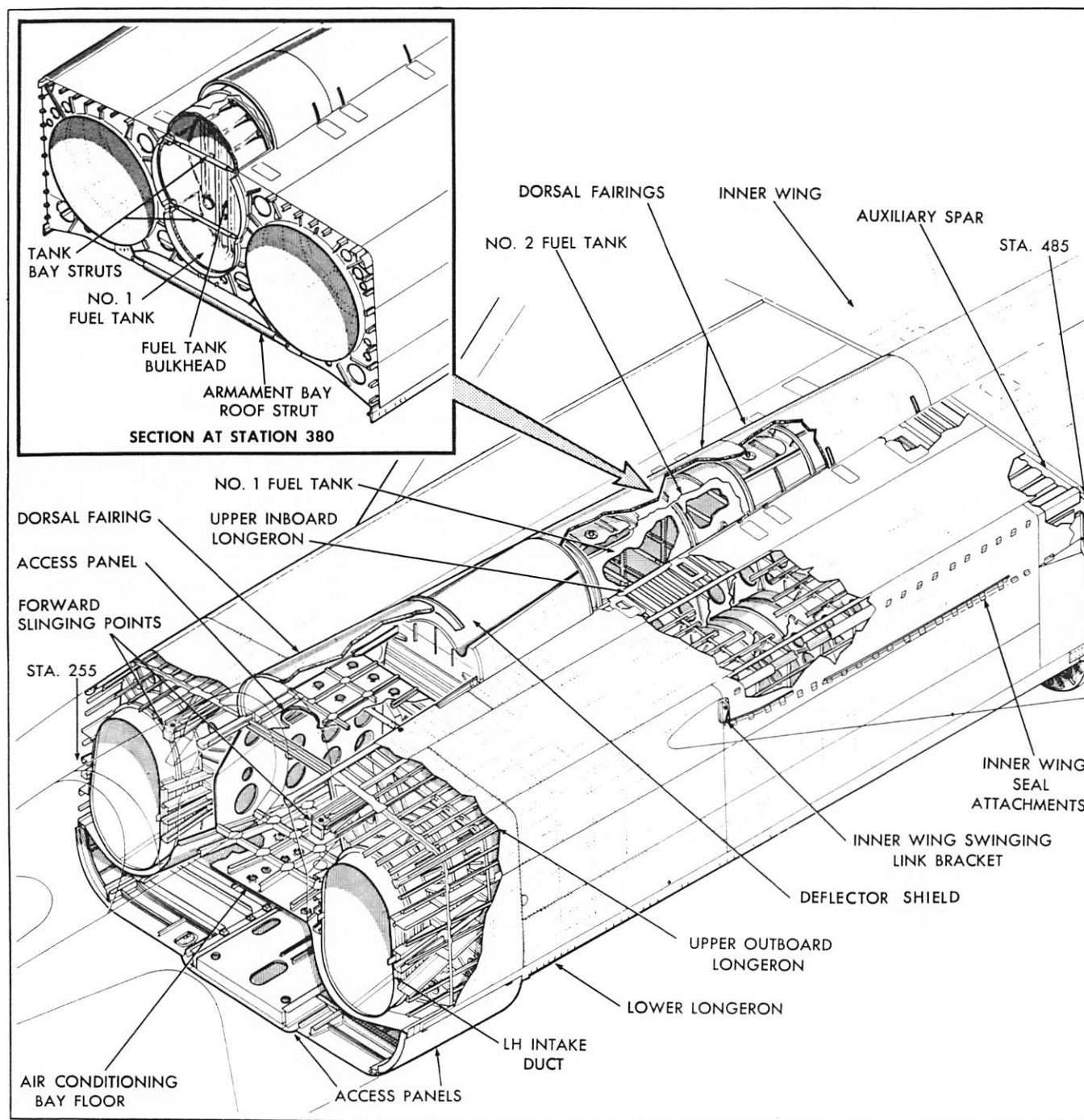


FIG. 11 CENTRE FUSELAGE

the armament bay skins. Three bulkheads divide the tank bay into two fuel cells. Transverse struts in the armament bay roof and the fuel tank bays, connect the LH and RH sides of the frames. For the installation and sealing of the fuel cells, see Arrow 1 Service Data - Fuel System.

46 Three detachable fairings, each held in position by six toggle latches are fitted over the dorsal area. One fitted directly aft of the rear arch provides access to the air conditioning system. A deflector shield fitted behind the air conditioning bay fairing provides an outlet

ARROW 1 SERVICE DATA

for the air conditioning system exhaust air. The remaining fairings cover the two fuselage tank bays.

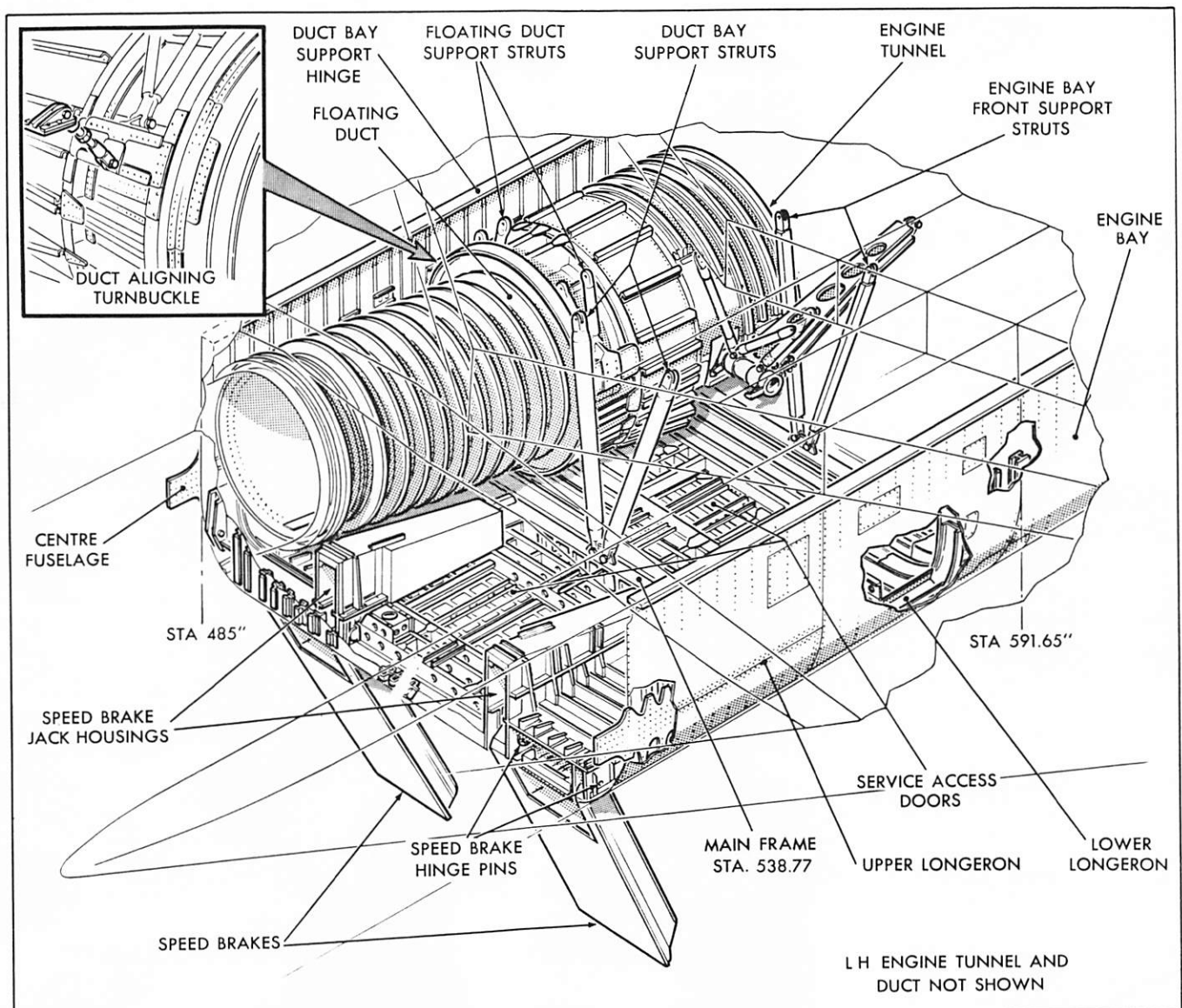
47 The centre fuselage is attached to the inner wing by swinging links at station 359 and to the auxiliary spar at station 485. The joint to the duct bay is by a spliced joint at the lower longeron.

48 Four support fittings, two on the forward face of the frame at station 485 and two suspended from the frame at station 303.5 support

the instrument pack. The pack is located by the rear two fittings which take the load in all three planes. The forward RH fitting has a degree of movement in the fore-and-aft direction and takes loads in the lateral and vertical planes. The forward LH fitting takes only vertical loads and is free to move in a lateral and fore-and-aft direction. This prevents the transfer of bending loads from the structure to the pack.

DUCT BAY (Fig 12)

49 The duct bay is suspended from the inner wing by piano type support hinges at each side



7M1-1507-2

FIG. 12 DUCT BAY

ARROW 1 SERVICE DATA

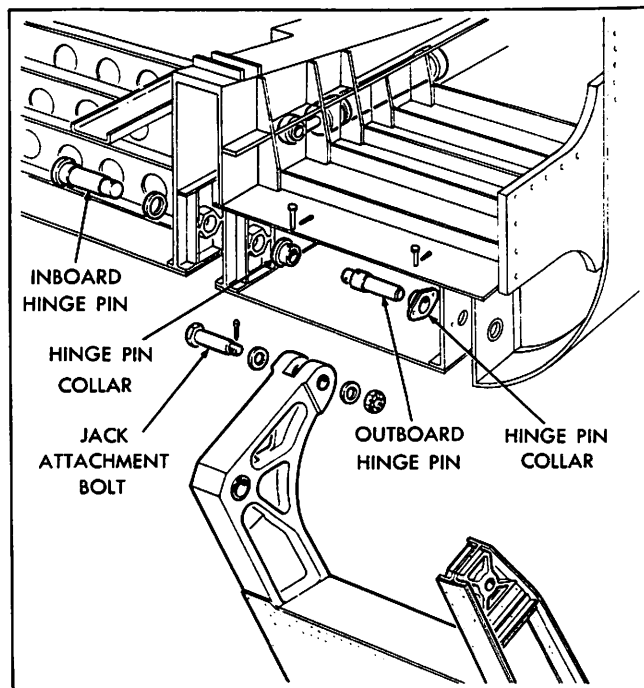


FIG. 13 SPEED BRAKE ATTACHMENT

and a 'V' support strut at station 538.77. It is attached to the centre fuselage bulkhead at station 485 and the engine bay frame at station 591.65. The bay houses two floating sections of the engine air intake ducts and two speed brakes. It consists of a main frame, four longerons and twenty intermediate frames covered by an outer skin.

50 The upper longerons connect with the lower longerons of the centre fuselage and terminate at the main frame at station 538.77. The two lower longerons are connected to bulkhead 485 at the instrument pack rear attachment points and extend the full length of the duct bay to connect with the engine bay main frame at station 591.65.

51 Two longitudinal beams, inboard of the speed brakes connect the bulkhead at station 485 to the main frame at station 538.77 and form the main members for the speed brake inboard hinges and the speed brake actuating jack attachments. The support hinges securing the duct bay to the inner wing are sealed by a stainless steel seal.

52 Each speed brake consists of two beams,

interconnected by frames and covered by an upper and a lower skin. Each speed brake is pivoted independently at the forward end on two hinge pins and is actuated by a jack enclosed in a sealed compartment in the duct bay. See fig 13.

53 The forward faces of the two floating duct sections are connected to the ducts in the centre fuselage by flexible joints which are sealed by rubber 'O'-rings. The aft end of each duct is supported by two 'V' struts from the inner wing and is located laterally by a turnbuckle from the structure. The joint between the aft end of the duct and the engine tunnel is sealed by a sheet rubber seal.

54 Twenty-four gills, spring-loaded to the open position are fitted to the inside of each duct in line with the engine adaptor ring. See fig 14. For operation of the cooling gills see Arrow 1 Service Data - Engine Installation.

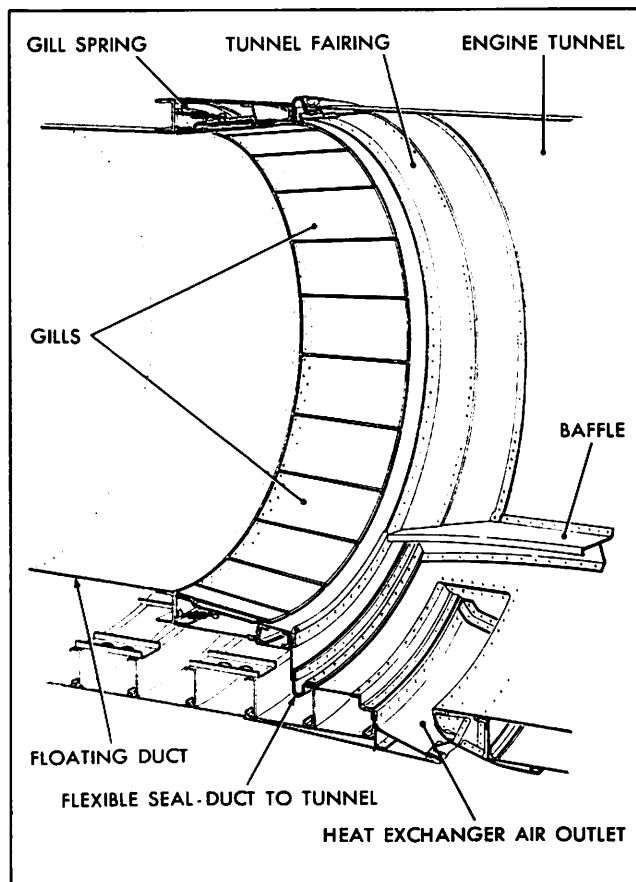


FIG. 14 ENGINE BAY COOLING GILLS

ARROW 1 SERVICE DATA

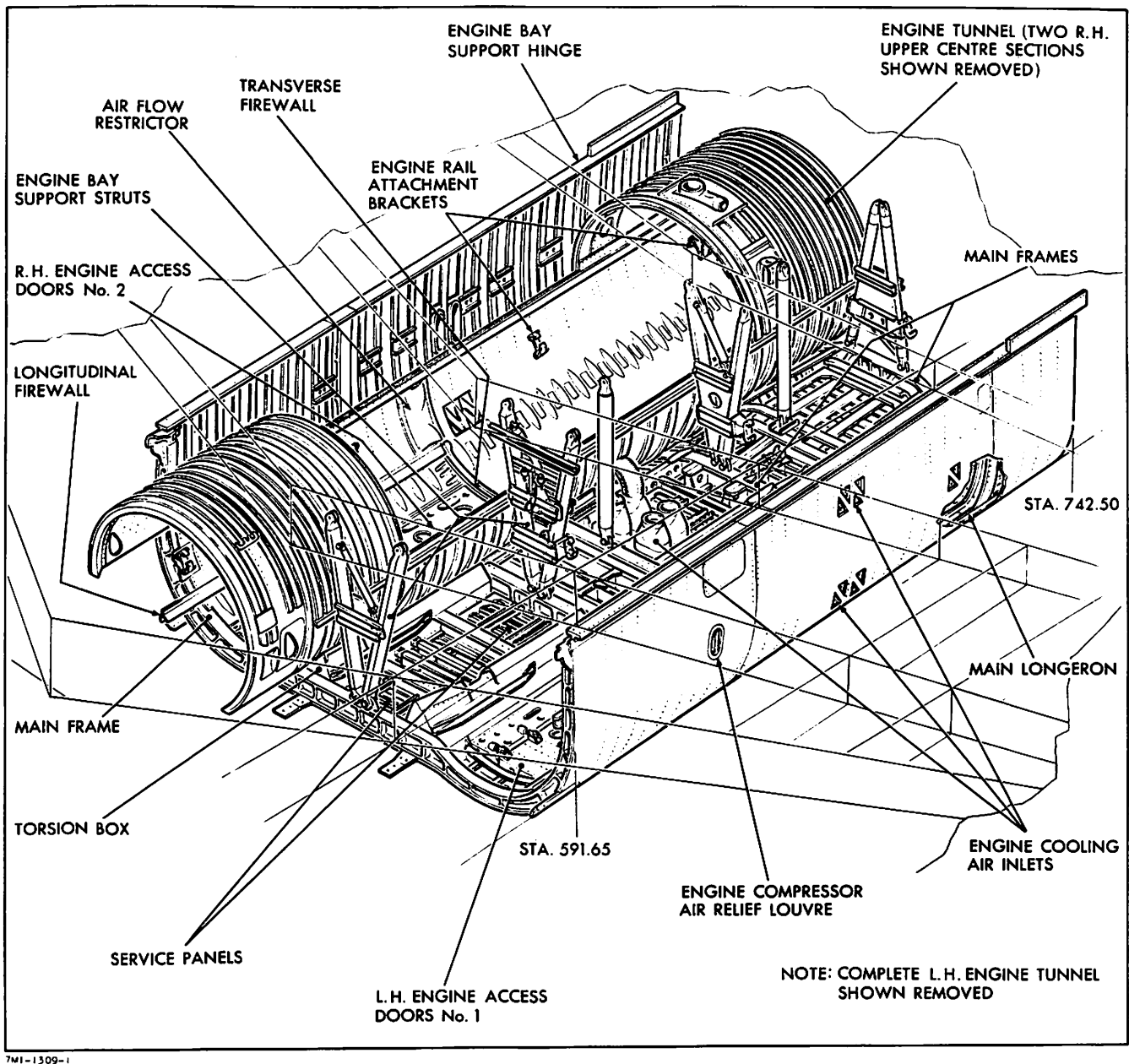


FIG. 15 ENGINE BAY

ENGINE BAY (Fig 15)

55 The engine bay extends from station 591.65 to station 742.50. It is suspended from the inner wing by piano type support hinges on each side and by three 'V' struts, one inverted 'V' strut and two single struts. It is attached at the forward end to the duct bay and at the aft end to the rear fuselage by splice joints.

56 Two longerons extend the length of the

bay and are connected with the main frames at station 591.65 and 742.50. The longerons connect with the duct bay and the rear fuselage longerons through the main frames and through splice plates. Two torsion boxes are formed inboard of the engine access doors No. 1 between the main frames at station 591.65 and station 644.43. Twenty-seven intermediate frames are fitted between the main frames and are connected in pairs by short intercostals.

ARROW 1 SERVICE DATA

57 Four service panels and two access panels are fitted along the centre line of the bay. Two engine access doors are fitted under each engine and each door is hinged in two sections. The doors are held closed by tension hook and fork end fittings, combined tension and shear pin latches, and Camloc fasteners. See fig 16. An engine starter connection access door, spring-loaded closed and locked by two spring-loaded latches is fitted in each engine access door No. 1. A rearward facing duct fitted in each engine access doors No. 2, is the outlet for the engine cooling air ejection nozzle. Cooling air is admitted into the engine tunnels through a series of spring-loaded blow in flaps on the outer surface of the engine bay. See Arrow 1 Service Data - Engine Installation, for engine cooling.

58 The engine tunnel is a circular duct enclosing the engine and extending from the rear of the duct bay to station 742.50. It is attached to the structure frames and is reinforced by ribs. The two upper sections between stations 610 and 707 are detachable when the engine is removed. Cut outs, formed in the tunnel for the various engine connections are sealed to prevent any leakage of cooling air. A restrictor is fitted at station 664 on the inner surface of the tunnel to proportion the flow of engine cooling air. Two longitudinal firewalls form a seal between the engine tunnel and the lower edges of the engine shroud. A transverse fireseal located at station 664 in the bottom of the tunnel is spring-loaded to form a seal with the engine shroud transverse firewall.

59 A glass fibre insulating blanket is installed in sections on the inside surface of each tunnel to prevent excessive heat transfer from the engine tunnel to the surrounding structure. The blankets are held in position by clips and Camloc fasteners.

REAR FUSELAGE (Fig 17)

60 The rear fuselage consists of a fixed section extending from station 742.50 to 803.06 with a detachable stinger and two detachable nacelles completing the section, the stinger terminating at station 880.

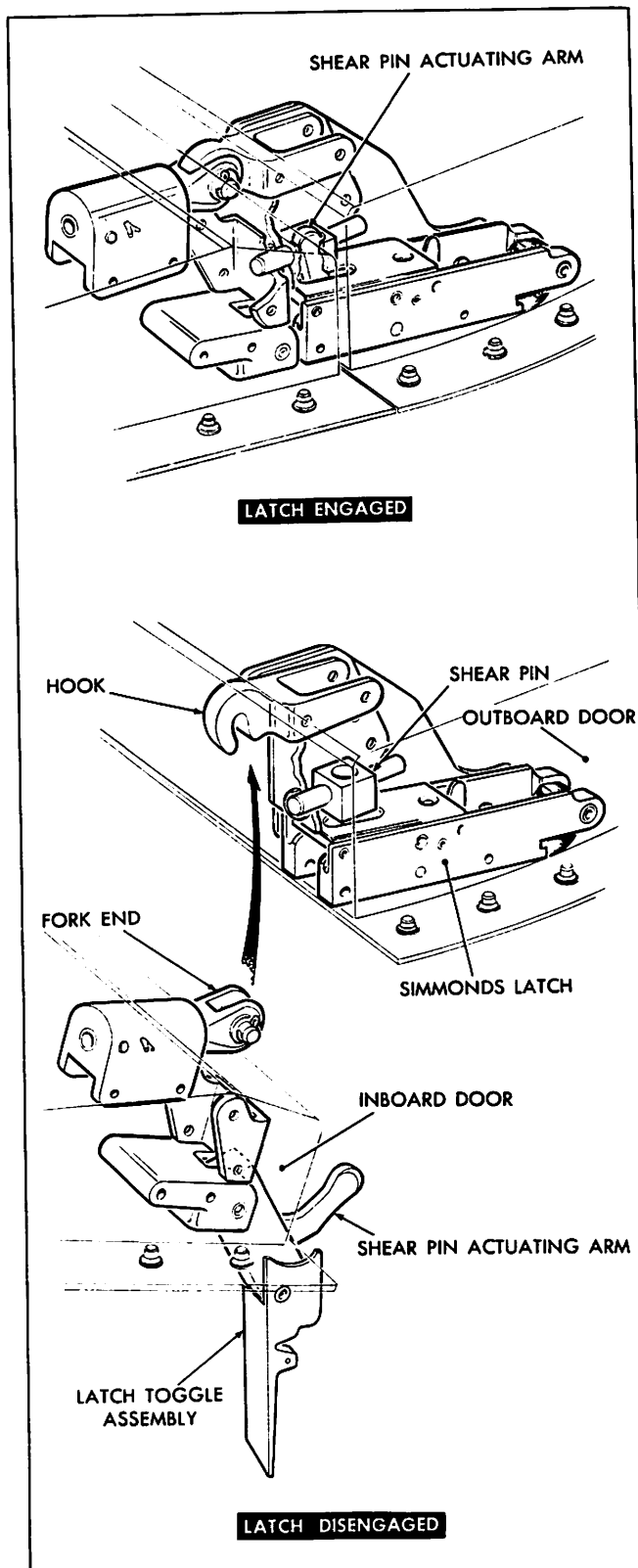
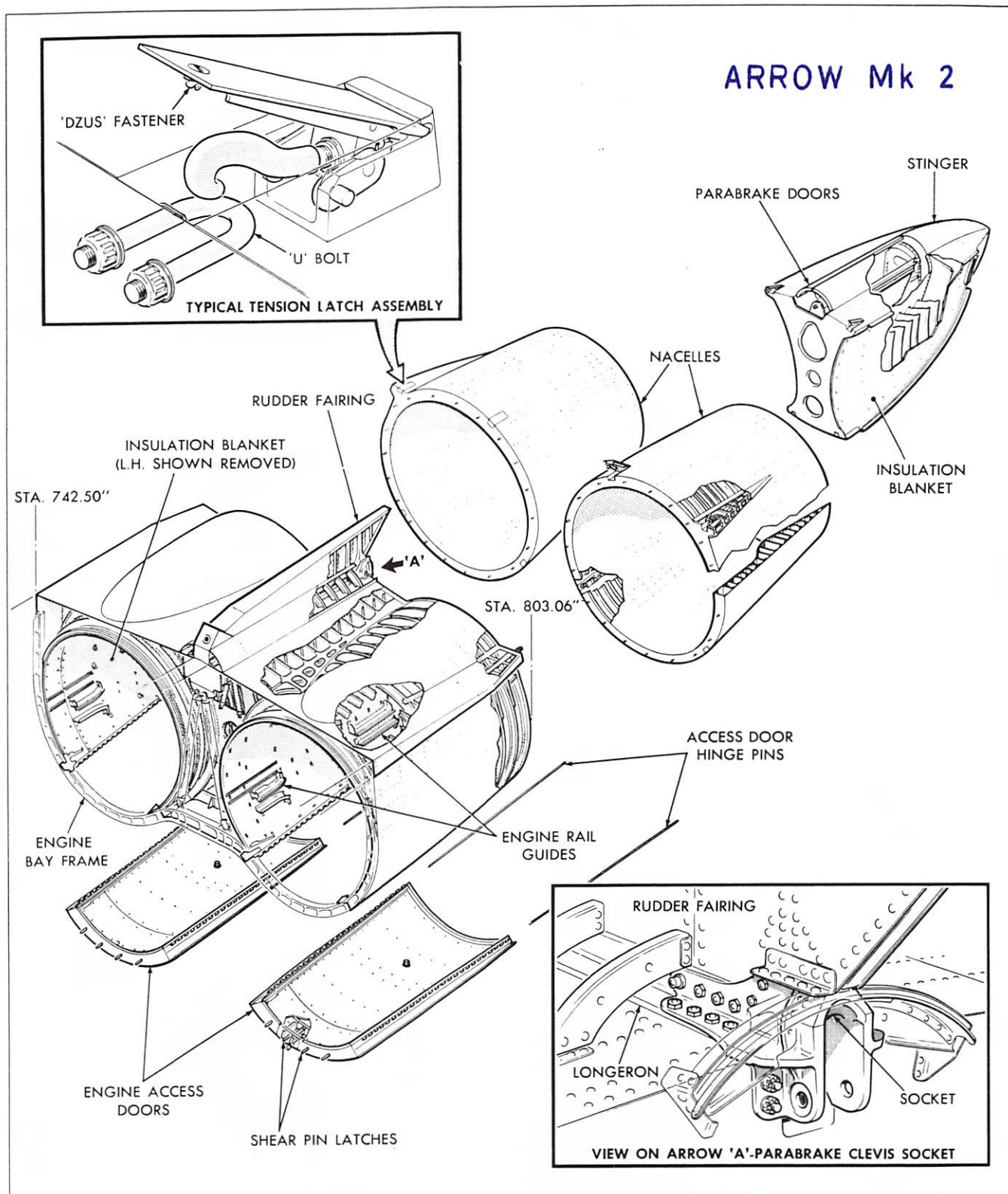


FIG. 16 ENGINE ACCESS DOOR LOCKING

ARROW 1 SERVICE DATA



7W1-1504-2

FIG.17 REAR FUSELAGE

UNCLASSIFIED

ARROW 1 SERVICE DATA

61 The fixed section is attached to the engine bay frame, the inner wing trailing edge and the centre box at station 742.50 by a bolted and riveted joint. It is formed by six longerons interconnected by eleven frames covered by an outer skin and skinned internally to form a rearward extension of the engine bay tunnel. On the centre line above the ducts a fairing for the lower end of the rudder is formed.

62 The undersurface of each duct is completed by an engine access door attached to the rear fuselage by two piano type hinges and to the engine bay rear frame by four shear pin latches.

63 A clevis socket fitting is attached to the two upper inboard longerons at the rear of the rudder fairing to retain the parabrake clevis.

64 Guides are fitted to the inner skins to facilitate installation of the engine guide rails.

65 The inner skin of the fixed section is covered by detachable glass cloth insulating blankets to limit the transfer of heat to the surrounding structure.

66 Two nacelles formed by stringers, frames and an inner and an outer skin are each attached to the rear fuselage frame at station 803.06 by four tension latches.

67 The stinger is fitted between the two nacelles and consists of frames, stringers, and an outer skin. It is attached to the fuselage frame at station 803.06 by four tension latches. A box enclosed by two curved doors is formed in the top of the stinger to house the parabrake assembly. See Arrow 1 Service Data - Parachute Brake. The outer surfaces of the stinger adjacent to the nacelles are covered by two detachable insulating blankets to limit the transfer of heat to the stinger and parabrake assembly.

UNCLASSIFIED

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Radome		REF. NO. 10	
AVRO PART NO. 7-1051-3		MANUFACTURER Brunswicke-Balke- Collender		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION		To provide a dielectric fairing with access to the electronic equipment and support the nose probe.					
LOCATION		Forward of the radar nose.					
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the radome on a sling. Raise into position. Lock 4 tension latches.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, cracks and condition of protective coating. Check latches for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Crane. (Type not finalized).		
SPECIAL TOOLS TO REMOVE OR SERVICE Cover and sling, Arrow 1 radome.		
REMARKS		

CONFIDENTIAL
UNCLASSIFIED

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - De-icing Equipment		REF. NO. 10	
AVRO PART NO. 7-1051-1691		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the radome de-icing equipment, if fitted.							
LOCATION On the radar nose upper surface between station 68.5 and station 78.95.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 44 screws.						MEN X MINUTES	

CONFIDENTIAL

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - De-icing Equipment		REF. NO. 10	
AVRO PART NO. 7-1051-1692		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the radome de-icing equipment, if fitted.							
LOCATION On the radar nose upper surface between station 78.95 and station 84.25							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 29 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - De-icing Tank		REF. NO. 10	
AVRO PART NO. 7-1051-1669		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To support and provide access to the radome de-icing tank, if fitted.							
LOCATION On the radar nose upper surface between station 84.25 and station 100.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect 2 tank hangers to the panel. Insert 4 screws at the filler aperture. Place the tank and panel in position. Insert 48 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Check for cracks, damage and corrosion. Check screws and anchor nuts for damage and wear.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - UHF Homer Antenna		REF. NO. 10	
AVRO PART NO. 7-1051-108		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the UHF Homer antenna.							
LOCATION On the radar nose lower surface between station 89.25 and 108.45.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 62 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, corrosion and distortion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Door - Radar Access		REF. NO. 10	
AVRO PART NO. 7-1051-151 LH 7-1051-152 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To provide access to the radar nose.							
LOCATION On the radar nose left and right, between station 68.5 and station 120.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the hinge pin. Lower into position. Lock 2 Simmonds tension latches. Lock 8 Hartwell shear latches.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and distortion. Check condition of latches.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Air Conditioning Bay		REF. NO. 10	
AVRO PART NO. 7-1052-4329		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the air conditioning bay.							
LOCATION On the underside of the fuselage between station 228 and station 246.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect connector to the antenna. Place the panel in position. Insert 76 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check screws and anchor nuts for damage and wear. Check for damage, distortion, cracks, corrosion and loose rivets. Check fit of panel.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Windshield		REF. NO. 10	
AVRO PART NO. 7-1052-4		MANUFACTURER Libby - Owens		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION Front cockpit windshield.							
LOCATION On the upper surface of the front fuselage between station 105 and station 150 approximately.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE To replace a glass panel: Place the panel complete with rubber seal in position (seal installed dry). Place the support strips in position and insert 21 bolts and 32 screws. Connect the electrical wiring.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, condition and cleanliness.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cabin leakage tester. B5 access stand. Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and condition of fasteners.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Pilot's LH Front Console		REF. NO. 10	
AVRO PART NO. 7-1052-4485		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the cockpit equipment.							
LOCATION Pilot's cockpit L.H. side.							
ACCESS Accessible with pilot's seat adjusted to maximum height.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 9 fasteners.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and condition of fasteners.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Pilot's RH Rear Console		REF. NO. 10	
AVRO PART NO. 7-1052-2224		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED-1500 hours							
FUNCTION To provide access to cockpit equipment.							
LOCATION Pilot's cockpit R.H. side.							
ACCESS Accessible with pilot's seat removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 6 fasteners.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and condition of fasteners.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Pilot's LH Rear Console		REF. NO. 10	
AVRO PART NO. 7-1052-4486		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to cockpit equipment.							
LOCATION Pilot's cockpit L.H. side.							
ACCESS Accessible when pilot's seat is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 6 fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and condition of fasteners.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

~~CONFIDENTIAL~~

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Navigator's Rear Console		REF. NO. 10	
AVRO PART NO. 7-1052-6497 LH 7-1052-6498 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to cockpit equipment.							
LOCATION Navigator's cockpit.							
ACCESS Accessible with the navigator's seat adjusted to maximum height.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 8 fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check for cracks, damage and condition of fasteners.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access Navigator's Rear Console		REF. NO. 10	
AVRO PART NO. 7-1052-6495 LH 7-1052-6496 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to cockpit equipment.							
LOCATION Navigator's cockpit.							
ACCESS Accessible with navigator's seat adjusted to maximum height.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 6 fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and condition of fasteners.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Door - Canopy Emergency Opening		REF. NO. 10	
AVRO PART NO. 7-1052-6236		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the canopy emergency opening lanyard.							
LOCATION On the fuselage right hand side at station 161.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 3 rivets in hinge.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and corrosion. Check hinge and latch for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Fairing - Dorsal - Air Conditioning Access		REF. NO. 10	
AVRO PART NO. 7-1054-5439		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the liquid oxygen converter and the air conditioning equipment bay.							
LOCATION On the top of the fuselage between station 268 and station 317.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 6 Simmonds tension latches.						MEN X MINUTES	

~~SECRET~~ UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check fit of fairing. Check for damage, distortion, cracks, corrosion and loose rivets in magnesium skin and 75 ST formers. Check security and operation of latches.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Door - Electronic Equip- ment Lower Access		REF. NO. 10	
AVRO PART NO. 7-1054-4681		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the electronic equipment bay.							
LOCATION On the underside of the fuselage between station 255 and station 292.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Attach the door hinge to the structure by 16 bolts. Connect the door operating cable. Close the door by operating the actuator motor. Lock 33 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check piano hinge and Camloc fasteners for wear. Operate actuator motor and check condition of cable and fit of door.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power supply.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Door - Electronic Equip- ment Side Access RH		REF. NO. 10	
AVRO PART NO. 7-1054-4684		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the electronic equipment.							
LOCATION On the front fuselage RH between station 255 and station 292.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert hinge pin. Lock 19 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check hinge and Camloc fasteners for wear and damage. Check fit of door and seal.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Air Conditioning Bay		REF. NO. 10	
AVRO PART NO. 7-1054-4679		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the air conditioning equipment bay.							
LOCATION On the centre fuselage upper surface, between station 268 and station 305 under the dorsal fairing.							
ACCESS Remove the dorsal fairing between station 268 and station 317 by unlocking 6 tension latches.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 56 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion, and loose rivets in skin and formers. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand. Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Fairings - Dorsal - Fuselage Fuel Tanks		REF. NO. 10	
AVRO PART NO. 7-1054-6373 Front 7-1054-6374 Rear		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the fuselage tank access panels.							
LOCATION On the centre fuselage upper surface between station 355 and station 414 front, and between station 414 and station 478 rear.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 6 Simmonds tension latches.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion and condition of latches. Check fairing for damage, distortion, cracks, corrosion and loose rivets in skin and formers.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Electronics Bay LH		REF. NO. 10	
AVRO PART NO. 7-1354-78		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the electronics bay LH.							
LOCATION On the LH underside of the fuselage between station 264.75 and station 292.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 54 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check for damage, corrosion, cracks, distortion and loose rivets in skin and formers. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Electronics Bay RH		REF. NO. 10	
AVRO PART NO. 7-1354-11		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the electronics bay RH							
LOCATION On the RH underside of the fuselage between station 265.75 and station 292.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 68 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Door - Access - Electronics Bay Panel Actuator Switch		REF. NO. 10	
AVRO PART NO. 7-1354-84		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the electronic bay access panel actuator switch.							
LOCATION On the RH underside of the electronic equipment bay at station 260.50.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Attach hinge to structure by two screws. Lock two Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, corrosion and general condition of panel and area. Check hinge and Camloc fasteners for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Fuselage Fuel Tanks		REF. NO. 10	
AVRO PART NO. 7-1054-4282		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to No. 1 and No. 2 fuselage fuel tanks.							
LOCATION On the upper surface of the fuel tanks.							
ACCESS Remove dorsal fairings by unlocking 6 latches on each.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 36 bolts.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for corrosion and signs of leakage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - De-icing Distributors		REF. NO. 10	
AVRO PART NO. 7-1055-2043 LH 7-1055-2044 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the air intake de-icing distributors.							
LOCATION On the upper surface of the LH and RH engine air intakes at station 220.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 24 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and security. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Electrics		REF. NO. 10	
AVRO PART NO. 7-1055-2693		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the electrical system.							
LOCATION On the underside of the LH and RH engine air intakes.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 8 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and security. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE	SUB-SYSTEM	COMPONENT Panel - Access - Hydraulic Equipment	REF. NO. 10
AVRO PART NO. 7-1056-2665	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours			
FUNCTION To provide access to the hydraulic equipment bay.			
LOCATION On the underside of the fuselage between station 553 and station 572.			
ACCESS Unobstructed.			MEN X MINUTES
REPLACEMENT PROCEDURE Place in position. Lock 52 Camloc fasteners.			MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check fit of panel and seal.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Electrical Equipment		REF. NO. 10	
AVRO PART NO. 7-1056-1479		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to electrical equipment bay.							
LOCATION On the RH underside of the fuselage between station 499 and station 524.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place panel in position by tilting to clear panel 7-1056-1457. Lock 44 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check fit of panel.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Electrical Equipment		REF. NO. 10	
AVRO PART NO. 7-1056-1457		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To provide access to the electrical equipment bay.							
LOCATION On the aircraft centre line on the underside of the fuselage between station 499 and station 524.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Before installing panel 7-1056-1479. Place in position. Lock 30 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check fit of panel.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Pressure Reducing and N.R.V.		REF. NO. 10	
AVRO PART NO. 7-1056-443 LH 7-1056-444 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the air conditioning system pressure reducing and non-return valve.							
LOCATION On the fuselage sides LH and RH at station 529.							
ACCESS Disconnect the main landing gear door actuating jack. Raise and support the door on strap.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 36 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, corrosion, distortion, cracks and loose rivets. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Strap, main landing gear door support. B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Floating Duct Attachment		REF. NO. 10	
AVRO PART NO. 7-1056-1503 7-1056-1504		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the floating duct attachments.							
LOCATION On the fuselage RH and LH sides between station 548 and station 558.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 26 screws.						MEN X MINUTES	

CONFIDENTIAL

UNCLASSIFIED

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check for cracks, damage, distortion and corrosion. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Engine Upper Forward Suspension Struts		REF. NO. 10	
AVRO PART NO. 7-1056-1643 7-1056-1644		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the forward engine mount upper fitting.							
LOCATION On the fuselage LH and RH sides between station 557 and station 581.9.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 16 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Engine Lower Forward Suspension Struts		REF. NO. 10	
AVRO PART NO. 7-1056-3137 LH 7-1056-3138 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the forward engine mounting lower fitting.							
LOCATION On the fuselage LH and RH sides between station 577 and station 581.9.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 4 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Refuel- ling and Limiter		REF. NO. 10	
AVRO PART NO. 7-1056-2183 7-1056-2184		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the master refuelling and limiter switches and test lights.							
LOCATION On the underside of the duct bay forward of the speed brakes.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 25 screws in hinge. Lock 13 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Refueling stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - External Power Supply		REF. NO. 10	
AVRO PART NO. 7-1056-1517		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the external power supply receptacle.							
LOCATION On the underside of the fuselage between station 485 and station 489.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 8 screws in the hinge. Lock 2 latches.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check panel for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check hinge and latches for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

91

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check fit of panel and seal.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Service - No. 2		REF. NO. 10	
AVRO PART NO. 7-1058-619		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the hydraulic equipment in the fuselage.							
LOCATION On the underside of the fuselage between station 625.25 and station 644.43.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 56 Camloc fasteners.						MEN X MINUTES	

~~UNCLASSIFIED~~

ARROW 1 SERVICE DATA

~~UNCLASSIFIED~~

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check fit of door.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA
COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Service - No. 3		REF. NO. 10	
AVRO PART NO. 7-1058-2911		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the flying control mechanical and hydraulic equipment and the fuel system equipment in the fuselage.							
LOCATION On the underside of the fuselage between station 678.05 and station 692.45.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 34 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, corrosion and loose rivets in skin and formers. Check fit of door and seal.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Service - No. 4		REF. NO. 10	
AVRO PART NO. 7-1058-2847		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION Provides access to the flying control hydraulics and the fire extinguisher bottles in the fuselage.							
LOCATION On the underside of the fuselage between station 718.75 and station 737.44.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 48 Camloc Fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners for wear. Check for damage, distortion, cracks and loose rivets in skin and formers. Check fit of door and seal.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Doors - Engine Access No. 1		REF. NO. 10	
AVRO PART NO. 7-1058-1435 LH 7-1058-1436 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To provide access to the engine oil filler, starter and disconnects.							
LOCATION On the underside of the engine bays LH and RH between station 596.45 and station 639.65.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Section No. 1 Place in position. (Inbd.fwd.) Attach door to hinge by 44 bolts. Lock 4 latches and 7 Camloc fasteners. Section No. 2 Place in position. (Inbd.aft) Attach door to hinge by 42 bolts. Lock 3 latches and 3 Camloc fasteners. Section No. 3 Place in position. (Outbd.) Attach door to hinge by 74 bolts and 12 Jo-bolts. Lock 12 Camloc fasteners. NOTE: Outboard door must be closed before closing the inboard doors.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners and hinges for wear. Check for damage, distortion, corrosion and loose rivets in skin and formers. Check fit of doors and seals.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Doors - Engine Access No. 2.		REF. NO. 10	
AVRO PART NO. 7-1058-2431 LH 7-1058-2432 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the engine controls.							
LOCATION On the underside of the engine bays, LH and RH, between stations 644.43 and station 663.63.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place the inboard and outboard doors in position. Insert 39 bolts in the inboard door hinge. Insert 35 bolts in the outboard door hinge. Close the doors and lock 3 latches and 17 Camloc fasteners. NOTE: The outboard door must be closed before closing the inboard door.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check fasteners and hinges for wear. Check for damage, distortion, corrosion and loose rivets in skin and formers. Check fit of doors and seals.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Doors - Access - Engine Starting		REF. NO. 10	
AVRO PART NO. 7-1058-279		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the engine starter air receptacles LH and RH.							
LOCATION In the engine access doors No. 1.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 8 screws in the hinge. Lock 2 latches.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check hinges and latches for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Gearbox		REF. NO. 10	
AVRO PART NO. 7-1058-2111		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To permit gearbox removal and installation.							
LOCATION On the underside of the fuselage between station 606 and station 625.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 8 bolts. Insert 47 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

CONFIDENTIAL

SYSTEM STRUCTURE		SUB-SYSTEM	COMPONENT Panels - Access - Gearbox Drain		REF. NO. 10	
AVRO PART NO. 7-1058-3817	MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours						
FUNCTION To provide access to the gearbox drain plugs.						
LOCATION In the gearbox access panel at station 613, LH and RH.						
ACCESS Unobstructed.					MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 4 screws.					MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check screws and anchor nuts for wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Compensator Removal		REF. NO. 10	
AVRO PART NO. 7-1058-4245		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To permit removal of flying control hydraulics rear compensator.							
LOCATION On the underside of the fuselage between stations 649.25 and station 658.85.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 30 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Air Conditioning Manifold		REF. NO. 10	
AVRO PART NO. 7-1058-2563 LH 7-1058-2564 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To permit the disconnection and connection of the air conditioning system bleed air quick disconnect during engine removal and installation.							
LOCATION On the fuselage side between station 630 and station 640.25.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 27 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check screws and anchor nuts for wear. Check for damage, distortion, cracks, corrosion and loose rivets.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Engine Rear Inboard Suspension Strut		REF. NO. 10	
AVRO PART NO. 7-1058-2143		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the engine rear inboard mountings LH and RH							
LOCATION On the inboard side of the engine tunnels at station 712.							
ACCESS Through service panel No. 4 on the underside of the fuselage.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 10 Camloc fasteners.						MEN X MINUTES	

UNCLASSIFIED**ARROW 1 SERVICE DATA**

INSPECTION Check for damage, cracks, distortion and corrosion. Check fasteners for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

**ARROW 1 SERVICE DATA
COMPONENT DATA SHEET**

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Inner - Engine Rear Outboard Suspension Strut		REF. NO. 10	
AVRO PART NO. 7-1058-2313 LH 7-1058-2314 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE : KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the engine rear outboard mountings LH and RH.							
LOCATION On the outboard side of the engine tunnels at station 712.							
ACCESS Through the access panel on the fuselage side at station 712.						MEN X MINUTES	
REPLACEMENT PROCEDURE Lower into position to engage hinge. Lock 6 Camloc fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check fasteners for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Outer - Engine Rear Outboard Suspension Strut		REF. NO. 10	
AVRO PART NO. 7-1058-5961		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the engine rear outboard mounting LH and RH.							
LOCATION On the fuselage side at station 712.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 16 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Doors - Fire Extinguishing		REF. NO. 10	
AVRO PART NO. 7-1058-3205 7-1058-3206		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the engine bay for fire extinguishing.							
LOCATION On the fuselage outer skin just below the lower longeron at station 603.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position through engine access door No. 1. Rivet hinge into position.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check hinge for wear and security.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation Top station 663 - 685		REF. NO. 10	
AVRO PART NO. 7-1058-3545 LH 7-1058-3546 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the engine bay to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside of the top of the engine tunnel between station 663 and station 685.							
ACCESS Accessible in the engine bay with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 50 Camloc blanket fasteners.						MEN X MINUTES	

UNCLASSIFIED
ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED
ARROW 1 SERVICE DATA
COMPONENT DATA SHEET

CONFIDENTIAL

SYSTEM STRUCTURE		SUB-SYSTEM	COMPONENT Blanket - Insulation Top station 685 - 707	REF. NO. 10	
AVRO PART NO. 7-1058-5273 LH 7-1058-5274 RH	MANUFACTURER H.I.Thompson	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-					
FUNCTION Insulates the engine bay, to prevent possible damage to the aircraft structure when the engine is operating.					
LOCATION Attached to the inside of the top of the engine tunnel between station 685 and 707.					
ACCESS Accessible in the engine bay with the engine removed.				MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 47 Camloc blanket fasteners.				MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM	COMPONENT Blanket - Insulation - Top Station 707 - 722	REF. NO. 10	
AVRO PART NO. 7-1058-3547 LH 7-1058-3548 RH	MANUFACTURER H.I. Thompson	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-					
FUNCTION Insulates the engine bay, to prevent possible damage to the aircraft structure when the engine is operating.					
LOCATION Attached to the inside of the top of the engine tunnel between station 707 and station 722.					
ACCESS Accessible in the engine bay with the engine removed.				MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 52 Camloc blanket fasteners.				MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Top station 722 - 742.50		REF. NO. 10	
AVRO PART NO. 7-1058-3551 LH 7-1058-3552 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the engine bay, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the top of the engine tunnel between station 722 and station 742.50.							
ACCESS Accessible in the engine bay with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 49 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

129

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Bottom station 687 - 717		REF. NO. 10	
AVRO PART NO. 7-1058-3561 LH 7-1058-3562 RH		MANUFACTURER H. I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the engine bay, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the bottom of the engine tunnels between station 687 and station 717.							
ACCESS Accessible in the engine bay with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 70 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Bottom sta. 717-742		REF. NO. 10	
AVRO PART NO. 7-1058-3565 LH 7-1058-3566 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the engine bay, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the bottom of the engine tunnels between station 717 and station 742.							
ACCESS Accessible in the engine bay with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 62 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Bottom sta. 742 - 753		REF. N 10	
AVRO PART NO. 7-1059-1131 LH 7-1059-1132 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVE 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the bottom of the engine tunnels in the rear fuselage between station 742 and station 753.							
ACCESS Accessible in the rear fuselage with the engine removed.						MEN X MINUTE	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 16 Camloc blanket fasteners.						MEN X MINUTE	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM	COMPONENT Blanket - Insulation - Top st. 742.5 - 753	REF. NO. 10	
AVRO PART NO. 7-1059-1133 LH 7-1059-1134 RH	MANUFACTURER H.I. Thompson	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-					
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.					
LOCATION Attached to the inside surface of the top of the engine tunnel in the rear fuselage between station 742.5 and station 753.					
ACCESS Accessible in the rear fuselage with the engine removed.				MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 20 Camloc blanket fasteners.				MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Inboard sta. 753 - 803		REF. NO. 10	
AVRO PART NO. 7-1059-1143 LH 7-1059-1144 RH		MANUFACTURER H. I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-							
FUNCTION Insulates the rear fuselage to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the top of the engine tunnel in the rear fuselage between station 753 and station 803.							
ACCESS Accessible in the rear fuselage with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 32 Camloc blanket fasteners.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

CONFIDENTIAL

SYSTEM STRUCTURE		SUB-SYSTEM	COMPONENT Blanket - Insulation - Top, sta. 753 - 778	REF. NO. 10
AVRO PART NO. 7-1059-1145 LH 7-1059-1146 RH	MANUFACTURER H.I.Thompson	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-				
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.				
LOCATION Attached to the inside surface of the top of the engine tunnel in the rear fuselage between station 753 and station 778.				
ACCESS Accessible in the rear fuselage with the engine removed.				MEN X MINUTES
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 31 Camloc blanket fasteners.				MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Top, sta. 778 - 803		REF. NO. 10	
AVRO PART NO. 7-1059-1153 LH 7-1059-1154 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the top of the engine tunnel in the rear fuselage between station 778 and station 803.							
ACCESS Accessible in the rear fuselage with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 44 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Lower Inbd. sta 753 - 803		REF. NO. 10	
AVRO PART NO. 7-1059-1147 LH 7-1059-1148 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-							
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the lower inboard side of the engine tunnel in the rear fuselage between station 753 and station 803.							
ACCESS Accessible in the rear fuselage with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 24 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges, and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Rubber walkway mats.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Engine Removal Door		REF. NO. 10	
AVRO PART NO. 7-1059-1157 LH 7-1059-1158 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-							
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the engine removal door between station 742 and station 753.							
ACCESS Accessible with the engine removal door removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 15 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE Drill gun (for the removal and installation of the engine removal door hinge pins).		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Engine Removal Door		REF. NO. 10	
AVRO PART NO. 7-1059-1161 LH 7-1059-1162 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the engine removal doors between station 753 and station 778.							
ACCESS Accessible with the engine removal door removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 28 Camloc blanket fasteners.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE Drill gun (for the removal and installation of the engine removal door hinge pins).		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Engine Removal Door		REF. NO. 10	
AVRO PART NO. 7-1059-1163 LH 7-1059-1164 RH		MANUFACTURER H. I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the engine removal door between station 778 and station 803.							
ACCESS Accessible when the engine removal door is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 31 Camloc blanket fasteners.						MEN X MINUTES	

UNCLASSIFIED**ARROW 1 SERVICE DATA**

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE Drill gun (for the removal and installation of the engine removal door hinge pins).		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

**ARROW 1 SERVICE DATA
COMPONENT DATA SHEET**

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Engine Rail Guides		REF. NO. 10	
AVRO PART NO. 7-1059-1135 LH 7-1059-1136 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-							
FUNCTION Insulates the rear fuselage, to prevent possible damage to the aircraft structure when the engine is operating.							
LOCATION Attached to the inside surface of the engine tunnel at the engine rail guides between station 753 and station 763.							
ACCESS Accessible in the rear fuselage with the engine removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the engine removed Place in position. Lock 3 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN	X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Stinger, sta 803 - 820		REF. NO. 10	
AVRO PART NO. 7-1059-2371 LH 7-1059-2372 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- NIL ESTIMATED-							
FUNCTION To insulate the stinger structure to prevent possible heat damage to the stinger and parabrake during engine operation.							
LOCATION On the stinger structure between station 803 and station 820 adjacent to the nacelles.							
ACCESS Accessible on the stinger when the stinger is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 20 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Wing mats. B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Blanket - Insulation - Stinger, sta 820 - 842		REF. NO. 10	
AVRO PART NO. 7-1059-2373 LH 7-1059-2374 RH		MANUFACTURER H.I. Thompson		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- NIL		ESTIMATED-			
FUNCTION To insulate the stinger structure to prevent possible heat damage to the stinger and parabrake during engine operation.							
LOCATION On the stinger structure between station 820 and station 842 adjacent to the nacelles.							
ACCESS Accessible on the stinger when the stinger is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 20 Camloc blanket fasteners.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Remove the blanket. Inspect the tunnel for damage, corrosion and signs of overheating. Inspect the blanket fastener retaining rings for security, and damage. Inspect the blanket for damage, burning, oil soaking, sealing of edges and security of ventilation hole grommets. Check all fasteners are serviceable.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Wing mats. B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Doors - Engine Removal		REF. NO. 10	
AVRO PART NO. 7-1059-1467 LH 7-1059-1468 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To permit engine removal and installation.							
LOCATION On the underside of the rear fuselage LH and RH between station 742 and station 803.							
ACCESS Remove the stinger and the applicable nacelle.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the shear pins withdrawn and before fitting the stinger and nacelle Place the door in position. Insert the two hinge pins. Lock the four shear pin latches.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check the hinges and hinge pins for wear and damage. Check the door for damage, distortion, cracks, corrosion and loose rivets in skin and formers.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Drill gun (for hinge pin removal and installation).		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Doors - Refuelling		REF. NO. 10	
AVRO PART NO. 7-1062-10205 LH 7-1062-10206 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the refuelling point.							
LOCATION In the flow proportioner access door on the underside of the inner wing.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 9 screws to attach the hinge. Lock 1 latch.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion, and loose rivets. Check hinge and latches for wear and security. Check fit of door.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Elevator Actuator		REF. NO. 10	
AVRO PART NO. 7-1062-2691 LH 7-1062-2692 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the elevator actuators.							
LOCATION On the upper surface of the inner wing inner trailing edge.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 100 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check screws and anchor nuts for security and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE	SUB-SYSTEM	COMPONENT Panels - Access - Fuel Tank No. 3	REF. NO. 10
AVRO PART NO. 7-1062-8481/2 7-1062-8483/4 7-1062-8485/6	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours			
FUNCTION To provide access to the fuel system components in fuel tank No. 3.			
LOCATION On the upper surface of tank No. 3.			
ACCESS Unobstructed.			MEN X MINUTES
REPLACEMENT PROCEDURE 7-1062-8481/2. Place in position. Insert 45 screws. 7-1062-8483/4. Place in position. Insert 36 screws. 7-1062-8485/6. Place in position. Insert 62 screws.			MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, leaks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Fuel Tank No. 4		REF. NO. 10	
AVRO PART NO. 7-1062-8491/2 7-1062-8493/4		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the fuel system components in fuel tank No. 4.							
LOCATION On the upper surface of tank No. 4.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE 7-1062-8491/2. Place in position. Insert 38 screws. 7-1062-8493/4. Place in position. Insert 62 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, leaks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE	SUB-SYSTEM		COMPONENT Panels - Access - Fuel Tank No. 5	REF. NO. 10
AVRO PART NO. 7-1062-7165/6 7-1062-11381/2 7-1062-855/6	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours				
FUNCTION To provide access to the fuel system components in tank No. 5.				
LOCATION On the upper surface of fuel tank No. 5.				
ACCESS The inboard panels are accessible when the dorsal fairing is removed after unlocking 6 latches. The outboard panels are unobstructed.				MEN X MINUTES
REPLACEMENT PROCEDURE 7-1062-7165/6. Place in position. Insert 29 screws. 7-1062-11381/2. Place in position. Insert 20 screws and 9 bolts. 7-1062-855/6. Place in position. Place doubler in position. Insert 61 screws and 31 bolts.				MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and leaks. Check screws, bolts and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Fuel Tank No. 6		REF. NO. 10	
AVRO PART NO. 7-1062-7165/6 7-1062-10957/8		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the fuel system components in tank No. 6.							
LOCATION On the upper surface of tank No. 6.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE 7-1056-7165/6. Place in position. Insert 29 screws. 7-1056-10957/8. Place in position. Insert 50 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Fuel Tank No. 7		REF. NO. 10	
AVRO PART NO. 7-1062-7165/6 7-1062-11377/8		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the fuel system components in tank No. 7.							
LOCATION On the upper surface of tank No. 7.							
ACCESS The inboard panels are accessible when the dorsal fairing is removed after unlocking 6 latches. The two outboard panels are unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE 7-1062-7165/6. Place in position. Insert 29 screws. 7-1062-11377/8. Place in position. Insert 23 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Fuel Tank No. 8		REF. NO. 10	
AVRO PART NO. 7-1062-7165/6 7-1062-10953/4		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the fuel system components in tank No. 8.							
LOCATION On the upper surface of tank No. 8.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 29 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Elevator Control Box		REF. NO. 10	
AVRO PART NO. 7-1062-141		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the elevator control linkage.							
LOCATION On the upper surface of the inner wing outer trailing edge.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 25 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Elevator Control Box		REF. NO. 10	
AVRO PART NO. 7-1062-78		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the elevator control linkage.							
LOCATION On the upper surface of the inner wing outer trailing edge.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 11 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN	X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Aero stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Engine Rear Suspension Struts		REF. NO. 10	
AVRO PART NO. 7-1062-9181		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the engine rear suspension struts.							
LOCATION On the upper surface of the inner wing inner trailing edge.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 127 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Check for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
Aero stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
Power screwdriver.		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - J4 Compass Transmitter and Compensator		REF. NO. 10	
AVRO PART NO. 7-1062-9622		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the J4 compass transmitter and compensator.							
LOCATION On the RH inner wing leading edge between ribs 8 and 9.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 54 screws.						MEN X MINUTES	

UNCLASSIFIED
ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, distortion and corrosion. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Main Landing Gear Jack		REF. NO. 10	
AVRO PART NO. 7-1062-4025 7-1062-4026		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the main landing gear jack.							
LOCATION On the inner wing undersurface at the outer wing transport joint.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 24 screws.						MEN X MINUTES	

06-12-24-33-41

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED
ARROW 1 SERVICE DATA
COMPONENT DATA SHEET

CONFIDENTIAL

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Fairings - Dorsal - Electronic Equipment		REF. NO. 10	
AVRO PART NO. 7-1000-371 Fwd. 7-1000-373 Aft.		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the dorsal electronic equipment.							
LOCATION On the upper surface of the inner wing on the aircraft centre line between station 478 and station 536.7 and between station 536.7 and station 601.5.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Lock 6 tension latches on each fairing.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and distortion. Check condition of latches.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Boxes - Elevator Control		REF. NO. 10	
AVRO PART NO. 7-1062-11 7-1062-12		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To support the elevator control linkage.							
LOCATION On the inner wing outer trailing edge.							
ACCESS Accessible when the elevator, the elevator actuator access panel and the aileron actuator access panel are removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the box on a cradle. Raise into position. Insert approximately 650 bolts attaching the box to the wing. Connect the electrical wiring. Connect the hydraulic connections at the inboard and outboard ends. Refit the aileron control cable pulleys and reconnect the cables. Connect the elevator actuator rod to the master bellcrank lever. Refit the aileron actuator, elevator actuator and master bellcrank lever bolt access panels. Refit the elevator control box lower skin by inserting approximately 500 bolts.						MEN X MINUTES	

CONFIDENTIAL

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and loose rivets. Check hinge for security, damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Mobile cradle to support control box. B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

~~UNCLASSIFIED~~
ARROW 1 SERVICE DATA
 COMPONENT DATA SHEET

CONFIDENTIAL

SYSTEM STRUCTURE	SUB-SYSTEM	COMPONENT Panel - Access - Dorsal Fairing	REF. NO. 10
AVRO PART NO. 7-1000-368	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours			
FUNCTION To provide access to the sense antenna disconnect.			
LOCATION On the dorsal fairing at station 591.			
ACCESS Unobstructed.			MEN X MINUTES
REPLACEMENT PROCEDURE Place in position. Lock 6 camloc fasteners.			MEN X MINUTES

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage and distortion. Check Camloc fasteners for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Aileron Actuator		REF. NO. 10	
AVRO PART NO. 7-1064-73 LH 7-1064-74 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To provide access to the aileron actuator.							
LOCATION On the underside of the outer wing.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 106 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skin and formers. Check fit of panel. Check fasteners for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Fairings - Aileron Control Links		REF. NO. 10	
AVRO PART NO. 7-1060-53, 54, 97, 98, 113, 114, 117, 118, 155, and 156		MANUFACTURER Avro Aircraft Ltd.		MAN'F'R'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION Fairing the control links at the joint of the outer wing to the aileron.							
LOCATION On the underside of the outer wing to aileron joint.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert attachment bolts. NOTE: On replacement it is essential that the bolts be replaced in the correct holes. Insert the bolt in the hole, screw in half a turn and measure the distance from the head of the bolt to the fairing. This should be equal to the length of the thread on the bolt. (NAS 333 - .406" and NAS 334 - .469")						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, corrosion and distortion. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panels - Access - Aileron Bellcranks		REF. NO. 10	
AVRO PART NO. 7-1064-907 LH 7-1064-908 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the aileron bellcranks for lubrication.							
LOCATION On the upper surface of the aileron control box.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 6 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, corrosion and distortion. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Boxes - Aileron Control		REF. NO. 10	
AVRO PART NO. 7-1064-5 7-1064-6		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To support the aileron control linkage.							
LOCATION On the outer wing trailing edge.							
ACCESS Accessible when the aileron is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the control box on a mobile cradle. Raise into position. Insert approximately 400 bolts to attach the box to the outer wing. Connect the aileron actuator rod to the master bellcrank lever. Place the aileron actuator access panel in position and insert 106 bolts.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and loose rivets. Check the hinge for security, damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Mobile support cradle. B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, corrosion and distortion. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Speed Brakes		REF. NO. 10	
AVRO PART NO. 7-1072-1 LH 7-1072-2 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To reduce airspeed in flight.							
LOCATION On the underside of the fuselage LH and RH between station 485 and station 538.77.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the dive brake in position. Insert the two hinge pins. Insert the two flat headed locking pins into the hinge pins. Lock each flat headed locking pin with a cotter pin. Connect the jack rod to the speed brake and lock the connecting bolt with a cotter pin.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets. Check hinge and jack attachment points for wear. Operate the speed brakes and check the fit.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Electrical ground power unit.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Ailerons		REF. NO. 10	
AVRO PART NO. 7-1074-1 LH 7-1074-2 RH		MANUFACTURER Avro Aircraft Ltd		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION Horizontal control surface to control the aircraft about the longitudinal axis.							
LOCATION On the outer wing trailing edge.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the aileron on a mobile cradle. Raise into position. Insert the hinge pin. Set the aileron 19° up. Connect the control links to the aileron. Refit the shroud brackets and shrouds. Refit the control link fairings.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, corrosion and loose rivets in the skin. Check hinges for damage, security, cracks and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Electrical ground power unit. Mobile support cradle. Wing mats. B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Elevator		REF. NO. 10	
AVRO PART NO. 7-1082-1 LH 7-1082-2 RH		MANUFACTURER Avro Aircraft Ltd		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION Horizontal control surface to control the aircraft about the lateral axis.							
LOCATION On the outer trailing edge of the inner wing.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the elevator on a mobile cradle. Raise into position. Secure the hinge to the elevator control box by inserting 102 bolts. Set the elevator 30° up. Connect the control links to the elevator. Replace the shrouds.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets in skins. Check hinge for security, damage, cracks, corrosion and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Electric ground power unit. Wing mats. B4 access stand. Elevator support cradle.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Vertical Stabilizer		REF. NO. 10	
AVRO PART NO. 7-1083-1		MANUFACTURER Avro Aircraft Ltd		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION Vertical stabilizer.							
LOCATION On the top of the inner wing centre box.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Sling the vertical stabilizer and raise into position. Draw the fin into the wing fingers using the locating fixture. Ream the attachment holes and insert the attachment bolts and Huck blind bolts. Reconnect the rudder control cables. Reconnect the electrical and antenna wiring. Reconnect the hydraulic and pitot static pipe lines. Replace the rudder actuator access door. Replace the fin fairing. Replace the rudder. See page 227 Replace the stinger and engine nacelles.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks, corrosion and loose rivets. Check hinges for security, damage, cracks, corrosion and wear. Inspect fin attachment to inner wing for cracks, corrosion and loose rivets.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Overhead crane. Sling for handling. Supporting trestles for nacelles and stinger. B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE Locating fixture to draw the fin into the wing finger.		
REMARKS		

UNCLASSIFIED
UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA
COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Rudder Hinge Moment Limiter		REF. NO. 10	
AVRO PART NO. 7-1083-1547		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the rudder hinge moment limiter.							
LOCATION On the LH side of the vertical stabilizer between spars 7 and 9 and above rib 4.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 59 screws.						MEN X MINUTES	

~~UNCLASSIFIED~~
ARROW 1 SERVICE DATA

INSPECTION Check for damage, cracks, distortion and corrosion.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Rudder Actuator		REF. NO. 10	
AVRO PART NO. 7-1083-1465		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the rudder actuator.							
LOCATION On the LH side of the vertical stabilizer between ribs No. 4 and No. 6 and between spars No. 3 and No. 5.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 114 screws.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check screws and anchor nuts for security, wear and damage. Check panel for damage, cracks, loose rivets and corrosion. Check fit of panel.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - Rudder Control Box Attachment		REF. NO. 10	
AVRO PART NO. 7-1083-1543 LH 7-1083-1544 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To provide access to the rudder control box attachments.							
LOCATION On the vertical stabilizer trailing edge LH and RH.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 21 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, distortion and corrosion. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT 20A Aero Stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE Power screwdriver.		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM	COMPONENT Panel - Access - Waveguide Connection		REF. NO. 10	
AVRO PART NO. 7-1083-109		MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours						
FUNCTION To provide access to the waveguide connection.						
LOCATION On the leading edge of the vertical stabilizer.						
ACCESS Unobstructed.					MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 16 screws.					MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, corrosion and distortion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT 20A Aero Stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE	SUB-SYSTEM	COMPONENT Panel - Access - Waveguide Connection	REF. NO. 10
AVRO PART NO. 7-1083-1535 LH 7-1083-1536 RH	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours			
FUNCTION To provide access to the waveguide connection.			
LOCATION On the side of the vertical stabilizer LH and RH.			
ACCESS Unobstructed.			MEN X MINUTES
REPLACEMENT PROCEDURE Place in position. Insert 21 screws.			MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check panel for damage, distortion, cracks and corrosion. Check screws and anchor nuts for damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT 20A Aero stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE Power screwdriver.		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Panel - Access - "X" Band Antenna		REF. NO. 10	
AVRO PART NO. 7-1083-1193 LH 7-1083-1194 RH		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To provide access to the "X" band antenna.							
LOCATION On the side of the vertical stabilizer LH and RH.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position. Insert 22 screws in panel. Insert 8 screws into "X" band antenna.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, distortion and corrosion. Check screws and anchor nuts for wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT 20A Aero stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE Power screwdriver.		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Box - Rudder Control	REF. NO. 10
AVRO PART NO. 7-1083-2	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To support the rudder control linkage.					
LOCATION On the trailing edge of the vertical stabilizer.					
ACCESS Accessible when the rudder is removed.					MEN X MINUTES
REPLACEMENT PROCEDURE Support the control box by a sling. Raise into position. Insert approximately 372 bolts. Refit the rudder actuator and connect to the master bellcrank lever. Replace the attachment bolt access panels and rudder actuator panels.					MEN X MINUTES

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, cracks and loose rivets. Check rudder hinge brackets for security, wear and damage.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. 20A Aero stand. Control box sling. B4 access stand. B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

**ARROW 1 SERVICE DATA
COMPONENT DATA SHEET**

SYSTEM STRUCTURE		SUB-SYSTEM		COMPONENT Rudder		REF. NO. 10	
AVRO PART NO. 7-1084-1		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION Vertical control surface to control the aircraft about the vertical axis.							
LOCATION On the trailing edge of the rudder control box.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Support the rudder on a sling. Raise into position. Insert 5 hinge pins and two locating hinge bolts. Turn rudder 90° to the right. Replace 6 sections of shroud and insert bolts. Turn rudder to neutral and insert 5 control link bolts. Replace the stinger.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion, corrosion, cracks and loose rivets in skins. Check hinges for security, damage, cracks, corrosion and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B5 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

CEPC Uslands
S/C Armstrong ed2

CONFIDENTIAL

ARROW 1 SERVICE DATA

SECTION 3

LUBRICATION

15 MAY 58

CONFIDENTIAL

ARROW 1 SERVICE DATA

LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

~~UNCLASSIFIED~~

CONFIDENTIAL

ARROW 1 SERVICE DATA

LUBRICATION

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Key to Lubricants and Symbols	2
2 Sheet 1	Lubrication Diagram	3
2 Sheet 2	Cockpit	4
2 Sheet 3	Engine Suspension	5
2 Sheet 4	Rudder Linkage	6
2 Sheet 5	Rear Fuselage	7
2 Sheet 6	Elevator Linkage	8
2 Sheet 7	Aileron Linkage	8
2 Sheet 8	Accessories Drives and Gearboxes	9
2 Sheet 9	Main Landing Gear	10
2 Sheet 10	Main Wheel Door	11
2 Sheet 11	Nose Landing Gear	12

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 To maintain complete serviceability it is essential that all moving parts be adequately lubricated with the correct grade and quantity of lubricant at the specified periods. Cleanliness is essential in the use of all lubricating equipment and materials to ensure that dirt and other impurities are not forced into the parts being lubricated. The parts should always be wiped clean before the application of the lubricant and any surplus lubricant should be removed afterwards.

2 In certain AN type pulleys and mechanical linkages, particularly in the flying control system where the bearings are not all readily accessible, pre-lubricated and sealed bearings are installed. These bearings do not require lubrication unless it is specified in the lubrication instructions or repair manual.

3 The pre-lubricated sealed bearings are divided into two groups:

- (a) The permanently sealed type.
- (b) The removable and replaceable plastic seal type.

4 The permanently sealed type is sealed by a pressed-in steel retainer disc and is pre-lubricated during manufacture. This lubrication is sufficient for the life of the bearing. Bearings with the removable plastic seal grease retainer may be cleaned and re-lubricated in accordance with the aircraft lubrication instructions.

5 Roller bearings in the flying control surfaces linkages are sealed with a stainless steel grease retaining shield and require periodic lubrication. Provision has been made to grease these bearings with a grease gun which is fitted with a pressure relief valve to avoid springing the grease retaining shield by excessive pressure build-up. When a pressure relief valve is used in conjunction with a

grease gun, it is necessary to apply pressure to the gun with slow deliberate strokes. Rapid application of the gun may force the grease through the relief valve rather than into the bearing.

CAUTION

Excessive pressure from the grease gun springs the metallic grease retaining shield. This necessitates replacement of the bearing and linkage as the grease retaining shield must not be refitted after springing.

6 Both the standard alemite (MS-15003) and the midget flush type (NAS16) grease nipples are employed at the various lubrication locations. When applying lubricant at a midget flush type nipple, care should be exercised to ensure that the grease gun is correctly aligned with the nipple.

7 The key to lubricants on fig 1 is to be used in conjunction with the illustrations in this section.

WARNING

Oil or grease when combined with oxygen forms a highly explosive mixture. The utmost care must be exercised when using grease or oil in the vicinity of oxygen and oxygen equipment.

CAUTION

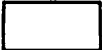
Grease, Spec 3-GP-683a and Oil, Spec MIL-L-6085A are injurious to natural and synthetic rubber, electrical insulation materials and paint. Ensure that all surplus lubricant is removed after lubricating.

8 Inspection periods will be added to the illustrations when available.

UNCLASSIFIED

ARROW 1 SERVICE DATA

TABLE OF LUBRICANTS			
LETTER IDENTIFICATION	BASE SPECIFICATION		TYPE OF LUBRICANT
	CANADIAN	AMERICAN	
A	3-GP-683a	MIL-G-3278A	GREASE
D	3-GP-335a	MIL-L-7870A	OIL, LOW TEMPERATURE
E	MIL-L-6085A	MIL-L-6085A	OIL, LUBRICATING
G	MIL-M-7866A + OIL 3-GP-335a	MIL-M-7866A + OIL MIL-L-7870A	MOLYBDENUM DISULFIDE POWDER + OIL
I	3-GP-802	MIL-T-5544A	LUBRICANT, ANTI-SEIZE
K	3-GP-690	MIL-L-3545	GREASE, HIGH MELTING POINT
L	MIL-L-7808C	MIL-L-7808C	OIL, LUBRICATING

FREQUENCY SYMBOLS	APPLICATION SYMBOLS
 PRIMARY INSPECTION	 GREASE GUN
 PERIODIC	 OIL CAN
 SPECIAL	 POUR
	 HAND
	 BRUSH
	 PRESSURE OIL DISPENSER

TM-1-20-1-3

FIG. 1 KEY TO LUBRICANTS AND SYMBOLS

ARROW 1 SERVICE DATA

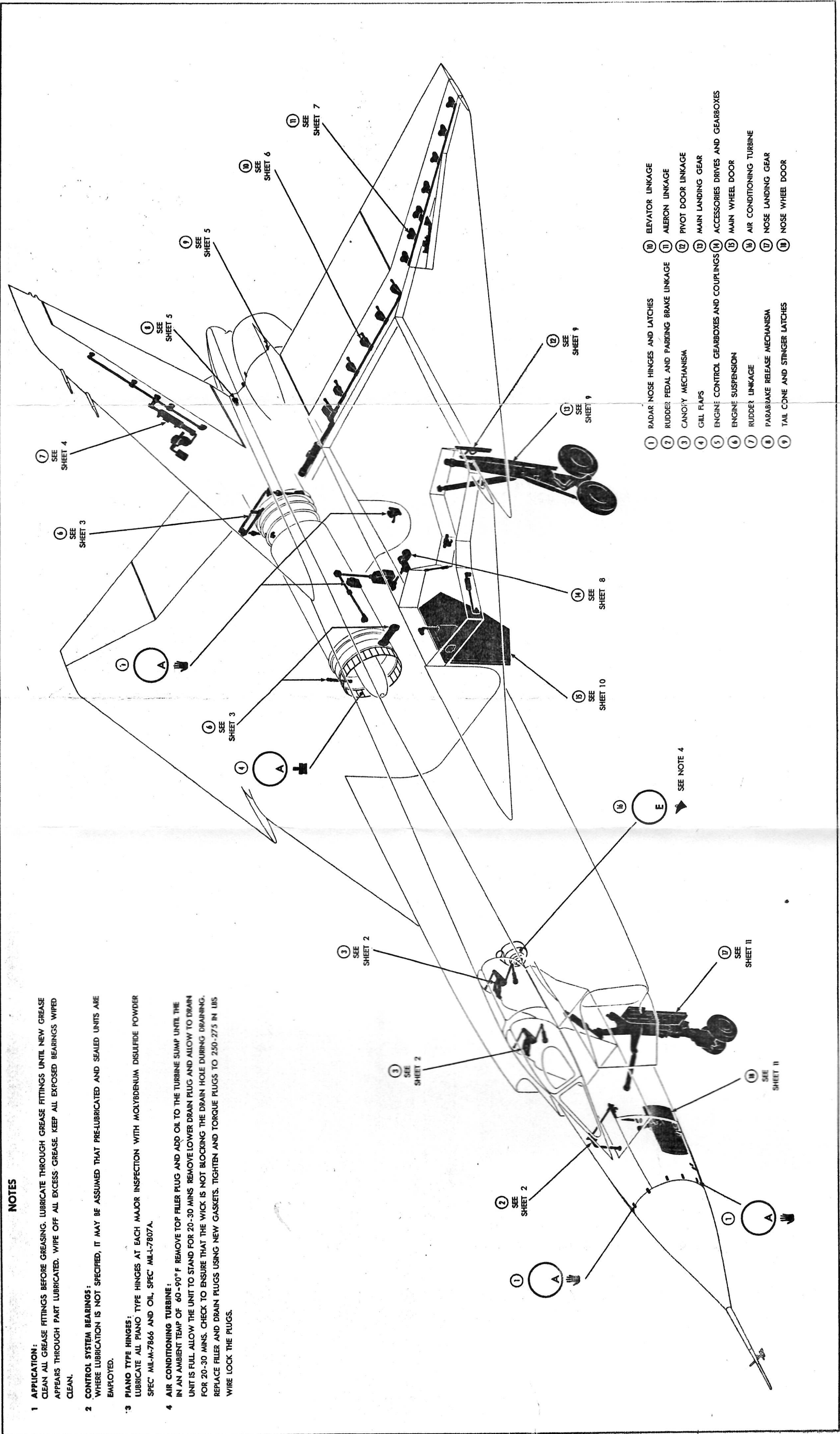
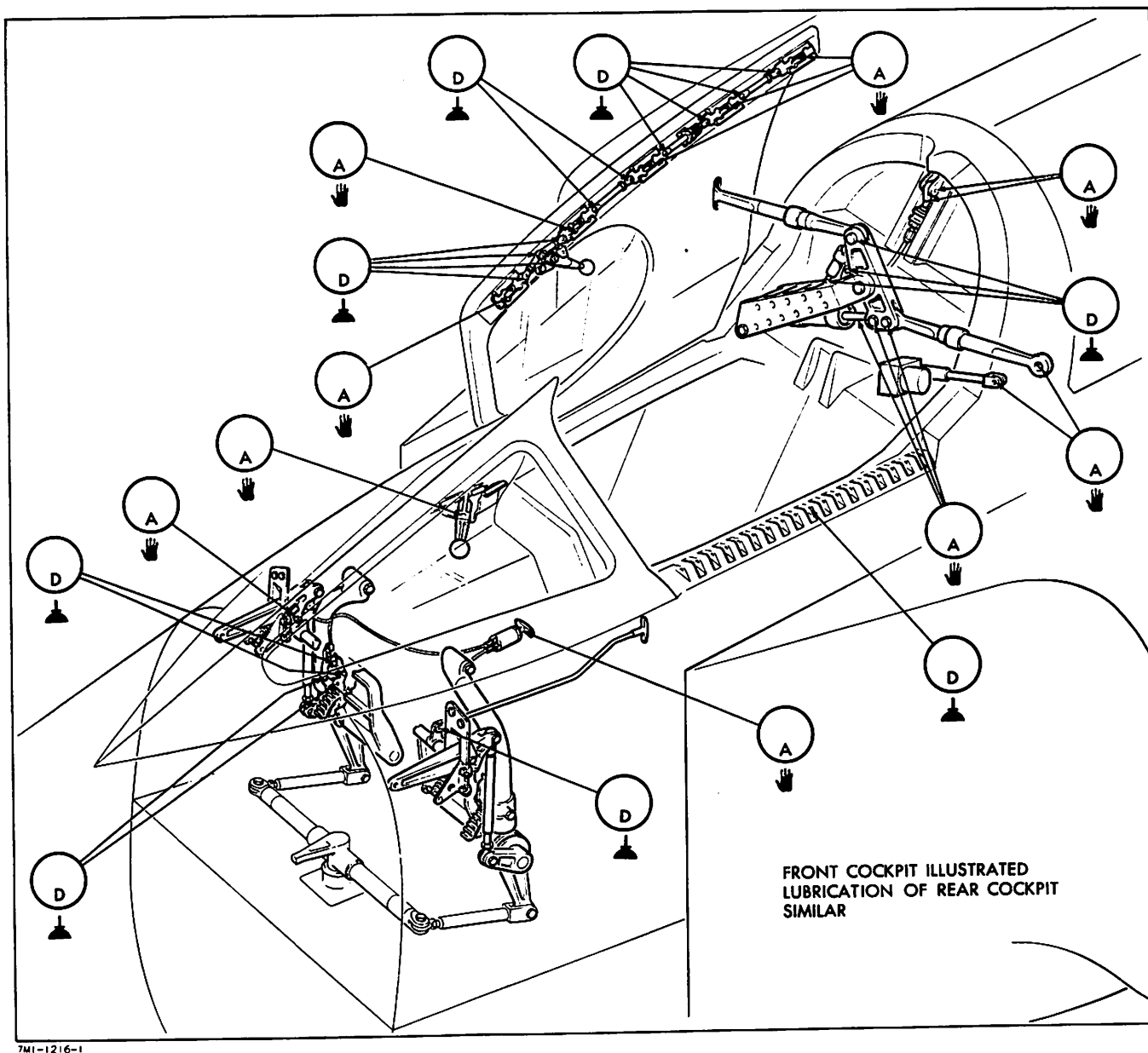


FIG. 2 Sheet 1 LUBRICATION DIAGRAM

11-981

UNCLASSIFIED

ARROW 1 SERVICE DATA



7M1-1216-1

FIG. 2 Sheet 2 COCKPIT

ARROW 1 SERVICE DATA

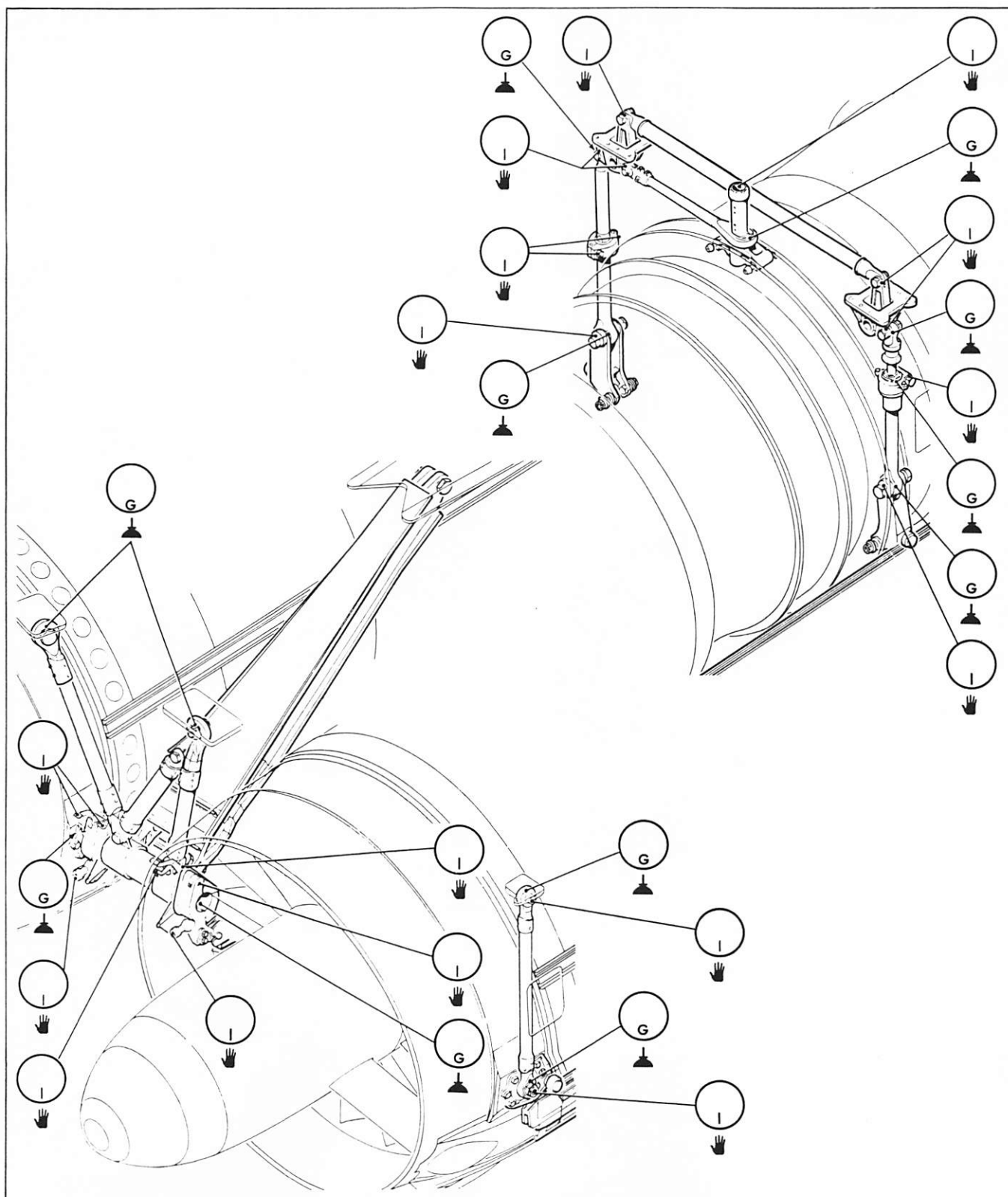


FIG.2 Sheet 3 ENGINE SUSPENSION

ARROW 1 SERVICE DATA

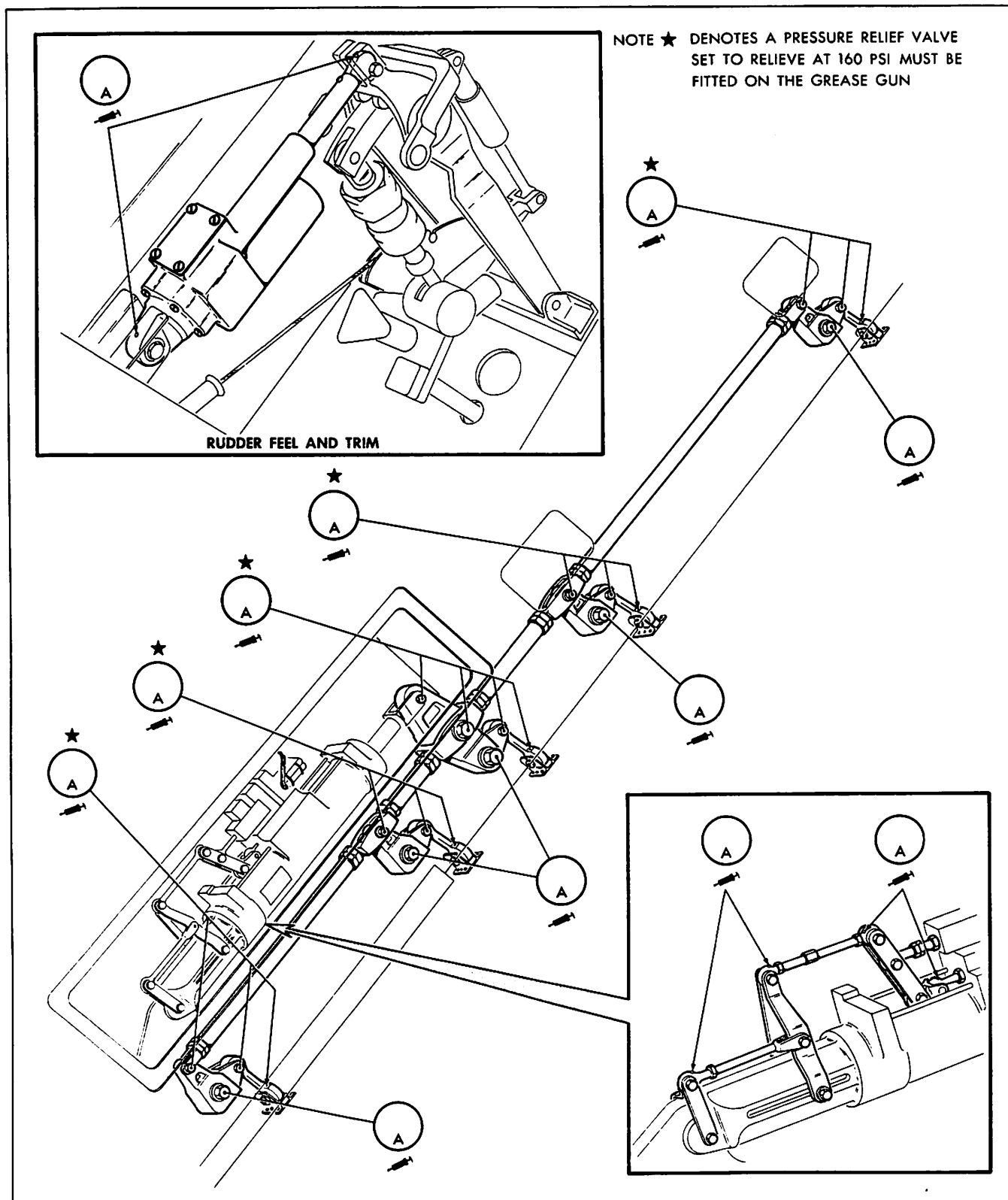


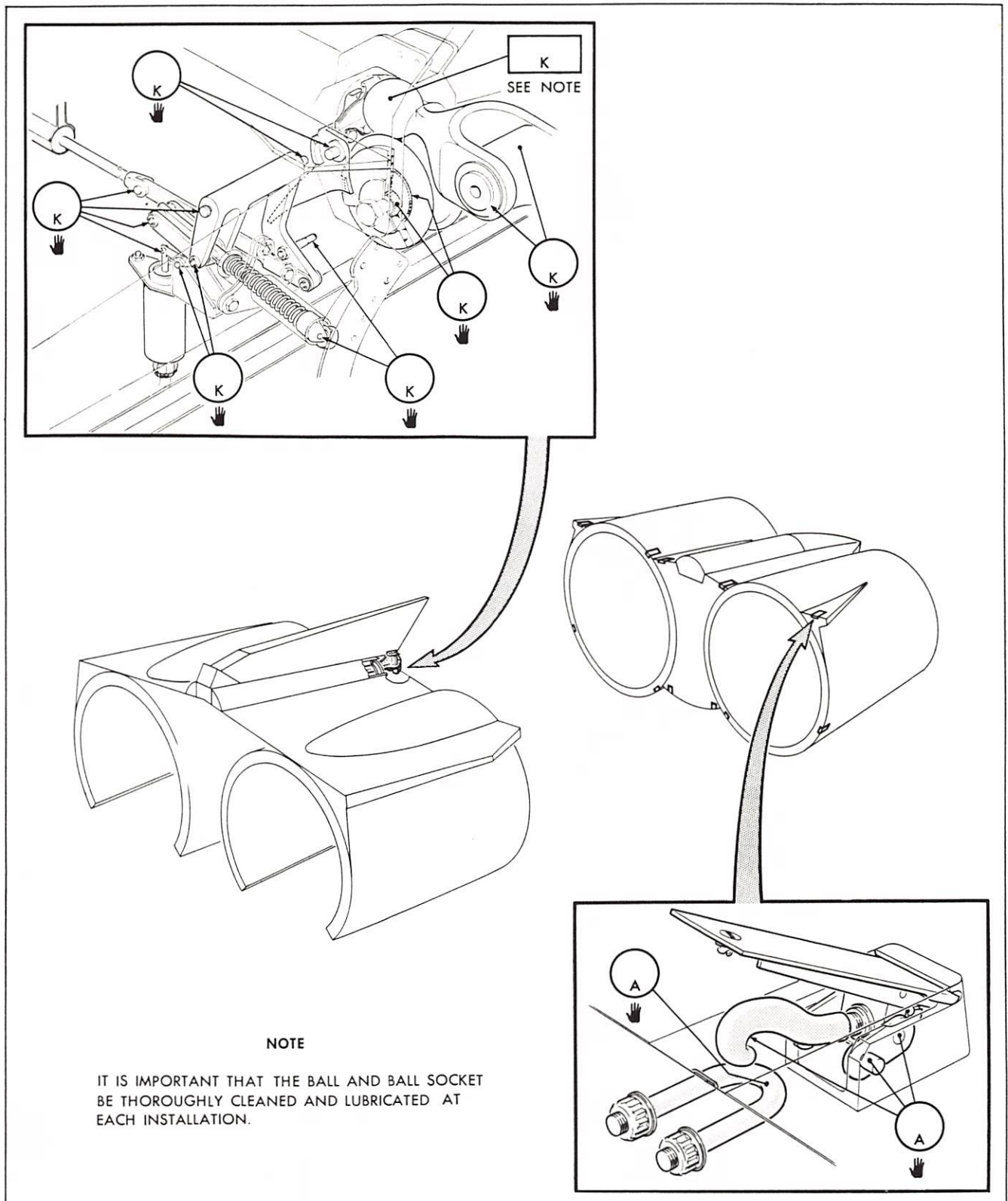
FIG. 2 Sheet 4 RUDDER LINKAGE

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

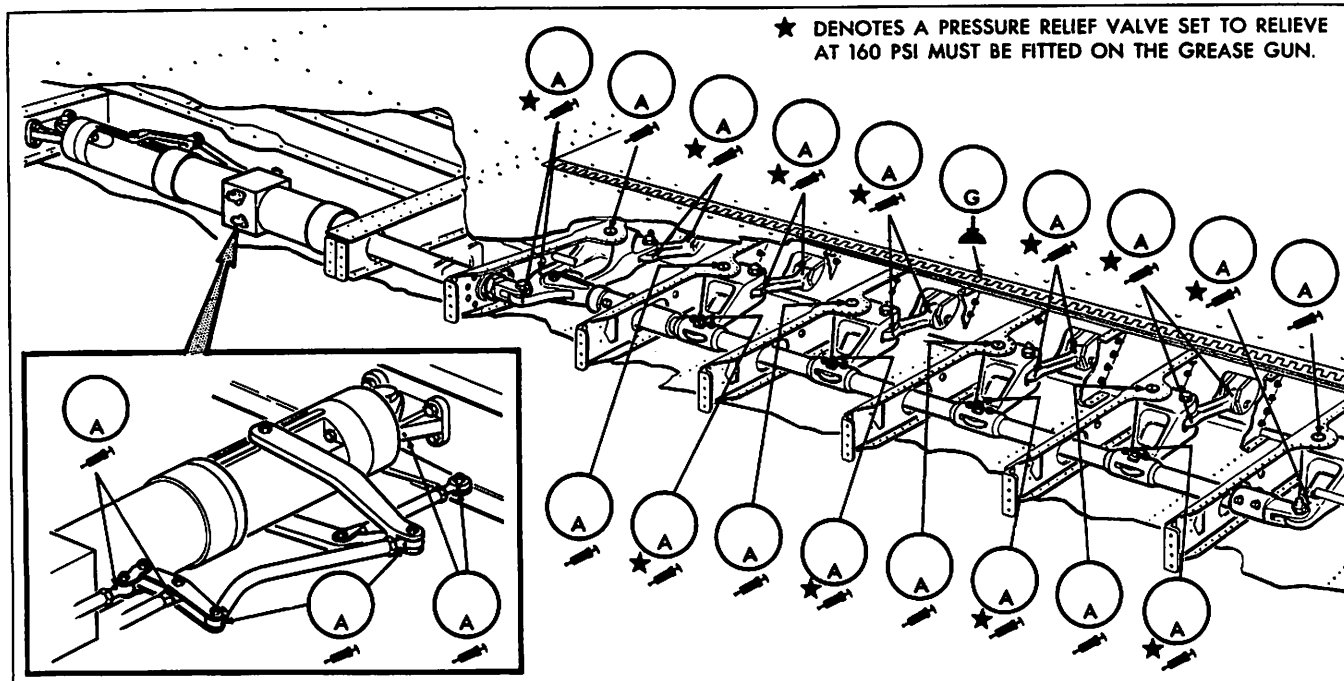
ARROW / 2



7M1-1217-2

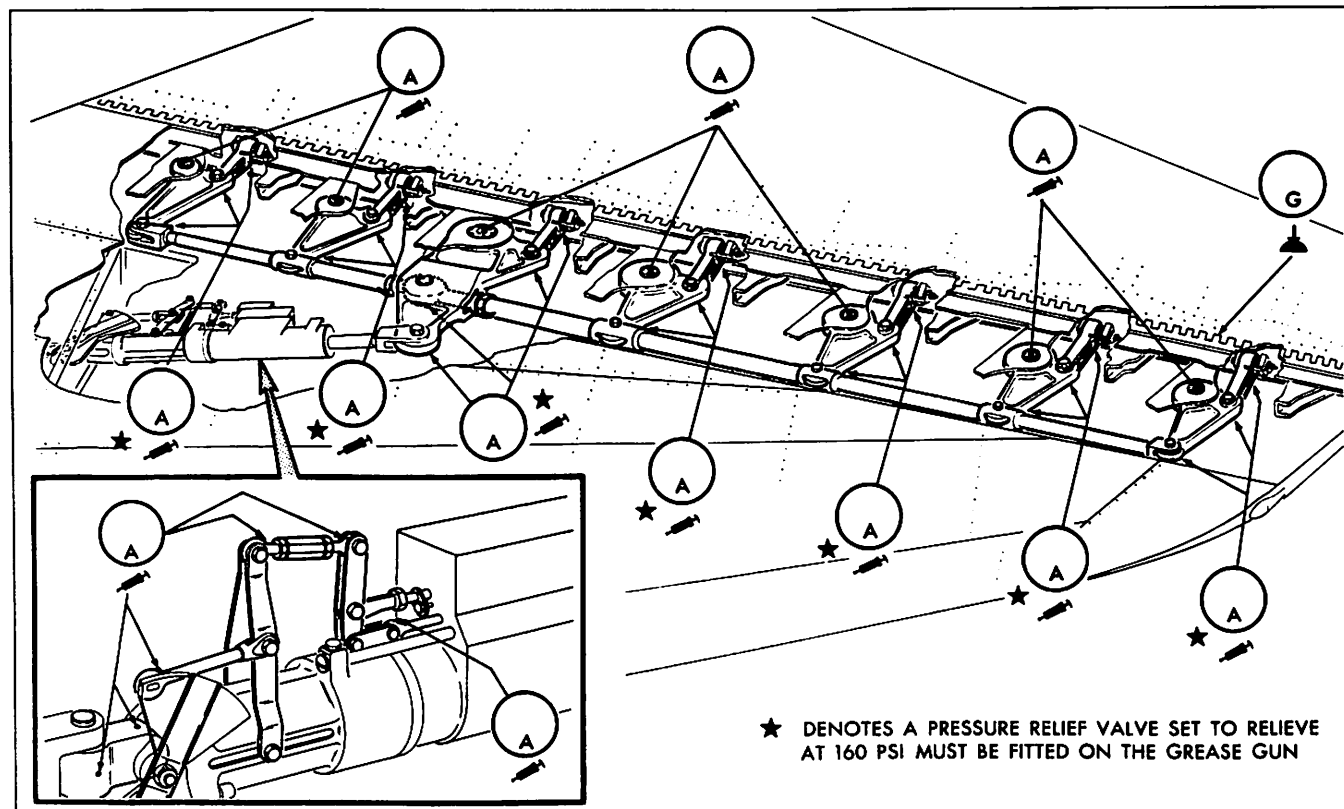
FIG. 2 Sheet 5 REAR FUSELAGE

ARROW 1 SERVICE DATA



7M1-1209-2

FIG. 2 Sheet 6 ELEVATOR LINKAGE



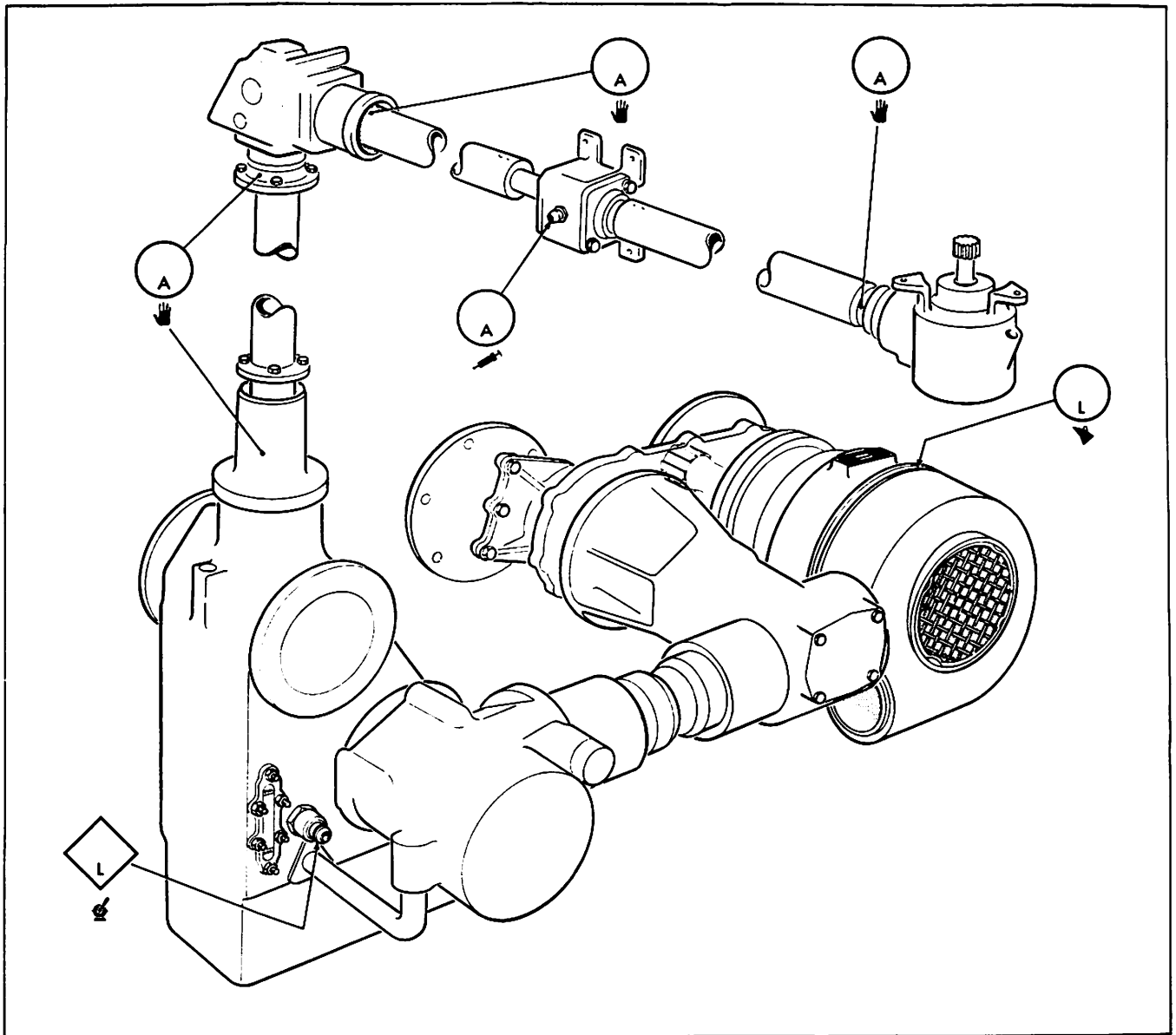
7M1-1210-1

FIG. 2 Sneet 7 AILERON LINKAGE

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA



701-1205-1

FIG. 2 Sheet 8 ACCESSORIES DRIVES AND GEARBOXES

UNCLASSIFIED

ARROW 1 SERVICE DATA

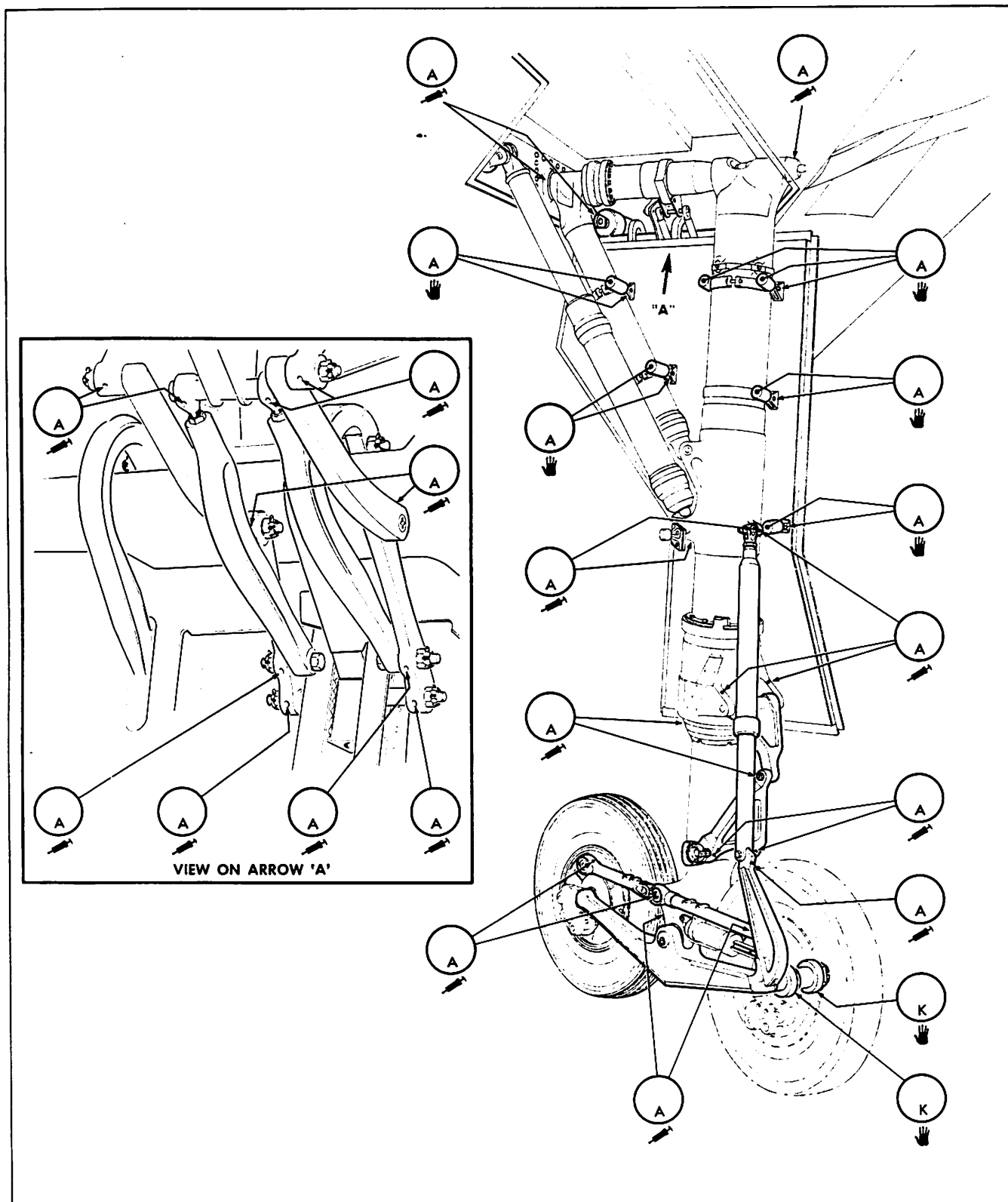
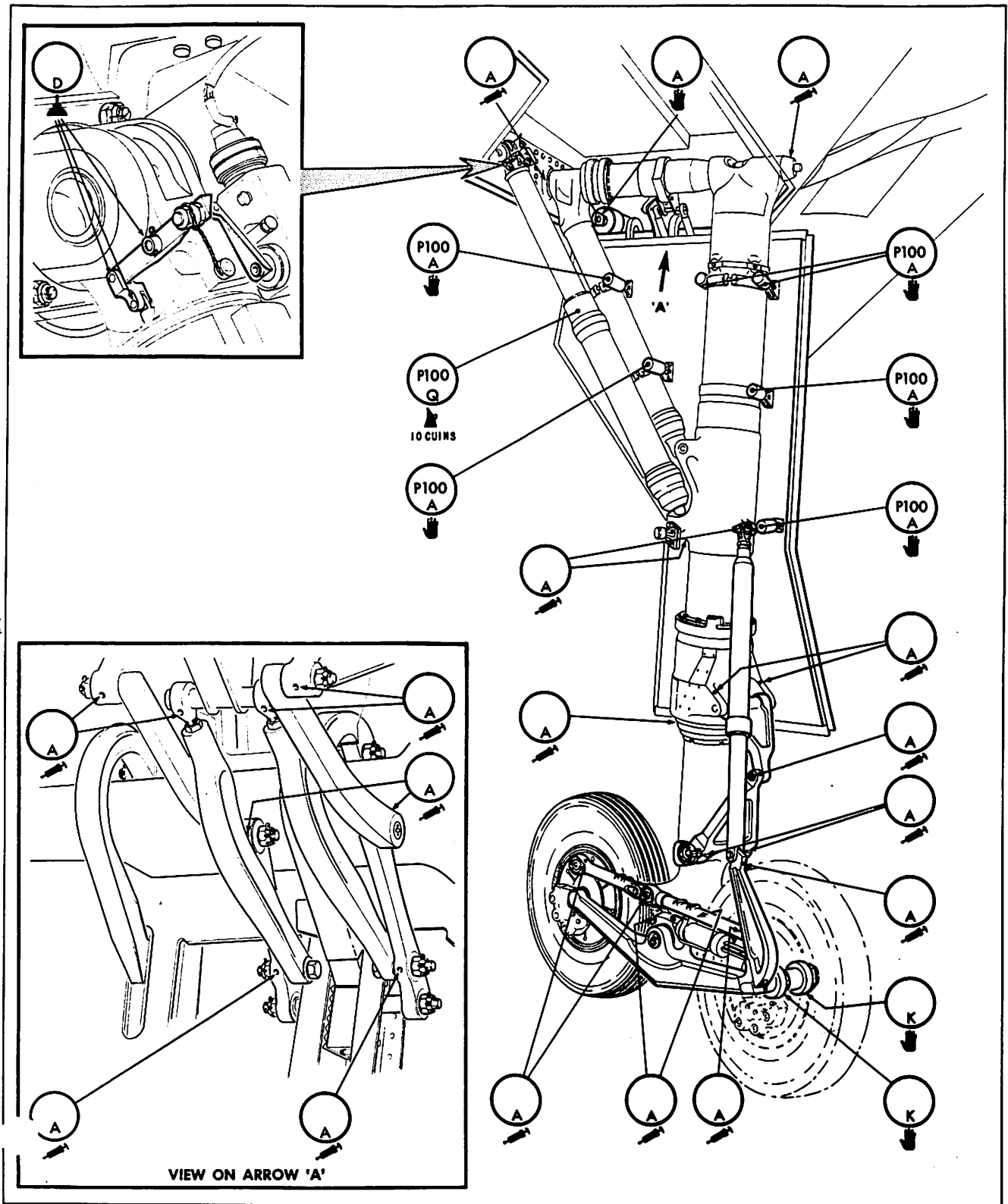
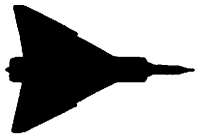
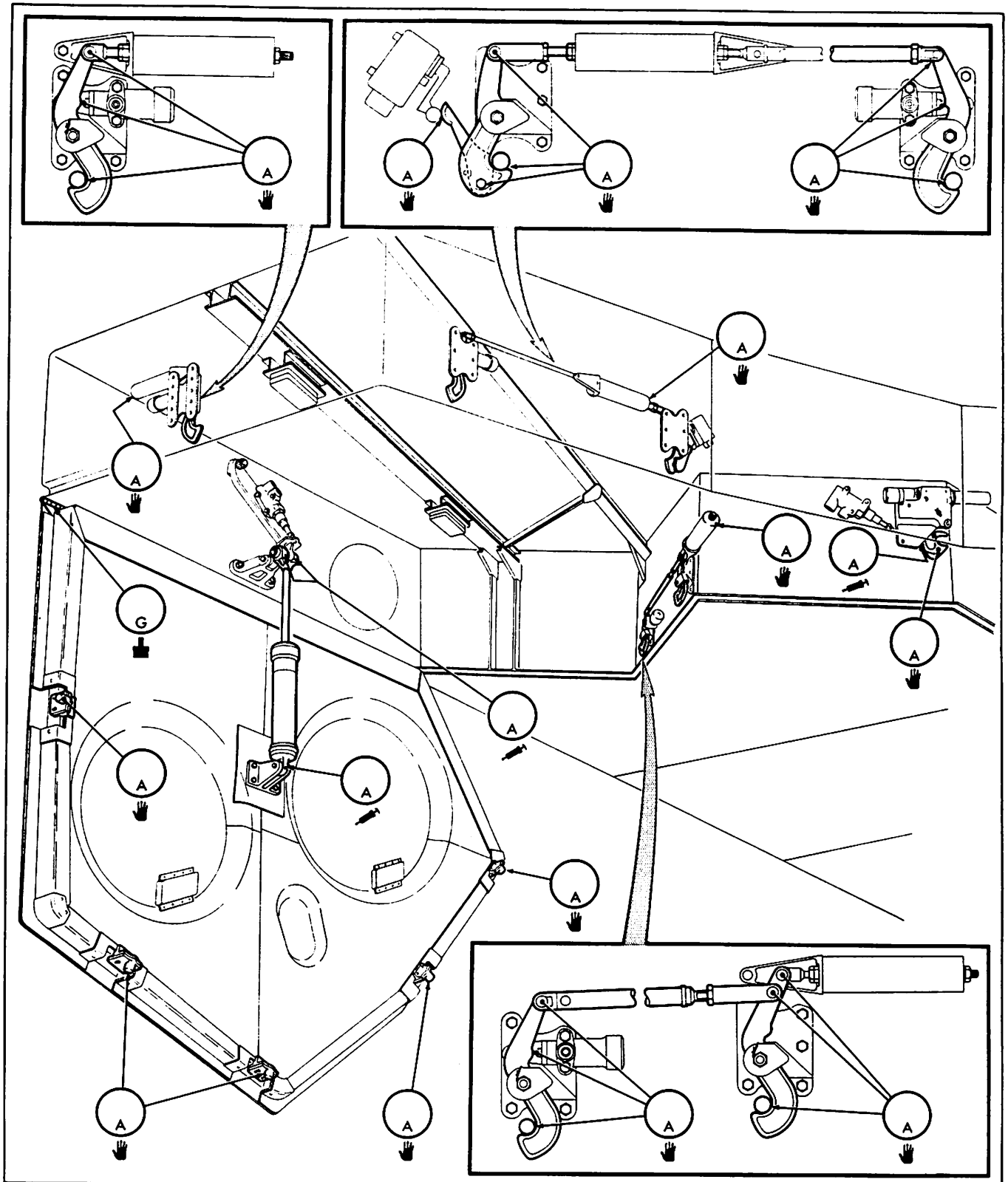


FIG. 2 Sheet 9 MAIN LANDING GEAR



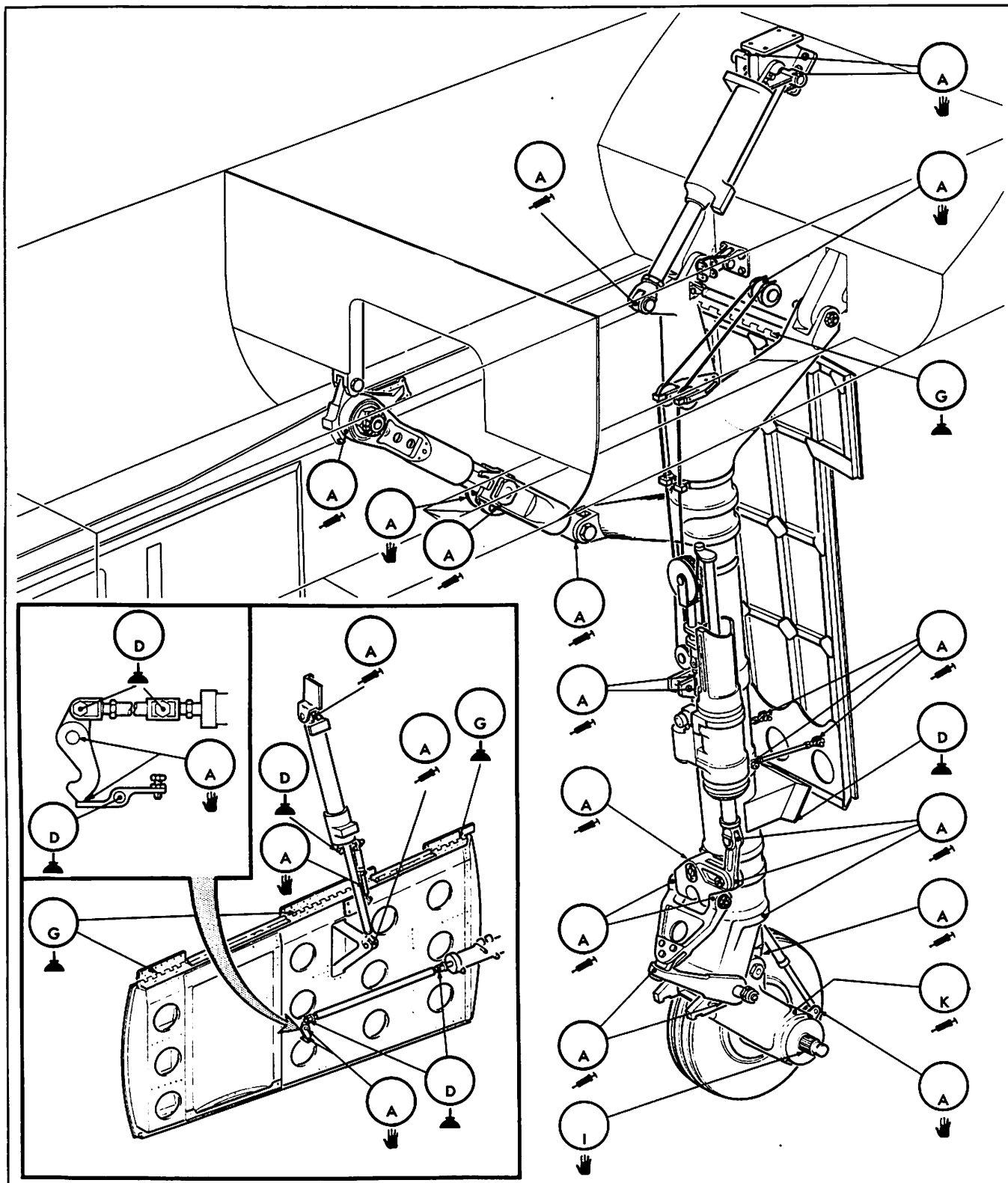
ARROW 1 SERVICE DATA



7M1-1213-1

FIG. 2 Sheet 10 MAIN WHEEL DOOR

ARROW 1 SERVICE DATA



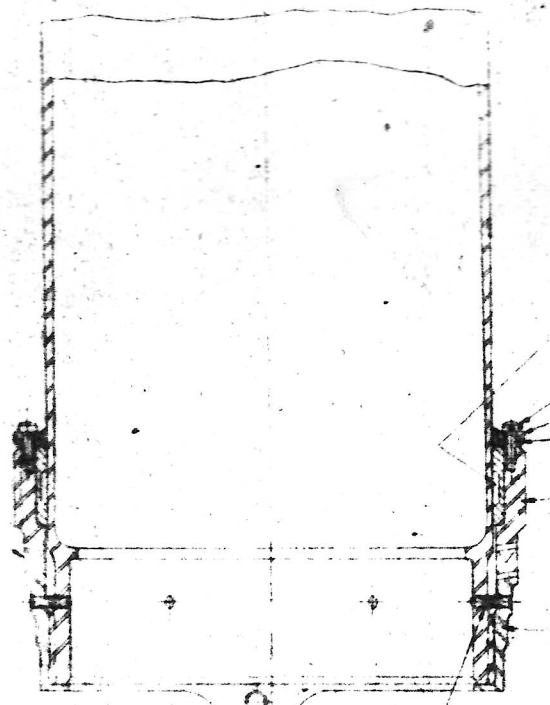
7M1-1202-2

FIG. 2 Sheet 11 NOSE LANDING GEAR

CONSTITUTION

DEWE. No.

THIS DRAWING IS TO AMERICAN PROJECTION

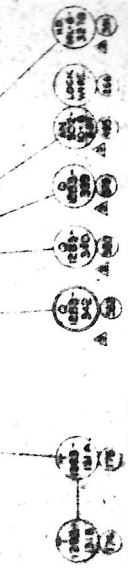


THIS SECTION TAKEN FROM
ROLLINS FOR CLARITY

IF ANY HEATING IS NECESSARY
FOR ANY PURPOSES, THE TEM-
PERATURE OF THIS FACT MUST NOT
EXCEED 800° F.

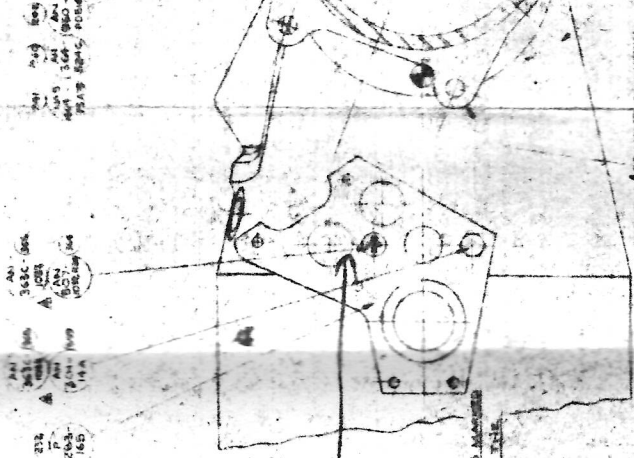
LEFT HAND RIGHT HAND

1. NEW YORK STATE BAR ASSOCIATION'S 615 N. ZEEB RD., SUITE 200, ALBANY, NEW YORK 12207-1000
(518) 487-2222 FAX (518) 487-2223
WWW.COURTSUPPLY.COM WWW.COURTSUPPLY.COM



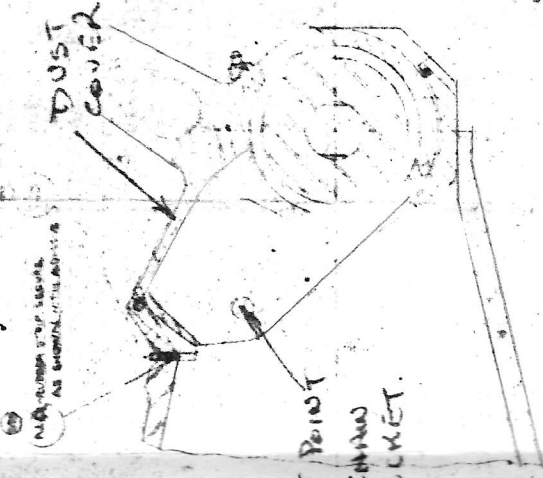
Micro
subites
Haupting
P.D.

THE PROTECTED OF THE TEMPLATES MARKED
THUS MOST BE WITHIN ONE OF THE
OF THESE LINES



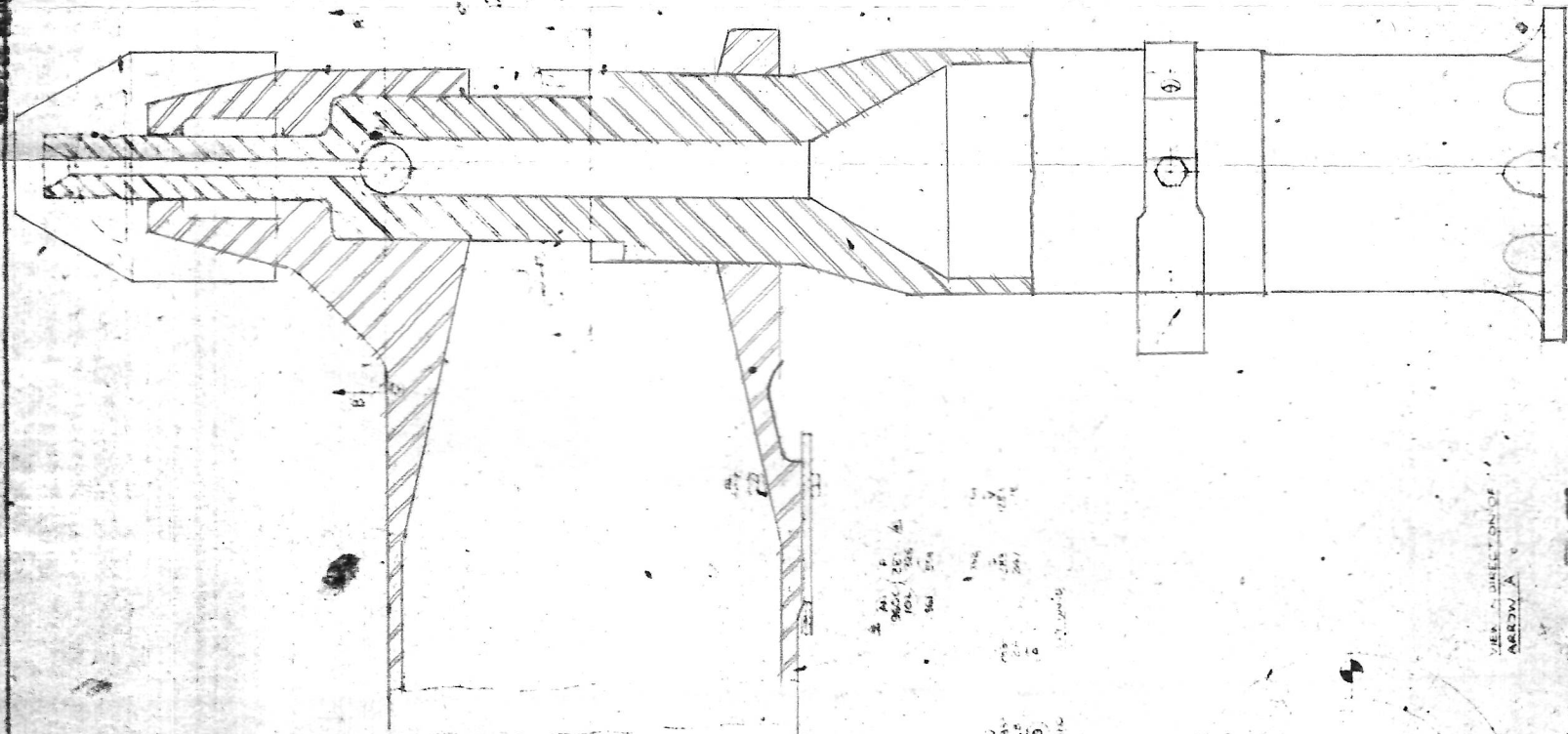
6. Chlorophyll is the green pigment in plants that captures light energy.

37747 REC ONLY
37753



Pivot Point
For Column
62Recht.

SECRET



VIEW A DIRECTION OF
ARROW A

F. G. 23

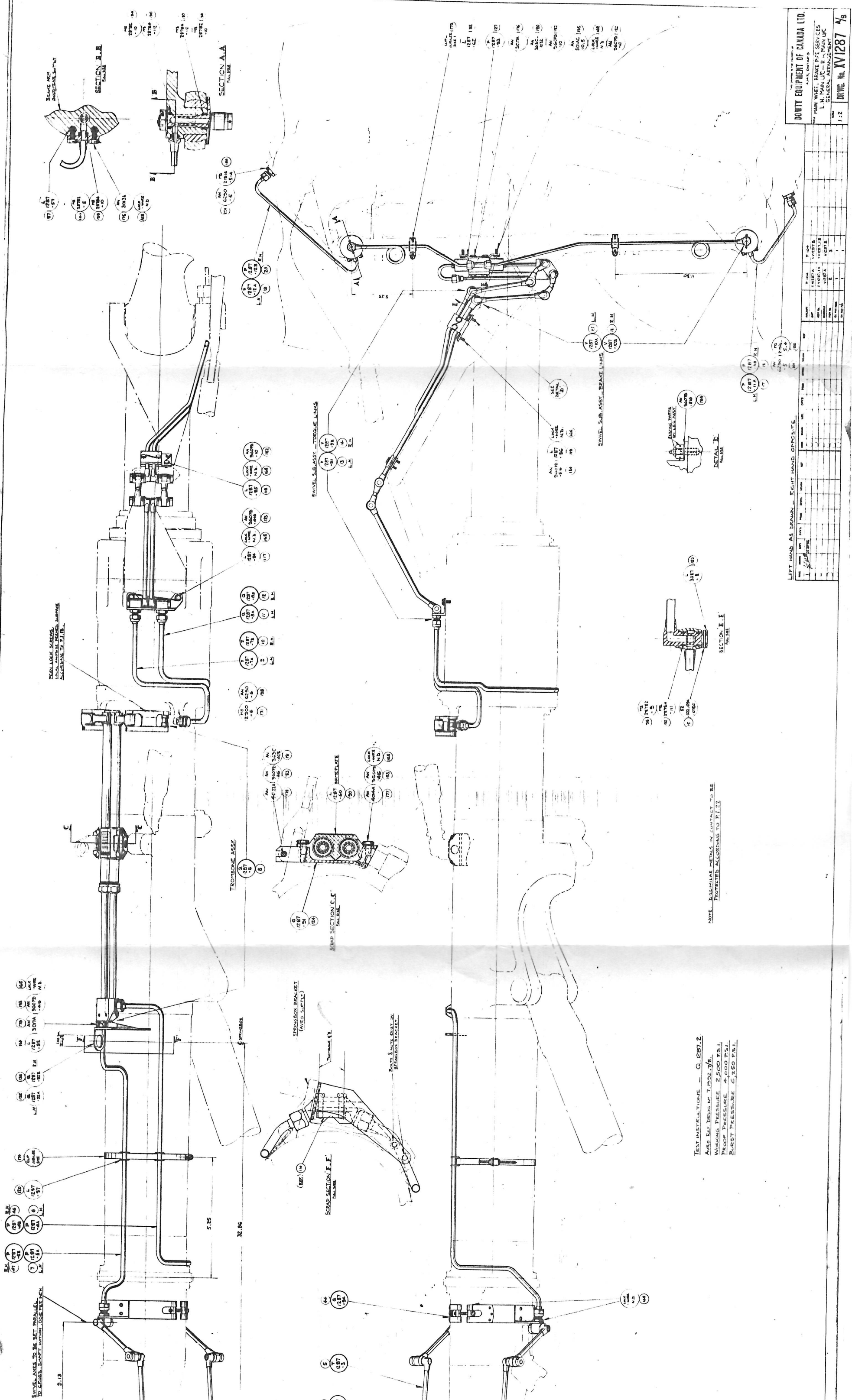
[illegible]

DATE	DESCRIPTION	AMOUNT	DATE	DESCRIPTION	AMOUNT
1950-1-1	...	...	1950-1-1	...	...
1950-1-2	...	...	1950-1-2	...	...
1950-1-3	...	...	1950-1-3	...	...
1950-1-4	...	...	1950-1-4	...	...
1950-1-5	...	...	1950-1-5	...	...
1950-1-6	...	...	1950-1-6	...	...
1950-1-7	...	...	1950-1-7	...	...
1950-1-8	...	...	1950-1-8	...	...
1950-1-9	...	...	1950-1-9	...	...
1950-1-10	...	...	1950-1-10	...	...
1950-1-11	...	...	1950-1-11	...	...
1950-1-12	...	...	1950-1-12	...	...
1950-1-13	...	...	1950-1-13	...	...
1950-1-14	...	...	1950-1-14	...	...
1950-1-15	...	...	1950-1-15	...	...
1950-1-16	...	...	1950-1-16	...	...
1950-1-17	...	...	1950-1-17	...	...
1950-1-18	...	...	1950-1-18	...	...
1950-1-19	...	...	1950-1-19	...	...
1950-1-20	...	...	1950-1-20	...	...
1950-1-21	...	...	1950-1-21	...	...
1950-1-22	...	...	1950-1-22	...	...
1950-1-23	...	...	1950-1-23	...	...
1950-1-24	...	...	1950-1-24	...	...
1950-1-25	...	...	1950-1-25	...	...
1950-1-26	...	...	1950-1-26	...	...
1950-1-27	...	...	1950-1-27	...	...
1950-1-28	...	...	1950-1-28	...	...
1950-1-29	...	...	1950-1-29	...	...
1950-1-30	...	...	1950-1-30	...	...
1950-1-31	...	...	1950-1-31	...	...
1950-2-1	...	...	1950-2-1	...	...
1950-2-2	...	...	1950-2-2	...	...
1950-2-3	...	...	1950-2-3	...	...
1950-2-4	...	...	1950-2-4	...	...
1950-2-5	...	...	1950-2-5	...	...
1950-2-6	...	...	1950-2-6	...	...
1950-2-7	...	...	1950-2-7	...	...
1950-2-8	...	...	1950-2-8	...	...
1950-2-9	...	...	1950-2-9	...	...
1950-2-10	...	...	1950-2-10	...	...
1950-2-11	...	...	1950-2-11	...	...
1950-2-12	...	...	1950-2-12	...	...
1950-2-13	...	...	1950-2-13	...	...
1950-2-14	...	...	1950-2-14	...	...
1950-2-15	...	...	1950-2-15	...	...
1950-2-16	...	...	1950-2-16	...	...
1950-2-17	...	...	1950-2-17	...	...
1950-2-18	...	...	1950-2-18	...	...
1950-2-19	...	...	1950-2-19	...	...
1950-2-20	...	...	1950-2-20	...	...
1950-2-21	...	...	1950-2-21	...	...
1950-2-22	...	...	1950-2-22	...	...
1950-2-23	...	...	1950-2-23	...	...
1950-2-24	...	...	1950-2-24	...	...
1950-2-25	...	...	1950-2-25	...	...
1950-2-26	...	...	1950-2-26	...	...
1950-2-27	...	...	1950-2-27	...	...
1950-2-28	...	...	1950-2-28	...	...
1950-2-29	...	...	1950-2-29	...	...
1950-2-30	...	...	1950-2-30	...	...
1950-3-1	...	...	1950-3-1	...	...
1950-3-2	...	...	1950-3-2	...	...
1950-3-3	...	...	1950-3-3	...	...
1950-3-4	...	...	1950-3-4	...	...
1950-3-5	...	...	1950-3-5	...	...
1950-3-6	...	...	1950-3-6	...	...

THEY SUPPLY TO THE COMPANY OF
BOWTY EQUIPMENT OF CANADA LTD.
100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913,

2000

DATE RECD. V. 5000



TEST INSTRUCTIONS - Q.1287.2
AURO KEY BEING N° 7.1932.7/8.
WORKING PRESSURE 2,500 P.S.I.
PROOF PRESSURE 4,000 P.S.I.
BURST PRESSURE 6,250 P.S.I.

NOTE. DISSIMILAR METALS IN CONTACT TO BE PROTECTED ACCORDING TO P.I.22

LEFT HAND AS SHOWN - RIGHT HAND OPPOSITE

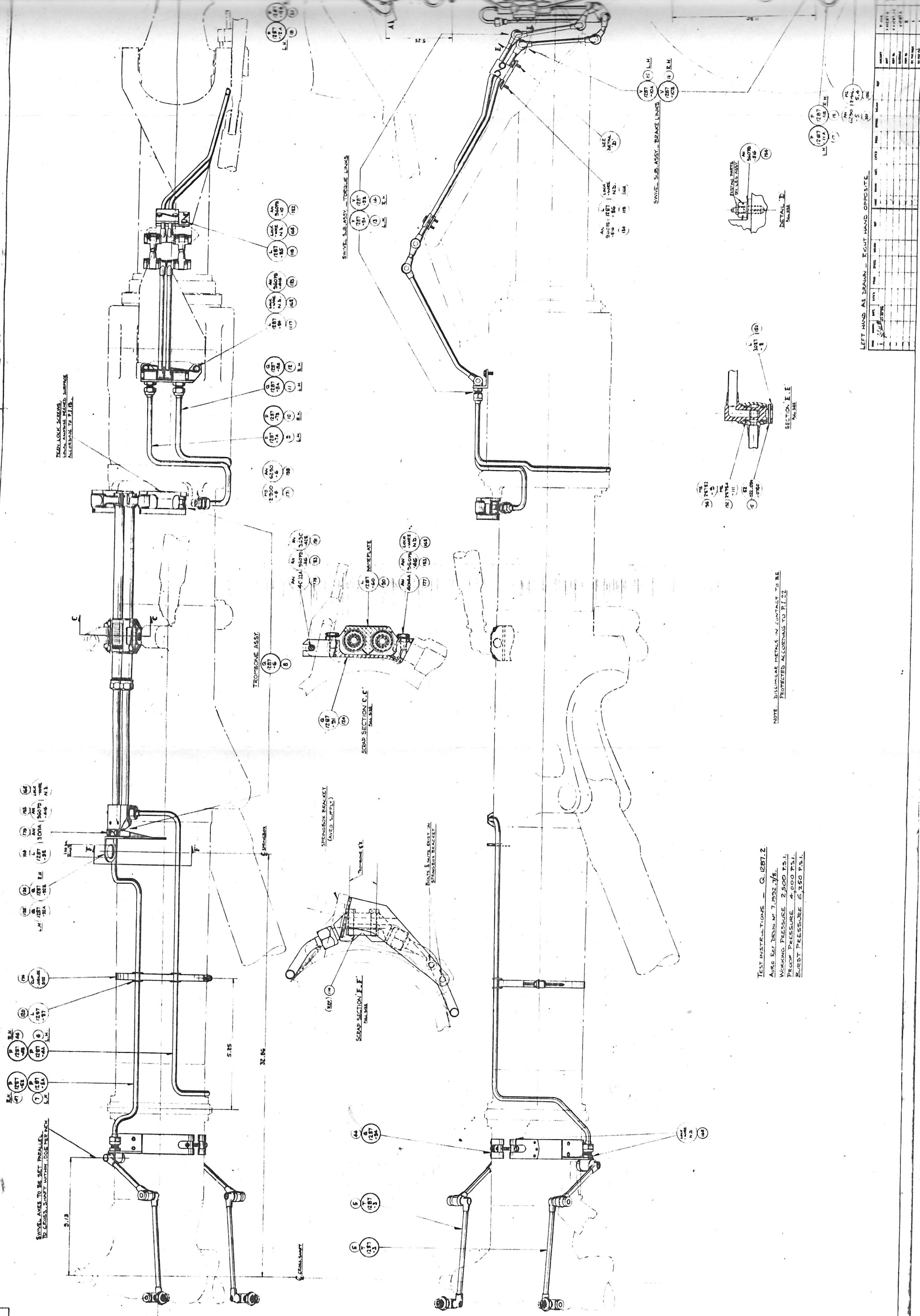
ITEM	QTY	UNIT	PRICE	TOTAL	REMARKS
1	1	EA	10.00	10.00	MAIN WHEEL
2	1	EA	15.00	15.00	AXLE
3	1	EA	20.00	20.00	SPINDLE
4	1	EA	25.00	25.00	DRUM
5	1	EA	30.00	30.00	BRAKE
6	1	EA	35.00	35.00	SHOCK
7	1	EA	40.00	40.00	STEERING
8	1	EA	45.00	45.00	WHEEL
9	1	EA	50.00	50.00	AXLE
10	1	EA	55.00	55.00	SPINDLE
11	1	EA	60.00	60.00	DRUM
12	1	EA	65.00	65.00	BRAKE
13	1	EA	70.00	70.00	SHOCK
14	1	EA	75.00	75.00	STEERING
15	1	EA	80.00	80.00	WHEEL
16	1	EA	85.00	85.00	AXLE
17	1	EA	90.00	90.00	SPINDLE
18	1	EA	95.00	95.00	DRUM
19	1	EA	100.00	100.00	BRAKE
20	1	EA	105.00	105.00	SHOCK
21	1	EA	110.00	110.00	STEERING
22	1	EA	115.00	115.00	WHEEL
23	1	EA	120.00	120.00	AXLE
24	1	EA	125.00	125.00	SPINDLE
25	1	EA	130.00	130.00	DRUM
26	1	EA	135.00	135.00	BRAKE
27	1	EA	140.00	140.00	SHOCK
28	1	EA	145.00	145.00	STEERING
29	1	EA	150.00	150.00	WHEEL
30	1	EA	155.00	155.00	AXLE
31	1	EA	160.00	160.00	SPINDLE
32	1	EA	165.00	165.00	DRUM
33	1	EA	170.00	170.00	BRAKE
34	1	EA	175.00	175.00	SHOCK
35	1	EA	180.00	180.00	STEERING
36	1	EA	185.00	185.00	WHEEL
37	1	EA	190.00	190.00	AXLE
38	1	EA	195.00	195.00	SPINDLE
39	1	EA	200.00	200.00	DRUM
40	1	EA	205.00	205.00	BRAKE
41	1	EA	210.00	210.00	SHOCK
42	1	EA	215.00	215.00	STEERING
43	1	EA	220.00	220.00	WHEEL
44	1	EA	225.00	225.00	AXLE
45	1	EA	230.00	230.00	SPINDLE
46	1	EA	235.00	235.00	DRUM
47	1	EA	240.00	240.00	BRAKE
48	1	EA	245.00	245.00	SHOCK
49	1	EA	250.00	250.00	STEERING
50	1	EA	255.00	255.00	WHEEL
51	1	EA	260.00	260.00	AXLE
52	1	EA	265.00	265.00	SPINDLE
53	1	EA	270.00	270.00	DRUM
54	1	EA	275.00	275.00	BRAKE
55	1	EA	280.00	280.00	SHOCK
56	1	EA	285.00	285.00	STEERING
57	1	EA	290.00	290.00	WHEEL
58	1	EA	295.00	295.00	AXLE
59	1	EA	300.00	300.00	SPINDLE
60	1	EA	305.00	305.00	DRUM
61	1	EA	310.00	310.00	BRAKE
62	1	EA	315.00	315.00	SHOCK
63	1	EA	320.00	320.00	STEERING
64	1	EA	325.00	325.00	WHEEL
65	1	EA	330.00	330.00	AXLE
66	1	EA	335.00	335.00	SPINDLE
67	1	EA	340.00	340.00	DRUM
68	1	EA	345.00	345.00	BRAKE
69	1	EA	350.00	350.00	SHOCK
70	1	EA	355.00	355.00	STEERING
71	1	EA	360.00	360.00	WHEEL
72	1	EA	365.00	365.00	AXLE
73	1	EA	370.00	370.00	SPINDLE
74	1	EA	375.00	375.00	DRUM
75	1	EA	380.00	380.00	BRAKE
76	1	EA	385.00	385.00	SHOCK
77	1	EA	390.00	390.00	STEERING
78	1	EA	395.00	395.00	WHEEL
79	1	EA	400.00	400.00	AXLE
80	1	EA	405.00	405.00	SPINDLE
81	1	EA	410.00	410.00	DRUM
82	1	EA	415.00	415.00	BRAKE
83	1	EA	420.00	420.00	SHOCK
84	1	EA	425.00	425.00	STEERING
85	1	EA	430.00	430.00	WHEEL
86	1	EA	435.00	435.00	AXLE
87	1	EA	440.00	440.00	SPINDLE
88	1	EA	445.00	445.00	DRUM
89	1	EA	450.00	450.00	BRAKE
90	1	EA	455.00	455.00	SHOCK
91	1	EA	460.00	460.00	STEERING
92	1	EA	465.00	465.00	WHEEL
93	1	EA	470.00	470.00	AXLE
94	1	EA	475.00	475.00	SPINDLE
95	1	EA	480.00	480.00	DRUM
96	1	EA	485.00	485.00	BRAKE
97	1	EA	490.00	490.00	SHOCK
98	1	EA	495.00	495.00	STEERING
99	1	EA	500.00	500.00	WHEEL
100	1	EA	505.00	505.00	AXLE

THIS QUANTITY IS THE MAXIMUM OF
DOVY EQUIPMENT OF CANADA LTD.
 1400, CANADA

NAME **MAIN WHEEL BRAKE PRE SERVICES**
L.H. MAIN UK - R.H. MAIN UK
GENERAL ARRANGEMENT

QTY **1/2**

DATE **DOVY No. XV1287 7/5**



LEFT HAND AS DRAWN - RIGHT HAND OPPOSITE									
LINE	DATE	TIME	STATION	TYPE	STATION	TIME	DATE	LINE	DATE
1	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	1	10/10/10
2	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	2	10/10/10
3	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	3	10/10/10
4	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	4	10/10/10
5	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	5	10/10/10
6	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	6	10/10/10
7	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	7	10/10/10
8	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	8	10/10/10
9	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	9	10/10/10
10	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	10	10/10/10
11	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	11	10/10/10
12	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	12	10/10/10
13	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	13	10/10/10
14	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	14	10/10/10
15	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	15	10/10/10
16	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	16	10/10/10
17	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	17	10/10/10
18	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	18	10/10/10
19	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	19	10/10/10
20	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	20	10/10/10
21	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	21	10/10/10
22	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	22	10/10/10
23	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	23	10/10/10
24	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	24	10/10/10
25	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	25	10/10/10
26	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	26	10/10/10
27	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	27	10/10/10
28	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	28	10/10/10
29	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	29	10/10/10
30	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	30	10/10/10
31	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	31	10/10/10
32	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	32	10/10/10
33	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	33	10/10/10
34	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	34	10/10/10
35	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	35	10/10/10
36	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	36	10/10/10
37	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	37	10/10/10
38	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	38	10/10/10
39	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	39	10/10/10
40	10/10/10	10:00	1000	1000	1000	10:00	10/10/10	40	10/10/10

ARROW 1 SERVICE DATA

SECTION 4

MAIN LANDING GEAR

(This data supersedes previous issue dated 11 Dec 56)

15 DEC 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

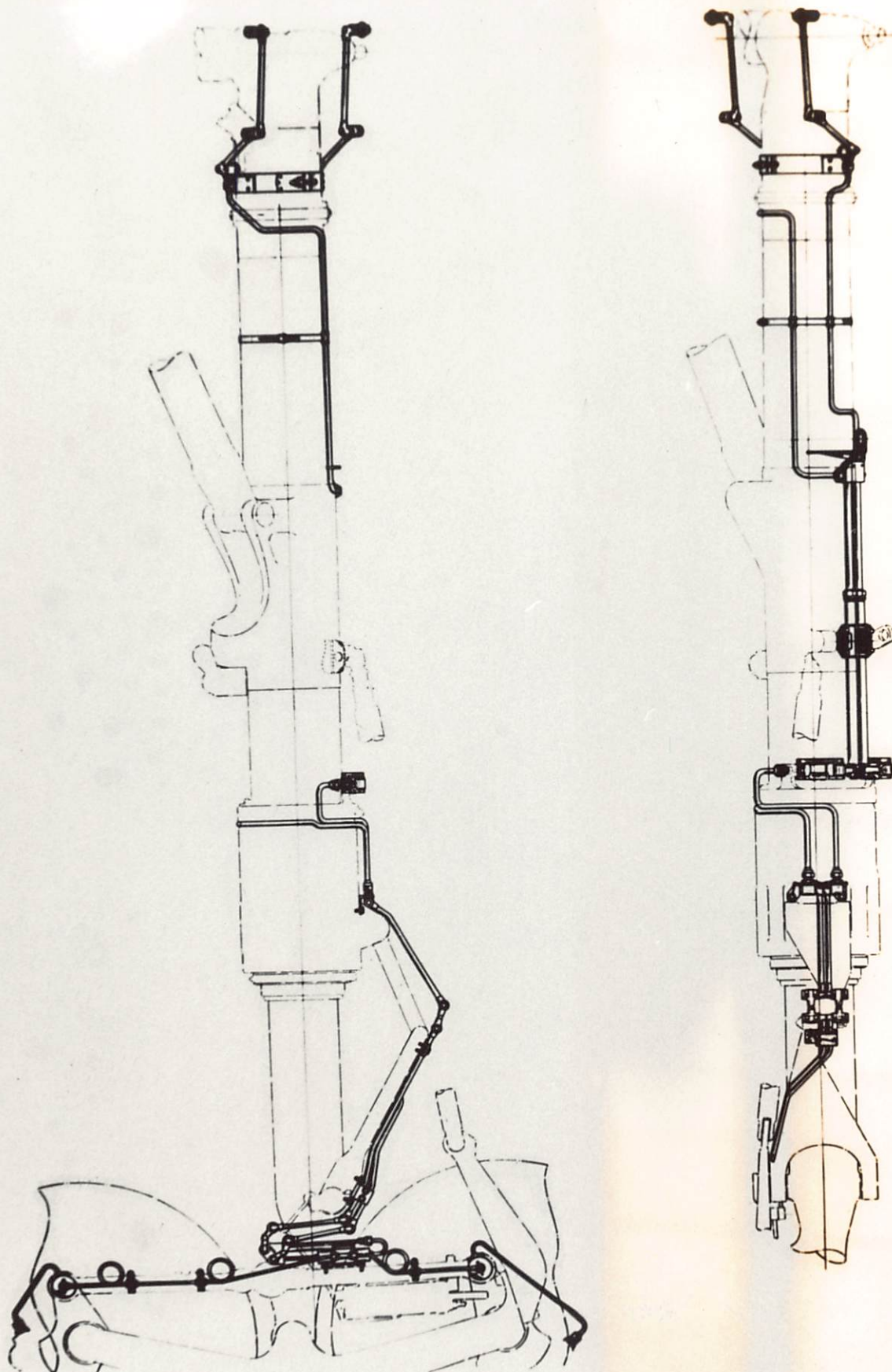


FIGURE 4 INSTALLATION OF RIGID BRAKE PIPES

ARROW 1 SERVICE DATA

MAIN LANDING GEAR

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General...	1
Main Landing Gear ...	1
Cross-shaft and Back Stay ...	1
Main Casing - External ...	1
Up-lock Roller Assembly ...	1
Main Casing - Internal ...	3
Chain and Sprocket Assembly ...	3
Shortening Mechanism Down-lock ...	3
Shortening Sleeve ...	4
Operating Sleeve ...	4
Sliding Member...	6
Shock Absorber...	6
Torque Links ...	6
Bogie Beam...	7
Tie-rod...	7
Leg Shortening and Rotation...	7
Brake Torque Links...	9
Shock Absorber Recuperator System...	9
Recuperator Valve ...	9
Side Stay ...	10
Leg Fairing...	11
Pivot Door and Linkage ...	12
Main Wheel Door ...	12
Main Leg Up-lock ...	14
Main Wheels ...	14
Wheel Brakes ...	16
Wheel Brake Mechanical Controls ...	17
SERVICING	
General...	20
Charging the Recuperator ...	20
Charging the Shock Absorber ...	20
REMOVAL	
General...	22
Cross-shaft and Leg Removal ...	22
Side Stay Removal ...	22
Back Stay Removal ...	23
Pivot Door and Leg Fairing Removal ...	23
Retraction Jack Removal ...	23
Shock Absorber Removal ...	24
Wheel Door Jack Removal ...	25

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
INSTALLATION AND ADJUSTMENTS	
General...	25
Installing the Main Leg and Back Stay ...	25
Installing the Side Stay ...	26
Rigging the Main Leg ...	26
Adjusting the Shortening Mechanism ...	27
Main Leg Up-lock and Sequence Valve Adjustment ...	29
Pivot Door Installation ...	29
Leg Fairing Adjustment ...	30
Retraction Jack Installation and Adjustment ...	30
Shock Absorber Installation ...	33
Wheel Door Up-lock Adjustment ...	35
Wheel Door Jack Installation and Adjustment ...	39
EQUIPMENT LIST...	40

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Main Landing Gear ...	2
2	Main Landing Gear Operation ...	3
3	Cross-shaft and Pivot Bearings ...	4
4	Leg Up-lock Roller Assembly ...	5
5	Main Leg Sectional View ...	5
6	Chain and Sprocket Assembly ...	6
7	Main Leg Shortening Mechanism ...	7
8	Main Leg Torque Fitting ...	8
9	Shock Absorber Recuperator System ...	10
10	Telescopic Side Stay ...	11
11	Leg Fairing Lower Spring Housings ...	12
12	Pivot Door ...	13
13	Pivot Door Operation ...	14
14	Main Wheel Door ...	15
15	Main Leg Up-lock ...	16
16	Main Wheel Assembly ...	17
17	Wheel Brake ...	18
18	Wheel Brake Mechanical Controls ...	19
19	Charging Index for Liquid Spring Shock Absorbers ...	21
20	Rigging the Main Leg ...	28
21	Leg Up-lock Adjustment ...	30
22	Leg Up-lock Sequence Valve Adjustment ...	31
23	Leg Fairing Adjustment ...	32
24	Retraction Jack Adjustment ...	34
25	Cam Roller Adjustment ...	35
26	Wheel Door Up-lock Adjustment ...	36
27	Wheel Door Sequence Valve Adjustment ...	38

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 Each main landing gear is equipped with a liquid spring shock absorber and two wheels, arranged in tandem, mounted on a bogie beam. The wheels have hydraulic disc type brakes which are applied automatically during retraction of the landing gear.

2 The landing gear is retracted hydraulically into a bay in the inner wing and when retracted is enclosed by a leg fairing, a pivot door and a wheel door. Extension of the gear is by gravity assisted by airloads when in flight.

3 The gear retracts forwards at an angle of approximately 45° to the aircraft centre line. This is achieved by setting the main pivot shaft at the appropriate angle. See fig 2. To bring the wheels into the same plane as the wheel bay, the lower portion of the main leg is rotated through an angle of $37-1/2^{\circ}$ during retraction. To accommodate the wheels in the wheel bay they must be tilted rearwards during retraction. This is accomplished by shortening the leg, and pivoting the bogie beam from a tie-rod attached to the front of the leg. The shortening mechanism is arranged so that the liquid spring is unaffected by the shortening action.

4 The leg is braced fore and aft by a back-stay, and laterally by a telescopic side stay which also contains the down-lock. The down-lock is locked mechanically and unlocked hydraulically.

5 The up-lock is fitted in the wheel bay. It engages mechanically with a roller on the leg and is unlocked hydraulically.

MAIN LANDING GEAR (Fig 1)

6 The main leg incorporates a shortening mechanism, a torque fitting, and a sliding member which houses the shock absorber. At the lower part of the leg are located a pair of torque links, a bogie beam with two integral wheel axles, and a telescopic tie-rod. Between the sliding member and the wheel brake assemblies are located two brake torque links, one of which mounts a recuperator for the shock absorber. The recuperator is rendered inoperative on Arrow 1 aircraft.

CROSS-SHAFT AND BACK STAY (Fig 3)

7 The cross-shaft assembly on which the main leg is mounted, is located between the main spar and the front spar of the inner wing. The cross-shaft is in two sections. A spacer is fitted between the flanged inner face of each section to facilitate removal of the main leg from the aircraft. An integral lug on the spacer is the attachment point for the retraction jack rod. The rear section of the cross-shaft is integral with the back stay and incorporates a journal locating in a self-aligning rear bearing housed in a fitting attached to the main spar.

8 The main casing of the leg is mounted on the front half of the cross-shaft and is secured by a shear pin. The top of the main casing is tapered at its forward end and locates in a self-aligning bearing housed in a fitting attached to the front spar. The cross-shaft is retained in this bearing by a thrust collar which fits against the tapered face of the bearing and is secured by a washer and thrust nut. Protruding from the end of the shaft is a locking stud retained by a roll pin. A lock washer and nut fitted on this stud locks the thrust nut.

9 The back stay, which is integral with the rear section of the cross-shaft, is fitted to brace the main leg fore-and-aft. The lower end of the stay is attached to two lugs on the main casing.

MAIN CASING - EXTERNAL (Fig 1)

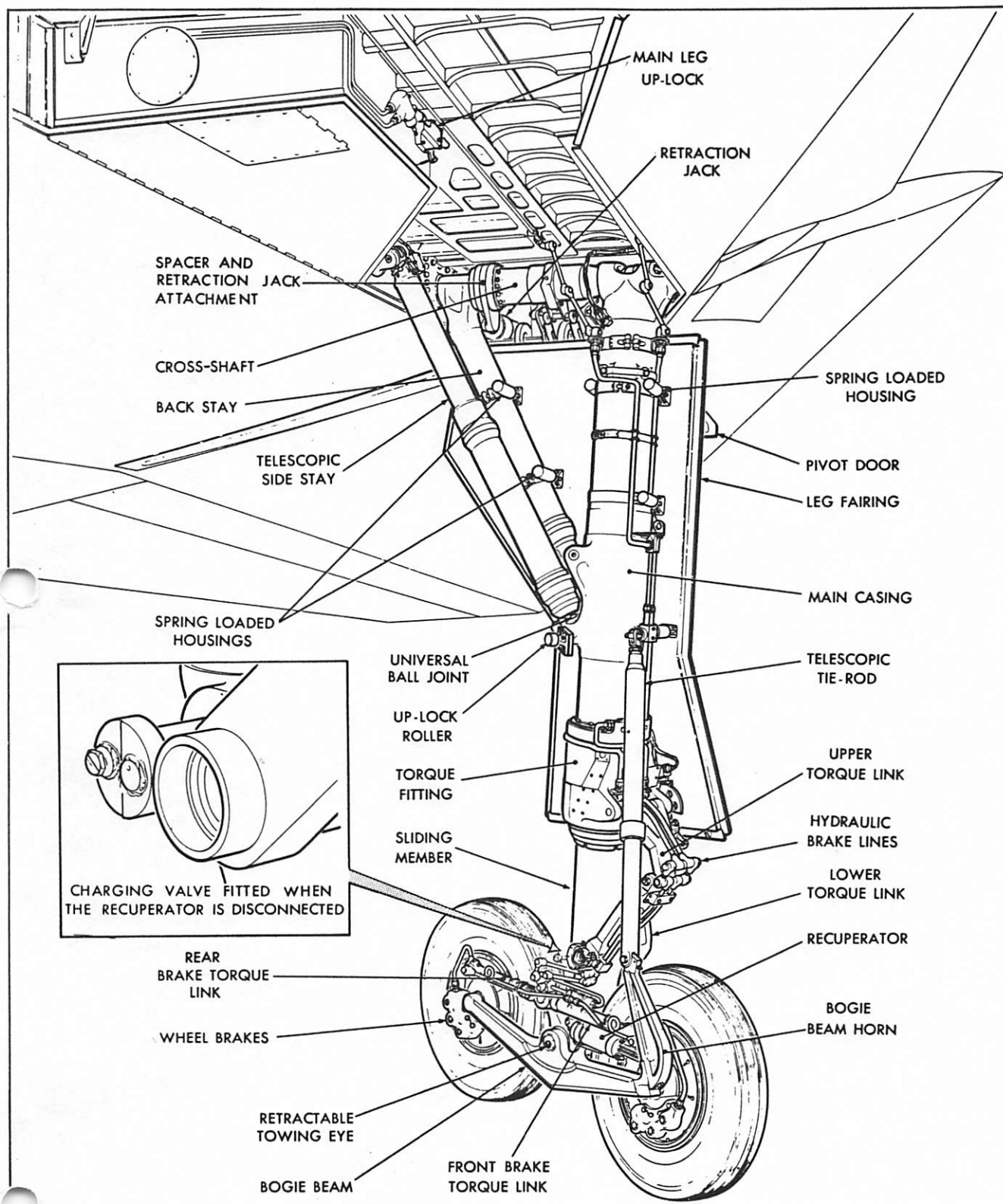
10 The main casing provides the lower attachment points for the back stay and the side stay, and the upper attachment point for the tie-rod. The back stay is attached to the main casing by a pin passing through two lugs on the casing. The lower end of the telescopic side stay is retained in an integral lug on the main casing. The lug also locates a fitting which carries the up-lock roller assembly.

UP-LOCK ROLLER ASSEMBLY (Fig 4)

11 The fitting securing the lower end of the side stay incorporates an integral lug which carries a spring housing for the leg fairing and also provides a vertically serrated back plate for the up-lock roller assembly. The

INTERIM REPAIR.
(SEE SEP 1958 REPORT)

ARROW 1 SERVICE DATA



1-1703-3

FIG. 1 MAIN LANDING GEAR

(INTERIM REPAIR)

ARROW 1 SERVICE DATA

roller assembly is attached to a horizontally serrated plate which is secured by four eccentric screws. A plate with horizontal and vertical serrations is fitted between the back plate and the roller assembly. The serrations, together with the eccentric screws, provide a two-way adjustment for the roller.

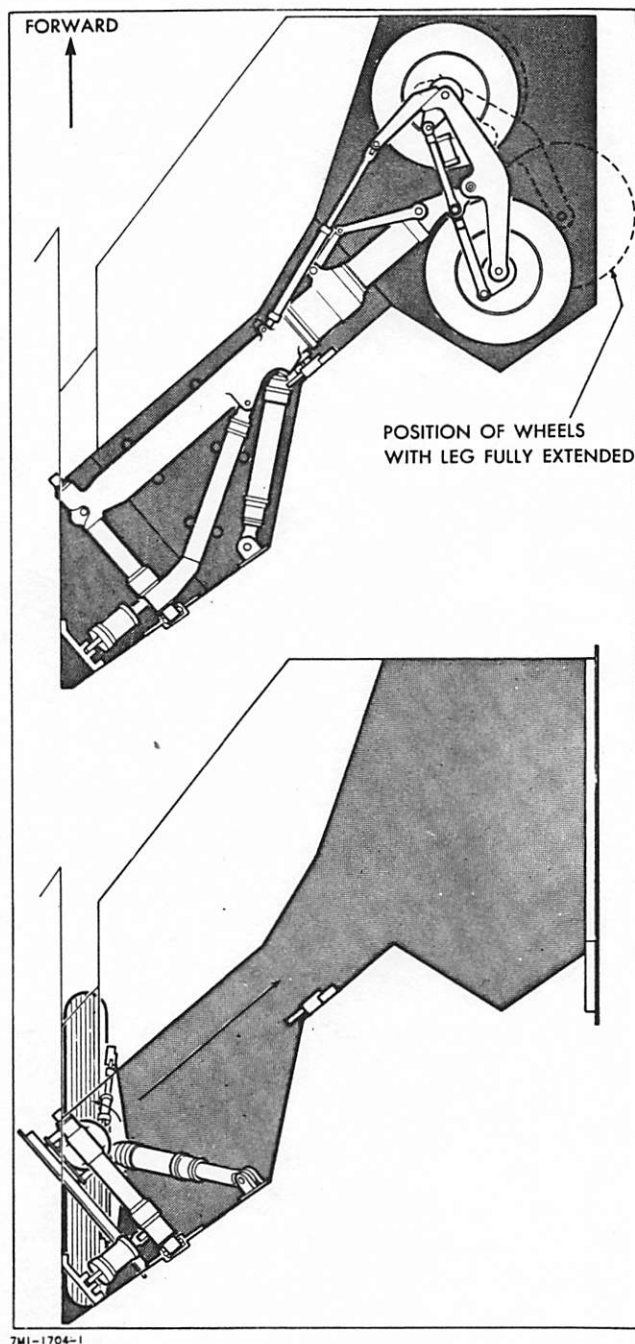


FIG. 2 MAIN LANDING GEAR OPERATION

MAIN CASING - INTERNAL (Fig 5)

12 Housed within the upper section of the leg is a shortening mechanism which withdraws the shock absorber together with the lower leg into the main casing during landing gear retraction. The shortening mechanism comprises a chain and sprocket assembly, a down-lock mechanism and a shortening sleeve.

CHAIN AND SPROCKET ASSEMBLY (Fig 6)

13 The chain and sprocket assembly consists of a double chain with one end attached to an adjustable drum mounted on top of a load transfer sleeve, and the other end to an operating cylinder in the down-lock mechanism. The drum is anchored to the main casing by a chain tension adjustment rod. The double chain passes around two sprockets attached to a fixed shortening bracket mounted on the front half of the cross-shaft, and also passes around a double sprocket attached to the top of the load transfer sleeve. The geometric arrangement of the chain and sprockets is such that, as the landing gear retracts, the chain pulls up on the operating cylinder.

14 The fixed shortening bracket is attached to the aircraft structure by an adjustment screw which passes through a barrel fitting and is retained in the fitting by a shear pin. Two locknuts secure the screw to the shortening bracket. Adjustment of the locknuts repositions the shortening bracket in relation to the structure and provides the adjustment for varying the amount of leg shortening. The chain tension adjustment is provided to remove any slack in the chain when the down-lock is fully engaged.

SHORTENING MECHANISM DOWN-LOCK (Fig 7)

15 The shortening mechanism down-lock engages to lock the leg in the fully extended position. The down-lock consists of an operating cylinder, a locking spring and a set of eight down-lock plungers. When the leg retracts, the operating cylinder is pulled upwards by the shortening chain to release the plungers from a recess around the lower section of the load transfer sleeve.

ARROW 1 SERVICE DATA

16 After the operating cylinder has moved upwards one inch it contacts the body of the down-lock and further movement of the shortening chain is transmitted through the lock to a shortening sleeve.

17 A double ball bearing fitted between the operating cylinder and the chain attachment prevents the rotary movement of the lower leg being transmitted from the operating cylinder to the shortening chain during landing gear retraction.

18 When the landing gear is lowered and the leg is fully extended, the locking spring pulls the operating cylinder downwards to force the plungers outward to lock the leg in this position. A telescopic rod attached to the operating cylinder moves a pivot lever to actuate a micro-switch mounted on the main casing. This micro-switch in conjunction with other down-lock switches supplies electrical power to the cockpit indicators.

SHORTENING SLEEVE (Fig 5 and 7)

19 The shortening sleeve is connected to the down-lock by a spherical bearing. This bearing provides the inner section of the leg

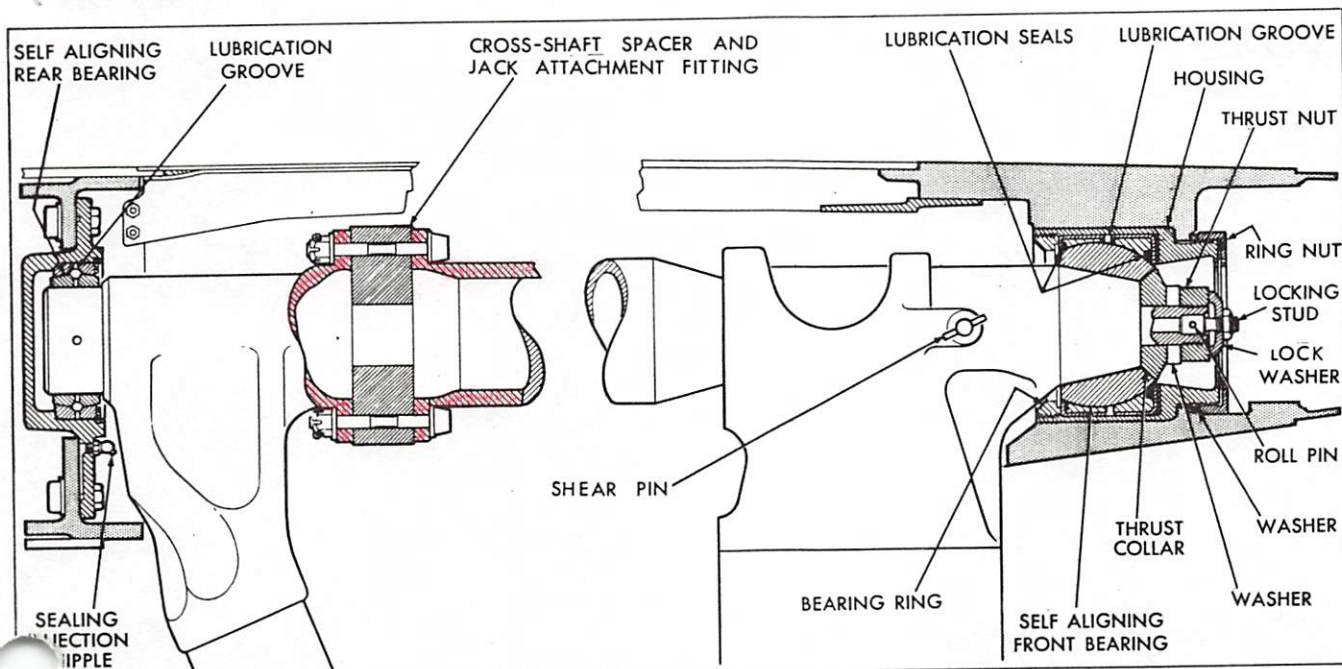
with a flexible joint which absorbs any movement within the main casing during landing. A pin connects the lower part of the shortening sleeve to an attachment collar and to the top of the shock absorber cylinder.

20 Shortening movement is transmitted from the chain through the down-lock and shortening sleeve to the top of the shock absorber cylinder. As the shortening loads are applied to the shock absorber cylinder, it is withdrawn into the main casing without compressing the shock absorber piston rod.

21 A leg extension spring is fitted around the outside of the shortening sleeve and extends the leg as the landing gear is lowered. The spring is located between two friction washers, one being fitted at the bottom of the load transfer sleeve and the other supported by a flange at the base of the shortening sleeve.

OPERATING SLEEVE (Fig 5 and 8)

22 The operating sleeve serves to transmit the shortening movement from the attachment collar to a torque fitting located on the lower part of the main casing. The upper part of the sleeve, which carries the upper bearing, is



JHI-1708-3

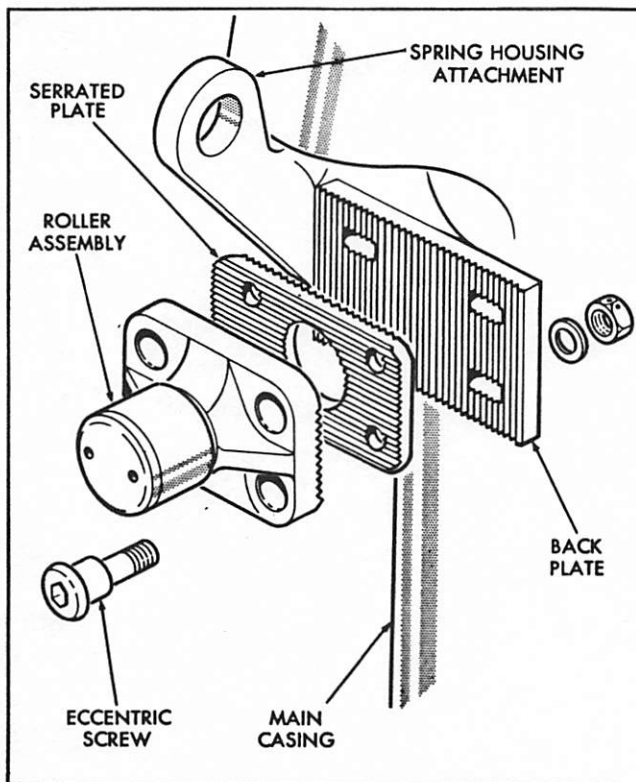
FIG.3 CROSS-SHAFT AND PIVOT BEARINGS

ARROW 1 SERVICE DATA

bolted to the attachment collar. The lower end, which carries the lower bearing, is attached to the torque fitting by four eccentric pins. The four pins protrude through the sleeve and retain the lower bearing.

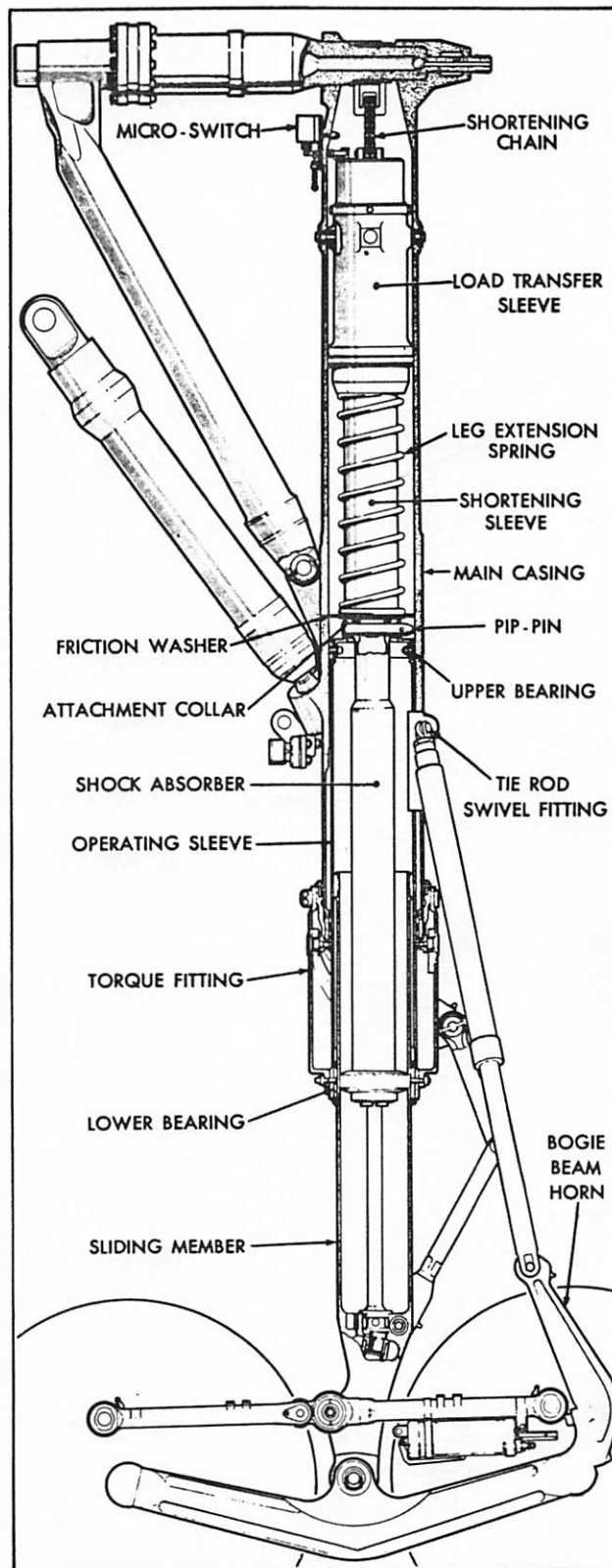
23 The torque fitting is located at the base of the main casing with its lower end attached to the bottom of the operating sleeve. A bearing located on the upper end of the fitting slides over the finished surface of the main casing when the gear is retracted.

24 The torque fitting converts the shortening movement of the leg into a rotary motion and transmits this through the torque links to the lower leg. Secured to the inner surface of the torque fitting are two sets of helical cam tracks. Two cam followers are located between the cam tracks. The followers rotate on needle rollers and are secured to the main casing. During leg retraction the torque fitting is pulled upwards and the cam tracks impart the rotary motion to the torque fitting. The contour of the cam tracks is such that the



7M1-1735-1

FIG. 4 LEG UP-LOCK ROLLER ASSEMBLY



7M1-1717-3

FIG. 5 MAIN LEG SECTIONAL VIEW

ARROW 1 SERVICE DATA

first movement of the torque fitting is straight upwards and allows a castellated curvic coupling to disengage.

25 The curvic coupling is engaged during the final movement of the leg extension and prevents the torque fitting from rotating when the gear is fully extended. The curvic coupling consists of an upper half and a lower half. The upper half is splined to the torque fitting and is retained by pins and a band clamp. This half forms the upper section of the torque fitting which, together with the upper bearing, slides over the lower surface of the main casing. A scraper ring is attached to the upper end of the coupling to remove any accumulation of foreign matter from the sliding surface. The lower half is splined to the base of the main casing and is located by roll pins.

26 The four eccentric pins which locate the torque fitting to the operating sleeve also provide the means of positioning the torque fitting alignment with the cam roller. A locking pad is fitted over each pin and these are secured by a band clamp around the base of the torque fitting.

SLIDING MEMBER (Fig 5)

27 The sliding member carries the lower part of the main leg assembly. The upper part of the member slides within the bore of the operating sleeve where it is located by a bearing and retained by the shock absorber. The bottom of the member is forked to accommodate a pivot pin which carries the bogie beam. An integral lug on the lower part of the member forms the main attachment point for two brake torque links. A ball type jacking point for jacking the main wheels is located on the bottom of the member.

SHOCK ABSORBER (Fig 5)

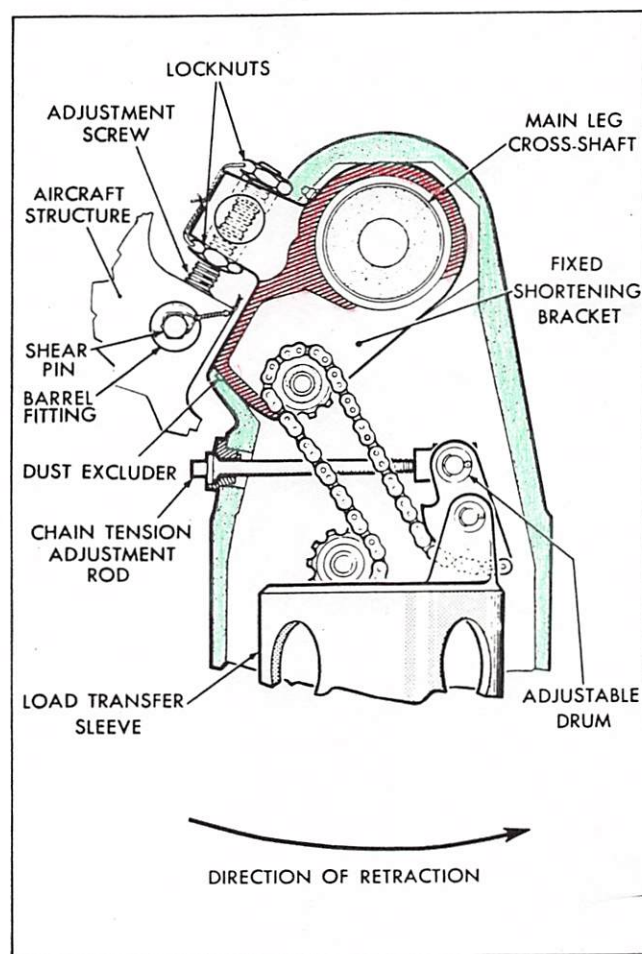
28 The liquid spring type shock absorber is housed within the sliding member and the operating sleeve. The cylinder of the shock absorber is connected to the shortening sleeve by a pin and the piston rod end is attached to the bottom of the sliding member by a special retaining nut. The nut is locked by a

tubular locking socket located between the fork of the sliding member.

TORQUE LINKS

29 The torque links are fitted to prevent rotation of the lower leg during taxiing and landing and to transmit the rotary motion of the torque fitting to the lower part of the leg during landing gear retraction.

30 The upper link is attached to the two lugs on the lower part of the torque fitting and is connected to the lower link by a bolt, nut and a distance washer. The lower torque link fork end is attached to the sliding member by a hinge pin. The inboard fork of the lower torque link mounts a cam which actuates a recuperator valve housed in the sliding member. (Not fitted on Arrow 1).



7M1-1720-3

FIG.6 CHAIN AND SPROCKET ASSEMBLY

ARROW 1 SERVICE DATA

BOGIE BEAM

31 The bogie beam pivots between the fork at the bottom of the sliding member. The pivot pin is secured to the beam by a bolt passing through the centre of the beam and is supported in two plain bearings, one in each arm of the fork. An earthing wire is attached to the lower end of the retaining bolt. Housed within the hollow pivot pin is a retractable towing eye which is spring-loaded to the housed position.

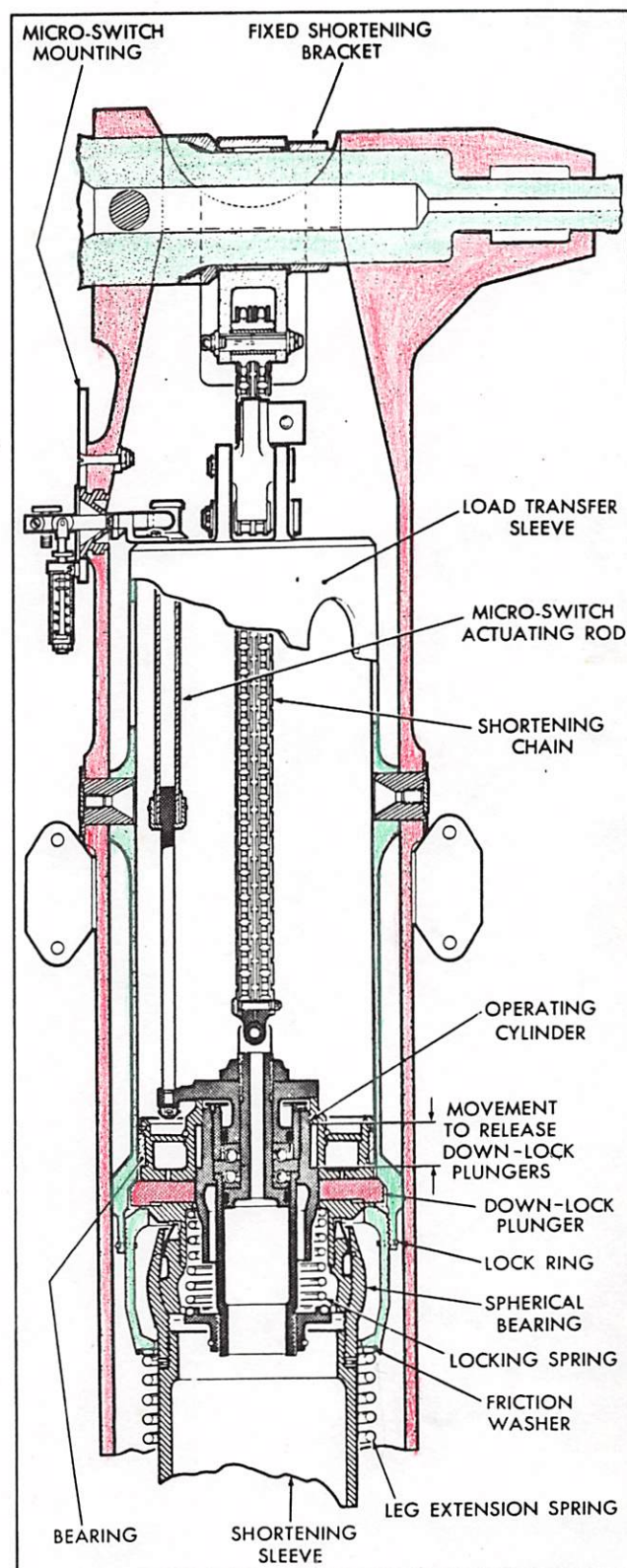
32 An integral axle at each end of the beam carries the twin tandem wheels. A bogie beam horn attached to the front of the beam provides the attachment point for the lower end of a telescopic tie-rod.

TIE-ROD

33 The telescopic tie-rod is fitted between a swivel fitting, attached to a lug on the main casing, and the bogie beam horn. The tie-rod is spring-loaded to the extended position and tilts the bogie beam forward when the landing gear is retracting. This locates the wheels in the correct position for stowage in the wheel bay. The spring-loaded tie-rod also dampens oscillation of the bogie beam when the aircraft lands.

LEG SHORTENING AND ROTATION
(Figs 5, 6, 7 and 8)

34 When the landing gear retracts, the distance between the sprocket on the fixed shortening bracket and the chain attachment point on the leg increases. See fig 6. This action pulls the free end of the chain, attached to the operating cylinder, in an upward direction. See fig 7. The operating cylinder is lifted, compressing the locking spring. When the lower and smaller end of the cylinder aligns itself with the down-lock plungers the plungers are forced inwards by the action of the tapered face and the down-lock is released. After the operating cylinder has lifted approximately one inch the plungers are fully released and the cylinder contacts the down-lock body. The chain movement is now transmitted through the down-lock to the shortening sleeve.



711-1718-4

FIG. 7 MAIN LEG SHORTENING MECHANISM

ARROW 1 SERVICE DATA

35 Further retraction of the leg now pulls the shortening sleeve upwards and compresses the leg extension spring. The shock absorber and operating sleeve, which are secured to the shortening sleeve, are pulled into the main casing and the leg is shortened progressively as the leg retracts. The sliding member and shock absorber which remain fully extended throughout the operation are lifted upwards with the operating sleeve. The spring-loaded telescopic tie-rod, which is secured to the main casing, tilts the bogie beam forward as the sliding member, shock absorber and operating sleeve are pulled into the main casing.

36 Simultaneously with leg shortening, the movement of the operating sleeve is transmitted to the torque fitting. The initial

movement of the operating sleeve lifts the torque fitting upwards and disengages the castellated teeth of the curvic coupling. Further movement of the operating sleeve causes the stationary cam followers to impart a rotary motion to the cam tracks and the torque fitting. This motion is transmitted through the torque links to the sliding member and bogie beam.

37 With the main leg shortened and partially rotated, and with the main wheels tilted by the tie-rod, the main leg and wheels are correctly positioned for stowage into the wheel bay.

38 Leg extension together with rotation of the lower leg occurs as the landing gear is lowered. Lowering the leg progressively releases the tension on the leg extension

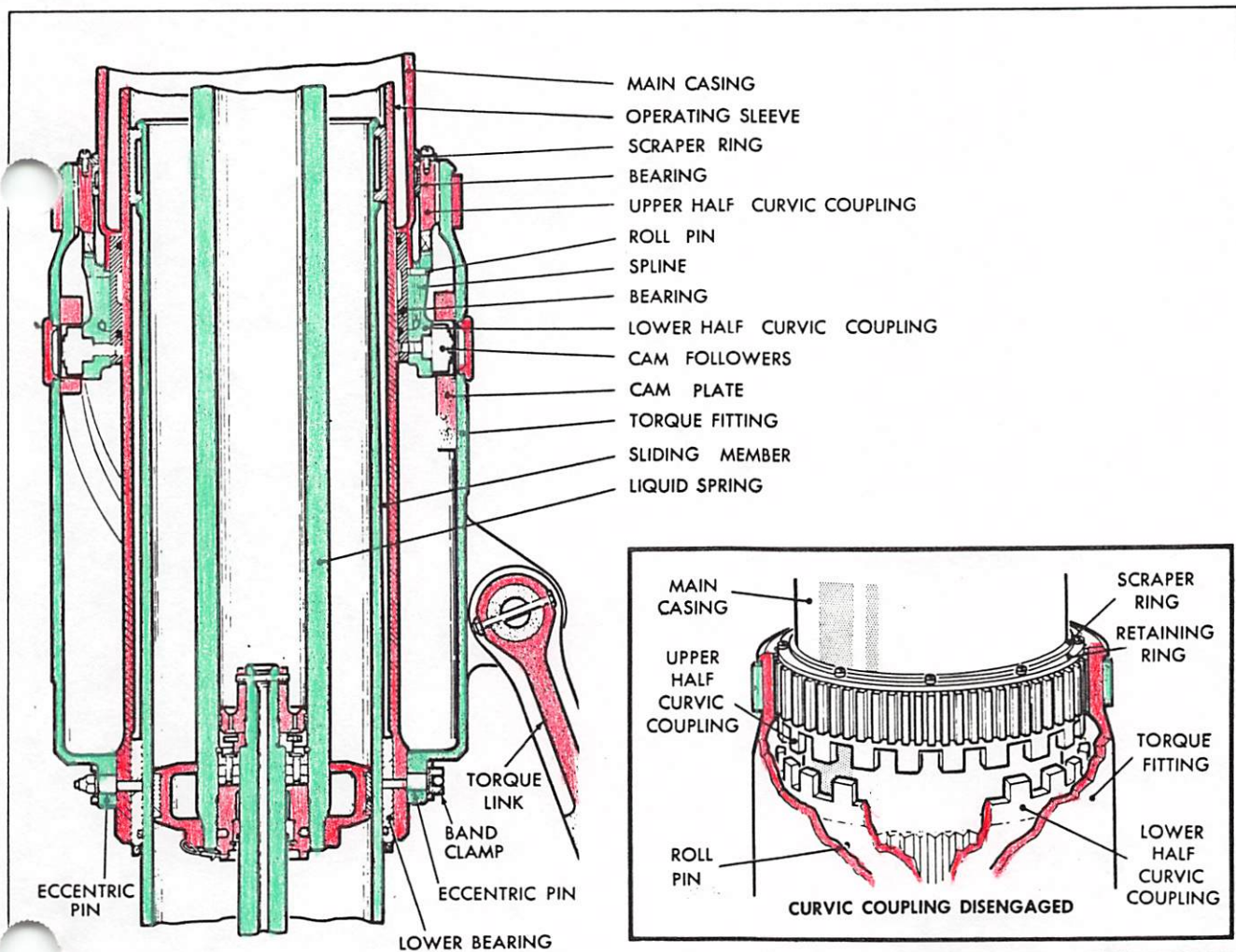


FIG.8 MAIN LEG TORQUE FITTING

ARROW 1 SERVICE DATA

spring and the operating sleeve is forced out of the main casing. The downward movement of the torque fitting rotates the lower leg until the wheels are aligned with the centre line of the aircraft. The final movement of the torque fitting engages the castellated teeth of the curvic coupling and locks the leg against rotation. When the leg is fully extended, the final movement of the shortening chain permits the down-lock locking spring to extend and the operating cylinder is pulled downwards. The down-lock plungers are forced outward and the leg is locked in the fully extended position. The final movement of the operating cylinder actuates a micro-switch which supplies electrical power to the cockpit indication.

BRAKE TORQUE LINKS

39 The front and rear brake torque links are attached to the lower part of the sliding member to provide an anchor for the wheel brake friction pads. The outer ends of the links carry spherical bearings which are attached to the wheel brake torque arms. The front link has two integral collars which mount a recuperator for the shock absorber. The hollow front link is internally sealed and connected with the nitrogen end of the recuperator. See fig 9.

SHOCK ABSORBER RECUPERATOR SYSTEM (Fig 9)

40 A recuperator system is fitted to the main leg but is disconnected on the Arrow 1 installation. When operative the recuperator maintains the shock absorber at the correct pressure and operates in conjunction with a recuperator valve which is actuated by a cam on the lower torque link.

41 The recuperator is mounted on the front brake torque link and consists of a cylinder with a floating piston. The forward end of the cylinder is connected to the inside of the front brake torque link and both of these sections are charged with nitrogen through a charging valve fitted to the front end of the cylinder. The rear end of the cylinder is filled with shock absorber fluid through a charging valve, and is connected by pipelines and a swivel coupling to the recuperator valve housed in the lower part of the sliding member.

42 An oil contents indicator is fitted at the front end of the cylinder. This indicator is in the form of a tube having a longitudinal slot calibrated in °F. Within the tube is housed a telescopic rod connected to the floating piston. The indicator is calibrated in °F so that the recuperator may be charged with the correct amount of oil for the prevailing ambient temperature. The rear end of the cylinder locates a minimum safe working pressure indicator. The indicator consists of a spring-loaded cranked pointer actuated by a plunger in the end of the cylinder. The pointer touches the side of the cylinder when the nitrogen pressure within the unit is above the minimum safe working pressure.

RECUPERATOR VALVE (Fig 9)

43 The recuperator valve is housed in the lower part of the sliding member and is actuated by the cam on the lower torque link each time the shock absorber is fully extended. Extension of the shock absorber causes the cam to depress an actuating rod and open a poppet valve. This connects the recuperator with the inside of the shock absorber, by a drilling through the shock absorber piston rod. The drilling incorporates a gravity valve at its extreme lower end to prevent loss of fluid when the recuperator valve is removed.

44 The outer end of the actuating rod is forked to accommodate a roller which contacts the cam attached to the lower torque link. A waisted section on the rod is aligned with the fluid inlet to allow passage of fluid through two longitudinal holes in the rod. Around the outside of this section a scroll groove caters for thermal expansion of the fluid between the recuperator and the inside of the shock absorber when the main leg is retracted into the wheel bay.

45 The inner end of the valve stem carries a spring-loaded plate valve which seals the two holes in the actuating rod. Fluid from the recuperator overcomes the spring to pass through the valve. The poppet valve at the end of the stem sits on a seat integral with the body and is spring-loaded to the closed position.

ARROW 1 SERVICE DATA

SIDE STAY (Fig 10)

46 The telescopic side stay is fitted between the main spar of the inner wing and the main casing to brace the main leg against side loads. The side stay also provides the down-lock for the main leg by an internal locking mechanism which is locked mechanically and unlocked hydraulically.

47 The unit consists of a cylinder and a sliding member incorporating a spring-loaded piston rod and a plunger assembly. The lower

end fitting of the cylinder houses a ball joint which is retained in a lug on the main casing. The upper end of the sliding member is secured by an attachment pin locating in a swivel bearing, housed in a fitting attached to the main spar. The two sections are coupled at their inner ends by a bearing and a retaining nut recessed into the inner end of the cylinder.

48 The piston rod, housed within the sliding member, has a piston at its upper end which locates in a cylinder in the top of the sliding member. The rod is spring-loaded by a return

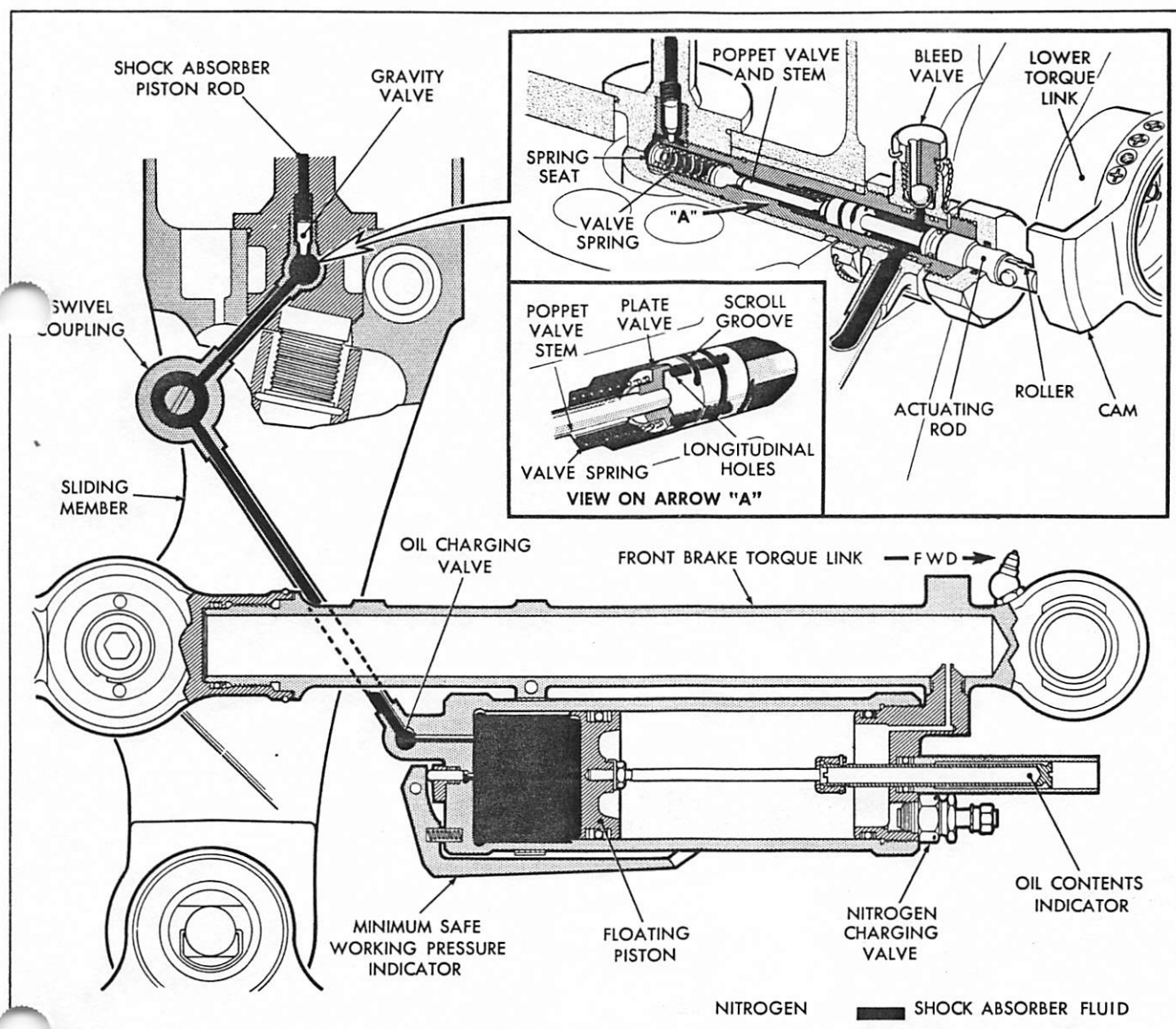


FIG. 9 SHOCK ABSORBER RECUPERATOR SYSTEM

ARROW 1 SERVICE DATA

spring fitted between a flange on the rod and a spring stop mounted on the rod and retained in the bore of the sliding member. A locking cone attached to the lower end of the piston rod locks the side stay in the extended position by retaining the plungers in the locking recess at the upper end of the cylinder. A micro-switch mounted on the upper end of the sliding member is actuated by a lever, pivoting on the switch mounting bracket, and connected to a spring-loaded indicator rod housed in the upper end of the sliding member. The side stay is charged with 10 cu in of oil (MIL-O-6083) through a plug on the inner end of the cylinder to provide lubrication for the locking cone and plunger assembly.

49 When the landing gear is selected up, hydraulic pressure is supplied to the end of the piston rod. This moves the locking cone downward, disengages the plungers and unlocks the side stay. As the landing gear retracts the cylinder and the sliding member telescope until the landing gear engages its up-lock in the wheel bay. When the landing gear is selected down the return spring remains compressed due to the locking cone being retained by the plungers. As the landing gear extends, the side stay extends until the plungers reach the recess in the inner end of the cylinder. When this occurs the return spring lifts the locking cone and the plungers are forced outward to lock the side stay and the main landing gear in the down position.

LEG FAIRING (Fig 1 and 11)

50 The leg fairing is attached to the main leg and back stay by nine spring-loaded housings. With the gear retracted these take up any movement of the leg due to flexing of the wing in flight. The two lower housings each incorporate a cam operated locking device which locks the housings when the landing gear is extended and prevents the airflow from forcing the fairing away from the leg. These two housings are mounted on lugs on the main leg while the remainder are attached to the leg and back stay by band clamps. Each housing is connected to a bracket on the fairing by a flat-head pin passing through the bracket and the eye-end of the spring-loaded rod in each housing.

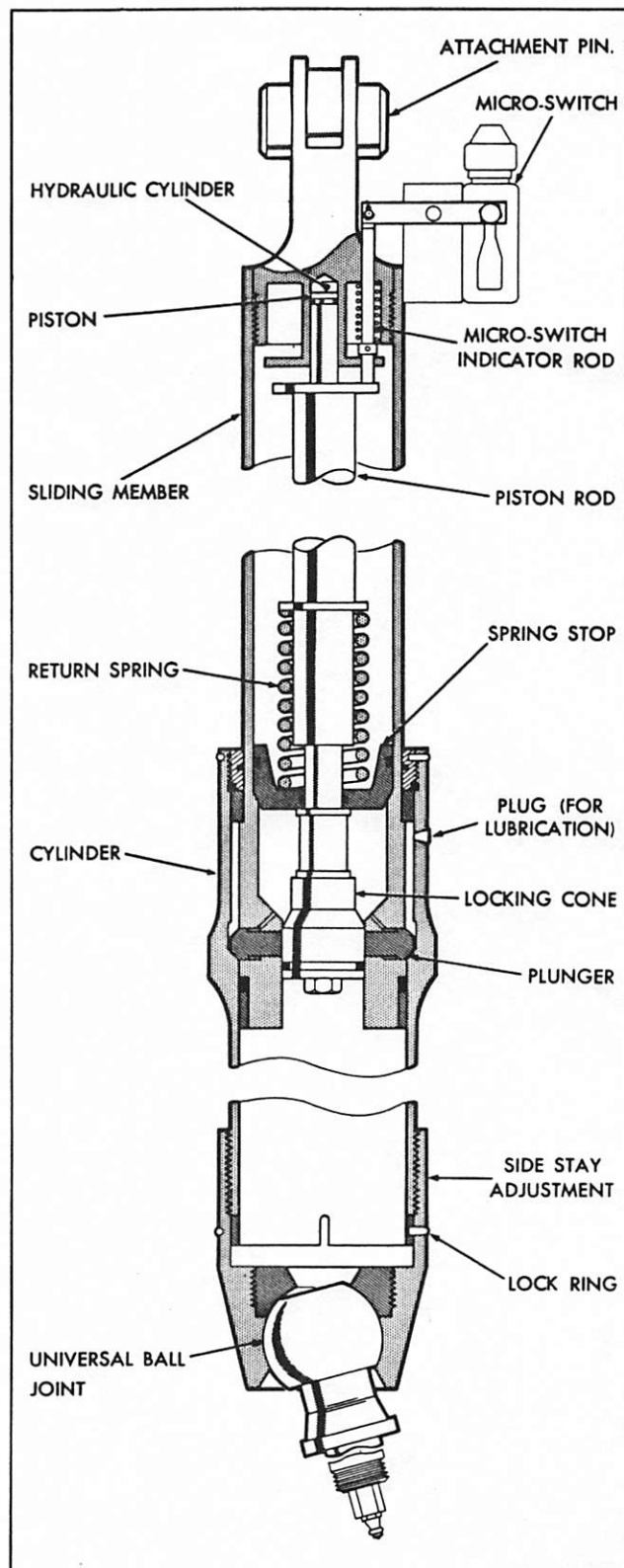


FIG.10 TELESCOPIC SIDE STAY

ARROW 1 SERVICE DATA

51 Each of the two lower housings (see fig 11) are fitted with two spring-loaded cams connected by a tie-bar and pivoting on two lugs on the outside of the spring housing. Two coil springs are retained within each housing by a rod, a washer and a nut. The washer has two lugs which locate in slots in the body of the housing. The cams are located on the underside of the lugs when the landing gear is extended and prevent compression of the springs. When the landing gear is retracted a striker in the wheel bay actuates a lug on the

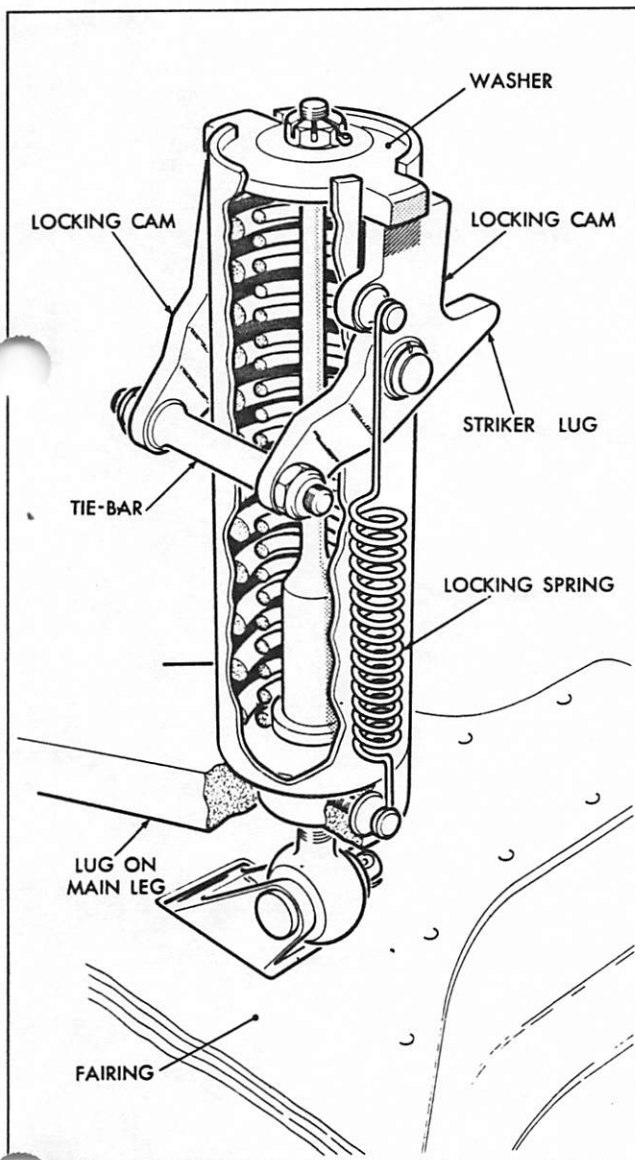


FIG. 11 LEG FAIRING LOWER
SPRING HOUSINGS

cams to release the cams from the underside of the washer. The springs are then free to take up any movement of the leg.

PIVOT DOOR AND LINKAGE (Fig 12 and 13)

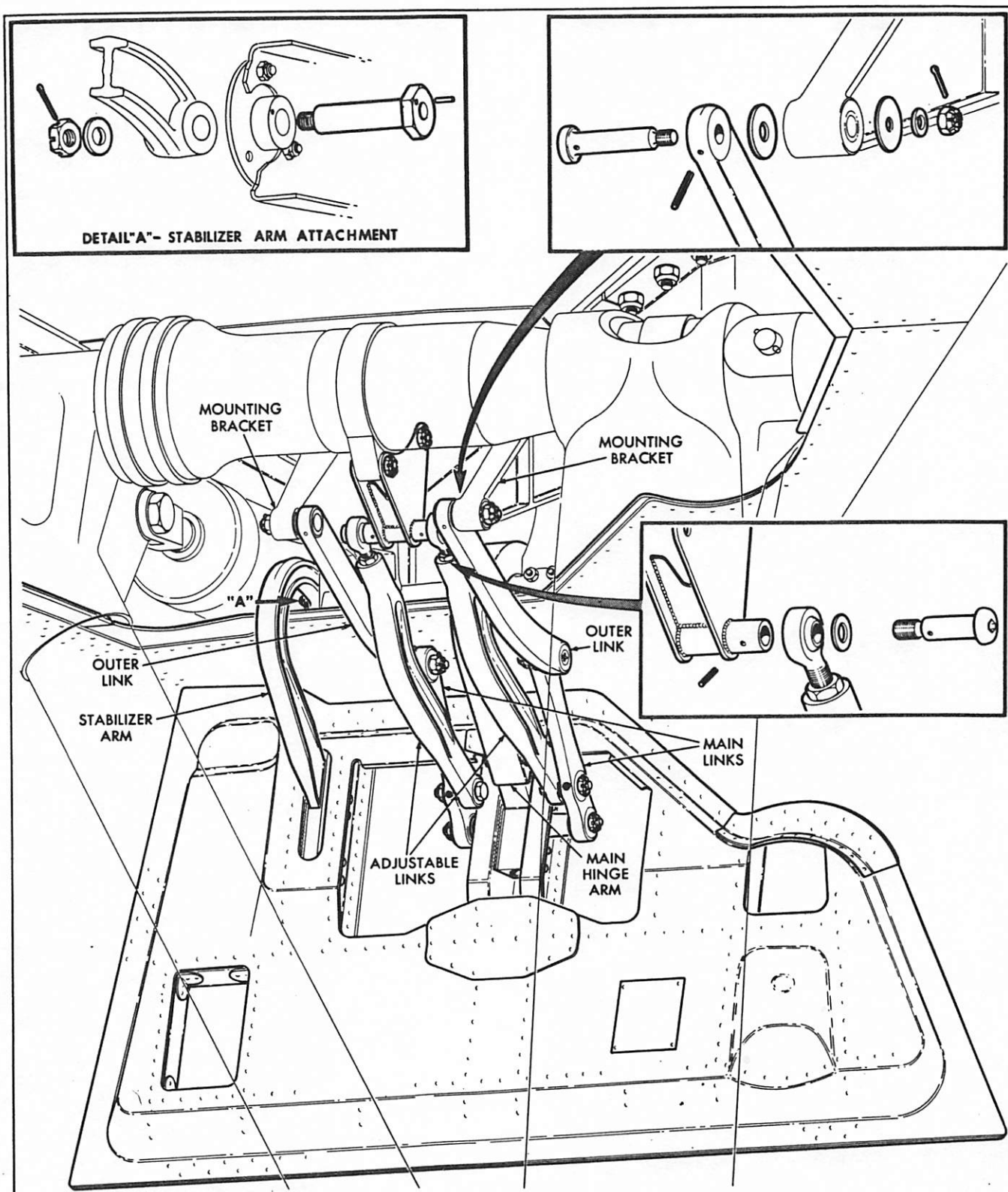
52 The pivot door covers the gap between the top of the leg fairing and the wing skin when the landing gear is retracted. The pivot door is hinged to the wheel bay structure by a main hinge arm and a stabilizer arm. These arms are attached to formers in the pivot door structure by bolts located in oversize holes in the channel section of the formers. The inner sides of the channel sections are fitted with gripping surfaces which mate with serrated plates riveted to the lower end of each arm. The serrations and the oversize holes provide adjustment for the correct seating of the pivot door in relation to the leg fairing and wing skin. Two main links are attached to the door and these connect with two outer links secured to mounting brackets in the wheel bay. The door operating linkage consists of two adjustable arms connected to a bracket attached to the landing gear cross-shaft and to the main links. The arms provide adjustment to ensure that the door fits flush with the wing skin.

MAIN WHEEL DOOR (Fig 14)

53 The main wheel door, together with the leg fairing and pivot door complete the contour on the underside of the inner wing when the landing gear is retracted. When flight stresses flex the wing the leg is lifted from its up-lock and the weight of the leg is supported on two rubber pads attached to the wheel door. The door is attached chordwise to the inboard end of the inner wing by a piano hinge and is operated by a hydraulic jack incorporating a two-stage lock to prevent block back. The cylinder of the jack is connected to a bracket on the door while the assembly at the end of the piston rod is mounted in the wheel bay.

54 The door is fitted with five serrated brackets each of which carry a mating serrated plate with an integral lug. The lugs engage with the latches of five up-locks when the door is closed. The latches are locked mechanically by spring units and are unlocked hydraulically by hydraulic release jacks. Up-locks 2 and 3, and up-locks 4 and 5, are interconnected in

ARROW 1 SERVICE DATA



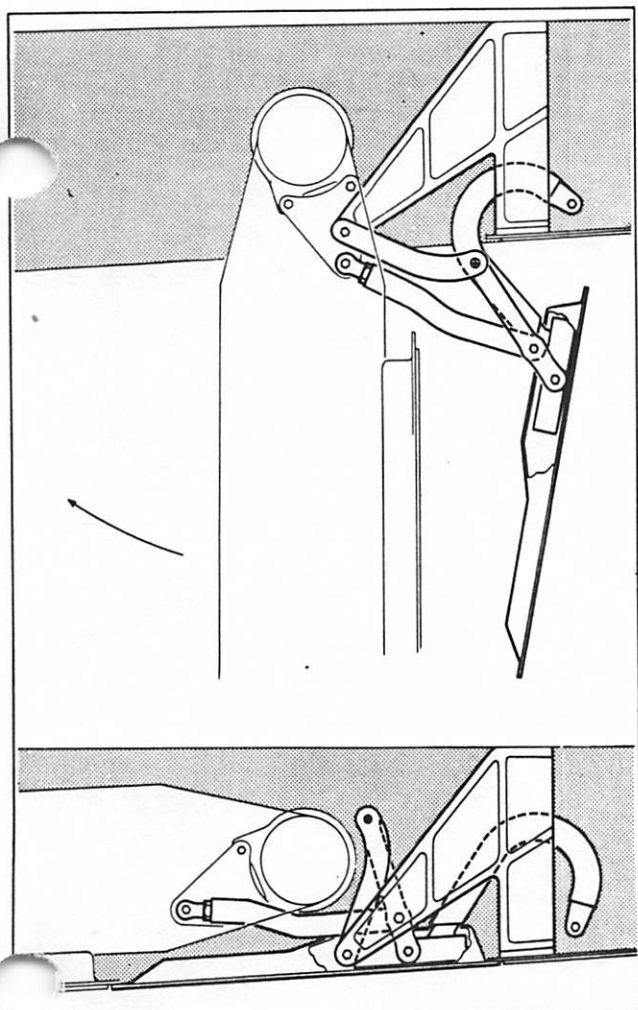
7M1-1707-2

FIG. 12 PIVOT DOOR

ARROW 1 SERVICE DATA

pairs. The latches of each pair are joined by an adjustable connecting rod so that one spring unit and one hydraulic jack will operate both latches. Up-lock No. 1 is independent having its own spring unit and hydraulic release jack.

55 When the landing gear is retracted the door is locked by the lugs snapping into engagement with the latches against the loading of the spring units. The latches are held in the locked position by the springs when the hydraulic release jacks are open to return pressure. On selection of landing gear down, hydraulic pressure is supplied to the jacks, the springs are compressed and the latches are opened, releasing the lugs and allowing the door to be opened by the door jack.



7MI-1710-1

FIG. 13 PIVOT DOOR OPERATION

MAIN LEG UP-LOCK (Fig 15)

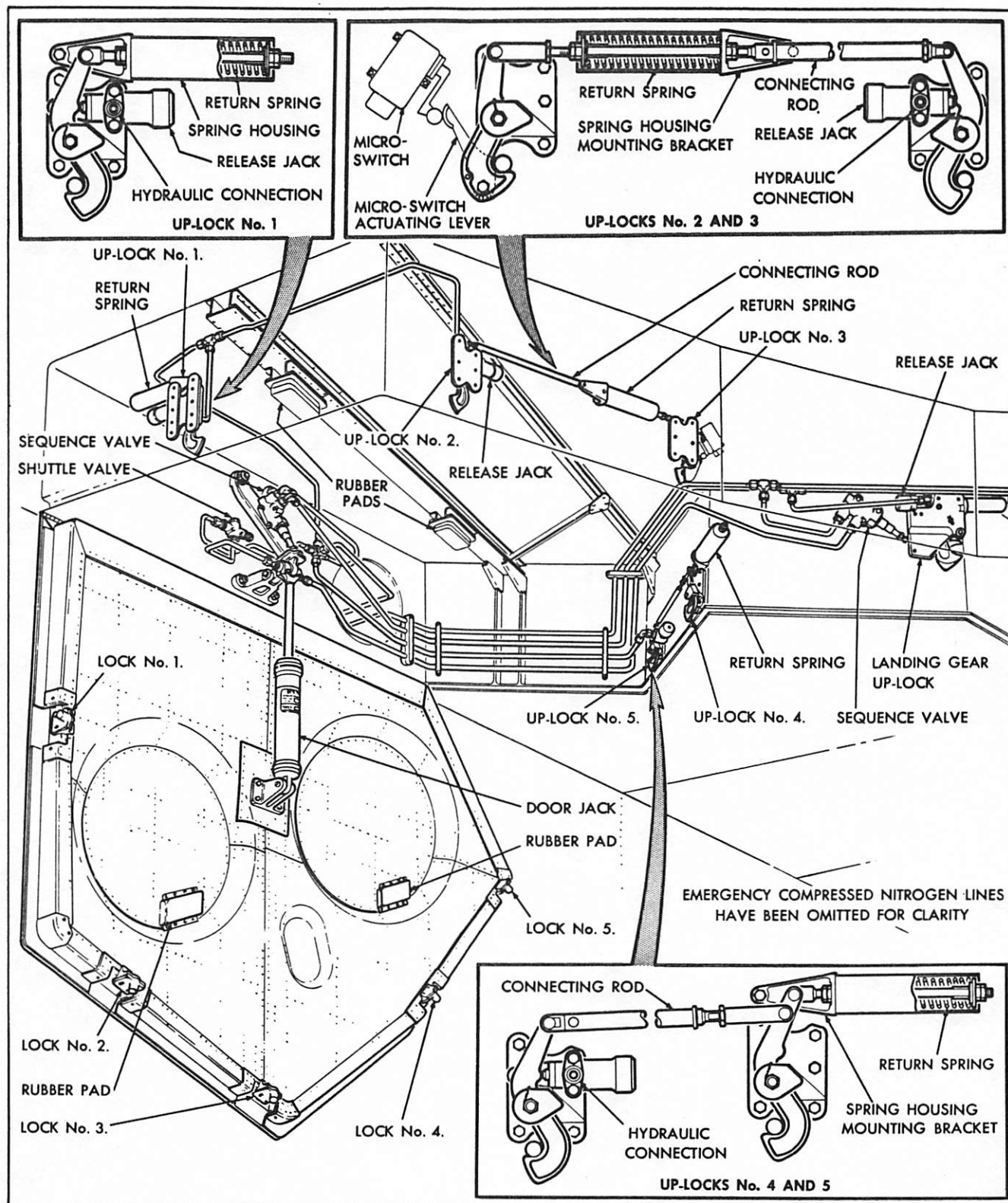
56 The main leg up-lock is mounted on the wheel bay diaphragm and engages with the adjustable roller on the main leg when the landing gear is retracted. The up-lock is engaged mechanically on retraction and released hydraulically when the landing gear has been selected down and the main wheel door jack has reached the first-stage blow-back lock position.

57 The up-lock assembly consists of a latch, a cam lever, a spring unit and a hydraulic release jack. The latch is mounted on a bearing with the upper end connected to the spring unit and located adjacent to the piston rod of the release jack. The cam lever also pivots on a bearing and contacts a spring-loaded lever to actuate a sequence valve. A coil spring attached to the cam lever returns the lever when the gear is lowered. When the landing gear is retracted the gear is locked up by the roller snapping into engagement with the latch against the loading of the spring unit. The latch is held in the locked position by the spring unit when the release jack is open to return pressure. When hydraulic pressure is supplied to the jack, the springs are compressed and the latch is actuated to release the roller.

MAIN WHEELS (Fig 16)

58 The two wheels of each main landing gear are arranged in tandem and are mounted on the bogie beam axles. Each wheel is of the split hub type with two halves secured together by attachment bolts. Each bolt is locked by a locking cap and clip. A seal is fitted between the two halves, to enable tubeless or conventional tires to be fitted. Each wheel is mounted on two tapered roller bearings and is retained on the axle by a washer, wheel nut and locking pin. A dust excluder is fitted to the inner bearing and a hub cap is fitted over the outer bearing and wheel nut. A set of ten driving blocks for the friction plates of the brake assembly are located in the hub and secured by countersunk screws.

ARROW 1 SERVICE DATA



7M1-1705-2

FIG. 14 MAIN WHEEL DOOR

ARROW 1 SERVICE DATA

WHEEL BRAKES (Fig 17)

59 The wheel brakes are of the hydraulic disc type and are self adjusting to compensate for wear in the friction pads. Each brake assembly is housed within the wheel and consists of two steel friction plates and three sets of three composite friction pads together with a hydraulically operated triple piston assembly.

60 The friction plates of the assembly are keyed to the interior of the wheel by ten driving blocks. The plates rotate with the wheel and provide a braking surface for the friction pads.

61 The outer and inner sets of friction pads are recessed into a pressure plate and back plate respectively. The centre set is recessed into a movable carrier. The pressure plate, movable carrier and back plate are in the form of segments and are mounted on two brake bolts which screw into the back plate. The

pressure plate and carrier slide along the bolts when brake pressure is applied. The bolts also retain the triple piston assembly to the torque arm which is mounted on the bogie beam axle and attached to the appropriate brake torque link. Two additional brake bolts pass through the triple piston assembly, the torque arm and the movable carrier. The bolts are retained in the back plate.

62 When the brake pedals are depressed, hydraulic pressure is applied to the triple piston assembly so that each piston extends to force the pads and plates together and against the back plate, causing the wheel to brake. When the brake pedals are released the pads and plates are freed by a spring within each piston assembly. The piston assembly incorporates a device providing self adjustment of the brakes when wear occurs in the friction pads. For description of wheel brake hydraulics see Arrow 1 Service Data - Section 7 - Wheel Brakes Hydraulics.

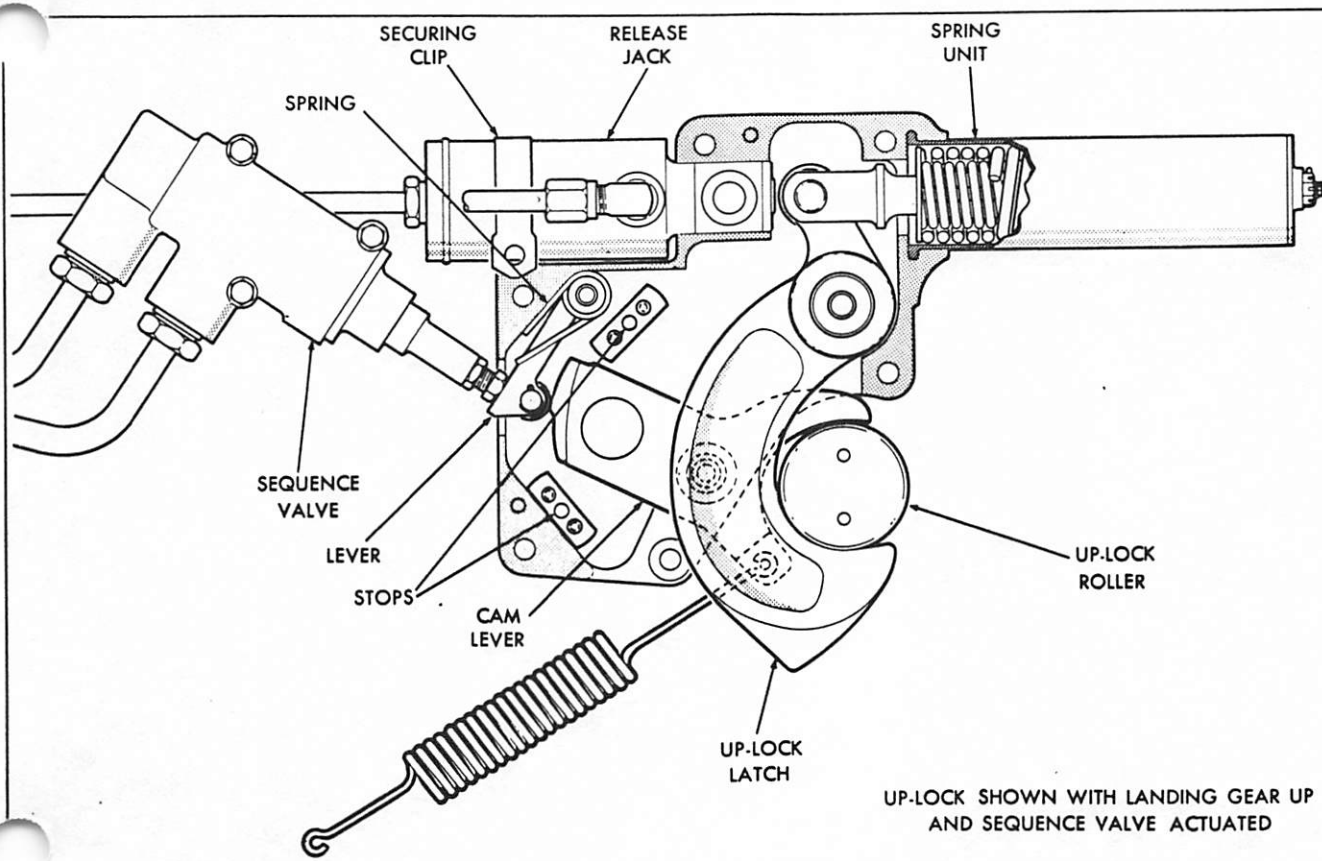
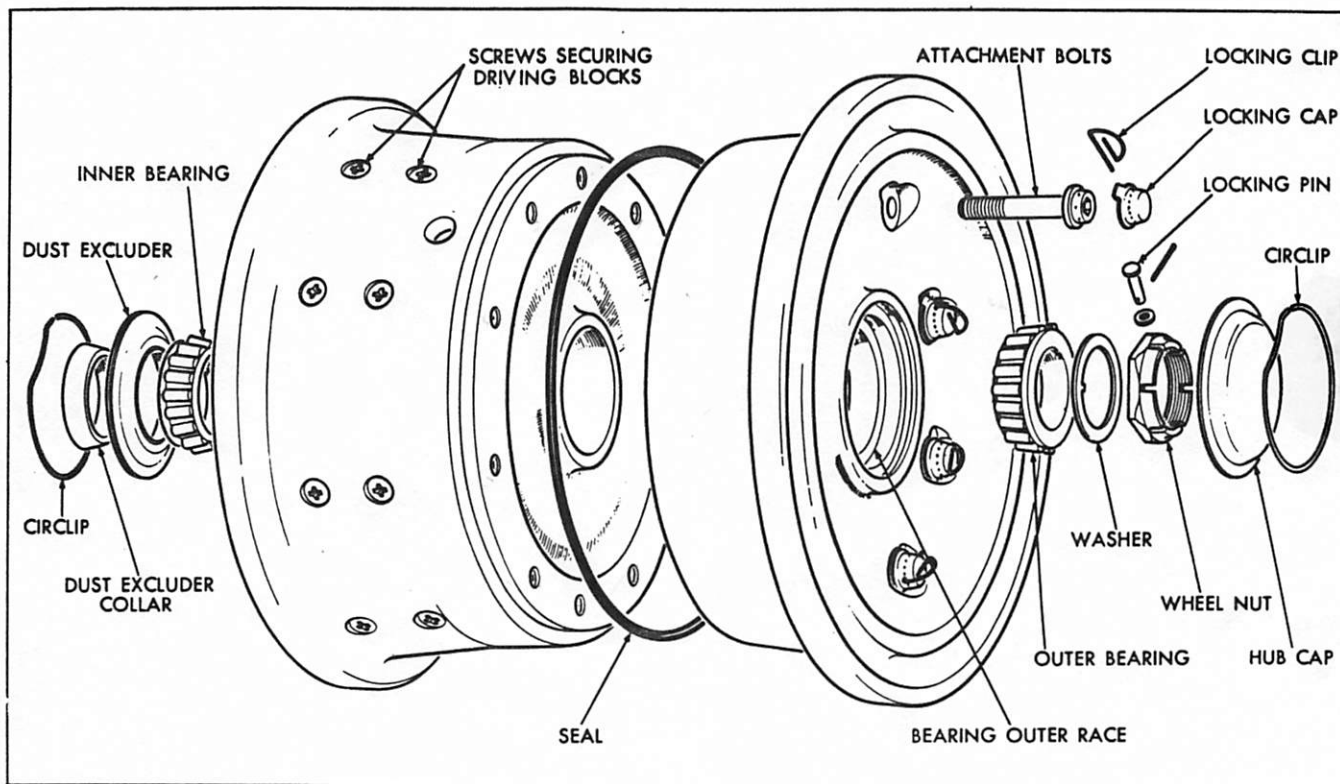


FIG.15 MAIN LEG UP-LOCK

ARROW 1 SERVICE DATA



7MI-1801-2

FIG. 16 MAIN WHEEL ASSEMBLY

WHEEL BRAKE MECHANICAL CONTROLS
(Fig 18)

63 The wheel brake units may be actuated independently or simultaneously by applying foot pressure to the respective rudder pedal. Each rudder pedal is mechanically connected to a hydraulic brake control valve located in the armament bay. A parking brake is provided to lock the rudder pedals in the brakes on position.

64 Each rudder pedal is mounted on the rudder suspension tube assembly together with a brake lever which is connected to a pivot lever by an operating tube. The other end of the lever is attached to an operating rod which passes through the cabin floor and connects with the brake control cable. The pivot lever is mounted on bearings and carried in a bracket attached to the structure. The bracket also mounts the parking brake locking latch and a cross-shaft. A cable tensioning spring is fitted between the pivot lever and the bracket.

65 When foot pressure is applied the respective brake pedal, the brake lever and operating tube transmit movement through the pivot lever, operating rod and cable to actuate the hydraulic brake control valve. When the pedals are released, a spring in the control valve returns the valve to neutral and the rudder pedals to the brakes off position. Tension is applied to the cable by the cable tensioning spring. For description of wheel brake hydraulics see Arrow 1 Service Data - Section 7 - Wheel Brakes Hydraulics.

66 The parking brake consists of a locking latch mounted on each pivot lever bracket and interconnected by a cross-shaft. The parking handle, fitted under the left-hand side of the instrument panel, is connected to a lever on the cross-shaft. Each locking latch engages a pin on the pivot lever when the rudder pedals are depressed and the handle is pulled. The parking brake is released when the rudder pedals are depressed. Each latch is disengaged from its respective pin by a latch return spring.

ARROW 1 SERVICE DATA

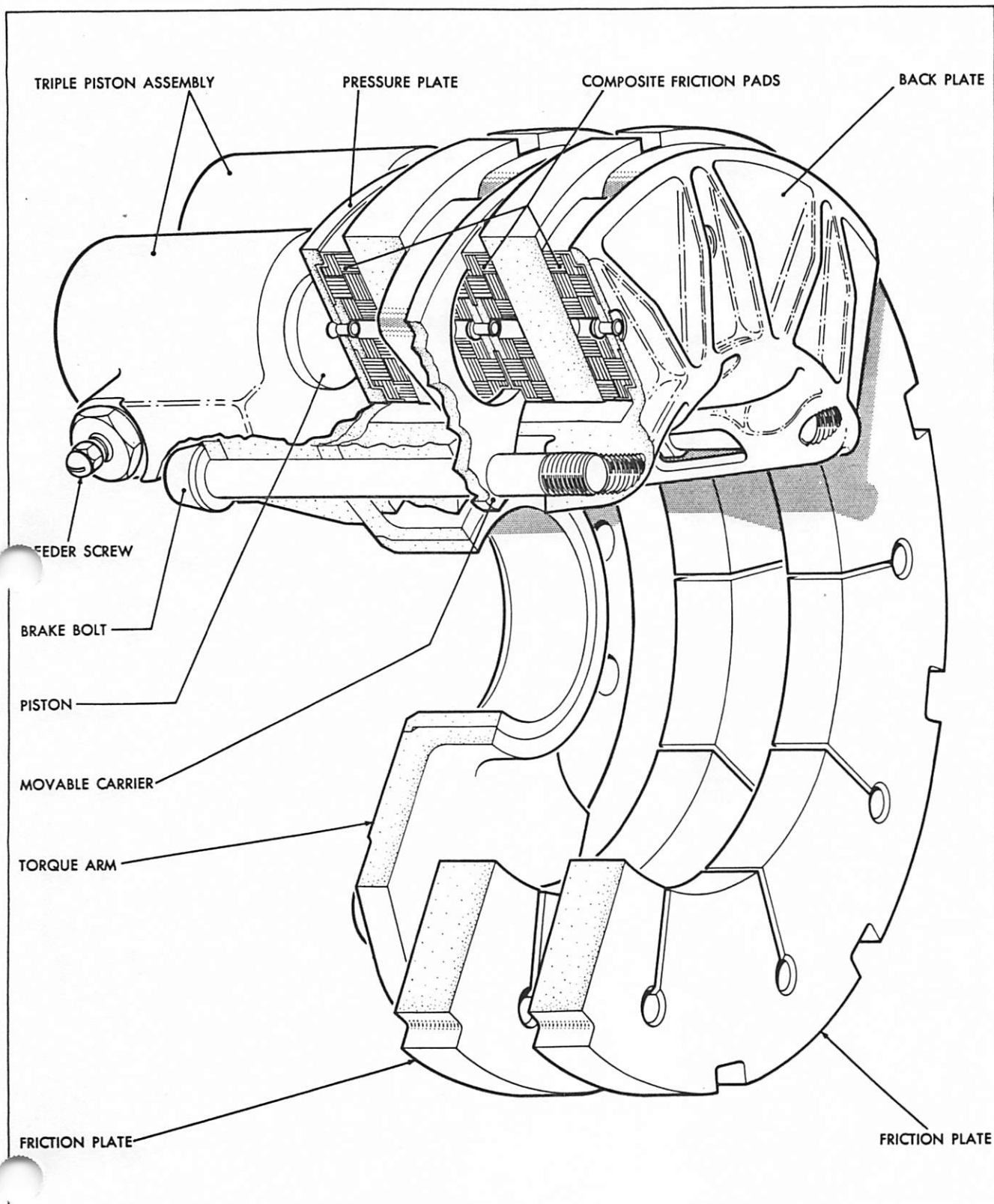


FIG.17 WHEEL BRAKE

ARROW 1 SERVICE DATA

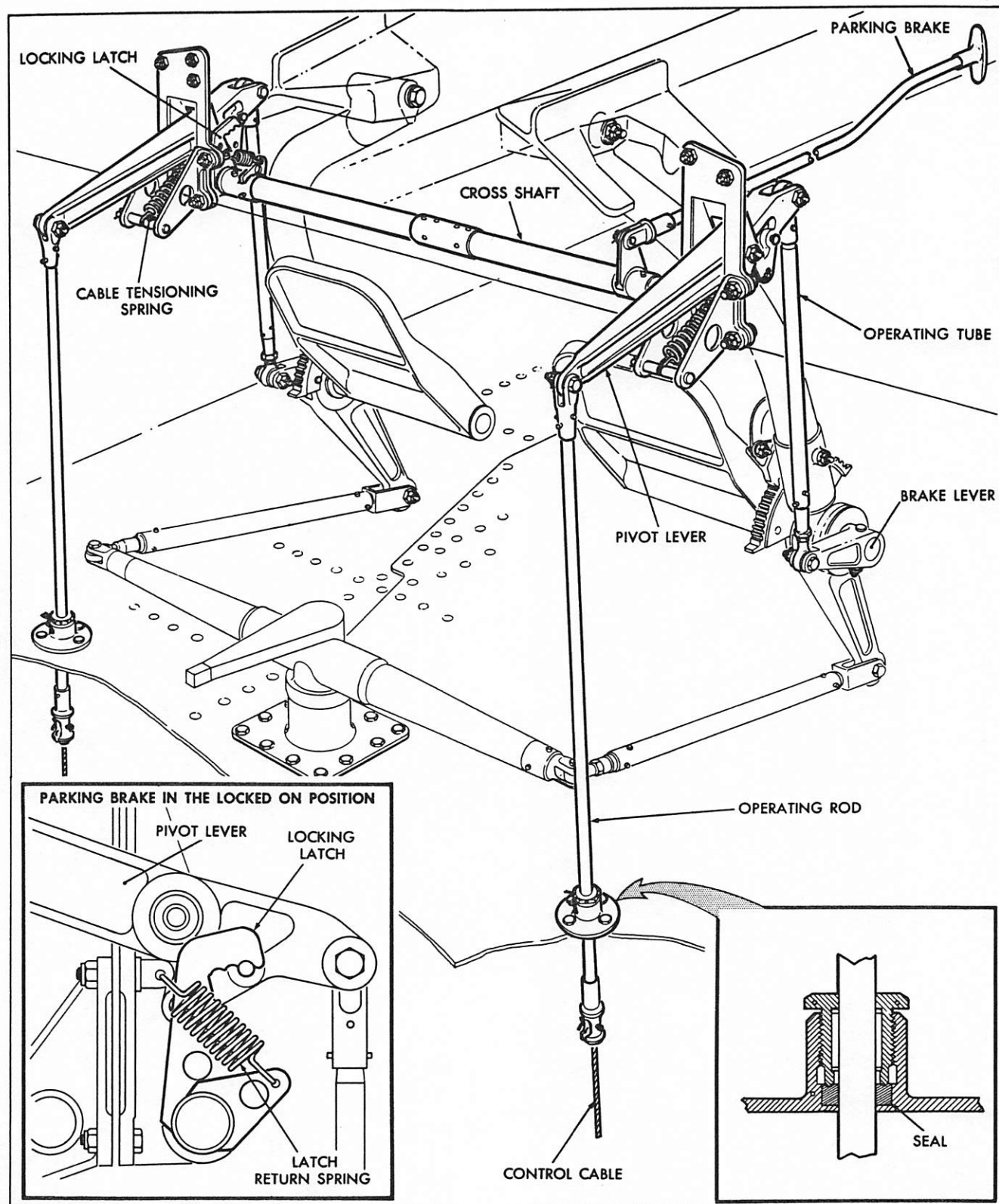


FIG.18 WHEEL BRAKE MECHANICAL CONTROLS

ARROW 1 SERVICE DATA

SERVICING

GENERAL

67 The landing gear should be kept free of dirt and excess grease, particular attention being given to the surfaces of the lower sliding member, the telescopic side stay sliding member, and also the surface of the main casing over which the torque fitting slides and rotates during retraction of the gear. The landing gear must be correctly lubricated in accordance with the lubrication instructions. See Arrow 1 Service Data - Section 3 - Lubrication.

CHARGING THE RECUPERATOR (Disconnected on Arrow 1)

68 If the aircraft has remained on the ground for a period of time a loss of oil from the shock absorber gland or recuperator valve will be evident by the lower sliding member telescoping into the torque fitting. If the shock absorber is leaking, oil will seep from the joint at the base of the sliding member and the oil contents indicator will show a drop in the oil contents. The leg will not collapse during normal flying conditions, as it is automatically replenished when the aircraft leaves the ground, although the oil indicator will still show a drop in oil contents. All oil leaks must be rectified before recharging the recuperator.

69 Should the recuperator indicate a low oil content or nitrogen pressure but the leg extension is normal, the recuperator can be recharged with the weight of the aircraft on the landing gear. If the sliding member has collapsed into the torque fitting the aircraft must be jacked and both the recuperator and shock absorber must be re-charged.

70 To charge the recuperator proceed as follows:

(a) From the procedure detailed on the instruction plate attached to the recuperator determine the reference temperature and compare this with the indicated temperature on the oil contents indicator. Any discrepancy greater than 20°F between the two readings must be corrected by adjusting the oil contents.

(b) An excess reading on the indicator scale can be corrected by bleeding oil from the bleed valve on the recuperator valve.

(c) To replenish the recuperator with oil, connect the oil pressure gun to the oil charging adaptor situated at the rear of the cylinder, and charge with oil until the oil content indicator is at the temperature mark required.

(d) To charge the recuperator with nitrogen, connect the air/nitrogen trailer to the charging valve situated at the forward end of the recuperator, and charge to a pressure of 1500 psi.

71 When charging an empty recuperator with oil and nitrogen proceed as follows:

(a) Lower the aircraft to the ground to ensure that the recuperator valve is closed.

(b) Connect the air/nitrogen trailer to the nitrogen charging valve and charge the recuperator to approximately 100 psi.

(c) Slacken the bleed valve and charge the recuperator with oil until bubble free fluid is flowing from the bleed valve. Tighten and lock the bleed valve.

(d) Continue charging with oil until the oil contents indicator corresponds with the ambient temperature.

(e) Charge the nitrogen section to 1500 psi.

(f) The aircraft must now be jacked fully, and the oil content and nitrogen charge rechecked. If necessary re-charge as detailed in para 70.

(g) Lower the aircraft to the ground, and remove the ground equipment.

CHARGING THE SHOCK ABSORBER

72 On all Arrow 1 aircraft the recuperator is disconnected and a charging valve is fitted to the lower leg casing. To charge the shock absorber proceed as follows:

(a) Determine the outside air temperature at ground level.

ARROW 1 SERVICE DATA

TEMP OF UNIT AT TIME OF CHARGING (°F)	ESTIMATED AVERAGE GROUND LEVEL AIR TEMPERATURE DURING LIFE OF CHARGE (°F)																	
	110	100	90	80	70	60	50	40	30	20	10	0	-10	-20	-30	-40	-50	-65
110	15	20	30	35	40	50	55	60	70	80	90	100	-	-	-	-	-	-
100	10	15	20	30	35	40	50	55	60	70	80	90	100	-	-	-	-	-
90	1	10	15	20	30	35	40	50	55	65	75	85	95	-	-	-	-	-
80	-	1	10	15	20	30	35	45	50	60	70	80	90	100	-	-	-	-
70	-	-	1	10	15	20	30	35	45	55	60	70	80	90	100	-	-	-
60	-	-	-	1	10	15	20	30	35	45	55	65	75	85	95	-	-	-
50	-	-	-	-	1	10	15	20	30	40	50	55	65	75	85	100	-	-
40	-	-	-	-	-	1	10	15	25	30	40	50	60	70	80	90	100	-
30	-	-	-	-	-	-	1	10	15	25	35	40	50	60	70	80	95	-
20	-	-	-	-	-	-	-	1	5	15	25	35	45	50	60	70	85	100
10	-	-	-	-	-	-	-	-	-	5	15	25	35	45	55	65	75	90
0	-	-	-	-	-	-	-	-	-	-	5	15	25	35	45	55	70	85

ALL PRESSURES ARE IN 100's OF PSI
(To be used on Shock Absorbers which have the Recuperator disconnected)

FIG.19 CHARGING INDEX FOR LIQUID SPRING SHOCK ABSORBERS

(b) Determine the temperature of the unit to be charged. When an aircraft which has been outside for several hours is brought into a heated hangar and insufficient time is allowed to bring the shock absorber up to hangar temperature, the outside air temperature should be taken as the shock absorber charging temperature.

(c) Determine the correct charging pressure from the charging index. See fig 19.

(d) The following examples are given to clarify the use of the charging index only:

(1) The aircraft has been in the hangar overnight, with the hangar temperature at 60°F. The outside air temperature at the time of charging is -10°F. The charging index will indicate that the shock absorber has to be charged at a pressure of 7500 psi.

(2) The aircraft is outside the hangar, and the outside air temperature at the time of charging is 40°F. The charging index will indicate that the shock absorber has to be charged at a pressure of 1500 psi.

(e) Connect the pressure gun adaptor to the valve.

ARROW 1 SERVICE DATA

- (f) Operate the pressure gun until the correct charging pressure is obtained.

REMOVAL

GENERAL

73 Before removing any components from the landing gear the aircraft should be jacked and ground locks fitted, when required. The utility hydraulic system and the wheel brake circuit must be relieved of all pressure before disconnecting the hydraulic connections on the landing gear or wheel brakes.

- (a) To relieve the pressure in the utility hydraulic system, operate the dump valve located on the forward face of the bulkhead at station 485 if the instrument pack is not fitted, or operate the speed brakes until they cease to function, if the instrument pack is fitted.

To relieve the pressure in the emergency wheel brake circuit, apply and release the wheel brakes until the brakes no longer operate with pedal pressure.

74 A main landing gear ground handling dolly is used to support the weight of the landing gear leg during removal and replacement of the leg or the back stay.

75 For jacking the aircraft and fitting the ground locks see Arrow 1 Service Data - Section 1 - General Information.

CROSS-SHAFT AND LEG REMOVAL

76 The landing gear leg and the forward part of the cross-shaft are removed from the aircraft as one unit. The removal procedure for the complete unit is as follows:

- (a) Jack the aircraft until the wheels are clear of the ground.
- (b) Remove the micro-switches fitted to bracket on the torque fitting and the micro-switch located on top of the main casing. Unclip the electrical wiring and secure switches to the wheel bay structure.

- (c) Relieve the hydraulic pressure in the utility hydraulic system and the emergency wheel brake circuit. See para 73.

- (d) Remove the leg fairing and pivot door. See para 79 - 80.

- (e) Disconnect the two hydraulic brake lines at the swivel joints on the top of the leg. Blank off the swivel joint assemblies and secure them to the leg to prevent damage during leg removal.

- (f) Disconnect the retraction jack from the cross-shaft spacer.

- (g) Remove the front and rear wheels. See fig 16.

- (h) Disconnect the hydraulic lines from the brakes and remove the front and rear brake assemblies. Fit the axle protection guards.

- (j) Position the ground handling dolly and secure it to the leg. Adjust the dolly to support the weight of the leg.

- (k) Remove the side stay. See para 77.

- (m) Remove the back stay. See para 78.

- (n) Remove the front pivot access panel.

- (p) Remove the nut and lock washer from the forward pivot bearing. Unscrew the thrust nut and withdraw the thrust collar. See fig 3.

- (q) Disconnect the leg shortening adjustment screw from the structure. See fig 6.

- (r) By manoeuvring the ground handling dolly withdraw the leg from the front bearing.

- (s) Clean off the leg and fit shipping protectors.

SIDE STAY REMOVAL

77 To remove the side stay from the aircraft proceed as follows:

- (a) Jack the aircraft until the wheels are clear of the ground.

ARROW 1 SERVICE DATA

(b) Connect the hydraulic hand pump rig to the up and down line connections in the duct bay.

(c) Apply hydraulic pressure to the up line until the down-lock in the side stay is released. Close the up line cock on the rig.

(d) Remove the locking plate and unscrew the side stay lower ball fitting out of the main casing until the thread is disengaged.

(e) Release the hand pump rig pressure and remove the rig.

(f) Remove the three bolts attaching the swivel joint to the side stay upper pivot pin.

(g) Remove the down-lock micro-switch and unclip enough wiring to enable the switch to be taped back in the wheel bay clear of operations.

(h) Extract the roll pin securing the upper bearing pivot.

(j) Support the side stay and withdraw the upper pivot.

(k) Remove the side stay and blank off all hydraulic connections. Fit shipping protectors.

BACK STAY REMOVAL

78 The back stay, which is integral with the aft portion of the cross-shaft must be removed before the main leg can be removed. To remove the back stay proceed as follows:

(a) Remove the leg fairing. See para 80.

(b) Jack the aircraft until the wheels are clear of the ground.

(c) Position the main landing gear handling dolly and secure to the leg. Adjust the dolly to support the weight of the leg.

(d) Disconnect the retraction jack from the cross-shaft spacer.

(e) Drive out the roll pin retaining the side stay lower attachment pin to the leg casing and extract the pin.

(f) Remove the cotter pins and nuts and withdraw the twelve bolts securing the cross-shaft spacer. Remove the spacer.

(g) Tilt the back stay lower attachment to disengage it from the casing, and withdraw the back stay from the rear self-aligning bearing.

(h) Fit the shipping protectors to the back stay.

PIVOT DOOR AND LEG FAIRING REMOVAL
(Fig 12)

79 The pivot door complete with operating linkage is removed as follows:

(a) Disconnect the two pivot door adjustable links, at their upper attachment to the door operating bracket, by driving out the roll pin and unscrewing the internal wrenching screw from each link.

(b) Disconnect the two outer links from the front and rear mounting brackets by driving out the roll pin in the upper end of each link and unscrewing the pivot pin.

(c) Disconnect the main hinge arm and the stabilizer arm at the hinge points on the structure. Remove the cotter pin and nut from each hinge pin and drive the pins straight out.

NOTE

Do not attempt to turn the bolts as they are locked against rotation by a lock tab on the main hinge arm, and a spring pin on the stabilizer arm.

80 To remove the leg fairing, withdraw the cotter pins and clevis pins securing the fairing to the nine spring housing attachments on the leg.

RETRACTION JACK REMOVAL

81 When removing the retraction jack it is necessary to partially retract the main leg and secure it in this position with a jury strap. This provides the necessary clearance to withdraw the jack from the wing.

ARROW 1 SERVICE DATA

82 To remove the retraction jack proceed as follows:

- (a) Jack the aircraft until the wheels are clear of the ground.
- (b) Connect the hand pump to the up and down lines in the duct bay and partially retract the leg.
- (c) Close the upline cock on the hand pump rig and fit the jury strap to support the leg.
- (d) Remove the jack access door located below the retraction jack.
- (e) Disconnect the two swivel joints at each end of the jack casing and blank off the open lines and connections.
- (f) Disconnect the jack rod from the cross-shaft spacer.
- (g) Remove the cotter pin, nut and bolt securing the jack body to the structure.
- (h) Withdraw the jack from the inner wing.

SHOCK ABSORBER REMOVAL

83 When removing the shock absorber the main leg must be retracted approximately 30° to allow the shock absorber to be pulled clear of the main casing. This retraction must be carried out after the shock absorber has been disconnected from the shortening sleeve and the pip-pin has been replaced. It is necessary to replace the pip-pin to prevent misalignment of the operating sleeve and the shortening sleeve during the partial retraction.

84 To remove the shock absorber proceed as follows:

- (a) Remove the leg fairing and disconnect the pivot door adjustable links from the cross-shaft. See para 79.
- (b) Jack the aircraft until the wheels are clear of the ground.

Relieve the hydraulic pressure in the utility hydraulic system and the emergency brake circuit.

(d) Disconnect and remove the hydraulic brake lines from the wheel brakes to the swivel joints on the torque links. The shuttle valve may be removed complete with the upper section of piping. See Arrow 1 Service Data - Section 7 - Wheel Brakes Hydraulics, for details of the brake lines and swivel joints.

(e) Unscrew and remove the recuperator valve dummy and insert the blanking plug.

NOTE

On Arrow 1 aircraft the recuperator is disconnected and a recuperator valve dummy and charging valve is fitted in place of the recuperator valve.

(f) Remove the main wheels and brakes. Fit axle guards and replace the axle nuts.

(g) Remove the circlip and special nut securing the brake torque links to the lower leg. Remove the complete assembly, comprising the forward and rear torque links together with the recuperator.

(h) Remove the tie-rod.

(j) Remove the bogie beam as follows:

(1) Remove the earthing wire and transverse bolt.

(2) Support the bogie beam and drive out the pivot pin complete with towing eye.

(k) Disconnect the torque link at the centre pivot bolt.

(m) Remove the band clamp around the base of the torque fitting and remove the four locking pads and eccentric screws.

(n) Attach a strap wrench to the lower end of the operating sleeve. Rotate the sleeve to line up the pip-pin with its access hole in the outer casing.

(p) Fit the retaining tool to support the operating sleeve when the pip-pin is removed.

ARROW 1 SERVICE DATA

(q) Attach the retaining strap to support the lower part of the leg when the pip-pin is removed.

(r) Extract the pip-pin, using the special extractor.

(s) Lower the sliding member on its retaining strap approximately 3 inches to enable the shock absorber to disengage from the shortening sleeve.

(t) Replace the pip-pin to retain alignment of the shortening sleeve and the operating sleeve. Remove the extractor.

(u) Connect the hand pump to the up and down lines in the duct bay. Retract the leg approximately 30° and close the up line cock on the rig. Secure the leg in this position by fitting the jury strap.

(v) Support the lower leg and withdraw the sliding member and shock absorber from the main casing.



Care should be exercised during the removal procedures to avoid abrasion and damage to the machined surface of the sliding member.

(w) To remove the shock absorber from the sliding member proceed as follows:

(1) Remove the bolt securing the locking tube to the lower part of the leg and withdraw the tube.

(2) Using a suitable extension wrench unscrew the nut securing the shock absorber piston rod to the sliding member.

WHEEL DOOR JACK REMOVAL

85 To remove the wheel door jack proceed as follows:

(a) Relieve the hydraulic pressure in the utility hydraulics system.

(b) Disconnect the hydraulic unions at the sequence valve body, and at the jack upper pivot connections. Blank off the pipes and the valve and jack connections to prevent ingress of dirt.

(c) Remove the sequence valve, by removing the two retaining bolts that attach it to the jack attachment bracket.

(d) Disconnect the jack cylinder from the door. Retain the shim washer if refitting the same door jack.

(e) Remove four nuts attaching the jack extension bracket to the wheel bay structure and withdraw the bracket from the studs.

NOTE

The jack must not be dismantled from the attachment bracket. New jacks are supplied with the attachment bracket assembled to the jack rod.

INSTALLATION AND ADJUSTMENTS

GENERAL

86 During installation and adjustment of components on the landing gear the aircraft must be supported on jacks and ground locks fitted to the components which are not being serviced. The ground locks must be removed during function testing and replaced when the test is completed. See Arrow 1 Service Data - Section 1 - General Information.

87 When function testing a single component of the landing gear a hand pump fitted with two hoses and a two-way valve is connected to the up and down lines leading to the component.

88 When function testing the complete landing gear, the hydraulic test stand is connected to the utility hydraulic ground test connections. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

INSTALLING THE MAIN LEG AND BACK STAY

89 When installing a replacement leg the back stay must be removed from the leg and the leg secured in the ground handling dolly.

ARROW 1 SERVICE DATA

90 To install the leg proceed as follows:

(a) Manoeuvre the leg into position and enter the forward pivot into the front pivot bearing.

(b) Assemble the thrust collar, washer and nut.

(c) Install the back stay in the reverse order to that detailed in para 78. Torque load the retraction jack pivot bolt to 1500-1800 in lb.

(d) Torque load the front pivot bearing nut to 420-480 in lb. Secure the bearing nut by fitting the lock washer, nut and cotter pin. See fig 3.

(e) Remove the ground handling dolly.

(f) Install the side stay. See para 91-92.

(g) Connect the shortening adjustment screw to the wheel bay structure. See fig 6.

(h) Install the hydraulic brake lines on the leg. See Arrow 1 Service Data - Section 7 - Wheel Brakes - Hydraulics.

(j) Install the front and rear wheel brakes.

(k) Fit the two main wheels.

(m) Install the nine spring housings to the leg. Apply a coat of adhesive PR1421 to the inner surface of the straps securing housings Nos. 1-7 prior to installation.

(p) Assemble the electrical wiring and micro-switches to the leg. See Arrow 1 Service Data - Section 9 - Landing Gear - Electrics.

(q) Connect the hand pump rig to the up and down lines in the duct bay. Slacken the pipe line fitting to the down-lock in the side stay and pump fluid through the up line until air free fluid flows from the fitting. Tighten the fitting.

Rig the main leg as detailed in para 93.

(s) Adjust the leg shortening mechanism as detailed in para 95.

(t) Install and adjust the leg fairing as detailed in para 101.

(u) Install and adjust the pivot door as detailed in para 99-100.

(v) Adjust the leg up-lock and sequence valve as detailed in para 97.

(x) Adjust the micro-switches as detailed in Arrow 1 Service Data - Section 9 - Landing Gear - Electrics.

(y) Lubricate the landing gear as detailed in Arrow 1 Service Data - Section 1 - General Information.

(z) Function test the complete landing gear.

INSTALLING THE SIDE STAY

91 Before installing the side stay lubricate the lower ball joint and check to ensure that the side stay has been filled with 10 cu in of lubricating oil Specification MIL-O-6083.

92 The installation procedure for the side stay is the reverse of the removal procedure detailed in para 77 with the following additions:

(a) Rig the main leg as detailed in para 93.

(b) Connect the hand pump rig to the up and down lines in the duct bay. Slacken the pipe line fitting to the down-lock and pump fluid through the up line until air free fluid flows from the fitting. Tighten the fitting.

(c) Retract and extend the leg, checking the down-lock for disengagement on retraction and engagement on extension.

RIGGING THE MAIN LEG (Fig 20)

93 The main legs are inclined inwards at an angle of $4^{\circ}15'$ to the vertical, this is resolved into a linear measurement of 156.20 - 156.70 inches from the outer face of the bogie beam to the centre line of the aircraft. The rigging position of the leg is varied by altering the length of the telescopic side stay. This is accomplished by means of an adjustable end fitting on the lower end of the side stay.

ARROW 1 SERVICE DATA

94 To rig the main leg proceed as follows:

(a) Jack the aircraft until the wheels are clear of the ground.

(b) Position the alignment fixture in the nose wheel bay and adjust the main jacks until the aircraft is laterally level.

NOTE

Due to the height to which the main landing gear jacks would have to be raised, it is impracticable to raise the aircraft so that the fuselage datum line is horizontal.

(c) Remove the hydraulic equipment access panel and the No. 1 service panel. Mark the centre of each frame on the forward face of the hydraulic access (station 553.1) and the rear face of No. 1 service access (station 606.05). Suspend plumb lines from these two points.

(d) Using a chalked length of string, transfer a line to the hangar floor passing directly under the two plumbobs.

(e) Drop a plumb line from the lower outboard face of each landing gear sliding member at the bogie beam attachment point. Ensure that each plumb line is suspended from an identical point on each sliding member.

(f) Using a chalked length of string, transfer a line to the hangar floor passing directly under these plumbobs. Ensure that the two chalk lines cross each other at right angles.

(g) Using a steel tape, measure the distance from the point of the appropriate main leg plumbob to the centre line of the aircraft. The measurement should be 156.20 - 156.70 inches. If not, the angle of the main leg must be corrected by adjusting the side stay as follows:

(1) Remove the lockring from the lower end fitting of the telescopic side stay and, by trial and error, adjust the lower end fitting until the correct adjustment is obtained.

(2) Turn the end fitting to allow alignment of the lockring with the slots in the side stay then replace the lockring.

NOTE

See the instruction plate attached to the side stay for maximum adjustment tolerances.

(h) The side stay adjustment affects the overtravel setting of the retraction jack. Check and, if necessary, adjust the main gear retraction jack as described in para 103.

ADJUSTING THE SHORTENING MECHANISM

95 The main leg must be shortened by 8.44-8.56 inches when the leg is fully retracted. The amount of leg shortening may be varied by adjusting the adjustment screw (see fig 6) in the leg shortening mechanism.

96 To adjust the leg shortening mechanism proceed as follows:

(a) Disconnect the main door jack from the door and secure the jack in a position where it can retract and extend without fouling.

(b) Detach the leg fairing by removing the flat head pins.

(c) Connect the hand pump rig to the up and down lines in the duct bay.

(d) Slowly retract the landing gear and check that the main leg is fully shortened before it enters the wheel bay and that the landing gear does not foul the wheel bay structure.

(e) Place a piece of adhesive tape around the main casing of the leg so that the edge just touches the upper end of the torque fitting.

(f) Extend the landing gear and measure the distance between the edge of the adhesive tape and the upper end of the torque fitting. The measurement should be 8.44-8.56 inches. If not, the shortening mechanism must be adjusted as follows:

ARROW 1 SERVICE DATA

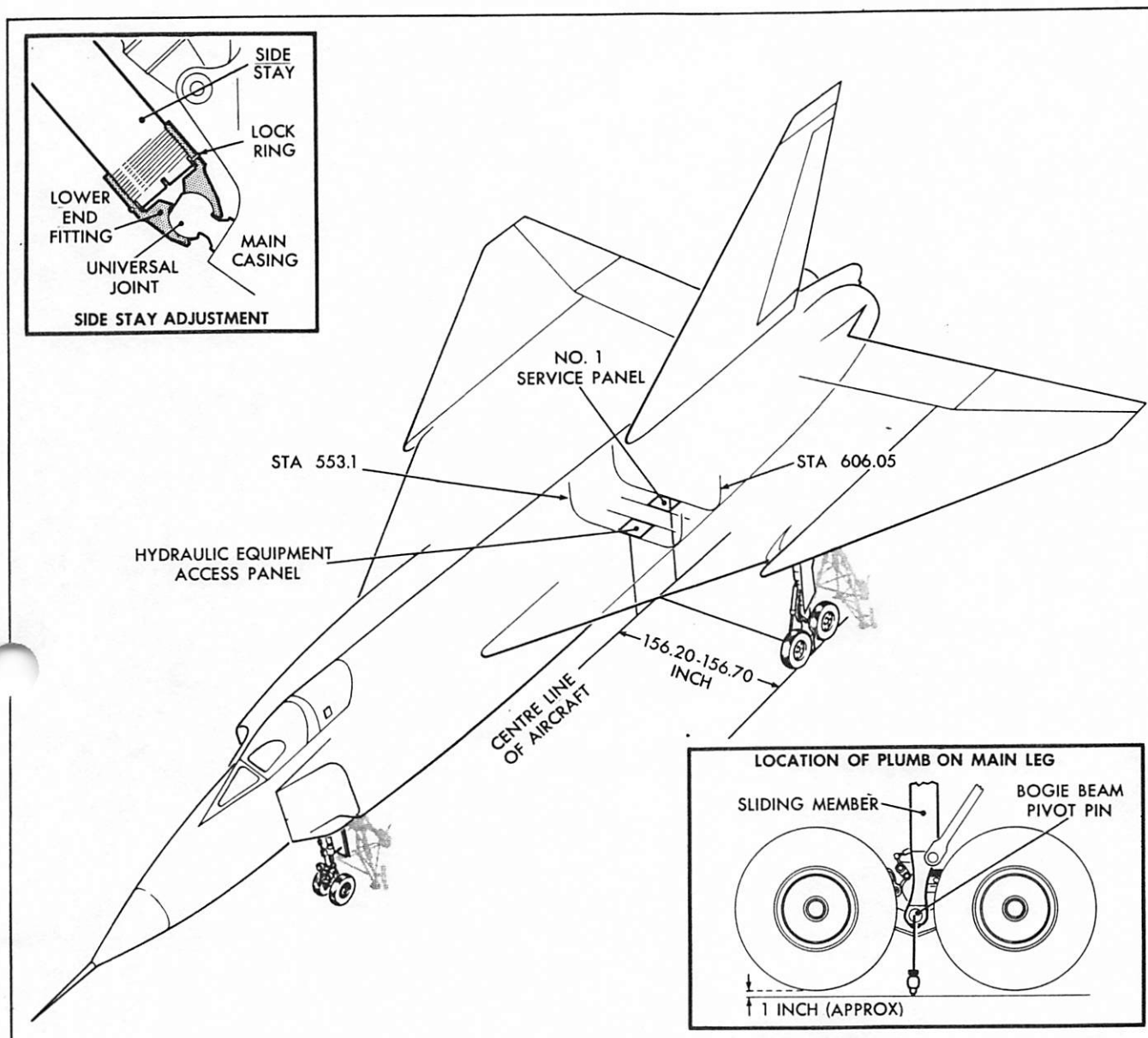


FIG. 20 RIGGING THE MAIN LEG

(1) Remove the wirelocking from the two locknuts of the fixed shortening bracket on the main leg cross-shaft.

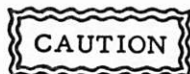
(2) Remove the lock plate from the shortening chain tension adjustment rod on the side of the main casing.

Slacken the chain tension adjustment rod until it just separates from its spherical seating.

(4) By trial and error, adjust the shortening bracket locknuts to reposition the bracket. Adjusting the bracket upwards and away from the leg will increase the amount of shortening. The chain must be correctly tensioned after each bracket adjustment. This is achieved by unscrewing the rod, if necessary, until it separates from its seat, screwing it in until the rod just seats without end play, then screwing in a further 180°.

ARROW 1 SERVICE DATA

- (5) Repeat items (d) to (f)(4) inclusive until the correct shortening measurement is obtained.



It is important that the chain is correctly tensioned on completion of all adjustments of the shortening bracket. Overtensioning of the chain will lift the operating cylinder of the down-lock, leaving the leg in a partially unlocked condition.

- (6) Wirelock the shortening bracket and fit the lock plate to the adjustment rod.

- (g) Adjust the micro-switch indicator. See Arrow 1 Service Data - Section 9 - Landing Gear - Electrics.

- (h) Replace the leg fairing and connect the door retraction jack.

- (j) Remove the hand pump and connect the hydraulic test stand to the ground service connections.

- (k) Bleed the utility hydraulic system and function test the landing gear.

MAIN LEG UP-LOCK AND SEQUENCE VALVE ADJUSTMENT (Fig 21 and 22)

97 The up-lock must be positioned in the wheel-bay to ensure that, when the leg is retracted, the centre line of the up-lock latch is aligned with the mid point on the roller. The roller must also be adjusted on its serrated plate so that it fully engages in the latch and locates the landing gear in the correct position in the landing gear bay.

98 To adjust the up-lock and roller proceed as follows:

- (a) Jack the aircraft until the wheels are clear of the ground.
- (b) Connect the hand pump rig to the up and down lines in the duct bay.

- (c) Detach the leg fairing by removing the flat head pins.

- (d) Adjust the up-lock and roller as detailed in fig 21.

- (e) Adjust the sequence valve as detailed in fig 22.

- (f) Remove the hand pump rig, bleed the utility hydraulic system and function test the landing gear.

PIVOT DOOR INSTALLATION (Fig 12 and 13)

99 The pivot door is installed in the reverse procedure to that detailed in para 79. After installation the door must be adjusted on the two adjustable links to align the inner edge of the door with the undersurface of the wing and also by repositioning the door on the two curved arms to align the outer edge of the door with the wing.

100 To adjust the door proceed as follows:

- (a) Jack the aircraft until the wheels are clear of the ground.

- (b) Detach the leg fairing by removing the flat head pins.

- (c) Connect the hand pump rig to the up and down lines in the duct bay.

- (d) Retract the leg and by trial and error adjust the two links until the inner edge of the door is flush with the undersurface of the wing.

- (e) Slacken the bolts securing the two curved arms to the door and reposition the door until the outer edge is flush with the undersurface of the wing.

- (f) Tighten the bolts securing the door to the curved arms.

- (g) Check that the skin gap between the door and the wing is 0.05 - 0.10 inches. If necessary carefully file the edge of the door to obtain this skin gap.

ARROW 1 SERVICE DATA

(h) Install the leg fairing and retract the leg.

(j) Check the skin gap between the fairing and the door as detailed in (g).

LEG FAIRING ADJUSTMENT (Fig 23)

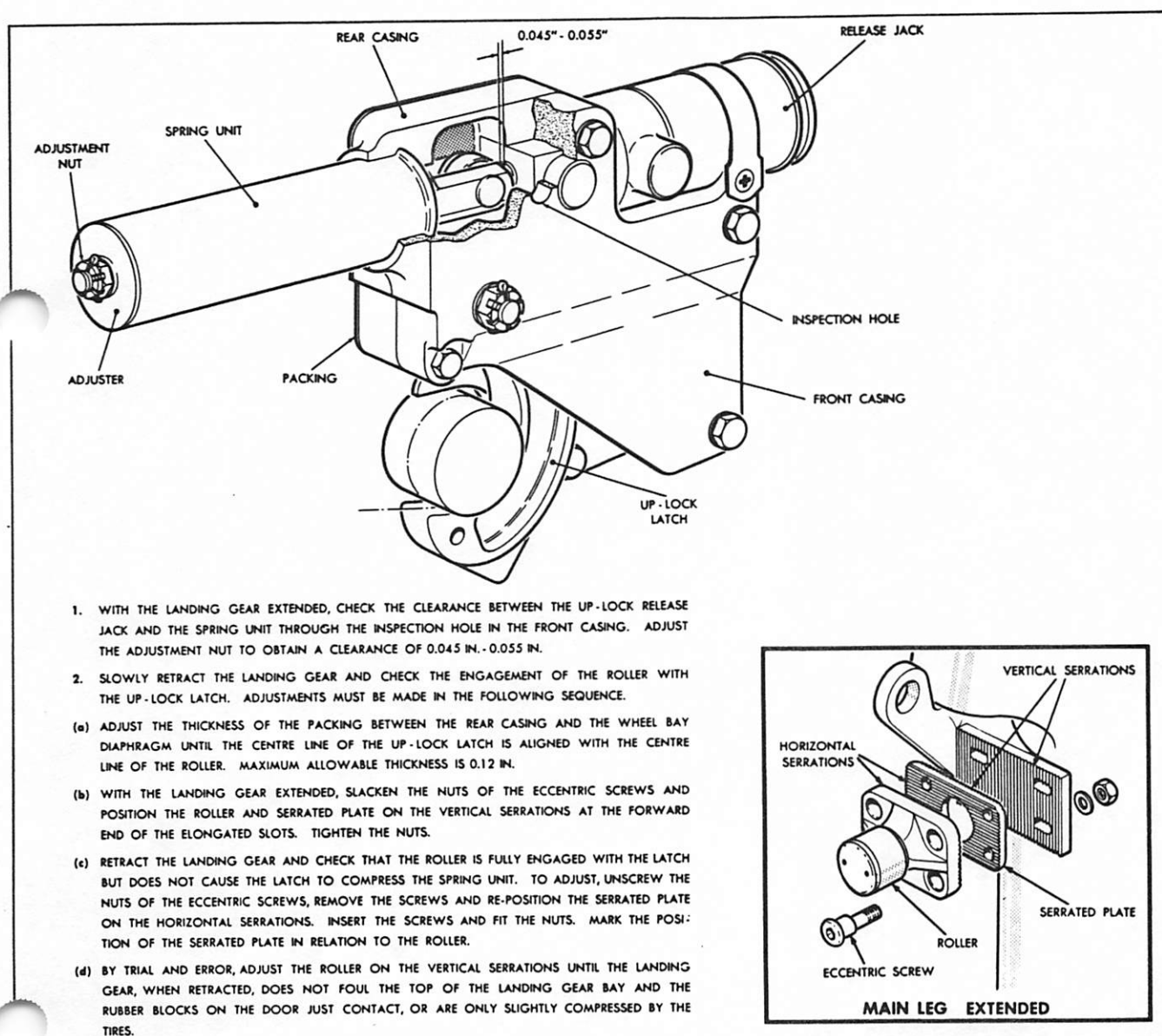
101 The nine housings securing the fairing to the leg must be adjusted so that they have sufficient travel remaining, when the gear is retracted, to allow for the wing flexing in flight.

102 The procedure for adjusting the housings is described in fig 23.

RETRACTION JACK INSTALLATION AND ADJUSTMENT (Fig 24)

103 After installing the jack to the aircraft structure, the end fitting must be adjusted to provide overtravel on the jack, in extended and retracted positions.

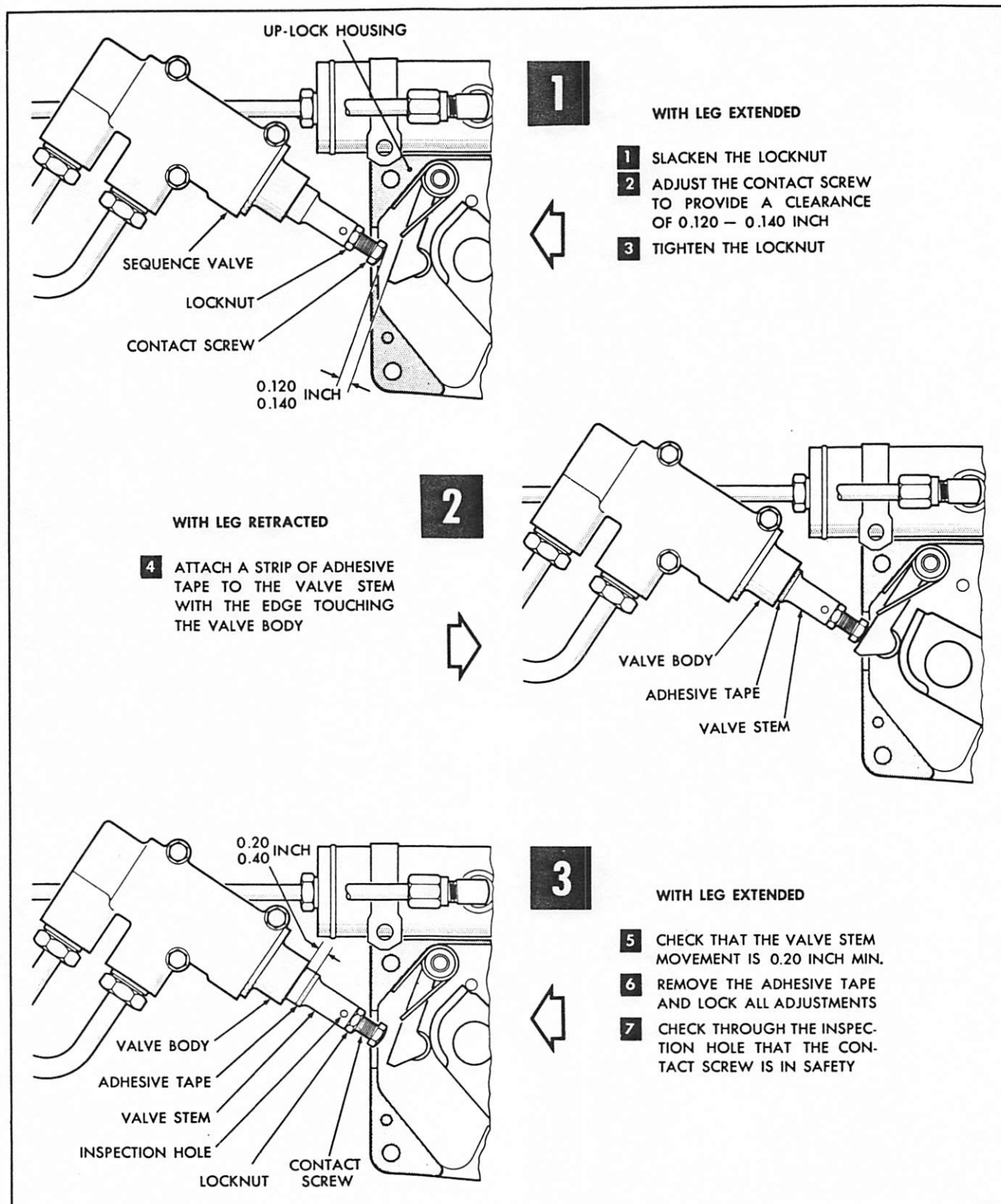
104 To install and adjust the jack proceed as follows:



7M1-1733-1

FIG. 21 LEG UP-LOCK ADJUSTMENT

ARROW 1 SERVICE DATA



712-1404-3

FIG. 22 LEG UP-LOCK SEQUENCE VALVE ADJUSTMENT

ARROW 1 SERVICE DATA

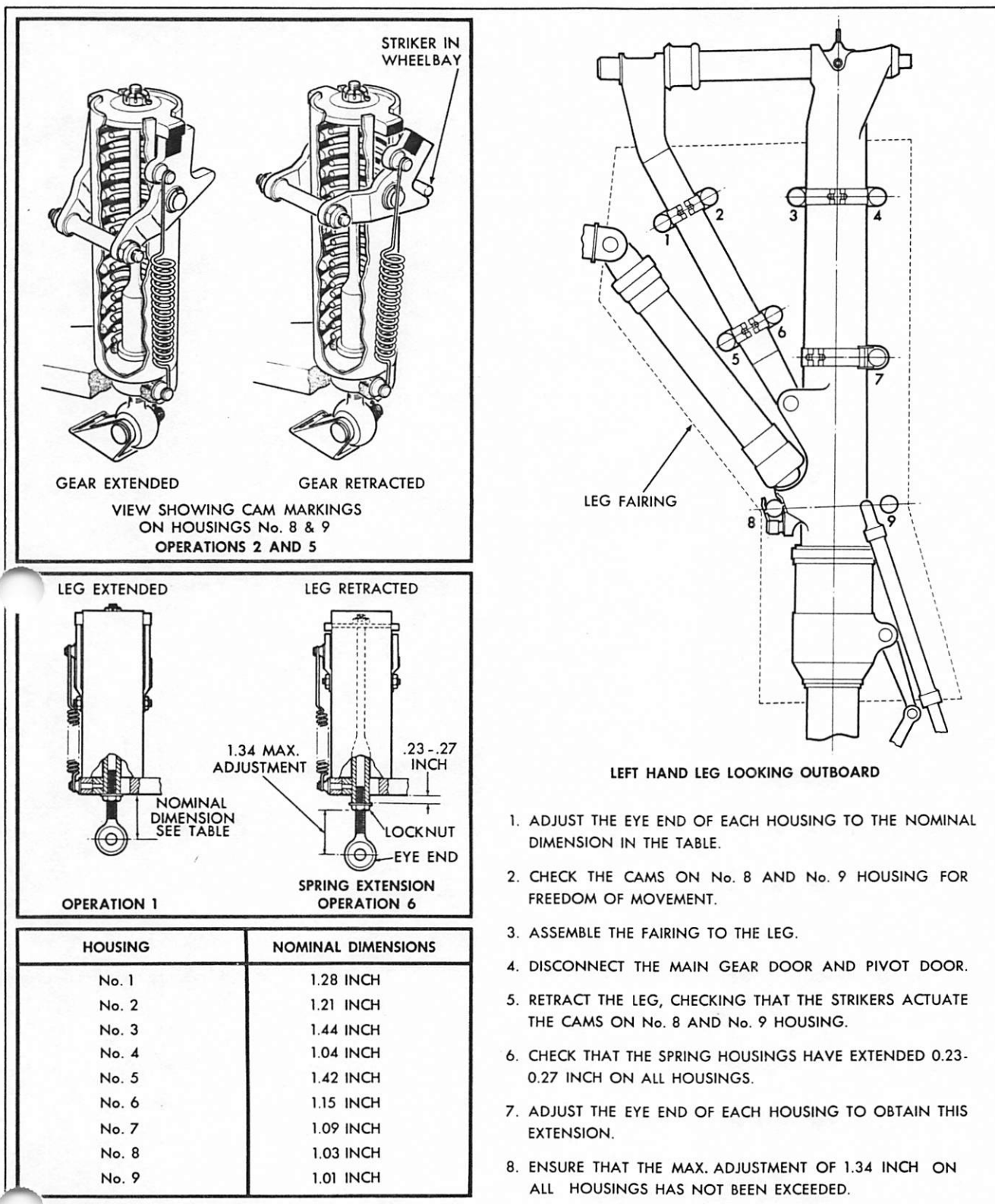


FIG.23 LEG FAIRING ADJUSTMENT

ARROW 1 SERVICE DATA

(a) Lubricate the pivot bearing, install the jack to the structure fitting and connect up the hydraulic lines.

(b) Remove the leg fairing and disconnect the adjustable links connecting the pivot door to the cross-shaft.

(c) Adjust the jack as detailed in fig 24.

(d) Torque the jack rod pivot bolt to 1500-1800 in lb.

(e) Replace the leg fairing and connect up the pivot door.

(f) Function the landing gear, checking the fairing and door for correct fitting.

SHOCK ABSORBER INSTALLATION

105 To install the shock absorber the main leg must be partially retracted to allow the shock absorber and sliding member to be fitted inside the leg. When the sliding member is positioned in the leg, the lower leg must be supported and the landing gear extended. This enables the shock absorber to be aligned with the shortening sleeve and the pip-pin to be fitted. The torque fitting must also be adjusted to position the rollers between the cam tracks.

106 A tool kit comprising a strap to support the leg in the partially retracted position, a strap to support the lower leg, an extractor for removal of the pip-pin, four wrenches to adjust the eccentric pins and two gauges to check the rollers, is required to facilitate installation of the shock absorber.

107 To install the shock absorber proceed as follows:

(a) Secure the shock absorber piston rod to the sliding member and fit the locking tube.

(b) Remove the blanking plug and screw the recuperator valve dummy into the sliding member.

NOTE

On Arrow 1 aircraft the recuperator is disconnected and a recuperator valve dummy and charging valve is fitted in place of the recuperator valve.

(c) Position the shock absorber with the cylinder uppermost and connect the charging rig to the charging point in the valve dummy. Bleed and charge the shock absorber as detailed in para 72. Tighten and wirelock the bleed plug.

(d) Insert the sliding member together with the lower bearing into the leg. Attach the support strap to the sliding member and adjust it to support the member approximately 3 inches short of its final assembled position.

(e) Extend the leg to the landing gear down position.

(f) Extract the pip-pin and carefully raise the lower leg until the upper part of the shock absorber is aligned with the shortening sleeve. Insert the pip-pin and remove the extractor.

(g) Check that the pip-pin is fully home and fit the rubber bung.

(h) With the lower bearing in position insert the four eccentric pins.

(j) Position the rollers in the cams as shown in fig 25. Fit the four locking pads to the eccentric screws and install the band clamp.

(k) Secure the upper and lower torque links by fitting the joint pin, nut and cotter pin.

(m) Attach the bogie beam to the sliding member by fitting the pivot pin, transverse bolt and earthing wire.

(n) Fit the tie-rod to the main casing and the bogie beam horn.

ARROW 1 SERVICE DATA

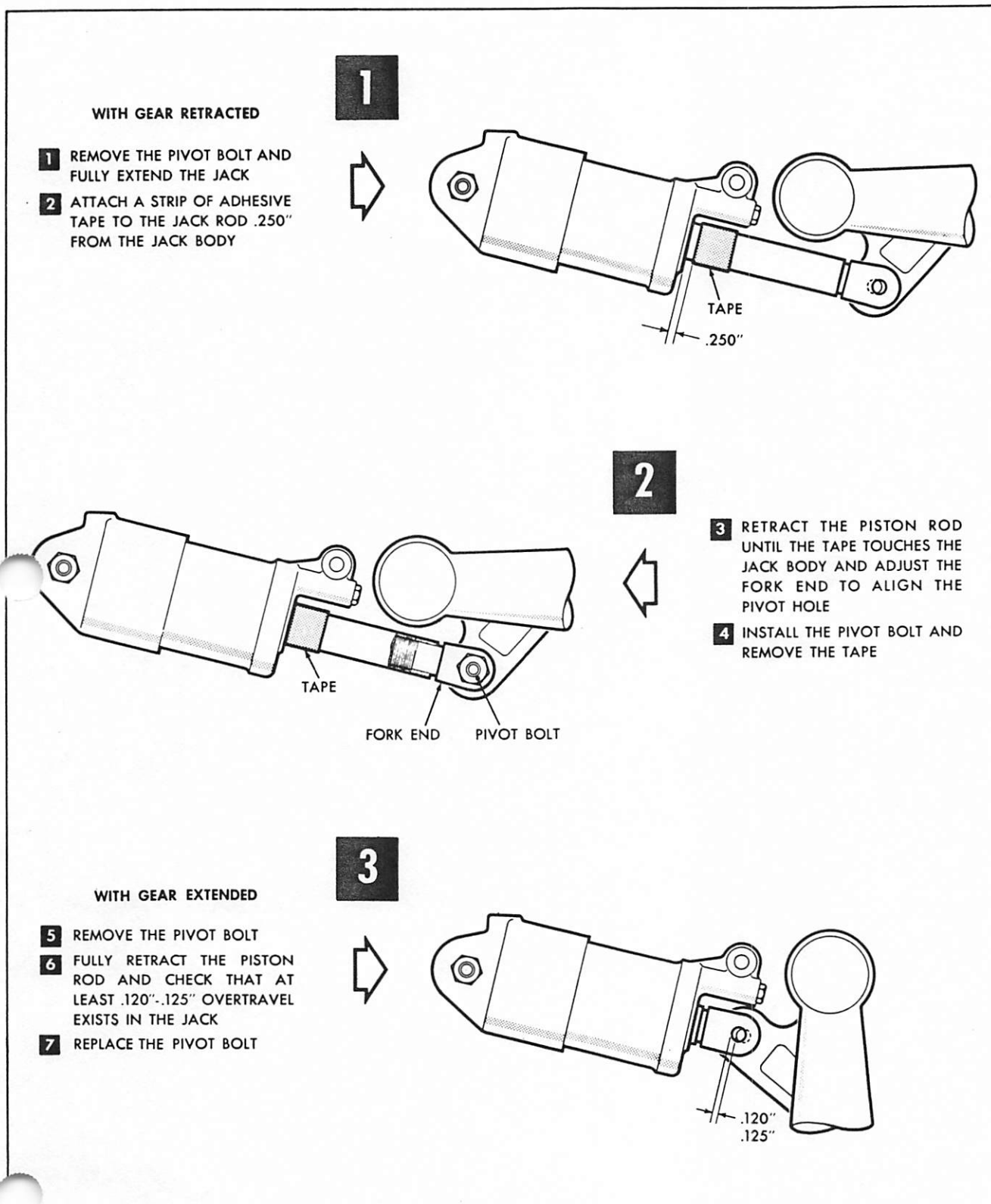


FIG. 24 RETRACTION JACK ADJUSTMENT

ARROW 1 SERVICE DATA

(p) Install the brake torque links on the centre pivot. Secure with the special bolt and fit the locking circlip.

(q) Locate the wheel brakes on the axles and secure to the brake torque links.

(r) Install the hydraulic brake lines and the shuttle valve. See Arrow 1 Service Data - Section 7 - Wheel Brakes - Hydraulics.

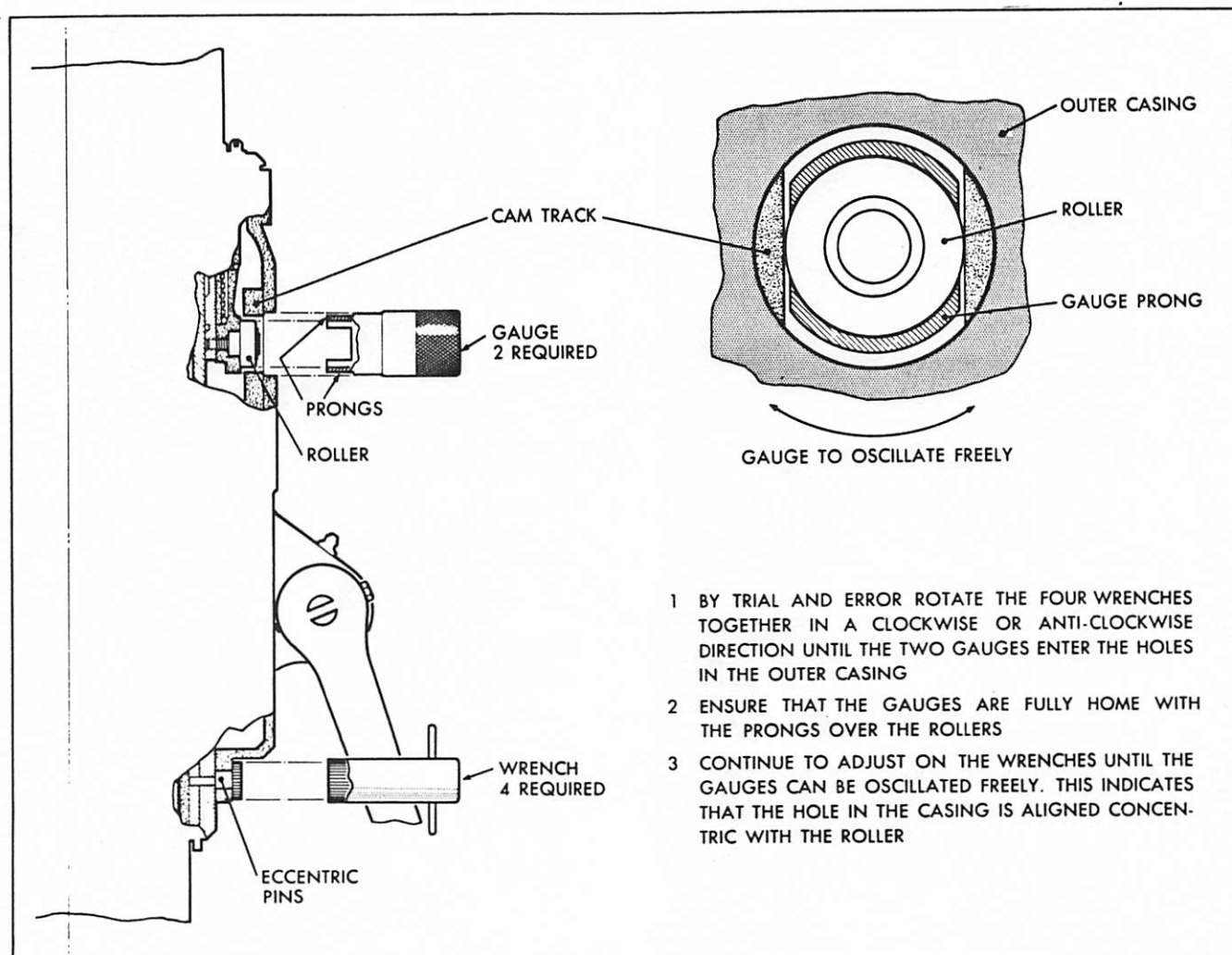
(s) Clean and lubricate the main leg as detailed in Arrow 1 Service Data - Section 3 - Lubrication.

(t) Bleed and function the brakes as detailed in Arrow 1 Service Data - Section 7 - Wheel Brakes - Hydraulics.

(u) Carry out a complete function test of the landing gear, checking the gear for clearance in the wheel bay.

WHEEL DOOR UP-LOCK ADJUSTMENT (Fig 26)

108 The wheel door up-locks in the wheel bay are fitted with adjustable rods to adjust the position of each latch, and also with an adjustment nut on each housing to tension the return spring. The five up-lock pins on the door are mounted on serrations to permit the door to be rigged so that all five locks are supporting the door and the door skin is flush with the wing skin.



7W2-1401-1

FIG.25 CAM ROLLER ADJUSTMENT

ARROW 1 SERVICE DATA

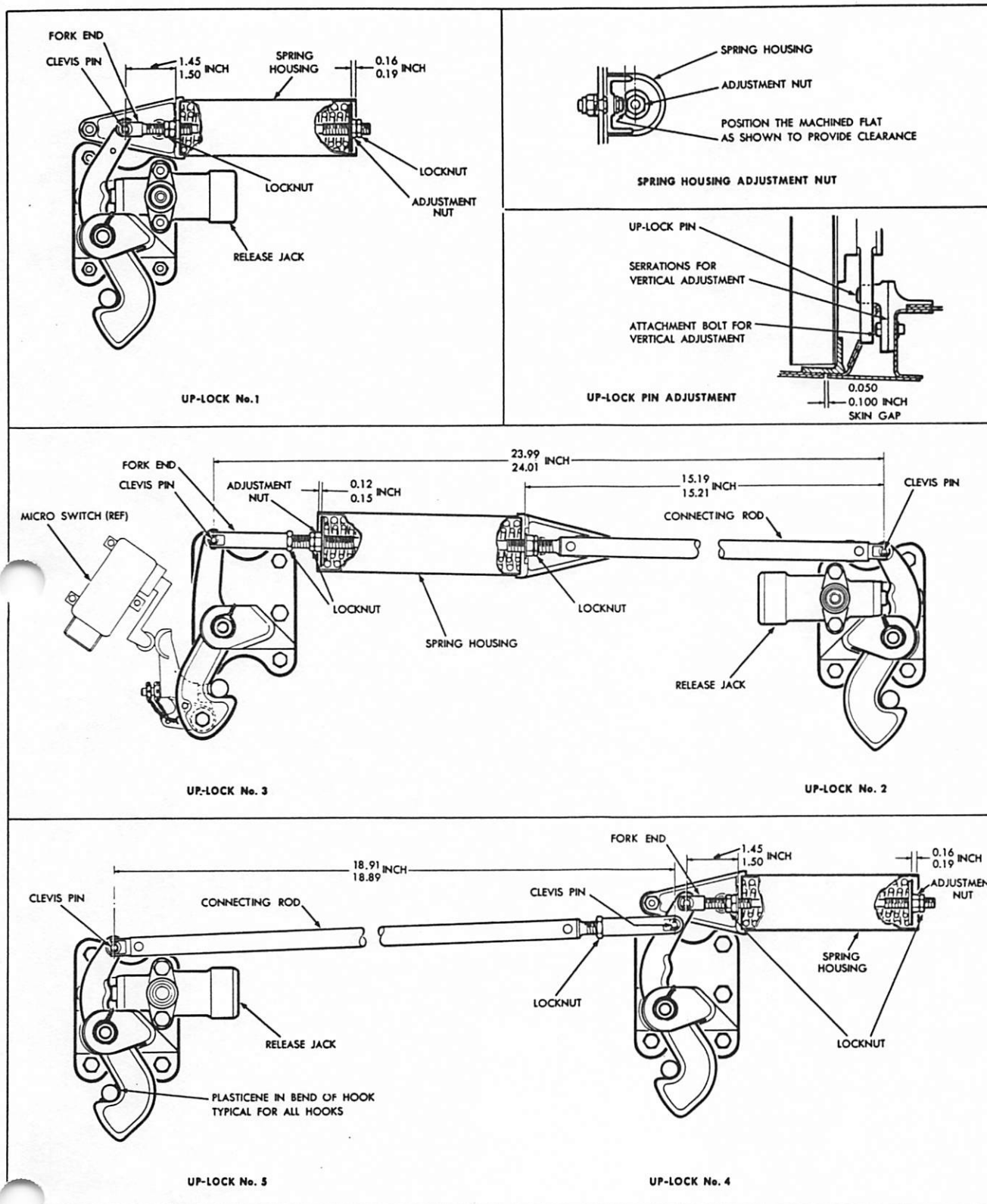


FIG. 26 WHEEL DOOR UP-LOCK ADJUSTMENT

ARROW 1 SERVICE DATA

CAUTION

It is important to secure all clevis pins before retracting the door. Failure to do this could result in the pin falling out and the door up-lock failing to release when the gear is selected down.

109 To adjust the wheel door up-locks and rig the wheel door in the up position proceed as follows:

(a) Adjust No. 1 up-lock latch as follows:

(1) Adjust the fork end to the 1.45-1.50 inch dimension, from the clevis pin to the spring housing face.

(2) Adjust the spring housing adjustment nut to the 0.16-0.19 inch dimension, from the adjustment nut flange to the end face of the housing.

NOTE

Ensure that the machined flat on the adjustment nut is positioned as shown in fig 26.

(3) Tighten the locknuts and secure the clevis pin.

(b) Adjust Nos. 2 and 3 up-locks as follows:

(1) Adjust the connecting rod to the 15.19-15.21 inch dimension.

(2) Adjust the adjustment nut to the 0.12-0.15 inch dimension, from the adjustment nut flange to the end face of the spring housing.

NOTE

Ensure that the machined flat on the adjustment nut is positioned as shown in fig 26.

(3) Adjust the fork end, connecting No. 3 lock to the spring housing, to the 23.99-24.01 inch dimension between the clevis pin centres.

(4) Tighten the locknuts and secure the two clevis pins.

(c) Adjust Nos. 4 and 5 up-locks as follows:

(1) Adjust the fork end, connecting No. 4 lock to the spring housing, to the 1.45-1.50 inch dimension.

(2) Adjust the adjustment nut to the 0.16-0.19 inch dimension, from the adjustment nut flange to the end face of the spring housing.

NOTE

Ensure that the machined flat on the adjustment nut is positioned as shown in fig 26.

(3) Adjust the connecting rod to the 18.89-18.91 inch dimension between the clevis pin centres.

(4) Tighten the locknuts and secure the clevis pins.

(d) Connect the hydraulic hand pump to the down line in the duct bay and the up line connection on the door jack.

(e) Place plasticene in the hook of each latch and retract the door by pressurizing the up line.

(f) Adjust on the door up-lock pins to position the door skin flush with the wing skin and at the same time check, by means of the plasticene, that the door is supported by each latch.

(g) Secure all the pin adjustments when the plasticene in the latches indicates that all five latches are supporting the door and that the door skin is flush with the undersurface of the wing.

(h) Check the skin gap between the door and wing skin is 0.05-0.10 inch. Trim the door skin, if necessary, to obtain this gap.

(j) Adjust the door jack sequence valve as detailed in fig 27.

(k) Disconnect the hand rig from the up line connection on the door jack and connect it to the up line in the duct bay. Reconnect the door jack line.

ARROW 1 SERVICE DATA

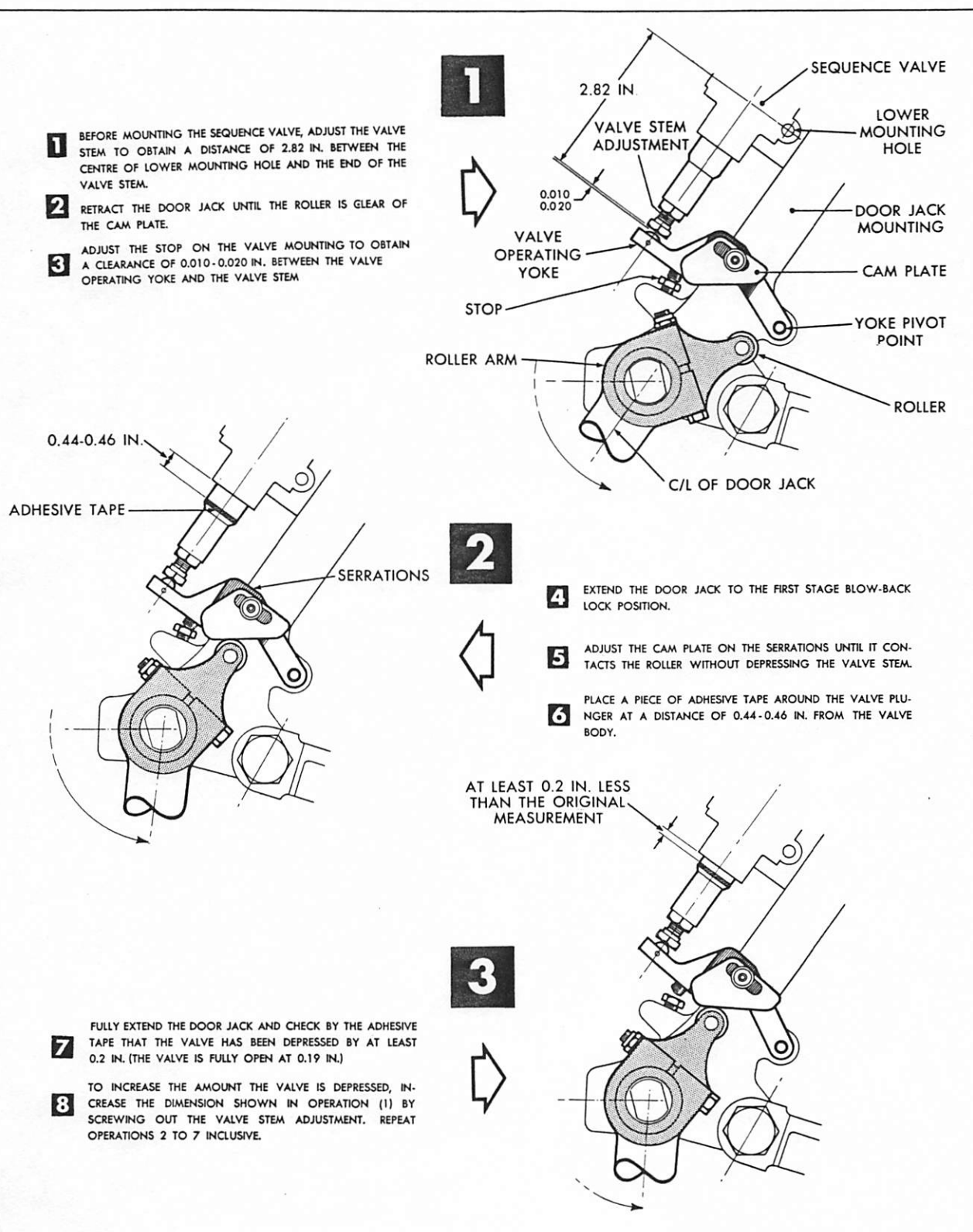


FIG. 27 WHEEL DOOR SEQUENCE VALVE ADJUSTMENT

ARROW 1 SERVICE DATA

(m) Check to ensure that all clevis pins are secure. Remove the main gear ground lock and retract the gear.

(n) Check that the door skin is flush with the wing skin and that a skin gap of 0.05-0.10 inch exists between the leg fairing and the door skin.

(p) Lower the landing gear and disconnect the hand pump rig. Connect the up and down lines in the duct bay.

(q) Connect the hydraulic test stand to the aircraft and bleed the system. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

(r) Function test the complete landing gear.

WHEEL DOOR JACK INSTALLATION AND ADJUSTMENT

110 Each door jack is supplied complete with attachment bracket and sequence valve mounting. To install the jack proceed as follows:

(a) Attach the mounting bracket to the four studs on rib No. 4 and secure with nuts.

(b) Remove the blanks from the jack and connect the hand pump lines to the jack connections.

(c) Install the sequence valve on the mounting.

(d) Remove the blanks from the pipelines and connect the pipelines to the sequence valve.

(e) Operate the hand pump and fully extend the jack.

(f) Measure the distance between the jack rod and cylinder pivot pin centres. This should be 26.125-26.375 inches.

(g) To adjust the extended length of the jack, release the lockring on the top of the

cylinder and adjust the cage plug to obtain the dimension in (f).

NOTE

Do not adjust the end fitting on the jack rod to alter the fully extended length of the jack.

(h) Fully retract the door jack and place a piece of adhesive tape around the jack rod so that one edge just touches the cylinder body.

(j) Extend the jack and connect the cylinder to the door bracket. A laminated shim washer must be fitted between the cylinder bearing and the door bracket to take up any clearance.

(k) Disconnect the hand pump line from the forward connection on the door jack and reconnect the line. Connect the hand pump line to the down line in the duct bay.

(m) Ensure all ground locks are fitted to the nose and main landing gears and apply pressure to the up line connection on the jack, to retract the door.

(n) With the aid of an inspection lamp and mirror verify that there is at least 0.12 inch of overtravel remaining on the jack rod.

(p) To alter the amount of overtravel, adjust on the jack rod end fitting by turning the jack rod with the aid of a strap wrench.

(q) Adjust the door jack sequence valve as shown in fig 27.

(r) Disconnect the hand pump lines from the aircraft and connect up the aircraft hydraulic lines.

(s) Check that the aircraft is correctly jacked. Remove the ground locks and connect the hydraulic test stand to the utility hydraulic ground test connections.

(t) Function test the landing gear, checking that the landing gear retracts and extends without fouling the door.

ARROW 1 SERVICE DATA

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-1962-17	Jarry Hydraulics P-199	Main Gear Jack LH	1
7-1962-18	Jarry Hydraulics P-199	Main Gear Jack RH	1
7-1962-11	Dowty XP3030	Up-lock Release Jack	2
7-1962-23	Dowty XT3086	Main Gear Door Jack	2
7-1062-2721	Avro Aircraft Ltd.	Pivot Door LH	1
7-1062-2722	Avro Aircraft Ltd.	Pivot Door RH	1
7-1062-2291	Avro Aircraft Ltd.	Main Gear Door LH	1
7-1062-2292	Avro Aircraft Ltd.	Main Gear Door RH	1
7-1062-3921	Avro Aircraft Ltd.	Main Gear Up-lock LH	1
7-1062-3922	Avro Aircraft Ltd.	Main Gear Up-lock RH	1
7-1092-3	Dowty XV1283-1A	Main Gear Leg LH	1
7-1092-4	Dowty XV1283-1B	Main Gear Leg RH	1
7-1062-4393	Avro Aircraft Ltd.	Leg Fairing LH	1
7-1062-4394	Avro Aircraft Ltd.	Leg Fairing RH	1
7-1092-11	Dowty XV1284-1A	Telescopic Side Stay LH	1
7-1092-12	Dowty XV1284-1B	Telescopic Side Stay RH	1
7-1092-1	Dowty V1283-9A	Shock Absorber LH	1
7-1092-2	Dowty V1283-9B	Shock Absorber RH	1
7-1092-165	Goodyear 9541028	Wheel	4
7-1092-167	Goodyear 771322	Tire	4
7-1092-169	Goodyear 9541027	Brake Unit	4

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM MAIN LANDING GEAR		SUB-SYSTEM		COMPONENT Main Landing Gear		REF. NO. 92-1	
AVRO PART NO. 7-4292-1 and 2		MANUFACTURER Dowty Limited		MAN'FR'S PART NO. XV 1283 - 1A and B		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Main landing gear.							
LOCATION Inner wing wheel bay between the main spar and front spar.							
ACCESS Accessible in the main wheel bay. Front bearing covered by an access panel in the wing leading edge.						MEN X MINUTES	
REPLACEMENT PROCEDURE Secure the landing gear in the ground handling rig. Remove the back stay. Position the leg in the front bearing. Assemble and tighten the bearing. Fit the back stay in the rear bearing. Assemble the cross shaft spacer and back stay pivot pin. Remove the ground handling rig. Install the telescopic side stay. Adjust the leg to the correct rigging position. Connect the retraction jack. Connect the shortening device. Connect the hydraulic brake swivel elbows and electrical wiring. Fit the pivot door and leg fairing. Carry out a complete functional test.						MEN X MINUTES	

UNCLASSIFIED

INSPECTION Check leg and attachments for security, cleanliness, damage, leaks and corrosion. Check all pivot pins and bearings for wear. Lubricate according to lubrication chart.						MEN X MINUTES			
FUNCTIONAL CHECKS Carry out retraction test and operate the emergency extension.						MEN X MINUTES			
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic ground test rig. Electrical ground power unit. B4 stand. Main leg ground handling rig. Aircraft jacks.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	11 Dec 56								

CF-105 SERVICE DATA
COMPONENT DATA SHEET

SYSTEM MAIN LANDING GEAR		SUB-SYSTEM		COMPONENT Main Landing Gear Leg Fairing		REF. NO. 92-2	
AVRO PART NO. 7-1062-4393 and 4394		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To enclose the landing gear when retracted.							
LOCATION Attached to the main landing gear leg.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Secure the fairing to the nine spring loaded housings on the main leg. Carry out a functional test. Adjust attachment rods to position the fairing.						MEN X MINUTES	

UNCLASSIFIED

INSPECTION Check for loose rivets, damage, cracks and corrosion. Check the fairing spring housings for freedom of movement. With the landing gear retracted check for fit and skin clearance.							MEN X MINUTES			
FUNCTIONAL CHECKS							MEN X MINUTES			
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Hydraulic ground test rig. Aircraft jacks. Electrical ground power unit.										
SPECIAL TOOLS TO REMOVE OR SERVICE Tool for compressing attachment springs - about 200 lb load.										
REMARKS										
ISSUE	1									
DATE	11 Dec 56									

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM MAIN LANDING GEAR		SUB-SYSTEM		COMPONENT Telescopic Side Stay		REF. NO. 92-3	
AVRO PART NO. 7-1092-11 and 12		MANUFACTURER Dowty Ltd.		MAN'FR'S PART NO. XV 1284-1A and 1B		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Braces the landing gear against side loads. Provides the main landing gear down lock.							
LOCATION Fitted between the main landing gear and main spar.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Remove the micro-switch and swivel elbows. Remove the upper pin. Support the side stay and unscrew the ball joint from the leg main fitting.						MEN X MINUTES	

INSPECTION Disconnect top end of stay and check for wear in the universal ball joint and the internal downlock mechanism. Drain the side stay and refill the 10 cubic inches of oil MIL Spec 0-6083.							MEN X MINUTES		
FUNCTIONAL CHECKS Functional test the landing gear. Check the downlock for engagement and unlocking.							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Hydraulic ground test rig. Aircraft jacks. Electrical ground power unit.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	11 Dec 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM MAIN LANDING GEAR		SUB-SYSTEM		COMPONENT Shock Absorber		REF. NO. 92-4	
AVRO PART NO.		MANUFACTURER Dowty Ltd.		MAN'FR'S PART NO. V 1284-9A and 9B		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To absorb landing loads.							
LOCATION Inside the main landing leg.							
ACCESS Remove the bogie beam, wheels, brakes and sliding member to gain access.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the shock absorber into the sliding member. Screw in the recuperator valve and tighten the nut securing the piston rod. Secure the lower torque scissor to prevent the cam opening the recuperator valve. Fit the sliding member into the torque fitting. Secure the shock absorber with the pip-pin. Locate the lower bearing with the four eccentric screws. Position the cam followers and lock the eccentric screws. Fit the bogie beam and connect the tie rod. Connect the recuperator lines, bleed and re-charge the recuperator. Connect the torque scissors and brake swivel elbows. Assemble wheels and brakes. Carry out a functional test on complete main landing gear and brakes.						MEN X MINUTES	

INSPECTION Check the oil content and nitrogen pressure indicators. Charge with oil to spec Dowcan 200 and compressed nitrogen as required.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT Aircraft jacks. High pressure nitrogen charging rig.									
SPECIAL TOOLS TO REMOVE OR SERVICE Fluid charging gun.									
REMARKS									
ISSUE	1								
DATE	11 Dec 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM MAIN LANDING GEAR		SUB-SYSTEM		COMPONENT Main Wheel Assembly		REF. NO. 92-5	
AVRO PART NO. 1092-13 and 15		MANUFACTURER Goodyear Tire Co.		MAN'FR'S PART NO. 9541028		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To facilitate motion.							
LOCATION Main landing gear.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Assemble the wheel to the axle. Assemble bearing and tighten the wheel nut until correct bearing end float is obtained. Lock the wheel nut and fit the hub cap. Check tire pressure. Lower wheel to the ground. Remove jury strap from the tie rod.						MEN X MINUTES	

UNCLASSIFIED

INSPECTION Check tires for pressure 255. psi, creep and condition. Remove wheels, clean and inspect for cracks, corrosion and general condition. Lubricate as required.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT Aircraft axle jack. Main landing gear jury strap.									
SPECIAL TOOLS TO REMOVE OR SERVICE Tool to remove tubeless tires. Tire pressure gauge.									
REMARKS									
ISSUE	1								
DATE	11 Dec 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM MAIN LANDING GEAR		SUB-SYSTEM		COMPONENT Telescopic Tie-rod		REF. NO. 92-6	
AVRO PART NO.		MANUFACTURER Dowty Ltd.		MAN'FR'S PART NO. V. 1283-290		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE : KNOWN-							
ESTIMATED- 500 hours							
FUNCTION To position the bogie beam correctly for landing gear retraction.							
LOCATION Fitted between the bogie beam and main leg.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Bolt the upper fitting to the main leg and the lower fitting to the bogie beam horn. Lower the aircraft and remove the jacks.						MEN X MINUTES	

INSPECTION Check for security, damage and cleanliness. Lubricate according to lubrication chart.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Aircraft jacks.									
SPECIAL TOOLS TO REMOVE OR SERVICE Tool for compressing the spring.									
REMARKS									
ISSUE	1								
DATE	11 Dec 56								

ARROW 1 SERVICE DATA

SECTION 5

NOSE LANDING GEAR

(This data supersedes previous issue dated 11 Dec 1956)

15 MAR 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE PAGE NO.

DATE PAGE NO.

ARROW 1 SERVICE DATA

NOSE LANDING GEAR

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Nose Leg Assembly	1
Main Casing	1
Up-lock Roller Assembly	1
Steering Jack and Control Valve	1
Bellcrank	1
Rotating Sleeve	3
Steering Links	3
Suspension Lever	3
Axle Assembly	4
Pneumatic Strut	5
Drag Strut Assembly	5
Nose Landing Gear Up-lock	6
Nose Leg Fairing	7
Nose Wheel Door	7
Nose Wheel Steering - General	7
Disconnect Assembly	9
Nose Wheel Steering Cables	9
Nose Wheel Steering Links	9
Nose Wheel Steering Operation	9
INSPECTION (To be issued later)	
ADJUSTING, TESTING AND SERVICING	
Nose Leg	12
Nose Gear Retraction Jack Adjustment	13
Nose Gear Up-lock Adjustment	14
Nose Gear Up-lock Sequence Valve	14
Nose Leg Fairing Installation	14
Nose Wheel Door Installation	15
Nose Wheel Door Sequence Valve Installation	15
Shock Absorber Charging	16
Shock Absorber Removal	16
Shock Absorber Bleeding	16
Pneumatic Strut Charging	16
Nose Wheel Steering	17
COMPONENT SERVICE DATA	
Nose Leg	21
Nose Leg Fairing	23
Drag Strut	25

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
Shock Absorber	27
Nose Wheel	29
Pneumatic Strut	31

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Nose Landing Gear	2
2	Nose Landing Gear Operation	3
3	Nose Landing Gear Attachments	4
4	Drag Strut Assembly	5
5	Nose Landing Gear Up-lock	6
6	Nose Wheel Door	8
7	Nose Wheel Steering - Component Layout	10
8	Follow-up Pulleys and Cables	11
9	Operation of Disconnect Assembly	11
10	Operation of Steering Links	12
11	Nose Gear Jack Removal	13
12	Shock Absorber Installation	17

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The nose landing gear assembly is a twin wheel unit incorporating a liquid spring shock absorber and hydraulic steering. The landing gear retracts forwards and upwards, under hydraulic pressure, into the nose wheel bay where it is faired by a nose leg fairing and a nose wheel door. The assembly is lowered by gravity after the nose wheel door is opened and the up-lock is released by hydraulic pressure.

2 Hydraulic steering is obtained by a control valve and a steering jack mounted on the nose leg main casing. The jack also makes provision for nose wheel castoring, centring and shimmy damping. The maximum degree of steering and castoring from the central position of the nose wheel is 55° in either direction.

3 A landing light and a taxiing light are mounted on the lower part of the nose leg assembly. An electrical connection is also attached to the nose leg as a supply point for engine starting and telecommunication.

NOSE LEG ASSEMBLY

4 The nose leg assembly consists of a main casing to which is attached the hydraulic steering jack together with its control valve, a picketing point and an adjustable up-lock roller. Connected to the casing are the steering links, a suspension lever which carries the axle assembly, and a pneumatic strut. The bore of the casing houses a rotating sleeve assembly which in turn houses the liquid spring shock absorber.

MAIN CASING

5 The upper part of the main casing is Y shaped and is attached to the navigator's forward bulkhead by two pivot pins, see fig 3. The two pins pass through two pick-up points in each arm. The pick-up points incorporate two flanged bushes on the right hand arm and two plain bushes on the left. The flanged bushes transmit the side loads through the right-hand attachment point to the aircraft structure.

6 An integral lug on the right-hand arm provides attachment for the hydraulic jack for nose leg retraction. A tie rod, attached to a lug on the inboard side of each arm, acts as a brace. An integral arm protrudes from the top right-hand side of the main casing and to this is attached a folding drag strut.

UP-LOCK ROLLER ASSEMBLY (Fig 5)

7 The up-lock roller assembly is attached to the upper part of the main casing. The assembly consists of a face plate which locates in the groove between two shoulders on the main casing while the other side of the plate is serrated to mate with the bracket carrying the adjustable roller. The bracket and face plate are secured to the main casing by two bolts fitting into elongated slots. The serrations and the slots provide the adjustment for the roller in the fore-and-aft direction when the nose leg is retracted.

STEERING JACK AND CONTROL VALVE

8 The steering jack provides for nose wheel steering, castoring, self-centring and shimmy damping.

9 The upper attachment point of the jack is bolted to a single lug adjacent to the up-lock roller assembly to which is also attached a bracket carrying a single pulley. The lower attachment point of the jack comprises three lugs on the leg which mate with, and are bolted to, corresponding lugs on the body of the jack. The control valve is attached to the jack. For description of the steering jack and control valve see Arrow 1 Service Data - Section 8 - Nose Wheel Steering - Hydraulics.

BELLCRANK

10 At the front lower end of the main casing a journal carries the nose wheel steering bellcrank and a flanged bush. The assembly is retained by a washer and a special bolt which screws into internal threads in the journal. The bolt is secured by two lockscrews which are wirelocked together after assembly, see fig 10. To ensure that the bellcrank is free to pivot on the journal a clearance is maintained between the underside of the bolt head and the washer.

ARROW 1 SERVICE DATA

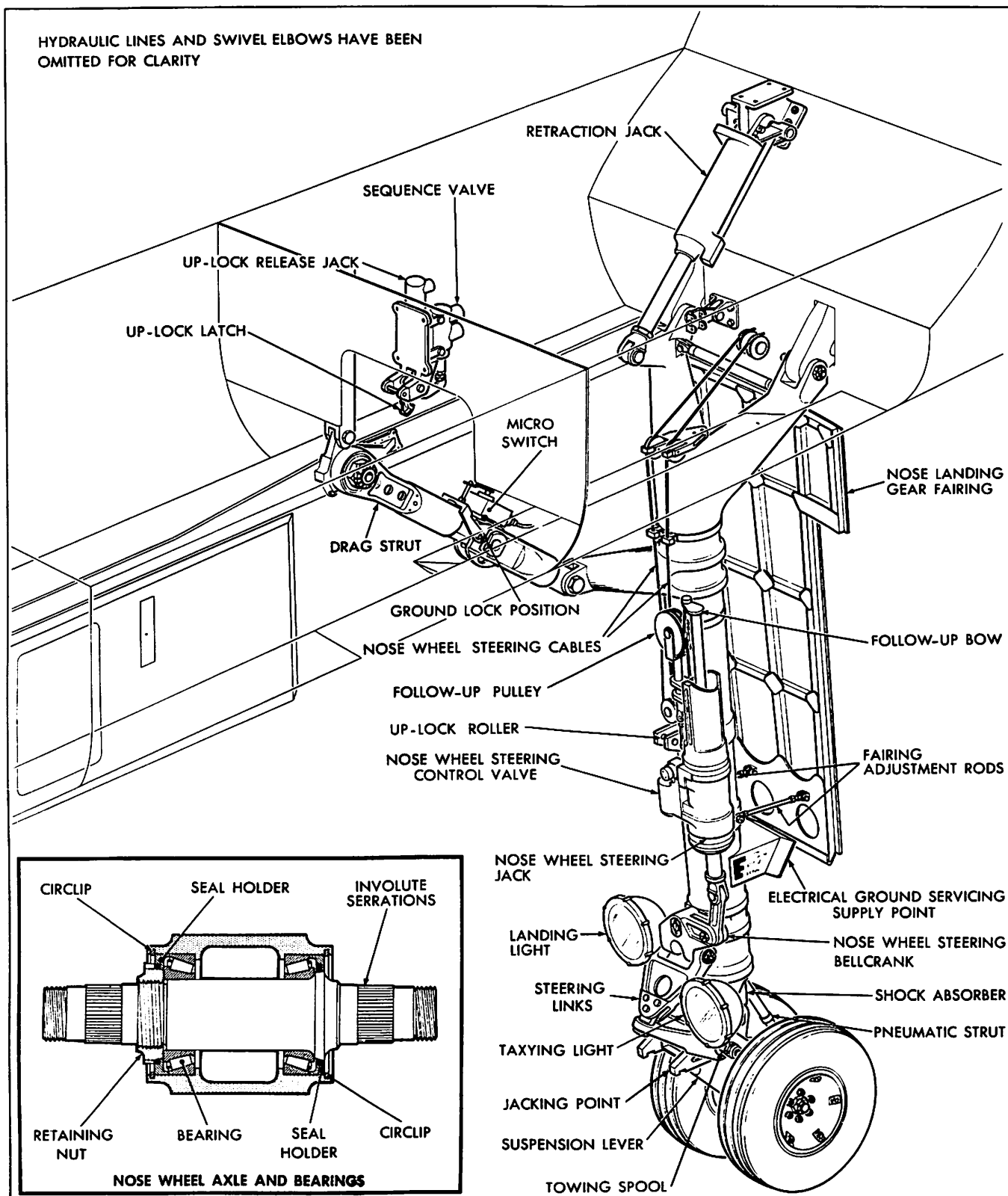


FIG. 1 NOSE LANDING GEAR

ARROW 1 SERVICE DATA

ROTATING SLEEVE

11 The rotating sleeve assembly permits the lower portion of the nose leg assembly to be partially rotated for steering and castoring. The assembly is secured and housed in the bore of the main casing and consists of a tapered sleeve with an integral 45° fork end.

12 To the upper end of the sleeve, and within its bore, is connected the piston rod of the shock absorber. The cylinder of the shock absorber is connected to the suspension lever. The upper part of the sleeve is centralized in the bore of the main casing by an upper bearing. At the base of the sleeve a thread accommodates the lower bearing nut, while beneath this, a conical seat mates with a corresponding seat on the inside face of the lower bearing nut. This nut fits into the base of the main casing and is locked by two lock pins retained by circlips. See fig 12.

13 A steering stop is fitted to the top forward part of the fork and is located by a roll pin. The stop abutts against two small integral lugs at the bottom of the main casing when the maximum steering angle of 55° is obtained for either direction.

14 Two small holes in the fork arm carry a bracket to operate a micro-switch housed in the suspension lever, see fig 10. On the underside of each fork a groove makes provision for the fitting of a jacking pad.

STEERING LINKS (Fig 10)

15 The upper steering link is attached to the nose wheel steering bellcrank by a main link axle which passes through the bore of the bellcrank. At each end of the main link axle a needle bearing carries the fork end of the upper steering link. The assembly is secured by a nut at each end and is prevented from rotating by a roll pin passing through a hole mid-way along the axle. To ensure that the bellcrank has freedom of movement, a clearance is maintained between the underside of the nut and the steering link at each end.

16 A ball joint connecting the steering links provides a scissors movement for landing and

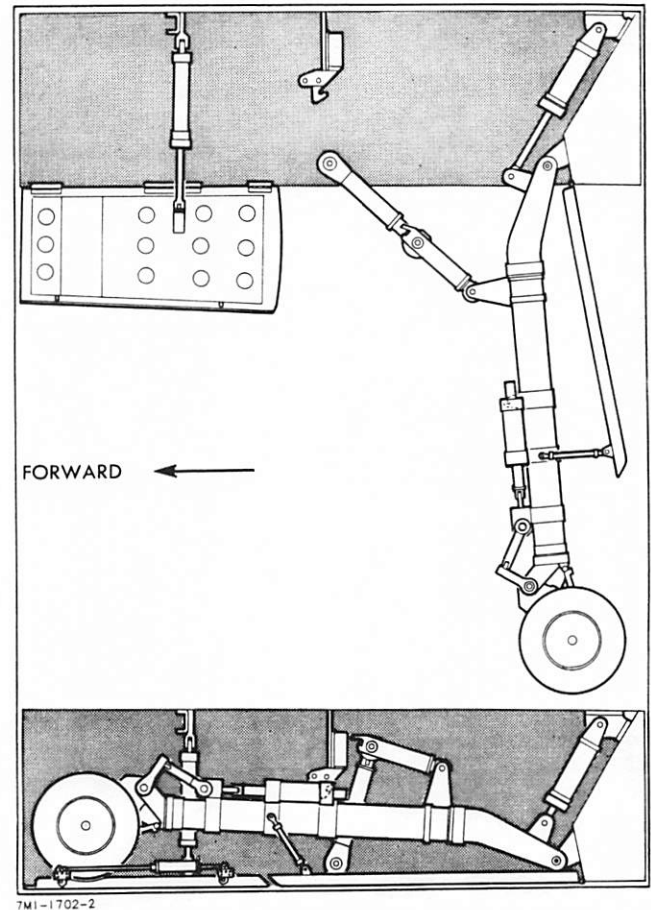


FIG. 2 NOSE LANDING GEAR OPERATION

taxying and also a swinging movement for nose wheel steering. The main body of the joint is located in a hole at the forward end of the lower steering link and is enclosed within two covers. The ball joint is sealed and is attached to the upper steering link by three nuts and bolts.

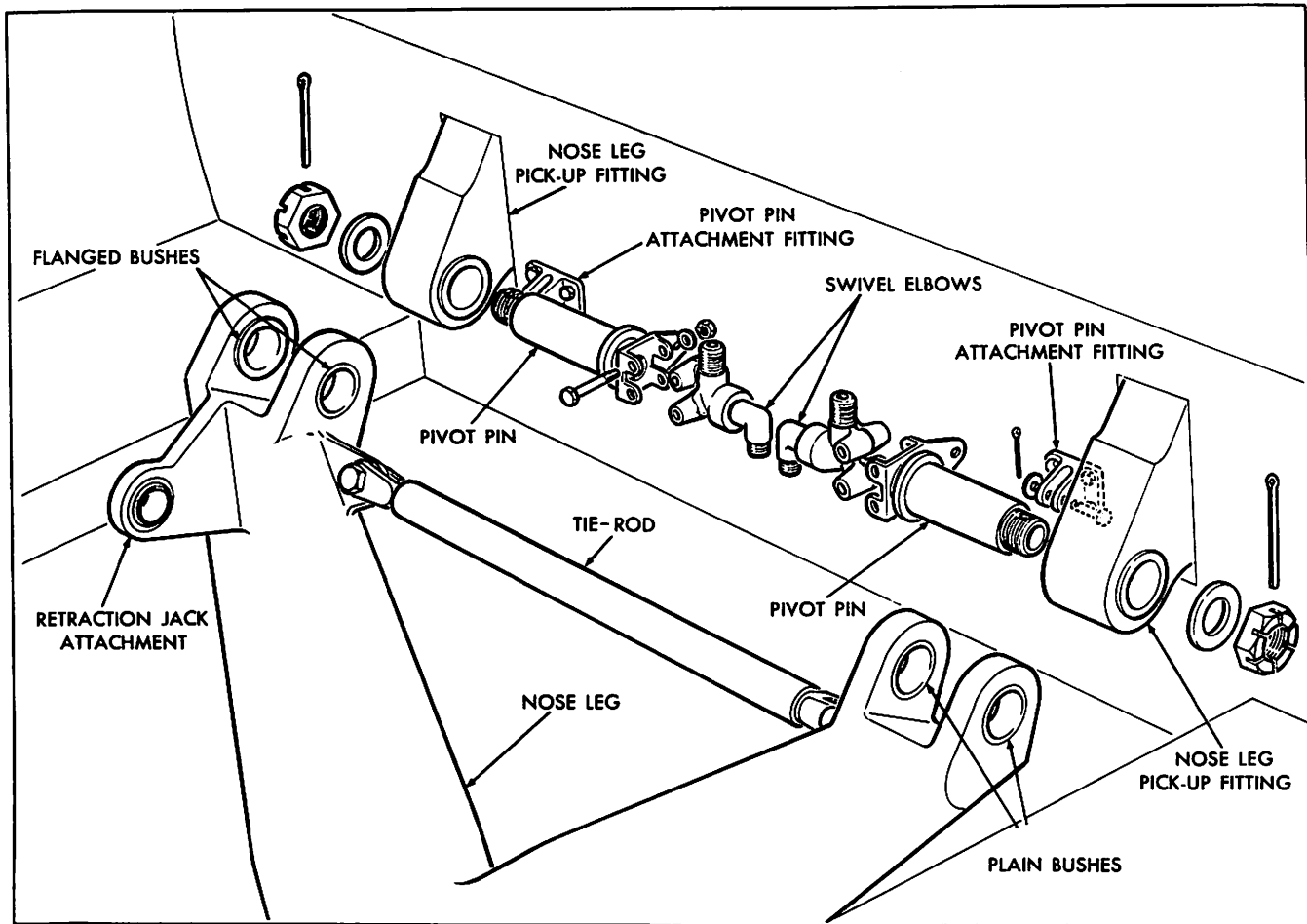
SUSPENSION LEVER

17 The upper end of the suspension lever connects with the rotating sleeve assembly and the lower end carries the nose wheel axle assembly. Between these points is attached the cylinder of the liquid spring shock absorber.

18 The suspension lever, the fork end of the rotating sleeve assembly and the lower steering link are mounted on a common shaft, see fig 12. The suspension lever is supported on the shaft by two needle bearings. Located on each side of the suspension lever is the

UNCLASSIFIED

ARROW 1 SERVICE DATA



7M1-1712-8

FIG. 3 NOSE LANDING GEAR ATTACHMENTS

fork end of the rotating sleeve assembly and outboard of this, the attachment points of the lower steering link.

19 A rod passes through the bore of the hollow shaft and carries a flanged towing spool at each end. The towing spools fit into a counterbore at each end of the shaft and are secured by the rod.

20 Located around the outside of the upper attachment point is a small calibrated chart which provides an indication of the nitrogen pressure to which the pneumatic strut must be charged.

21 At the upper end of the lever two integral lugs, each fitted with a flanged bush, provide the attachment point for the cylinder of the shock absorber. The oil charging valve is

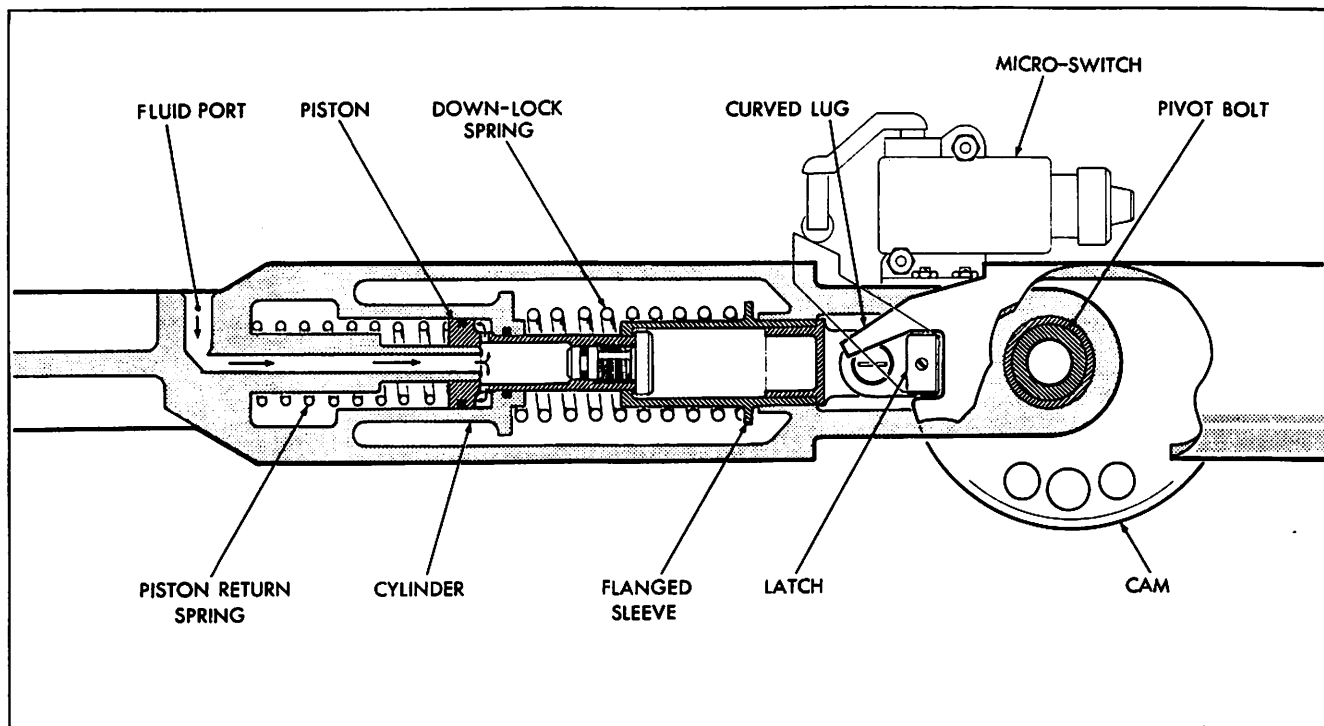
located at the rear of the shock absorber adjacent to the attachment point, see fig 12.

22 A micro-switch housed within the suspension lever is operated by deflection of the shock absorber when the weight of the aircraft is on the nose wheels. Actuation of the micro-switch ensures that hydraulic steering cannot be selected when the weight of the aircraft is removed from the nose wheels.

AXLE ASSEMBLY (Fig 1)

23 The lower end of the suspension lever accommodates an axle assembly mounted on two tapered roller bearings located in each end of the bore and abutting against a shoulder. The left-hand side of the shaft has a shoulder, the face of which abutts against the inner race of the left-hand bearing. The right-hand side carries the retaining nut which bears against

ARROW 1 SERVICE DATA



7M1-1724-1

FIG. 4 DRAG STRUT ASSEMBLY

the inner race of the right-hand bearing. Each bearing is sealed against the ingress of dust by a seal mounted in a seal holder and retained by a circlip. The retaining nut provides the adjustment for the axle end float. Involute serrations at each end of the axle accommodate a nose wheel which is retained by a wheel nut and cotter pin.

PNEUMATIC STRUT

24 The pneumatic strut is attached to a lug at the rear of the base of the rotating sleeve assembly and to two lugs at the bottom of the suspension lever. The strut ensures that the shock absorber is fully extended, before the nose landing gear is retracted, to allow correct stowage of the leg in the nose wheel bay and to permit closing of the nose wheel door. This is of particular importance in extremely low temperatures when the high viscosity of the fluid slows the extension of the shock absorber. The strut is charged with compressed nitrogen to an initial pressure of 1000 psi with the shock absorber fully extended. A charging point is located at the top of the strut. See fig 12.

DRAG STRUT ASSEMBLY (Fig 4)

25 The drag strut assembly consists of a top half and a bottom half joined together by a pivot bolt and a latch assembly. This arrangement provides a geometric down lock and also allows the strut to fold upwards during retraction of the landing gear. The latch assembly is unlocked hydraulically when the landing gear is selected up and is locked mechanically when the landing gear is extended.

26 The eye end of the top half of the strut houses a spherical bearing which is attached to a fitting in the nose wheel bay. The eye end of the bottom half also houses a spherical bearing and is attached to the arm at the top of the nose leg main casing. The lower eye end is threaded and provides adjustment for rigging the nose gear.

27 The two halves are joined by a pivot bolt passing through the fork end of the bottom half and a split flanged bush fitted in the eye end of the top half. The pivot bolt is locked against rotation by a roll pin located in a groove in the bolt head.

ARROW 1 SERVICE DATA

28 The top half of the strut houses the assembly for the hydraulic and mechanical operation of the latch. The bottom half of the strut has an integral cam on the underside of each fork. The latch engages a slot in each cam when the nose leg assembly is extended.

29 The hydraulic component within the body of the top half consists of a cylinder together with a moving piston and a flanged sleeve which is attached to the latch. Two springs are incorporated, one between the head of the piston and the body and the other between the flange on the sleeve and the underside of the cylinder.

30 During retraction, movement of the piston moves the sleeve to unlock the latch. As the latch moves, it bears against an integral curved lug which serves to break the geometric lock so that the strut folds upwards with the latch riding on the periphery of the cams. For description of the landing gear hydraulics see Arrow 1 Service Data - Section 6 - Landing Gear - Hydraulics.

31 When the landing gear is selected down and the drag strut begins to unfold, the latch rides on the cam until it reaches the slot. When this occurs the compression of the sleeve spring is released, the sleeve returns to its original position, and the latch snaps into the slot to lock the two halves of the drag strut together, forming the geometric down lock for the landing gear.

32 When the landing gear is locked down a hole in each half of the strut is aligned for the insertion of a ground lock pin. This hole is located adjacent to the pivot bolt.

33 A micro-switch mounted on the end of the lower half of the strut actuates the landing gear down indicator in the pilot's cabin to indicate that the nose landing gear is locked down. It is also connected with the main landing gear switches to actuate the light in the selector lever.

NOSE LANDING GEAR UP-LOCK (Fig 5)

34 The nose landing gear up-lock is mounted on the nose wheel bay central bulkhead and

engages with the adjustable roller on the nose leg when the landing gear is retracted. The roller is engaged and locked mechanically and is disengaged hydraulically when the nose wheel door reaches the first blow-back lock position. See para 38.

35 The up-lock body houses a coil spring and a hydraulic release jack. A latch assembly is pivoted between the two forks on the lower section of the body. The coil spring tension and hydraulic jack movement is transmitted to the latch by an adjustable rod. Adjustment of the rod positions the latch for full engagement. A cam lever is pivoted on the same shaft as the latch. This lever is actuated by the leg roller and transmits movement to a sequence

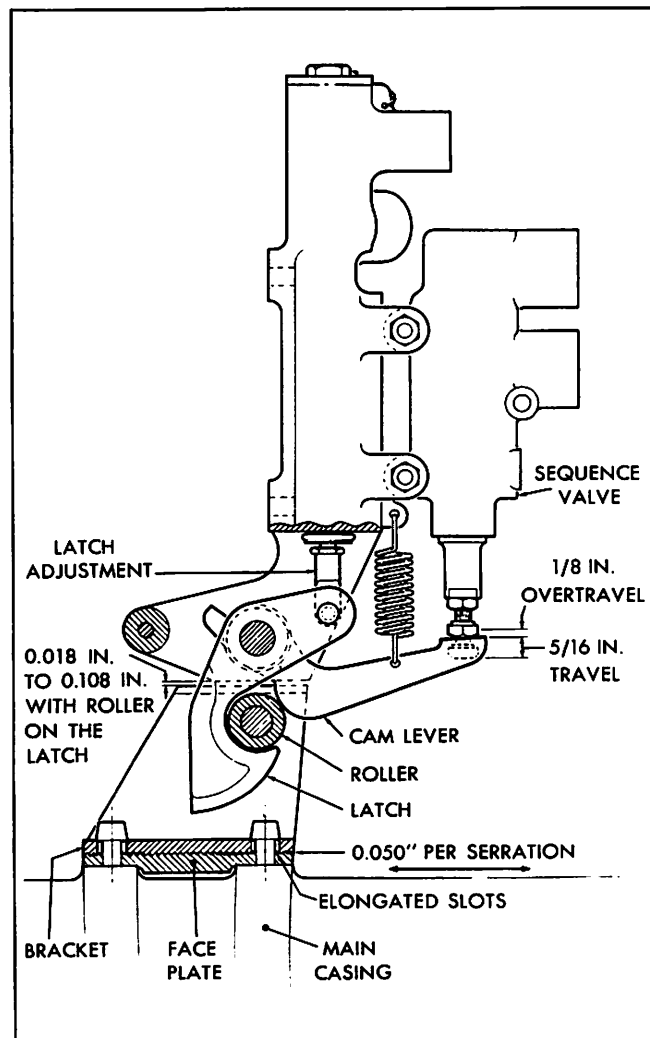


FIG. 5 NOSE LANDING GEAR UP-LOCK

ARROW 1 SERVICE DATA

valve bolted to the rear of the up-lock body. The sequence valve directs hydraulic fluid to the nose wheel door jack when the landing gear is in the retracted position.

NOSE LEG FAIRING

36 The leg fairing is located behind the nose leg assembly. It is attached to the aircraft structure at the rear of the nose wheel bay by a piano hinge and to the nose leg main casing by two adjustable rods. The adjustable rods are provided to ensure a smooth contour on the underside of the fuselage when the nose landing gear is retracted.

NOSE WHEEL DOOR (Fig 6)

37 The nose wheel door together with the leg fairing complete the contour on the underside of the fuselage when the landing gear is retracted. The nose wheel door is hinged to the right-hand side of the forward part of the nose wheel bay by a piano hinge. The door is operated by a hydraulic jack mounted in the nose wheel bay and connected to a bracket on the door.

38 Adjacent to the jack is a sequence valve and operating mechanism. This consists of a telescopic rod which is connected by linkage to the sequence valve mounted on a strut behind the door jack. The sequence valve supplies hydraulic pressure to release the nose leg up-lock when the nose wheel door has reached the first blow-back lock position during landing gear extension.

39 Two rollers on the LH side of the door engage with two locking latches located on the lower LH longeron in the nose wheel bay. Two adjustable rods connect the two latches to a spring-loaded hydraulic release jack. The spring tension holds the latches in the locked position when the hydraulic jack is open to return. On a landing gear down selection, hydraulic pressure is supplied to the jack, the spring is compressed and the latches are released. When the landing gear is retracted the nose wheel door is locked up by the two door rollers snapping into engagement with the latches against the loading of the spring. The latches pivot on eccentric bushes which allow adjustment of the latch position.

NOSE WHEEL STEERING - GENERAL

40 The nose wheel steering is a cable controlled and hydraulically powered system. The system is activated electrically by a push-button on the control column which energizes a hydraulic steering selector valve. The steering mechanism caters for any intermediate degree of turning required between the central position of the nose wheel and its maximum range of movement of 55° in either direction.

41 The angle to which the nose wheel is turned, when the weight of the aircraft is on the nose wheel and the hydraulic power is selected, is dependent upon the amount of movement applied to the rudder control.

42 A micro-switch located inside the suspension lever isolates the nose wheel steering selector valve when the weight of the aircraft is off the nose wheel. When the nose landing gear is fully retracted a disconnect assembly prevents the steering cables from actuating the control valve.

43 For description of nose wheel steering hydraulic components and electrical circuits see Arrow 1 Service Data - Section 8 - Nose Wheel Steering - Hydraulics, and Section 9 - Landing Gear - Electrics, respectively.

44 The nose wheel steering mechanism consists of the following components:

- (a) A quadrant attached to the base of the rudder bar torque tube below the rudder control quadrant.
- (b) A disconnect assembly mounted on the navigator's forward bulkhead.
- (c) A follow-up pulley located on the front face of the nose leg and supported by the steering cables.
- (d) A hydraulic steering jack and control valve.
- (e) A steering bellcrank which transmits the movement of the jack to the nose wheels through the upper and lower steering links.

ARROW 1 SERVICE DATA

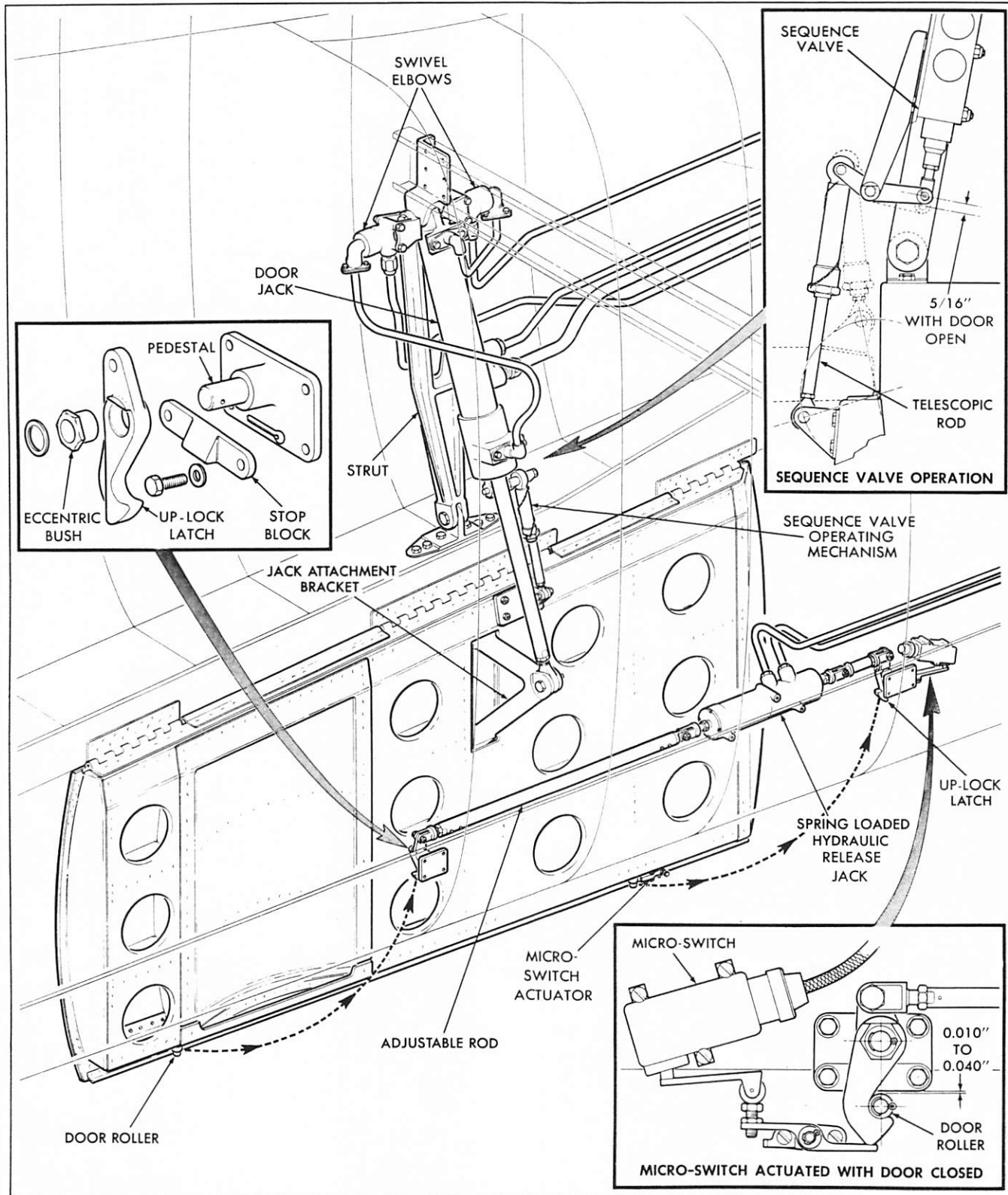


FIG. 6 NOSE WHEEL DOOR

ARROW 1 SERVICE DATA

45 The quadrant at the base of the rudder bar accommodates two cables which pass over pulleys and through fairleads to the two inner pulleys of the disconnect assembly.

DISCONNECT ASSEMBLY (Figs 7 and 9)

46 The disconnect assembly consists of a bracket with four pulleys mounted on a common shaft. The pulleys are linked together in pairs. Each pair consists of an inner and outer pulley which are coupled together by a drive pin secured to the outer pulley. One end of each drive pin is located in a groove in the outboard face of its mating inner pulley while the other end accommodates the loop end of a clock type spring. The spring is wound around the shaft with its opposite end secured to the shaft.

47 A gear secured to the inboard face of each inner pulley meshes with a gear pinion mounted on bearings and housed in the bracket. Movement of the cables from the quadrant rotates the respective inner pulley with the corresponding inner pulley being rotated in the opposite direction through the gear pinion. Each outer pulley of the assembly is connected by a cable to the steering mechanism on the front of the nose leg. An arm is secured to each end of the pulley shaft. One end of the arm is forked and engages with the nose leg main casing tie-rod. A bolt attached to the other end of the arm acts as a follower and guard for the cables of the outer pulleys when the nose landing gear is retracting.

NOSE WHEEL STEERING CABLES

48 The cable from the disconnect assembly right-hand outer pulley is connected to the follow-up pulley. A shorter cable from this pulley is connected to the upper end of a follow-up bow which is integral with the steering jack piston and moves with it. The left-hand cable is connected to the lower end of the follow-up bow after passing around a single pulley, secured to the bracket on the steering jack upper attachment point, and the follow-up pulley. See fig 8. The follow-up pulley is supported entirely by the cables. To its fulcrum is attached a short link arm which is connected by an adjustable rod to the steering control valve. This follow-up arrangement returns

the control valve to neutral when the required degree of nose wheel steering has been obtained.

NOSE WHEEL STEERING LINKS (Fig 10)

49 The bellcrank, which pivots on a journal on the nose leg, is connected to the piston rod of the hydraulic steering jack by a short link arm and also to the upper steering link. A ball joint connects the upper and lower steering links and the lower link is connected to the suspension lever. See para 15-16.

NOSE WHEEL STEERING OPERATION

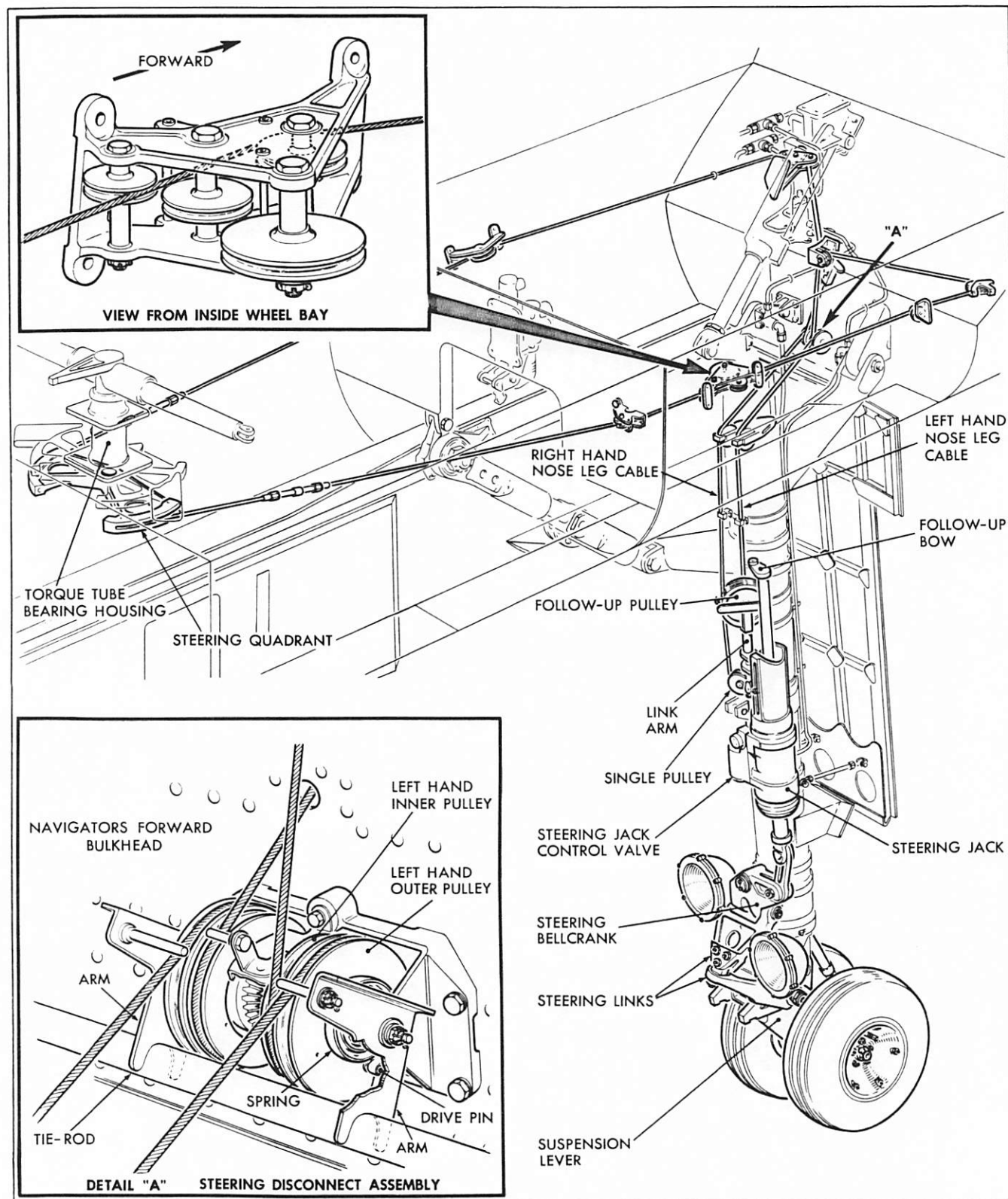
50 Nose wheel steering can be employed by depressing the selector button on the stick grip when the weight of the aircraft is on the nose wheel providing hydraulic power is available. When the weight of the aircraft is off the nose wheel, extension of the shock absorber actuates the micro-switch housed within the suspension lever. This isolates the solenoid operated selector valve and hydraulic pressure cannot be supplied to the control valve and steering jack.

51 When the steering power is not selected a clutch within the control valve is disengaged. This permits the nose wheel to castor when the aircraft is being towed. Should the position of the nose wheel be out of alignment with that of the rudder control when nose wheel steering is selected, the rudder control will have to be operated until alignment occurs. The clutch will then automatically engage, and nose wheel steering can be employed.

52 When the nose landing gear is retracted the steering cables tend to slacken. This relieves the loading on the quick disconnect springs and rotates the outer pulleys. The drive pins then take up an approximate mid-position in the grooves of the inner pulley as shown in fig 9, with both sets of cables retaining their tension.

53 Movement of the rudder control in flight will operate the inner pulleys in opposite directions to each other through the gear pinion. As the drive pins are mid-way along the grooves, movement is prevented from being

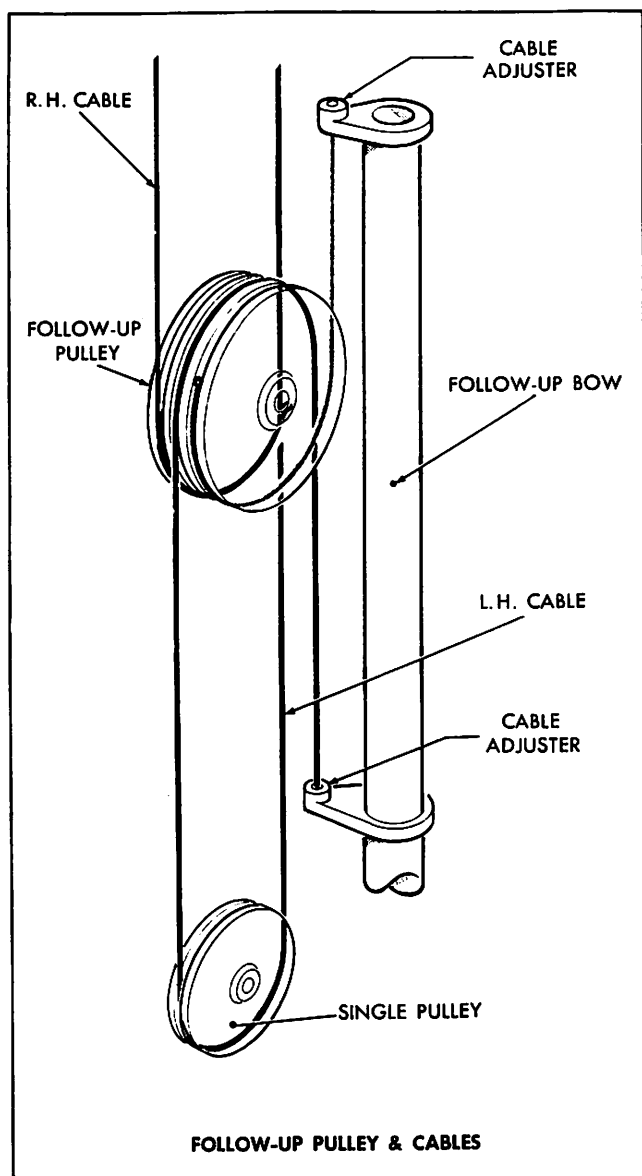
ARROW 1 SERVICE DATA



7M1-2402-3

FIG. 7 NOSE WHEEL STEERING - COMPONENT LAYOUT

ARROW 1 SERVICE DATA



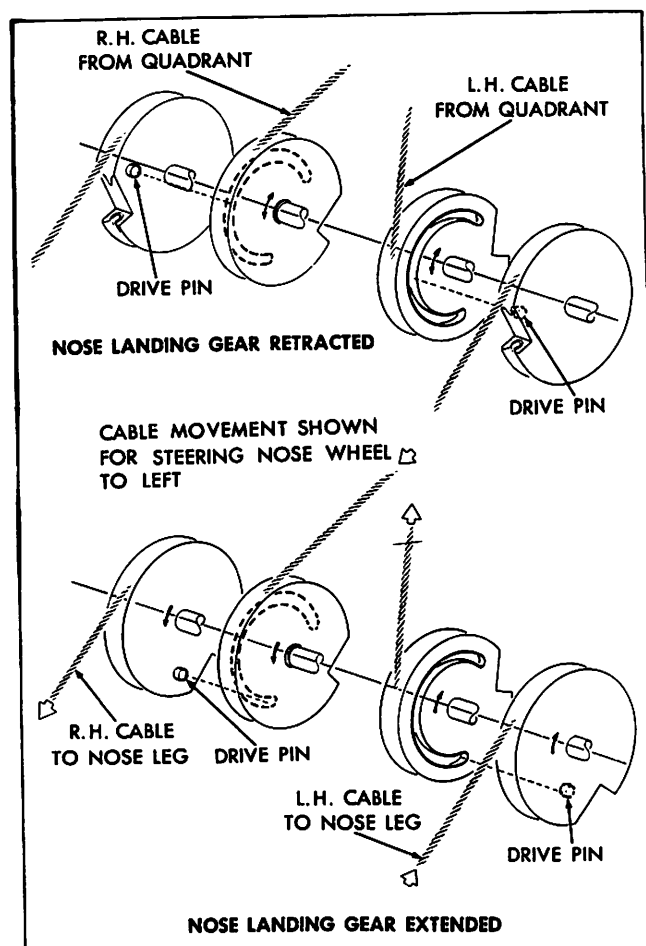
7MI-1725-2

FIG. 8 FOLLOW-UP PULLEYS AND CABLES

transmitted to the outer pulleys to operate the nose leg cables.

54 As the nose landing gear is extended the nose leg cables increase the loading of the springs causing the outer pulleys to rotate until the drive pins contact the end of the grooves in the inner pulleys. The inner and outer pulleys will now be in the position shown in fig 9. Any movement of the rudder control will be transmitted through the disconnect assembly to the nose leg cables.

55 When the pilot desires to turn in a LH direction, he pushes the left-hand rudder pedal forward to the desired degree. This turns the steering quadrant in the same direction and rotates the left-hand inner pulley of the disconnect assembly. Movement of the inner pulley is transmitted to its outer pulley by the drive pin being in contact with the end of the groove. The outer pulley movement is transmitted to the left-hand cable connected to the lower end of the follow-up bow through the single pulley and the follow-up pulley. This moves the follow-up pulley downward and operates the control valve through the linkage. Simultaneously with the above action, the left-hand inner pulley rotates the right-hand inner pulley in the opposite direction through the gear pinion and compensates the RH cable for movement in the opposite direction.



7MI-1721-2

FIG. 9 OPERATION OF DISCONNECT ASSEMBLY

ARROW 1 SERVICE DATA

56 The control valve supplies hydraulic pressure to the steering jack and the piston commences to move, upwards in this case, transmitting movement to the upper steering link through the bellcrank pivoting about the journal on the nose leg. The upper steering link tilts to the left causing the ball joint between the links to swing, taking the path of an arc. As the lower steering link is attached to the suspension lever and the rotating sleeve, these units rotate, causing the axle and the nose wheels to turn to the left. Movement of the control valve selects the steering jack and follow-up bow in an opposite direction to the valve. The follow-up pulley progressively returns the control valve to neutral, when the required degree of steering is obtained.

ADJUSTING, TESTING AND SERVICING

NOSE LEG

57 The nose leg is adjusted so that its centre line is inclined rearwards at an angle of $93^{\circ} 36' \pm 7'$ to the fuselage datum line. To obtain this setting proceed as follows:

(a) Position the aircraft jacks, fit the jacking pads to the aircraft and raise the aircraft until the wheels are clear of the ground. For the aircraft jacking procedure see Arrow 1 Service Data - Section 1 - General Information.

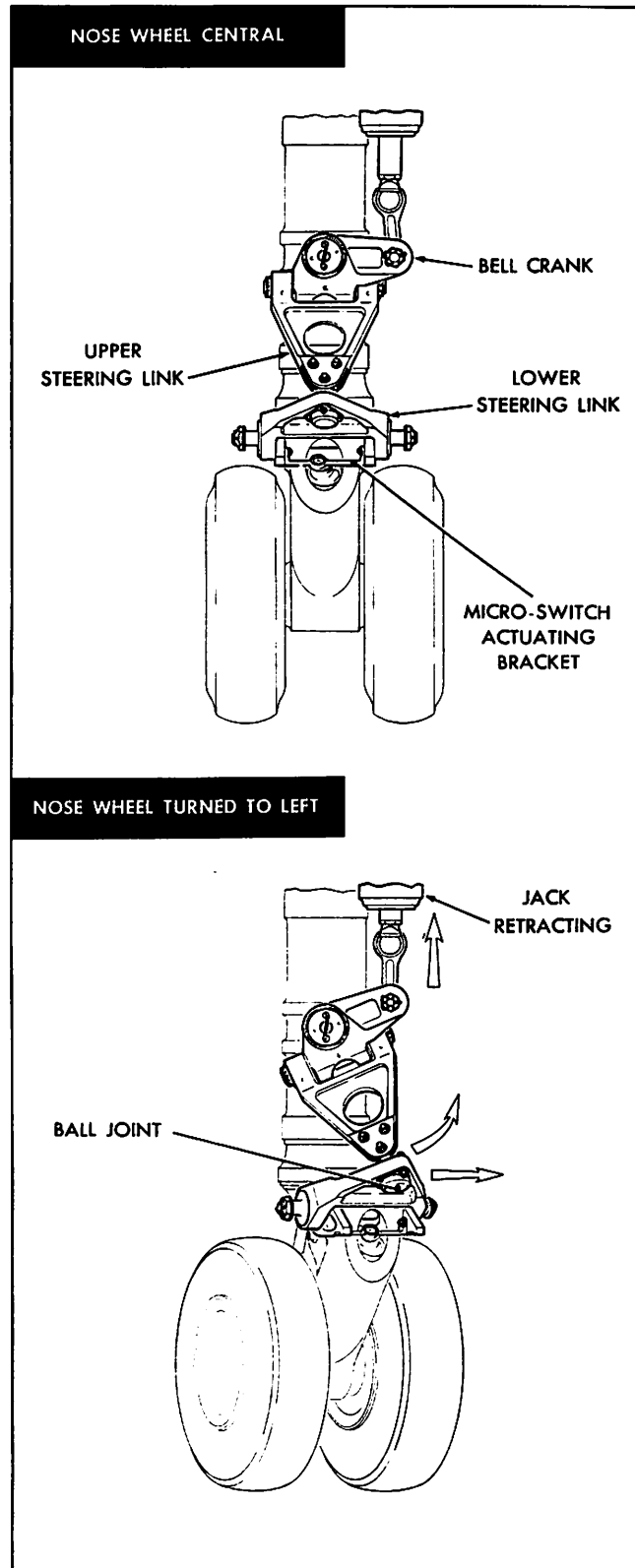
NOTE

Due to the height to which the main jacks would have to be raised, it is impracticable to raise the aircraft so that the fuselage datum line is horizontal.

(b) Place the alignment fixture in position in the nose wheel bay. The fixture is positioned on two drums at the two nose leg pick up points and also on a shaft inserted in the hollow drag strut upper attachment point.

(c) Place the inclinometer on the lateral mounts of the fixture. Adjust the main jacks until the aircraft is laterally level.

(d) Place the inclinometer on the longitudinal mounts of the fixture and note the angle of the aircraft to the fuselage datum line. As the attitude of the aircraft is nose up, the inclinometer will read between 4° and 5° .



7M1-1722-2

FIG.10 OPERATION OF STEERING LINKS

ARROW 1 SERVICE DATA

(e) Place the inclinometer on the centre line of the rear face of the nose leg in an unobstructed part and note the reading on the instrument.

(f) The sum of these two readings should be $93^{\circ} 29'$ - $93^{\circ} 43'$. If not, the angle of the nose leg must be corrected by adjusting the drag strut as follows:

(1) Slacken the locknut at the lower end of the drag strut.

(2) Disconnect the strut from the leg and by trial and error adjust the eye-end until the correct angle is obtained.

(3) Reconnect the drag strut to the leg and lock the eye-end locknut.

(4) Any adjustment of the drag strut will alter the position of the retraction jack piston. Check the jack for correct over-travel, and adjust if necessary. See para 58.

(g) Lower the aircraft to the ground and remove the jacking pads from the aircraft.

(h) Remove the alignment fixture from the nose leg.

NOSE GEAR RETRACTION JACK ADJUSTMENT

58 To adjust the length of the retraction jack proceed as follows:

(a) Jack the aircraft until all wheels are clear of the ground.

(b) Disconnect the leg fairing from the nose leg.

(c) Disconnect the lower end of the jack and secure the jack in a position where the piston rod can retract without fouling any part of the aircraft.

(d) Retract the jack by selecting the landing gear UP.

(e) Place a strip of adhesive tape around the jack rod so that the edge of the tape touches the jack body.

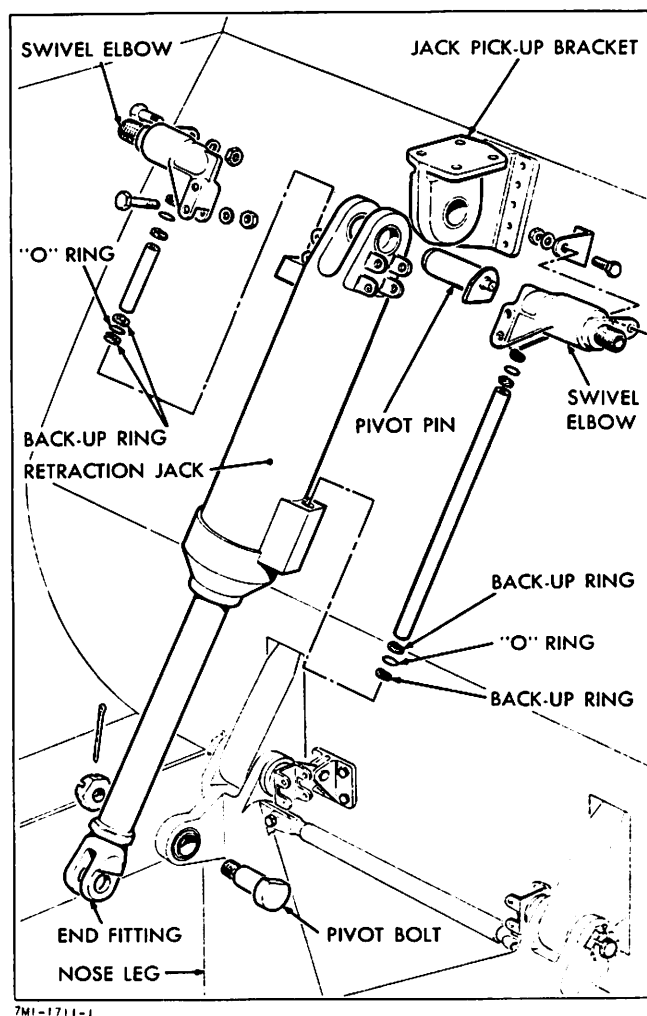
(f) Fully extend the jack by selecting the landing gear down and applying tension to the jack rod.

(g) Place another piece of adhesive tape around the jack rod so that the edge of the tape is 0.12 inch from the jack body.

(h) Partially retract the jack until the edge of this tape just touches the jack body.

(j) Slacken the locknut at the eye-end of the piston rod and, ensuring that the leg is locked down, align the eye-end with the bearing in the leg pick-up point.

(k) Fit the pivot bolt and ensure that the position of the jack has not altered.



7M1-1711-1

FIG. 11 NOSE GEAR JACK REMOVAL

ARROW 1 SERVICE DATA

(m) Remove the upper piece of adhesive tape and retract the landing gear.

(n) When it is locked up, check by means of the piece of adhesive tape that there is at least 0.12 inch over-travel remaining on the piston rod of the jack.

(p) Function the landing gear up and down to expel any air from the jack.

(q) Extend the landing gear and fit ground locks to the legs.

(r) Lower the aircraft to the ground and remove the jacking pads from the aircraft.

NOSE GEAR UP-LOCK ADJUSTMENT (Fig 5)

59 To check the engagement of the up-lock, jack the aircraft until the wheels are clear of the ground, disconnect the leg fairing from the nose leg, then proceed as follows:

(a) Retract the landing gear and check the up-lock roller for correct engagement in the latch. The roller should be directly beneath the latch pivot pin and fully engaged in the latch as shown in fig 5.

(b) If necessary, adjust the position of the roller on the leg by the serrations provided on the roller assembly.

(c) With the roller on the latch, check that there is 0.108 - 0.018 inch clearance between the striker plate on the leg and the stop face of the up-lock.

(d) Extend the landing gear and fit the ground locks to the legs.

(e) Connect the leg fairing then lower the aircraft to the ground and remove the jacking pads from the aircraft.

NOSE GEAR UP-LOCK SEQUENCE VALVE (Fig 5)

60 The operation of the nose gear up-lock sequence valve may be checked simultaneously with the up-lock adjustment. To check the sequence valve, jack the aircraft until the wheels are clear of the ground, remove the leg fairing, then proceed as follows:

(a) With the landing gear extended, measure the extension of the plunger from the valve body and check that the total stroke is 0.44 - 0.46 inch.

(b) Fully retract the landing gear and re-check the plunger extension. The plunger should be depressed a minimum of 5/16 inch.

(c) If necessary, adjust the dome headed bolt by screwing it in or out until the correct travel is obtained.

(d) Extend the landing gear and fit the ground locks to the legs.

(e) Connect the leg fairing then lower the aircraft to the ground and remove the jacking pads from the aircraft.

NOSE LEG FAIRING INSTALLATION

61 To adjust the fairing during its installation, jack the aircraft until the wheels are clear of the ground, disconnect the nose wheel door jack from the door and secure it in a position where the jack rod can extend and retract without fouling, then proceed as follows:

(a) Attach the fairing to the aircraft structure by aligning the hinges and inserting the hinge pin.

(b) Attach the two adjustable rods to the fairing attachment brackets and the leg attachments.

(c) Slacken the rod locknuts and extend the rods to their maximum length.

(d) Fully retract the landing gear.

(e) Adjust the rod until the fairing is positioned with its skin flush with the fuselage skin.

(f) Check the fairing for the correct skin gap. If necessary, trim the fairing to obtain a clearance of 0.050 - 0.100 inch.

(g) Extend the landing gear and fit the ground locks to the legs.

(h) Check the rod ends for safety and lock by tightening the locknuts.

(j) Connect the nose wheel door jack to the door.

ARROW 1 SERVICE DATA

(k) Lower the aircraft to the ground and remove the jacking pads.

NOSE WHEEL DOOR INSTALLATION (Fig 6)

62 To install the nose wheel door, jack the aircraft until the wheels are clear of the ground then proceed as follows:

- (a) Fit the ground lock pin in the drag strut.
- (b) Disconnect the nose gear retraction jack and secure it in a position where the piston rod can retract without fouling any part of the aircraft.
- (c) Attach the door to the aircraft structure by its hinge.
- (d) Select UP on the landing gear selector and retract the door jack by actuating the up-lock sequence valve.
- (e) Place a strip of adhesive tape around the jack rod so that its edge just touches the jack body.
- (f) Extend the jack by selecting DN and attach the jack rod end to the door bracket.
- (g) Attach the sequence valve operating mechanism to the door.
- (h) Retract the door by selecting UP on the landing gear selector and check the alignment of the door with the fuselage skin.
- (j) If necessary, adjust the alignment by repositioning the eccentric bushes of the door locking latches.
- (k) Check the door for correct skin gap. If necessary, trim the door to obtain a clearance of 0.050 - 0.100 inch.
- (m) Check the clearance between the stop block and the door roller. See fig 6. This should be 0.010 - 0.040 inch.
- (n) With the door retracted check by means of the adhesive tape that there is a minimum of 0.120 inch of over-travel remaining on the piston rod of the jack. Adjust on the jack rod end fitting to obtain this.

(p) Check the sequence valve for correct operation as detailed in para 63.

(q) Connect the nose gear retraction jack and carry out a functional test of the nose landing gear.

(r) Extend the landing gear and fit ground locks to the legs.

(s) Lower the aircraft to the ground and remove the jacking pads from the aircraft.

NOSE WHEEL DOOR SEQUENCE VALVE INSTALLATION (Fig 6)

63 To install and check the operation of the nose wheel door sequence valve, jack the aircraft until the wheels are clear of the ground, then proceed as follows:

- (a) Fit the ground lock pin in the drag strut.
- (b) Disconnect the nose gear retraction jack and secure it in a position where the piston rod can retract without fouling any part of the aircraft.
- (c) Secure the sequence valve to the strut and connect the two hydraulic unions.
- (d) Slacken the sequence valve plunger locknut and screw in the threaded eye-end to its full extent.
- (e) Measure and record the extension of the sequence valve plunger. Check that the total travel of the plunger is 0.44 - 0.46 inch.
- (f) Select UP on the landing gear selector and retract the door by actuating the up-lock sequence valve.
- (g) Connect the sequence valve operating mechanism.
- (h) Select the landing gear down to fully open the door. Measure the sequence valve plunger extension. Adjust the threaded eye-end of the plunger until the extension is 5/16 inch less than in (e).
- (j) Tighten the locknut on the sequence valve plunger.

ARROW 1 SERVICE DATA

(k) With the landing gear extended, fit the ground locks to the legs.

(m) Connect the nose gear retraction jack then lower the aircraft to the ground and remove the jacking pads and jacks from the aircraft.

SHOCK ABSORBER CHARGING

64 To charge the liquid spring shock absorber proceed as follows:

(a) Jack the aircraft until the wheels are clear of the ground.

(b) Determine the ambient temperature then verify the correct charging pressure from the temperature/pressure chart located on the leg.

(c) Connect the pressure gun to the oil charging valve and operate the gun until the correct pressure is obtained.

(d) Remove the gun and fit the protective cap.

(e) Lower the aircraft to the ground and remove the jacking pads from the aircraft.

SHOCK ABSORBER REMOVAL (Fig 12)

65 To remove the shock absorber proceed as follows:

(a) Jack the aircraft until the wheels are clear of the ground.

(b) Release the nitrogen pressure from the pneumatic strut by depressing the valve core.

(c) Remove the strut upper and lower attachment bolts and detach the strut.

(d) Disconnect the lower steering link attachment pivot from the suspension lever as follows. See Detail A of fig 12.

(1) Unscrew one of the nuts securing the rod. Withdraw the rod and the two towing spools.

(2) Remove the taxiing light bracket.

(3) Support the lower steering link and drive out the pivot shaft from the right-hand side. Remove and retain the locating pin from the fork of the rotating sleeve.

(4) Secure the steering link clear of the suspension lever.

(e) Supporting the suspension lever, remove the bolt securing the shock absorber to the suspension lever.

(f) Remove the rotating sleeve from the main casing as follows:

(1) Remove the two circlips and lock pins from the lower bearing.

(2) Support the suspension lever and unscrew the lower bearing.

(3) Withdraw the rotating sleeve and shock absorber from the main casing.

(g) Remove the bolt securing the shock absorber to the rotating sleeve and withdraw the shock absorber.

SHOCK ABSORBER BLEEDING

66 To bleed the shock absorber proceed as follows:

(a) Pressurize the shock absorber with the pressure gun and open the bleed screw.

(b) Continue charging the unit until air-free fluid is flowing from the bleed aperture.

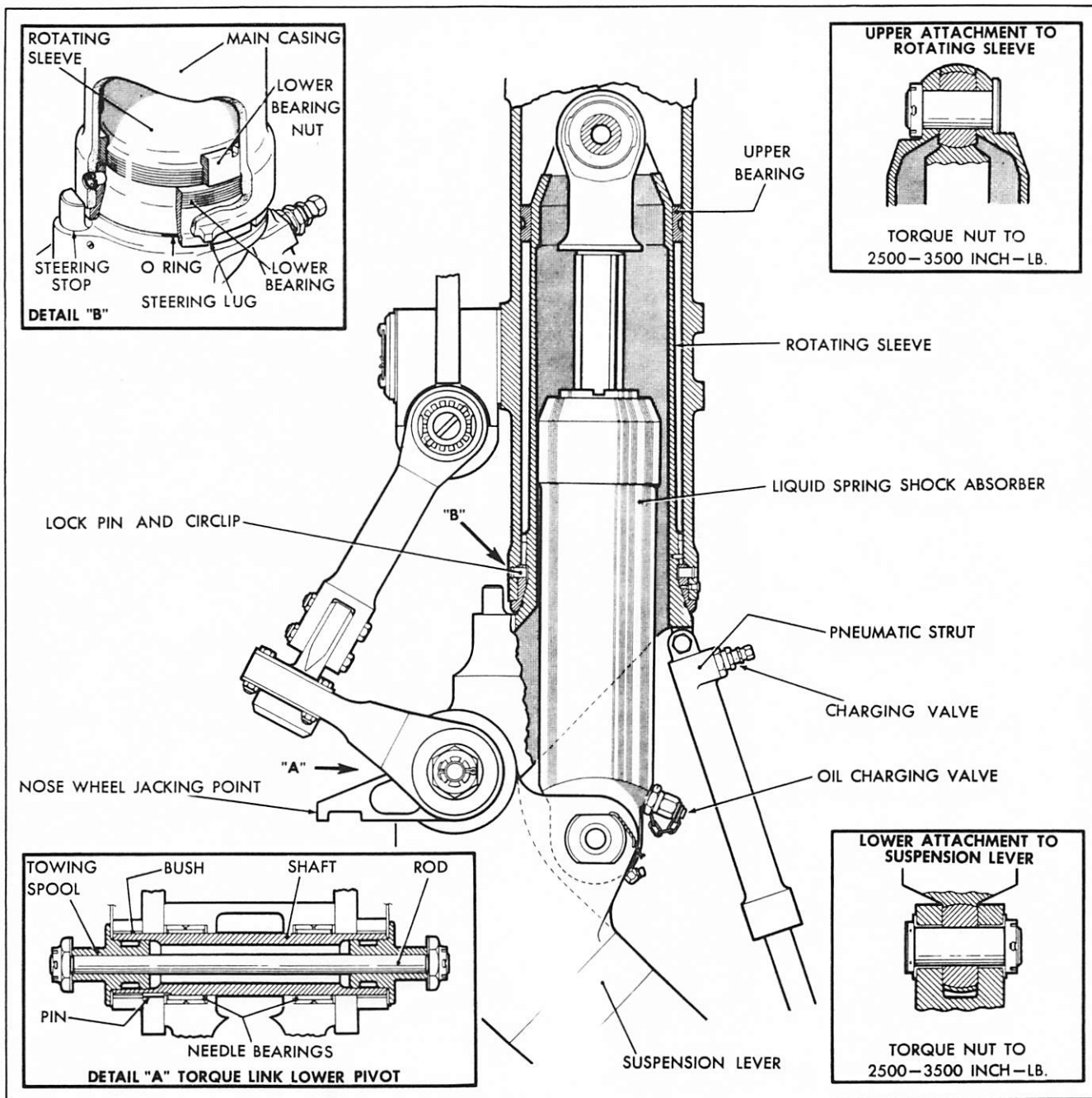
(c) Close the bleed screw whilst the air-free fluid is still flowing.

(d) Continue charging the unit until the correct pressure is reached.

PNEUMATIC STRUT CHARGING

67 The pneumatic strut can be charged with the weight of the aircraft on the nose leg. To charge the strut proceed as follows:

ARROW 1 SERVICE DATA



7MI-1728-2

FIG. 12 SHOCK ABSORBER INSTALLATION

(a) Determine the correct charging pressure for the strut corresponding to the leg extension. This is obtained from the chart at the top of the suspension lever.

(b) Connect the nitrogen line from the charging trailer to the charging valve on the strut and charge to the pressure indicated on the chart.

(c) Disconnect the nitrogen line and fit the dust cap to the charging valve.

NOSE WHEEL STEERING

68 To rig the nose wheel steering mechanical controls the following preparations must be made:

ARROW 1 SERVICE DATA

(a) Position the aircraft jacks, fit the jacking pads and raise the aircraft until the wheels are clear of the ground. See Arrow 1 Service Data - Section 1 - General Information.

(b) Remove the bracket between the fork ends of the nose leg rotating sleeve to actuate the micro-switch housed within the suspension lever. See fig 10.

(c) Disconnect the adjustable link arm attached to the steering control valve spindle.

(d) Disconnect the nose gear door jack from the bracket on the door and secure it in a position where the piston rod can retract and extend without fouling any part of the aircraft.

(e) Disconnect the two adjustable rods of the nose leg fairing from their leg attachments.

(f) Slacken the turnbuckles of the cables between the steering quadrant and the disconnect assembly. See fig 7.

(g) Unscrew the cable adjusters to slacken the cables between the disconnect assembly and the follow-up bow. See fig 8.

(h) Connect the external AC electrical supply and select the MASTER ELEC switch to ON.

(j) Connect the hydraulic test machine to the utility hydraulics ground test connections and select mode 2 on the test machine panel.

69 When these preparations have been made the nose wheel steering controls are rigged as follows:

(a) Centralize the rudder bar and insert the rigging pin in the travel limit arm.

(b) Remove the cover from the steering disconnect assembly and insert the rigging pin through the four pulleys.

(c) Tension the cables between the steering quadrant and the disconnect assembly to 40 lb. Wirelock the turnbuckles.

(d) Check that the steering jack is in the neutral position by ensuring that the mid-point

of the slot in the jack casting extension coincides with the centre of the bolt adjacent to the lower follow-up bow. The jack is spring-loaded to the neutral position and should take up this position.

NOTE

Lines will be etched at these two points in later issues of the steering jack.

(e) Visually check the fore-and-aft alignment of the nose wheels with the centre line of the aircraft. If necessary, adjust the fork end at the steering jack rod lower end to obtain this alignment.

(f) Tension the cables between the disconnect assembly and the follow-up bow to 15 lb, ensuring that the jack rod remains stationary. Check that the cable adjusters are engaged in their self-locking devices in the follow-up bow.

(g) Using the hydraulic test machine trailer, regulate the hydraulic pressure to the utility hydraulics power circuit to 1200 psi.

(h) Slowly move the control valve spindle up and down about the central position until the clutch engages. Check the alignment of the adjustable link arm, attached to the follow-up pulley, with the fork end of the control valve spindle. If necessary, adjust the link arm to obtain alignment.

NOTE

Do not move the spindle after the clutch has engaged.

(j) Verify that the steering jack, control valve and the nose wheels are still in the neutral position and then remove the rigging pins from the rudder bar travel limit arm and the disconnect assembly.

(k) Increase the hydraulic pressure on the hydraulic test machine trailer, to 4000 psi.

(m) Depress the steering button on the stick grip of the control column then slowly move the LH rudder pedal forward. Check that the nose wheels turn to the left and that the steering

ARROW 1 SERVICE DATA

stop on the rotating sleeve contacts the steering stop lug on the nose leg main casing. Verify that there is at least 0.25 inch clearance between the follow-up pulley and the cable adjuster on the lower part of the follow-up bow.

(n) With the steering button depressed, slowly return the rudder bar to neutral, then slowly move the RH rudder pedal forward. Check that the nose wheels turn to the right and that the steering stop contacts the lug on the main casing. Verify that there is at least 0.25 inch clearance between the follow-up pulley and the cable adjuster on the upper part of the follow-up bow.

(p) Slowly return the rudder bar to neutral.

(q) If lost motion exists between the rudder pedals and the control valve spindle when the nose wheel steering is selected, increase the tension of the cables between the disconnect assembly and the follow-up bows. If this adjustment is made, repeat operations (j) to (p) inclusive.

(r) With the steering button depressed, move the LH rudder pedal forward to its full travel and check that the wheel deflection is 55° .

Remove the foot from the pedal and check that the rudder bar returns to neutral unassisted.

(s) Repeat the check with the RH rudder pedal.

(t) Replace the bracket between the fork of the nose leg rotating sleeve. Check the function of the micro-switch within the suspension lever by depressing the steering button and moving the rudder pedals to their full travel in both directions. There should be no movement of the wheels.

(u) Retract the landing gear and check that the cable tensions have been maintained.

(v) Operate the rudder pedals in both directions and check that there is no movement of the cables between the disconnect assembly and the control valve spindle.

(w) Extend the landing gear and connect the door jack to the door and the leg fairing to the nose leg.

(x) Replace the cover of the steering disconnect assembly.

(y) Lower the aircraft to the ground, remove the jacking pads and jacks.

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM NOSE LANDING GEAR		SUB-SYSTEM		COMPONENT Nose Leg		REF. NO. 91	
AVRO PART NO. 7-4291-1		MANUFACTURER Jarry Hydraulics		MAN'FR'S PART NO. 1500		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION Nose landing gear.							
LOCATION Navigators bulkhead, station 215.							
ACCESS Accessible in the nose wheel bay.						MEN X MINUTES	
REPLACEMENT PROCEDURE Secure the landing gear in the ground handling rig. Position the leg and fit the two pivot pins. Install the drag strut and adjust the leg to rigging position. Assemble the swivel elbows and connect nosewheel steering hydraulic lines. Connect the dog leg swivel to the drag strut. Connect the nosewheel steering cables and electrical cables. Adjust and connect up the retraction jack. Connect the leg fairing. Function test the landing gear and adjust the up-lock roller and leg fairing.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check leg and attachments for security, cleanliness, damage, leaks and corrosion. Check all pivot pins and bearings for wear. Lubricate according to lubrication chart.	MEN X MINUTES	
FUNCTIONAL CHECKS Retraction Test.		
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic ground test rig. Nose leg ground handling rig. Electrical ground power unit. B4 stand. - Mobile dolly 4G 1596. Aircraft jacks.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM NOSE LANDING GEAR		SUB-SYSTEM		COMPONENT Nose Leg Fairing		REF. NO. 91	
AVRO PART NO. 7-1052-7		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To enclose the nose landing gear when retracted.							
LOCATION Attached to the nose leg and wheel bay rear skin.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Secure fairing to the aircraft skin with a wire hinge. Connect the two adjustable rods. Carry out nose leg functional test, and check fairing for flush fitting. Adjust the two adjustable rods to obtain flush fit.						MEN X MINUTES	

CONFIDENTIAL
UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for damage, distortion and loose rivets. Check hinge and adjustable rods for wear and security.	MEN X MINUTES	
FUNCTIONAL CHECKS Retraction Test.		
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic ground test rig. Aircraft jacks. Electrical ground power unit. B4 stand - 4G/1596.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED
CONFIDENTIALARROW 1 SERVICE DATA
COMPONENT DATA SHEET

SYSTEM NOSE LANDING GEAR		SUB-SYSTEM		COMPONENT Drag Strut		REF. NO. 91	
AVRO PART NO. 7-4291-3		MANUFACTURER Jarry Hydraulics		MAN'FR'S PART NO. 1510		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION Braces the nose landing gear for fore and aft loads. Provides the nose landing gear down lock.							
LOCATION Fitted to the nose landing gear and the structure at station 177.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Assemble the drag strut to the leg and structure fittings. Connect the dog leg swivel and micro-switch to the strut. Adjust the strut to obtain the correct nose landing gear rigged position. Carry out complete functional test of the nose landing gear.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, cracks, corrosion and leaks. Check bearings and downlock for wear. Lubrication - ensure latch is thoroughly greased, particularly in cold weather.	MEN X MINUTES	
FUNCTIONAL CHECKS Retraction Test.	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic ground test rig. Electrical ground power unit. B4 stand. Nose leg ground handling rig. Aircraft jacks.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM NOSE LANDING GEAR		SUB-SYSTEM		COMPONENT Shock Absorber		REF. NO. 91	
AVRO PART NO. 7-4291-2		MANUFACTURER Dowty Canada Ltd.		MAN'FR'S PART NO. XT 3105-2		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To absorb landing loads.							
LOCATION Inside the nose leg lower section.							
ACCESS Dismantle lower section of nose leg.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect the shock absorber piston rod to the rotating sleeve. Install the sleeve in the leg. Connect the suspension lever and torque links to the rotating sleeve. Connect the shock absorber cylinder to the suspension lever. Fit the pneumatic strut and charge with compressed nitrogen. Carry out functional test.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for correct extension. Charge with Silicone Oil to Spec Dowcan 200. Lubricate according to lubrication chart.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Aircraft jacks.		
SPECIAL TOOLS TO REMOVE OR SERVICE Fluid charging gun.		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM NOSE LANDING GEAR		SUB-SYSTEM		COMPONENT Nose Wheel		REF. NO. 91	
AVRO PART NO. 7-4291-4		MANUFACTURER Dunlop		MAN'FR'S PART NO. AHM 50548		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		pending	
FUNCTION To facilitate motion.							
LOCATION Nose landing gear.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the wheel on the axle serrations. Assemble the washer and axle nut. Tighten the nut and lock with cotter pin. Check tire pressure. Lower wheel to the ground.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check tires for condition, pressure (170 psi) and creep. Remove wheels, clean and inspect for cracks and corrosion. Lubricate according to the lubrication chart.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Aircraft axle jack. Air/nitrogen charging trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE Tire pressure gauge.		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM NOSE LANDING GEAR		SUB-SYSTEM		COMPONENT Pneumatic Strut	REF. NO. 91
AVRO PART NO.	MANUFACTURER Jarry Hydraulics	MAN'FR'S PART NO. 1650		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To fully extend the shock absorber during landing gear retraction					
LOCATION Fitted between suspension lever and nose leg.					
ACCESS Unobstructed.					MEN X MINUTES
REPLACEMENT PROCEDURE Assemble the strut to the lower leg and suspension lever. Inflate the strut with compressed nitrogen.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check for correct pressure. Inspect for security, damage, cracks and leaks.	MEN X MINUTES	
FUNCTIONAL CHECKS Retraction Test.	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT High pressure gauge. Aircraft jacks.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

SECTION 7

WHEEL BRAKES HYDRAULICS

(This data supersedes previous issue dated 8 Dec 56)

1 JUN 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

WHEEL BRAKES HYDRAULICS

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Brake Control Valves	2
Trombone Fitting Assemblies	2
Swivel Joints	5
Shuttle Valve	5
Brake Cylinders	5
INSPECTION (To be issued later)	
TESTING AND SERVICING	
General	5
Testing the Normal Brake System	5
Testing the Emergency Brake System	7
Testing the Transfer from Normal to Emergency Braking	8
Bleeding the Wheel Brakes System	8
REMOVAL AND INSTALLATION	
General	8
Brake Control Valves	9
EQUIPMENT LIST	10

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Wheel Brakes Schematic	1
2	Layout of Wheel Brakes Lines and Components	3
3	Brake Control Valve Schematics	4
4	Brake Cylinder Schematics	6

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The wheel brakes circuit consists of a normal braking system and an emergency braking system. The normal system derives its power from the utility hydraulic main pressure line and the emergency system derives its power from two 110 cubic inch capacity emergency brake accumulators in the utility hydraulics power circuit. The emergency

system takes over automatically from the normal system whenever the pressure in the normal system falls below 850-900 psi. A limited number of brake applications can be obtained from the charge in the accumulators after the engines have been shut down.

2 Two pairs of brake units, one pair on each main landing gear, are controlled respectively by left hand and right hand brake control valves located at the rear of the armament bay. Each side is independently operated

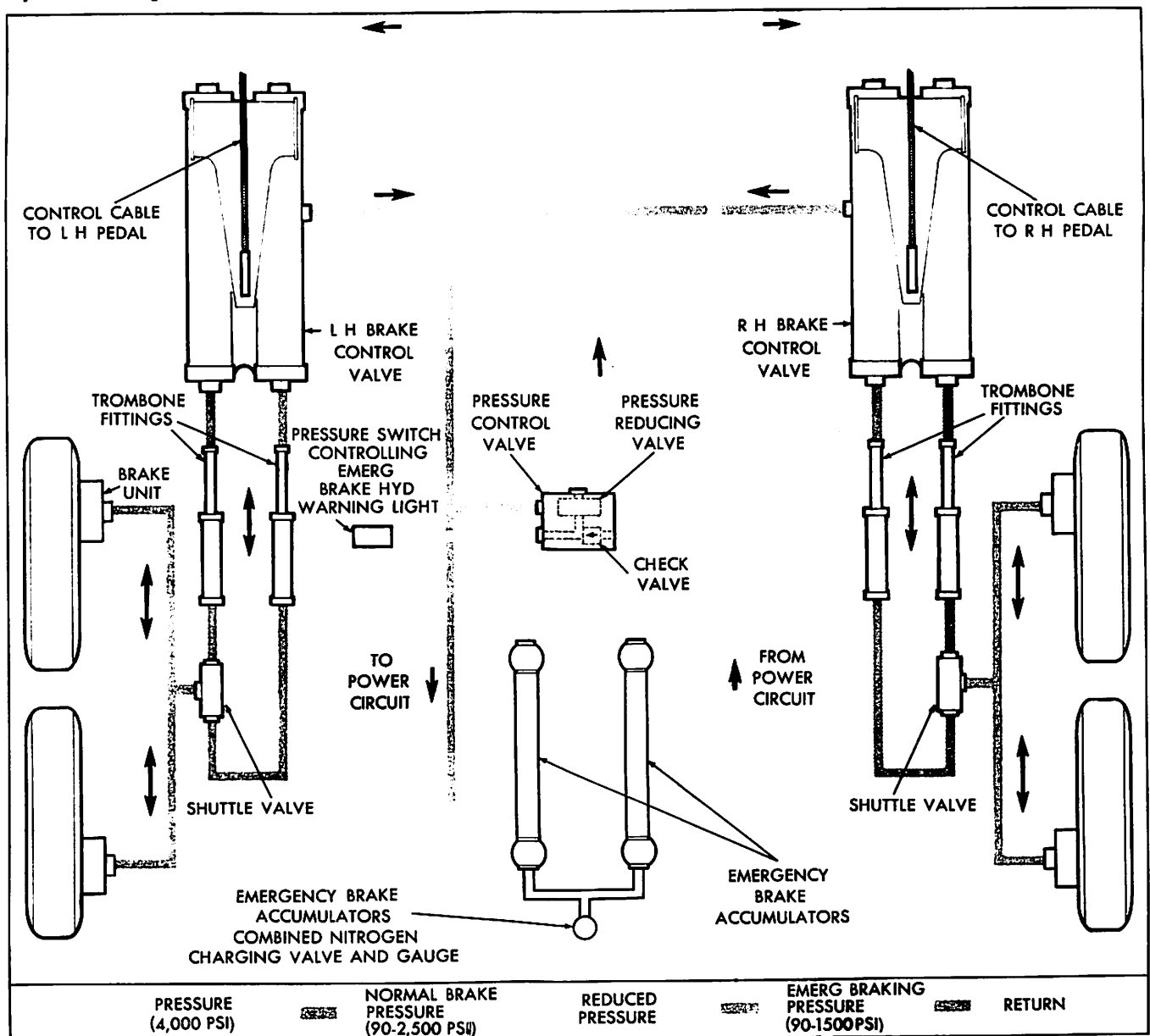


FIG. 1 WHEEL BRAKES SCHEMATIC

ARROW 1 SERVICE DATA

to provide differential braking by applying foot pressure on each of the pilot's rudder pedals. Each pedal is linked to its respective control valve through a mechanical linkage and cable run. See Arrow 1 Service Data - Section 4 - Main Landing Gear. The degree of braking is proportional to foot pressure applied.

3 The brakes are automatically applied during retraction of the landing gear.

4 For parking, the brake pedals may be retained in the on position by depressing the brake pedals, pulling a handle marked PARKING, below the main instrument panel and releasing the brake pedals before releasing the parking brake handle.

5 Two warning lights on the master warning panel located on the RH console in the pilot's cockpit, are operated by pressure switches in the power circuit. One, marked UTIL HYD, warns the pilot that the utility hydraulic main system pressure has dropped sufficiently to bring the emergency braking system into operation. The other light, marked EMERG BRAKE HYD, warns the pilot that the emergency brake pressure has failed or the accumulators have been exhausted.

6 Stainless steel pipelines on each main landing gear incorporate swivel joints and trombone fitting assemblies to compensate for varying attitudes, length and rotation of the landing gear.

7 An anti-skid^d provision will be added to the system at a later date, but is not included in the system at present.

BRAKE CONTROL VALVES (Fig 3)

8 Fluid pressure for the normal operation of each of the two brake control valves is delivered to a normal pressure port in the valve from the utility hydraulics main pressure line. Fluid pressure for the emergency operation of each valve is delivered to an emergency pressure port from the two emergency brake accumulators in the utility

hydraulic system power circuit. Normal and emergency outlet lines from the valve lead to the brake units via a shuttle valve. Return fluid from each of the valves is directed into the utility hydraulic system common return line. Each control valve performs the following functions:

(a) Directs fluid pressure from the main pressure line to the brake units under normal braking operation.

(b) Acts as a variable pressure reducing valve to reduce fluid pressure from the main pressure supply line to between 90 and 2500 psi during normal operation of the brake units. The fluid delivery pressure to the brake units varies proportionally to foot pressure applied to the rudder pedal.

(c) Automatically applies the brakes by electro-hydraulic action during retraction of the landing gear.

(d) Directs fluid pressure from the emergency supply line to the brake units in the event of failure of the main pressure supply.

(e) Acts as a variable reducing valve to reduce the fluid pressure from the emergency supply line to between 90 and 1500 psi during emergency operation of the brake units. The fluid delivery pressure to the brake units varies proportionally to foot pressure applied to the rudder pedal.

(f) Relieves any pressure in excess of 2700 psi from the supply line to the brake units.

9 Fig 3 shows the operation of the brake control valves.

TROMBONE FITTING ASSEMBLIES (Fig 2)

10 A trombone fitting assembly is fitted to the upper main casing on each main leg. Each assembly permits automatic adjustment of the lines to compensate for shortening, lengthening and rotation of the lower half of the leg during raising and lowering of the main landing gear.

ARROW 1 SERVICE DATA

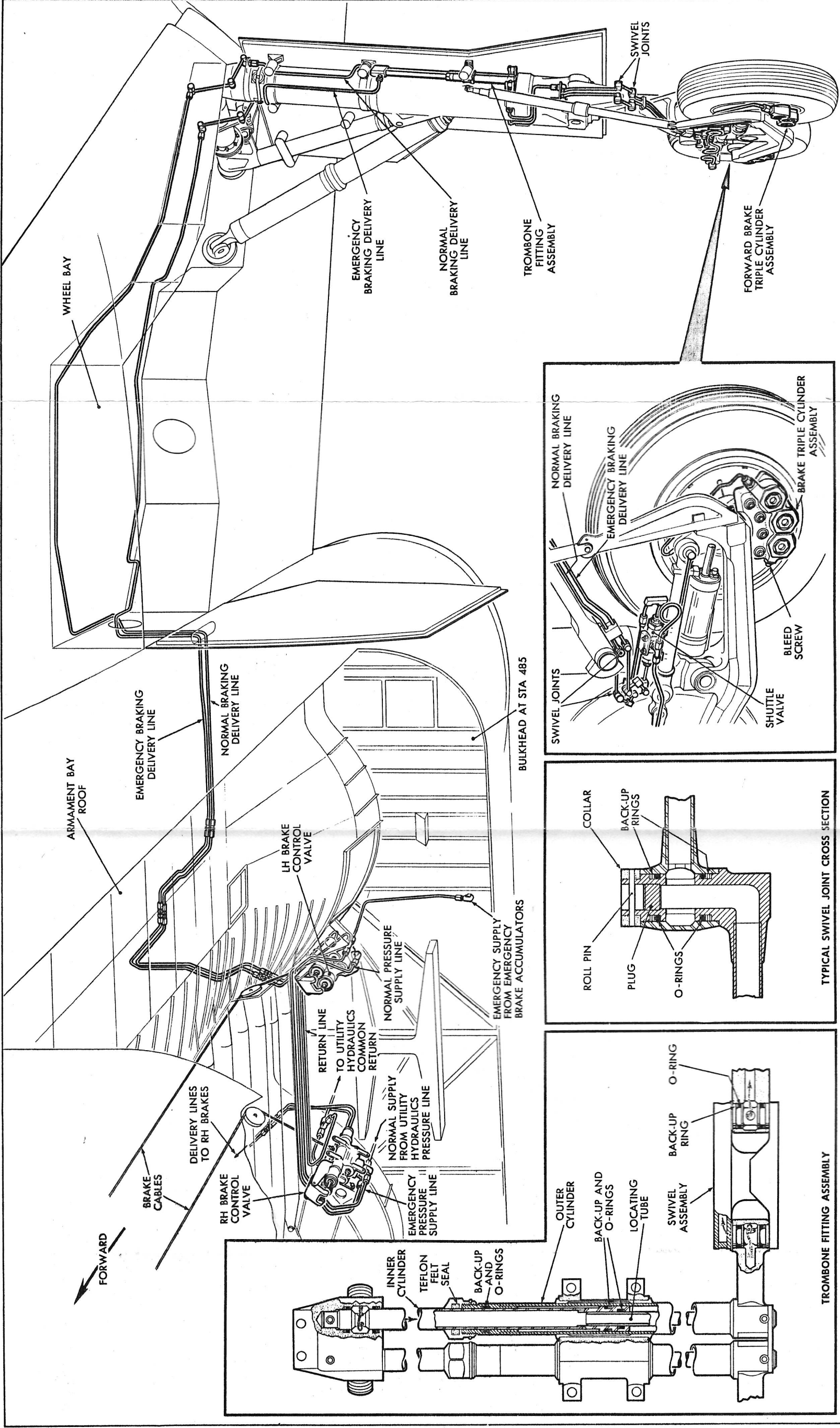
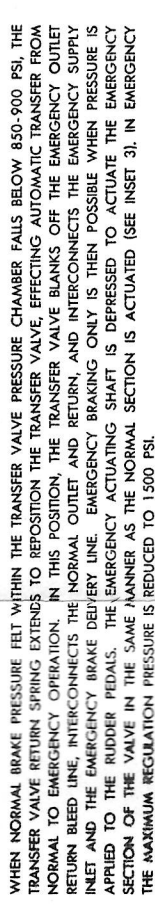
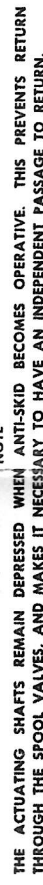
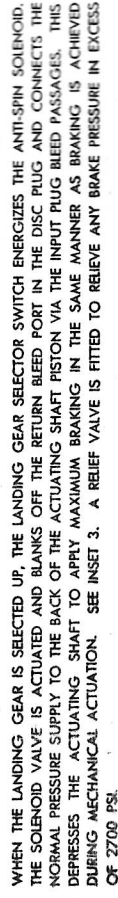


FIG. 2 LAYOUT OF WHEEL BRAKES LINES AND COMPONENTS

91-981



RETURN

STATIC FLUID

ARROW 1 SERVICE DATA

See Arrow 1 Service Data - Section 4 - Main Landing Gear. Each trombone fitting assembly comprises two trombone units and two lower swivel assemblies. To compensate for the varying lengths of the main leg, the trombone units have an inner cylinder which telescopes within an outer cylinder and a locating tube which simultaneously telescopes within the inner cylinder. The lower swivel assemblies swivel to compensate for the rotation of the leg.

SWIVEL JOINTS (Fig 2)

11 Swivel joints are incorporated in the normal and emergency brake delivery lines at the main landing gear. Three of these joints located at the top of each line permit the lines to swivel during raising and lowering of the landing gear. Six other swivel joints, incorporated in each of the lines where they follow the contour of the torque links, compensate for bogie movement and for shock absorber extension and compression. Each joint comprises an inner barrel retained within an outer barrel by a collar which is locked in position by a roll pin. The joint is sealed by an O-ring fitted at each end of the inner barrel. During swivelling the inner barrel rotates within the outer barrel.

SHUTTLE VALVE

12 A shuttle valve mounted on the forward brake torque link on each main leg, is fitted between the downstream ends of the normal and emergency brake delivery lines and the single delivery line to the brakes. The valve serves to isolate the emergency brake line during normal operation of the brakes and to isolate the normal brake line during emergency operation of the brakes.

BRAKE CYLINDERS

13 Brake pressure fluid is delivered via the shuttle valves to triple cylinder assemblies mounted one on each brake torque arm. The incoming brake pressure depresses the piston in each cylinder to exert pressure on a pressure plate which in turn forces stationary friction pads against two brake discs to effect braking. See Arrow 1 Service Data - Section 4 - Main Landing Gear. Each cylinder mechanism

automatically re-adjusts to compensate for wear in the friction pads. The amount of friction pad wear is indicated by self-adjusting pins in the centre of each cylinder body. The combined wear of the four pads is equal to the distance that the end face of the self-adjusting pin has receded into the grip retaining nut in the cylinder body. See fig 4 for the operation of the cylinders.

TESTING AND SERVICING

GENERAL

14 For the purpose of the following instructions it is assumed that the utility hydraulic power circuit is fully serviced and functioning correctly, and that the hydraulic test stand and the electrical ground power supply is connected. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

TESTING THE NORMAL BRAKE SYSTEM

15 To test the normal brake system proceed as follows:

(a) Jack the aircraft and fit ground locks to the landing gear as detailed in Arrow 1 Service Data - Section 1 - General Information.

(b) Remove the bleed screw adaptor on one of the brake units on each side of the aircraft and install a 0-3,000 psi pressure gauge, using a suitable length of flexible hose fitted with an adaptor. Allow the gauge to lie on the floor and open the relevant bleed screws.

NOTE

The gauge and hose must be primed with clean hydraulic fluid before fitment.

(c) Select mode 2 on the hydraulic test stand control panel, start the auxiliary pump by depressing the auxiliary pump starter button, and adjust the low pressure adjustment controls to obtain a low pressure gauge reading of 50 psi at each gauge. Ensure that the needles on the safety gauge remain within the safety range. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit for operating the test stand.

ARROW 1 SERVICE DATA

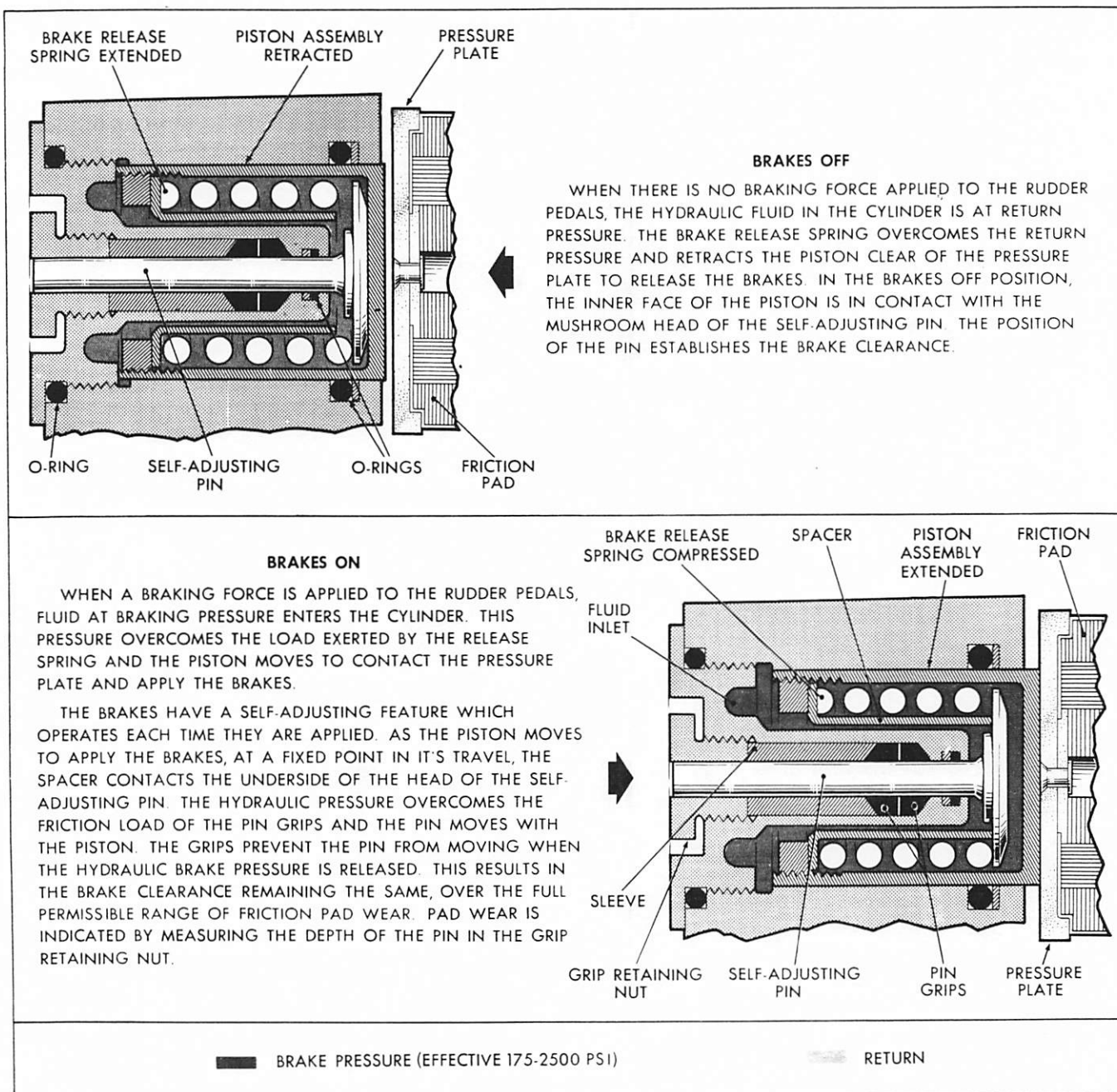


FIG. 4 BRAKE CYLINDER SCHEMATICS

(d) Start the hydraulic test stand main pumps by depressing the main pump starter button. Adjust the flow control to obtain a flow rate of 5 gpm from each pump, and adjust the high pressure control valves to obtain a reading of 4,000 psi on each high pressure gauge.

(e) Depress each rudder pedal in turn

to its full extent and check that a reading of 2,300-2,500 psi is obtained on the respective pressure gauge at the brake unit, and that the wheels are locked against rotation.

(f) Check that the brakes release correctly by applying a rotational load on the wheels with rudder pedals fully depressed then rapidly

ARROW 1 SERVICE DATA

releasing the pedals. This should result in even and almost instantaneous release of the wheels.

(g) Disconnect the electrical connector at the landing gear selector valve to isolate the landing gear selector.

(h) Check the anti-spin braking by selecting UP on the landing gear selector lever. Check that a reading of 2,300-2,500 psi is obtained on both of the pressure gauges at the brake units, and that all the main wheels are locked against rotation.

(j) Check the anti-spin braking release by applying a rotational load on each main wheel with the landing gear selector lever in the UP position. A DN selection should result in an even and almost instantaneous release of the wheels.

(k) With the landing gear selector lever in the DN position, reconnect the electrical connector to the selector valve.

(m) Carry out a landing gear retraction test to ensure that the landing gear selector valve and indicator lights are functioning correctly. See Arrow 1 Service Data - Section 4 - Main Landing Gear.

TESTING THE EMERGENCY BRAKE SYSTEM

16 To test the emergency brake system proceed as follows:

(a) Switch off the hydraulic test stand main pumps and auxiliary pump.

(b) Relieve the pressure in the main utility hydraulic system by operating the dump valve located on the forward face of the bulkhead at Station 485 if the instrument pack is not fitted, or by operating the speed brakes if the instrument pack is fitted.

(c) Relieve the pressure in the emergency brake system by alternately applying and releasing the wheel brakes until the brakes no longer operate with pedal pressure.

(d) Check the nitrogen charge in the emergency brake accumulators at the emergency

brake accumulators combined nitrogen charging valve and gauge in the hydraulic bay. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit. Recharge if necessary.

NOTE

The pressure reading on the gauge must be in accordance with the fluid temperature equivalent laid down on an accumulator charging chart located immediately below the gauge. The fluid temperature may be obtained from the fluid temperature gauge in the hydraulic bay.

(e) Repressurize the emergency brake accumulators to 4,000 psi using the hydraulic test stand. See para 15(c) and (d). Shut off the test stand and relieve the main utility hydraulic system pressure. See para 16(b).

(f) Ensure that a 4,000 psi reading is obtained on the emergency brake accumulator combined nitrogen charging valve and gauge. There must be no pressure drop when checked over a 30 minute period. This ensures that the accumulators and the pressure control valve check valve in the supply line to the accumulators are not leaking.

(g) Depress each rudder pedal in turn to its full extent and check that a reading of 1,300-1,500 psi is obtained on the respective pressure gauge at the brake units, and that the wheels are locked against rotation.

(h) Check that the brakes release correctly by applying a rotational load on the wheels with the rudder pedals fully depressed then rapidly releasing the pedals. This should result in an even and almost instantaneous release of the wheels.

(j) Depress both rudder pedals to their full extent and apply the parking brake for a period of five minutes. The pressure gauges at the brake units must retain a reading of 1,000-1,500 psi, and there must be no pressure drop at the emergency brake accumulator combined nitrogen charging valve and gauge over this period.

ARROW 1 SERVICE DATA

(k) Release the parking brake and check that the wheels are free to rotate.

(m) Repressurize the emergency brake accumulators to 4,000 psi from the hydraulic test stand. See para 15(c) and (d). Shut off the test stand and relieve the main utility hydraulic system pressure. See para 16(b).

(n) Alternately apply and release full braking until it is no longer possible to obtain a reading of 1,300-1,500 psi on the gauges at the brake units. A minimum of 50 full applications should be possible.

TESTING THE TRANSFER FROM NORMAL TO EMERGENCY BRAKING

17 To test the transfer from normal to emergency braking proceed as follows:

(a) Pressurize the utility hydraulic system to 4,000 psi from the hydraulic test stand, see para 15(c) and (d) and shut off the test stand.

(b) Alternately apply and release full braking at both rudder pedals until a pressure drop occurs at each of the gauges at the brake units. When the pressure drops to 850-900 psi, there should be a sudden rise in pressure to 1,300-1,500 psi at each gauge. This indicates that transfer to emergency braking has been effected in each of the brake control valves.

(c) Remove the gauges and hoses from the brake units. Refit the bleed screw adaptors and bleed the wheel brakes. See para 18.

BLEEDING THE WHEEL BRAKES SYSTEM

18 To bleed the wheel brakes system proceed as follows:

(a) Supply the utility hydraulic system with pressure from the hydraulic test stand as detailed in para 15(c) and (d). Adjust the high pressure control valve to obtain a reading of 1,200 psi.

(b) Connect a length of rubber hose to the bleed screw on each brake unit and immerse the open end of each hose in a glass jar partially filled with clean hydraulic fluid.

(c) Depress the rudder pedals and apply the parking brake.

(d) Open in turn the bleed screws on each brake unit until air free fluid flows from the respective bleed hose into the jar then close the screw.

(e) Release the parking brake.

(f) Adjust the high pressure control valve on the hydraulic test stand to obtain a reading of 4,000 psi.

(g) Ensure that the pressure readings on the combined nitrogen charging valve and gauge in the hydraulic bay is at 4,000 psi. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

(h) Switch off the hydraulic test stand main pumps and auxiliary pump.

(j) Relieve the main utility hydraulic system pressure. See para 16(b).

(k) Check that the reading on the emergency brake accumulator combined nitrogen charging valve and gauge has remained at 4,000 psi.

(m) Depress the rudder pedals and apply the parking brake.

(n) Open in turn the bleed screws on the brake units until air free fluid flows from the respective bleed hose into the jar, then close the screw.

(p) Release the parking brake and disconnect the bleed hoses.

REMOVAL AND INSTALLATION

GENERAL

19 Before commencing removal of any wheel brake hydraulic components, all utility hydraulic system pressures must be released as described in Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

20 Except in the case of extensive line removals, it is not necessary to drain the

ARROW 1 SERVICE DATA

complete system if blanking unions are fitted to the ports immediately after disconnection. The blanks must remain in position until immediately before refitment to prevent any foreign matter from entering the system.

NOTE

Protective covers must be fitted over the main wheels when removing lines or components on or above the main legs.

21 When reconnecting the hydraulic lines, all flareless fitting nuts must be torqued to a value of 150-200 inch-pounds, with the exception of the flareless fitting nuts on the tee pieces and 1/4 inch pipelines in the vicinity of the shuttle valve at the base of each main leg, which must be torqued to a value of 85-115 inch-pounds.

BRAKE CONTROL VALVES

22 To remove a brake control valve proceed as follows:

(a) Disconnect the electrical connection at the brake control valve.

(b) Slacken off the brake cable at its turn-buckle in the armament bay and disconnect the cable end fitting from the control valve actuating lever.

(c) Disconnect and blank off in turn, each of the six hydraulic lines from the control valve.

(d) Remove the four attachment bolts securing the brake control valve to its attachment bracket and remove the valve.

23 The installation procedure is the reverse of that given for removal. The cables must be tensioned and the brake operating mechanism rigged in accordance with the rigging instructions in Arrow 1 Service Data - Section 4 - Main Landing Gear.

~~CONFIDENTIAL~~
UNCLASSIFIED

SEC 7

ARROW 1 SERVICE DATA

WHEEL BRAKES HYDRAULICS

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-1954-11	Hydra-Power HP 402100	Valve - Brake Control	2
7-1992-107	Hydra-Power HP 51800	Valve - Shuttle	2
7-1092-15	Goodyear PD 732	Unit - Brake	4
7-1992-21	Dowty Q1287-6	Fitting - Trombone	4
7-1992-25	Dowty	Joint - Swivel	36

UNCLASSIFIED

ARROW 1 SERVICE DATA

SECTION 9

LANDING GEAR

ELECTRICS

(This data supersedes previous issue dated 14 May 57)

15 FEB 58

ARROW 1 SERVICE DATA

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Landing Gear Position Indication	1
Landing Gear Actuation Circuits	2
Landing Gear Warning Circuits	2
Pre-retraction Wheel Braking Control Circuit	2
Nose Wheel Steering Control Circuit	5
Parabrake Safety Circuit	5
INSPECTION (To be issued later)	
FUNCTION TESTING	
Preliminary Procedure	5
Landing Gear Actuation and Indication Circuits Test	5
Pre-retraction Wheel Braking Circuits Test	6
Nose Wheel Steering Circuits Test	6
Parabrake Safety Lock Solenoid Circuit Test	6
Parabrake Safety Lock Micro-switch Adjustment	6
FAULTS AND REMEDIES (To be issued later)	
COMPONENT SERVICE DATA	
Landing Gear Position Indicators - 3	11
Landing Gear Selector Panel	13
Anti-spin Solenoid - LH and RH	15
Nose Wheel Steering Solenoid	17
Solenoid, Parabrake Door Latch	19

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Landing Gear Position Indication Schematic	1
2	Landing Gear Actuation Circuits Schematic	3
3	Landing Gear Warning Circuits Schematic	4
4	Parabrake Safety Lock Micro-switch Adjustment	7
5	Location of Landing Gear Electrical Circuits Components	9

ROUTING DIAGRAMS

6	Landing Gear Electrical Circuits	10
---	----------------------------------	----

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

UNCLASSIFIED

DESCRIPTION

GENERAL

1 The landing gear electrical system includes the landing gear position indication circuits, and the control circuits provided for the hydraulically operated landing gear actuation, nose wheel steering and pre-retraction wheel braking systems. Included also, is a description of the operation of the parabrake system safety circuit.

LANDING GEAR POSITION INDICATION (Fig 1)

2 The position of the nose landing gear and of each leg of the main landing gear is indicated individually by three indicators which are controlled by micro-switches operated by the landing gear. The indicators incorporate two circuits, one for 'up' indication and the other for 'down' indication. The circuits derive a common power supply from the emergency DC bus-bar.

3 Three door-up micro-switches, operated

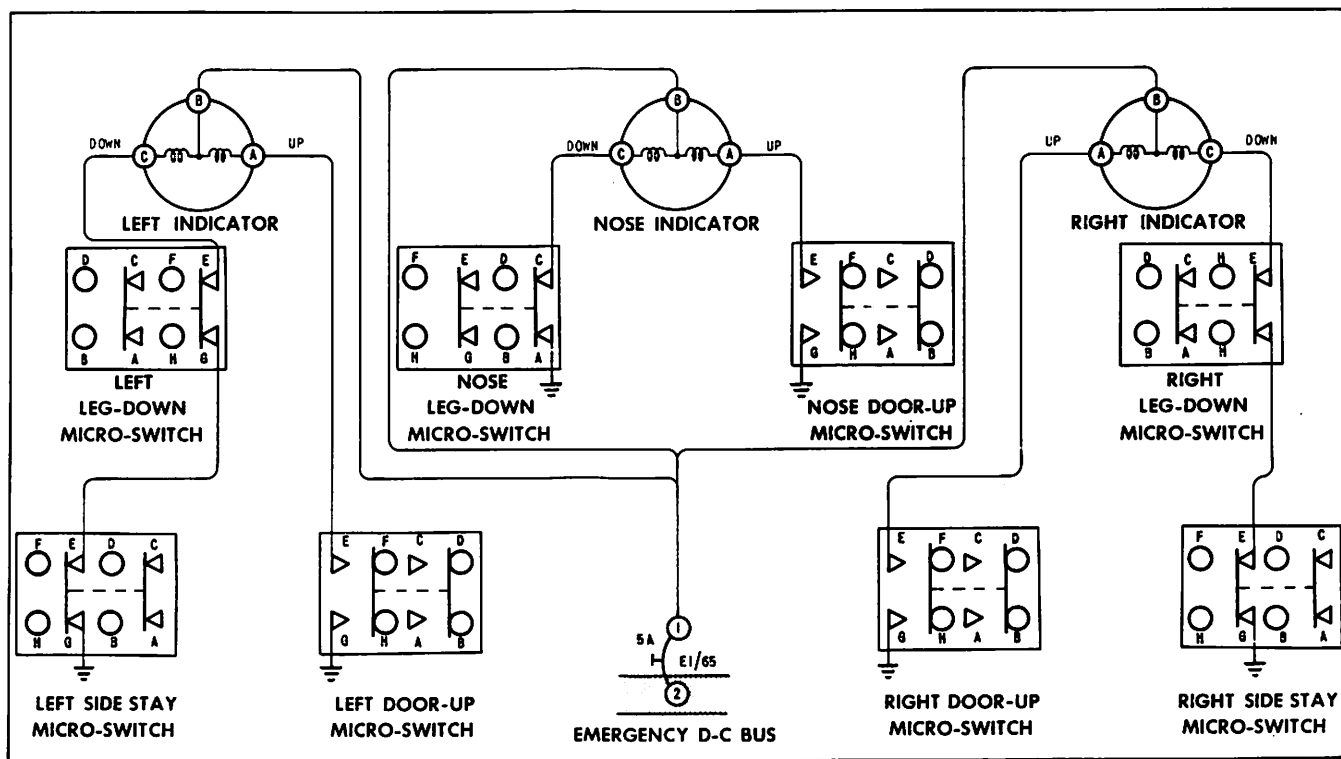
by the main and nose landing gear door locks, close when the legs are up and the doors are locked closed. These switches ground the 'up' circuit of the relevant indicator. The word UP is visible in the indicators when the landing gear is up and the doors are locked closed.

4 The nose gear 'down' indication circuit is completed to ground by a micro-switch operated by the down lock on the drag strut.

5 Each main gear 'down' indication circuit is completed to ground by two micro-switches in series. One micro-switch is operated by the leg shortening and turning mechanism, and the other is operated by the side-stay down lock.

6 As each leg of the gear extends and locks, a wheel symbol appears in the relevant LEFT, RIGHT and NOSE indicator.

7 When the landing gear is unlocked there is no power supply to the indicators. In this condition a spring-controlled between-locks indication, of white diagonal bars on a black background, is given.



TM1-5402-2

FIG. 1 LANDING GEAR POSITION INDICATION SCHEMATIC

ARROW 1 SERVICE DATA

UNCLASSIFIED

LANDING GEAR ACTUATION CIRCUITS (Fig 2)

8 The operation of the actuation circuits is initiated by the landing gear selector lever which is marked UP, DN and EMERGENCY EXTENSION. The actuation circuits control the operation of the landing gear hydraulic selector valve.

9 Incorporated in the selector lever assembly is an electro-mechanical lock circuit which prevents an UP selection being made when the aircraft weight is on the main wheels. The supply to the solenoid is completed via two micro-switches connected in series and fitted one on each torque link of the main gear.

10 Selecting the UP position on the landing gear selector lever completes a supply circuit to the up solenoid of the hydraulic selector valve. The supply circuit is derived from the emergency DC bus-bar via the relay-open contacts of one (No. 1) of the two 'door-up' relays. When the three legs are fully retracted and the doors are locked, the 'door-up' relay is energized and the supply to the control valve is interrupted. The 'door-up' relay is energized by a supply circuit derived from the main DC bus-bar via series-connected contacts in each of the three 'door-up' micro-switches of the indication circuits.

11 When the landing gear selector lever is set to the DN position, a supply circuit derived from the emergency DC bus-bar is completed via the selector switch contacts directly to the 'down' solenoid of the hydraulic selector valve. In the DN position the supply is maintained on the 'down' solenoid.

12 When the EMERGENCY EXTENSION position is selected, the power supply circuit to the hydraulic selector valve is interrupted by an emergency down limit switch and a mechanical linkage initiates the operation of the high pressure nitrogen system used for the emergency extension of the landing gear. To prevent inadvertent selection of the EMERGENCY EXTENSION position, a mechanically operated stop is fitted which must be released by depressing a button fitted adjacent to the selector lever.

LANDING GEAR WARNING CIRCUITS (Fig 3)

13 Incorporated in the knob of the landing gear selector lever is an indicator light which can be operated by either one of two warning circuits. One warning circuit illuminates the indicator light until the landing gear is locked in the position selected on the landing gear selector lever. The other warning circuit flashes the indicator light if either power lever is set within a range of from one third open to idle when the landing gear selector lever is set to the UP position.

14 Setting the landing gear selector lever to the UP position energizes an 'up-warning' relay, so completing a supply circuit to the warning circuits indicator light via the relay-open contacts of No. 1 'door-up' relay. When each leg is retracted and its door is locked, the 'door-up' relay is energized by the operation of the 'door-up' micro-switches of the indication circuits. This interrupts the supply to the indicator light.

15 Also completed when the 'up-warning' relay is energized is a supply to two micro-switches located in the power lever box. The micro-switches are operated in parallel, one serving the RH power lever and the other the LH power lever, and are positioned so that they are closed by their relevant power levers when these are set within a range of from one third open to idle. When either micro-switch is closed with the landing gear selector lever in the UP position, a circuit is completed via a flasher unit to the indicator light.

16 Setting the landing gear selector lever to the DN position completes a supply circuit via any 'leg-down' or side-stay micro-switch to the selector lever indicator light. When all three legs are down and locked, the indicator light circuit is interrupted by the action of the 'leg-down' micro-switches and side-stay micro-switches in completing the DN position indication circuits. The warning circuits derive their power supply from the emergency DC bus-bar.

PRE-RETRACTION WHEEL BRAKING CONTROL CIRCUIT

17 The pre-retraction wheel braking system brakes the main wheels when the landing gear

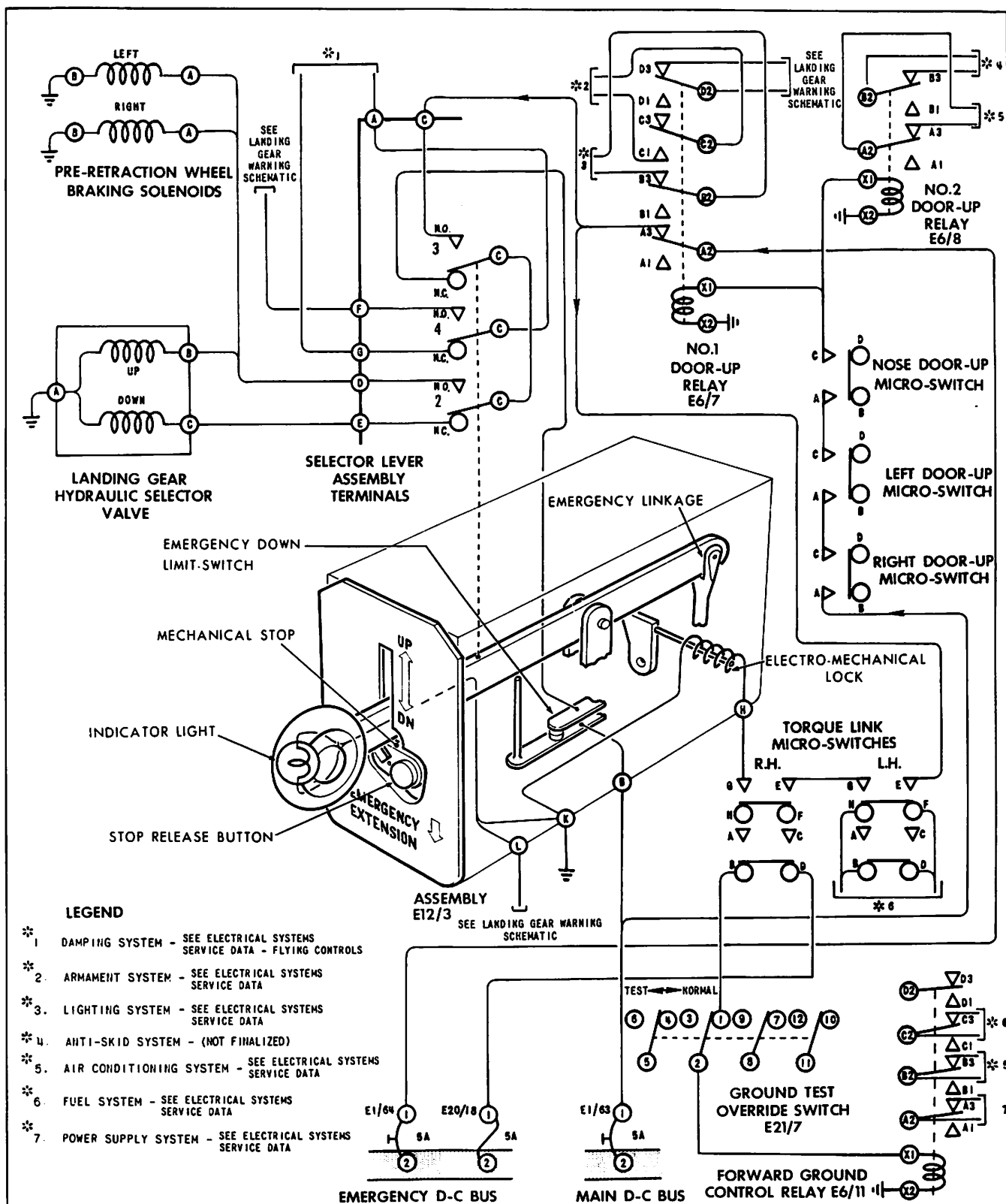
ARROW 1 SERVICE DATA **UNCLASSIFIED**

FIG. 2 LANDING GEAR ACTUATION CIRCUITS SCHEMATIC

ARROW 1 SERVICE DATA

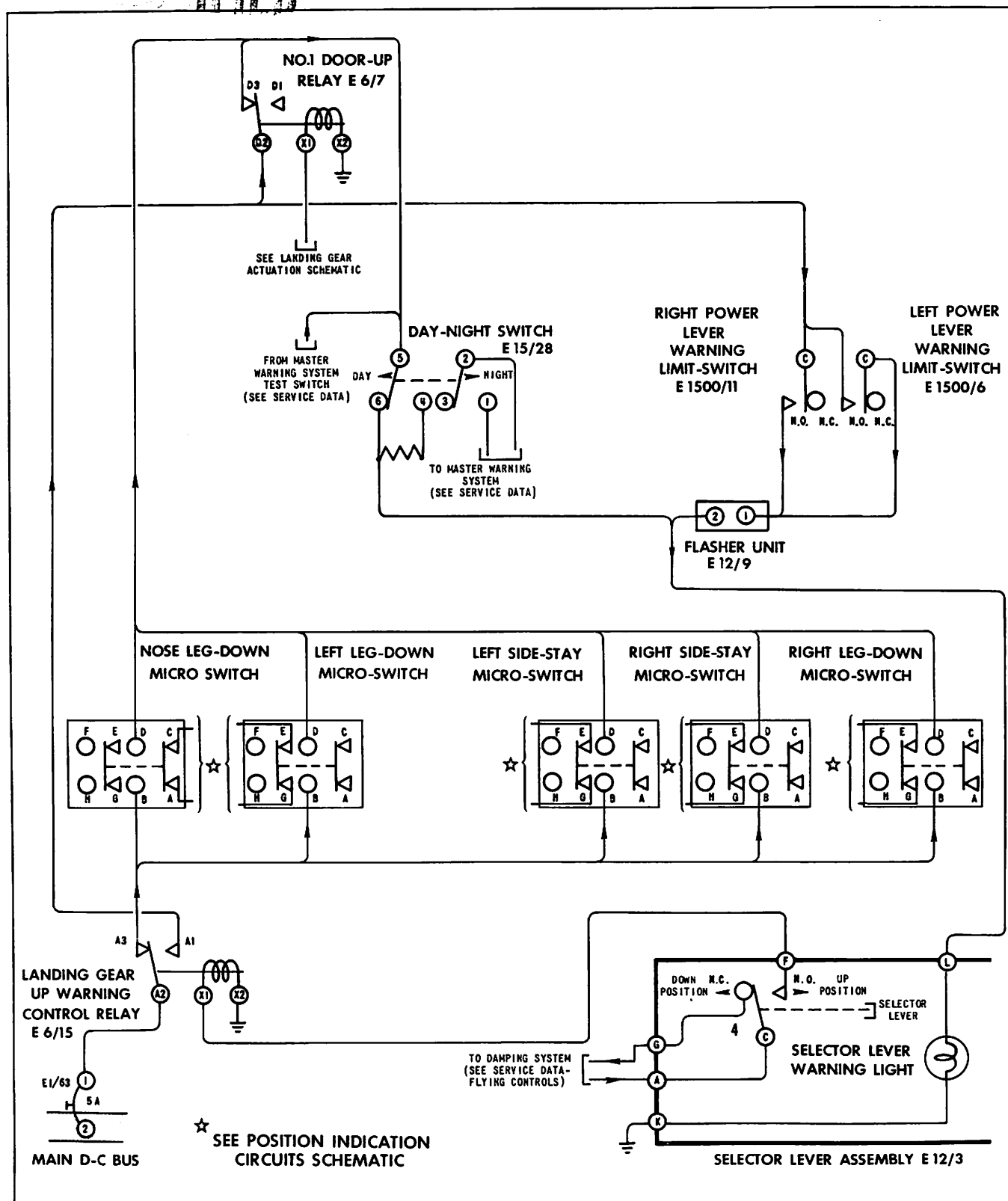


FIG. 3 LANDING GEAR WARNING CIRCUITS SCHEMATIC

ARROW 1 SERVICE DATA

is retracting. A solenoid fitted on each main wheel brake control valve is energized by a circuit paralleled with the supply circuit to the up solenoid of the landing gear hydraulic control valve. When the solenoid is energized the brakes are applied. Further information is contained in the Arrow 1 System Service Data-Utility Hydraulics - Wheel Brakes.

NCSE-WHEEL STEERING CONTROL CIRCUIT

18 Hydraulic power for the nose-wheel steering system is controlled by a solenoid operated valve. The power supply circuit for the solenoid, derived from the main DC bus, is completed when the nose-wheel steering button switch on the control column is depressed and a micro-switch is closed. The micro-switch is fitted on the nose-wheel torque link and interrupts the solenoid supply circuit when the aircraft weight is off the nose wheel.

PARABRAKE SAFETY CIRCUIT

19 The parabrake door is mechanically released by control cables which are operated by a selector lever located in the front cockpit on the LH console below the power lever control box. To guard against a malfunction or a cable fouling condition affecting the release of the parachute when the selector lever is in the 'parachute stowed' position, a safety lock solenoid is fitted. The solenoid lock is energized when a supply circuit is completed through a micro-switch which is closed when the selector lever is in the 'parachute stowed' position. Further information is contained in the Arrow 1 System Service Data for the Parachute Brake.

FUNCTION TESTING

PRELIMINARY PROCEDURE

20 Function testing the electrical circuits of the landing gear should be carried out when the aircraft is prepared for hydraulic system tests, i.e. with the aircraft jacked and a hydraulic test machine trailer connected into the hydraulic system.

21 Before commencing the function tests proceed as follows:

(a) Check that an external source of AC power supply is connected into the aircraft external supply receptacle.

(b) Check that the three circuit breakers marked UNDERCARRIAGE - UP, DOWN and INDICATION, located on circuit breaker panel E1, are switched on. Check also that the circuit breaker marked NORMAL - DC SUPPLY, located on the damper circuit breaker panel R8, is switched on.

(c) Check that the MASTER ELECTRIC switch is set to the 'on' position.

LANDING GEAR ACTUATION AND INDICATION CIRCUITS TEST

22 Test the landing gear actuation and indication circuits proceeding as follows:

(a) Set the LH power lever and the RH power lever to a position in advance of one third open.

(b) Set the landing gear actuation selector lever to UP. During the retraction of the landing gear, check that each of the three position indicators reverts to a between locks indication. Note also, that the warning circuits indicator fitted in the knob of the selector lever is illuminated. When retraction is complete, check that the word 'UP' which indicates that the gear is up and locked, is visible in each of the three indicators. Check that the warning circuits indicator is extinguished.

(c) Set the LH power lever to a position between one third open and idle. Note that the warning circuits indicator in the landing gear selector lever commences to flash.

(d) Set the LH power lever back to cut-off. Note that the warning circuits indicator is extinguished.

(e) Repeat operations (c) and (d) for the RH power lever.

(f) Set the landing gear actuation selector lever to DN. During the extension of the landing

ARROW 1 SERVICE DATA

gear, check that each of the three position indicators reverts to a between locks indication. Note also, that the warning circuits indicator is illuminated. As each leg of the gear extends and locks, check that the wheel symbol appears in the relevant LEFT, RIGHT and NOSE indicator. When extension is complete, check that the warning circuits indicator is extinguished.

23 Check the operation of the torque link micro-switches proceeding as follows:

- (a) Have the LH main landing gear jacked up at the wheel jacking point until the torque link micro-switch is actuated.
- (b) Have the ground locks fitted.
- (c) Check that it is not possible to select the landing gear actuation selector lever to the UP position.
- (d) Remove the jack from the LH main landing gear and jack up the RH main gear.
- (e) Check that it is not possible to select the landing gear actuation selector lever to the UP position.
- (f) Remove the jack from the RH main gear.

PRE-RETRACTION WHEEL BRAKING CIRCUITS TEST

24 Test the pre-retraction wheel braking circuits, proceeding as follows:

- (a) Disconnect cable E1104/9 from the landing gear hydraulic selector valve.
- (b) Set the landing gear actuation selector lever to the UP position.
- (c) Check that the LH and the RH main wheels are locked.
- (d) Set the landing gear selector lever to the DN position.
- (e) Reconnect cable E1104/9 to the hydraulic selector valve.

NOSE WHEEL STEERING CIRCUITS TEST

25 The solenoid circuit of the nose wheel

steering is tested during tests contained in the Arrow 1 Service Data - Nose Landing Gear.

PARABRAKE SAFETY LOCK SOLENOID CIRCUIT TEST

26 Prior to stowing the parachute, check the operation of the safety lock proceeding as follows:

- (a) Set the parabrake selector lever to the stowed position.
- (b) Close the parachute compartment stowage doors.
- (c) Check that the indicator light located on the refuel and test panel E21 illuminates when depressed.
- (d) Pull on the parabrake control cable which is accessible in the armament bay and check that the doors remain closed.
- (e) Set the parabrake selector lever to the STREAM position then check that the stowage doors open and that the indicator light on panel E21 does not illuminate when depressed.

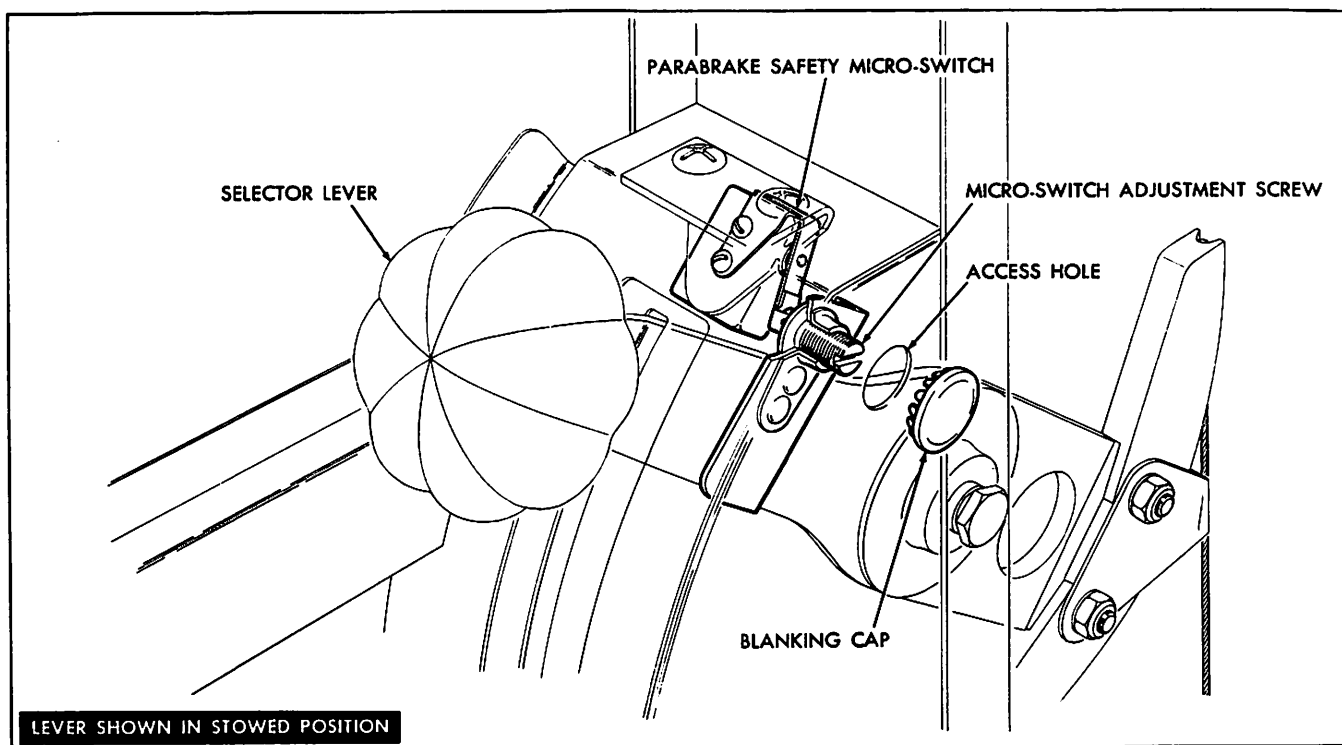
PARABRAKE SAFETY LOCK MICRO-SWITCH ADJUSTMENT (Fig 4)

27 To adjust the micro-switch proceed as follows:

- (a) Gain access to the micro-switch adjusting screw by locating and removing the blanking cap fitted in the assembly cover of the parabrake selector lever.
- (b) Set the parabrake selector lever to the stowed position.
- (c) Check that the indicator on the refuel and test panel E21 does not illuminate when depressed. If necessary, back off the micro-switch adjusting screw until the indicator is extinguished.
- (d) Tighten the micro-switch adjusting screw until the indicator on panel E21 is illuminated when depressed, then tighten the screw a further one and one-quarter turns.
- (e) Refit the blanking cap and test the circuit as described in para 26.

ARROW 1 SERVICE DATA

UNCLASSIFIED



7M1-5405-1

FIG. 4 PARABRAKE SAFETY LOCK MICRO-SWITCH ADJUSTMENT

THE UNIVERSITY OF CHICAGO



10

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL	SUB-SYSTEM LANDING GEAR	COMPONENT Landing Gear Position Indicators - 3	REF. NO. 11-4
AVRO PART NO.	MANUFACTURER Keystone Watch (RCAF Ref AN5839-1)	MAN'FR'S PART NO. 303-14L	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN-		ESTIMATED- 500 hours	
FUNCTION To indicate whether the landing gear is locked down, locked up or between locks. The 'locked down' position is indicated by a wheel, the 'locked up' position by the word 'UP', and positions between locks by diagonal bars.			
LOCATION Front cockpit main instrument panel - one indicator for each leg of the landing gear.			
ACCESS			MEN X MINUTES
Unobstructed, when identification cover is removed.			
REPLACEMENT PROCEDURE			MEN X MINUTES
Fit and secure the electrical connector to the indicator. Fit and secure the indicator to the panel - two screws. Fit the identification cover to the panel - four screws.			

ARROW 1 SERVICE DATA

INSPECTION Check that the indicator is securely mounted and that the correct electrical connector is securely and properly fitted. Check that the identification plate is securely fitted and that the wording is legible.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM LANDING GEAR		COMPONENT Landing Gear Selector Panel		REF. NO. 11-4	
AVRO PART NO. 7-1152-8		MANUFACTURER M. J. Johnson Aircraft Engineering Co.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To house the landing gear position selector lever and associated electrical switching and wiring.							
LOCATION Front cockpit LH console, forward.							
ACCESS Unobstructed, when panel E12 is released from the console.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure one electrical connector. Locate the panel in the console and secure - four screws. Connect and secure the bottom fork of the emergency link to the lever of the pneumatic valve.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check that the unit is securely mounted. Check the serviceability of the warning light filament by depressing the master test switch located on the master warning panel.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM LANDING GEAR		COMPONENT Anti-spin Solenoid - LH and RH		REF. NO. 11-4	
AVRO PART NO. 7-1954-11		MANUFACTURER Hydra-Power		MAN'FR'S PART NO. HP402100		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 500 hours			
FUNCTION To initiate the operation of the hydraulically operated pre-retraction wheel braking system. The solenoid is energized automatically when the landing gear is selected to UP.							
LOCATION Fitted to the brake control valve at station 485, LH and RH.							
ACCESS Unobstructed, when the missile pack is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure one electrical connector.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check that the electrical connector is securely and properly fitted.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM LANDING GEAR		COMPONENT Nose Wheel Steering Solenoid		REF. NO. 11-4	
AVRO PART NO. 7-1952-23		MANUFACTURER Aviation Electric		MAN'FR'S PART NO. AE418		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To direct the supply of hydraulic fluid for nose wheel steering.							
LOCATION Aft of bulkhead at station 215.							
ACCESS Remove the electronic power bay access door - 76 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure one electrical connector.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check that the electrical connector is securely and properly fitted.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM LANDING GEAR		COMPONENT Solenoid, Parabrake Door Latch		REF. NO. 11-4	
AVRO PART NO. 7-1159-11		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To release the parabrake door safety latch.							
LOCATION Forward of stinger at station 798 to 803.							
ACCESS When stinger is removed, accessible through openings in former at station 803.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure one electrical connector. Fit and secure mounting to bracket at station 798 - two bolts. Fit and secure mounting to bracket at station 803 - two bolts. Fit and secure the stinger - four locking clamps. NOTE: The parabrake solenoid and the linkage are mounted as a unit.						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Check that the solenoid is securely mounted. Check that the electrical connector is securely and properly fitted.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

SECTION 10

PARACHUTE BRAKE

(This data supersedes previous issue dated 19 March 1957)

15 MAR 58

ARROW 1 SERVICE DATA

LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

PARACHUTE BRAKE

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Selector Lever	1
Control Cable	1
Cable Tension Regulator	2
Parabrake Box	2
Parabrake Indicator	4
Door Release Mechanism	4
Electrical Safety Lock	4
Electrical Safety Lock Indicator Light	4
Parabrake Release Mechanism	4
Parachute Assembly	6
INSPECTION (To be issued later)	
TESTING AND SERVICING	
General	7
Tensioning the Cable	7
Testing the Cable System	7
Adjusting the Electrical Safety Lock	8
Testing the Electrical Safety Lock	8
Installing the Parachute Assembly	8
Pre-flight Check	10
COMPONENT SERVICE DATA	
Parachute Assembly	11
Door and Parabrake Release	13
Cable Tension Regulator	15
Parabrake Box Assembly	17
Parabrake Doors	19
Parabrake Indicator	21
Parabrake Control	23

ARROW 1 SERVICE DATA

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Parabrake Controls - Schematic	1
2	Parabrake Cable Tension Regulator	2
3	Parabrake Box	3
4	Parabrake Release	5
5	Parachute Assembly	6
6	Installation of Parachute Assembly	9

ARROW 1 SERVICE DATA ~~UNCLASSIFIED~~

DESCRIPTION

GENERAL

1 A parachute brake is fitted in the rear fuselage stinger, between the engine nacelles aft of the rudder.

2 The parachute is streamed on touchdown to assist in reducing the aircraft landing run and to prolong the life of the aircraft wheels and brakes. The complete parachute assembly can be jettisoned by the pilot when the landing run is complete.

3 The parachute brake assembly consists of a selector lever, control cable, cable tension regulator, parabrake box, door release mechanism, parabrake release mechanism and a parachute assembly.

SELECTOR LEVER (Fig 2)

4 The selector lever is mounted in a quadrant outboard of the power levers. The knob of the lever is shaped like a parachute for easy identification. A plate marked STREAM and JETTISON with arrows to indicate the selector lever movement is riveted to the quadrant. Selection of STREAM is accomplished by moving the lever downwards to a gate position. The lever is prevented from springing back to the doors closed position by a spring-loaded lock plate. Selection of JETTISON is accomplished by an inward and downward movement from the STREAM position. To reset the selector lever to the doors closed position it is necessary to release the lock plate.

CONTROL CABLE

5 A 3/32 inch steel cable runs from the selector lever and tension regulator in the

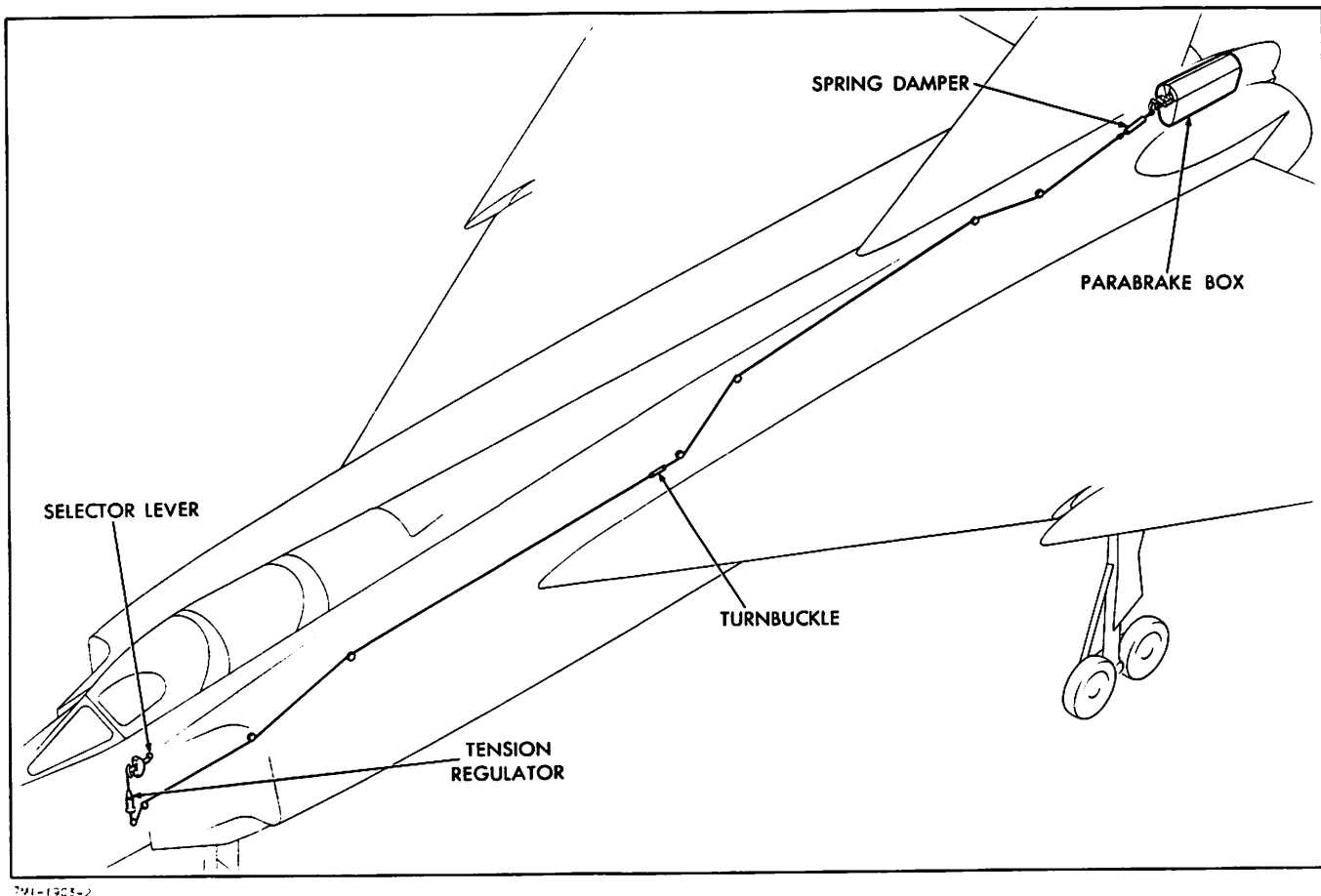
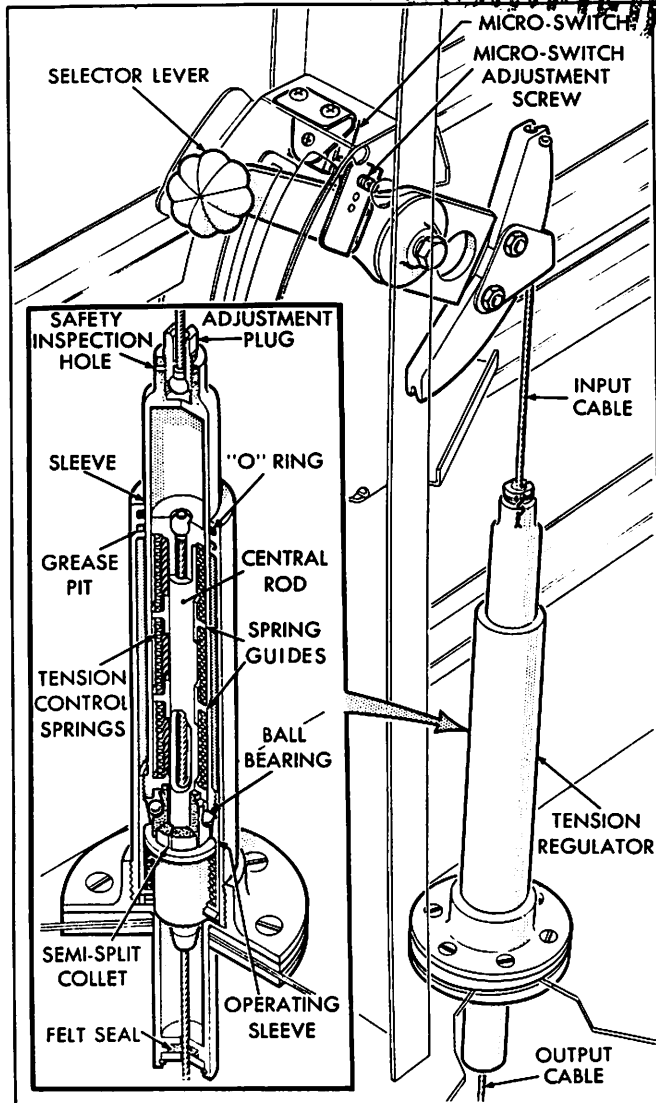


FIG.1 PARABRAKE CONTROLS - SCHEMATIC

ARROW 1 SERVICE DATA

UNCLASSIFIED



7M1-1902-3

FIG. 2 PARABRAKE CABLE
TENSION REGULATOR

cockpit to the release mechanism in the rear fuselage. The cable runs through the front fuselage, armament bay and rear fuselage, over pulleys and through fairleads, to a spring damper in the release mechanism. The control cable shares pulley banks with the flying control cables at stations 280 and 485. A turnbuckle is provided in the armament bay to connect and adjust the control cable.

CABLE TENSION REGULATOR (Fig 2)

6 A cable tension regulator, connected to the selector lever quadrant by a short input

cable, is fitted on the cockpit floor. It is sealed to prevent leakage of cabin pressure. The regulator maintains a tension on the output cable under all conditions of temperature and structural flexing. When tension is applied to the input cable, a clutch in the tension regulator locks the input and output cables to give a positive pull through the regulator.

7 The clutch consists of a central rod, a semi-split collet, eight ball bearings and a sleeve. The central rod is attached to the output cable and moves with the cable. The input cable is attached to the sleeve. The semi-split collet fits over the central rod and has eight segments with a tapered flute machined on each. Attached to the lower end of the sleeve is an operating sleeve with eight matching tapered flutes machined on its inner surface. A ball bearing is inserted in the space between each flute of the operating sleeve and the semi-split collet.

8 When tension is applied to the input cable it pulls upwards on the sleeve and the ball bearings force the segments of the semi-split collet against the central rod. The central rod then transfers the load to the output cable.

9 When tension on the input cable is relieved, tension control springs push the sleeve downwards against a stop. A spring fitted under the clutch then pushes the semi-split collet upwards to disengage the clutch.

10 With no load on the input cable, the tension control springs maintain a tension of 25 lbs on the output cable when they are fully compressed, and a tension of 8.5 lbs when they are fully extended.

PARABRAKE BOX (Fig 3)

11 A parabrake box located in the fuselage stinger between the engine nacelles provides stowage for the parachute assembly. The upper section of the box is enclosed by two curved doors pivoted on lever arms at each end. Quadrants riveted to the two forward lever arms are connected together by two wire cables running over two adjustable pulleys. This synchronizes the operation of the doors and provides positive locking of both doors when

ARROW 1 SERVICE DATA

UNCLASSIFIED

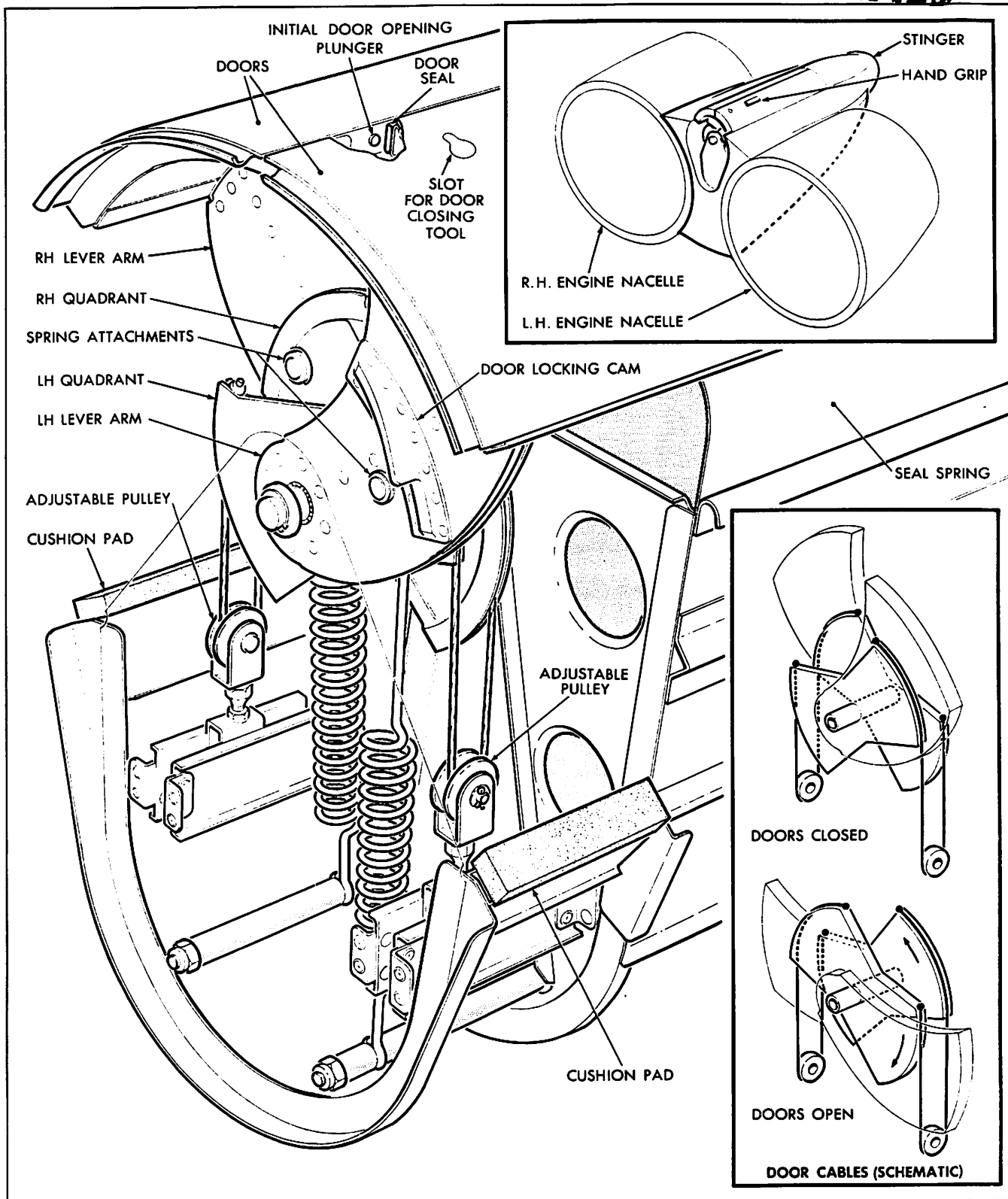


FIG. 3 PARABRAKE BOX

ARROW 1 SERVICE DATA

the LH door is locked. A cam on the LH forward lever arm engages with a spring-loaded cam follower to lock the doors in the closed position. When the cam follower is withdrawn by the selector lever, the doors are opened by two coil springs attached to the lever arms. An initial opening spring, fitted at the forward end of the RH door between the inner and outer door skins provides an assist to the initial opening movement. In the open position the doors rest on four rubber cushion pads. A handgrip is provided on the inner and outer skin of each door to facilitate manual closing. A keyhole slot in the LH door provides a means of fitting a door closing tool.

12 A small hinged door, secured by quick-release fasteners, is fitted in the RH door to provide access to the pin and bracket to which the pilot chute release pin is attached after the doors are closed.

PARABRAKE INDICATOR

13 An indicator fitted in the parabrake box gives an external indication that the parachute assembly is installed, without the necessity of opening the parabrake doors. The indicator consists of a spring-loaded platform connected to an indicator rod sliding in a guide tube. The spring-loaded platform is hinged to the lower skin of the parabrake box and when the parachute assembly is removed, the platform rises and the indicator rod protrudes through a hole in the lower skin of the rear fuselage stinger. When the parachute assembly is installed the platform is held down and the indicator rod is withdrawn into the guide tube.

DOOR RELEASE MECHANISM (Fig 4)

14 A parabrake box door release mechanism is fitted in the upper section of the rear fuselage at station 803. It consists of a spring damper, an actuating lever with linkage, and a cam follower. Movement of the selector lever to STREAM moves the spring damper rod forward and operates the actuating lever, pulling the cam follower out of engagement with the parabrake door cam. Two coil springs attached to the forward lever arms and to the box structure open the two doors when the lock is released. When the doors are closed the spring-loaded

cam follower engages with the cam on the LH door lever arm and locks the doors in this position. The selector lever must be in the doors closed position and the master electrical switch must be OFF before closing the doors.

ELECTRICAL SAFETY LOCK (Figs 2 and 4)

15 A solenoid operated safety lock in the release mechanism prevents inadvertent opening of the parabrake box doors. When the selector lever is in the doors closed position a micro-switch on the selector lever energizes the solenoid. The solenoid plunger retracts and actuates a locking lever to lock the cam follower in the extended position. Initial movement of the selector lever opens the micro-switch and de-energizes the solenoid. In the event of electrical failure the lock is in the released position.

ELECTRICAL SAFETY LOCK
INDICATOR LIGHT

16 An indicator light, located on the refuel and test panel forward of the LH speed brake and marked PARABRAKE LOCK, is illuminated by a relay when the electrical safety lock solenoid plunger is retracted. The indicator light provides an indication that the cam follower is extended and the lock is engaged. The indicator light is a "press-to-operate" type light and must be depressed to provide the indication.

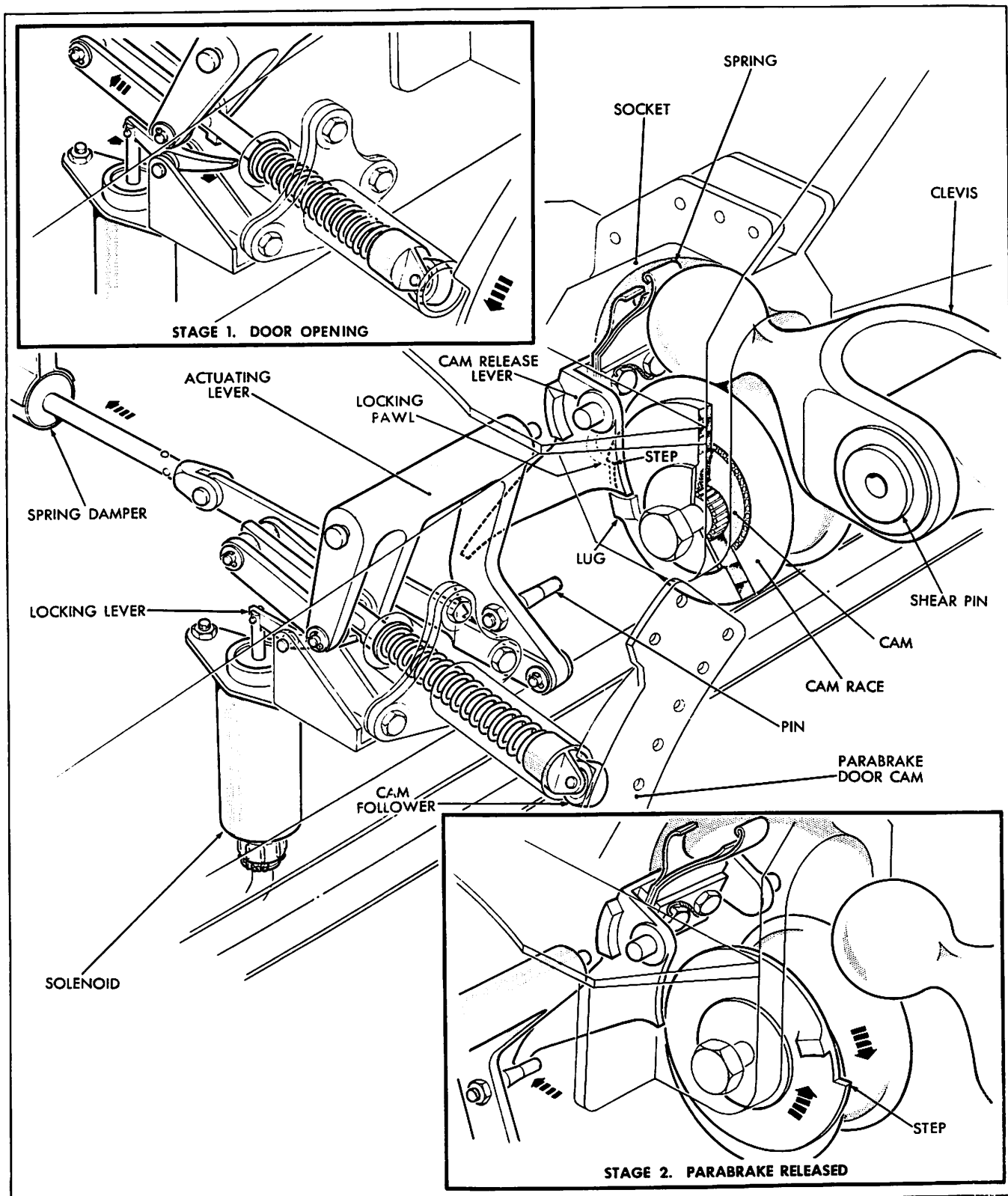
PARABRAKE RELEASE MECHANISM (Fig 4)

17 The parabrake release mechanism is fitted to the two upper longerons at the extreme end of the rear fuselage. Prior to release of the parabrake, a ball-ended clevis, to which is attached the riser, is retained in an open socket by a cam and release lever mechanism.

18 The cam is eccentric, and revolves about a needle bearing. A cam race, also on a needle bearing, revolves on the cam and retains the ball-ended clevis in the socket when the cam is locked by the release lever. A step machined on the circumference of the cam flange is engaged with a locking pawl on the release lever when the mechanism is in the locked position.

19 The mechanism is arranged so that the load on the ball-ended clevis tends to rotate the cam in an anti-clockwise direction, viewed from the LH side.

ARROW 1 SERVICE DATA



741-904-5

FIG. 4 PARABRAKE RELEASE

ARROW 1 SERVICE DATA

20 When the selector lever is moved to the JETTISON position, a pin on the curved arm of the actuating lever pivots the cam release lever. This disengages the locking pawl from the step on the cam, and allows the cam to rotate and release the ball-ended clevis. A tongue on the cam release lever bears against a lug on the cam to initiate rotation.

21 When replacing the parachute, the selector lever must be in the doors closed position and the master electrical switch OFF. The clevis is inserted in the socket and the cam rotated by hand until the locking pawl engages with the step on the cam. The RH side of the cam is knurled to provide a gripping surface.

PARACHUTE ASSEMBLY

22 The parachute assembly consists of a pilot chute, a bridle line, a deployment bag, a main canopy, suspension lines and riser.

23 The pilot chute is a non-fouling vane type parachute made from Dacron material with a conical coil spring housed in the centre cone of the vanes. The chute is packed in a separate stowage bag with the coil spring compressed.

24 The flaps of the stowage bag are held in position by a steel pin which is attached to the RH door by a loop. See fig 6. Withdrawal of this pin allows the pilot chute to be ejected by the spring action. The pilot chute stowage bag is secured to the upper forward part of the deployment bag.

25 The deployment bag is reinforced by webbing and shaped to fit in the parachute box. Packed within the bag are the suspension lines, bridle line, and the main canopy. The use of a deployment bag reduces the opening shock and provides orderly deployment of the main canopy.

26 A bridle line connects the pilot chute to the deployment bag and the deployment bag to

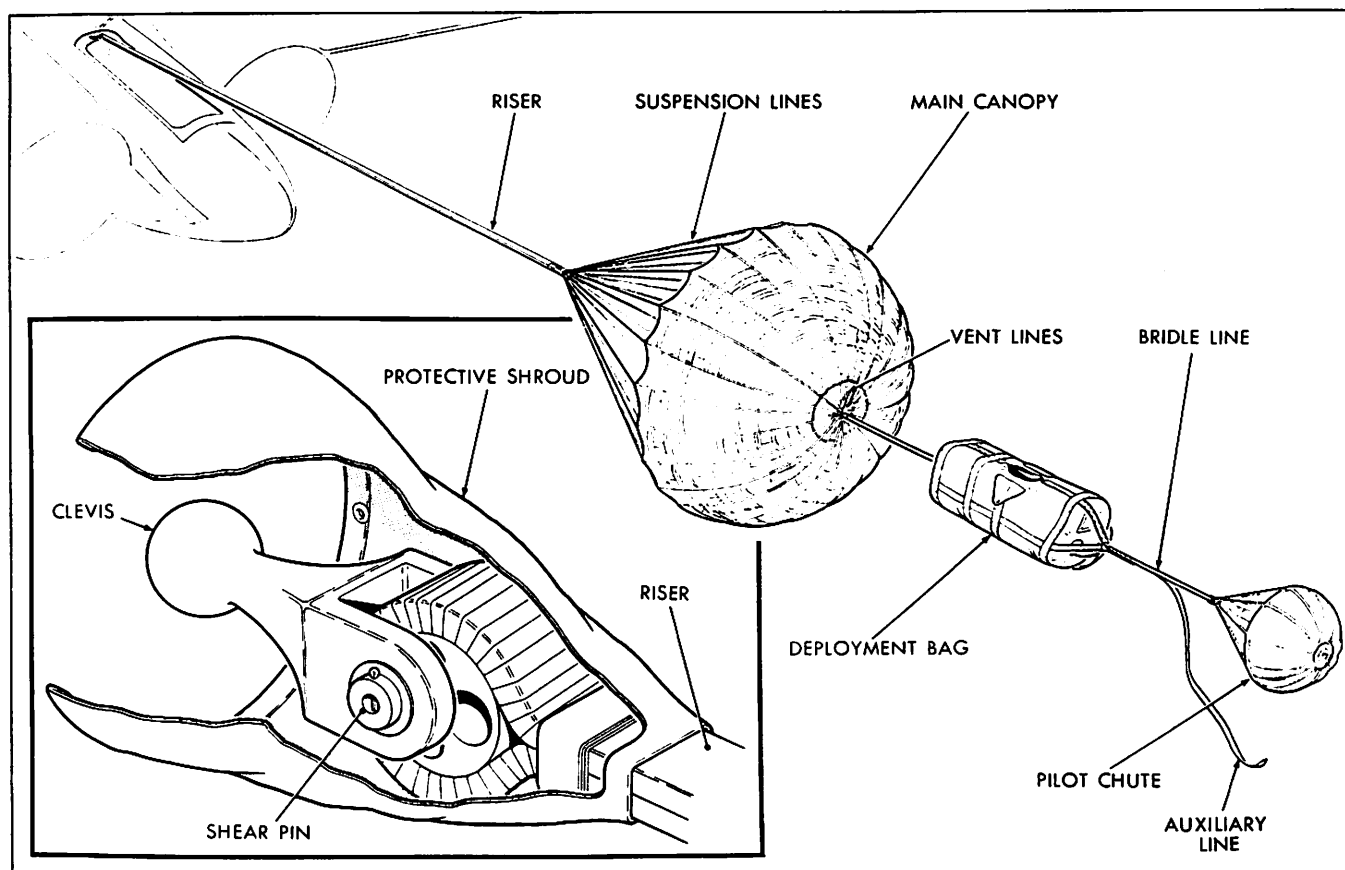


FIG. 5 PARACHUTE ASSEMBLY

ARROW 1 SERVICE DATA

the main canopy vent lines. An auxiliary line, to assist in lifting the deployment bag from the box, is attached to the rear section of the bridle line. The end of the auxiliary line is secured to the lower forward part of the deployment bag by 100 lb breaking thread.

27 The main canopy is a Fist ribbon type parachute with an inflated diameter of approximately 16 feet. It is made up of panels of Dacron material constructed in a horizontal, vertical and radial pattern. The horizontal and radial ribbons are two inches wide and the vertical ribbons are 5/8 inches wide.

28 The twenty-four suspension lines and vent lines are manufactured in continuous loops of tubular Dacron webbing. The lines are bound together to form the riser which is twenty-three feet long. The riser terminates in a loop bound round a hardened steel bush which is secured to the clevis by a shear pin. In the event of inadvertent release of the parachute in flight, the excessive load will cause the pin to shear and release the parachute assembly. A protective shroud attached to the riser covers the clevis and shear pin.

29 When the selector lever is moved to STREAM, the door is released and the door opens, withdrawing the pin from the pilot chute bag. The conical spring then ejects the pilot chute into the airstream where it inflates and pulls the deployment bag from the parabrake box. The auxiliary line on the bridle line lifts the rear end of the bag from the box and the 100 lb thread breaks. Tension on the riser opens the deployment bag and withdraws the suspension lines and main canopy which then inflates and applies the braking load to the aircraft.

30 On completion of the braking run the selector is moved to JETTISON. This allows the cam in the release gear to rotate and release the clevis from the socket, disconnecting the complete parachute assembly from the aircraft, all components being retained with the assembly.

TESTING AND SERVICING

GENERAL

31 When carrying out the rigging procedure or checking the cable tension of the parachute

brake control cable, the aircraft should be supported by the landing gear and standing on firm, level ground. The instrument pack must be removed to gain access to the turnbuckle and control cable in the armament bay. As the cable tension is adjusted for ambient temperature, the aircraft should be allowed to stand in an even temperature for approximately 12 hours prior to taking tension readings. See Arrow 1 Service Data - Section 1 for aircraft stability with the instrument pack removed.

TENSIONING THE CABLE

32 To tension the cables proceed as follows:

- (a) Set the parabrake selector lever to the doors closed position.
- (b) Remove the forward access panel from the LH console in the front cockpit. Adjust on the tension regulator to remove any slack in the cable between the selector lever and the tension regulator. Check that the adjustment plug is in safety and wirelock.
- (c) Slacken the turnbuckle until there is no tension on the cable.
- (d) Check that the total compensation range of 3.75 inches can be obtained by applying a tension of 30 lbs to the output cable and measuring the extension.
- (e) Fit a tensiometer on the cable and adjust the turnbuckle in the armament bay until the required tension is obtained. Check that the turnbuckle is in safety and wirelock.

TESTING THE CABLE SYSTEM

33 To ensure that the system is operating correctly, carry out the following function test:

- (a) Check that the master electrical switch is OFF and set the selector lever in the doors closed position.
- (b) Fit the clevis in the socket, and rotate the cam clockwise, viewed from the LH side of the aircraft, until it locks. Check that the clevis is securely engaged.

ARROW 1 SERVICE DATA

(c) Close the doors and check that the door lock is engaged. Do not connect the pin on the RH door to the pilot chute release pin.

(d) With an assistant in the front cockpit, move the selector lever to STREAM, and check that the doors open freely and fully, and that the clevis is still securely engaged.

(e) With tension applied to the clevis, move the selector lever to JETTISON and ensure that the clevis disengages satisfactorily.

ADJUSTING THE ELECTRICAL SAFETY LOCK

34 The adjustment for the electrical safety lock consists of a special screw mounted on a bracket on the selector lever. Access is through a small hole in the inboard face of the lever cover which is normally closed by a plug button. See fig 2. To adjust the micro-switch proceed as follows:

- (a) Remove the plug button.
- (b) Set the selector lever in the doors closed position.
- (c) Back off the adjusting screw until clear of the micro-switch actuator.
- (d) Screw in the adjusting screw to the point when the micro-switch operates.
- (e) Screw in the adjusting screw a further 1-1/4 turns.
- (f) Replace the plug button.

TESTING THE ELECTRICAL SAFETY LOCK

35 To ensure satisfactory operation of the electrical safety lock the following test should be carried out:

- (a) Set the selector lever in the doors closed position.
- (b) Close the parabrake box doors. Do not connect the pin on the RH door to the pilot chute release pin.
- (c) Connect the electrical ground power unit and switch the master electrical switch ON.

(d) Apply a tension of approximately 150 lb in a forward direction, on the cable in the armament bay and check that the doors remain locked.

(e) Remove the load from the cable and check that the initial movement of the selector lever to STREAM de-energizes the solenoid and releases the electrical safety lock.

(f) Switch the master electrical switch OFF.

(g) Disconnect the electrical ground power unit.

INSTALLING THE PARACHUTE ASSEMBLY

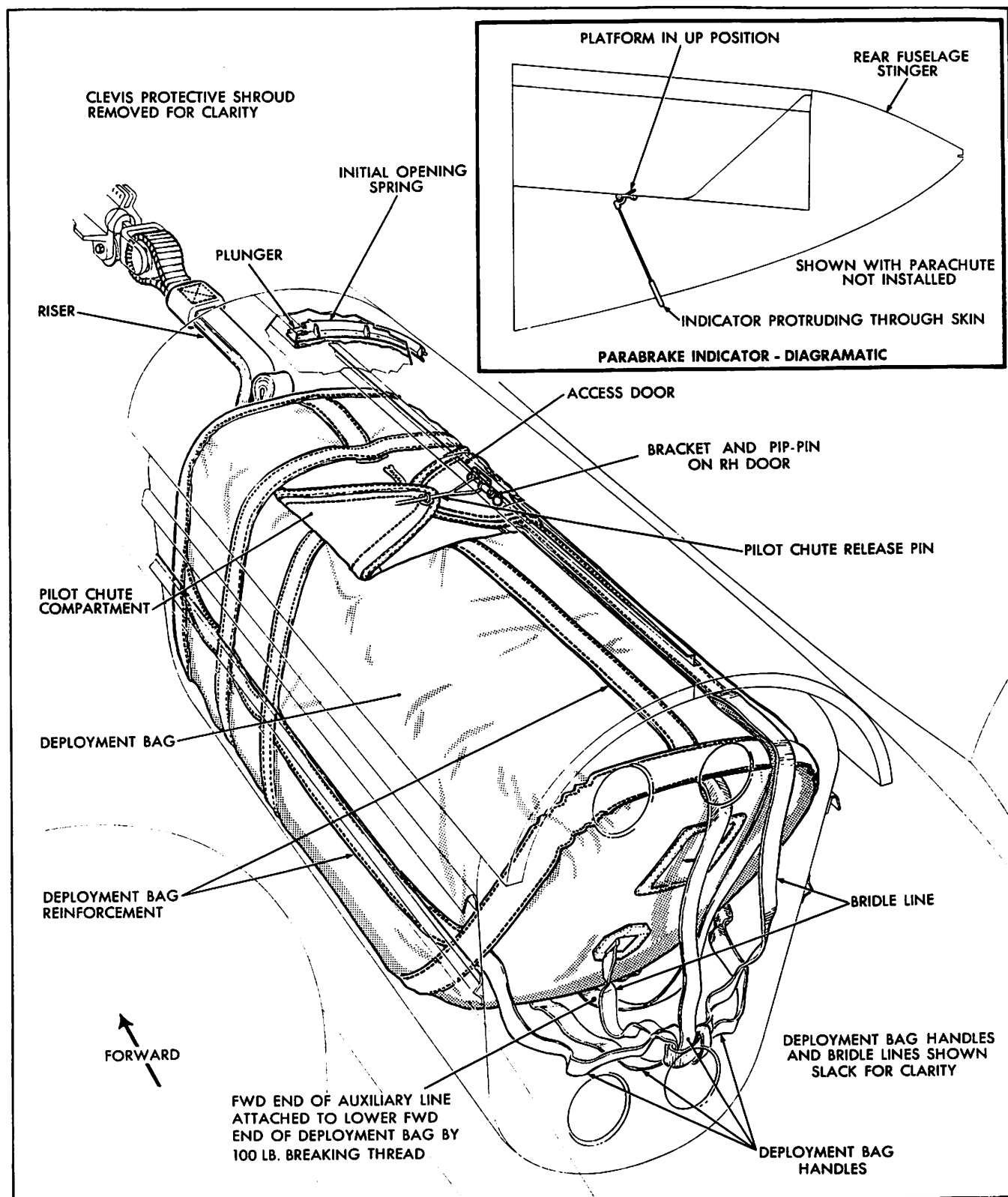
36 When installing the parachute assembly in the parabrake box the aircraft must be in the following condition:

- (a) The control cable must be correctly tensioned.
- (b) The master electrical switch must be OFF.
- (c) The selector lever must be in the doors closed position.
- (d) The parabrake release must be open.

37 To install the parachute assembly, proceed as follows:

- (a) Install the correctly packed deployment bag in the parabrake box with the pilot chute compartment uppermost and the clevis and riser to the front. Ensure that the bridle lines and deployment bag handles do not become entangled. See fig 6.
- (b) Slide the protective shroud back along the riser to expose the clevis.
- (c) Push the clevis into the socket and rotate the cam clockwise (viewed from the LH side of the aircraft), until it locks. Pull on the riser to ensure that the clevis is secure.
- (d) Slide the protective shroud over the clevis and attach the female halves of the two press studs on the shroud to the male halves on the aft face of the frame at station 803.

ARROW 1 SERVICE DATA



7M1-1906-2

FIG. 6 INSTALLATION OF PARACHUTE ASSEMBLY

ARROW 1 SERVICE DATA

(e) Tuck the spare section of riser down between the front end of the deployment bag and the front of the parabrake box.

(f) Close the doors. Open the access door in the RH door and connect the loop of the pilot chute release pin to the bracket on the RH door, using the special pip-pin. Close the access door.

(g) Carry out a pre-flight check. See para 38.

PRE-FLIGHT CHECK

38 Before flight the parabrake should be checked as follows:

(a) Ensure that the parabrake doors are closed and locked.

(b) Open the access door in the RH door and check that the pilot chute release pin is

connected to the bracket on the RH door. Close the access door.

(c) Ensure that the indicator rod is flush with the lower skin of the rear fuselage stinger.

(d) Ensure that the selector lever in the front cockpit is in the doors closed position.

(e) Switch the master electrical switch ON.

(f) Check that the PARABRAKE LOCK indicator light on the refuel and test panel can be illuminated by depressing the body of the light. The refuel and test panel is located forward of the LH speed brake and the access door can only be opened when the speed brake is IN.

(g) Close and fasten the refuel and test panel access door.

(h) Switch the master electrical switch OFF.

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Parachute Assembly	REF. NO. 31
AVRO PART NO. 7-3159-11		MANUFACTURER Irving Air Chute Co.	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 50 landings					
FUNCTION To reduce aircraft speed during landing.					
LOCATION Rear fuselage stinger.					
ACCESS Accessible when the parachute box doors are opened.					MEN X MINUTES
REPLACEMENT PROCEDURE Position the selector lever in the doors closed selection. Install the parachute and deployment bag in the box. Insert the ball of the clevis in the socket. Rotate the cam by hand until the locking pawl engages. Connect the pilot chute release pin to the parachute box door. Close the doors. Check to ensure the door lock is engaged.					MEN X MINUTES

ARROW 1 SERVICE DATA

~~UNCLASSIFIED~~

INSPECTION Check release mechanism for security, wear, damage and correct functioning. Check the solenoid operation. Lubricate according to lubrication chart.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power unit. B4 Access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Door and Parabrake Release		REF. NO. 31	
AVRO PART NO. 7-3159-1		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION (1) To open parabrake box and stream the parachute. (2) To jettison the parachute assembly.							
LOCATION Upper section of the rear fuselage at station 803.							
ACCESS Remove the rear fuselage stinger.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the release lever in the socket. Tighten and wirelock the two bolts securing the release lever pivot. Assemble the race on the cam and fit to the socket. Torque load the bolt 660 lb-ins to 780 lbs-ins and lock with a cotter pin. Install cam follower assembly, 3 bolts. Connect link to damper and cam follower, 2 clevis pins and split pins. Replace rear fuselage stinger.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check for security, wear, damage and correct operation. Lubricate according to lubrication chart.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Cable Tension Regulator	REF. NO. 31
AVRO PART NO. 7-3352-95	MANUFACTURER Pneuma Serve Ltd.		MAN'FR'S PART NO. PS. AV-105	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION Compensates for changes in cable length due to temperature changes and structural flexing.					
LOCATION Secured to the pilots cockpit floor at station 150.					
ACCESS Remove the pilot's seat and left hand front console panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Secure the regulator to the cockpit floor with six screws and nuts. Connect the input and output cables. Adjust the cable to the correct length. Replace the console panel, secured with nine camlocs. Replace the pilot's seat.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Carry out a functional check. Check the cable tension.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand. B4 stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Parabrake Box Assembly		REF. NO. 31	
AVRO PART NO. 7-1059-5145		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION Provides stowage for the parachute brake.							
LOCATION Rear fuselage stinger.							
ACCESS The box is integral with the rear fuselage stinger. Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the rear fuselage stinger on the aircraft. Tighten and lock the four latches. Check the parabrake box doors for operation and locking.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, damage, distortion and loose rivets. Check the fibre glass fairing for damage. Carry out a functional test.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Electrical ground power unit.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Parabrake Doors		REF. NO. 31	
AVRO PART NO. 7-1059-6101, 6102		MANUFACTURER Fleet Aircraft		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To enclose the parabrake box.							
LOCATION Parabrake box.							
ACCESS Unobstructed when the doors are closed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Lock the forward lever arms in the closed position. Attach the door to the lever arms with ten screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for damage, security and clearance.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Parabrake Indicator	REF. NO. 31	
AVRO PART NO. 7-1059-11585	MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours						
FUNCTION To indicate the presence of the parachute assembly in the parabrake box.						
LOCATION Lower skin of parabrake box. Indicator rod at lower skin of stinger.						
ACCESS Unobstructed when parachute assembly removed.					MEN X MINUTES	
REPLACEMENT PROCEDURE Slide indicator rod into guide tube. Secure indicator panel to parabrake box with 18 bolts.					MEN X MINUTES	

UNCLASSIFIED
ARROW SERVICE DATA

INSPECTION Check indicator for security, damage and freedom of movement. Check that indicator rod does not protrude through lower skin of stinger when parachute is installed.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 Stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PARACHUTE BRAKE		SUB-SYSTEM		COMPONENT Parabrake Control		REF. NO. 31	
AVRO PART NO. 7-3352-3		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION Provides pilot with means of streaming and jettisoning the parachute.							
LOCATION L.H. side of pilots cockpit, Station 157.							
ACCESS Remove power lever control box.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect cable to selector lever. Install unit in position with 3 bolts. Install cover plate, 12 screws.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, wear and damage. Carry out function test.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand. Electrical ground power unit.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

SECTION 11

FLYING CONTROLS

MECHANICAL

(This data supersedes previous issue dated 20 December 1956)

15 FEB 58

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

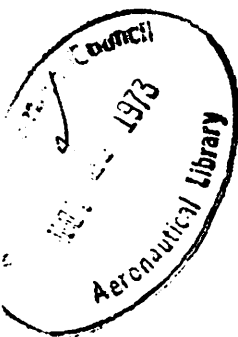
PAGE NO.

Classification cancelled ~~Arrow 1~~ SERVICE DATA

by authority of (date)

Signature *[Signature]* Rank *FLC*
TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Modes of Control	1
Normal Mode	1
Damping in the Normal Mode	1
Pitch Damping	1
Roll Damping	2
Yaw Damping and Rudder Turn Co-ordination	2
Pilot Feel in the Normal Mode	2
'G' Command Limit	2
'G' Limiter	2
Rate of Roll Command Limit	4
Rate of Roll Limiter	4
Limitation about the Yaw Axis	4
Re-engaging into the Normal Mode	4
Trimming in the Normal Mode	4
Normal Mode Disengagement	4
Automatic Feel Trim	4
Pressure Trim	4
Automatic Flight Mode	4
Automatic Control in the Automatic Flight Mode	5
Pilot Assist Functions of the Automatic Flight Mode	5
Emergency Disengagement of the Automatic Flight Mode	5
Emergency Mode	5
Control Column	5
Rudder Bar Assembly	6
Elevator Control Circuit	6
Elevator Rear Quadrant and Linkage	8
Elevator Control Linkage	10
Aileron Control Circuit - Fuselage	11
Aileron Rear Quadrant and Linkage	12
Aileron Control Cable Circuits - Inner Wing	13
Aileron Control Linkage	13
Rudder Control Circuit	14
Rudder Control Linkage	15
Cable Tension Regulator Quadrants in Fuselage	15
Cable Tension Regulators in Wings	15
Elevator Feel-and-Trim Unit	16
Aileron Feel-and-Trim Unit	18
Rudder Feel-and-Trim and Hinge Moment Limitation System	1
Speed Brakes	2
INSPECTION	(To be issued later)
RIGGING PROCEDURE	
General	2
Elevator Controls	2
Aileron Controls	2



ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
-------	------

Rudder Controls	27
Speed Brakes	28

FAULTS AND REMEDIES	(To be issued later)
---------------------	----------------------

COMPONENT SERVICE DATA

Control Column.....	29
Stick Force Transducer.....	31
Rudder Pedals	33
Aileron Feel-and-Trim Unit	35
Elevator Feel-and-Trim Unit	37
Rudder Feel-and-Trim and Hinge Moment Limitation System.....	39
Aileron Cable Tension Regulator Quadrant in Fuselage	41
Elevator Cable Tension Regulator Quadrant	43
Rudder Cable Tension Regulator Quadrant	45
Aileron Rear Fuselage Quadrant	47
Elevator Rear Quadrant.....	49
Aileron Cable Tension Regulators in Wings	51
Aileron Fuselage Cables - Front	53
Aileron Fuselage Cables - Rear	55
Aileron Wing Cables.....	57
Elevator Front Cables	59
Elevator Rear Cables	61
Rudder Front Cables	63
Rudder Centre Cables	65
Rudder Rear Cables	67
Bellcrank Levers - Aileron Control Linkage.....	69
Control Rod - Aileron Control Linkage	71
Link - Aileron Control Linkage	73
Bellcrank Levers - Elevator Control Linkage	75
Control Rod - Elevator Control Linkage	77
Link - Elevator Control Linkage	79
Bellcrank Levers - Rudder Control Linkage	81
Control Rods - Rudder Control Linkage	83
Link - Rudder Control Linkage	85
Bearings - Flying Control Linkages	87

ARROW 1 SERVICE DATA

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Modes of Control	1
Normal Mode	1
Damping in the Normal Mode	1
Pitch Damping	1
Roll Damping	2
Yaw Damping and Rudder Turn Co-ordination	2
Pilot Feel in the Normal Mode	2
'G' Command Limit	2
'G' Limiter	2
Rate of Roll Command Limit	4
Rate of Roll Limiter	4
Limitation about the Yaw Axis	4
Re-engaging into the Normal Mode	4
Trimming in the Normal Mode	4
Normal Mode Disengagement	4
Automatic Feel Trim	4
Pressure Trim	4
Automatic Flight Mode	4
Automatic Control in the Automatic Flight Mode	5
Pilot Assist Functions of the Automatic Flight Mode	5
Emergency Disengagement of the Automatic Flight Mode	5
Emergency Mode	5
Control Column	5
Rudder Bar Assembly	6
Elevator Control Circuit	6
Elevator Rear Quadrant and Linkage	8
Elevator Control Linkage	10
Aileron Control Circuit - Fuselage	11
Aileron Rear Quadrant and Linkage	12
Aileron Control Cable Circuits - Inner Wing	13
Aileron Control Linkage	13
Rudder Control Circuit	14
Rudder Control Linkage	15
Cable Tension Regulator Quadrants in Fuselage	15
Cable Tension Regulators in Wings	15
Elevator Feel-and-Trim Unit	16
Aileron Feel-and-Trim Unit	18
Rudder Feel-and-Trim and Hinge Moment Limitation System	19
Speed Brakes	20
INSPECTION (To be issued later)	
RIGGING PROCEDURE	
General	22
Elevator Controls	22
Aileron Controls	25

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
-------	------

Rudder Controls	27
Speed Brakes	28

FAULTS AND REMEDIES	(To be issued later)
---------------------	----------------------

COMPONENT SERVICE DATA

Control Column.....	29
Stick Force Transducer.....	31
Rudder Pedals	33
Aileron Feel-and-Trim Unit	35
Elevator Feel-and-Trim Unit	37
Rudder Feel-and-Trim and Hinge Moment Limitation System.....	39
Aileron Cable Tension Regulator Quadrant in Fuselage	41
Elevator Cable Tension Regulator Quadrant	43
Rudder Cable Tension Regulator Quadrant	45
Aileron Rear Fuselage Quadrant	47
Elevator Rear Quadrant.....	49
Aileron Cable Tension Regulators in Wings	51
Aileron Fuselage Cables - Front	53
Aileron Fuselage Cables - Rear	55
Aileron Wing Cables.....	57
Elevator Front Cables	59
Elevator Rear Cables	61
Rudder Front Cables	63
Rudder Centre Cables	65
Rudder Rear Cables	67
Bellcrank Levers - Aileron Control Linkage.....	69
Control Rod - Aileron Control Linkage	71
Link - Aileron Control Linkage	73
Bellcrank Levers - Elevator Control Linkage	75
Control Rod - Elevator Control Linkage	77
Link - Elevator Control Linkage	79
Bellcrank Levers - Rudder Control Linkage	81
Control Rods - Rudder Control Linkage	83
Link - Rudder Control Linkage	85
Bearings - Flying Control Linkages	87

ARROW 1 SERVICE DATA

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Flying Controls Schematic...	3
2	Control Column ...	6
3	Rudder Bar Assembly...	7
4	Elevator Cable Tension Regulator Quadrant and Linkage ...	8
5	Elevator Rear Quadrant and Linkage ...	9
6	Elevator Control Linkage ...	10
7	Aileron Cable Tension Regulator Quadrant and Linkage...	11
8	Aileron Rear Quadrant and Linkage ...	12
9	Aileron Control Linkage ...	13
10	Rudder Control Linkage ...	14
11	Cable Tension Regulator Quadrant (Fuselage) ...	16
12	Elevator Feel-and-Trim Unit Schematic ...	17
13	Elevator Feel-and-Trim Emergency Release Mechanism ...	18
14	Rudder Feel-and-Trim and Hinge Moment Limitation System ...	19
15	Rudder Feel-and-Trim and Hinge Moment Limitation System Function Schematics ...	21
16	Neutral Position of the Actuator Linkages ...	22
17	Provisional Cable Tensioning Chart ...	23
18	Ranges of Movement of Control Surfaces ...	24
19	Ranges of Movement of Cockpit Controls ...	25

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The flying controls are fully power operated by a system which comprises mechanical, hydraulic, electronic and electrical components. Power operation eliminates the necessity for mass balancing, and also permits the entire surfaces to be trimmed, eliminating the need for trimming tabs.

2 There is no direct mechanical linkage between the cockpit controls and the control surfaces, so without hydraulic power no control is possible. For this reason, as a safety measure, two independent flying control hydraulic systems are fitted. See Arrow 1 Service Data - Flying Controls Hydraulics for the hydraulic operation, and Electrical Systems - Flying Controls for the electrical operation.

3 The system gives full rate operation throughout a hydraulic fluid temperature range of 0°F to 275°F. A limited rate performance is given at temperatures down to -20°F, but at temperatures below -20°F it is necessary to warm up the hydraulic fluid before flight by running the engines and operating the controls. Warm-up from -65°F to 0°F takes approximately six minutes.

4 Incorporated in the flying control system is an automatic damping system which adjusts the control surfaces to stabilize the aircraft in pitch, roll and yaw, and also automatically co-ordinates the movement of the rudder with the pilot's control movements of the ailerons and elevators.

MODES OF CONTROL

5 There are three modes of control:

- (a) Normal mode.
- (b) Automatic flight mode.
- (c) Emergency mode.

NORMAL MODE

6 The normal mode is the primary mode

of operation. Forces exerted on the control column are converted into signals by a stick force transducer incorporated in the aileron and elevator circuits at the control column. The signals are modified by an electronic network and an air data computing system and are then fed to parallel servos in the respective control circuits. The parallel servos are electro-hydraulic units which convert the amplified signals into hydraulic power to actuate the respective rear quadrants.

7 The rear quadrants are linked mechanically to hydraulic actuator control valves which direct fluid to the appropriate side of the actuator pistons. The movement of the actuator pistons is transmitted to the control surfaces by control linkages. See figs 6 and 9.

8 Modified signals originating from the stick force transducers are also fed to electro-hydraulic differential servos, which are fitted in the actuator linkage as part of the damping system. This increases the speed of response of the control surfaces to control column movement.

9 Movement of each parallel servo from neutral progressively increases the inductance of a feed-back transformer which is fitted in a feed-back circuit to nullify the signal to the parallel servo. When control surface movement reaches a position to achieve the commanded manoeuvre, the feed-back signal nullifies the input signal to the parallel servo terminating its movement.

DAMPING IN THE NORMAL MODE

10 Damping in the normal mode is provided about all three axes, and is controlled by electrical signals fed through damping networks by inputs from a pitch rate gyro and a roll rate gyro for pitch and roll damping, and by a yaw rate gyro and lateral accelerometer for yaw damping. See Arrow 1 Service Data - Electrical Systems - Flying Controls.

PITCH DAMPING

11 In the pitch axis, short-term movements, i.e. movements at rates of more than four cycles per second, are damped out by the

ARROW 1 SERVICE DATA

UNCLASSIFIED

differential servos in the elevator actuator linkage. Movements at rates of less than four cycles per second, i.e. long-term movements, are damped out by the elevator parallel servo during normal flight.

12 During corrective damping movements of the differential servos, the actuator linkages reposition the actuator control valves which in turn direct hydraulic fluid to the appropriate side of the actuator pistons to effect movement of the control surfaces through the control linkages. The oscillatory movement of the linkages are not fed back to the control column because the parallel servos prevent movement of the rear quadrants.

13 During take-off and landing all damping is provided by the rate gyro through the differential servos.

ROLL DAMPING

14 In the roll axis, aileron damping movement is controlled during normal flight by electronic signals derived from a roll rate gyro feeding to the differential and parallel servos. All damping signals are fed to the differential servos, and signals deriving from long-term movements are also fed to the parallel servo. The differential and parallel servos transmit damping movement to the control surfaces in the same way as with pitch damping.

15 The damping signal to the aileron parallel servo is switched off when a landing gear down selection is made.

YAW DAMPING AND RUDDER TURN CO-ORDINATION

16 Yaw damping and rudder turn co-ordination in the normal mode is provided by a normal yaw damping system, which is controlled automatically by electronic signals.

17 The signals automatically initiate movement of a rudder dual differential servo which operates a rudder actuator control valve through the rudder actuator linkage. The control valve in turn directs hydraulic fluid to the appropriate

side of the rudder actuator piston. The actuator piston rod is mechanically linked to the control surface by the rudder control linkage. See Arrow 1 Service Data - Flying Controls Hydraulics for the operation of the differential servo, the rudder actuator control valve and the rudder actuator and linkage. See fig 10 for the rudder control linkage.

18 The yaw damping system is duplicated to provide emergency yaw damping and turn co-ordination should the normal damping system fail, or should control of the aircraft be reverted to the emergency mode. See para 28. A hydraulically driven emergency alternator provides the electrical supply for yaw damping when the normal a-c supply is not available.

19 A portion of the yaw damping signal is nullified when the landing gear is selected down. This allows the pilot to introduce intentional yaw if necessary during the landing approach.

PILOT FEEL IN THE NORMAL MODE

20 Pilot feel at the control column is provided artificially by the electronic network. Stick force required for manoeuvring in normal flight is proportional to normal acceleration ('g') for the elevators and is proportional to rate of roll for the ailerons. During landing and take-off, feel is proportional to the degree of movement of the aileron and elevator control surfaces.

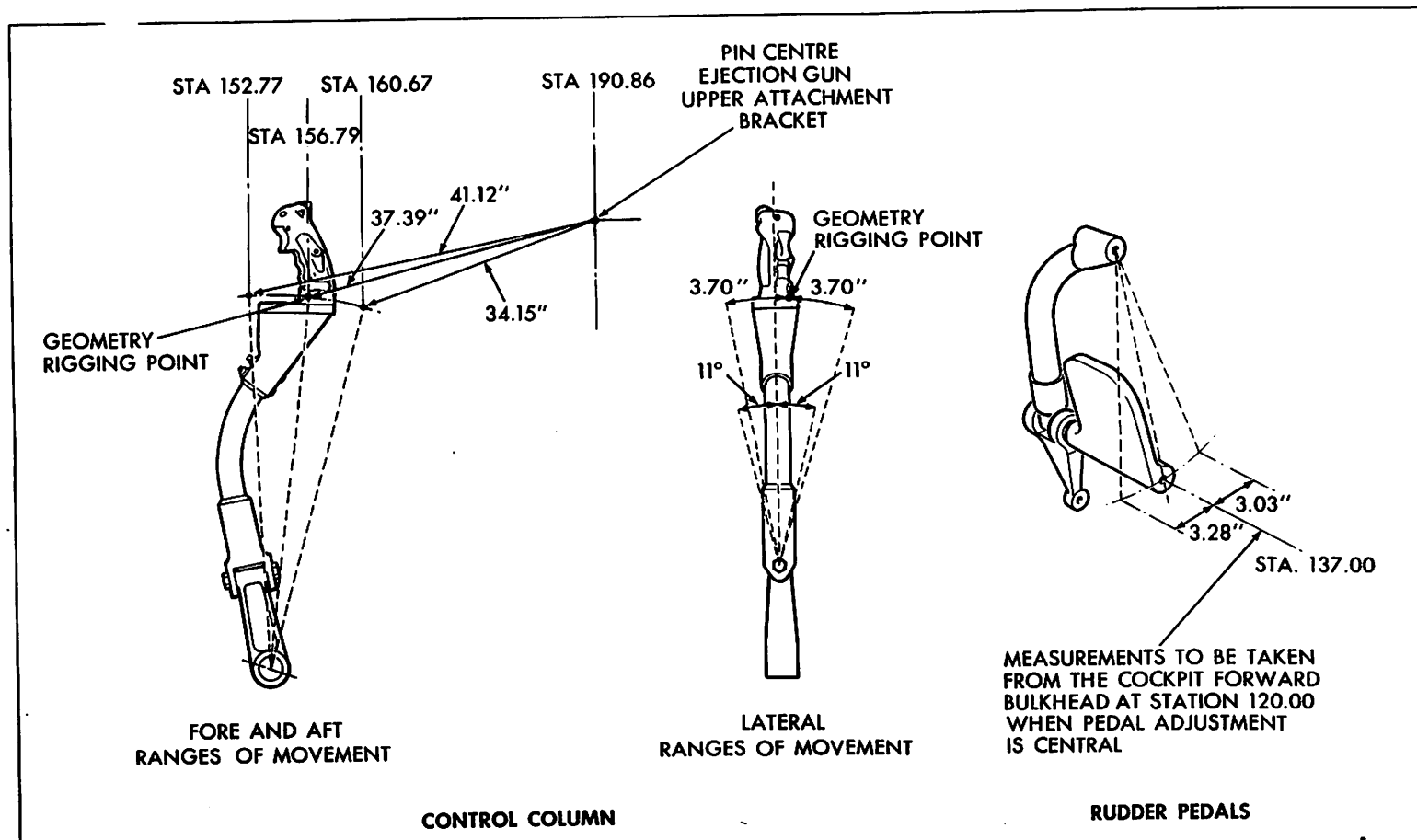
'G' COMMAND LIMIT

21 To prevent overstressing the aircraft structure, the amount of 'g' which may normally be pulled is limited. This is achieved by mechanical stops which limit the output from the stick force transducer.

'G' LIMITER

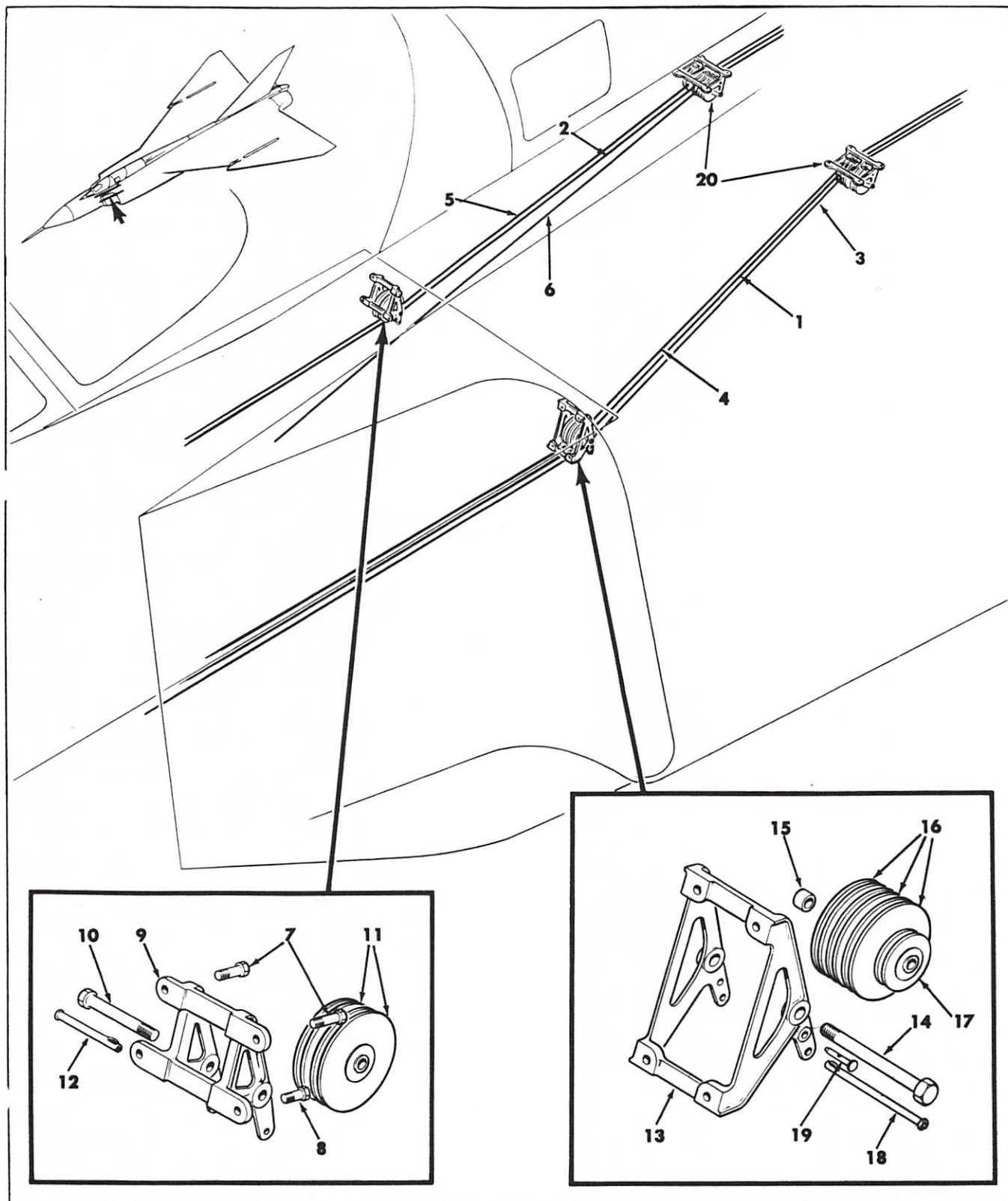
22 A 'g' limiter controlled by two accelerometers is provided to transfer elevator control from the normal mode to the emergency mode in the event that failure of any of the components in the elevator circuits produces conditions of excessive 'g'. 'G' limiting is then manually controlled by the pilot.

ARROW MK 2



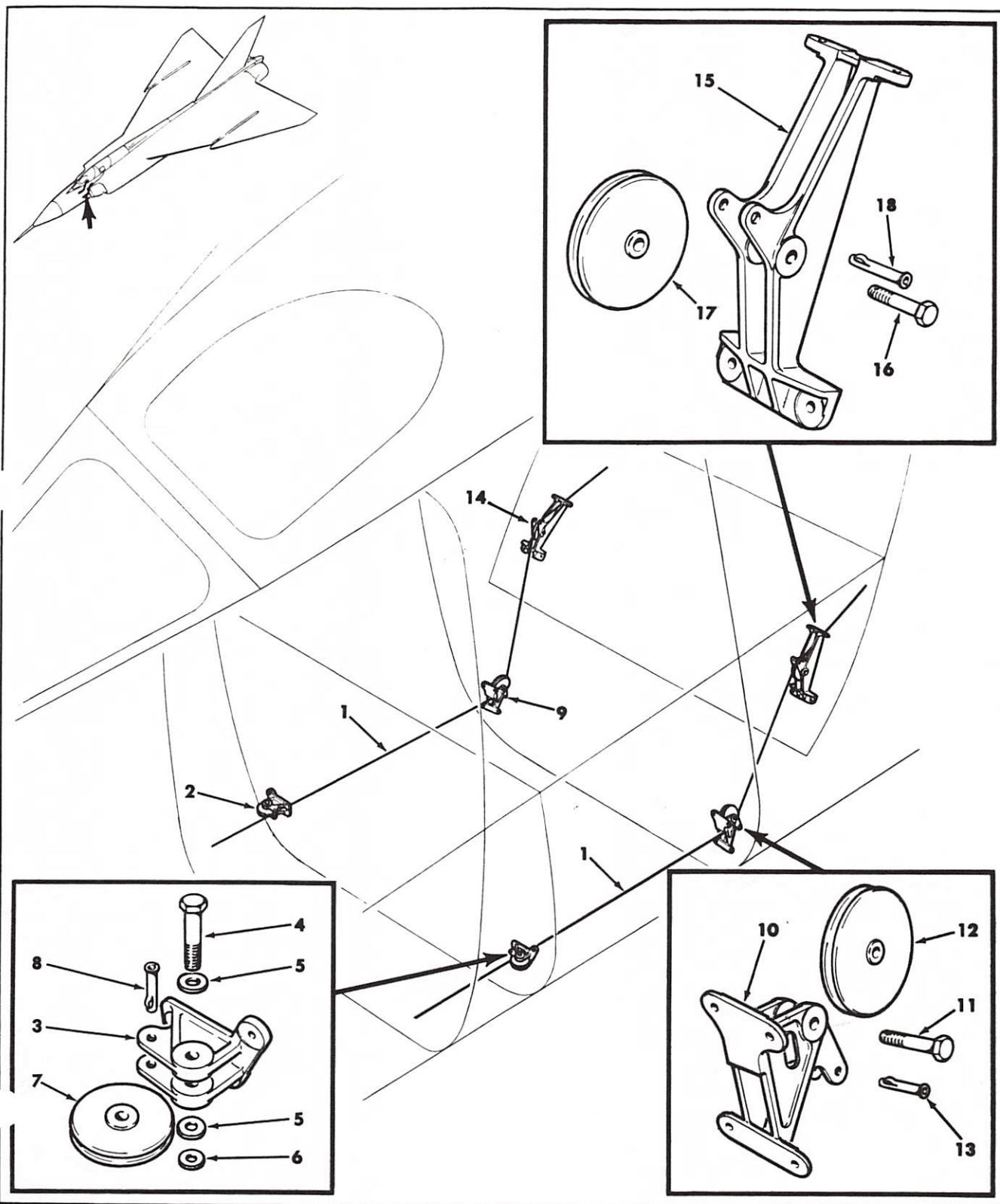


ARROW Mk 2



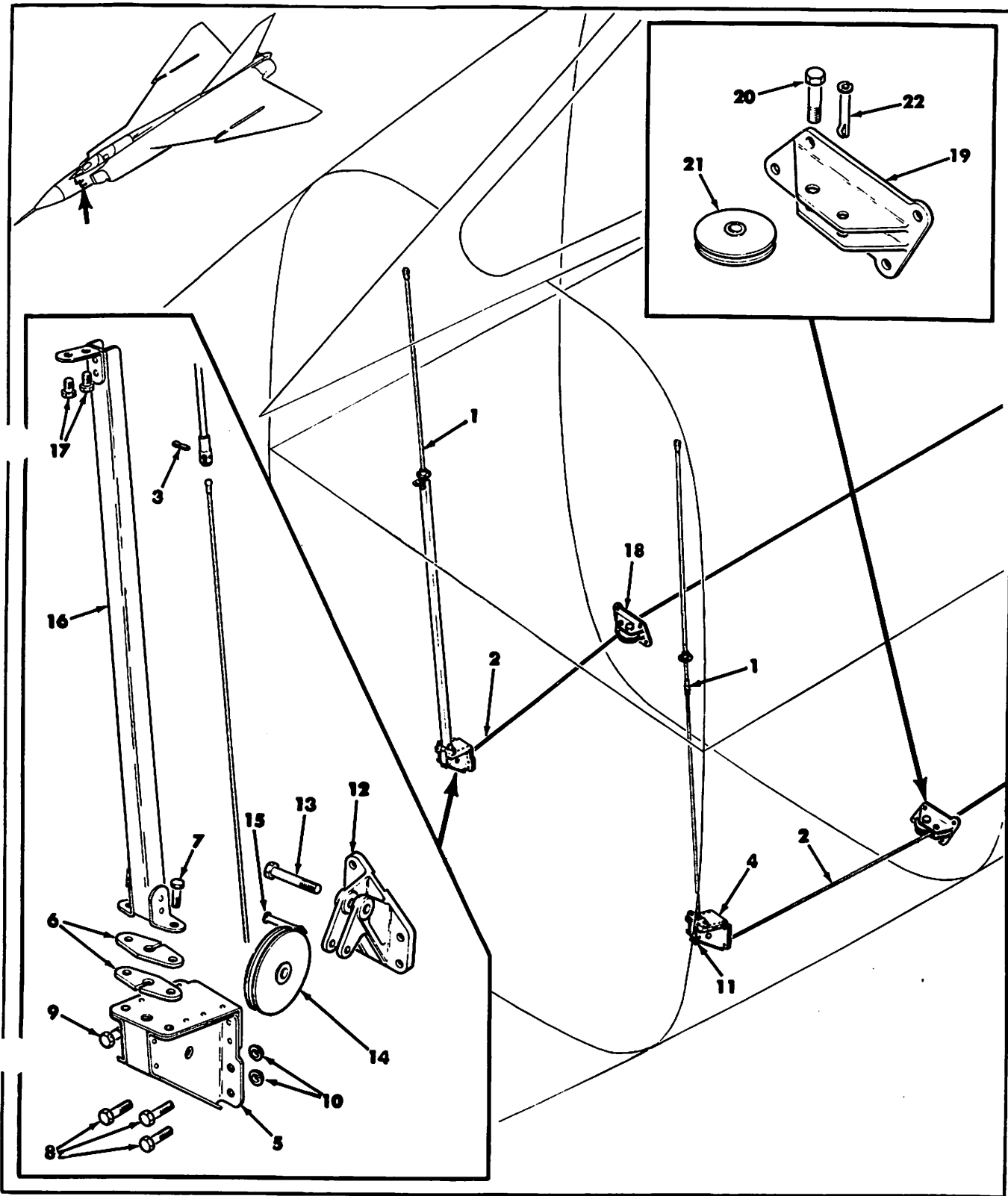


ARROW Mk 2



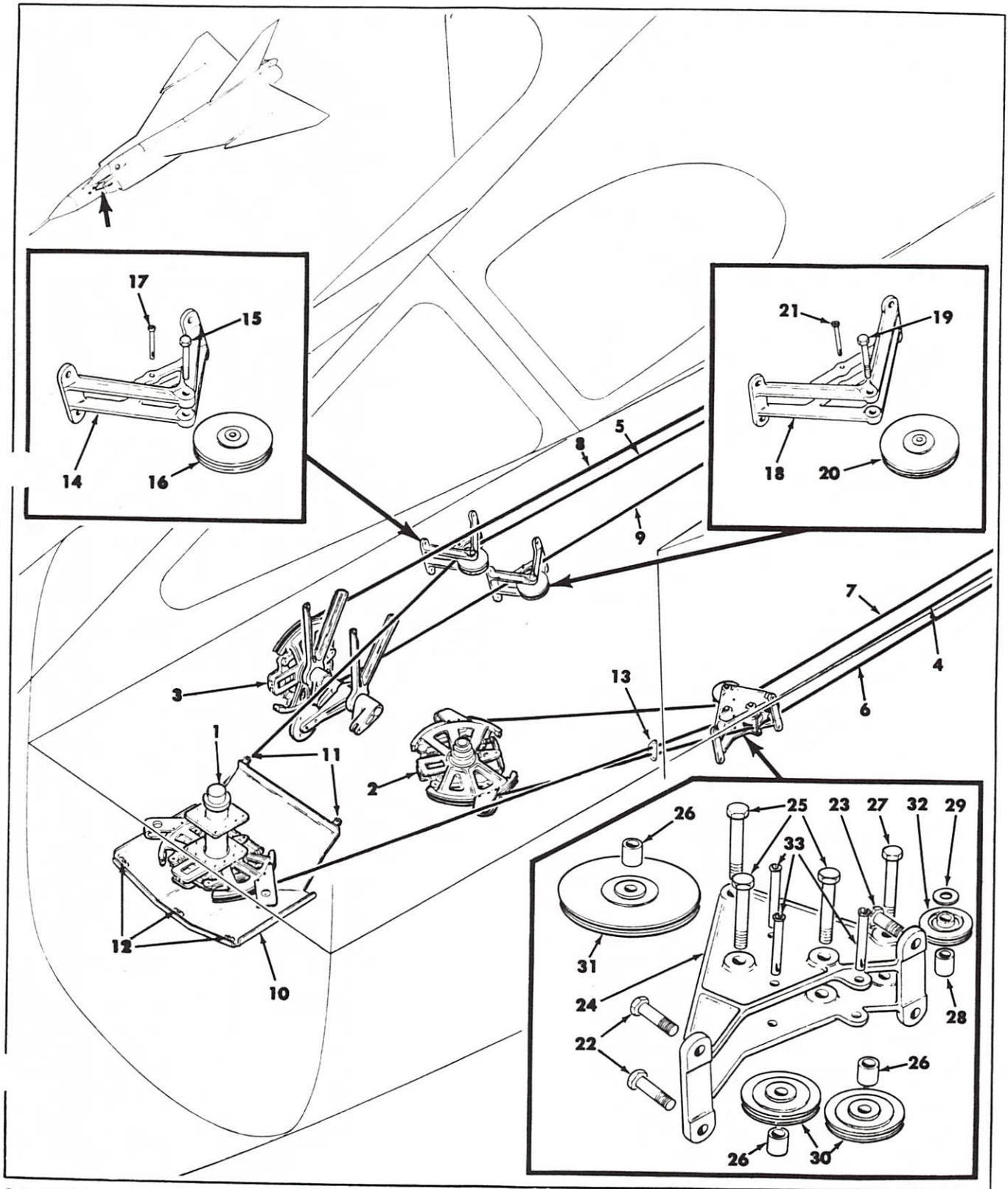


ARROW Mk 2



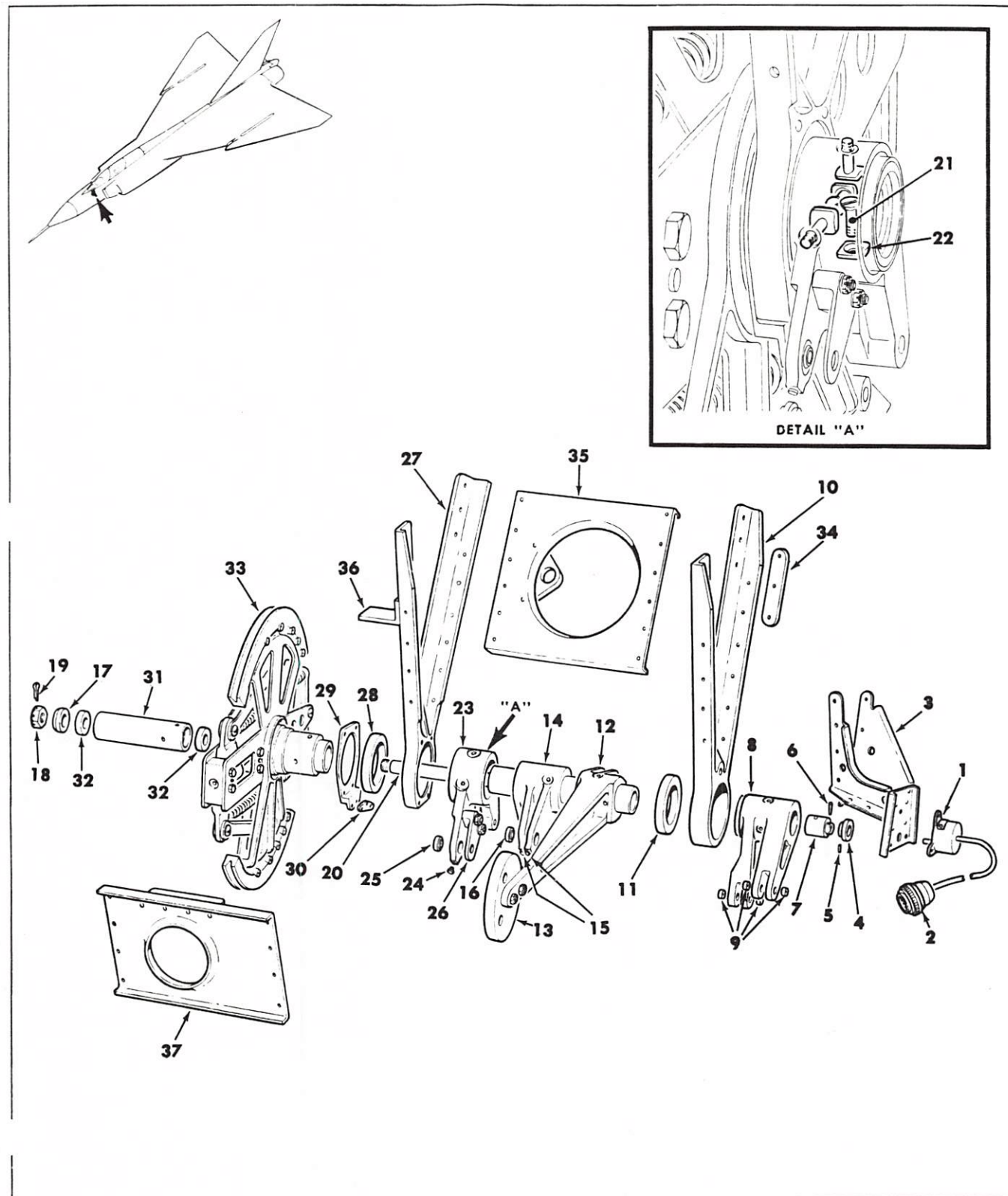


ARROW Mk 2



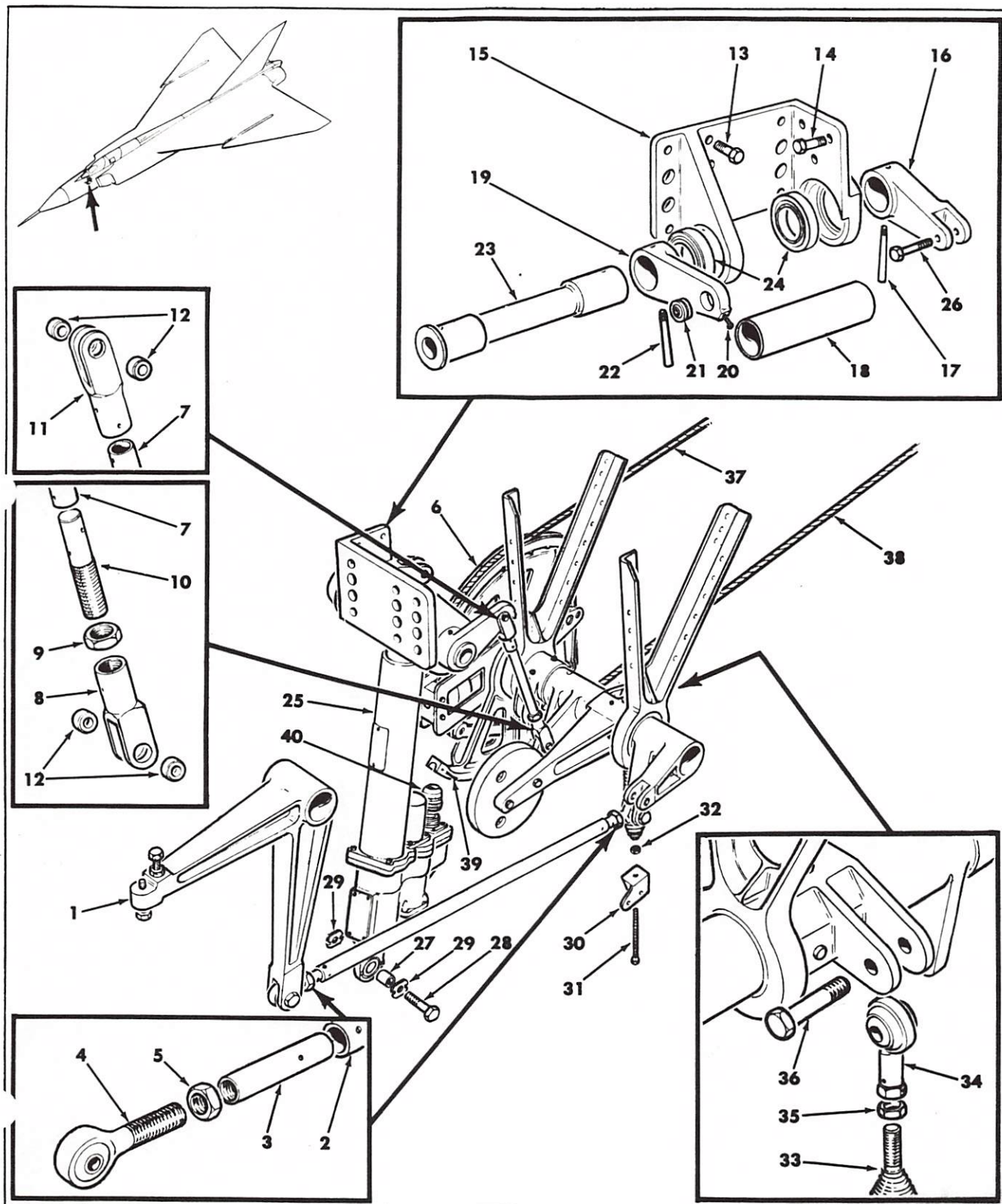


ARROW Mk 2



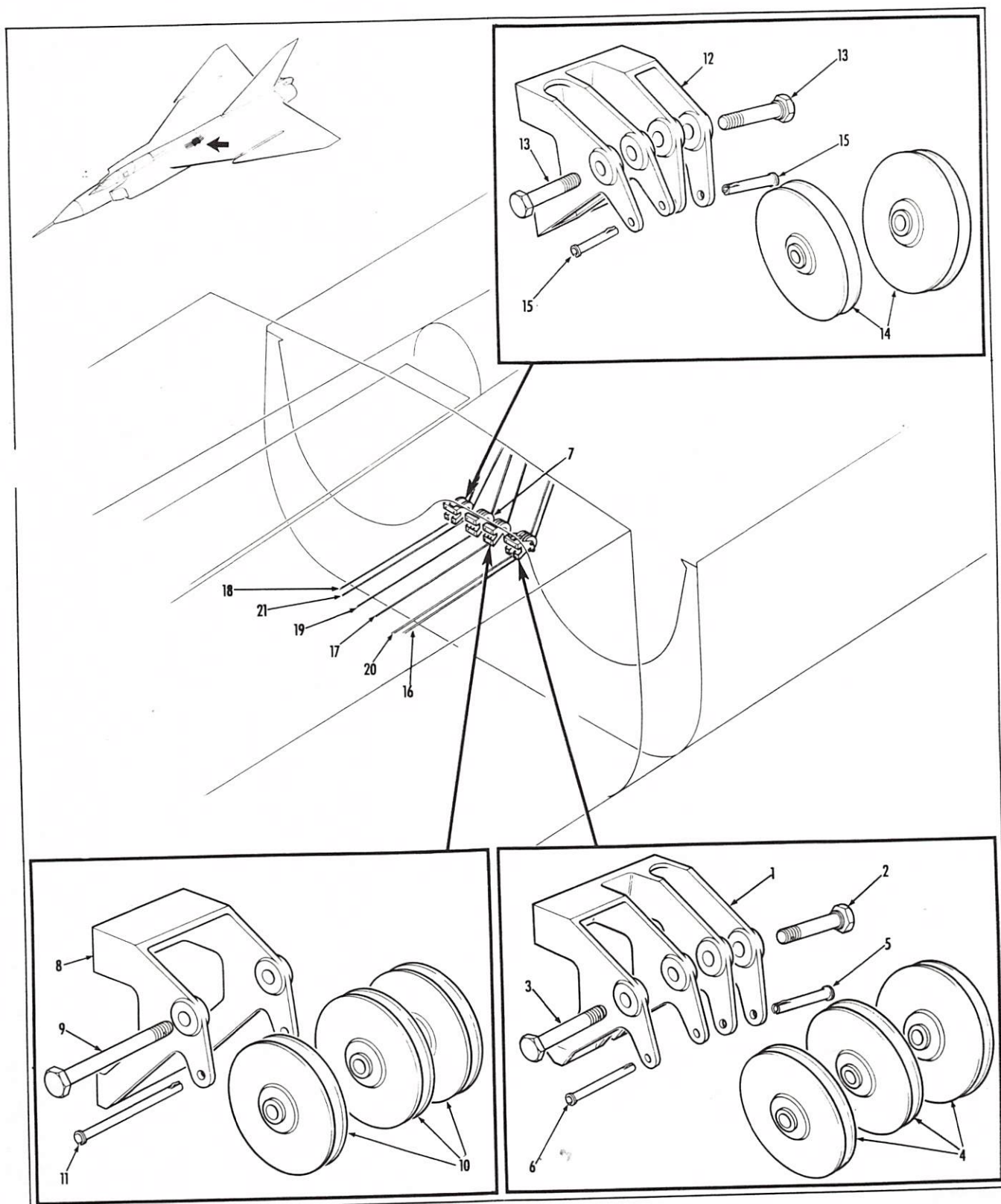


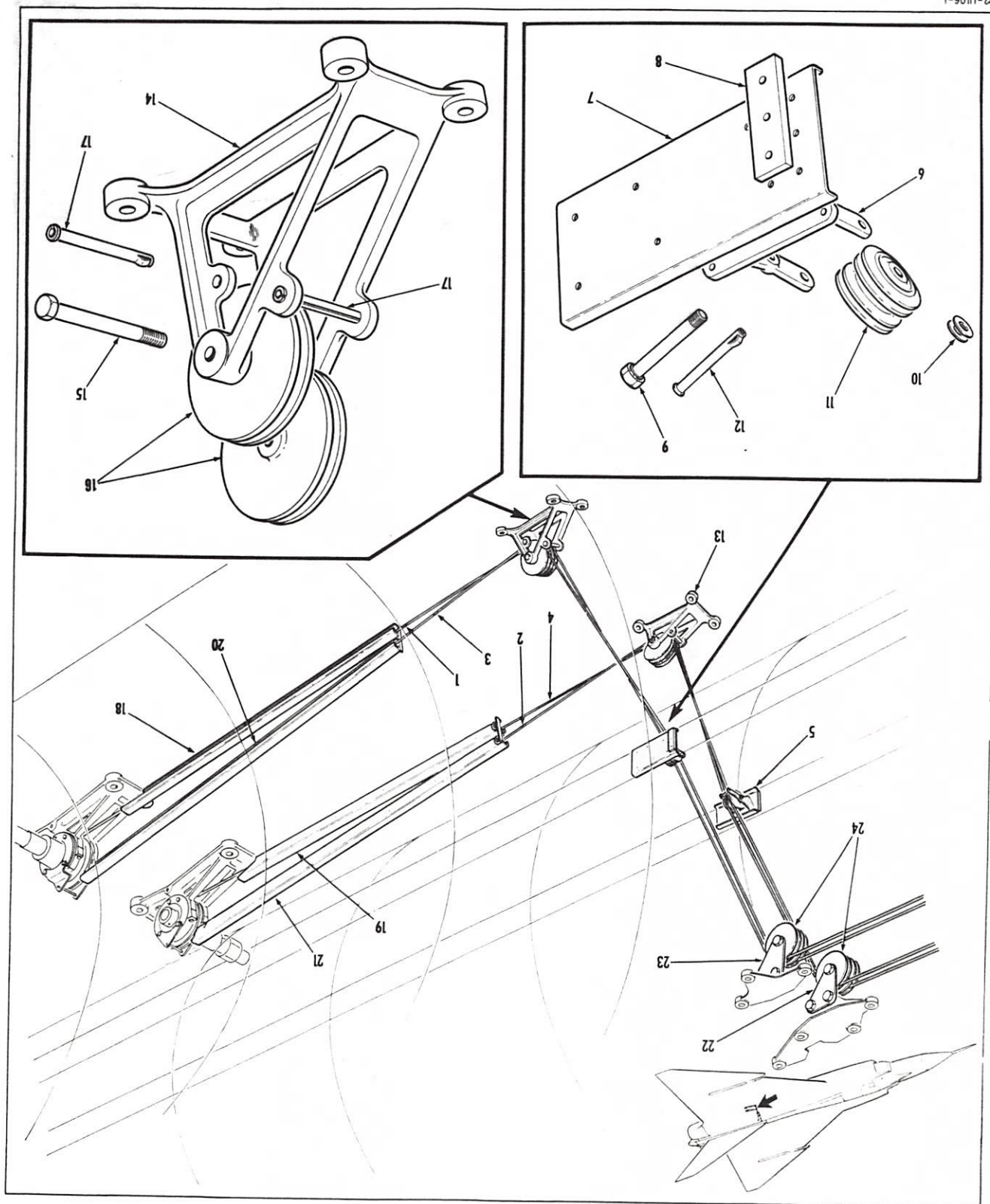
ARROW Mk 2





ARROW Mk 2





ARROW MK 2



AVRO ARROW

AVRO AIRCRAFT LIMITED

ARROW 1 SERVICE DATA

RATE OF ROLL COMMAND LIMIT

23 To prevent overstressing the structure, the rate of roll which may normally be commanded is limited. This is achieved by mechanical stops which limit the output from the stick force transducer.

RATE OF ROLL LIMITER

24 A rate of roll limiter controlled by an accelerometer is provided to transfer aileron control from the normal mode to the emergency mode in the event that failure of any of the components in the aileron circuits causes excessive roll rates. Rate of roll is then manually controlled by the pilot.

LIMITATION ABOUT THE YAW AXIS

25 To prevent overstressing the structure due to excessive sideslip or lateral acceleration, the complete normal damping system is disengaged by a rudder monitor should the aircraft exceed a pre-set lateral acceleration or an angle of sideslip of 10° . Control in all three axes is then in the emergency mode.

RE-ENGAGING INTO THE NORMAL MODE

26 The pilot may re-engage into the normal mode from the emergency mode after limiter disengagement in any of the three axes, by depressing a re-engage button located on the damper function selector panel on the LH console in the pilot's cockpit.

TRIMMING IN THE NORMAL MODE

27 Trimming is normally not necessary for straight and level flight in the normal mode but the pilot may trim to a manoeuvre by operating a four-way switch located on the handgrip on the control column. The switch has four effective positions UP, DOWN, LEFT and RIGHT. The pilot must hold the switch in the desired position until the required manoeuvre is achieved. The switch is spring-loaded to assume a neutral position when released.

NORMAL MODE DISENGAGEMENT

28 The normal mode is automatically disengaged by limiter disengagement in the event of failure of the components in the normal mode system. The normal mode may also be disengaged by the pilot depressing an emergency

button located on the damper function selector panel on the LH console in the pilot's cockpit or by depressing the emergency damping switch on the control column handgrip.

29 When the normal mode is disengaged, pre-engage circuits are made which energize the components to ensure smooth re-engagement should the pilot select re-engage by depressing the ENGAGE button on the damper function selector panel.

AUTOMATIC FEEL TRIM

30 Automatic feel trim is provided in the elevator circuit to prevent a change in pilot feel during changeover from the normal to the emergency mode.

31 An elevator feel-and-trim unit is fitted between the elevator rear quadrant and the aircraft structure to provide pilot feel and trim when in the emergency mode. (See fig 12). When control is in the normal mode, the electric motor operated trim unit is actuated by signals derived from a pressure sensing ram in the elevator parallel servo. This operates the trim motor in such a manner that parallel servo load is transmitted to the feel spring in the feel-and-trim unit. Thus, on changeover to the emergency mode there is no change in pilot feel.

32 There is no provision for automatic feel trim in the aileron system.

PRESSURE TRIM

33 Pressure trim circuits, controlled by hydraulic pressure sensing rams in the parallel servos, permit re-engagement into the normal mode from the emergency mode, only when pressures in the parallel servos are equalized. This ensures smooth re-engagement free from undesirable control column movement.

AUTOMATIC FLIGHT MODE

34 The automatic flight mode provides for controlling the aircraft automatically by signals from a ground control station, the aircraft fire control system, or the airborne navigational instruments. It also provides for pilot assist functions when the aircraft is controlled by the pilot.

ARROW 1 SERVICE DATA

AUTOMATIC CONTROL IN THE AUTOMATIC FLIGHT MODE

35 The automatic flight mode provides for automatic control of the aircraft by signals from an integrated coupler feeding into the parallel servo and damping networks. The inputs into the integrated coupler are from any one of the following sources:

- (a) Automatic ground control interceptor (A.G.C.I.).
- (b) Attack.
- (c) Automatic navigation.
- (d) Automatic ground control approach (A.G.C.A.).

PILOT ASSIST FUNCTIONS OF THE AUTOMATIC FLIGHT MODE

36 The automatic flight mode in conjunction with the damping system provides for the following pilot assist functions:

- (a) Pitch attitude hold.
- (b) Roll attitude hold.
- (c) Heading hold.
- (d) Mach hold.
- (e) Altitude hold.

EMERGENCY DISENGAGEMENT OF THE AUTOMATIC FLIGHT MODE

37 The automatic flight mode is automatically disengaged by limiter disengagement in the event of failure of the components in the automatic flight control system or the damping system, and control reverts to the emergency mode. The automatic flight mode may also be disengaged by depressing the automatic flight disengage switch on the control column handgrip, and control reverts to the normal mode.

38 In the automatic flight mode with no stick force applied, the elevator feel-and-trim unit is trimmed to within $\pm .5$ 'g' from the straight and level flight condition of 1 'g' by the elevator automatic trim circuit, so that in the event of 'g' limiter disengagement, the pitch acceleration is automatically reduced to within the range of $+ .5$ 'g' to $+ 1.5$ 'g'.

EMERGENCY MODE

39 The emergency mode is the mechanical mode of operation, and is a secondary system to the normal mode of operation. In this mode the hydraulic actuator control valves are actuated mechanically through conventional cable and quadrant circuits by movement of the control column and if necessary the rudder bar.

40 Emergency yaw damping and rudder turn co-ordination only are retained in the emergency mode.

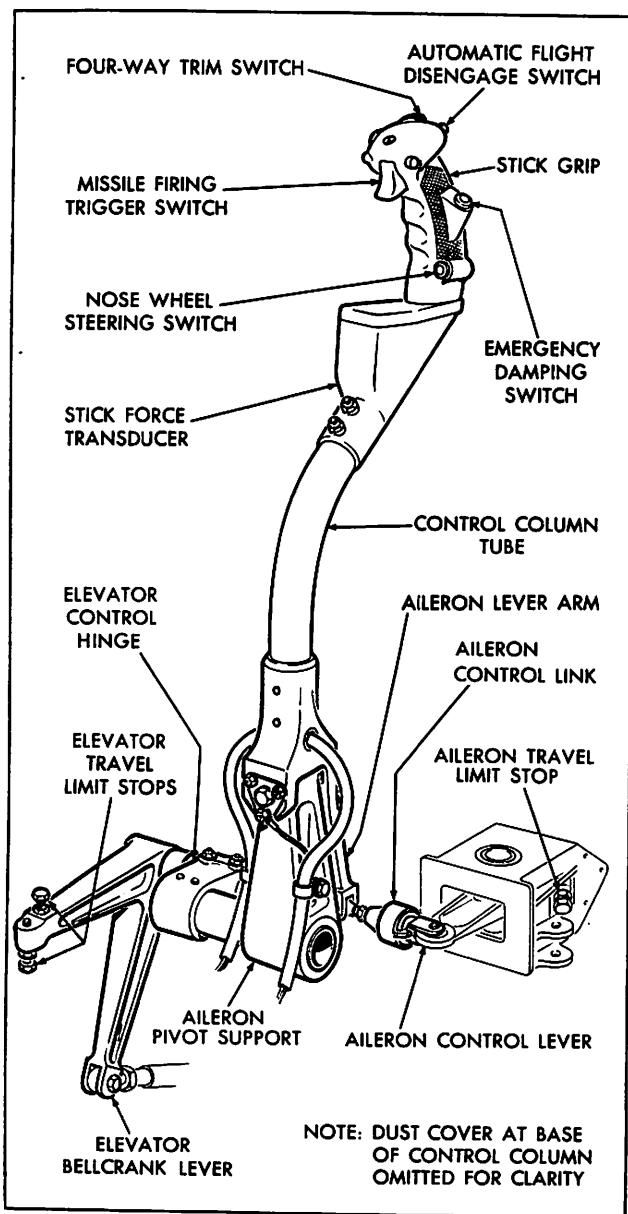
41 Fig 1 illustrates the routing of the cables. Each control cable circuit is fitted with a cable tension regulator quadrant to compensate for structural deflections and thermal expansion. All straight runs of the control cables are covered with swaged aluminum alloy tubing. Bare sections of cable occur at pulley locations and at cable end connections. Guards are fitted at all pulleys and quadrants to retain the cables in the grooves. All cables are routed through fairleads at points where chafing against the airframe or adjacent controls would otherwise occur.

42 Pilot feel is provided in the emergency mode by springs in feel-and-trim units in the elevator, aileron and rudder circuits. A 'g' bob weight supplements the feel in the elevator system, providing, to a limited extent, a stick force per 'g' feel. The feel-and-trim units also provide for adjustment of the control surfaces to achieve trim in the emergency mode. The rudder feel-and-trim unit also incorporates a hinge moment limitation system which restricts rudder movement, preventing high loads from being inadvertently applied to the vertical stabilizer at high air speeds.

CONTROL COLUMN (Fig 2)

43 The control column located in the pilot's cockpit is of the conventional stick type. The control column handgrip incorporates the four-way switch for aileron and elevator trim, the emergency damping switch push button, the automatic flight disengage switch push button, a missile firing trigger switch and a nose wheel steering switch push button. The stick force transducer is secured to the control tube immediately below the stick grip by taper pins and self-locking nuts.

ARROW 1 SERVICE DATA



7M1-1602-3

FIG. 2 CONTROL COLUMN

44 The base of the control tube is riveted to an aileron lever arm which is pivot mounted to an aileron pivot support. The aileron pivot support is in turn secured to an elevator control hinge torque tube by taper pins and self-locking nuts.

45 The maximum total travel at the handgrip for elevator movement is 10.01 inches and the maximum total travel at the handgrip for aileron movement is 9.10 inches.

RUDDER BAR ASSEMBLY (Fig 3)

46 The rudder bar assembly consists of left hand and right hand pedal assemblies suspended by rudder pedal suspension tube assemblies from support brackets riveted to the top long-erons. The pedal assemblies are connected by push rods to a cross tube assembly mounted on a vertical torque tube which rotates in a torque tube bearing housing. The torque tube and bearing housing pass through the cockpit floor into the nose wheel well. The rudder cable tension regulator quadrant and nose wheel steering quadrant are fitted at the lower end of the torque tube. A travel limit arm in the centre of the cross tube assembly contacts two adjustable travel limit stops to limit rudder movement. A rudder self centre unit is fitted between the travel limit arm and the structure at station 120, and is a double acting strut which returns the rudder bar assembly to its central position when the load on the pedals is released, following a pilot commanded movement of the rudder bar.

47 Provision is made to retain the rudder bar assembly in its central position during rigging operations by inserting a rigging pin in rigging pin holes located in the rudder stop bracket and in the travel limit arm.

48 The rudder pedals' fore-and-aft position is adjustable and each pedal is retained in the desired fore-and-aft position by a spring-loaded pawl engaging with a serrated quadrant on each pedal assembly. The pawl may be disengaged to readjust the pedal position by pulling on a pedal adjust handle at the base of the main instrument panel. The handle is connected to the pawls by Bowden cables. A pedal adjustment tension spring and cable assembly returns each rudder pedal assembly to its fully aft position on pawl disengagement, if no load is applied to the rudder pedals.

49 The maximum total rudder pedal movement is 6.31 inches.

ELEVATOR CONTROL CIRCUIT (Figs 4 and 5)

50 Fore-and-aft movement of the control column rotates an elevator control pivot fitting about its hinge. A bellcrank lever is mounted

ARROW 1 SERVICE DATA

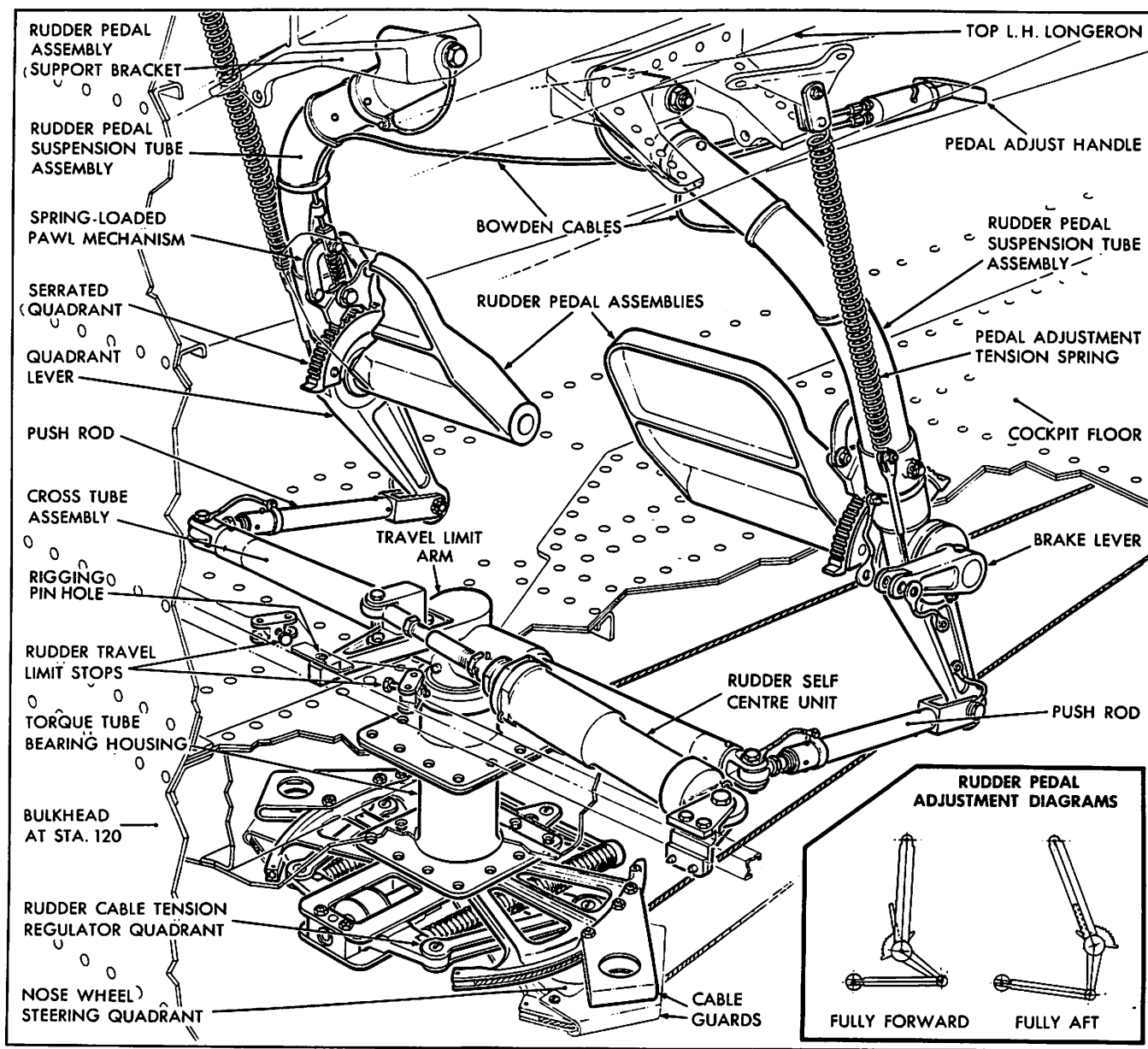


FIG. 3 RUDDER BAR ASSEMBLY

on the pivot fitting shaft and rotates with each pivot fitting movement. The lower arm of the bellcrank lever is connected by a push rod to a lever mounted on the elevator cable tension regulator torque tube to transmit the rotary movement of the bellcrank to the quadrant and operate the cables. The upper arm of the bellcrank lever is fitted with upper and lower travel limit stops which contact upper and lower faces of a travel limit bracket to limit up and down movement of the elevators.

51 The 'g' bob weight is secured to a lever which is mounted on the elevator cable tension regulator torque tube. A torsion spring fitted between the regulator torque tube and the RH quadrant support bracket, balances the quadrant against the weight of the 'g' bob weight. The spring is pre-torqued through 150° on assembly.

52 Provision is made to retain the quadrant in its central position during rigging operations

ARROW 1 SERVICE DATA

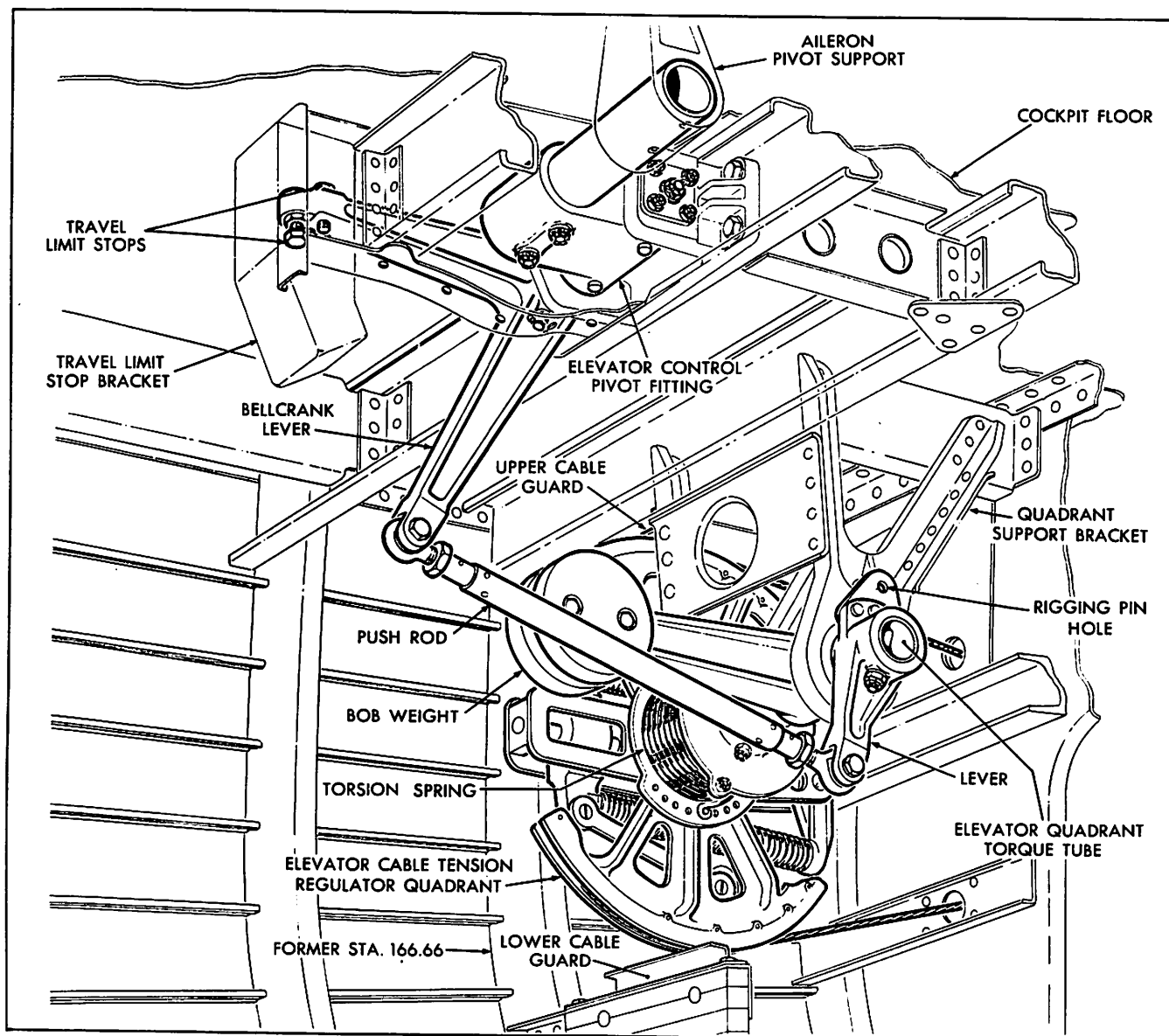


FIG. 4 ELEVATOR CABLE TENSION REGULATOR QUADRANT AND LINKAGE

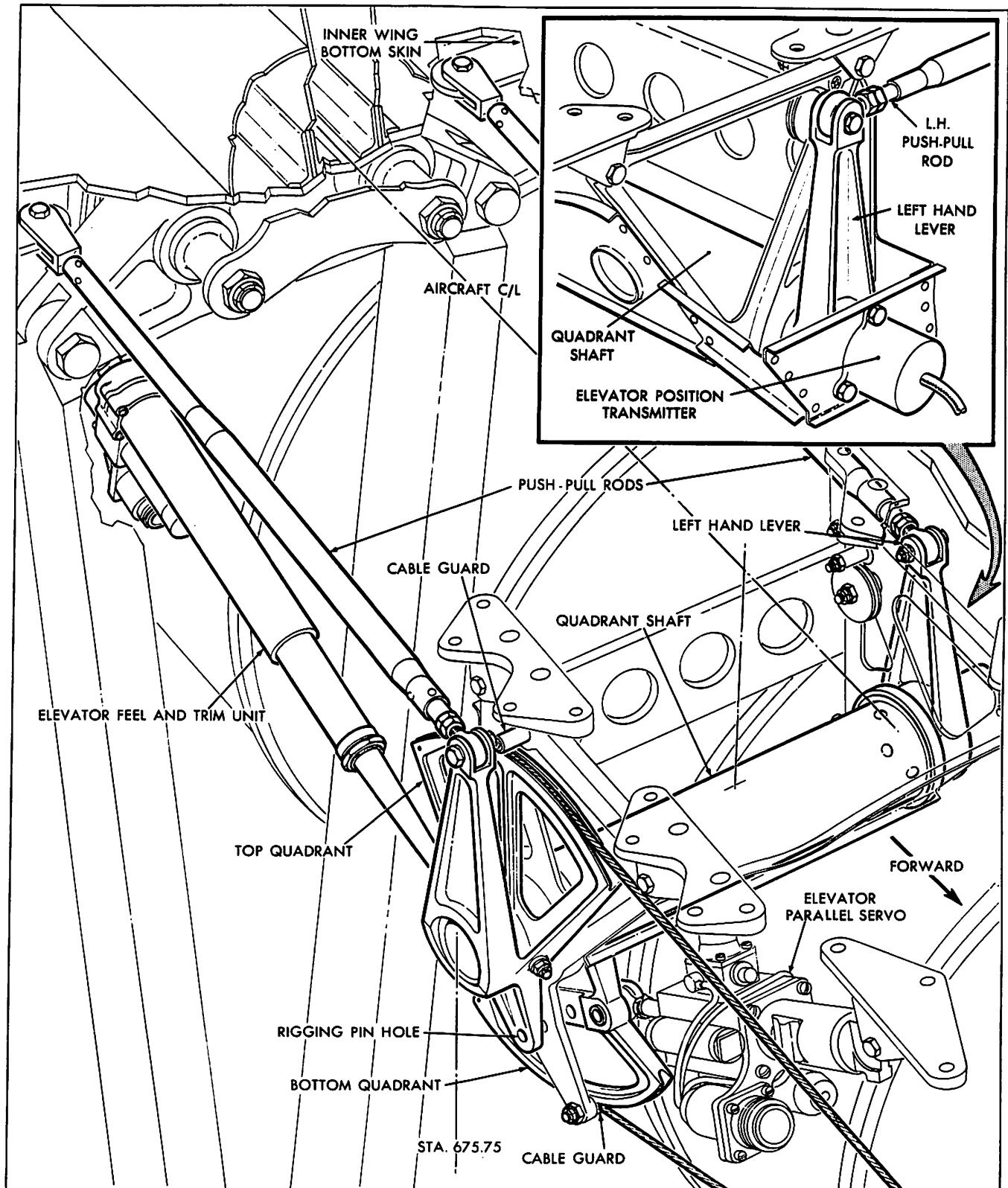
by inserting a rigging pin through rigging pin holes located in an extension of the lever on the quadrant torque tube and in the quadrant support bracket.

53 Control cables attached to the elevator cable tension regulator quadrant run aft along the top right-hand side of the armament bay. At the rear of the armament bay the cables then pass upwards and aft to terminate at the elevator rear quadrant which is mounted on a quadrant shaft located below the inner wing bottom skin at station 675.75 in the engine bay.

ELEVATOR REAR QUADRANT AND LINKAGE (Fig 5)

54 The elevator rear quadrant assembly rotates on bearings in quadrant mounting fittings suspended from the inner wing bottom skin. The quadrant assembly consists of a top quadrant and a bottom quadrant each secured to the right-hand end of the quadrant shaft by means of taper pins and self-locking nuts. A right-hand lever is built integrally with the top quadrant, and a left-hand lever is riveted to the left-hand extremity of the quadrant shaft.

ARROW 1 SERVICE DATA



7MI-1609-4

FIG. 5 ELEVATOR REAR QUADRANT AND LINKAGE

ARROW 1 SERVICE DATA

UNCLASSIFIED

Each lever is linked to its respective elevator actuator linkage by a push-pull rod and a bellcrank to convey movement of the rear quadrant assembly to each elevator actuator control valve.

55 The elevator parallel servo is fitted between a forward attachment point on the bottom quadrant and the inner wing bottom skin structure.

56 The elevator feel-and-trim unit is fitted between a rear attachment point on the bottom quadrant and an elevator feel-and-trim emergency release mechanism lever fitted to the inner wing bottom skin structure. See para 81.

57 Provision is made to retain the quadrant in its central position during rigging operations by inserting a rigging pin through rigging pin holes located in an extension lug on the top quadrant, a fixed lower cable guard arm, and a quadrant centering hole in the bottom quadrant.

ELEVATOR CONTROL LINKAGE (Fig 6)

58 The elevator control linkage for each elevator consists of six bellcrank levers interconnected by a control rod. The inboard lever is the master bellcrank lever which is rotated about its pivot point on rib 1 on the inner wing outer trailing edge by extension or retraction of the elevator actuator piston rod. Each bellcrank lever is connected to its corresponding control fitting on the elevator by an elevator control link. Rotation of the bellcranks causes fore-and-aft movements of the control links to lower or raise the elevator about the elevator hinge on the top skin.

59 The rear bearing of each link is an eccentric bearing with a notched flange, the rotation of which varies the pin centre length of the link for rigging purposes. The eccentric bearings are locked in the desired position by a rigging adjustment locking plate, the arm of which is secured to the elevator bottom skin.

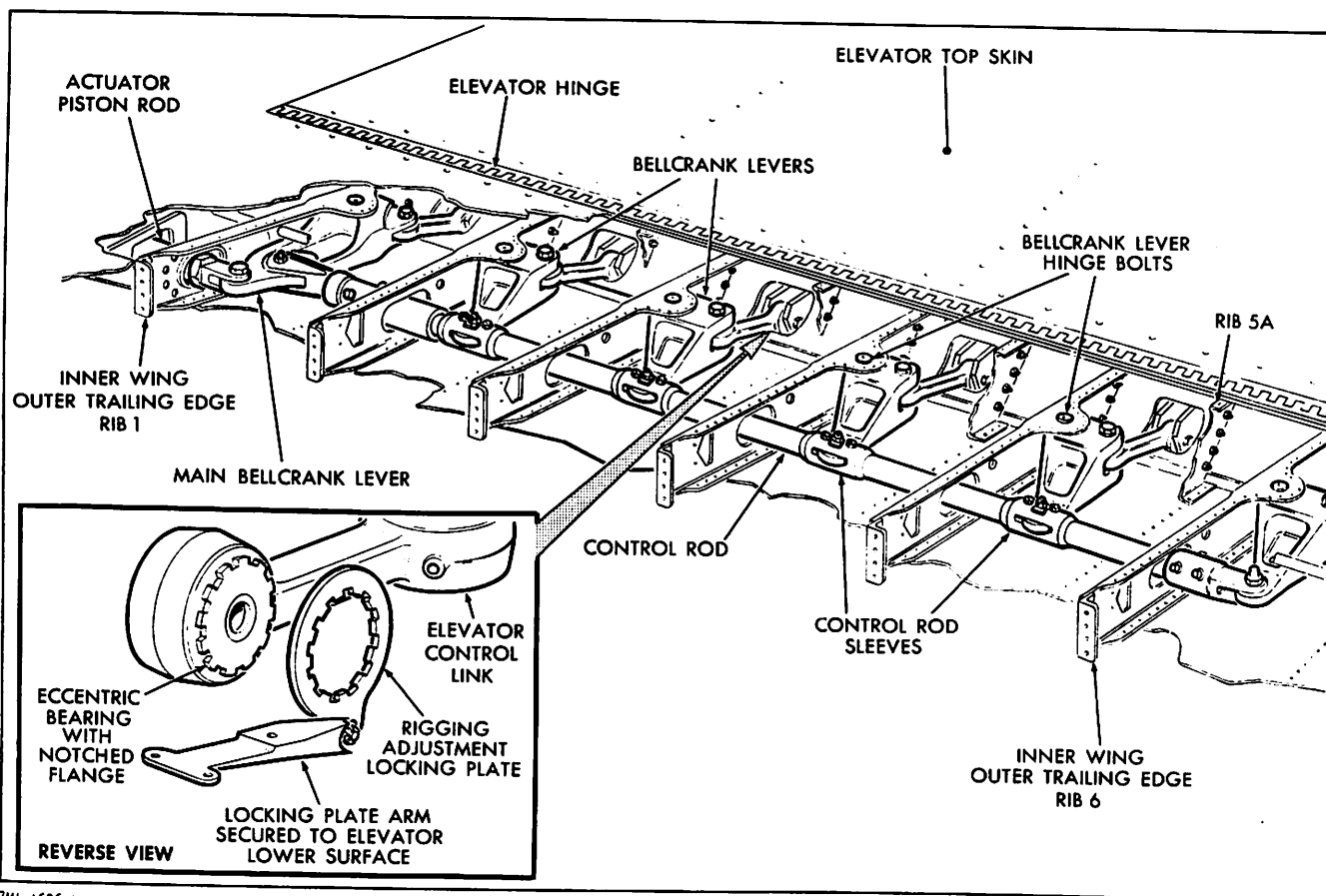
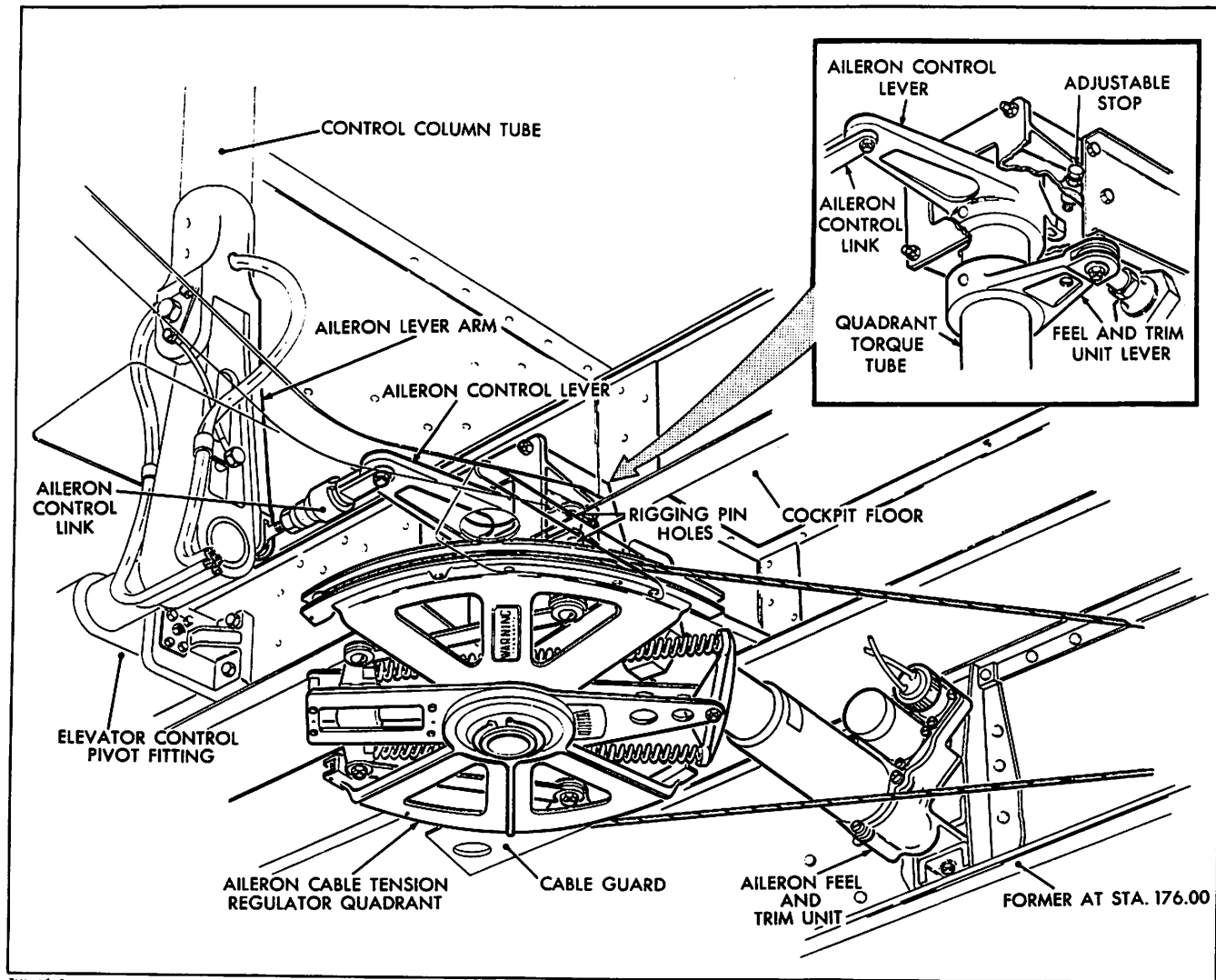


FIG.6 ELEVATOR CONTROL LINKAGE

ARROW 1 SERVICE DATA



7MI-1612-1

FIG. 7 AILERON CABLE TENSION REGULATOR QUADRANT AND LINKAGE

AILERON CONTROL CIRCUIT - FUSELAGE (Figs 7 and 8)

60 The aileron lever arm at the base of the control column pivots on the aileron pivot support during lateral movement of the control column. The lower arm of the pivot lever is linked by an aileron control link to an aileron control lever which is secured to the aileron cable tension regulator torque tube. Control cables attached to the quadrant are operated by the rotary movement of the quadrant.

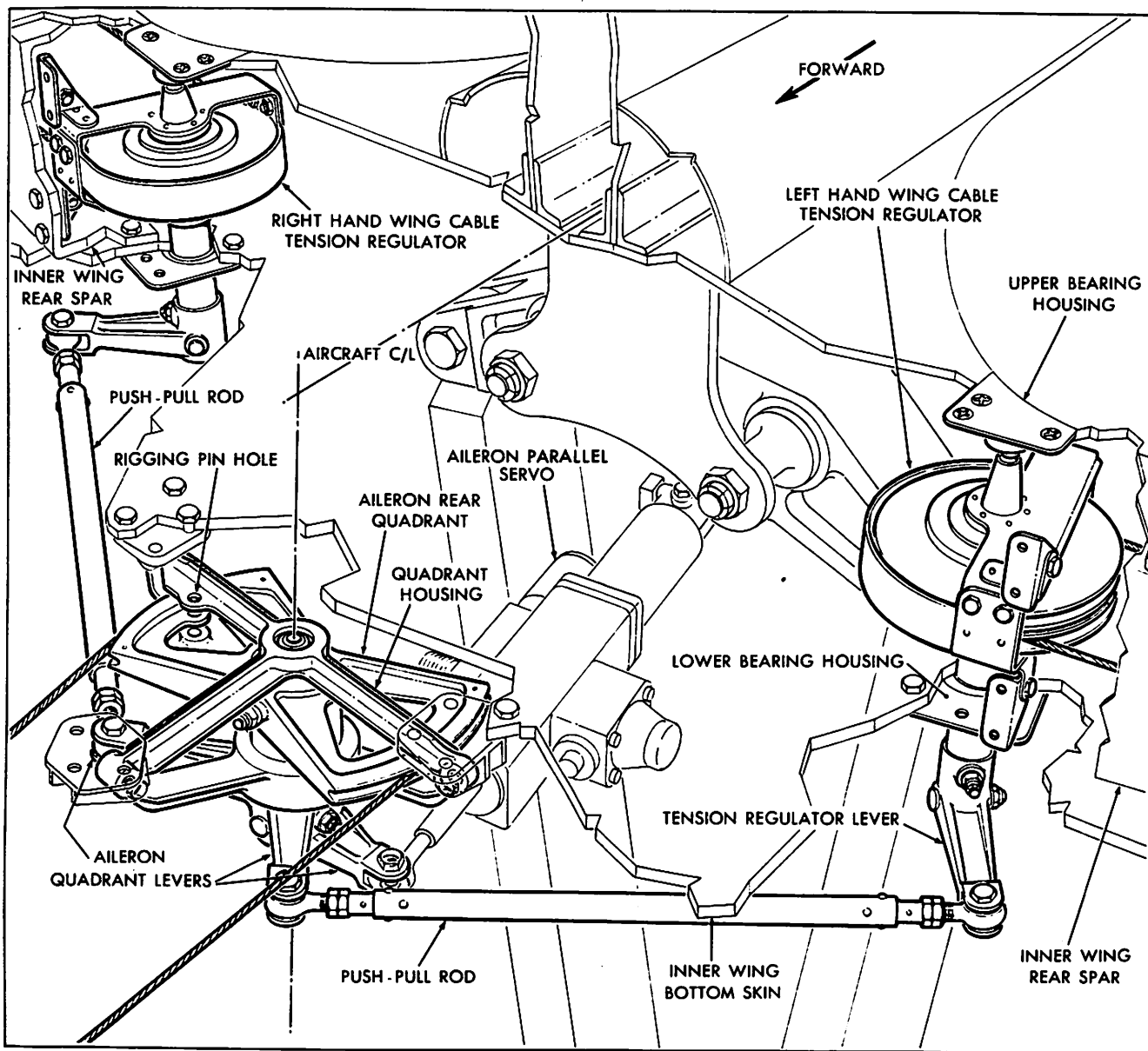
61 The aileron feel-and-trim unit is attached by means of a lever to the quadrant torque tube at one end, and to a channel on

the former at station 176.00 at the other end.

62 Provision is made to retain the quadrant in its central position during rigging operations by inserting a rigging pin through rigging pin holes located in lugs on the travel limit stop housing and in the aileron feel-and-trim unit lever.

63 The aileron control cables run aft along the top left-hand side of the armament bay. From the rear of the armament bay, the cables then pass upwards and aft to terminate at the aileron rear quadrant, the housing of which is secured to mounting brackets on the bottom skin of the inner wing at station 683.14 in the engine bay.

ARROW 1 SERVICE DATA



7N1-1621-1

FIG. 8 AILERON REAR QUADRANT AND LINKAGE

AILERON REAR QUADRANT AND LINKAGE
(Fig 8)

64 The aileron rear quadrant is mounted on a torque tube which rotates on a bearing in the quadrant housing. A parallel servo lever is also secured to the torque tube. The aileron parallel servo is mounted between the servo lever and the structure.

65 The quadrant torque tube is rotated by

extension or retraction of the parallel servo during normal mode operation, and by the aileron cables during emergency mode operation. The rotation of the quadrant is transmitted to each of the wing tension regulator levers by means of a quadrant lever and a push-pull rod.

66 The quadrant may be locked in its central position for rigging purposes by inserting a rigging pin into rigging pin holes in the quadrant housing and the quadrant.

ARROW 1 SERVICE DATA

AILERON CONTROL CABLE CIRCUITS -
INNER WING

67 The control cable circuits in each side of the inner wing are operated by linkages from the aileron rear quadrant to the wing cable tension regulator quadrants. Cables from these regulators run along the rear face of the rear spars to a quadrant mounted on the pivot point of each aileron actuator. A push rod connects each quadrant to its actuator linkage.

AILERON CONTROL LINKAGE (Fig 9)

68 The aileron control linkage for each

aileron consists of seven bellcrank levers interconnected by a control rod. The third lever from the inboard end of the linkage is the master bellcrank lever, which is rotated about its pivot on rib 3 of the outer wing trailing edge by extension or retraction of the aileron actuator piston. Each bellcrank lever is connected to its corresponding control fitting on the aileron by an aileron control link. Rotation of the bellcranks causes fore-and-aft movement of the control links to lower or raise the aileron about the aileron hinge on the top skin.

69 The rear bearing of each aileron control link is an eccentric bearing with a notched

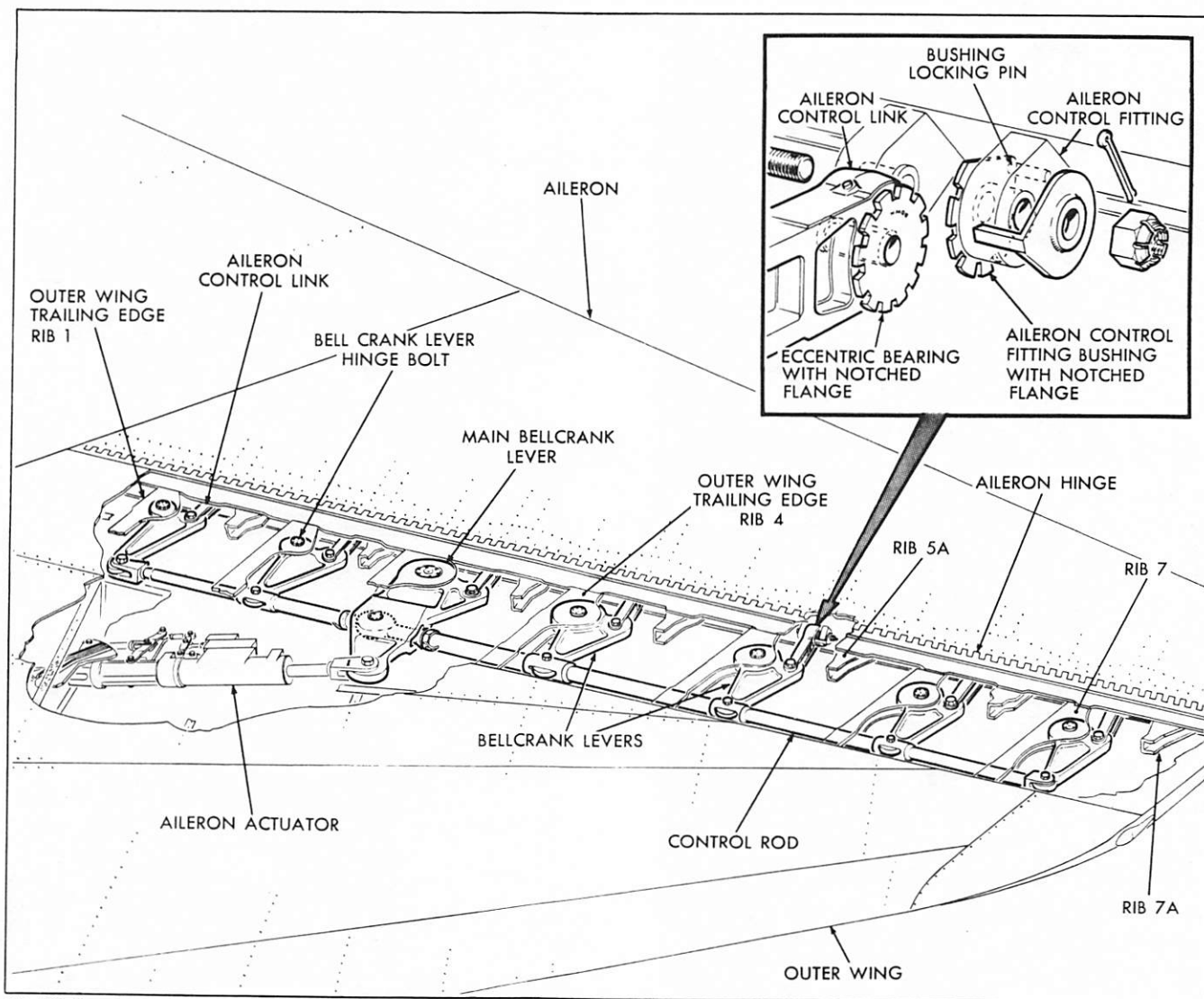


FIG. 9 AILERON CONTROL LINKAGE

ARROW 1 SERVICE DATA

flange, the rotation of which varies the pin centre length of the link for rigging purposes. Each eccentric bearing is locked in the desired position to a control fitting bushing with a notched flange by means of a tab washer. The bushing is locked to the control fitting by a bushing locking pin. The notches on the control fitting bushing are further apart than the notches on the bearing to provide for vernier adjustment of the eccentric bearing.

RUDDER CONTROL CIRCUIT

70 Movement of the rudder pedals operates the rudder cables attached at the forward end of the rudder cable tension regulator quadrant through the rudder bar assembly. The cables run aft from the quadrant along each side of the armament bay. At the rear of the armament bay the cables then pass upwards and aft to the end of the duct bay where they pass up into the

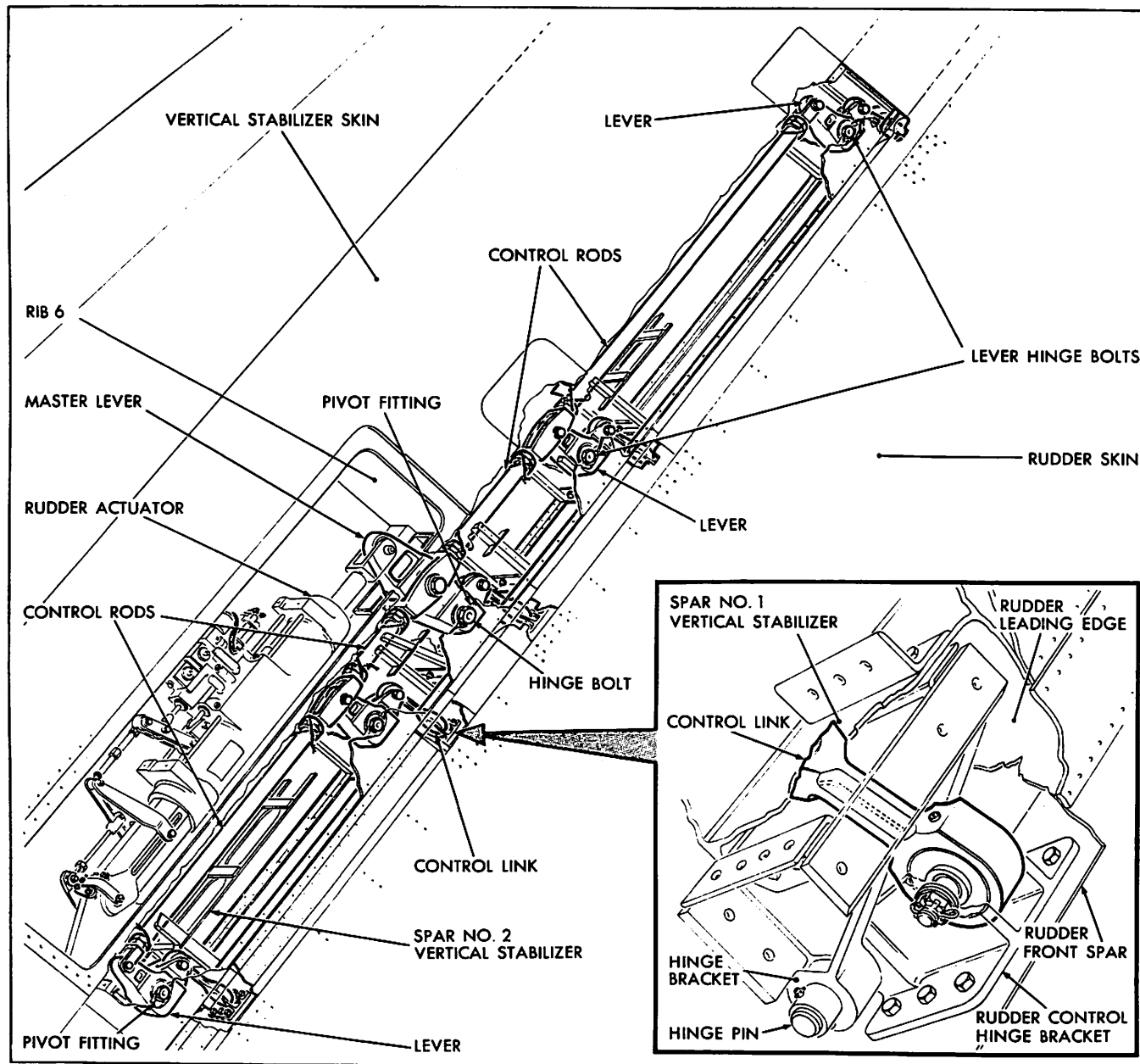


FIG. 10 RUDDER CONTROL LINKAGE

ARROW 1 SERVICE DATA

vertical stabilizer and terminate at a rudder rear quadrant. An electric trim unit is built integrally with the rear quadrant, and the feel-and-trim and hinge moment limitation system is attached to the quadrant. See para 84. The quadrant is linked to the rudder actuator linkage by a push-pull rod and a bellcrank lever. The actuator piston rod is attached to a system of mechanical linkage to convey movement to the control surface.

RUDDER CONTROL LINKAGE (Fig 10)

71 The rudder control linkage consists of five bellcrank levers interconnected by control rods. The centre lever is the master lever which is rotated about its pivot point by extension or retraction of the rudder actuator piston. Each bellcrank lever is connected to its corresponding rudder control hinge bracket by a control link. Rotation of the bellcranks causes fore-and-aft movement of the control links to turn the rudder about hinge pins at the right hand side of each of the five pick-up points. The control rods are adjustable for rigging purposes.

CABLE TENSION REGULATOR QUADRANTS IN FUSELAGE (Fig 11)

72 Three of these units are located in the nose wheel bay and compensate for structural deflections and temperature changes affecting the ailerons, elevators and rudder control cables.

73 Each cable tension regulator quadrant assembly consists of two half quadrants which rotate independently on bearings about the quadrant torque tube secured to the main body of the quadrant assembly. Each half quadrant is linked to an upper crossbar with an integral barrel which slides along a centre shaft at the forward end of the main body. Tensioning springs are secured at one end to the upper crossbar, and at the other end to the lower crossbar, which is pivot-mounted to the aft end of the main body.

74 Changes in cable tensions are compensated for by the tensioning springs which slide the barrel on the crossbar along the centre

shaft, the movement being transmitted to the half quadrants through the links.

75 During a control movement the increased tension on one cable tilts the crossbar, locking the barrel on the centre shaft. Further movement rotates the complete assembly to operate the cables.

76 When the differential loading on the cables is released, the quadrant assembly returns to its central position and automatic cable tensioning recommences.

77 Provision is made to set or check cable tensions over a wide range of temperatures. A compensation scale is built integrally with each side of the main body of the quadrant. A line etched on each half quadrant is aligned with the appropriate setting on the respective compensation scale during tensioning of the cables. The total compensation range is 2.50 inches with each increment on the compensation scale measuring 0.125 inch, and cable tensions vary between 40 lb and 60 lb over the full range of compensation.

CABLE TENSION REGULATORS IN WINGS

78 The aileron cable tension regulator quadrants located aft of the rear spar at the inboard end of each side of the inner wing, are of the revolving type comprising two cable drums, one mounted immediately above the other. The aileron rear cable is secured to the top drum, and the aileron front cable is secured to the bottom drum. The drums, which are spring-loaded, rotate independently to compensate for changes in cable tensions when there is no differential load on the cables, and lock together to rotate simultaneously in the same direction during a control movement.

79 Provision is made to set or check cable tensions over a wide range of temperatures. Two compensation scales are etched on opposite sides of the top drum. A line etched on each side of the main body of the quadrant is aligned with the appropriate setting on the compensation scales during tensioning of the cables. The total compensation range is 1.28 inches per cable and the cable tensions vary between 40 lb and 60 lb over the full range of compensation.

ARROW 1 SERVICE DATA

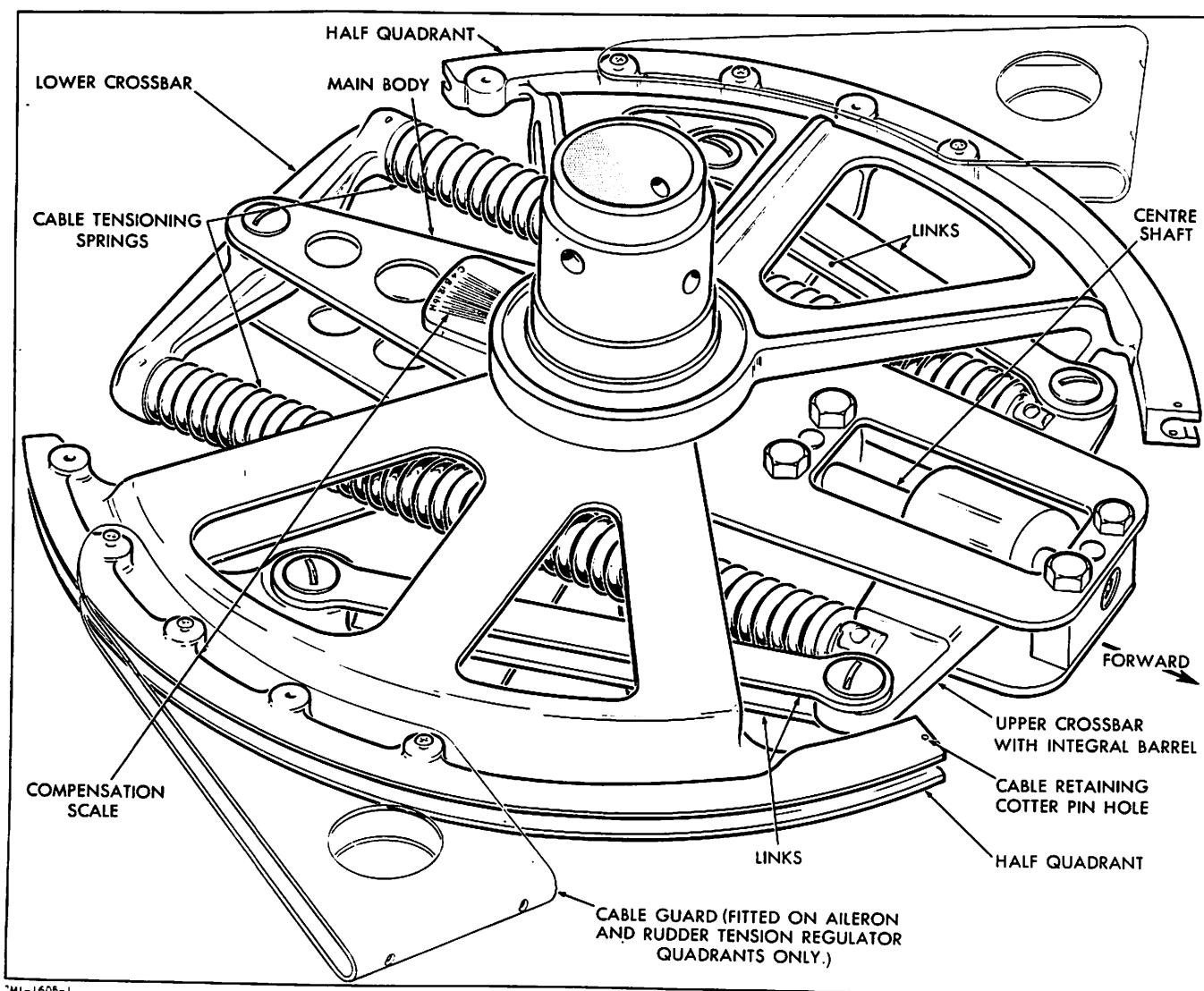


FIG. 11 CABLE TENSION REGULATOR QUADRANT (FUSELAGE)

ELEVATOR FEEL-AND-TRIM UNIT (Fig 12)

80 The elevator feel-and-trim unit allows adjustment of the elevators to achieve longitudinal trim and also provides pilot feel during the emergency mode of flight control. Trim is controlled by fore-and-aft movement of the four-way switch on the control column handgrip in the emergency mode, and trimming of the unit is automatically controlled by signals from a pressure pick-off operated by the pressure sensing ram in the parallel servo, in the normal mode. See para 31.

81 One end of the elevator feel-and-trim

unit is connected to the elevator rear quadrant, and the other end is secured to an electric actuator operated elevator feel-and-trim emergency release mechanism. The release mechanism is fitted to permit the pilot to eliminate the feel-and-trim unit from the system in the event of jamming, seizing or runaway of the unit. The disengage unit is controlled by an ELEV TRIM DISENGAGE switch on the forward LH console in the pilot's cockpit. See fig 12 for the operation of the elevator feel-and-trim unit and fig 13 for the operation of the elevator feel-and-trim emergency release mechanism.

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

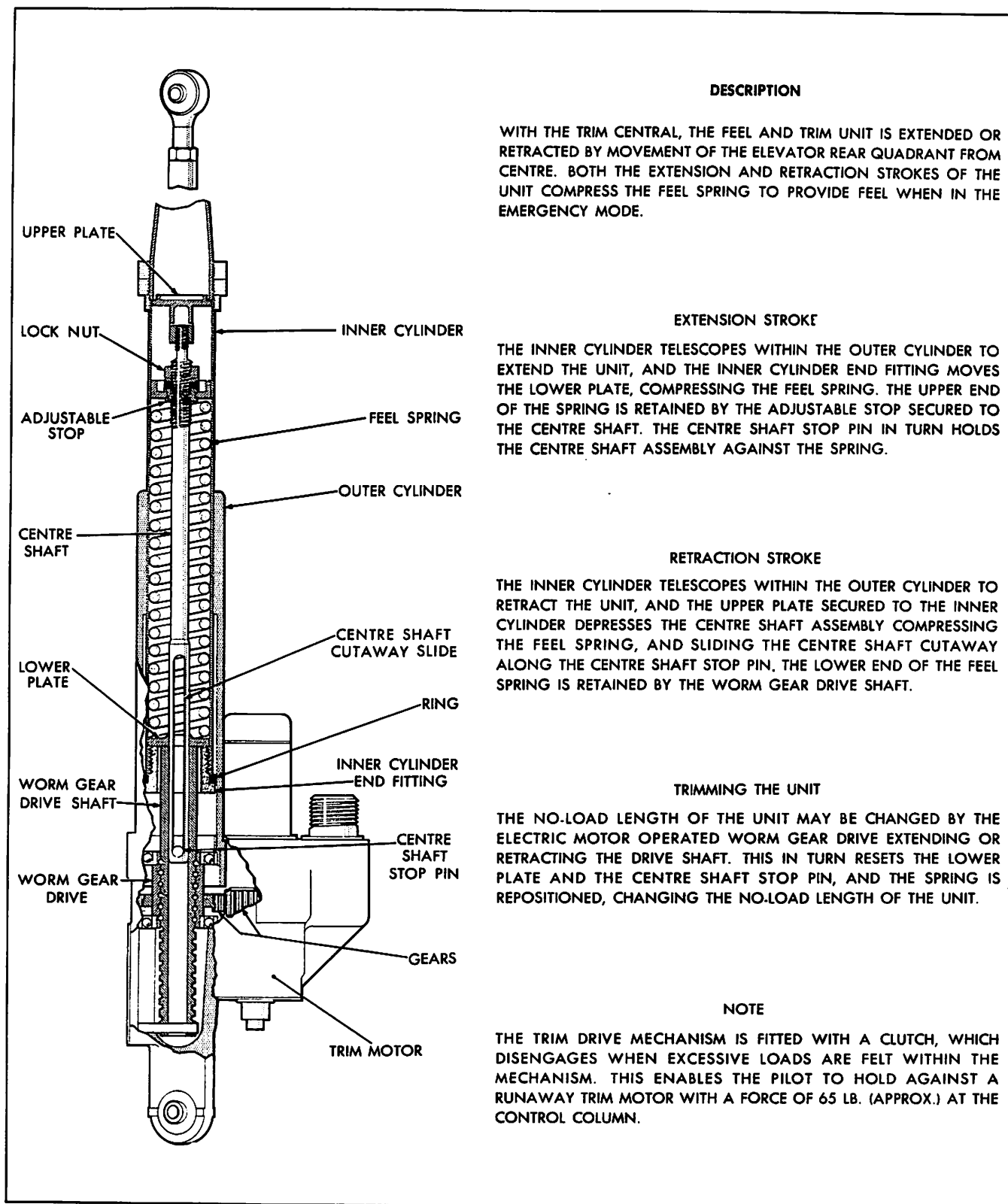


FIG. 12 ELEVATOR FEEL-AND-TRIM UNIT SCHEMATIC

UNCLASSIFIED

ARROW 1 SERVICE DATA

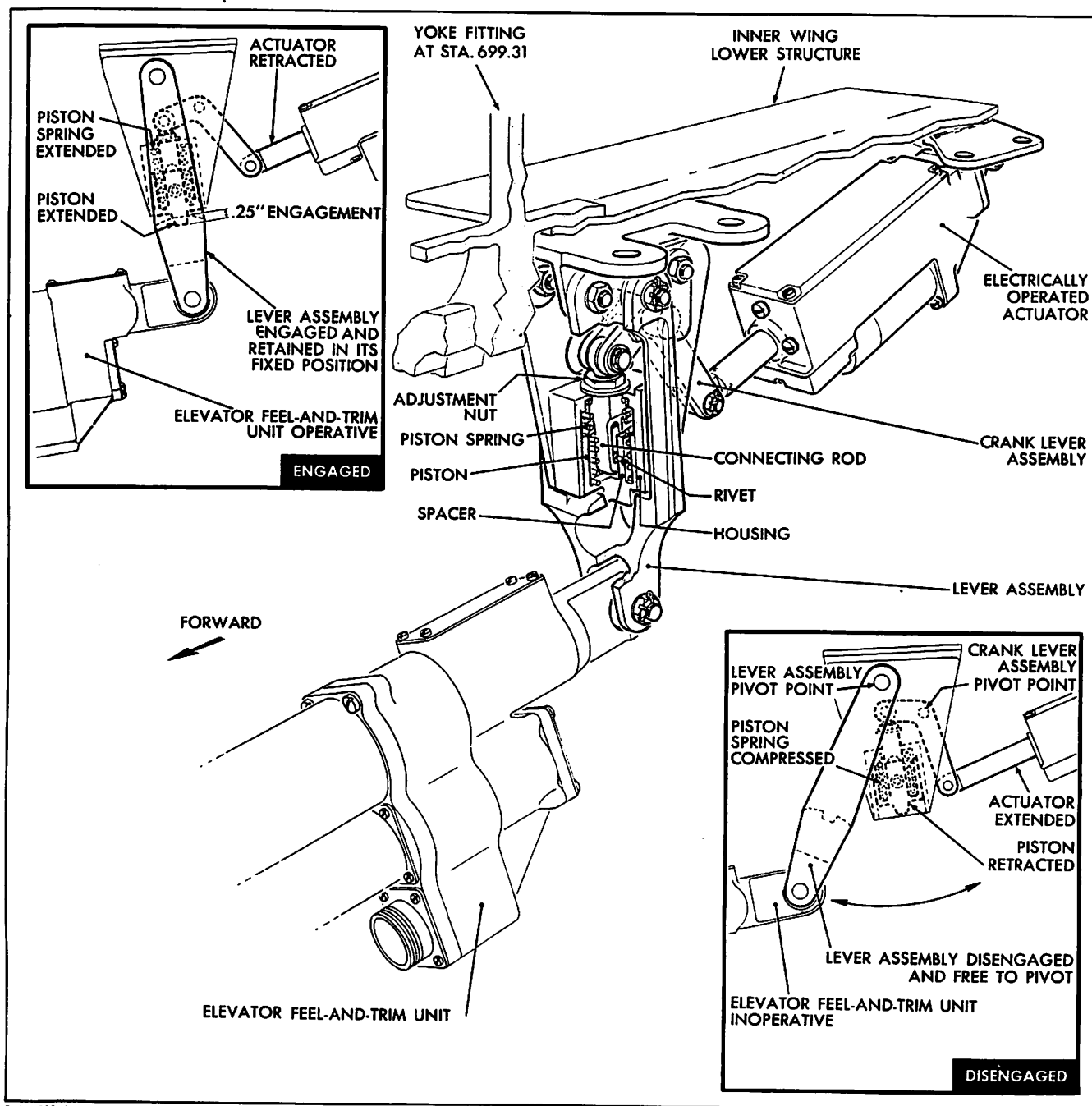


FIG. 13 ELEVATOR FEEL-AND-TRIM EMERGENCY RELEASE MECHANISM

AILERON FEEL-AND-TRIM UNIT

82 The aileron feel-and-trim unit allows adjustment of the ailerons to achieve lateral trim and also provides pilot feel during the emergency mode of flight control. Trim is controlled by lateral movement of the four-way switch on the control column handgrip.

83 One end of the feel-and-trim unit is connected by means of a lever to the aileron cable tension regulator torque tube in the nose wheel well, and the other end is secured to a bracket on the forward face of the former at station 176.00. The operation of the unit is similar to that of the elevator feel-and-trim unit, but there is no automatic feel trim

ARROW 1 SERVICE DATA

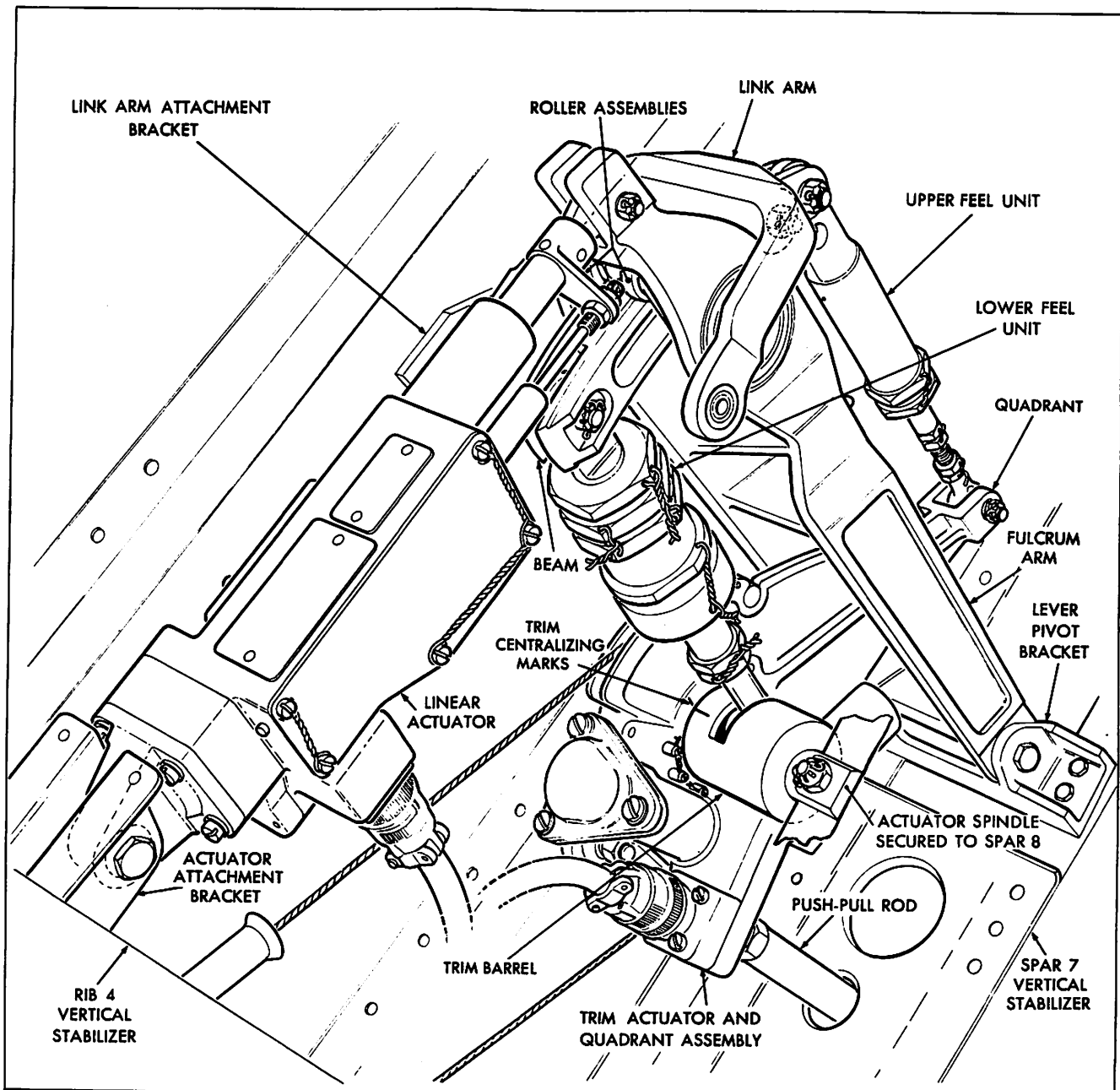
provision and no clutch is fitted to the trim drive.

RUDDER FEEL-AND-TRIM AND HINGE MOMENT LIMITATION SYSTEM (Figs 14 and 15)

84 The rudder feel-and-trim and hinge moment limitation system located on the

forward face of spar 7 in the vertical stabilizer performs the following functions:

- (a) Supplies pilot feel.
- (b) Progressively restricts rudder movement in proportion to the increase of aerodynamic loads on the rudder.



7M1-1611-2

FIG. 14 RUDDER FEEL-AND-TRIM AND HINGE MOMENT LIMITATION SYSTEM

ARROW 1 SERVICE DATA

(c) Resets the position of the rudder to achieve directional trim when the rudder trim switch on the LH console in the pilot's cockpit is operated.

85 The rudder feel-and-trim and hinge moment limitation system consists of a quadrant with an integral trim mechanism, an upper and a lower feel unit, a linear actuator and a fulcrum arm. The lower end of the upper feel unit is pivot mounted to the quadrant, and the lower end of the lower feel unit is pivot mounted to the quadrant through the trim mechanism. The feel units are interconnected at their upper ends by a beam, which is connected to the structure by a link arm. The beam is retained by rollers which are bearing mounted to the fulcrum arm. The linear actuator is secured to the structure at one end, and to the upper end of the fulcrum arm at the other end. The fulcrum arm is pivot mounted at its lower end to the structure. See inset 1 of fig 15.

86 The linear actuator is extended or retracted by signals which are proportional to indicated air speed. At low indicated air speeds, the linear actuator is in its fully retracted position, and the rollers on the fulcrum arm are positioned close to the beam lower pivot point. Because of the close proximity of the beam lower pivot point to the rollers and the comparatively large leverage from the beam upper pivot point to the rollers, the beam is able to tilt with a small compression of the spring in the lower feel unit. The spring in the upper feel unit is also compressed slightly to hold in equilibrium the forces on each side of the rollers. In this position 150 lb of pilot effort rotates the quadrant 30°. See inset 2 of fig 15.

NOTE

The springs are compressible from each end, and the degree of movement in each direction per given pilot effort is the same.

87 As airspeed increases, the linear actuator extends and the rollers on the fulcrum arm are repositioned progressively closer to the beam upper pivot point. The force required to tilt the beam and so rotate the quadrant is then

increased due to the increased leverage between the rollers and the beam lower pivot point, and the force of the lower feel unit spring. Equilibrium is maintained by compression of the spring in the upper feel unit balancing the forces on each side of the rollers. When the linear actuator is fully extended, 150 lb of pilot effort rotates the quadrant 1-1/2°. See inset 3 of fig 15.

88 The electrically operated trim actuator resets the position of the lower attachment point of the lower feel unit with respect to the quadrant up to a maximum of 20° in the appropriate direction when LEFT or RIGHT is selected on the rudder trim switch.

89 Maximum trim movement can be obtained only at low airspeeds when the linear actuator is fully retracted. In this position, movement of the lower attachment point of the lower feel unit is very restricted owing to the small distance between the beam lower pivot point and the rollers. Consequently the operation of the trim motor rotates the quadrant with respect to the lower attachment point to tilt the beam and maintain its equilibrium by balancing the forces at each side of the fulcrum lever rollers. This resets the no-load position of the quadrant. See inset 4 of fig 15.

90 As airspeed increases and the linear actuator extends, the distance between the beam lower pivot point and the rollers increases, allowing more movement of the lower feel unit during trimming. In consequence, the rotation of the lower attachment point of the lower feel unit is increased, and the movement of the quadrant is decreased for a given angle of trim. See inset 5 of fig 15.

91 The trim unit may be set in its central position during rigging operations by operating the rudder trim switch to bring the trim centralizing lines on the quadrant and on the trim barrel into alignment.

SPEED BRAKES

92 Two hydraulically operated speed brakes are installed on the undersurface of the fuselage aft of the armament bay, one on each side of the centre line of the aircraft. The power to

ARROW 1 SERVICE DATA

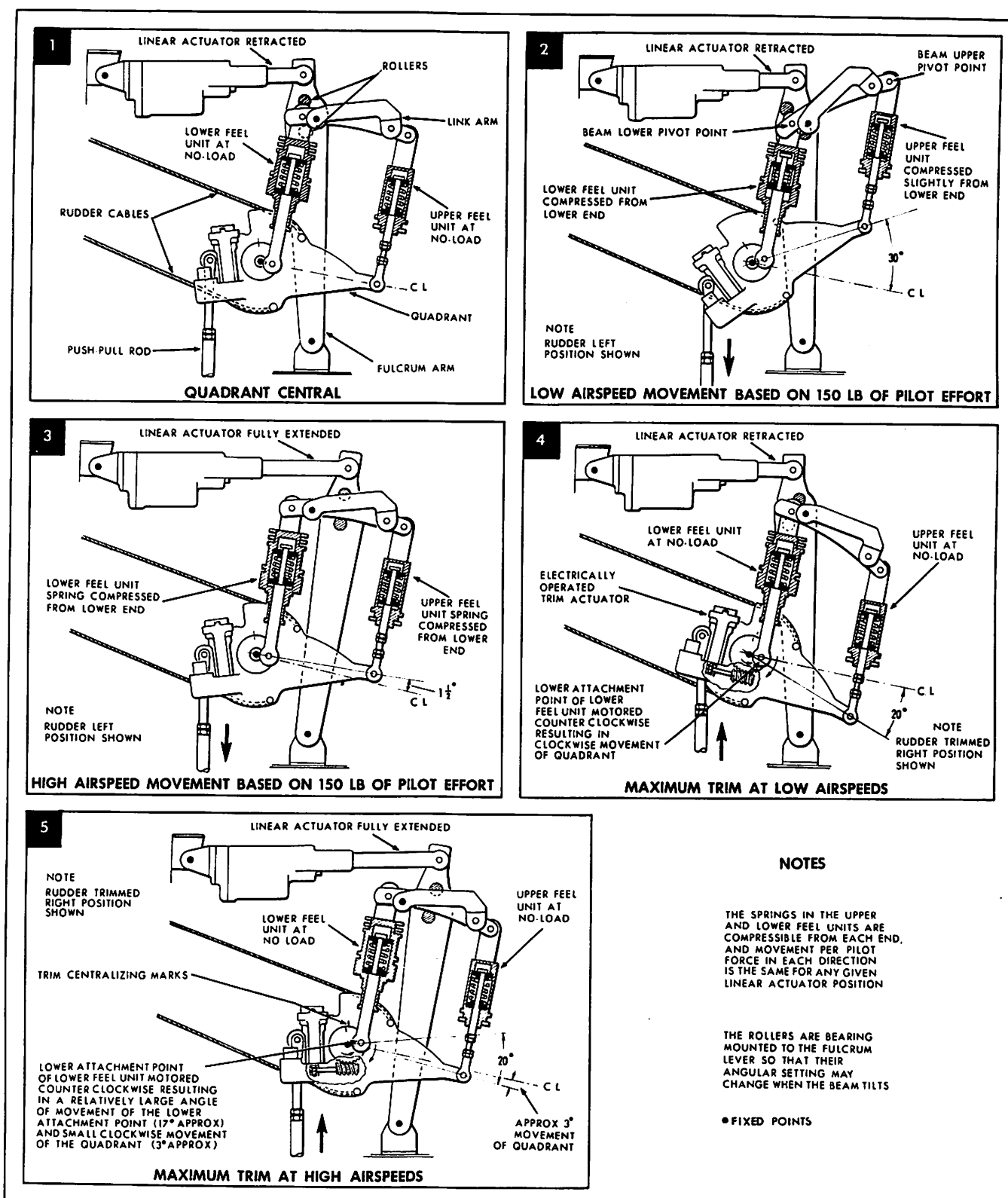


FIG. 15 RUDDER FEEL-AND-TRIM AND HINGE MOMENT LIMITATION SYSTEM FUNCTION SCHEMATICS

ARROW 1 SERVICE DATA

operate the speed brakes is derived from the Utility Hydraulic System. For the operation of the speed brakes, see Arrow 1 Service Data - Utility Hydraulics - Speed Brakes.

RIGGING PROCEDURE

GENERAL

93 Prior to any rigging operations, the aircraft must be left standing in a hangar at a regulated temperature for a minimum of 12 hours to allow the structure to assume the temperature of the ambient air.

94 Before proceeding to rig the flying controls, support the aircraft on jacks in the normal ground attitude and adjust as necessary to bring the aircraft to a laterally level position. See Arrow 1 Service Data - General Information. It is not necessary to place the aircraft in rigging position. For the purpose of the following instructions it is assumed that the elevators, ailerons and rudder surfaces, actuators, hydraulic lines and linkages are already installed, that the flying control hydraulic system is operative, and that the actuators, differential servos, control valves and linkages are correctly rigged and are set in their central position. See fig 16. It is also assumed that the control cables are fitted but not tensioned. For identification of cable routes see fig 1.

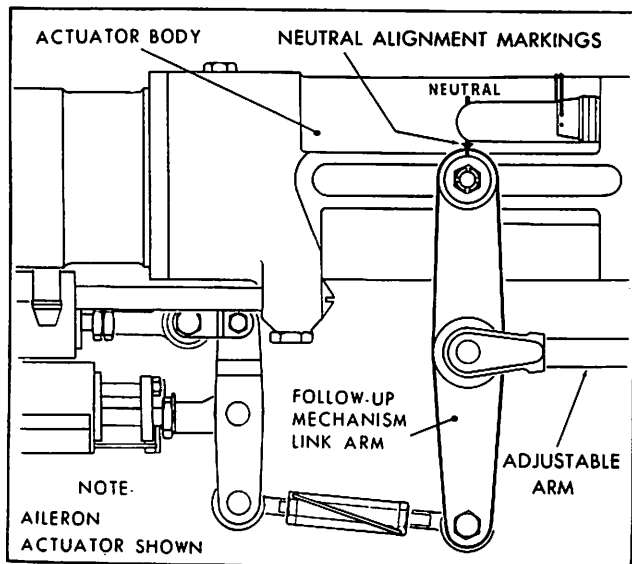


FIG. 16 NEUTRAL POSITION OF THE ACTUATOR LINKAGES

NOTE

The parallel servos and the aileron and elevator feel-and-trim units must not be connected to their respective quadrants until the initial rigging has been completed.

95 To avoid repetitive instructions, it is assumed that all turnbuckles are in safety and locked, and that all bolts, pins, nuts, washers, locknuts and bonding leads in the control linkages are correctly fitted and locked on completion of any rigging operation. It is also assumed that all covers, access panels and equipment removed for purposes of accessibility, are correctly replaced and secured on completion of the rigging operations.

96 In each of the following procedures, a hydraulic test machine trailer and an electric ground power unit must be connected to provide hydraulic and electrical power for movement of the control surfaces. See Arrow 1 Service Data - Flying Controls Hydraulics.

97 In these instructions, a control surface is said to be in the 'neutral' position when it is in line with its fixed surface (i.e. wing or vertical stabilizer). A control surface is said to be in its 'mean' position when it is in the central position of its travel. For the ailerons and rudder the 'neutral' position coincides with the 'mean' position. For the elevators, the 'mean' position is 5° up with respect to 'neutral'.

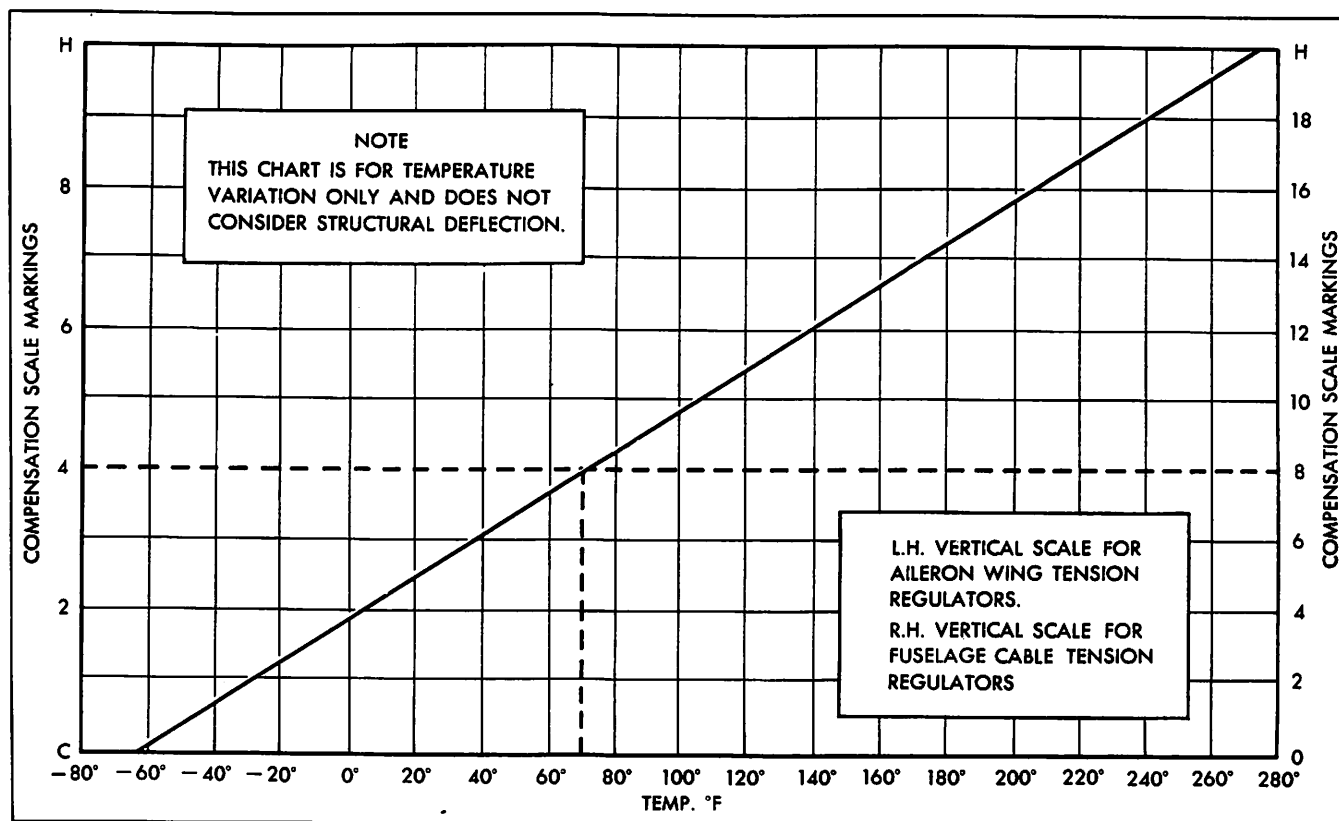
ELEVATOR CONTROLS

98 The procedure for rigging the elevator controls is as follows:

(a) Pin-lock the elevator tension regulator quadrant and the elevator rear quadrant in the mean position.

(b) Tension the elevator cables equally at the turnbuckles located below the armament bay roof until the reading on the compensation scales on the elevator tension regulator quadrant is at the appropriate setting for the ambient temperature. See fig 17.

ARROW 1 SERVICE DATA



7MI-1618-1

FIG. 17 PROVISIONAL CABLE TENSIONING CHART

NOTE

It is essential that both cables be tightened evenly or the tension regulator quadrant will lock and an inaccurate reading will be obtained.

CAUTION

It is not necessary to adjust or dismantle any of the cable tension regulator quadrants and it is dangerous to attempt to do so, as the springs, being under constant load, will react violently unless prevented by the proper restraining fixtures.

(c) Vibrate the cables to remove friction at the contact points along the cable run. Re-check the setting on the compensation scales and reset if necessary.

(d) Check the cable tensions with a tension meter. The reading should be between 40 lb and 60 lb (1/8 inch cable).

(e) Adjust the push rod from the bellcrank to the quadrant lever below the cockpit floor to set the control column in its mean position in the fore-and-aft plane. This setting is achieved by positioning the grip reference mark 11.34 inches aft of the face of the main instrument panel.

(f) Disconnect the elevator actuators from the elevator control linkages and set the elevators in their mean position (5° above neutral) using an inclinometer. Retain the elevators in position by means of the aileron and elevator support. See Arrow 1 Service Data - General Information.

NOTE

The neutral setting of the elevators may be obtained by aligning the elevator skins with the inner wing skins, by means of a straight edge, the forward end of which must not be placed more than 18 inches forward of the inner wing rear spar.

ARROW 1 SERVICE DATA

(g) Check that the elevator actuators and linkages are in their central position (see fig 16) and adjust each piston rod end to line up with the hole at its attachment point in the elevator control linkage master bellcrank lever. Fit the bolts.

CAUTION

Do not alter the pre-set adjustment of the rods in the actuator linkages.

(h) Adjust the push-pull rods from the elevator rear quadrant so as to line up the fork ends with the holes at their attachment points in the bellcrank levers in the actuator linkages. Fit the bolts.

(j) Remove the rigging pins securing the elevator tension regulator quadrant and the elevator rear quadrant, and remove the aileron and elevator support.

(k) With hydraulic power on, check the ranges of movement. See fig 18. Adjust the travel limit stops in the nose wheel bay if necessary.

(m) Check that the full travel of the elevator corresponds with the full fore-and-aft movement of the control column. See fig 19.

(n) Set the elevator parallel servo to its fully extended position and, with the control column fully forward, adjust the servo rod end

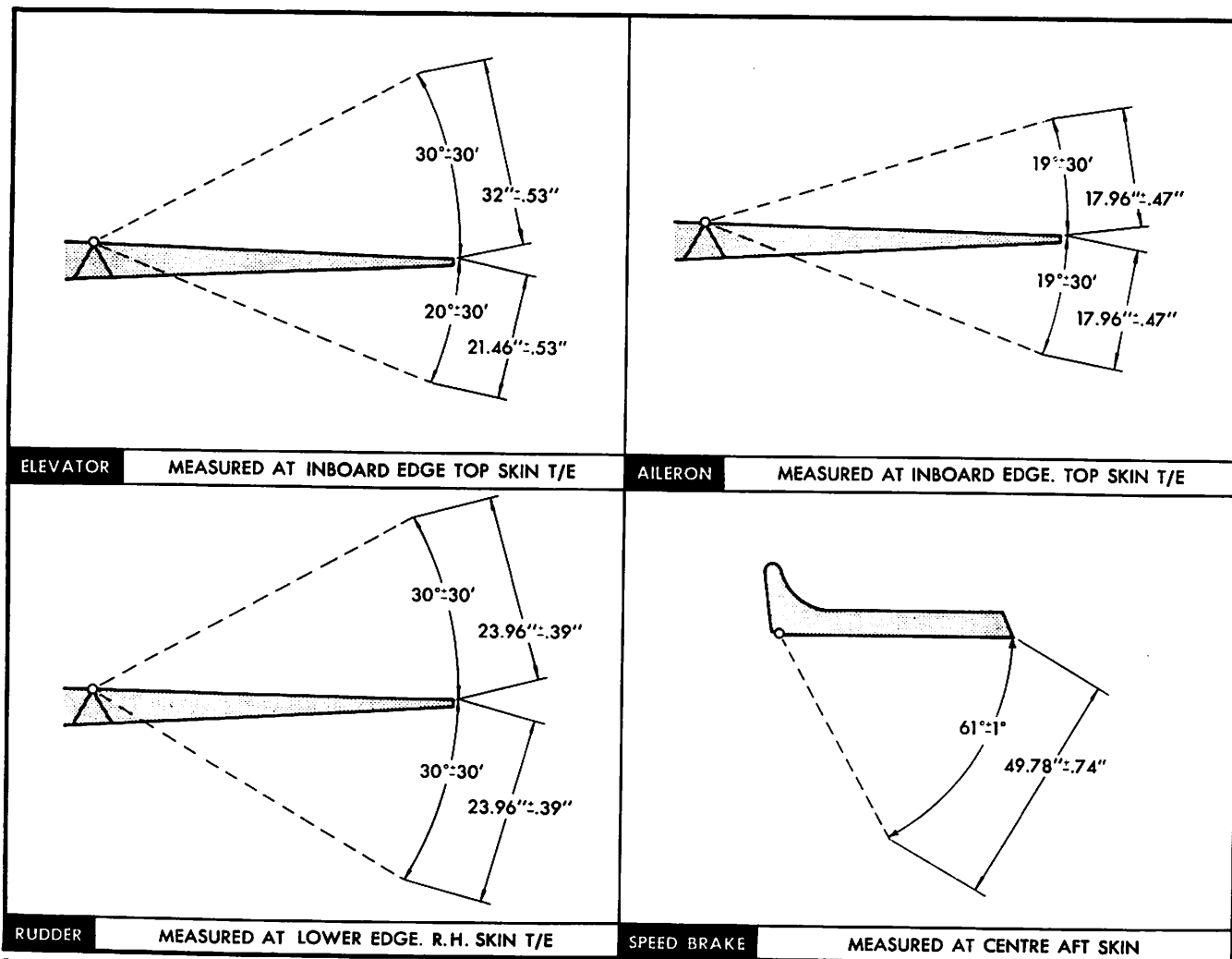


FIG. 18 RANGES OF MOVEMENT OF CONTROL SURFACES

ARROW 1 SERVICE DATA

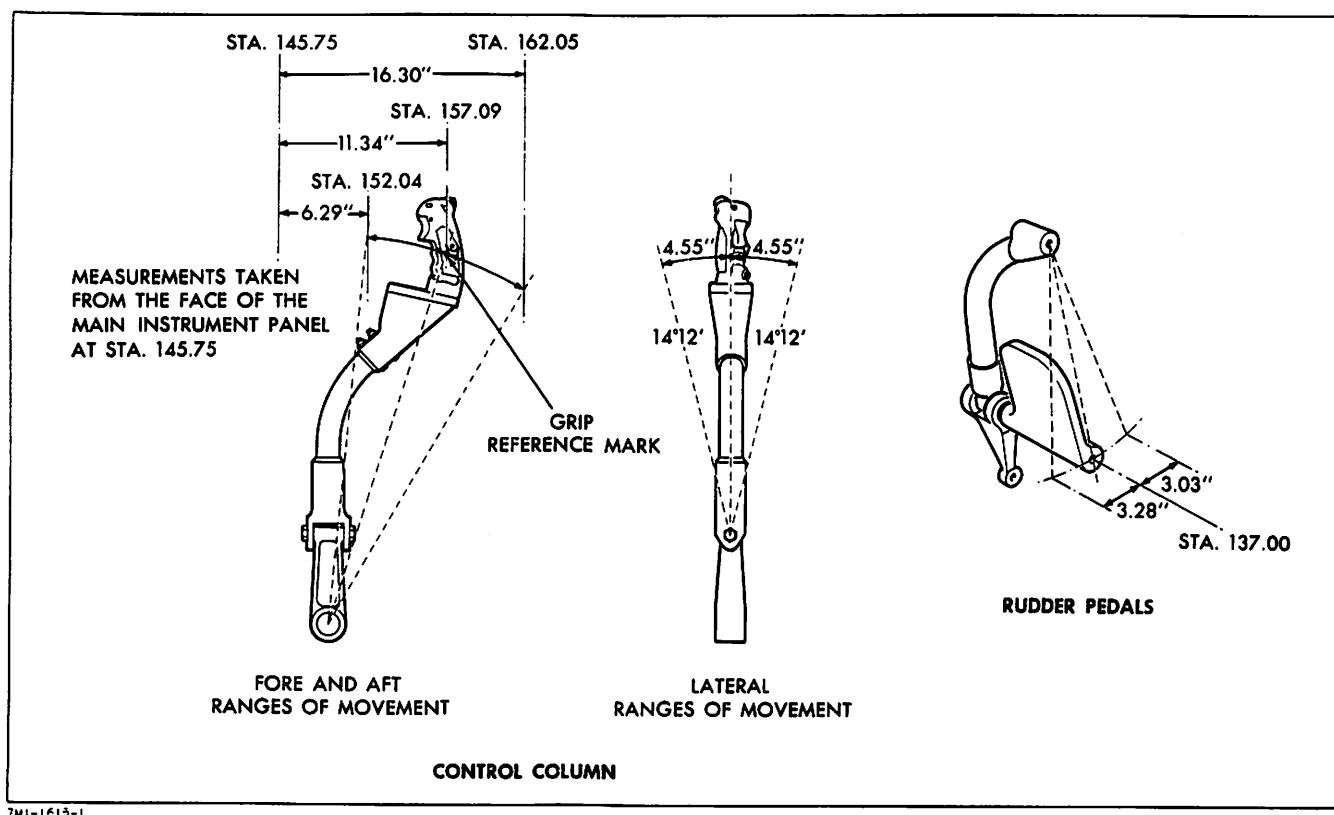


FIG. 19 RANGES OF MOVEMENT OF COCKPIT CONTROLS

to align with the hole in its attachment point on the elevator rear quadrant. Extend the rod end by one half turn and fit the bolt.

(p) Move the control column fully aft and re-check the travel to ensure that the inclusion of the parallel servo has not restricted travel.

(q) Set the control column to obtain an elevator setting of 18° up from neutral. This may be achieved by measuring the angle of the elevator at neutral by means of an inclinometer and resetting the elevator to an 18° difference reading on the inclinometer. Retain in position by placing a support below each elevator.

(r) Fully extend the elevator feel-and-trim unit by operating the four-way switch on the control column handgrip aft.

(s) Adjust the feel-and-trim unit rod end to align with the hole at its attachment point in the elevator rear quadrant. Fit the bolt.

(t) Remove the elevator supports and re-check the travel to ensure that the feel-and-trim unit has not restricted travel.

NOTE

Should travel be restricted in one direction, adjust the rod end of the feel-and-trim unit in the appropriate direction in small increments until full travel is obtained.

(u) Position the control column to set the elevator in its neutral position, and check the maximum elevator trim movements by operating the four-way switch on the control column handgrip to obtain full trim in each direction, and measuring the deflection of the elevators. The maximum trim movements must be as follows:

(1) Elevator up movement - 17° - 19° (18.34 - 20.34 inches) from neutral.

(2) Elevator down movement - 5.7° - 7.7° (6.2 - 8.2 inches) from neutral.

AILERON CONTROLS

99 The procedure for rigging the aileron controls is as follows:

ARROW 1 SERVICE DATA

(a) Pin-lock the aileron tension regulator quadrant and the aileron rear quadrant in the neutral position.

(b) Tension the aileron cables in the fuselage circuit equally at the turnbuckles located below the armament bay roof until the reading on the compensation scales on the aileron tension regulator quadrant is at the appropriate setting for the ambient temperature. See fig 17.

(c) Vibrate the cables to remove friction at the contact points along the cable run. Re-check the setting on the compensation scales and reset if necessary.

(d) Check the cable tensions with a tension meter. The reading should be between 40 lb and 60 lb (1/8 inch cable).

(e) Adjust the link from the control column aileron lever and the lever on the cable tension regulator torque tube located below the cockpit floor, to set the control column laterally vertical. This may be verified by placing an inclinometer on the side of the control column tube.

(f) Set each wing tension regulator to neutral by adjusting the push-pull rod from the aileron rear quadrant lever to the tension regulator lever until the rod is at 90° to the tension regulator lever with the holes in alignment. Fit the bolt.

(g) Disconnect the aileron actuators from the aileron control linkages and set the ailerons in the neutral position by aligning the aileron skins with the outer wing skins by means of a straight edge, the forward end of which must not be placed forward of the outer wing rear spar. Retain the ailerons in position by means of the aileron and elevator support. See Arrow 1 Service Data - General Information.

(h) Check that each aileron actuator and linkage is in its neutral position (see fig 16) and adjust each piston rod end to align with the hole at its attachment point in the aileron control linkage master bellcrank lever. Fit the bolt.



Do not alter the pre-set adjustment of the rods in the actuator linkages.

(j) Tension each set of aileron cables in the wing circuits equally, at the turnbuckles in the elevator actuator compartment in the inner wing, maintaining the neutral position of the actuators and linkages, until the reading on the compensation scales on the aileron wing tension regulator is at the appropriate setting for the ambient temperature. See fig 17.

(k) Vibrate the cables to remove friction at the contact points along the cable run. Re-check the settings on the compensation scales and reset if necessary.

(m) Check the cable tensions with the tension meter. The reading should be between 40 lb and 60 lb (1/8 inch cable).

(n) Remove the rigging pins securing the aileron tension regulator quadrant and the aileron rear quadrant, and remove the aileron and elevator support.

(p) With hydraulic power on, check the ranges of movement. See fig 18. Adjust the travel limit stops in the nose wheel bay if necessary.

(q) Check that the full travel of the ailerons corresponds with the full lateral travel of the control column. See fig 19.

(r) Set the aileron parallel servo to its fully extended position, and with the control column fully over to the left, align the servo rod end with the hole in its attachment point on the lever on the aileron rear quadrant torque tube. Extend the rod end by one half turn and fit the bolt.

(s) Move the control column fully over to the right and re-check the travel to ensure that the inclusion of the parallel servo has not restricted travel.

(t) Refit the rigging pins.

ARROW 1 SERVICE DATA

(u) Set the aileron feel-and-trim unit in its mean position, and adjust its rod end to align with the hole in its attachment point on the lever on the aileron cable tension regulator torque tube in the nose wheel bay. Fit the bolt.

NOTE

The feel-and-trim unit mean position may be established by fully extending the unit by operating the four-way switch on the control column handgrip and measuring the extended length of the unit, and then fully retracting the unit and measuring the retracted length. The mean position is the position midway between the extended and retracted positions.

(v) Remove the rigging pins and re-check the travel to ensure that the inclusion of the feel-and-trim unit has not restricted travel.

NOTE

Should travel be restricted in one direction, adjust the rod end of the feel-and-trim unit to obtain full travel.

(w) Position the control column to set the ailerons in the neutral position, and check the maximum trim movement by operating the four-way switch on the control column handgrip to obtain maximum trim, and measuring the deflection of each aileron. The maximum up and down movement of each aileron must be 7.5° - 7.7° (7.2 - 7.4 inches).

RUDDER CONTROLS

100 The procedure for rigging the rudder controls is as follows:

(a) Disconnect the rudder self centre unit at its attachment fitting on the travel limit arm.

(b) Pin-lock the rudder bar in the neutral position.

(c) Adjust the self centre unit rod end to align with the hole in its attachment fitting on the travel limit arm. Fit the bolt.

(d) Set the rudder rear quadrant in the neutral position as follows:

(1) Set the feel-and-trim actuator to neutral by operating the rudder trim switch on the LH console in the pilot's cockpit until the trim centralizing lines on the quadrant and the trim barrel are in alignment. See fig 14.

(2) Disconnect the linear actuator from the fulcrum lever arm.

(3) Rotate the quadrant until the fulcrum lever arm can be moved freely backwards and forwards between the two feel units without producing any quadrant movement.

(4) Reconnect the linear actuator.

(e) Tension the rudder cables equally at the turnbuckles located below the armament bay roof until the reading on the compensation scales on the rudder tension regulator quadrant is at the appropriate setting for the ambient temperature. See fig 17.

(f) Vibrate the cables to remove friction at the contact points along the cable run. Re-check the setting on the compensation scales and reset if necessary.

(g) Check the cable tensions with a tension meter. The reading should be between 40 lb and 60 lb (1/8 inch cable).

(h) Check that the rudder rear quadrant is still in neutral following cable tensioning.

(j) Set the rudder in its neutral position by aligning the rudder trailing edge with the vertical stabilizer trailing edge.

(k) Check that the rudder actuator and linkage is in the neutral position (see fig 16) and adjust the actuator rod end to align with the hole at its attachment point in the master bellcrank lever. Fit the bolt.

(m) Adjust the rod from the rudder rear quadrant to the actuator linkage to align with the hole at its attachment point in the bellcrank lever. Fit the bolt.

ARROW 1 SERVICE DATA

UNCLASSIFIED

(n) Remove the rigging pin from the rudder travel limit arm.

(p) With hydraulic power on, check the ranges of movement. See fig 18. Adjust the travel limit stops in the cockpit if necessary.

(q) Check that the full movement of the rudder corresponds with the full fore-and-aft travel of the rudder pedals. See fig 19.

(r) Position the rudder pedals to set the rudder in its neutral position, and check the maximum trim movement by operating the rudder trim switch on the LH console in the pilot's cockpit to obtain maximum trim in each direction, and measuring the rudder deflection. The maximum rudder trim movements in each direction must be 19° - 21° (15.2 - 16.8 inches).

SPEED BRAKES

101 The procedure for rigging the speed brakes is as follows:

(a) Disconnect the speed brake jack rod ends from the speed brake levers.

(b) With hydraulic power on select IN on the speed brake selector. See Arrow 1 Service Data - Utility Hydraulics - Speed Brakes.

NOTE

The jacks must be held clear of the structure during their operation.

(c) Align the speed brakes with the surrounding skin line.

(d) Adjust the jack rod end to align with the hole at its attachment point in the brake lever. Fit the bolt.

(e) Operate the speed brake slowly to the OUT position and back to the IN position. Re-check the speed brake alignment with the skin.

NOTE

Any slight misalignment of the speed brakes must be corrected by a small adjustment of the jack rod ends.

(f) Operate the speed brakes to the OUT position and check the range of movement. See fig 19.

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Control Column		REF. NO. 15	
AVRO PART NO. 7-1552-3		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION Pilot's control for the operation of the ailerons and elevators.							
LOCATION Pilot's cockpit.							
ACCESS Unobstructed in the pilot's cockpit and nose landing gear well.						MEN X MINUTES	
REPLACEMENT PROCEDURE Bolt the aileron pivot lever to the aileron pivot support. Bolt the aileron pivot lever to the aileron control link. Bolt the electric cable clips, spacers, and bonding jumper to the aileron pivot support. Connect the electrical connection. Install the dust cover over the control column at the cockpit floor. Check the control column mean position with the aileron and elevator tension regulator quadrant rigging pins fitted.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion, wear, and freedom and range of movement.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Cockpit access stand. B4 stand. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Stick Force Transducer		REF. NO. 15	
AVRO PART NO. 7-1552-383		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To transmit signals proportional to stick force via the electronic networks, to actuate the parallel servos.							
LOCATION At the top of the control column tube.							
ACCESS Unobstructed in the pilot's cockpit.						MEN X MINUTES	
REPLACEMENT PROCEDURE Replace the complete control column assembly. See page 29.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage and corrosion.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Electrical ground power unit. Cockpit access stand. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Rudder Pedals		REF. NO. 15	
AVRO PART NO. 7-1552-195,6		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION Pilot's control for the operation of the rudder, the nose wheel steering and the brakes.							
LOCATION Pilot's cockpit.							
ACCESS Restricted owing to the close proximity of the main instrument panel. It may be necessary to remove the main instrument panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Align the pedal adjustment Bowden cables to the spring-loaded pawl mechanism. Fit the pin. Bolt the tension spring to the pedal adjustment cable. Align the upper hinge point to its bracket on the top longeron. Fit the bolt. Bolt the brake push rod and the bonding clips to the brake lever. Bolt the lower push rod and the bonding clip to the rudder pedal lever.						MEN X MINUTES	

ARROW 1 SERVICE DATA

10-1-1964

INSPECTION Check the pedal assembly for security, damage and corrosion, and for range and freedom of movement. Check the operation of the pedal adjustment and parking brake.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Cockpit access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Feel-and-Trim Unit		REF. NO. 15	
AVRO PART NO. 7-1552-341		MANUFACTURER Airesearch		MAN'FR'S PART NO. 39872-2		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To provide trim adjustment, and pilot's artificial feel in the emergency mode of flight control.							
LOCATION Nose landing gear bay.							
ACCESS Unobstructed in the nose landing gear bay.						MEN X MINUTES	
REPLACEMENT PROCEDURE Bolt the unit to its bracket on the front face of the former at station 176.00. Pin-lock the aileron cable tension regulator quadrant in neutral. Set the feel-and-trim unit in its central position, and adjust the rod end to align with the hole at its attachment point on the regulator torque tube. Bolt in position. Connect the electrical connection.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION	MEN X MINUTES	
Check for security, damage, corrosion and wear. Check the aileron controls for range and freedom of movement.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. B4 stand. Rigging pin.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

CONFIDENTIAL

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Elevator Feel-and-Trim Unit		REF. NO. 15	
AVRO PART NO. 7-1562-247		MANUFACTURER Airesearch		MAN'FR'S PART NO. 39872-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To provide trim adjustment and pilot's artificial feel in the emergency mode of flight control. To provide automatic trim in the normal mode of flight control.							
LOCATION Engine bay.							
ACCESS Accessible through No. 3 service panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Bolt the unit to the attachment lever at station 701.67. Pin-lock the elevator rear quadrant in the mean position. Set the feel-and-trim unit in its central position and adjust the rod end to align with the hole at its attachment point on the elevator rear quadrant. Bolt in position. Connect the electrical connection.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion and wear. Check the elevator controls for range and freedom of movement.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. B4 stand. Rigging pin.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Rudder Feel-and-Trim and Hinge Moment Limit- ation System	REF. NO. 15
AVRO PART NO. 7-1583-145	MANUFACTURER Avro Aircraft Ltd. and Airesearch	MAN'FR'S PART NO. Trim Unit - 39886 Linear Actuator - 39852		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN- ESTIMATED- 500 hours			
FUNCTION To provide trim adjustment and pilot's artificial feel in the emergency mode of flight control. To prevent inadvertent application of large rudder deflections at high speeds.					
LOCATION In the vertical stabilizer between spars 7 and 10, and ribs 4 and 5.					
ACCESS Through the access door in the LH side of the vertical stabilizer.					MEN X MINUTES
REPLACEMENT PROCEDURE Position the rear quadrant complete with trim actuator, linear actuator, and the feel and limitation mechanism to the vertical stabilizer. Fit the quadrant actuator spindle attachment bolts. Bolt the link to the link attachment brackets. Bolt the fulcrum lever to the lever pivot bracket. Bolt the linear actuator to the actuator attachment bracket. Bolt the push-pull rod from the rudder actuator linkage to the rear quadrant. Connect the rudder cables to the rudder rear quadrant. Fit the cotter pins. Re-rig the rudder controls.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion and wear. Check for freedom and range of movement of the rudder controls.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Hydraulic test machine trailer. Electrical ground power unit. B5 stand. Rigging pin.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Cable Tension Regulator Quadrant in Fuselage		REF. NO. 15	
AVRO PART NO. 7-1552-165		MANUFACTURER Pacific Scientific		MAN'FR'S PART NO. XR86-5001-50-00		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To compensate for temperature changes and structural deflections affecting the aileron cables in the fuselage.							
LOCATION Nose landing gear bay.							
ACCESS Unobstructed in the nose landing gear bay.						MEN X MINUTES	
REPLACEMENT PROCEDURE Slide the quadrant torque tube through the feel-and-trim unit lever into position in its bearings in the lever mounting. Secure the aileron lever to the torque tube by means of one threaded taper pin. Secure the feel-and-trim unit lever to the torque tube by means of one threaded taper pin. Fit the aileron front cables to the quadrant. Re-rig the aileron controls.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion and wear. Check cable tensions and attachments.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Cable tension meter. B4 stand. Rigging Pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Elevator Cable Tension Regulator Quadrant		REF. NO. 15	
AVRO PART NO. 7-1552-165		MANUFACTURER Pacific Scientific		MAN'FR'S PART NO. XR86-5001-50-00		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To compensate for temperature changes and structural deflections affecting the elevator cables.							
LOCATION Nose landing gear bay.							
ACCESS Unobstructed in the nose landing gear bay.						MEN X MINUTES	
REPLACEMENT PROCEDURE Secure the elevator cable tension regulator quadrant to the torque tube by means of two threaded taper pins. Bolt the quadrant assembly support bracket to the structure. Connect the push-pull rod from the elevator control linkage to the lever on the inboard end of the quadrant torque tube. Connect the elevator control cables to the quadrant. Re-rig the elevator controls.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION	MEN X MINUTES	
Check for security, damage, corrosion and wear. Check cable tensions and attachments.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
	Cable tension meter. B4 stand. Rigging Pins.	
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Rudder Cable Tension Regulator Quadrant		REF. NO. 15	
AVRO PART NO. 7-1552-165		MANUFACTURER Pacific Scientific		MAN'FR'S PART NO. XR86-5001-50-00		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To compensate for temperature changes and structural deflections affecting the rudder cables.							
LOCATION Nose landing gear bay.							
ACCESS Unobstructed in the nose landing gear bay.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the rudder cable tension regulator quadrant torque tube into the rudder pedestal bearing housing. Secure the torque tube to the rudder bar cross tube fitting in the cockpit by means of two threaded taper pins. Install and secure the nose wheel steering quadrant to the torque tube. Connect the rudder cables to the quadrant. Re-rig the rudder controls.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Check for security, damage, corrosion and wear. Check cable tensions and attachments.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cable tension meter. Cockpit access stand. B4 stand. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Rear Fuselage Quadrant		REF. NO. 15	
AVRO PART NO. 7-1562-143		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To relay the required control movement to the aileron actuators.							
LOCATION Engine bay.							
ACCESS Accessible through No. 3 service panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the aileron rear fuselage quadrant secure in its housing, bolt the assembly to its attachment brackets on the inner wing bottom skin. Connect to the assembly the push-pull rods that lead to the aileron cable tension regulators in the wings. Connect the aileron control cables in the fuselage to the aileron rear fuselage quadrant. Re-rig the aileron controls.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cable tension meter. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Elevator Rear Quadrant		REF. NO. 15	
AVRO PART NO. 7-1562-163		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To relay control movement to the elevator actuators.							
LOCATION Engine bay.							
ACCESS Accessible through No. 3 service panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the elevator rear quadrant secure in its housing, bolt the assembly to its attachment brackets on the inner wing bottom skin. Connect the push-pull rods to the lever at each end of the torque shaft. Connect the elevator control cables to the elevator rear quadrant. Re-rig the elevator controls.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cable tension meter. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Cable Tension Regulators in Wings	REF. NO. 15
AVRO PART NO. 7-1562-207, 8	MANUFACTURER Pacific Scientific	MAN'FR'S PART NO. R75-9006-50-00		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To compensate for temperature changes and structural deflections affecting cable circuits in the wings.					
LOCATION In the inner wing, adjacent to the elevator actuator.					
ACCESS Accessible through the elevator actuator compartment panel, on the top surface of the inner wing.					MEN X MINUTES
REPLACEMENT PROCEDURE Bolt the aileron cable tension regulator in its position between the upper and lower skins of the inner wing. Connect the push-pull rod attached to the aileron rear quadrant assembly, to the lever on the lower end of the regulator torque shaft. Connect the aileron control cables in the wings to the pulleys of the cable tension regulators. Re-rig the aileron controls.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check for security, damage, corrosion and wear. Check cable tensions.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cockpit access stand. Cable tension meter. B4 stand. Wing mats. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Fuselage Cables - Front		REF. NO. 15	
AVRO PART NO. 7-1550-15, 1o		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To convey control column lateral movement to the aileron rear quadrant.							
LOCATION Front fuselage - Centre fuselage.							
ACCESS In the nose landing gear well - unobstructed. Through the air conditioning panel (76 screws). Through the electronic equipment bay (33 camlocs). In the armament bay with the missile pack lowered.						MEN X MINUTES	
REPLACEMENT PROCEDURE Draw the new cables into position from rear to front. Bolt the pulleys in position at station 228.00 and station 280.00. Refit the clevis pins to the pulley bracket at station 188.48. Fit the cables to the aileron cable tension regulator quadrant. Fit the cotter pins. Fit the turnbuckles between the aileron front and rear cables. Tension the aileron fuselage cables with the front and rear quadrants pin-locked neutral.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Examine the cables for fraying, pulled swaged ends, corrosion and correct routing. Check that the turnbuckles are in safety and are correctly locked. Examine the cable attachment to the aileron cable tension regulator quadrant in the nose landing gear well.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Rigging pins. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UNCLASSIFIED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Fuselage Cables - Rear		REF. NO. 15	
AVRO PART NO. L.H. 7-1562-391 R.H. 7-1562-387		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To convey control column lateral movement to the aileron rear quadrant.							
LOCATION Centre fuselage - Duct bay - Engine bay.							
ACCESS In the armament bay with the missile pack lowered. Through the electrics bay access panel (62 camlocs). Through No. 1 service panel (47 camlocs, eight screws), and through No. 2 service panel (42 camlocs) with the front flying controls compensator and the utility hydraulic accumulator removed. Through No. 3 service panel (36 camlocs).						MEN X MINUTES	
REPLACEMENT PROCEDURE Draw the new cables into position from front to rear. Refit the guide pin to the pulley bracket at station 629.00. Bolt the pulleys in position at station 485 and station 512.00. Fit the cables to the aileron rear quadrant. Fit the cotter pins. Fit the turnbuckles between the aileron front and rear cables. Tension the aileron fuselage cables with the front and rear quadrants pin-locked neutral.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION Examine the cables for fraying, pulled swaged ends, corrosion and correct routing. Check that the turnbuckles are in safety, and are correctly locked. Examine the cable attachment to the aileron rear quadrant in the engine bay.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Cable tension meter. B4 stand. Rigging pins.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Aileron Wing Cables	REF. NO. 15
AVRO PART NO. Front 7-1562-83 Rear 7-1562-85		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To convey movement of the aileron rear quadrant to the aileron actuators.					
LOCATION Inner wing trailing edge.					
ACCESS Accessible for inspection through the following panels: 1. Elevator jack access panels. 2. Aileron jack access panels. 3. Elevator bellcrank access panels. Accessible for removal of cables by removing the elevator control box skin.					MEN X MINUTES
REPLACEMENT PROCEDURE Draw the inboard cables into position, and secure to the wing tension regulator quadrant. Draw the outboard cables into position, and secure to the actuator quadrant. Refit all pulley guard pins and fairleads. Fit the turnbuckles between the inboard and outboard cables. Tension the aileron wing cables with the wing tension regulators set in the neutral position and the actuator linkages central. Slide the cable shields into position and secure by means of one bolt to its outboard attachment bracket.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Examine the cables for fraying, pulled swaged ends, corrosion, and correct routing. Check that the turnbuckles are in safety, and are correctly locked. Examine the cable attachments to the wing tension regulators and the actuator quadrants.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Elevator Front Cables	REF. NO. 15
AVRO PART NO. Upper - 7-1550-11 Lower - 7-1550-12		MANUFACTURER Avro Aircraft Ltd	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To convey control column fore-and-aft movement to the elevator rear quadrant.					
LOCATION Front fuselage - Centre fuselage.					
ACCESS In the nose landing gear well - unobstructed. Through the air conditioning panel (76 screws). Through the electronic equipment bay (33 camlocs). In the armament bay with the missile pack lowered.					MEN X MINUTES
REPLACEMENT PROCEDURE Draw the new cables into position from rear to front. Bolt the pulleys in position at station 280.00. Refit the clevis pins to the pulley brackets at station 194.00 and station 228.00. Fit the cables to the elevator tension regulator quadrant. Fit the cotter pins. Fit the turnbuckles between the elevator front and rear cables. Tension the elevator cables with the front and rear quadrants pin-locked in the mean position.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Examine the cables for fraying, pulled swaged ends, corrosion, and correct routing. Check that the turnbuckles are in safety, and are correctly locked. Examine the cable attachments to the elevator tension regulator quadrant.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
B4 stand. Rigging pins. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Elevator Rear Cables	REF. NO. 15
AVRO PART NO. Upper - 7-1562-334 Lower - 7-1562-335		MANUFACTURER Avro Aircraft Ltd.	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To convey control column fore-and-aft movement to the elevator rear quadrant.					
LOCATION Centre fuselage - Duct bay - Engine bay.					
ACCESS In the armament bay with the missile pack lowered. Through the electrics bay access panel (62 camlocs). Through No. 1 service panel (47 camlocs eight screws), and through No. 2 service panel (42 camlocs) with the front flying controls compensator and the utility hydraulics accumulator removed. Through No. 3 service panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Draw the new cables into position from front to rear. Refit the guide pin to the pulley bracket at station 620.49. Bolt the pulleys in position at station 485 and station 512. Fit the cables to the elevator rear quadrant. Fit the cotter pins. Fit the turnbuckles between the elevator front and rear cables. Tension the elevator cables with the front and rear quadrants pin-locked in the mean position.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Examine the cables for fraying, pulled swaged ends, corrosion and correct routing of cables. Check that the turnbuckles are in safety, and are correctly locked. Examine the cable attachments to the elevator rear quadrant.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Rigging pins. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

UK

ED

CONFIDENTIAL

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

CLASSIFIED

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Rudder Front Cables	REF. NO. 15
AVRO PART NO. L.H. - 7-1550-14 R.H. - 7-1550-13		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To convey movement of the rudder pedals to the rudder rear quadrant.					
LOCATION Front fuselage - Centre fuselage.					
ACCESS In the nose landing gear well - Unobstructed. Through the air conditioning panel (76 screws). Through the electronic equipment bay (33 camlocs). In the armament bay with the missile pack lowered.					MEN X MINUTES
REPLACEMENT PROCEDURE Draw the new cable into position from rear to front. Bolt the pulleys in position at station 228.00 and station 280.00. Refit the clevis pins to the pulley bracket at station 188.00. Fit the cables to the rudder cable tension regulator quadrant. Fit the cotter pins. Fit the turnbuckles between the rudder front and rear cables. Tension the rudder cables with the rudder bar pin-locked central, and the rudder rear quadrant set in its central position.					MEN X MINUTES

UNCLASSIFIED**ARROW 1 SERVICE DATA**

INSPECTION	MEN X MINUTES	
Examine the cables for fraying, pulled swaged ends, corrosion and correct routing of cables. Check that the turnbuckles are in safety and are correctly locked. Examine the cable attachments to the elevator rear quadrant.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Rigging pins. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Rudder Centre Cables	REF. NO. 15
AVRO PART NO. L.H. - 7-1562-355 R.H. - 7-1562-357		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To convey movement of the rudder pedals to the rudder rear quadrant.					
LOCATION Centre fuselage - Duct bay.					
ACCESS In the armament bay with the missile pack lowered. Through the electrics bay access panel (62 camlocs). Through the hydraulic bay access panel (52 camlocs), with the utility hydraulics compensator removed.					MEN X MINUTES
REPLACEMENT PROCEDURE Draw the new cables in position from front to rear. Feed the rudder rear cables through the cable shields. Connect the rudder centre cables to the rudder rear cables. Clip the cable shields in position. Bolt the pulleys in position at station 485.00 and station 507.52. Fit the turnbuckles between the rudder front and centre cables. Tension the rudder cables with the rudder bar pin-locked central, and the rudder rear quadrant set in its central position.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Examine the cables for fraying, pulled swaged ends, corrosion and correct routing of cables. Check that the turnbuckles are in safety, and are correctly locked. Examine the cable attachments to the elevator rear quadrant.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Rigging pins. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Rudder Rear Cables		REF. NO. 15	
AVRO PART NO. L.H. - 7-1583-171 R.H. - 7-1583-177		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To convey rudder pedal movement to the rudder rear quadrant.							
LOCATION Duct bay - Vertical stabilizer.							
ACCESS Through the hydraulic bay access panel (52 camlocs) with the utility hydraulics compensator removed. Through the hinge moment limiter access panel on the L.H. side of the vertical stabilizer (61 screws).						MEN X MINUTES	
REPLACEMENT PROCEDURE Draw the new cables into position from the duct bay through the vertical stabilizer. Fit the cables to the rudder rear quadrant. Fit the cotter pins. Feed the rudder rear cables through the cable shields. Connect the rudder centre cables to the rudder rear cables. Clip the cable shields in position. Tension the rudder cables with the rudder bar pin-locked central and the rudder rear quadrant set in its central position.						MEN X MINUTES	

CONFIDENTIAL
UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION Examine the cables for fraying, pulled swaged ends, corrosion and correct routing of cables. Check that the turnbuckles are in safety and are correctly locked. Examine the cable attachments to the elevator rear quadrant.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Rigging pins. Cable tension meter.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Bellcrank Levers - Aileron Control Linkage		REF. NO. 15	
AVRO PART NO. See Remarks column		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 50 hours initially							
FUNCTION To connect the aileron control rod via links to the aileron.							
LOCATION Outer wing trailing edge.							
ACCESS Accessible for lubrication through lubrication access holes in the bottom skin of the aileron control box. Accessible for removal of levers only when the aileron control box is removed from the wing.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the bellcrank levers to the control rod. Position the control rod and lever assembly to the control box. Fit the pivot bolts. Bolt the aileron control links to the bellcrank levers. Refit the rib anchor nut plates.						MEN X MINUTES	

CLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Mobile cradle.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS Bellcrank lever part numbers are as follows: No. 1 - 7-1564-525,6 No. 2 - 7-1564-533,4 No. 3 - 7-1564-541,2 No. 4 - 7-1564-547,8 No. 5 - 7-1564-555,6 No. 6 - 7-1564-563,4 No. 7 - 7-1564-571,2		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Control Rod - Aileron Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1564-257		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To connect the aileron bellcrank levers and synchronize their movements.							
LOCATION Outer wing trailing edge.							
ACCESS Accessible only when the aileron control box is removed from the outer wing.						MEN X MINUTES	
REPLACEMENT PROCEDURE The replacement procedure is the same as for the aileron bellcrank levers. See page 69.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Mobile cradle.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Link - Aileron Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1564-531, -537, -545 -533, -561, -567, -573		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 50 hours initially			
FUNCTION To connect the bellcrank levers to the aileron.							
LOCATION Outer wing trailing edge.							
ACCESS Unobstructed when the aileron is raised.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the aileron in the fully 'up' position, remove and replace the links one at a time, adjusting the eccentric bearing with notched flange to obtain alignment. Bolt and lock in position. Refit the link fairings. Check that the neutral position of the aileron corresponds to the centre position of the actuator linkage.						MEN X MINUTES	

ARROW 1 SERVICE DATA

UNCLASSIFIED

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Bellcrank Levers - Elevator Control Linkage	REF. NO. 15
AVRO PART NO. Standard - 7-1562-603, 4 Master - 7-1562-605, 6		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 50 hours initially					
FUNCTION To connect the elevator control rod via links to the elevator.					
LOCATION Inner wing trailing edge.					
ACCESS Accessible with the elevator control box lower skin removed - 500 screws (approx.).					MEN X MINUTES
REPLACEMENT PROCEDURE Position each bellcrank lever to its pivot fitting. Fit the pivot bolt. Bolt the bellcrank levers to the control rod. Bolt the elevator actuator rod end to the master bellcrank lever. Bolt the links to the bellcrank levers.					MEN X MINUTES

~~UNCLASSIFIED~~ ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
B4 stand. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Control Rod - Elevator Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1562-14		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To connect the elevator bellcrank levers and synchronize their movement.							
LOCATION Inner wing trailing edge.							
ACCESS Accessible for inspection through two access panels - 25 screws and 11 screws respectively. Accessible for removal only when the elevator control box is removed from the inner wing.						MEN X MINUTES	
REPLACEMENT PROCEDURE Slide the control rod into position from outboard to inboard. Fit the bellcrank levers. See page 75.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for cracks, corrosion, damage and wear.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. B5 stand. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Link - Elevator Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1562-617		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		50 hours initially	
FUNCTION To connect the elevator bellcrank levers to the elevator.							
LOCATION Inner wing trailing edge.							
ACCESS Accessible with the elevator control box lower skin removed - 500 screws (approx.).						MEN X MINUTES	
REPLACEMENT PROCEDURE With the elevator in the fully 'up' position, remove and replace the links one at a time, adjusting the eccentric bearing with notched flange to obtain alignment. Bolt and lock in position. Check that the elevator mean position corresponds with the centre position of the actuator linkage.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA **COMPONENT DATA SHEET**

CONFIDENTIAL
UNCLASSIFIED

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Bellcrank Levers - Rudder Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1583-221 7-1583-223 7-1583-225 7-1583-227 7-1583-229		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 50 hours initially							
FUNCTION To connect the rudder control rod via links to the rudder.							
LOCATION Vertical stabilizer trailing edge.							
ACCESS Accessible only when the rudder control box is removed from the vertical stabilizer.						MEN X MINUTES	
REPLACEMENT PROCEDURE						MEN X MINUTES	

UNCLASSIFIED

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. B5 stand. Aerostand. Control box support sling. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Control Rods - Rudder Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1583-275,6,7,8		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To connect the rudder bellcrank levers and synchronize their movements.							
LOCATION Vertical stabilizer trailing edge.							
ACCESS Limited accessibility for inspection through access holes. Accessible for removal only when the rudder control box is removed from the vertical stabilizer.						MEN X MINUTES	
REPLACEMENT PROCEDURE						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. B5 stand. Aerostand. Control box support sling. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Link - Rudder Control Linkage		REF. NO. 15	
AVRO PART NO. 7-1583-257 (Links 1, 2, 4, 5) 7-1583-255 (Link 3)		MANUFACTURER Avro Aircraft Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 50 hours initially							
FUNCTION To connect the rudder bellcrank levers to the rudder.							
LOCATION Vertical stabilizer trailing edge.							
ACCESS Unobstructed with the rudder hard over to the right.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the rudder held hard over to the right, bolt the link to the bellcrank lever and to the rudder control hinge bracket.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand. B5 stand. Hydraulic test machine trailer.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FLYING CONTROLS MECHANICAL		SUB-SYSTEM		COMPONENT Bearings - Flying Control Linkages		REF. NO. 15	
AVRO PART NO. 7-1500-21		MANUFACTURER Shafer		MAN'F'R'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		50 hours initially	
FUNCTION To provide smooth low friction movement of the linkages between the actuators and the control surfaces.							
LOCATION In the elevator, aileron and rudder linkages.							
ACCESS Accessible for lubrication with the control box access panels and plugs removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE The bearings are a shrink fit and must not be removed and replaced. Complete replacement of the relevant bellcrank levers and/or the links must be carried out if bearings are faulty.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Mobile cradles and slings. B4 stand. B5 stand. Aerostand. Hydraulic test machine trailer. Electrical ground power unit.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

✓3

ARROW 1 SERVICE DATA

SECTION 12

FLYING CONTROLS

HYDRAULICS

(This data supersedes previous issue dated 15 Jan 58)

1 DEC 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

FLYING CONTROLS HYDRAULICS

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General.....	1
Pumps	2
Pump Delivery Manifold	3
Multi Outlet Filter	3
Accumulator 100 cu in	4
Pressure Control Valve	4
Pressure Switches	4
Reduced Pressure Gauge	5
Compensator	5
Expansion Couplings	6
High Pressure Filter	6
High Pressure Dual Filter	7
Elevator and Aileron Parallel Servos	7
Actuator Control Valve	10
Elevator and Aileron Differential Servos.....	10
Rudder Double Differential Servo	14
Control Surface Actuators	16
Surge Damping Accumulator.....	16
Temperature Gauge	16
Oil-to-air Heat Exchanger	17
Oil-to-fuel Heat Exchanger	17
Ground Service Connections	17
Booster Actuators	17
Booster Actuator Damper/Feel Unit.....	18
INSPECTION (To be issued later)	
SERVICING AND FUNCTION TESTING	
Equipment	18
Charging the Accumulators	19
Checking the Accumulators for Leaks	20
Priming the System	20
Filling the Compensators	21
Function Testing	21
REMOVAL AND INSTALLATION	
General	23
Pumps	24
Compensators	25
Surge Damping Accumulators	26
Accumulators 100 cu in	26

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
Oil-to-Air Heat Exchanger	26
Aileron Actuator	27
Elevator Actuator	27
Rudder Actuator	28
EQUIPMENT LIST	30

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Component Layout	iii
2	Flying Control Hydraulic System - Schematic	iv
3	Variable Delivery Pump - Schematic	2
4	Pump Delivery Manifold	3
5	Multi-Outlet Filter	3
6	Accumulator	4
7	Pressure Control Valve - Schematic	5
8	Compensator	6
9	Expansion Coupling	7
10	Parallel Servo - Schematic	8
11	Parallel Servo Disengaged - Schematic	9
12	Aileron Actuator Control Valve	11
13	Actuator Control Valve Selected Mechanically - Schematic	12
14	Actuator Control Valve Selected by Differential Servo - Schematic	13
15	Centering Mechanism Timing Control	14
16	Rudder Double Differential Servo - Schematic	15
17	Temperature Gauge	17
18	Torque Values for Installing Flareless Fittings	29

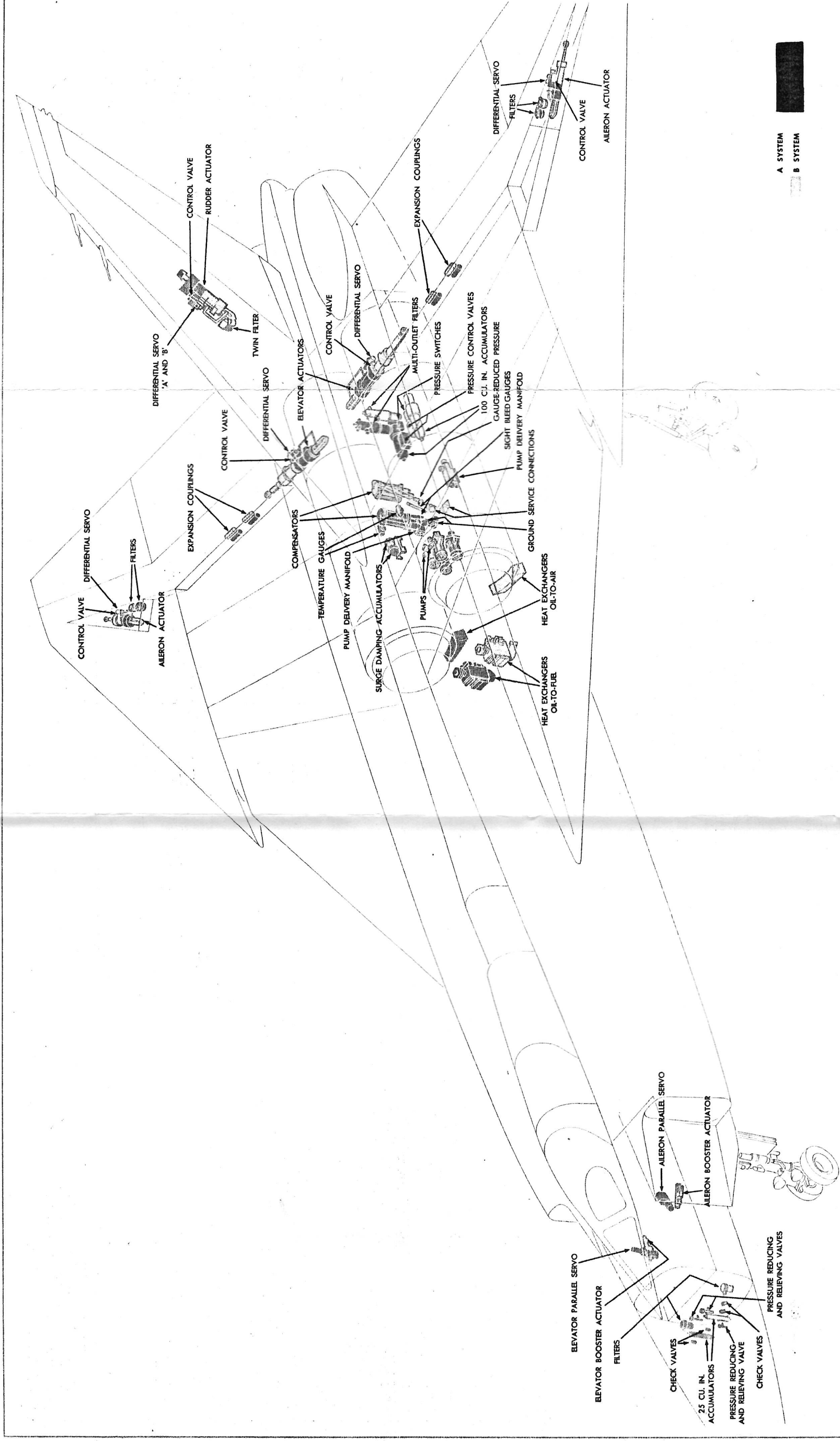
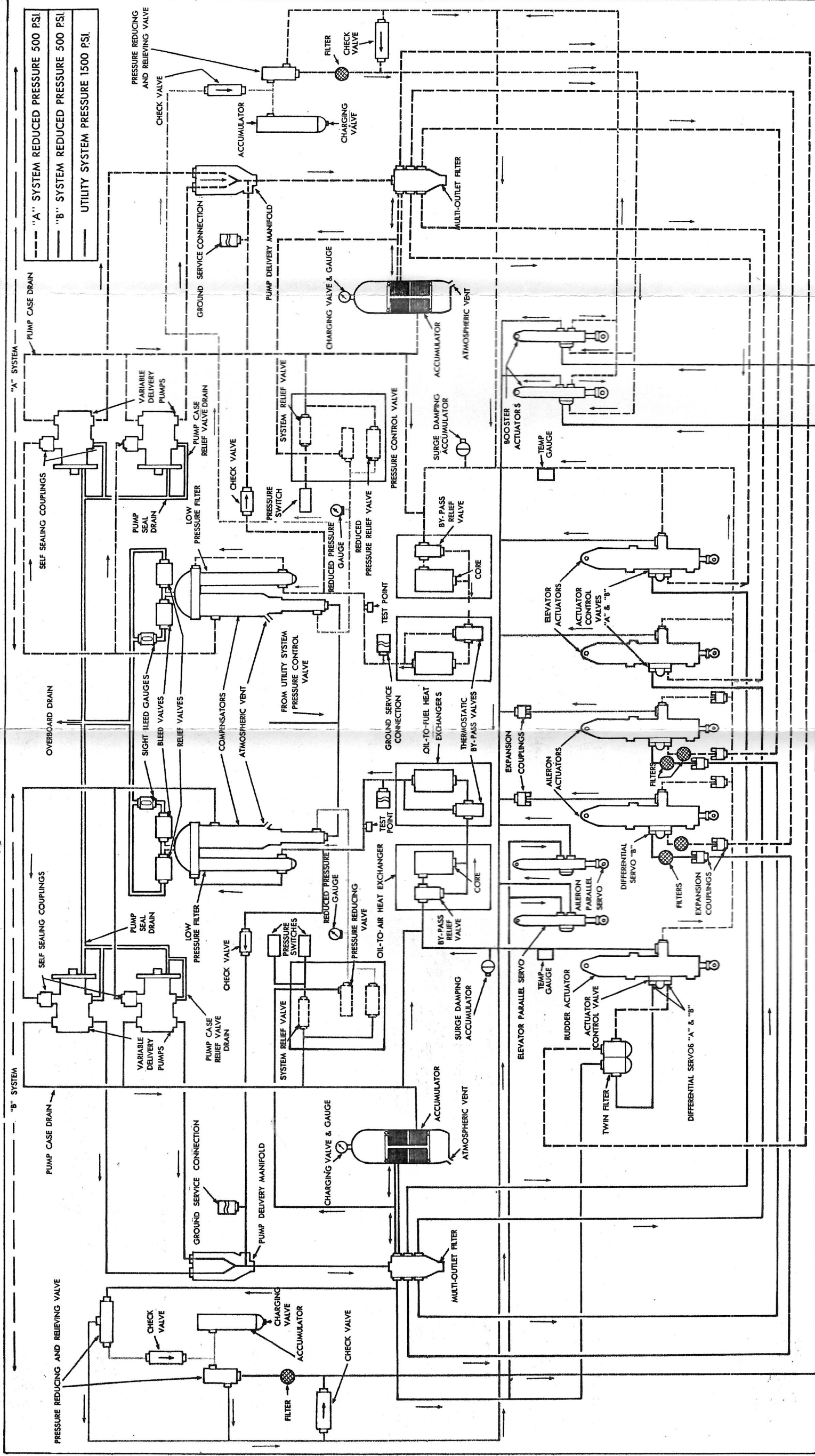


FIG. 1 COMPONENT LAYOUT

UNCLASSIFIED

UNCLASSIFIED



--- "A" SYSTEM PRESSURE 4000 P.S.I. --- "B" SYSTEM PRESSURE 4000 P.S.I. --- "A" SYSTEM RETURN 90 P.S.I. --- "B" SYSTEM RETURN 90 P.S.I. --- "A" SYSTEM REDUCED PRESSURE 1250 P.S.I. --- "B" SYSTEM REDUCED PRESSURE 1500 P.S.I.

FIG. 2 FLYING CONTROL HYDRAULIC SYSTEM - SCHEMATIC

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The aileron, elevator and rudder flying control surfaces are operated by hydraulic actuators. As there is no direct mechanical connection between the cockpit controls and the control surfaces, the hydraulic actuators are, in the interests of safety, served by two independent hydraulic systems. The systems are identified as the "A" system and the "B" system. Both systems normally supply hydraulic power to the actuators but, should one system fail, normal performance with certain limitations, can be maintained on the remaining system.

2 Each system is pressurized by two variable displacement pumps, one driven by each accessories gearbox. The pumps supply fluid at 4000 psi through a manifold and filter to the flying control actuator control valves. The return fluid passes from the actuators through heat exchangers to a compensator. The compensator acts as a reservoir of fluid and maintains a constant pressure of 90 psi on the return side of the system.

3 The flying control system is designed to function in three modes; the automatic mode, the normal mode and the emergency mode.

4 In the automatic mode the aircraft is controlled from a ground station, from the aircraft fire control system, or from the airborne navigational equipment. Signals from these services are passed to the automatic flight control sub-system which supplies electrical signals to the elevator and aileron parallel servos and differential servos. The parallel servos are connected to the mechanical controls which operate the hydraulic actuator control valves. The differential servos are mounted on the hydraulic actuators and are connected by mechanical linkages to the actuator control valves. Rudder turn co-ordination is automatic.

5 The aircraft is stabilized in the automatic mode by the damping system. Electrical signals from the damping system control the operation of the aileron and elevator parallel

and differential servos and the rudder double differential servos.

6 In the normal mode, electrical transducers in the control column signal forces applied by the pilot at the control column to the elevator and aileron parallel and differential servos. Otherwise control is the same as for the automatic mode.

7 In the emergency mode, movement of the control column is transmitted mechanically, through cables and linkages to the elevator and aileron hydraulic actuator control valves. Hydraulic boosters fitted to the aileron and elevator circuits assist in moving the mechanical controls. Automatic rudder co-ordination is still available in this mode through an emergency yaw damping system.

8 The "A" hydraulic system supplies fluid to operate the aileron and elevator booster actuators, the aileron, elevator and rudder actuators together with their control valves, and the rudder emergency differential servo.

9 The "B" hydraulic system duplicates all the functions of the "A" system and additionally supplies fluid to the rudder primary differential servo to the aileron and elevator differential and parallel servos.

10 During operation of the flying controls the initial movement of an actuator control valve creates an instant demand for pressure fluid. This is momentarily satisfied by a pressurized accumulator and is almost instantly supported by a flow from the variable delivery pumps.

11 The pressure fluid supply from the pumps flows through the pump delivery manifold to a multi-outlet filter. From the multi-outlet filter the pressure fluid is supplied to the accumulator, the actuator control valves, the differential servos and into the actuator cylinders. Fluid displaced from the actuator cylinders flows through the actuator control valves, the two heat exchangers and compensator, to the return side of the pumps.

12 The system can be operated throughout a fluid temperature range of 0°F to 250°F.

ARROW 1 SERVICE DATA

A limited rate performance is possible at temperatures down to -20°F but at temperatures below -20°F it is necessary to warm up the fluid by operating the control surfaces. The control surfaces should be cycled for approximately 6 minutes to warm up the fluid from -65°F to 0°F .

PUMPS (Fig 3)

13 Four Vickers pumps, two for each system, are mounted on the two engine driven accessories gearboxes which are located between the engines at station 621. One "A" system pump and one "B" system pump are driven by each gearbox. The pumps are of the axial piston variable displacement type, delivering a non-pulsating flow of hydraulic fluid at a constant pressure.

14 Each pump consists of nine pistons arranged around a universally jointed drive shaft. A cylinder block revolves with the pistons and bears on a variable position yoke which contains the inlet and outlet ports. Varying the angular setting of the yoke varies the piston stroke and the amount of fluid displaced. A pressure control unit locates the position of the yoke. When the yoke is set at 90° to the axis of the pump drive, the pump ceases to displace fluid.

15 Pump cooling is achieved by the fluid flow through the pump when the pump is delivering fluid and by a cooling flow through a pump case drain during zero delivery conditions. The case drain, which is connected to return, also prevents a pressure build up within the pump case under normal operating conditions.

16 An emergency case relief valve is also fitted to the outer case of the pump. This valve will relieve to prevent damage to the pump case, should the pressure within the pump case exceed 240 psi. Drainage from this valve flows into the overboard drain line together with a drain from the pump seal.

17 The pumps are mounted on the rear of the accessories gearbox and are secured by six studs. The inlet line of each pump is fitted with a self-sealing, quick-disconnect coupling to facilitate removal of the pump and to minimize loss of fluid during removal.

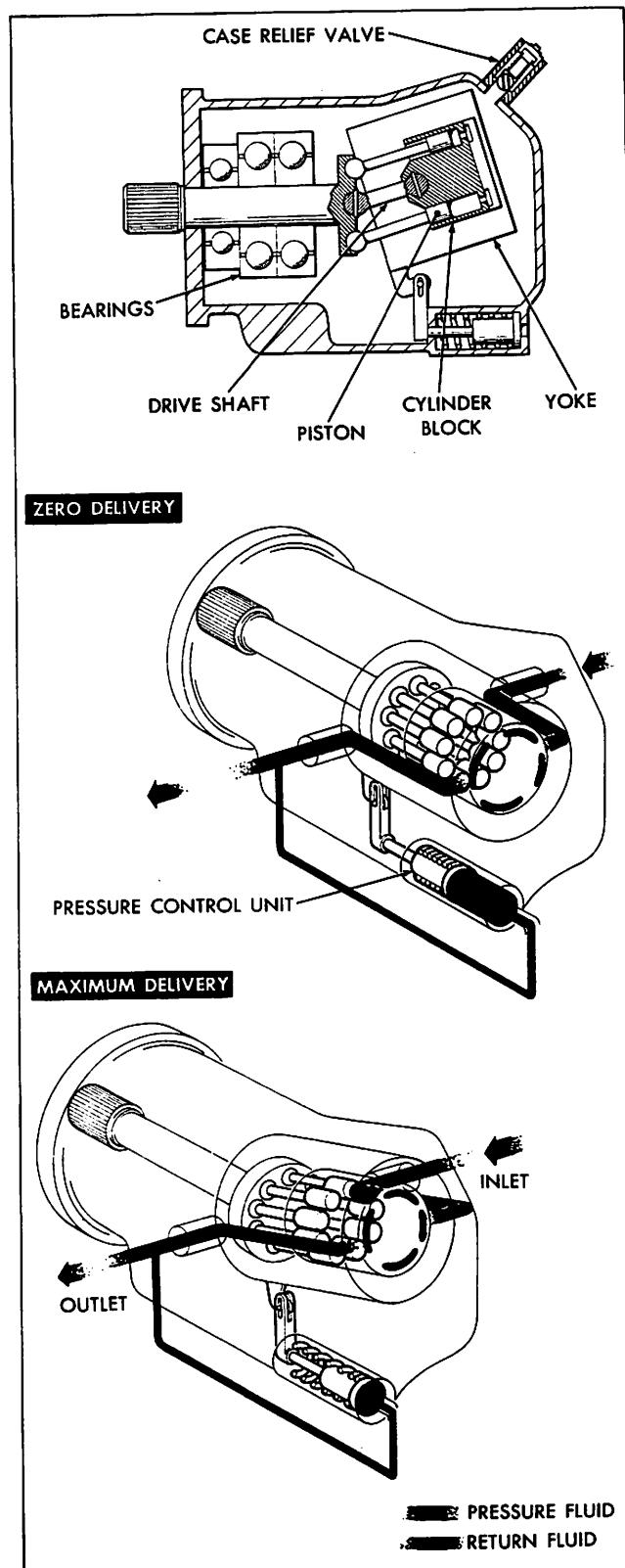


FIG. 3 VARIABLE DELIVERY PUMP - SCHEMATIC

ARROW 1 SERVICE DATA

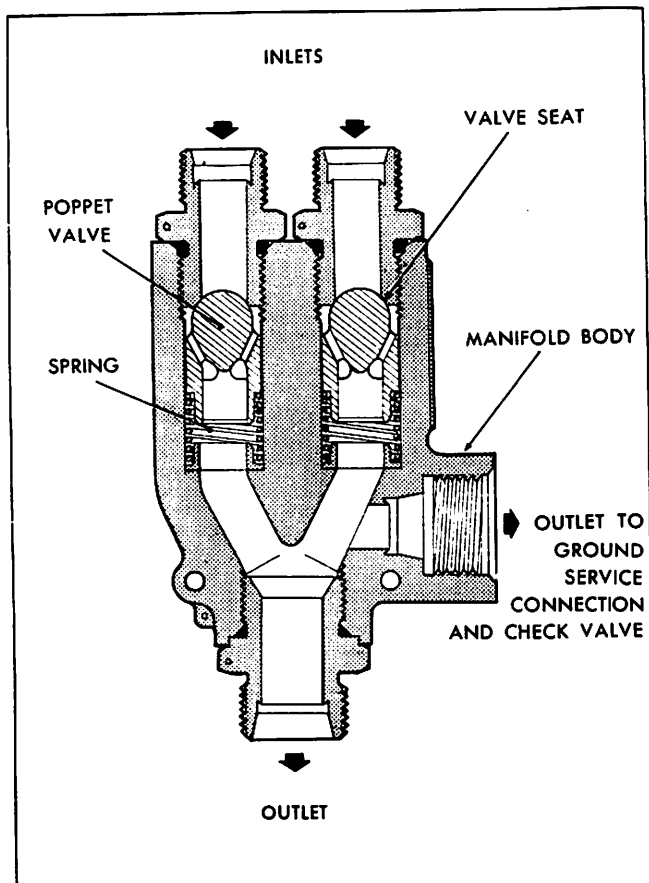
PUMP DELIVERY MANIFOLD (Fig 4)

18 From the pump outlets in each system, the fluid passes to a manifold which units the output of the two pumps into a common outlet. Two check valves in each manifold prevent a reverse flow through an inoperative pump, or through both pumps when operating from a ground servicing unit. From the common outlet, the manifold directs the fluid to the inlet of a multi-outlet filter.

MULTI-OUTLET FILTER (Fig 5)

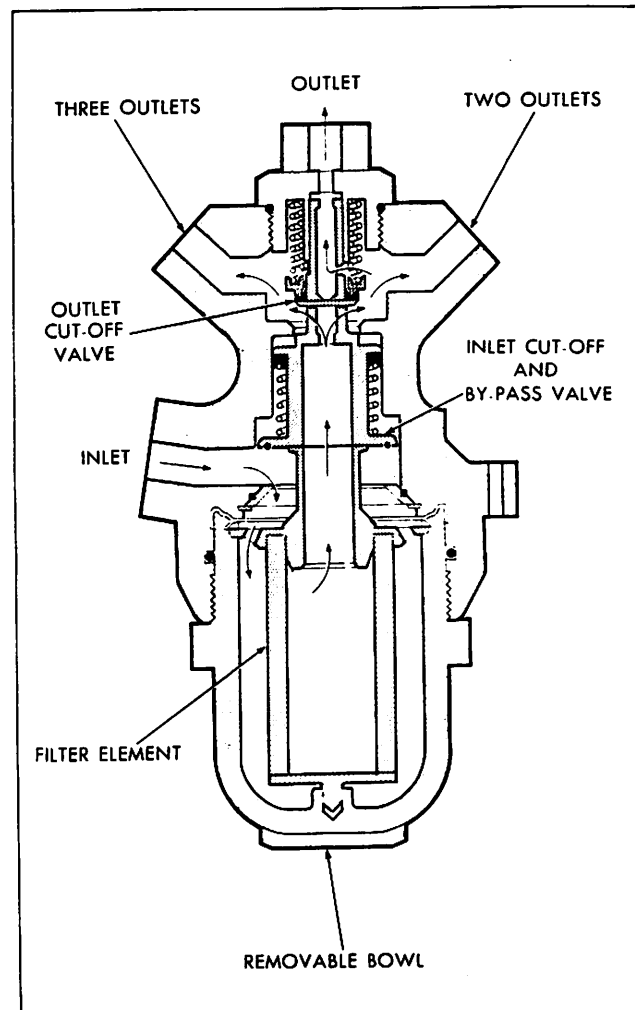
19 In each system, a multi-outlet high pressure filter with a maximum flow rate of 33 gpm, is fitted between the engines at station 697. This unit filters the fluid output from the pump delivery manifold.

20 The multi-outlet filter comprises a main body with a single inlet and six outlets, a removable bowl complete with filter element, an inlet cut-off and by-pass valve, and an outlet



7M2-2604-1

FIG.4 PUMP DELIVERY MANIFOLD



7M1-2606-1

FIG.5 MULTI-OUTLET FILTER

cut-off valve. The outlet cut-off valve is mounted above the inlet cut-off and by-pass valve and when closed seals off all of the outlets. When the filter is assembled, the filter element supports and opens the inlet cut-off and by-pass valve, and the outlet cut-off valve.

21 During normal operation, the hydraulic fluid enters the inlet and passes through the filter element to the six outlets through apertures in the cut-off valve spindle. In the event of filter element blockage, the pressure of hydraulic fluid causes a pressure build-up at the inlet, and when the pressure differential across the filter element reaches 45-55 psi, the inlet cut-off and by-pass valve opens and allows the incoming fluid to by-pass the filtering element.

ARROW 1 SERVICE DATA

22 When the bowl is removed during ground servicing, the cut-off valve springs extend, causing both valves to seat and seal off the filter inlet and outlets.

ACCUMULATOR 100 CU IN (Fig 6)

23 A self-displacing, piston type accumulator of 100 cu in capacity is fitted below the multi-outlet filter in each system at station 700. Each accumulator comprises two cylinders joined and divided by a central pressure bulkhead, two pistons, and a piston connecting rod. The central bulkhead provides two ports for hydraulic fluid and also supports the piston connecting rod. Each cylinder is divided into two compartments by a piston, the pistons being interconnected by the connecting rod. One compartment of the forward cylinder is charged with compressed nitrogen and the other compartment contains hydraulic fluid at main system pressure. One compartment of the rearward cylinder contains hydraulic fluid at return pressure and its other compartment is vented to atmosphere.

24 The accumulators perform the following functions:

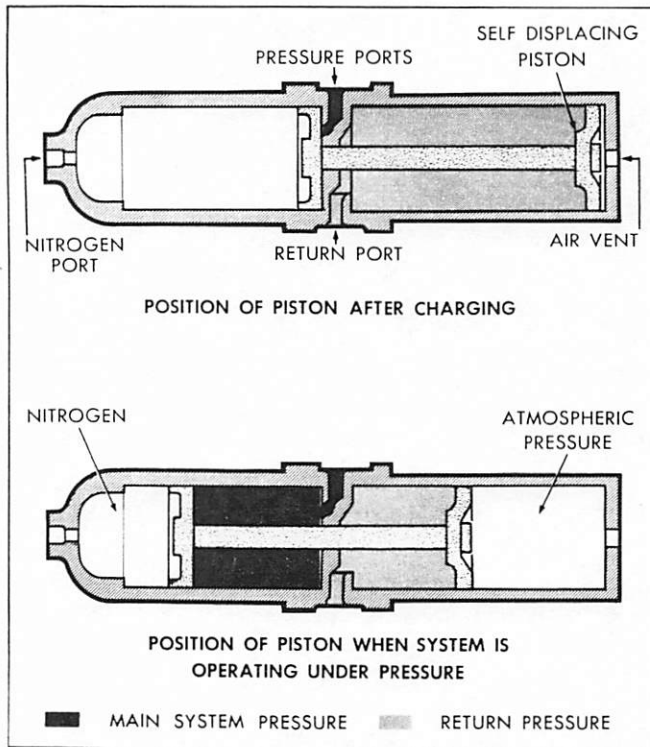


FIG. 6 ACCUMULATOR

(a) Supplies immediate high pressure fluid to the actuators when the control valves are operated.

(b) Absorbs return fluid displaced by the actuators during rapid movement of the controls.

PRESSURE CONTROL VALVE (Fig 7)

25 A pressure control valve for each system is fitted in the engine bay between the accumulators at station 697. Each unit houses the following three valves:

(a) A relief valve for the main system pressure. This valve commences to relieve at 4315 psi.

(b) A pressure reducing valve which reduces the main 4000 psi pressure to 1250 psi for emergency pressurization of the compensator. This source of pressure fluid is also utilized to supply the "A" system booster actuator circuit.

(c) A relief valve for the reduced pressure.

PRESSURE SWITCHES

26 Three pressure switches are fitted in the system, two for the "B" system and one for the "A" system. The switches are located adjacent to the system accumulators at station 705 and are connected to the system pressure port of the respective pressure control valve. Each switch consists of a hydraulic actuator and a micro-switch housed within a common body.

27 The "A" system pressure switch illuminates the system pressure warning lights in the pilot's cockpit in the event of system pressure failure and conversely extinguishes the warning lights when the pressure rises to a safe working pressure. The switch contacts will close and illuminate the warning lights if the hydraulic pressure drops to 600 - 1400 psi. The switch contacts will open and extinguish the warning lights when the pressure increases to 2800-3600 psi.

28 The two "B" system pressure switches perform the following functions:

ARROW 1 SERVICE DATA

(a) One of the switches operates in a similar manner to the "A" system switch and illuminates and extinguishes the "B" system cockpit warning lights.

(b) The other switch operates when the system pressure drops to 1225 - 1375 psi. When this occurs electrical power is supplied to energize the solenoid disengage valve in the "A" system rudder differential servo emergency circuit and also illuminates the EMERG DAMPING warning light. A rise in pressure to 1325 - 1475 psi reverses the procedure.

REDUCED PRESSURE GAUGE

29 A pressure gauge is fitted in each system to check the reduced pressure from the pressure control valve during ground testing. One gauge is attached to each arm of the V-strut at station 644. The RH gauge serves the "A" system and the LH gauge the "B" system.

COMPENSATOR (Fig 8)

30 A compensator is installed in each system above and to the rear of the engine driven pumps and performs the following functions:

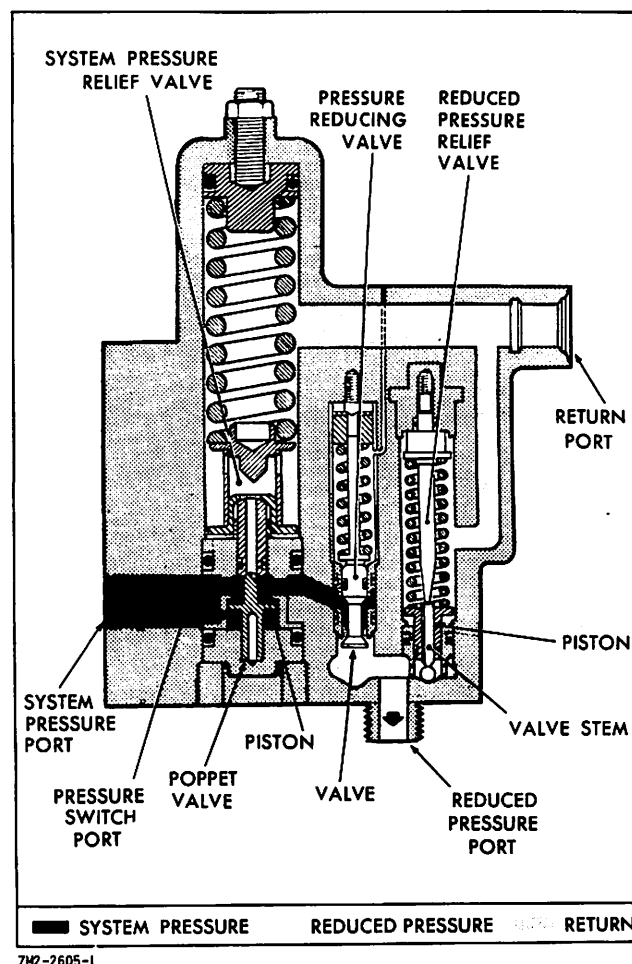
(a) Maintains a steady pressure on the return side of the system to ensure a constant supply of hydraulic fluid to the inlet side of the pumps.

(b) Provides an airless reservoir of fluid to compensate for fluid displacement during the operation of the system components and for volumetric variations due to temperature changes.

(c) Maintains a static pressure of 90 psi in the return system when the pumps are not operating and the utility hydraulic accumulator is charged, or alternatively maintains a pressure of 75 psi when receiving reduced pressure from the flying controls pressure control valve.

(d) Provides a means of trapping air and bleeding it from the system through an air separator compartment in the head of the compensator.

31 The compensator contains two opposed pistons on a common rod, the effective area of



7M2-2605-1

FIG.7 PRESSURE CONTROL VALVE - SCHEMATIC

the lower piston being 6% of that of the upper piston. Hydraulic fluid at 1500 psi is fed from the utility hydraulic system to the lower piston head. This pressure produces an opposing pressure of 90 psi on the flying control hydraulic fluid in the upper section of the compensator.

32 A floating piston located below the smaller piston is subject to hydraulic pressure at 1250 psi from the flying control system pressure control valve. Should the utility hydraulic pressure drop below 1250 psi, the piston will lift and contact the piston head of the lower piston. A pressure of 1250 psi on the floating piston produces a pressure of 75 psi in the upper section of the compensator.

ARROW 1 SERVICE DATA

33 Any air in the system is trapped in an air separator compartment in the head of the unit. A manually operated bleed valve is fitted for bleeding off this air into an overboard drain line. A sight bleed gauge installed in the drain line provides a visual means of checking for a bubble-free flow of fluid.

A relief valve in the air separation chamber relieves at a pressure of 275 psi and provides a relief for excess fluid should the system be overfilled.

34 A temperature calibrated tape is fitted on the unit and when used in conjunction with a temperature gauge, fitted above the compensator, gives a correct indication of fluid level for topping up operations. A bleed screw is provided at the lower end of the indicator rod to bleed off any air which collects in the high pressure side of the compensator during filling and servicing the utility hydraulic system.

35 A 33 gpm filter is fitted at the low pressure inlet side of the compensator. Incorporated in this filter is a cut-off valve to minimize fluid loss during removal of the bowl. Bypass valves fitted in the filter body open in the event of filter element blockage.

36 A line from the inlet side of the compensator is connected to the outlet of the pump delivery manifold. This line provides a supply of fluid to the pressure side of the system when it drops to a pressure below that of the return circuit. This will occur when the pumps are not operating, the accumulator is at the end of its stroke and the fluid is cooling and contracting after operation. A check valve is fitted in the line to prevent high pressure fluid flowing to the return circuit during normal operation.

EXPANSION COUPLINGS (Fig 9)

37 Expansion couplings are fitted in the pressure and return lines of the aileron actuators on both "A" and "B" systems. The couplings are hydraulically balanced units and have a movement range of one inch which compensates for thermal expansion and contraction, and wing flexing during flight.

HIGH PRESSURE FILTER

38 A high pressure filter is installed in each aileron actuator pressure line in both "A" and "B" systems. These filters remove foreign matter from the fluid prior to its entry into the actuator control valves and the actuator. They are located in the actuator bay and embody a

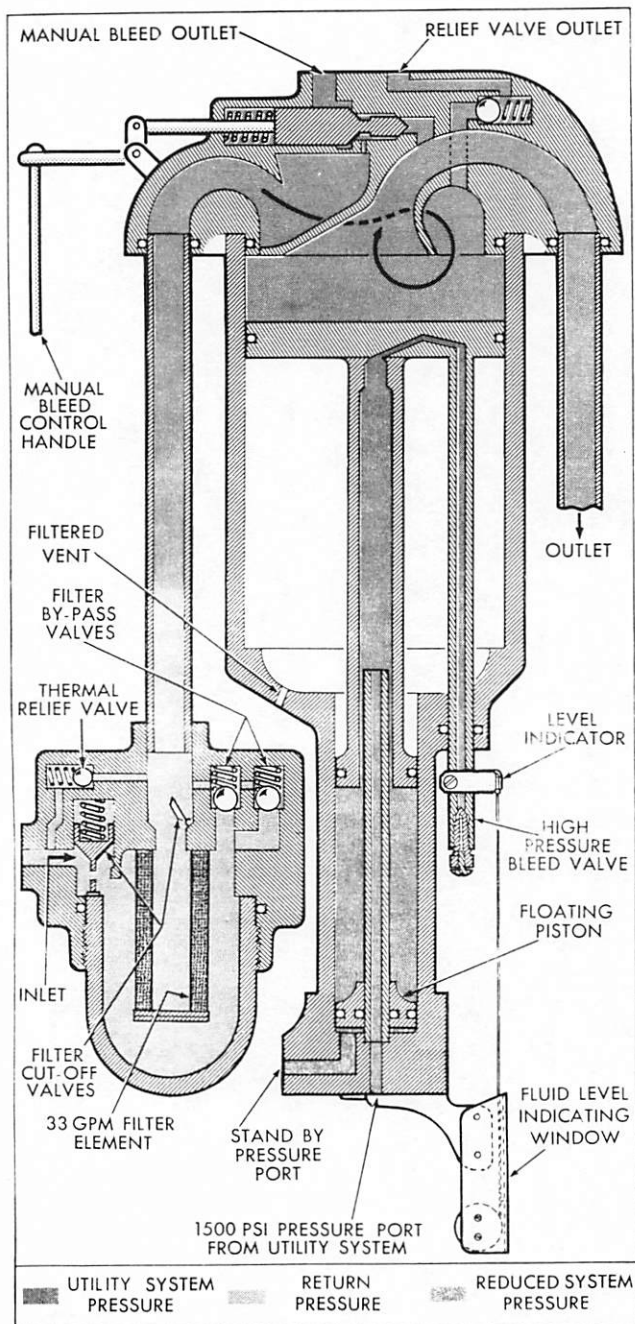


FIG. 8 COMPENSATOR

ARROW 1 SERVICE DATA

by-pass relief valve and a 10 micron Rigimesh element with a maximum flow rate of 5.8 gpm.

HIGH PRESSURE DUAL FILTER

39 A twin element side by side filter assembly is fitted to the rudder pressure lines and serves both "A" and "B" systems. It is located in the vertical stabilizer adjacent to the rudder actuator. Each unit incorporates a by-pass relief valve and a 10 micron Rigimesh element, with a maximum flow rate of 3.3 gpm.

ELEVATOR AND AILERON PARALLEL SERVOS (Figs 10 and 11)

40 The elevator and aileron parallel servos are located in the nose wheel bay between stations 207 and 214. These units are electro-hydraulic actuators which convert electrical signals into linear movement through hydraulic power. The electrical signals are originated either by the stick force transducer and damping network or by the automatic flight mode. Hydraulic power is supplied from the "B" system only.

41 Each servo is fitted to the aircraft structure and connected to the mechanical controls of its respective system. The output rod of the elevator servo is attached to the mechanical controls which operate the elevator booster selector valve and that of the aileron servo to the mechanical controls which operate the aileron booster selector valve.

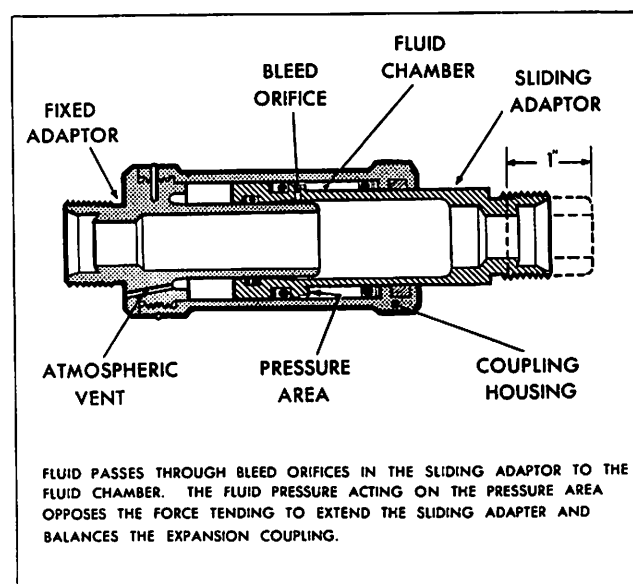
42 Movement of the servo is transmitted to the booster actuator which in turn operates the mechanical controls to the hydraulic control valves on the control surface actuators. Selection of the control valves supplies hydraulic power to move the control surfaces.

43 Each parallel servo consists of an electro-hydraulically controlled transfer valve, a by-pass valve, a piston operated output rod, and force limiters. A pressure sensing ram and a feed-back transformer on the output rod transmit electrical signals to the electronic flight control system.

44 The transfer valve is a spool type valve which directs high pressure fluid to operate

the output rod in the required direction. The position of the spool valve is controlled by the combination of spring pressure and metered fluid pressure operating on each end of the valve. The fluid is metered by two metering orifices which allow system pressure to discharge into the return system through two metered discharge outlets. A flapper valve located between the two discharge outlets, controls the fluid flow from the outlets. The position of the flapper valve is controlled by a torque motor. Movement of the valve nearer to a discharge outlet decreases the flow of fluid from this outlet and produces a pressure build-up on this end of the spool valve. The fluid flow from the opposite outlet increases and a corresponding drop in pressure is effected on the other end of the spool valve. The pressure difference produces movement of the valve which in turn compresses one spring and extends the other. The combination of the fluid and spring pressures places the transfer valve in equilibrium.

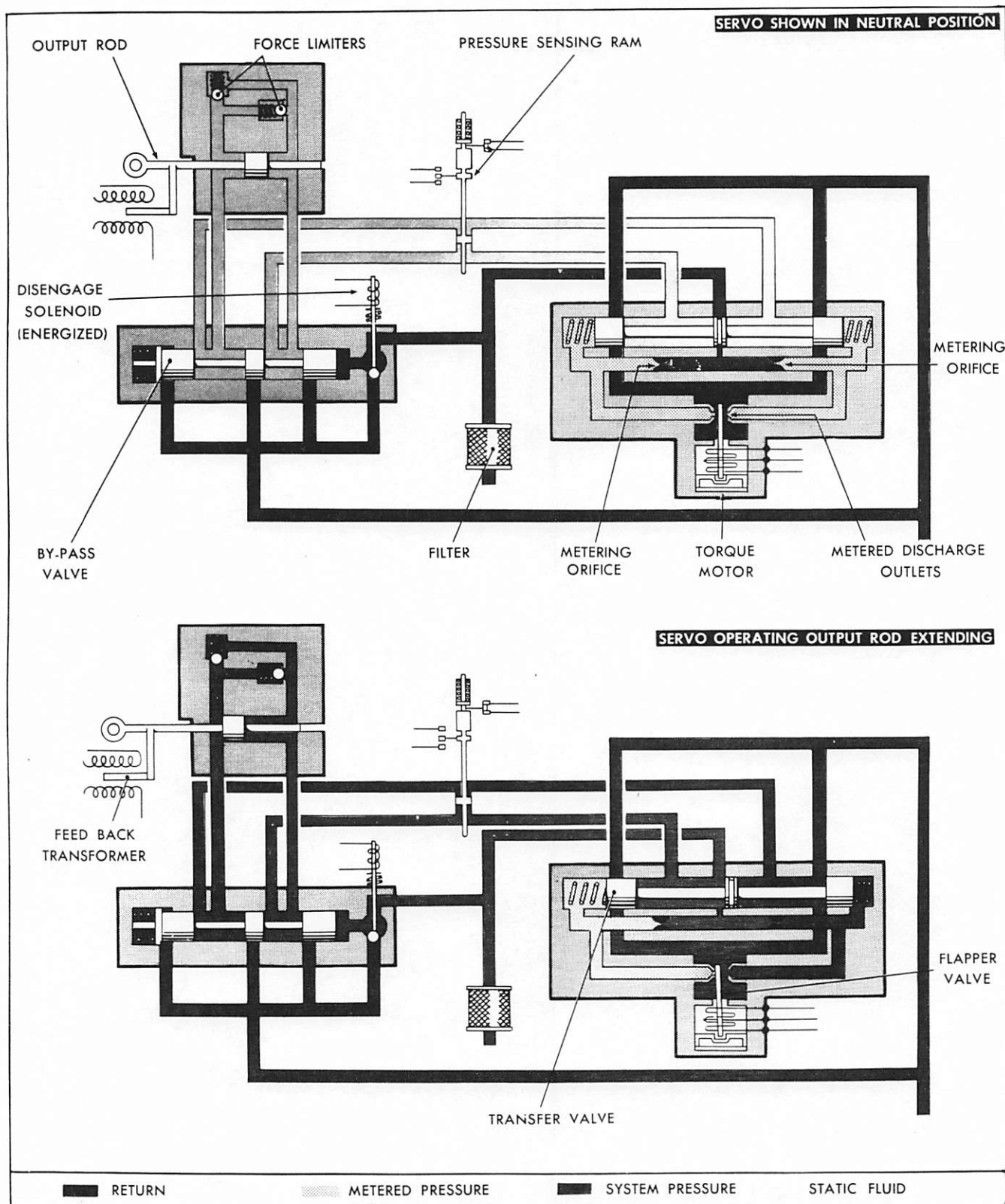
45 Movement of the transfer valve allows the high pressure inlet port to align with one of two outlets. The outlets are connected through a by-pass valve, to opposite sides of the output rod piston and supply fluid under pressure to move the output rod in the appropriate direction. Movement of the output rod



742-2607-1

FIG.9 EXPANSION COUPLING

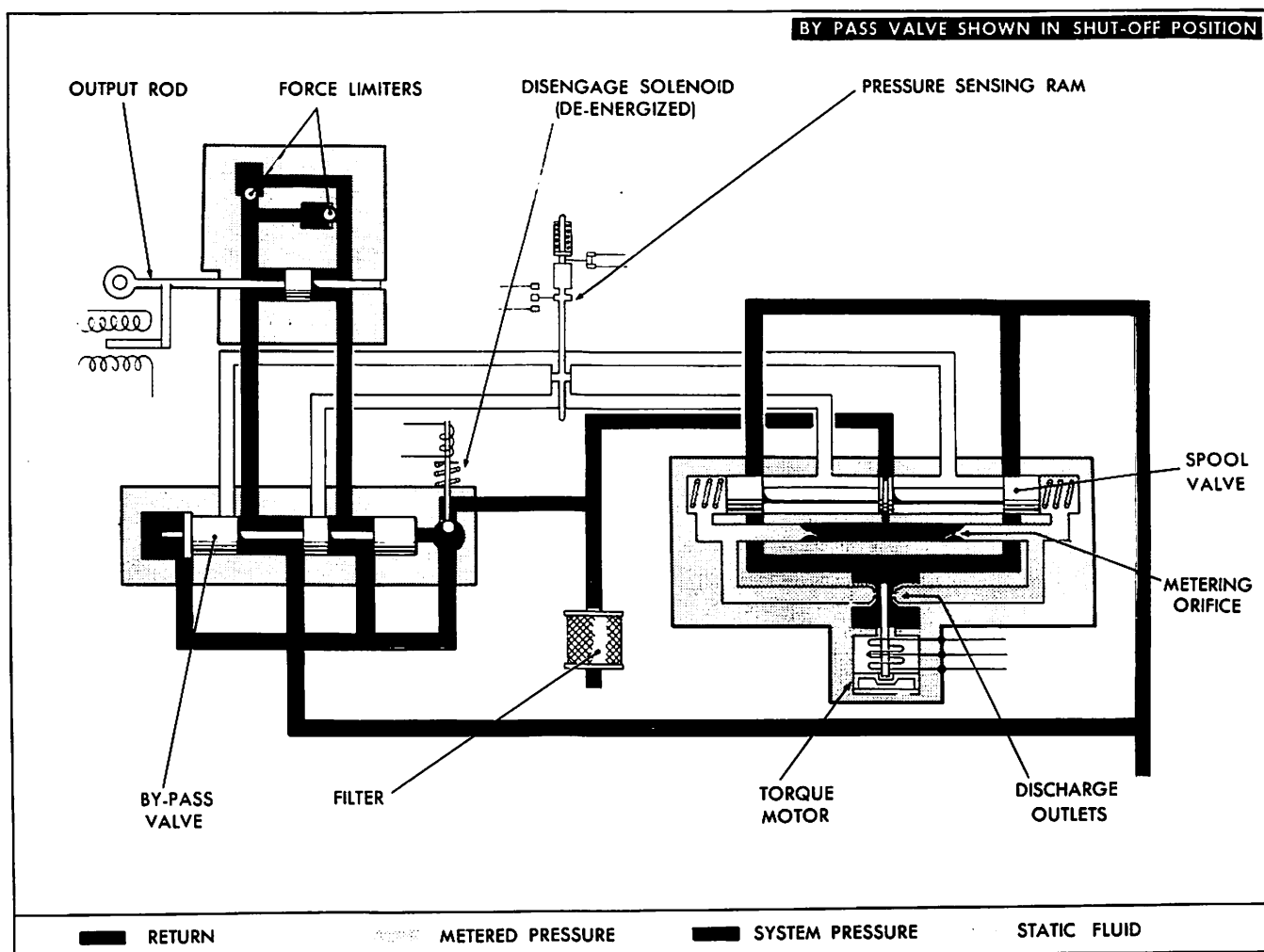
ARROW 1 SERVICE DATA



7M2-2608-1

FIG.10 PARALLEL SERVO - SCHEMATIC

ARROW 1 SERVICE DATA



7H2-2614-1

FIG.11 PARALLEL SERVO DISENGAGED - SCHEMATIC

also operates a feedback transformer that relays modifying signals back to the electronic system. These signals progressively nullify incoming signals to the torque motor and centralize the flapper valve when the required degree of output rod movement is achieved.

46 The by-pass valve is interposed between the transfer valve and the output rod. In the event of electrical power failure or failure of the "B" system hydraulic supply, the valve operates and permits the output rod to idle without resistance to the mechanical controls. For normal operation the valve is in the open position as shown in fig 10 and affords unobstructed ducts for system pressure or return fluid, between the transfer valve and the output rod.

47 The by-pass valve incorporates a spring-loaded spool valve and a solenoid disengage valve. The solenoid disengage valve is located in the high pressure system and in the open position allows the main system pressure fluid to oppose the force of a spring installed at the opposite end of the valve. De-energizing the solenoid valve or failure of the hydraulic pressure allows the spring to move the valve to the shut-off position, as shown in fig 11, closing the main pressure ports to the output rod and opening the output rod ports to return flow. This allows the output rod to move freely with the mechanical flying controls.

48 Force limiters are incorporated as a precautionary measure against the possibility

ARROW 1 SERVICE DATA

of a runaway servo. The force limiters consist of a relief valve located in each of the two pressure lines to the output rod actuator. These valves relieve and direct pressure fluid to return through the by-pass valve and transfer valve when sufficient mechanical force is applied to the output rod to overpower the hydraulic pressure.

49 An internal pressure sensing ram is incorporated in the circuit between the transfer valve and the output rod. It is a sensitive double acting piston rod, the piston end being open to pressure fluid fluctuations from both sides of the output rod. The opposite end of the ram operates a series of micro-switches that are connected to the electronic flight control and trim system.

ACTUATOR CONTROL VALVE (Fig 12)

50 A mechanically operated control valve is mounted on each of the flying control surface actuators. The valve is pressurized by both the "A" and "B" systems through individual pressure ports and is connected by drillings and pipelines to the actuator.

51 The control valve, in effect, embodies twin valves arranged in tandem inside a common housing. The assembly consists of a spool valve, two pressure ports and two return ports, one set of ports being connected to the "A" system and the other to the "B" system. Two coil springs are installed on the end of the spool valve shaft to impose a progressive loading on the spool when the valve is operated and also to assist in centering the valve.

52 The spool valve consists of landed and waisted sections arranged in tandem, and operates in a housing which is internally drilled for passage of pressure and return fluid. Movement of the spool either side of the neutral position aligns the pressure and return passages so that "A" and "B" system pressure is directed to one side of the actuator and movement of the actuator displaces fluid through the valve to return.

53 Two drillings in the aileron and elevator valve body and four drillings in the rudder valve body permit the passage of pressure and return fluid to the differential servos irrespective of the control valve position.

54 A damping unit is fitted to each actuator control valve spool to modify high frequency low amplitude oscillations of the spool valve and ensure positive valve action.

55 The aileron damping unit is installed at the end of the spool valve adjacent to the feel rate springs. See fig 12. The elevator and rudder spool valve damping units are mounted to the actuator body and are connected to the control valve spool by a link rod.

56 The damper comprises a common housing which embraces a cylindrical reservoir, a damper cylinder, a spring supported floating piston, a piston, a connecting quill shaft, two screw caps and a bleed screw. The reservoir and damper cylinder are interconnected by two drilled passages. The drillings permit a limited fluid flow between the reservoir and damper cylinder. The reservoir and damper cylinder are filled to a predetermined level with Dow Corning 200 silicone fluid.

57 In operation the normal selections of the spool valve will move the piston within the damper cylinder causing fluid from the compression side of the cylinder to flow through the drilled passage to the reservoir and into the opposite side of the cylinder. Under these conditions only a low resistance to spool valve movement is offered by the damper. Should the valve oscillate at high frequency, movement is resisted by the viscosity of the fluid and no appreciable piston movement will occur. The spring supported floating piston in the reservoir chamber prevents the air above the piston mixing with the fluid below the piston. The spring supports the piston and locates it on the fluid level line.

ELEVATOR AND AILERON DIFFERENTIAL SERVOS (Fig 13 and 14)

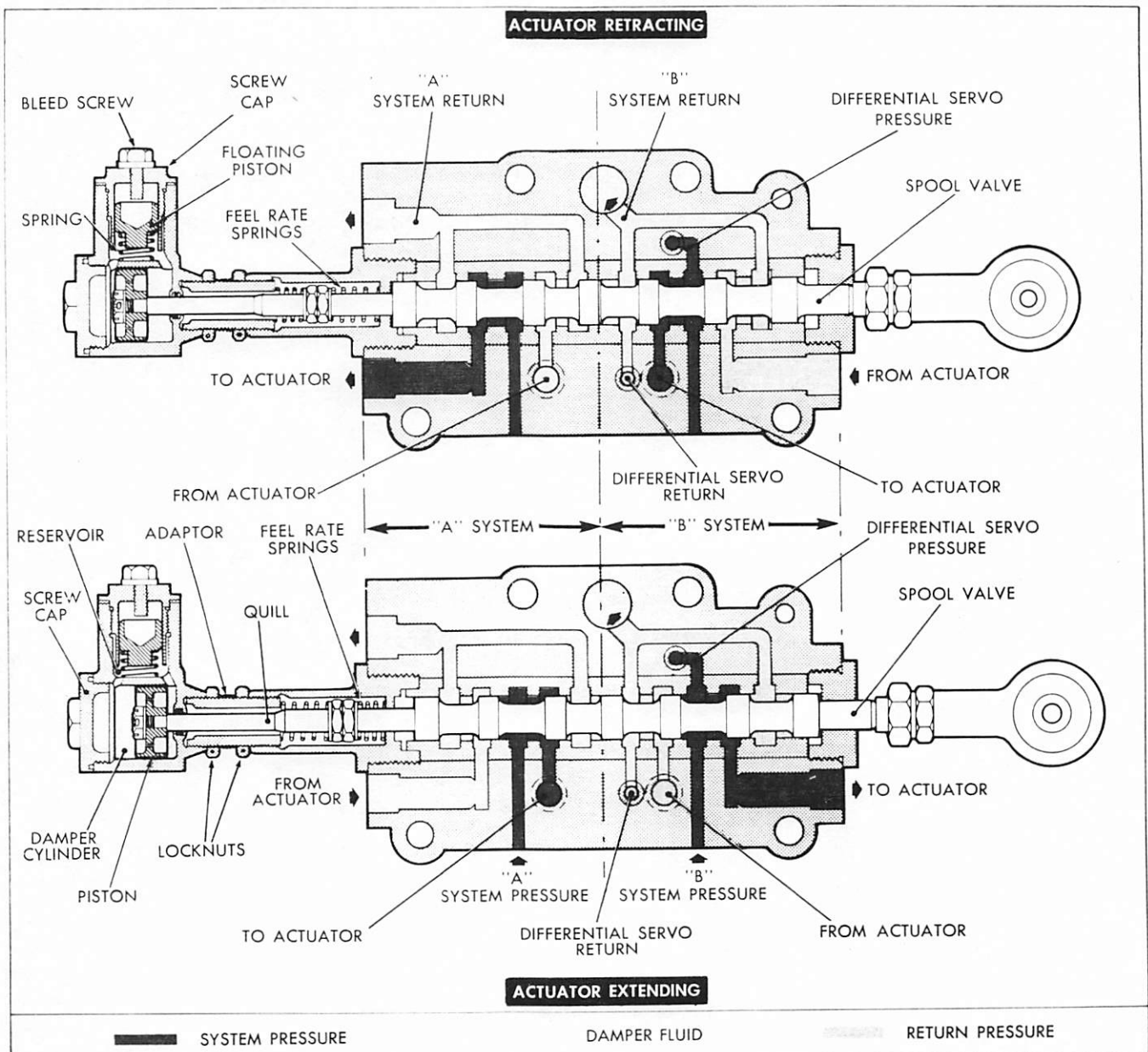
58 The differential servos are quick acting, electro-hydraulic actuators which transform electrical signals from the aircraft stabilization system into linear movement by utilizing hydraulic power. In the normal mode, stick force is also signalled from the force transducer to the differential servo simultaneously with the signals to the parallel servo, to provide a more rapid response at the control surface.

ARROW 1 SERVICE DATA

59 The differential servo is mounted on the actuator control valve. Provision is made by internal boring of the actuator control valve body for pressure and return portings to the differential servo.

60 The unit consists of an electro-hydraulically controlled transfer valve, a solenoid operated disengage valve, an output rod, an output rod feed-back transformer, a centering mechanism and a centering mechanism timing control.

61 The transfer valve is similar in construction and operation to the parallel servo transfer valve with the exception of two check valves which are fitted in the lines to the output rod piston. (For a detailed description of the parallel servo transfer valve see paras 44 and 45). The transfer valve directs high pressure fluid to one side of the output rod piston and connects the opposite side of the piston to return. Movement is transmitted to the actuator control valve through mechanical linkage. See fig 14.



7MI-2614-4

FIG.12 AILERON ACTUATOR CONTROL VALVE

ARROW 1 SERVICE DATA

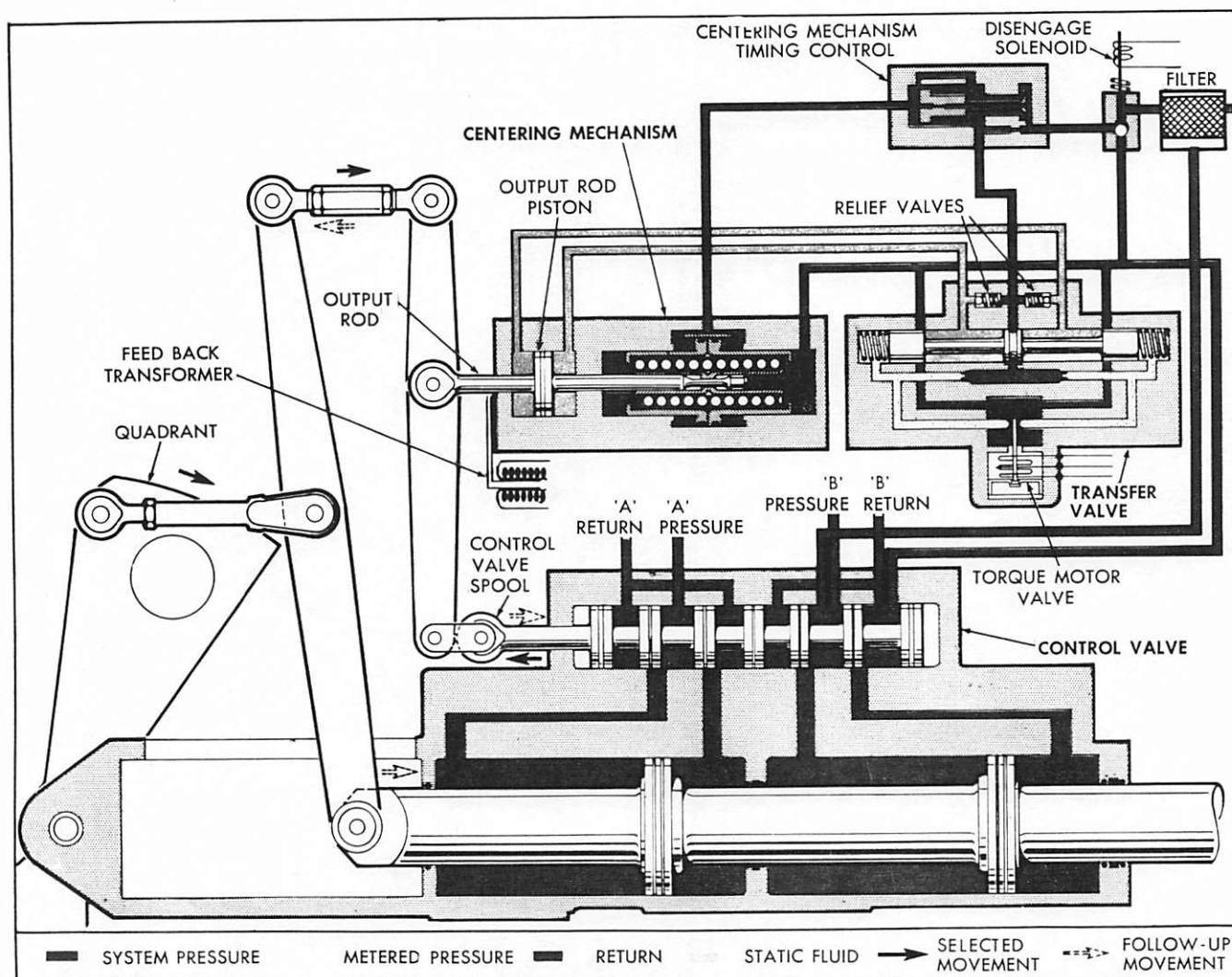


FIG. 13 ACTUATOR CONTROL VALVE SELECTED MECHANICALLY - SCHEMATIC

62 A centering mechanism in the unit locates the output rod in a central position should the electronic system or hydraulic system fail. The output rod then becomes a fixed pivot point in the actuator control valve linkage.

63 The centering mechanism consists of radially split inner and outer sleeves and a coil spring. Hydraulic pressure on the flanges of the outer sleeve keeps the mechanism compressed. When the pressure is relieved the spring forces the sleeves apart and the inner sleeves act as stops for the waisted section of the output rod. This locks the output rod in the centered position.

64 The centering mechanism timing control (see fig 15) is fitted to delay the rate of engagement of the servo output rod when the differential servo is brought into operation. It consists of a floating spool with a central orifice, a spool seat, a spool by-pass passage and a restrictor.

65 When the disengage solenoid is opened the initial surge of system pressure moves the metering spool on to its seat and restricts the fluid flow to a central orifice in the spool. The restricted fluid flow commences to compress the centering mechanism and gradually releases the output rod. Simultaneously the transfer valve receives a limited pressure

ARROW 1 SERVICE DATA

supply through the restrictor in the timing control. The fluid flowing through this restrictor produces a reduced operating rate of the transfer valve which can begin operating the output rod from the start of its release from the centering mechanism. As the centering mechanism is progressively compressed by fluid pressure, the range of movement of the output rod increases proportionately. When release is complete, and fluid ceases to flow through the central orifice of the spool, the pressures on both sides of the spool will equalize. The area differential of the spool will cause it to move away from its seat permitting an unrestricted flow of fluid pressure to the transfer valve.

66 When the disengage solenoid is closed or system pressure fails, the fluid displaced by the expansion of the centering mechanism is rapidly absorbed through the spool by-pass passage in the timing control, allowing the centering mechanism to expand rapidly.

67 The relief valves which are fitted in each passage from the transfer valve to the output rod, prevent hydraulic locking of the output rod in an off-centered position. This would occur if the servo was disengaged with the output rod in an off-centered position. When the servo is disengaged the transfer valve spool is centered by the action of the springs, trapping fluid in the lines between the transfer

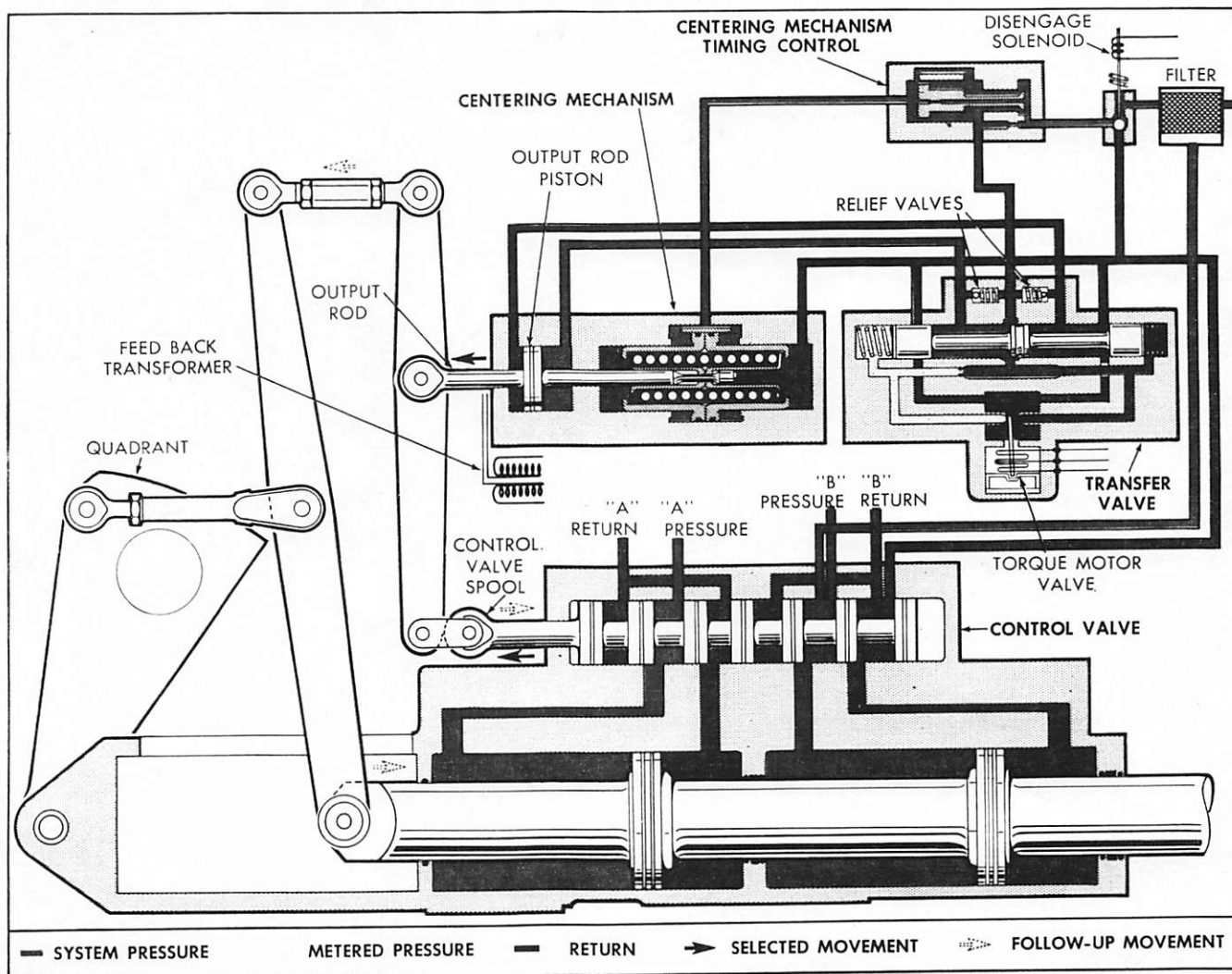
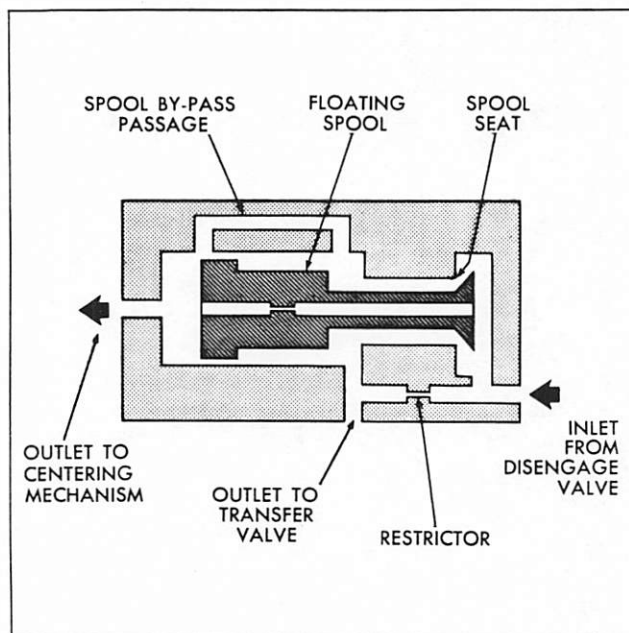


FIG. 14 ACTUATOR CONTROL VALVE SELECTED BY DIFFERENTIAL SERVO - SCHEMATIC

ARROW 1 SERVICE DATA



7M2-2618-1

**FIG. 15 CENTERING MECHANISM
TIMING CONTROL**

valve and the output rod piston chamber. As the centering mechanism expands and the output rod is moved, the relief valves lift and allow the trapped fluid to escape to return.

68 A feed-back transformer is actuated by movement of the output rod initiating feed-back signals for the electronic control.

69 The differential servos may be isolated at any time by operation of the solenoid controlled disengage valve. Operation of the valve shuts off the flow of high pressure fluid to the unit and opens up the lines to return.

RUDDER DOUBLE DIFFERENTIAL SERVO (Fig 16)

70 The rudder double differential servo performs the same function for the rudder as the aileron and elevator differential servos do for their respective control surfaces. It is also similar in construction and operation although it is a duplicated unit and receives hydraulic power from both "A" and "B" systems. A dual piston output rod is operated by two transfer valves one of which is supplied by the "A" system and the other by the "B" system. The "B" system transfer valve functions in the normal and automatic modes.

The "A" system transfer valve functions in the emergency mode only.

71 In addition to the dual piston output rod and the two transfer valves, the unit incorporates two solenoid operated disengage valves, an output rod centering mechanism, a centering mechanism timing device, a shuttle valve and a by-pass valve.

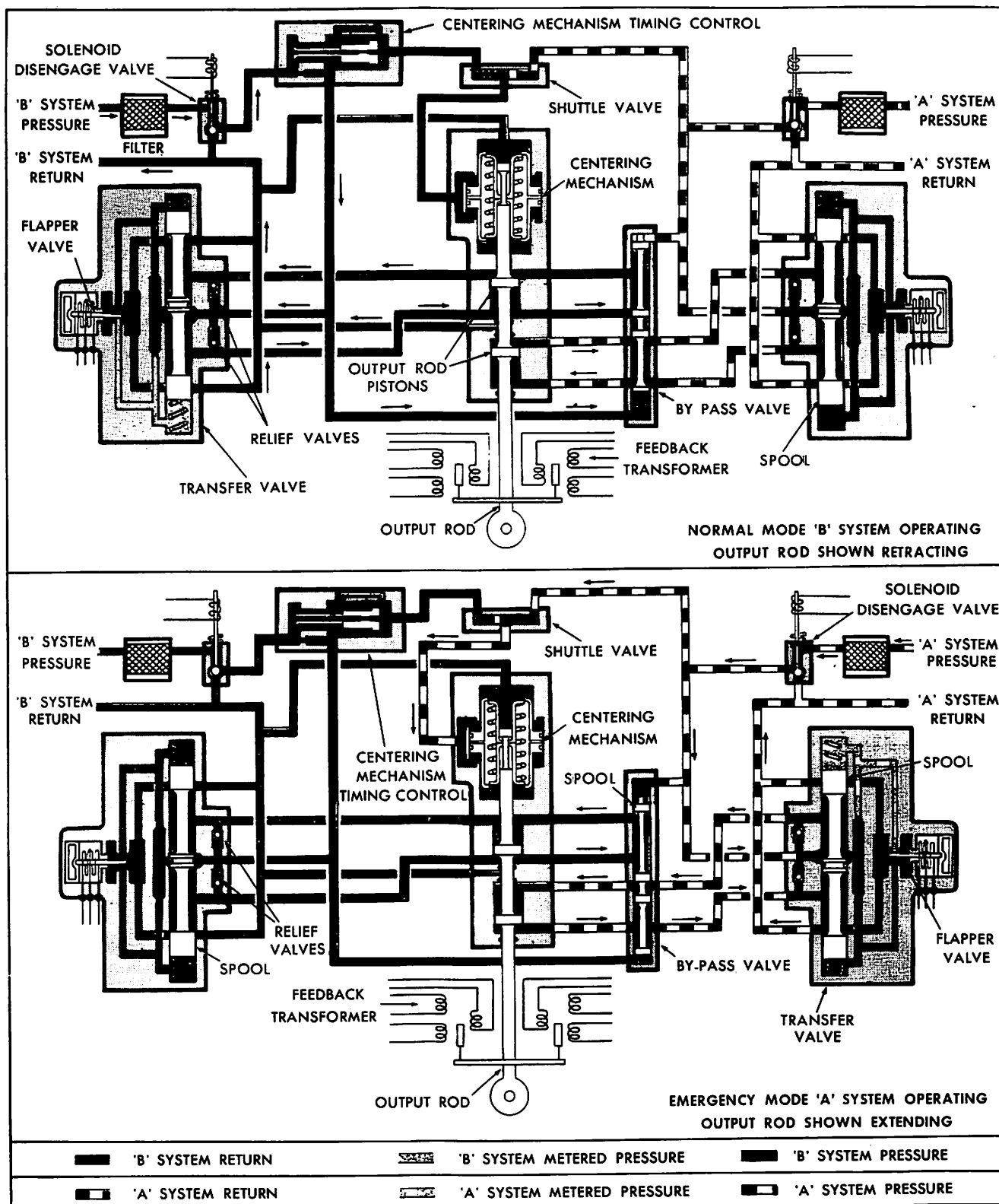
72 The output rod centering mechanism and the timing control function in an identical manner to those of the aileron and elevator servos. The centering mechanism timing control functions in the normal circuit only. When the emergency circuit is operated, the shuttle valve is moved by "A" system pressure to shut off the "B" system pressure to the centering mechanism. Simultaneously the shuttle valve opens up the centering mechanism to "A" system pressure. When normal damping is selected the shuttle valve, assisted by a spring, moves in the opposite direction and opens up the centering mechanism to normal circuit pressure via the timing control.

73 The by-pass valve is interposed between the two transfer valves and the output rod pressure and return passages. With the normal circuit in operation, the "B" system pressure aligns the by-pass valve spool to direct the "B" system pressure to operate the output rod piston and at the same time allow the inoperative piston to displace fluid, and so offer no resistance to output rod movement. Conversely when the emergency circuit is operated, the by-pass valve spool is moved to direct the "A" system pressure to operate the output rod, and the inoperative piston to idle and displace fluid.

74 Two relief valves are fitted in each transfer valve to prevent a hydraulic lock occurring when the centering mechanism expands while the output rod is extended or retracted. The relief valves operate in a similar manner to the relief valves fitted in the aileron and elevator differential servos. See para 67.

75 With the normal mode operating, the "B" system disengage valve is energized open and "B" system pressure is admitted to the transfer valve and to the centering mechanism via the centering mechanism timing control.

ARROW 1 SERVICE DATA



742-2610-3

FIG.16 RUDDER DOUBLE DIFFERENTIAL SERVO - SCHEMATIC

ARROW 1 SERVICE DATA

Signals from the damping system initiate movement of the flapper valve causing the spool valve to direct pressure fluid to the appropriate side of the output rod piston. The movement of the output rod is transmitted through the mechanical linkage to the actuator control valve.

76 When the emergency circuit is brought into operation the "B" system disengage valve is closed, cutting off the pressure supply to the normal circuit and opening the circuit to return. Simultaneously the "A" system disengage valve is opened and "A" system pressure is allowed into the emergency circuit. The shuttle valve directs "A" system pressure to retain the centering mechanism compressed. The by-pass valve moves to allow "A" system pressure from the transfer valve to operate the output rod and also provides a closed idling circuit for the inoperative piston to displace fluid.

CONTROL SURFACE ACTUATORS (Fig 13)

77 There are five actuators in the flying control system, two aileron actuators, two elevator actuators and one rudder actuator. Each actuator is of the twin tandem type. The two portions share a common body and piston rod, but are hydraulically independent.

78 The five units are installed in the aircraft relative to the control surfaces which they operate. The aileron actuators are mounted in the outer wing with the cylinder body pivoted on a fitting attached to rib No. 18 and the outer wing skin. The elevator actuators are mounted in the inner wing with the cylinder body pivoted on a fitting secured to the centre box at station 685. The rudder actuator is mounted in the vertical stabilizer with the cylinder body pivoted on a fitting secured to spar No. 3 and rib No. 4. Access panels are provided for all actuators, the aileron actuator access panels being located in the lower wing skin, the elevator actuator access panels in the upper wing skin and the rudder actuator access panel in the LH side of the vertical stabilizer.

79 The piston rod ends of the actuators are connected by mechanical linkage through control boxes to the control surfaces. The eye

end of each piston rod is provided with an adjustment to allow the control surface and the actuator to be aligned and set in the neutral position.

80 The actuators receive hydraulic power from the "A" and "B" systems through the actuator control valves. The actuator piston rod, the differential servo output rod and the control valve are interconnected by mechanical linkage. This linkage provides the control valve with a follow-up mechanism and mechanically links the differential servo to the control valve. For operation of the control valve and differential servo see paras 50 - 69.

SURGE DAMPING ACCUMULATOR

81 A surge damping accumulator, one for each system, is fitted between the engines in the equipment bay, immediately above the utility 200 cu in accumulator at station 621.

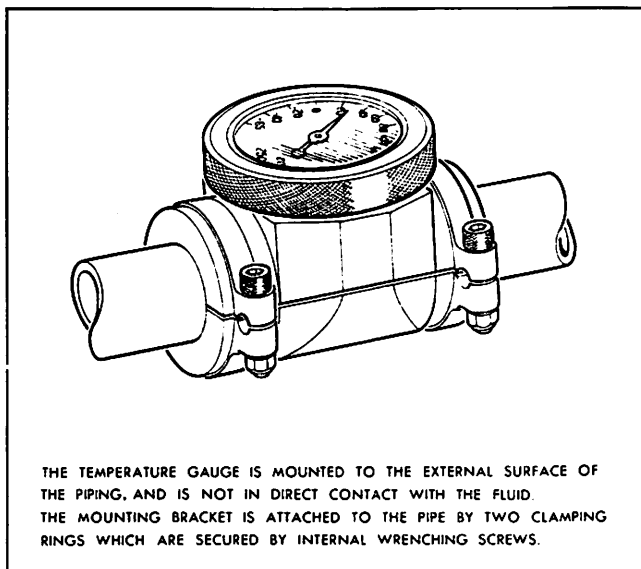
82 The accumulator is a spherical diaphragm type and has a capacity of 60 cu ins. The diaphragm divides the sphere into two separate chambers. One chamber is charged with nitrogen gas to 100 psi and the other chamber is open to system return fluid pressure.

83 The accumulator is installed in the system return line and functions to absorb momentary pressure peaks that occur in the return line during rapid cycling of the control surface actuators. When excessive pressures occur they are absorbed into the fluid chamber of the accumulator, flexing the diaphragm and compressing the nitrogen charge. The excess pressure in the return system is progressively absorbed by the compensator and pressure within the accumulator returns to a normal value.

TEMPERATURE GAUGE (Fig 17)

84 A temperature gauge located on the return line above the compensator indicates system temperature. This gauge is used in conjunction with the compensator indicator tape when topping up the system to the correct level or with the accumulator pressure/temperature charts when charging the accumulators. The temperature gauge is mounted by clamps to the external surface of the piping and is not in direct contact with the fluid.

ARROW 1 SERVICE DATA



742-2613-1

FIG.17 TEMPERATURE GAUGE

OIL-TO-AIR HEAT EXCHANGER

85 Two oil-to-air heat exchangers, one located below each engine intake, provide cooling for the "A" and "B" systems. The LH unit serves the "A" system and the RH unit the "B" system. A relief valve allows the oil to by-pass the heat exchanger during cold starting.

OIL-TO-FUEL HEAT EXCHANGER

86 Two oil-to-fuel heat exchangers located in the equipment bay provide additional cooling for the "A" and "B" systems, the LH unit for the "A" system and the RH unit for the "B" system. These heat exchangers are a section of the multiple heat exchangers, which also provide cooling for the engine oil, accessories gearbox oil, and utility hydraulics oil. A thermostatically controlled valve allows the oil to by-pass the heat exchanger at a temperature below 90°C (195°F).

GROUND SERVICE CONNECTIONS

87 Quick disconnect, self-sealing couplings are installed in both high pressure and return lines to facilitate connection to ground servicing and testing units. Test points are also provided in each of the "A" and "B" system return lines.

BOOSTER ACTUATORS (Fig 2)

88 Hydraulic booster actuators are fitted to the aileron and elevator cable tension regulator quadrant assemblies to overcome the friction of the mechanical linkage and to ensure smooth and positive response of the control surface actuator control valves. Each booster actuator is operated by hydraulic fluid pressure supplied from both the "A" and "B" systems.

89 The booster circuit for the "A" system comprises an accumulator, a combination pressure reducing and relieving valve, a filter and two check valves. The "B" system is similar in every respect except that it employs an additional pressure reducing valve to reduce the 4000 psi fluid to the 1500 psi stage.

90 The booster actuators are installed in the nose wheel bay and the remainder of the components are installed in the radar nose.

91 The elevator booster actuator is fitted with one end attached to the structure and the other end to the elevator cable tension regulator quadrant. The aileron booster is fitted in a similar manner to the aileron quadrant and the structure. The control valve of each booster is connected to the mechanical controls from the control column and is also interconnected with the output rod of the parallel servo.

92 Each booster actuator is of the twin cylinder tandem type, incorporating an integral control valve with follow-up linkage and a damper/feel unit. The twin cylinders are hydraulically independent of each other, with the actuating rod common to both cylinders. The actuator operates with a fluid pressure of 500 psi, which is supplied to each of its two cylinders, from the "A" and "B" systems.

93 Hydraulic fluid for the "A" system booster circuit is supplied from the "A" system reduced pressure at 1250 psi and is passed through a pressure reducing and relieving valve to produce a supply of fluid at 500 psi to the booster actuators. See fig 2.

ARROW 1 SERVICE DATA

94 The hydraulic fluid supply for the "B" system booster circuit is obtained from the "B" system main 4000 psi supply. This is reduced in two stages to 500 psi by utilizing two reducing valves. The initial reduction produces a fluid pressure of 1500 psi. The second stage reduces this pressure to the 500 psi required for operating the booster actuator. See fig 2.

95 A nitrogen charged hydraulic accumulator with a capacity of 25 cu in is installed in each booster circuit in the 1250 psi supply line. It is charged with nitrogen to a pressure of 500 psi and ensures an immediate supply of pressure fluid to the booster actuator control valve via the pressure reducing valve.

96 A filter is installed in each booster circuit, in the 500 psi supply line, to filter the fluid prior to its entry into the booster actuator control valve. The filter element is of 10 micron mesh and embodies a by-pass valve which opens in the event of filter element blockage and allows fluid to by-pass the element.

97 Two check valves are installed in each booster circuit. One check valve is installed in the supply line to the reducing valve. This functions to prevent the accumulator pressure from dissipating into the supply source should the supply fail, and by so doing conserves fluid pressure for a limited number of actuator movements. The second check valve is installed between the 500 psi pressure supply and system return. In the event of pressure fluid supply failure, the check valve permits fluid from system return to flow through the actuator cylinder to return. This provides a free idling circuit through the actuator and permits the actuator to function on the system which is still operating.

BOOSTER ACTUATOR DAMPER/FEEL UNIT

98 A damper/feel unit is installed on each booster actuator control valve and is connected to the control valve spool by mechanical linkage. The unit performs the following functions:

(a) Provides a progressive degree of feel to the unit.

(b) Provides positive centering of the booster actuator control valve with the release of the stick force.

(c) Provides damping action for the booster actuator control valve spool.

99 The unit comprises an integral piston and piston rod enclosed within a housing. Springs are installed on the rod, one on each side of the piston. The bore of the housing is liberally coated with grease to specification Dow Corning 200/100,000 on assembly.

SERVICING AND FUNCTION TESTING

EQUIPMENT

100 Specially designed ground equipment is employed for charging, topping up, testing and bleeding the flying controls hydraulic system. Three units are used, a hydraulic test stand, a charging and bleed trailer and a compressed air/nitrogen trailer.

CAUTION

The aileron and elevator supports must be removed before the hydraulic test machine trailer is connected for ground testing the system.

101 The hydraulic test stand incorporates two separate hydraulic systems each capable of supplying hydraulic fluid to the aircraft systems at a pressure of 4000 psi and flow rates up to 20 gpm. It has a dual control panel. The unit may be used for both function testing and initial priming of the aircraft systems.

102 The hydraulic charging and bleed trailer is a small portable unit. It incorporates a reservoir, filter, hand pump, release valve, delivery and return hoses. It is used for filling or topping up the aircraft compensators and for priming the hydraulic pumps after installation.

103 The high pressure compressed air/nitrogen trailer incorporates a high pressure compressor, pressure reducing valves, a

ARROW 1 SERVICE DATA

UNCLASSIFIED

drier and nitrogen bottles. The nitrogen bottles are used for charging the aircraft systems accumulators. It can supply air or nitrogen at pressures up to 5000 psi.

CHARGING THE ACCUMULATORS

104 Access to the nitrogen charging valves and pressure gauges for the 100 cu in accumulators, also the nitrogen charging valves for the surge damping accumulators, is through No. 2 service panel. The booster circuit 25 cu in accumulators are accessible through the radar nose access panels.

105 The accumulators are charged with nitrogen from the air/nitrogen trailer as follows:

(a) Relieve all residual hydraulic pressure in the systems by moving the control column until the control surfaces cease to respond to stick movement.

(b) To charge the 100 cu in accumulator proceed as follows:

(1) Remove the protective cap from the accumulator charging valve.

(2) Select the control lever on the nitrogen charging trailer to MEDIUM.

(3) Check the pressure required as indicated on the accumulator pressure/temperature label and adjust the medium regulator until the gauge indicates this pressure.

(4) Crack the charging trailer FLOW VALVE and purge the supply hose.

(5) Connect the supply hose to the accumulator charging valve.

(6) Open the FLOW VALVE and charge to the regulated pressure.

(7) Close the FLOW VALVE and open the BLEED VALVE.

(8) Disconnect the hose.

(c) To charge the surge damping accumulators proceed as follows:

(1) Remove the protective cap from the accumulator charging valve.

(2) Select the control lever on the nitrogen charging trailer to LOW.

(3) Check the pressure required, as indicated on the accumulator pressure/temperature label and adjust the LOW regulator until the gauge indicates this pressure.

(4) Repeat 105 (b) (4) to (8).

(d) To charge the 25 cu in booster accumulators follow the procedure given in para 105 (c)(1) to (4), for the damping accumulators.

106 To pressurize the system accumulators, ensure that both systems are primed as per para 110(a) to (aa) and proceed as follows:

(a) Connect the pressure and return hoses of the hydraulic test stand to the ground service quick disconnect couplings of the system or systems to be pressurized.

(b) Select mode 3 on the test stand control panel and start the auxiliary pump.

(c) Select the No. 1 and No. 2 circuit outlet overrides to VALVE OPEN.

(d) Allow the pressure readings on the 100 cu in accumulator gauges to stabilize at 4000 psi and the 25 cu in accumulator pressures to stabilize at 1250 psi on the "A" system gauge, and 1500 psi on the "B" system gauge.

(e) Select the No. 1 and No. 2 circuit outlet overrides to VALVE CLOSED.

(f) Switch off the auxiliary pump.

(g) Relieve the high pressure in the system by operating the high pressure dump valve on the test machine control panel.

(h) Disconnect the test stand pressure and return hoses from the aircraft ground service quick disconnect couplings.

ARROW 1 SERVICE DATA

CHECKING THE ACCUMULATORS FOR LEAKS

107 To locate external accumulator leaks proceed as follows:

(a) Ensure that the accumulators are charged and the system is pressurized. See paras 105 - 106.

(b) Coat all the nitrogen pipeline joints and connections with a mild soap and water solution.

(c) Inspect for nitrogen leaks, which will be indicated by bubbles.

(d) Inspect for external hydraulic leaks, which will be indicated by fluid seepage.

108 External leaks may be remedied by re-torquing the fittings to the maximum acceptable limits. Replacement of the pipe is necessary if a joint leaks after the maximum torque has been applied to the fitting.

109 Internal hydraulic leaks may be traced by releasing a portion of the nitrogen charge through a piece of clean white cloth or absorbent paper and noting any contamination by hydraulic fluid. Internal leaks will necessitate replacing the defective accumulator.

PRIMING THE SYSTEM

110 To fill and prime the complete hydraulic system proceed as follows:

(a) Check all accumulator nitrogen pressures with the system hydraulic pressure relieved and re-charge the accumulators if required. See paras 105 - 106.

(b) Prime the four hydraulic pumps with hydraulic fluid by pumping fluid into the pump at the pump inlet, using the hydraulic charging and bleed trailer with a suitable connecting hose and adaptors.

(c) Connect the hydraulic test stand No. 1 and No. 2 circuit pressure and return hoses to the aircraft "A" and "B" systems ground service connections.

(d) Check the fluid level in the test stand reservoir and replenish if necessary.

(e) Plug in the test stand to a convenient external power supply.

(f) Check that the test stand circuit breakers are in the closed position.

(g) Select the mode switch to mode 3.

(h) Open the four gauge outlet valves on No. 1 and No. 2 circuit control panels.

(j) Start the auxiliary pump. Pressure will build up and be indicated on both the low and high pressure gauges on the control panel for both systems.

(k) Check that the duplex vacuum gauge on the centre control panel is within the safety range. The danger area is indicated by a red line on the dial face.

(m) Select No. 1 and No. 2 circuit outlet overrides to VALVE OPEN.

(n) Operate all the aircraft flying control services in turn, at the same time pulling both of the test stand bleed valves, until a bubble-free flow of fluid is visible in each sight glass on the test stand.

(p) Crack the fittings on the pressure switches at station 702 until all the air is expelled.

(2) Crack the fittings on the reduced pressure gauges on the 'V'-strut at station 644 until all air is expelled.

(r) Crack the fittings in the reduced pressure lines where they enter the bottom of the "A" and "B" compensators, until all air is expelled.

NOTE

When filling or bleeding the flying control compensators, it is necessary to have the utility system pressurized. See Arrow 1 Service Data - Section 20 - Utility Hydraulic Power Circuit.

ARROW 1 SERVICE DATA

UNCLASSIFIED

- (s) Switch off the auxiliary pump.
- (t) Turn the mode selector to OFF.
- (u) Check the fluid level in the test stand reservoir, by reference to the tank level indicator, and replenish if necessary.
- (v) Operate the manual bleed valves on the aircraft compensators to release any trapped air. Check the aircraft compensator fluid levels by reference to the indicator tapes and temperature gauge readings.
- (w) Shut down the hydraulic test stand and disconnect the hoses from the aircraft.
- (x) Motor both engines and operate any one of the three flying control services to bleed the lines on each side of the pumps.
- (y) Connect up the hydraulic test stand and repeat operations (j) and (n), operating only the one service used during motoring.
- (z) Shut down and disconnect the test stand. Re-cap the aircraft ground service couplings.
- (aa) Repeat operation (v), and replenish the compensators if required.

FILLING THE COMPENSATORS

111 To fill the flying control compensators proceed as follows:

- (a) Remove the No. 2 service panel.
- (b) Check the pressure in the utility system accumulator. This should be 1500-4000 psi. Re-charge if necessary. See Arrow 1 Service Data - Section 20 - Utility Hydraulics Power Circuit.
- (c) Connect the test stand low pressure hose of No. 1 and No. 2 circuits to the aircraft return line service connections of the "A" and "B" systems.
- (d) Start the auxiliary pump and adjust the pressure on the low pressure gauge to 130 psi.
- (e) Select mode 4.

- (f) Press and hold No. 1 circuit aircraft compensator filling button and release the button when the desired level in the aircraft compensator is reached, as determined by reference to the fluid temperature reading and the compensator indicator tape reading.
- (g) Press and hold No. 2 circuit aircraft filling button and release the button when the desired level in the aircraft compensator is reached, as determined by reference to the fluid temperature reading and the compensator indicator tape reading.
- (h) With the pressure still on, disconnect the low pressure hoses at the service connections.
- (j) Decrease both low pressure circuits on the test stand to 50 psi.
- (k) Stop the auxiliary pump.
- (m) Switch the mode selector OFF.

FUNCTION TESTING

112 To function test the "A" and "B" systems proceed as follows:

- (a) Check all accumulators for correct nitrogen charge and re-charge if necessary. See paras 105 - 106.
- (b) Check the "A" and "B" system compensator levels and top up if required. See para 111.
- (c) Operate the speed brakes and wheel brakes until the utility hydraulic system accumulators are discharged. This will ensure that the compensators are functioning on the reduced pressure from the flying control system.
- (d) Connect the test stand electrical supply line to a convenient service outlet.
- (e) Select mode 4 on the mode selector switch on the control panel.
- (f) Connect the pressure and return hoses of the hydraulic test stand to the aircraft ground service quick disconnects for both "A" and "B" systems.

ARROW 1 SERVICE DATA

- (g) Start the auxiliary pump.
- (h) Allow the test stand compensators to stabilize. This state will be attained when the pump gauge dials cease to fluctuate.
- (j) Operate in turn the bleed control valves on the test stand compensators until a bubble-free fluid flow is visible in the control panel sight glasses.
- (k) Bleed both aircraft flying control compensators manually, by pulling down on the bleed valve handle and observing the fluid flow through the adjacent drain sight glass, until a bubble-free flow of fluid is visible.
- (m) Adjust the test stand low pressure control valves until the low pressure gauge reads approximately 50 psi.
- (n) Preset the main pump pressure control to 4000 psi and the flow control for a 20 gpm flow.
- (p) Start the test stand main pumps.
- (q) Select No. 1 and No. 2 circuits outlet overrides to VALVE OPEN.

113 To proof test the system and check the operation of the systems relief valves, proceed as follows:

- (a) With the cockpit controls in the neutral position, increase the main pump pressures until the aircraft systems pressure control main relief valves are fully open. The pressures will peak at approximately 4800 psi indicating that the systems relief valves are fully open.
- (b) Reduce the test stand main pump pressures to 4000 psi and in order to obtain a measurable time response for control surface movement, reduce the flow settings to 5 gpm.

114 To check the aileron circuit for correct operation proceed as follows:

- (a) With electrical power on the aircraft, select the cockpit POWER selector on the pilot's LH console to ON.

- (b) Select "normal mode" by depressing the ENGAGE button on the LH console damper panel.

- (c) Complete 10 cycles of aileron operation, checking that the ailerons function in correct relation with control column movement.

- (d) Check that the angle of aileron movement is 19° up and 19° down from the neutral position. See Arrow 1 Service Data - Section 11 - Flying Controls Mechanical.

- (e) Check that the time response for one half cycle of movement (control column full left to full right) is approximately 1.5 seconds at maximum rate of control column movement.

- (f) Select "emergency mode" by depressing the EMERG button on the LH console damper panel.

- (g) Repeat operations (d) and (e).

115 To check the elevators for correct operation proceed as follows:

- (a) Select the "normal mode" as in 114(b).
- (b) Complete 10 cycles of elevator operation, checking that the elevators function in correct relation to control column movement.
- (c) Check that the elevators move 30° up and 20° down from the neutral position. See Arrow 1 Service Data - Section 11 - Flying Controls Mechanical.

- (d) Check that the time response for one half cycle of movement (control column full forward to full back) is approximately 2.5 seconds at the maximum rate of control column movement.

- (e) Select the "emergency mode" and repeat operations (b) to (d).

116 To check the rudder for correct operation proceed as follows:

- (a) With "emergency mode" still selected complete 10 cycles of rudder operation, checking that the rudder functions in correct relation to rudder pedal movement.

ARROW 1 SERVICE DATA

UNCLASSIFIED

(b) Check that the rudder moves 30° right and 30° left. See Arrow 1 Service Data - Section 11 - Flying Controls Mechanical.

(c) Check that the time response for one half cycle of movement (rudder pedals full left to full right) is approximately 1.25 seconds at the maximum rate of rudder pedal movement.

(d) Select "normal mode" by depressing the ENGAGE button on the LH console damper panel and repeat operations (b) and (c).

117 To test each system independently proceed as follows:

(a) On the test stand select the circuit outlet override switch controlling the output to "A" system to VALVE CLOSED. Check that the "A" system cockpit warning light is illuminated.

(b) Repeat operations 114(e), 115(d) and 116(c).

(c) Select the test stand circuit outlet override switch to VALVE OPEN and select the override switch controlling the output to the "B" system to VALVE CLOSED. Check that the "A" system cockpit warning light is extinguished and the "B" system warning light is illuminated.

(d) Repeat operations 114(e), 115(d) and 116(c).

(e) Select the "B" system override switch on the ground test stand to VALVE OPEN.

118 To check the pressure switches and the cockpit warning lights for correct operation, proceed as follows:

(a) Check that the FLY CONT HYD and EMERG DAMPING cockpit warning lights on the master warning panel are functioning by using the press-to-test master switch.

(b) Decrease the systems pressure slowly by adjusting the pressure control valve on the test stand.

(c) Check that both the FLY CONT HYD and EMERG DAMPING warning lights and the master warning lights are illuminated when the pressure drops to 1400-600 psi.

(d) Slowly increase the systems pressure and note that both of the FLY CONT HYD and EMERG DAMPING warning lights and the master warning lights are extinguished at pressures between 2800 psi and 3600 psi.

119 On termination of the tests proceed as follows:

(a) Bleed both the aircraft and test stand compensators.

(b) Stop the test stand main pumps.

(c) Check the aircraft system compensators fluid level by reference to the compensator indicator tape and temperature gauge readings. If the level is too low, adjust the test stand low pressure adjustment to increase the pressure to 130 psi and operate the compensator filling button.

(d) Stop the test stand auxiliary pump.

(e) If the fluid level in the aircraft system compensators is too high, adjust by depressing the low pressure dump control on the test stand control panel until the correct level is reached.

(f) Relieve the high pressure in the system by operating the high pressure dump valve on the test stand control panel.

(g) Disconnect the pressure and return hoses and cap the aircraft ground service couplings.

120 Observation for leaks at the various components and fittings in the aircraft system should be made during the functioning tests. Where corrective action is required, re-cycling of the functioning tests is necessary.

REMOVAL AND INSTALLATION

GENERAL

121 When removing components, disconnecting or removing pipelines, it is essential to prevent the ingress of foreign material into

ARROW 1 SERVICE DATA

the systems. This is accomplished by fitting suitable blanking caps to the lines and component orifices after disconnection. When removing a component, blanking caps should be fitted to the disconnected pipeline joints immediately following disconnection. This will avoid draining the complete system.

122 Direct access to certain of the components installed in the upper section of the hydraulic equipment bay may be made through the removable sections of the engine tunnel. Access through these sections will necessitate removal of the engine. It will also be necessary in some instances to disconnect and remove pipelines of other services in order to remove a specific hydraulic component or pipeline.

CAUTION

Before attempting to disconnect any hydraulic lines in the system all pressure must be relieved from both the utility hydraulic system and the flying control hydraulic system. Nitrogen pressure must be released from the accumulators before disconnecting the nitrogen charging lines.

123 To dissipate the system and return pressures from the flying controls hydraulic system, without emptying the compensators, the pressure in the utility hydraulic system must be relieved before opening the bleed valves on the flying controls compensators.

(a) To relieve the pressure from the utility hydraulic system proceed as follows:

(1) Operate the manual dump valve, if the instrument pack is removed, or by selecting the speed brakes until they cease to function, if the pack is fitted.

(2) Depress the wheel brakes pedals until the brakes cease to operate.

(3) Open the bleed valve on the utility compensator until fluid ceases to flow from the overboard drain.

(b) To relieve the pressure from the flying controls system proceed as follows:

(1) Remove the aileron and elevator support and function the control surfaces until they cease to respond to stick movement. If the system has been inoperative for a while it is improbable that the system will be pressurized.

(2) Ensure that the utility system pressure is relieved.

(3) Open the bleed valve on both the "A" and "B" system compensators until fluid ceases to flow from the overboard drain.

124 Pipe joints should be torqued to the values shown in the tables in fig 18. New joints must be slackened off after applying the initial torque and obtaining a permanent set, and should then be re-torqued to the applicable value. New 'O'-ring seals must be fitted at all times when replacing components. The 'O'-rings must be lubricated with hydraulic fluid to specification MIL-O-5606 prior to installation.

125 After fitting new components the system must be replenished and function tested. During function testing the pipeline connections in the replacement area must be checked for leaks. The hydraulic pump connections must be checked for leaks with the engine running.

PUMPS

126 To remove a hydraulic pump proceed as follows:

(a) Remove the No. 2 service panel.

(b) Ensure that the system pressure is relieved. See para 123.

(c) Disconnect and remove four hydraulic pipelines. Removal of an upper pump necessitates the removal of the corresponding lower pump return line.

(d) Remove the nuts from the mounting flange studs and withdraw the pump rearwards.

ARROW 1 SERVICE DATA

127 The installation procedure is the reverse of that given for removal. Prior to fitting a new pump, remove the plug from the case drain port and the cap from the inlet port. Drain and flush the pump with hydraulic fluid MIL-O-5606.

(a) After mounting the pump, prime it with hydraulic fluid through the inlet port prior to connecting the return line.

(b) Replenish the appropriate compensator.

(c) Motor the engines and bleed the system.

COMPENSATORS

128 To remove the front compensator proceed as follows:

(a) Remove the No. 2 service panel.

(b) Relieve the system pressure. See para 123.

(c) Disconnect and remove from the aircraft the six pipelines connected to the compensator.

(d) Disconnect and remove the pump supply pipe from the rear compensator.

(e) Disconnect and remove the section of overboard drain pipe below the compensator.

(f) Remove the low pressure filter.

(g) Support the compensator and remove the attachment bolt.

(h) Lower the compensator through the No. 2 service panel aperture.

(j) Drain the fluid from the compensator, reinstall the filter unit to the compensator and cap or seal all apertures.

129 The installation procedure is the reverse of that given for removal with the addition of the following:

(a) To facilitate the location of the top lugs in their respective retaining pins, the guide

pins should be inserted in the lower end of the channel and the compensator lifted until the top lugs are fully engaged. The lower lugs may then be aligned with the attachment bracket holes, and the attachment bolt inserted.

(b) After installation of the compensator, fill with fluid, bleed and function test the flying controls. Check for leaks.

130 To remove the rear compensator proceed as follows:

(a) Remove either one of the engines. See Arrow 1 Service Data - Section 23 - Power Plant.

(b) Remove the rear section of the engine bay removable tunnel.

(c) Relieve the system pressure. See para 123.

(d) Remove the compensator access panel and the No. 3 service panel.

(e) Disconnect and remove from the aircraft the six pipelines connected to the compensator.

(f) Disconnect and remove the section of overboard drain pipe below the compensator.

(g) Support the compensator and remove the attachment bolt.

(h) Lower the compensator with the aid of the cable hoist provided.

(j) Disconnect the hoist shackles from the compensator.

(k) Drain the compensator and blank off all apertures.

131 The installation procedure is the reverse of that given for removal with the addition of the following:

(a) To facilitate the location of the top lugs on their respective retaining pins, the guide pins should be inserted in the lower end of the channel and the compensator hoisted until the

ARROW 1 SERVICE DATA

top lugs are fully engaged. The lower lugs may then be aligned with the attachment bracketholes and the attachment bolt inserted.

- (b) After installation of the compensator, fill with fluid, bleed and function test the flying controls. Check for leaks.

SURGE DAMPING ACCUMULATORS

132 To remove a surge damping accumulator proceed as follows:

- (a) Remove either one of the two engines. See Arrow 1 Service Data - Section 23 - Power Plant.
- (b) Remove the front section of the engine bay removable tunnel.
- (c) Relieve the system pressure. See para 123.
- (d) Release nitrogen pressure in the accumulator by depressing the charging valve core.
- (e) Disconnect the nitrogen and hydraulic pipelines from the accumulator.
- (f) Remove the four bolts securing the accumulator to the mounting bracket, and remove the accumulator.

133 The installation procedure for a surge damping accumulator is the reverse of that given for removal, with the addition of the following:

- (a) Re-charge accumulator with nitrogen. See para 105(c).
- (b) Top up and bleed the appropriate compensator. Function test and check for leaks.

ACCUMULATORS 100 CU IN

134 To remove a 100 cu in accumulator proceed as follows:

- (a) Remove No. 3 and No. 4 service panels.
- (b) Relieve the system pressure. See para 123.

- (c) Release the nitrogen pressure at the charging valve.

- (d) Disconnect the nitrogen pipeline and the two hydraulic pipelines.

- (e) Slacken the clamp bolts and disengage the clamps.

- (f) Withdraw the accumulator rearwards.

135 The installation procedure is the reverse of that given for removal with the addition of the following:

- (a) Re-charge the accumulator with nitrogen. See para 105.
- (b) Top up and bleed the appropriate compensator. Function test and check for leaks.

OIL-TO-AIR HEAT EXCHANGER

136 To remove the oil-to-air heat exchanger proceed as follows:

- (a) Relieve the system pressure. See para 123.
- (b) Remove the engine. See Arrow 1 Service Data - Section 23 - Power Plant.
- (c) Remove No. 2 service panel.
- (d) Remove three sections of fuel delivery pipe immediately aft of the crossfeed valve on the relevant side of the aircraft.
- (e) Disconnect the two hydraulic pipelines from the heat exchanger.
- (f) Remove the deflector springs.
- (g) Remove the heat exchanger fairing.
- (h) Remove the four screws securing the heat exchanger and withdraw the exchanger.

137 The installation procedure is the reverse of that given for removal with the addition of the following:

- (a) Top up and bleed the appropriate compensator. Function test the system and check for leaks.

ARROW 1 SERVICE DATA

(b) Pressure test the fuel system and check the disturbed pipeline unions for leaks. See Arrow 1 Service Data - Section 15 - Fuel System.

AILERON ACTUATOR

138 To remove an aileron actuator proceed as follows:

- (a) Fit the aileron and elevator support.
- (b) Remove the aileron access panel.
- (c) Relieve the system pressure. See para 123.
- (d) Remove the 8 nuts and bolts attaching rib No. 20 to the wing structure.
- (e) Remove the bolt securing the actuator linkage to the cable quadrant.
- (f) Disconnect the two flexible pipes from the actuator.
- (g) Disconnect the electrical connectors.
- (h) Slacken the two rigid pipes at the inboard ends, i.e. at the filters.
- (j) Remove the bolt connecting the actuator output rod to the aileron bellcrank.
- (k) Remove the lockwire and with the actuator supported, remove the four bolts securing the actuator cylinder to the quadrant pivot bearing attachment bracket.
- (m) Disengage the actuator output rod from the aileron bellcrank.
- (n) Lower the outboard end of the actuator until access can be gained to the rigid pipe connections on the upper side of the actuator. Disconnect the pipes and lower the actuator. Remove the rib from the actuator and retain.

139 The installation procedure is the reverse of that given for removal with the addition of the following:

- (a) Install new pre-load indicating washers to the four actuator attachment bolts.

(b) Fit new 'O'-rings to the actuator where flanged elbow fittings have been removed.

(c) Flanged elbow fitting bolts to be torqued to 70-80 lb ins.

(d) Top up and bleed the compensators. Function test the flying control systems. Check the aileron actuator for leaks.

ELEVATOR ACTUATOR

140 To remove an elevator actuator proceed as follows:

- (a) Fit the aileron and elevator support.
- (b) Remove the actuator access panel. Remove the actuator output rod end access panels on the upper and lower surfaces.
- (c) Relieve the system pressure. See para 123.
- (d) Disconnect the electrical connectors.
- (e) Disconnect the two flexible pipes at the actuator.
- (f) Disconnect the two rigid pipes at the elbows on the inboard ends.
- (g) Remove the bolt securing the actuator linkage to the cable quadrant.
- (h) Retract the actuator output rod by lowering the elevator.
- (j) Remove the bolt connecting the actuator output rod to the elevator bellcrank.
- (k) Remove the lockwire and the four bolts attaching the actuator cylinder to the actuator pivot bearing attachment bracket.
- (m) Lift the inboard end of the actuator and withdraw the output rod from the apertures in the ribs. Lift clear of aircraft.
- (n) Remove the rigid pipes from the actuator. Blank off and retain.

ARROW 1 SERVICE DATA

141 To install an elevator actuator the procedure is the reverse of that given for removal with the addition of the following:

(a) New pre-load indicating washers must be fitted to the four actuator attachment bolts.

(b) Top up and bleed the compensators. Function test the flying controls. Check the elevator actuator for leaks.

RUDDER ACTUATOR

142 To remove a rudder actuator proceed as follows:

(a) Remove the rudder actuator access panel.

(b) Relieve the system pressure. See para 123.

(c) Disconnect the electrical connectors.

(d) Disconnect the flexible pipe at the actuator.

(e) Disconnect the three rigid pipes and remove from the aircraft.

(f) Remove the bolt connecting the actuator linkage to the control bellcrank.

(g) Support the actuator.

(h) Remove the bolt connecting the actuator output rod to the rudder bellcrank.

(j) Remove the bolt securing the actuator to the mounting bracket.

(k) Move the rudder to disengage the actuator output rod from the rudder bellcrank.

(m) Remove the actuator from the aircraft.

143 The procedure for installing a rudder actuator is the reverse of that given for removal with the addition of the following:

(a) After installation top up and bleed the compensators. Function test the flying controls. Check the rudder actuator for leaks.

ARROW 1 SERVICE DATA

Torque values for steel pipes with male and female steel nuts and male aluminum alloy nuts					
ASSY DASH NO.	DIA.	INSTALLATION TORQUE RANGE LB. INS			
		CS-N-108 and CS-N-112 NUTS		CS-N-114 NUTS	
		Acceptable Limits	Absolute Max.	Acceptable Limits	Absolute Max.
- 4	1/4 in	85-115	150	85-115	150
- 6	3/8 in	150-200	250	150-200	250
- 8	1/2 in	300-380	460	300-380	400
-10	5/8 in	500-630	860	500-630	700
-12	3/4 in	720-880	1200	720-880	1100
Torque values for aluminum alloy pipes with male and female aluminum alloy nuts					
ASSY DASH NO.	DIA.	INSTALLATION TORQUE RANGE LB. INS			
		CS-N-114 and CS-N-115 NUTS			
		Acceptable Limits		Absolute Max.	
- 3	3/16 in	60-80		100	
- 4	1/4 in	85-115		150	
- 5	5/16 in	115-155		200	
- 6	3/8 in	145-195		250	
- 8	1/2 in	200-280		400	
-10	5/8 in	385-505		700	
-12	3/4 in	670-830		1100	
-16	1 in	950-1150		1500	

FIG.18 TORQUE VALUES FOR INSTALLING FLARELESS FITTINGS

ARROW 1 SERVICE DATA

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-3258-13	Vickers Inc. R185774	Variable Delivery Pump	4
7-3258-16	Aviation Electric AE1-417	Pump Delivery Manifold	2
7-3258-43	Parmatic Engineering E11061	Multi-Outlet Filter	2
7-3258-41	Bendix 1010580	Accumulator 100 cu in	2
7-3258-14	Vinson Manufacturing A50029	Pressure Control Valve	2
7-3258-29	Aviation Electric AEP 20084	Reduced Pressure Gauge	2
7-3258-35	Maletron Corporation 146DS-2000-11	Pressure Switch	2
7-3264-65	Aircraft Porous Media AB 645-1-A	High Pressure Filter 5.8 gpm	2
7-3283-11	Aircraft Porous Media AB 464-1-A	High Pressure Dual Filter 3.3 gpm	1
7-3264-23/24	Jarry Hydraulics 1400	Aileron Actuator	2
7-3264-15/18	Jarry Hydraulics 1020	Elevator Actuator	2
7-3283-6	Jarry Hydraulics 1900	Rudder Actuator	1
7-3262-33	Minneapolis-Honeywell DVG17B	Elevator Actuator Control Valve	2
7-3264-12	Minneapolis-Honeywell DVG19A	Aileron Actuator Control Valve	2
7-3283-8	Minneapolis-Honeywell DVG20A	Rudder Actuator Control Valve	1
7-3260-11	Minneapolis-Honeywell DMG51B	Elevator and Aileron Differential Servo	4
7-3283-7	Minneapolis-Honeywell DMG62A	Rudder Double Differential Servo	1

ARROW 1 SERVICE DATA

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-3262-11	Minneapolis-Honeywell MG55B	Elevator Parallel Servo	1
7-3262-21	Minneapolis-Honeywell MG55B	Aileron Parallel Servo	1
7-3256-3/4	Garrett Corp. 150750	Oil-to-Air Heat Exchanger	2
7-3256-5/6	Airesearch 151170	Oil-to-Fuel Heat Exchanger	2
CS-G-108	Prencos Progress Eng. PD 006	Sight Bleed Gauge	2
7-3258-145	Aviation Electric Ltd. 9028X1, AE 1426	Fluid Level Indicator	2
7-3258-327	Powerlite Devices Ltd. X152028	Temperature Gauge	2
7-3258-123	H.W. Loud 7875	Compensator	2
7-1958-185	Vickers Inc.	Surge Damping Accumulators	2
7-3252-231	National Water Lift Co. 1256-1	Booster Actuator	2
7-3251-95	Arkwin Industries 52-27A-3	Pressure Reducing Valve 1500-500	2
7-3251-97	Vinson Manufacturing A80102	Pressure Reducing Valve 4000-1500	1
7-3251-57	Bendix 548025	Accumulator 25 cu in	2

13

ARROW 1 SERVICE DATA

ELECTRICAL SYSTEM

FLYING CONTROLS

1 OCT 57

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

01/10/2000

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

UNCLASSIFIED

ELECTRICAL SYSTEM

FLYING CONTROLS

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	3
DAMPING SYSTEM	
General	3
PITCH AXIS	
Command Circuits	4
Sensing Circuit	5
Trim Circuits	6
Attitude Trim Circuit	6
Pressure Trim Circuit	7
Artificial Feel Circuit.....	7
Disengage Circuits	8
ROLL AXIS	
Command Circuits	9
Sensing Circuit	11
Trim Circuits	11
Attitude Trim Circuit	11
Pressure Trim Circuit	12
Disengage Circuits	12
YAW AXIS	
General	13
Yaw Rate	14
Aileron Position	14
Transverse Acceleration	14
Aileron Position - Pitch Rate	15
Rudder Monitor	15
Rudder Feel, Trim and Hinge Moment Limitation	15
FUNCTION TESTING	(To be issued later)
INSPECTION	(To be issued later)
COMPONENT SERVICE DATA	(To be issued later)

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Pitch Axis Block Diagram	17
2	Roll Axis Block Diagram	18
3	Yaw Axis Block Diagram	19
4	Location of Damper System Components	20

ARROW 1 SERVICE DATA

UNCLASSIFIED

DESCRIPTION

General

1. Movement of the aircraft's ailerons, elevators and rudder is effected by hydraulic components which are normally controlled by electrical means, or, in emergency, by mechanical means through cables. There is no provision for direct mechanical control. In the interests of safety, two independent flying control hydraulic systems are fitted.
2. There are three modes of control, the normal mode, the automatic flight mode, and the emergency mode.
3. In the normal mode, a damping system automatically stabilizes the aircraft in all three axes, and also co-ordinates rudder movement with movement of the ailerons and elevators. Control of the ailerons and elevators in this mode is by an electrical force transducer fitted in the control column.
4. In the automatic flight mode, the damping system is operative as in the normal mode, but aileron and elevator position is controlled by an Automatic Flight Control Sub-system (AFCS). The AFCS allows the aircraft to be controlled from the ground for automatic ground control interception (AGCI) or for automatic ground control approach (AGCA). It also provides certain pilot assist functions by holding any set course and altitude, or it may hold a set Mach number by varying the aircraft's pitch attitude. The AFCS also provides for automatic navigation by controlling the aircraft according to information fed into a dead reckoning computer by the navigator.
5. In the emergency mode, the hydraulic components for the ailerons and elevators are controlled mechanically. Yaw stabilization and rudder co-ordination are maintained by an emergency yaw damping system.
6. Pilot 'feel' at the control column is provided by the damping system in the normal mode, and by mechanical means in the emergency mode.
7. A four-way push button on the control column allows for aileron and elevator trim. There are no trimmer tabs, trim being achieved by altering the position of the entire control surfaces. To reduce elevator trim drag at high altitudes, provision is made for an automatic up deflection of both ailerons.
8. If certain flight limitations are exceeded, the system automatically changes over to the emergency mode.

DAMPING SYSTEM

General

9. Three distinct channels comprise the damping system; the pitch channel, which controls the elevators; the roll channel, which controls the ailerons; and the yaw channel, which controls the rudder.
10. The switching controls for the damper system are located on a control panel fitted in the front cockpit LH console, and on the control column. Mounted on the control panel are an ON-OFF switch protected by a guard, an ENGAGE push switch for the normal mode and an EMERG push switch for engaging the emergency mode. Note that when the ON-OFF switch is selected on, power is supplied to the damper system and the AFCS. In addition, the normal mode of operation must be selected before the emergency mode of operation can be selected. Two push switches are fitted in the control column grip. One switch, when operated, reverts the damper system to the emergency mode of operation, and the other switch, when operated, disengages the automatic flight

ARROW 1 SERVICE DATA

~~UNCLASSIFIED~~

mode system. Three indicator lights fitted on the master warning system panel indicate, respectively, roll and/or pitch axis disengaged, emergency yaw damping system operative and all damping inoperative.

PITCH AXIS

Command Circuits

11. The pitch axis command circuits operate in response to command signals from the control column force transducer in the normal mode of operation or from the automatic flight control subsystem (AFCS) in the automatic mode of operation. On receiving such signals the command circuits actuate the electro-hydraulic parallel servo unit and the electro-hydraulic differential servo units, and these, in turn, effect the appropriate positioning of the elevators. The operation of the command circuits is described in the following paragraphs. The hydraulic operation of the servo units is described in Service Data Ref. No. 32.

12. Force exerted on the control column handgrip results in an output voltage from the force transducer which is fitted in the control column at the base of the handgrip. The magnitude of this voltage is directly proportional to the force exerted on the control column. The phasing of the voltage depends upon the direction of the motivating force relative to the neutral position of the control column, voltages produced by motion forward being 180° out of phase with voltages produced by motion aft. Note that changes in attitude are not commanded by movement of the control column but by the application of force on the handgrip, which deflects the core of the force transducer. Movement of the control column, in effect, follows the positioning of the elevators by the command circuits, but the response of the system is so immediate that attitude changes appear to result from movement of the control column.

13. The output voltage from the transducer is approximately one volt for each six pounds of force exerted on the control column handgrip. The output of the transducer is restricted by means of adjustable mechanical stops which limit the maximum output to six volts. A pitch axis control adjustment fitted in the circuit is, however, set at present to result in a maximum output of 4.5 to 5 volts.

14. The output from the transducer is supplied via a summing network as a command signal to an integrator unit the output voltage of which increases at a rate proportional to the strength of the command signal. The rate of increase of the integrator output is such as to prevent an excessive rate of control surface movement. The integrator maintains its output even after the command signal is withdrawn, and until it is provided with a signal of opposite phase to reduce, cancel or reverse the output according to the strength of the new signal.

15. The output of the integrator is supplied through a summing network to a servo amplifier unit which amplifies the signal and determines its phase by means of a discriminator circuit.

16. From the servo amplifier the signal passes to the transfer valve of an electro-hydraulic parallel servo which controls the elevator movement in magnitude and direction in accordance with the strength and phase of the input signal. The parallel servo effects movement of the elevators via the elevator quadrant, and so a sympathetic movement of the control column takes place.

17. A self-balancing or feed-back circuit is introduced from the parallel servo to the servo amplifier. Any movement of the parallel servo output rod produces a feed-back signal opposite in phase to the initiating signal and of a magnitude proportional to the extent of the movement of the parallel servo. This feed-back signal is applied to the summing point between the integrator and the servo amplifier, where it opposes and presently nullifies the integrator output and, consequently, output from the servo amplifier. When this nullifying effect occurs, movement of the parallel servo, and therefore of the elevators, ceases.

ARROW 1 SERVICE DATA

18. The system is designed, by the provision of a normal accelerometer and air data transducer components, to produce a given 'g' loading in response to a given force applied to the control column handgrip, independent of airspeed and altitude. The normal accelerometer provides an output signal of one volt per 'g' of loading in the pitch axis. This signal is 180° out of phase with the command signal from the transducer, so that when the aircraft commences a manoeuvre imposing a 'g' loading, the resulting output of the normal accelerometer progressively nullifies the command signal. The command signal is also modified by the air data transducer components to compensate for changes in airspeed and altitude. Thus, since the transducer output signal is proportional to the applied force and the accelerometer output signal is proportional to 'g' loading, the force that must be applied to the control column handgrip to produce a manoeuvre of a given 'g' will be constant, regardless of airspeed and altitude.

19. As described above, force exerted on the control column in a fore or aft motion relative to the neutral position will produce elevator movement in proportion to the applied force, and the elevator movement will cease when the integrator output is balanced by the feed-back signal from the parallel servo. Meanwhile the resultant 'g' loading will have produced an accelerometer signal to nullify the signal from the transducer, and the system will remain balanced until a new command signal appears. If the force exerted on the handgrip is reduced to zero the signal from the accelerometer is no longer opposed by a signal from the transducer amplifier and therefore acts as a new command signal. Being of equal strength but of opposite phase to the original command signal, its appearance at the integrator input results in the cancelling of the integrator output. The feed-back signal from the parallel servo thereupon finds itself unopposed and returns the parallel servo and therefore the elevators and the control column to a position where the 'g' loading is removed from the axis.

20. A slight time lag occurs between the receipt of a signal by the integrator and the subsequent output by the integrator of a signal to the servo amplifier. While this delay has a useful effect in preventing the transmission to the control column via the parallel servo of short-term corrective movements of the elevators (see paras 23 through 26), it would also have the undesirable effect of delaying the response of the elevators to command signals but for the action of the differential servos. Command signals which are fed to the integrator are also fed to the two differential servos connected into the elevator control linkages. These electro-hydraulic units operate the elevators immediately in response to the command signals. Elevator movement is then taken over by the parallel servo as output becomes available from the integrator. As the command signal circuit to the differential servos does not incorporate an integrator, the differential servos return to their original position as soon as the command signal is nullified by the action of the accelerometer. This allows them to return to their main task of damping uncontrolled movements about the pitch axis as described in paras 23 through 29.

21. The operation of the command circuits under command signals from the AFCS in the automatic mode of operation is identical with that in the normal mode. In the automatic mode the command signal from the AFCS substitutes for the signal from the transducer.

22. Selecting the landing gear down introduces certain changes in the command circuits. The main effects of such action are to interrupt the command circuit to the differential servos and to prevent the accelerometer output and the airspeed compensation from acting upon the command signal, which is supplied directly to the parallel servo amplifier, by-passing the integrator. These command circuit changes are effected by two fader units and result in elevator movement becoming directly proportional to control column movement without regard to airspeed and altitude. Other effects resulting from selecting the landing gear down are the re-routing of the attitude trim circuit through a point immediately preceding the integrator instead of through the trim motor (see paras 34 and 35), and the shorting out of the integrator in the pitch rate gyro circuit (see para 29).

Sensing Circuit

23. A pitch rate gyro is incorporated in the system as a sensing device to correct

ARROW 1 SERVICE DATA

uncontrolled movement about the pitch axis. On detecting movement the gyro produces a signal which is proportional to the rate of pitch, rather than to aircraft displacement, so that comparatively quick corrective action can be achieved automatically before the displacement becomes significant.

24. The output signal from the gyro is supplied to the circuits of the differential and parallel servos to correct the uncontrolled movement and maintain stable flight.

25. In order to prevent signals from the pitch rate gyro from opposing command signals for pitch changes, an integrator is incorporated in the sensing circuit the function of which is to nullify output signals from the gyro resulting from steady state attitudes of climb or dive about the pitch axis.

26. Signals resulting from movement of the aircraft about its pitch axis at a rate of 4 cps or more are referred to as short term signals. Signals produced by movement of less than 4 cps are called long term signals. An operating time lag in the gyro circuit integrator prevents the nulling out of short term signals, which are supplied only to the differential servos. It also permits long term signals to appear in the differential and the parallel servo circuits, thus initiating corrective movements of the servos. Movement of the parallel servo produces sympathetic movement of the control column via the mechanical linkage of the elevator quadrant so that the balance of the command circuit is maintained. Corrections applied by the differential servos, however, do not produce movement of the control column, the mechanical linkage of the hydraulic jack acting to prevent such an effect. See Service Data Ref. No. 15.

27. Short term signals resulting from movements exceeding 4 cps about the pitch axis effect the operation of the differential servos only. These signals are not supervised by the gyro circuit integrator because of its operating time lag, and, for the same reason, they do not affect the parallel servo integrator. Thus short term signals are effectively blocked out of the parallel servo circuit where they would produce undesirable control column reactions. The differential servos are positioned continuously by the short term signals to correct short term movements automatically and maintain stable flight.

28. When a corrective movement is initiated and the aircraft commences to return to its original attitude, the signal produced by the gyro will be of the opposite phase. In the case of short term movement, the differential servos will then be moved in the opposite direction, positioning the elevators to limit the correction. In the case of long term movements, the signal cancels the output of the parallel servo integrator, thus permitting the servo feedback signal to operate the amplifier and return the elevators to the neutral position.

29. When the landing gear is selected down and the command circuits are operative as described in para 22, the gyro circuit integrator is shorted out. In this condition steady state pitch rate signals, in addition to long term and short term signals, are supplied to the differential servos. This action aids stability in the pitch axis at low airspeeds.

Trim Circuits

30. Three trim circuits are incorporated in the pitch axis damper channel, viz. an attitude trim circuit, a pressure trim circuit and an artificial feel circuit.

Attitude Trim Circuit

31. The attitude trim circuit can be used to trim the aircraft into a climb or dive. The circuit is controlled by the trim switch on the control column grip. Operating the trim switch provides a power supply to a motor-positioned potentiometer incorporated in the trim unit. The voltage picked off this potentiometer is supplied to the summing point of signals from the

ARROW 1 SERVICE DATA

normal accelerometer and signals from the force transducer or the AFCS. The trim signal operates in the command circuits in the same way as does a command signal.

32. When the trim switch is operated, the movement of the aircraft about the pitch axis produces signals from the rate gyro and the normal accelerometer. The signal from the pitch rate gyro being a steady state signal is nullified by the integrator. Note that, due to the inability of the integrator to follow, short term signals continue to be provided by the pitch rate gyro to the differential servos. The output of the normal accelerometer nullifies the trim signal with the same results as when a command signal is nullified. Until the trim switch is again operated, transducer signals will add to or subtract from the standing signal from the trim potentiometer to effect further movement of the elevators.

33. When the pitch axis damper channel is disengaged, the trim switch will govern the feel and trim unit of the artificial feel circuit instead of the attitude trim circuit. See para 43.

34. When the landing gear is selected down, the power supply from the trim switch is supplied directly to the parallel servo integrator. This prevents the normal accelerometer and the air-speed compensation from acting on the trim signal, these functions being by-passed in the command signal circuits.

35. The output of the integrator is supplied to the summing point of command signals from the force transducer and the parallel servo feed-back circuit. The trim signal will effect movement of the parallel servo until the circuit is balanced by the feed-back signal. Subsequent command signals will then add to or subtract from the standing trim signal to effect further movement of the elevators.

Pressure Trim Circuit

36. The pressure trim circuit is operative automatically when the pitch axis channel of the damper system is disengaged. The function of the circuit is to simulate command signals relative to the position of the elevators. These signals are supplied to the input of the integrator. By this means, when the system is re-engaged, the output of the integrator will correspond with the output of the control column force transducer thus ensuring smooth re-engagement.

37. The operation of the circuit is such that during emergency mode operation, the normal feed-back signal produced through movement of the output rod of the parallel servo will continue to be applied to the summing point preceding the servo amplifier. This signal will effect the operation of the amplifier and in turn the transfer valve of the parallel servo. Note that in the emergency mode of operation, action by the transfer valve does not influence the output rod, which is not subjected to hydraulic pressure during emergency mode operation. See Service Data Ref. No. 32. The operation of the transfer valve results in a pressure differential between the two hydraulic metered supply lines. This action moves a pressure sensing ram which is connected to the core of a trim transformer. The signal from the trim transformer is supplied to the integrator which provides an output signal to nullify the feed-back signal. Due to the inherent time lag of the integrator a portion of the trim transformer signal by-passes the integrator to speed response. See also Disengage Circuits, para 48.

38. Incorporated in the trim circuit feed-back transformer assembly are two switches. One switch completes the supply circuit to the feel and trim unit of the artificial feel circuit. See para 41. The other switch functions to prevent the channel engaging if the elevators are moving.

Artificial Feel Circuit

39. The purpose of the artificial feel circuit is to prevent a sudden change in feel at the control column if the pitch axis damper channel dis-engages.

ARROW 1 SERVICE DATA

40. The artificial feel circuit consists of an artificial feel and trim unit which comprises an electrically operated actuator and a spring. Operating the actuator increases or decreases the load on the spring dependent upon the direction of rotation of the actuator. One end of the unit is attached to the aircraft structure. The other end is attached to the elevator quadrant, adjacent to the point of attachment of the parallel servo.
41. Exerting a force on the control column closes a switch which completes a circuit from the actuator to the parallel servo. When the parallel servo operates to execute the command signal the trim actuator receives a power supply. This action increases or decreases the loading of the spring according to the position of the quadrant. If the pitch axis damper suddenly reverts to emergency, the trim unit ensures that the load required on the quadrant by the cables from the control column balances the load that was being imposed on the quadrant by the parallel servo.
42. An additional switch is fitted in parallel with the control column switch to serve as a safety precaution against overstressing the airframe should an automatic mode failure occur. This second switch opens when the normal acceleration exceeds ± 0.5 'g' from the straight and level flight condition of 1 'g'. Therefore, 'g' in excess of this figure applied by the automatic mode is against the feel spring. Consequently, if an automatic mode failure or disengagement occurs the feel spring re-asserts itself and reduces the 'g' loading imposed by the elevators to 0.5 'g' or less.
43. The feel and trim unit serves also to trim the elevators via movement of the elevator quadrant when the damper channel is disengaged. The actuator in this condition is controlled by the control column trim actuation switch which is transferred automatically from the position trim motor to the trim actuator upon disengagement of the damper channel.
44. In the event of a seizure in the feel and trim unit, movement of the elevator quadrant would not be possible. To meet this contingency, a release circuit is incorporated in the feel and trim unit linkage to the quadrant. The circuit comprises a control switch fitted in the front cockpit and a solenoid, the plunger of which is attached to a link pin in the feel and trim linkage to the quadrant. Operating the switch energizes the solenoid which extracts the link pin. This action permits the feel and trim unit to pivot freely with movement of the quadrant. The release circuit supersedes a shear pin fitted on the first aircraft.

Disengage Circuits

45. The pitch axis disengage circuit operates automatically if the normal acceleration exceeds 5.0 - 5.5 'g'. The circuit is controlled by an electronic 'g' limiter which, when operated, completes supply circuits to the differential servos centering circuit and the parallel servo disengage circuit. See Service Data, Ref. No. 32. Note that the power supply to the damper system components is uninterrupted in the emergency mode.
46. The pitch axis disengage circuit also operates if the yaw axis monitor acts due to excessive skid, sideslip or transverse acceleration.
47. Operation of the disengage circuits reverts the channel to the pre-engage condition and illuminates the R-P AXIS indicator light on the master warning system panel. In the pre-engage condition the pressure trim circuit is operative, and the attitude trim actuation switch is transferred to the trim actuator of the feel trim circuit.
48. When the channel is in the pre-engage condition the output of the force transducer, the normal accelerometer and the pitch rate gyro is routed to the trim unit to ensure smooth re-engagement. A trim unit amplifier, fitted in the circuit immediately preceding the trim unit, discriminates upon the phase of the applied signals to effect the proper direction of rotation of the motor-driven potentiometer of the trim unit. The effect of this provision is such that any unbalanced signals appearing in the command circuit initiate the operation of the trim unit

ARROW 1 SERVICE DATA

and are balanced out by the resulting output signal from the trim unit. This ensures that the channel will be re-engaged into a balanced circuit and, as described in paras 36 and 37, in agreement with the prevailing position of the elevators. But for this provision, an unbalanced signal, resulting for example from failure of the gyro circuit integrator to nullify a pitch rate signal, would produce unexpected and undesirable movement of the elevators.

49. Note that if an unbalanced signal is being nulled by the trim unit when re-engagement occurs, the effect is equivalent to introducing an out-of-trim condition on the axis. This is due to the trim signal standing at the summing point of signals from the force transducer and normal accelerometer. In this condition, to regain level flight with the control column in neutral, the trim actuation switch must be operated to cancel the trim signal.

ROLL AXIS

Command Circuits

50. The roll axis command circuits operate in response to command signals from a force transducer in the normal mode of operation or from the Automatic Flight Control Sub-system (AFCS) in the automatic mode of operation. On receiving such signals, the command circuits actuate an electro-hydraulic parallel servo unit and two electro-hydraulic differential servo units which effect the appropriate positioning of the ailerons. The operation of the command circuits is described in the following paragraphs. The operation of the electro-hydraulic servo units is contained in Service Data Ref. No. 32.

51. In order to reduce elevator trim drag at high altitude, both ailerons are deflected up when the aircraft reaches a pressure altitude of 45,000 feet. This is done by an actuator fitted on the aileron quadrant in such a manner that it rotates a cam which drives the quadrant levers apart. The actuator is controlled by a pressure switch adjusted to close and complete the actuator supply circuit at 45,000 feet. To provide an operating differential, the switch is adjusted to re-open at 42,000 feet. The operation of this circuit does not affect the positioning of the ailerons by the damper system.

52. Force exerted on the control column handgrip in a left or right motion, produces an output voltage from the force transducer which is fitted in the control column at the base of the grip. The magnitude of this voltage is directly proportional to the force exerted on the handgrip. The phasing of the voltage depends upon the direction of the motivating force relative to the neutral position of the control column, voltages resulting from left motion being 180° out of phase with voltages resulting from right motion. Note that changes in attitude are not commanded by movement of the control column but by the application of force on the handgrip, which deflects the core of the force transducer. Movement of the control column, in effect, follows the positioning of the ailerons by the command circuits, but the response of the system is so immediate that attitude changes appear to result from movement of the control column.

53. The roll rate produced is proportional to the output voltage from the transducer, 0.05 volt output producing unit rate of roll. The maximum output of the transducer is limited by means of mechanical stops to six volts with a force of 20 lb exerted on the handgrip, which produces a roll rate of 120 degrees per second. A roll axis adjustment control is fitted in the circuit so that the output of the transducer may be preset.

54. The resulting output from the transducer is supplied via a summing network as a command signal to an integrator unit the output voltage of which increases at a rate directly proportional to the strength of the command signal. The rate of increase of the integrator output is such as to prevent an excessive rate of control surface movement. The integrator maintains its output even after the command signal is withdrawn, and until it is provided with a signal of opposite phase to reduce, cancel or reverse the output according to the strength of the new signal.

ARROW 1 SERVICE DATA

55. The output of the integrator is supplied through a summing network to a servo amplifier unit. This unit, in addition to its function of amplifying signals, incorporates a discriminator circuit to determine the phasing of the applied signal.

56. From the servo amplifier the signal passes to the transfer valve of an electro-hydraulic parallel servo which controls the aileron movement in magnitude and direction in accordance with the strength and phase of the input signal. The parallel servo effects movement of the ailerons via the aileron quadrant, and so a sympathetic movement of the control column takes place.

57. A self-balancing or feed-back circuit is introduced from the parallel servo to the servo amplifier. Any movement of the parallel servo output rod produces a feed-back signal opposite in phase to the initiating signal and of a magnitude proportional to the extent of the movement of the parallel servo. This feed-back signal is applied to the summing point between the integrator and the servo amplifier, where it opposes and presently nullifies the integrator output and, consequently, output from the servo amplifier. When this nullifying effect occurs, movement of the parallel servo, and therefore of the ailerons, ceases.

58. The system is designed, by the provision of a roll rate gyro and air data transducer components, to produce a given rate of roll in response to a given force applied to the control column handgrip almost independent of airspeed. The roll rate gyro provides an output signal of 0.05 volt per unit rate of roll. This signal is 180° out of phase with the command signal. The command signal is also modified by the air data transducer components to compensate for changes in airspeed. The compensation function is preset to result in a decrease of gain at the extremes of low and high airspeeds and is constant for all other airspeeds. This action aids stability in the roll axis by limiting over-control by the ailerons. Thus, since the transducer output signal is proportional to the applied force and the roll rate gyro output signal is proportional to the rate of roll, the force that must be applied to the control column handgrip to produce a manoeuvre of a given roll rate is constant, except at high and low airspeeds when the force to produce a given rate of roll is increased.

59. As described above, force exerted on the handgrip in a left or right motion relative to the neutral position will produce aileron movement in proportion to the applied force, and the aileron movement will cease when the integrator output is balanced by the feed-back signal from the parallel servo. Meanwhile the resultant roll rate will have produced a roll rate gyro signal to nullify the signal from the transducer, and the system will remain balanced until a new command signal appears. If the force exerted on the handgrip is reduced to zero, the signal from the roll rate gyro is no longer opposed by a signal from the transducer amplifier and therefore acts as a new command signal. Being of equal strength but of opposite phase to the original command signal, its appearance at the integrator input results in the cancelling of the original signal there and, consequently, in the cessation of integrator output. The feed-back signal from the parallel servo thereupon finds itself unopposed and returns the parallel servo and therefore the ailerons and the control column to a position where the roll rate is zero.

60. A slight time lag occurs between the receipt of a signal by the integrator and the subsequent output by the integrator of a signal to the servo amplifier. While this delay has a useful effect in preventing the transmission to the control column via the parallel servo of short-term corrective movements of the ailerons (see paras 65 and 66), it would also have the undesirable effect of delaying the response of the ailerons to command signals but for the action of the differential servos. Command signals which are fed to the integrator are also fed to two differential servos connected into the aileron control linkages. These electro-hydraulic units operate the ailerons immediately in response to the command signals. Aileron movement is then taken over by the parallel servo as output becomes available from the integrator. As the command signal circuit to the differential servos does not incorporate an integrator, the differential servos return to their original position as soon as the command signal is nullified by the action of the roll rate gyro. This allows them to return to their main task of damping uncontrolled movements about the roll axis as described in paras 63 through 67.

ARROW 1 SERVICE DATA

UNCLASSIFIED

61. The operation of the command circuits under command signals from the AFCS in the automatic mode of operation is identical with that in the normal mode. In the automatic mode the command signal from the AFCS substitutes for the signal from the transducer.

62. Selecting the landing gear down introduces certain changes in the command circuit. One effect of this action is to prevent the roll rate gyro signal and the airspeed compensation from acting upon the command signal. In this condition, the command signal is supplied directly to the parallel servo amplifier. Consequently, movement of the ailerons is directly proportional to control column movement as opposed to airspeed.

Sensing Circuit

63. In addition to its function in the command circuit, the roll rate gyro functions as a sensing device to detect uncontrolled movement about the roll axis. Since the gyro output signal is proportional to rate of roll rather than to aircraft displacement, comparatively greater control of the ailerons can be achieved automatically before the displacement becomes significant.

64. The output signal from the gyro is supplied to the circuits of the parallel and differential servos to correct uncontrolled movement and maintain stable flight.

65. Signals from the rate gyro resulting from movement exceeding 4 cps about the axis are defined as short term signals and effect the operation only of the differential servos. The short term signals are effectively blocked out of the parallel servo circuit due to the operating time lag of the parallel servo integrator. The differential servos are positioned continuously by the short term signals to suit stability requirements. Corrective movements of the differential servos will not effect movement of the control column.

66. Long term signals resulting from movement of less than 4 cps about the axis are supplied to the differential servos and the parallel servo. The corrective movement of the parallel servo will effect a movement of the control column via the mechanical linkage of the aileron quadrant. This action ensures that the balance of the command circuit is maintained.

67. When a corrective movement is initiated and the aircraft commences to return to its original attitude, the signal produced by the gyro will be of the opposite phase. In the case of short term movement, the differential servos will then be moved in the opposite direction, positioning the ailerons to limit the correction. In the case of long term movements, the signal cancels the output of the integrator, thus permitting the servo feed-back signals to operate the amplifier and return the ailerons to their original position.

Trim Circuits

68. Two trim circuits are incorporated in the roll axis damper channel, viz. an attitude trim circuit and a pressure trim circuit. When the channel is in the pre-engage condition, a trim actuator is operative in lieu of the attitude trim.

Attitude Trim Circuit

69. When the roll axis damper channel is engaged the attitude trim circuit is used to trim the aircraft by deflecting the ailerons. The circuit is controlled by the trim switch on the control column handgrip. Operating the trim switch drives a motor-positioned potentiometer incorporated in the trim unit. The voltage picked off this potentiometer is supplied to the summing point of signals from the rate gyro and signals from the force transducer or the AFCS. The trim signal operates in the command circuits in the same way as does a command signal.

70. When the trim switch is operated, the movement of the aircraft about the roll axis

UNCLASSIFIED

ROW 1 SERVICE DATA

produces a signal from the roll rate gyro. This signal nullifies the trim signal with the same results as when a command signal is nullified. Until the trim switch is again operated, transducer signals will add to or subtract from the standing signal from the trim potentiometer to effect further movement of the ailerons.

71. When the roll axis channel is disengaged, the trim switch will govern a trim unit instead of the attitude trim circuit.

72. The trim unit serves to trim the ailerons via movement of the aileron quadrant. The unit comprises an electrical actuator and a spring. One end of the unit is attached to the aircraft structure. The other end is attached to the aileron quadrant. When the trim switch is operated the trim actuator increases or decreases the loading on the spring so effecting movement of the elevator quadrant.

Pressure Trim Circuit

73. The pressure trim circuit is operative automatically when the roll axis channel of the damper system is disengaged. The function of the circuit is to simulate command signals relative to the position of the ailerons. These signals are supplied to the input of the integrator. By this means, when the system is re-engaged, the output of the integrator will correspond with the output of the control column force transducer and will ensure smooth re-engagement.

74. The operation of the circuit is such that during emergency mode operation, the normal feed-back signal produced through movement of the output rod of the parallel servo will continue to be applied to the summing point preceding the servo amplifier. This signal will effect the operation of the amplifier and in turn the transfer valve of the parallel servo. Note that in the emergency mode of operation, action by the transfer valve does not influence the output rod, which is not subjected to hydraulic pressure during emergency mode operation. See Service Data Ref. No. 15. The operation of the transfer valve results in a pressure differential between the two hydraulic metered supply lines. This action moves a pressure sensing ram which is connected to the core of a trim transformer. The signal from the trim transformer is supplied to the integrator which provides an output signal to null the feed-back signal. Due to the inherent time lag of the integrator a portion of the trim transformer signal by-passes the integrator to speed control response. See also Disengage Circuits, paras 77 and 78.

Disengage Circuits

75. The roll axis channel disengage circuits operate automatically if the roll rate exceeds 159 degrees per second. The circuits are controlled by a roll rate disengage accelerometer which at the predetermined roll rate limit completes supply circuits to the differential servos centering circuit and the parallel servo disengage circuit. See Service Data Ref. No. 15. Note that the power supply to the damper system components is uninterrupted in the emergency mode.

76. The roll axis disengage circuit will also operate if the yaw axis monitor operates due to excessive skid, sideslip, or transverse acceleration.

77. Operation of the disengage circuits reverts the channel to the pre-engage condition and illuminates the R-P AXIS indicator light on the master warning system panel. In the pre-engage condition, the pressure trim circuit is operative and the attitude trim actuation switch is transferred to the aileron trim circuit.

78. When the channel is in the pre-engage condition the output of the force transducer and the roll rate gyro is routed to the trim unit to ensure smooth re-engagement. A trim circuit amplifier, fitted in circuit immediately preceding the trim unit, discriminates upon the phasing of the applied signals to effect the proper direction of rotation of the motor-driven potentiometer of the trim unit. The effect of this provision is such that any unbalanced signals

ARROW 1 SERVICE DATA

UNCLASSIFIED

appearing in the command circuit initiate the operation of the trim unit and are balanced out by the resulting output signal from the trim unit. This ensures that the channel will be re-engaged into a balanced circuit and, as described in paras 73 and 74, in agreement with the prevailing position of the ailerons. But for this provision, an unbalanced signal, resulting, for example, from failure of the gyro circuit integrator to nullify a roll rate signal, would produce unexpected and undesirable movement of the ailerons.

79. Note that if an unbalanced signal is being nulled by the trim unit when re-engagement occurs, the effect is equivalent to introducing an out-of-trim condition on the axis. This is due to the trim signal standing at the summing point of signals from the force transducer and normal accelerometer. In this condition, to regain level flight with the control column in neutral, the trim actuation switch must be operated to cancel the trim signal.

YAW AXIS

General

80. The yaw axis channel of the damper system corrects yawing motion and provides for co-ordinated rudder movement in manoeuvres as necessary.

81. The channel incorporates two independent systems. One system is operative in the normal mode of damper system operation. The other system is operative only in the event of the normal system disengaging, i.e. in emergency mode operation. Except that a circuit is deleted in the emergency mode, both systems are identical in operation. The effect of the deleted circuit is to restrict the rudder co-ordination to manoeuvres of normal flight.

82. No independent command signals are supplied to the yaw axis channel in either the normal mode system or the emergency mode system. The motivating signals are provided by sensing devices which operate automatically in particular attitudes of the aircraft. These signals are, in most instances, consolidated at various summing points and the resultant supplied to a servo amplifier.

83. Signals applied to the amplifier are amplified to a usable level and the phasing discriminated against a reference. The output of the amplifier initiates the operation of a rudder dual differential servo valve which in turn operates the rudder hydraulic jack control valve to cause the deflection of the rudder in the direction appropriate to the phase of the amplifier unit input.

84. A self-balancing or feed-back circuit is introduced from the rudder dual differential servo to the servo amplifier. Movement of the dual differential servo results in a feed-back signal proportional to such movement, appearing at a summing point preceding the amplifier input. When this signal nulls the input signal to the servo amplifier, the servo circuit is balanced and further movement of the rudder does not take place. Upon the input signal to the amplifier being cancelled, the feed-back signal operates the amplifier causing the rudder to be returned to its original position.

85. The rudder dual differential servo valve is described in the Flying Controls Service Data Ref. No. 15.

86. Signals are supplied by the sensing devices in the normal mode system in respect of yaw rate, transverse acceleration, and aileron position differential by, respectively, a yaw rate gyro, a transverse accelerometer, and a transducer. A signal which is the product of pitch rate and aileron position is also provided. All signals are compensated for airspeed by air data transducer components.

87. The yaw rate and aileron position signals are supervised by an integrator unit whose action is similar to that of the pitch axis sensing circuit integrator in that it has no effect

ARROW 1 SERVICE DATA

UNCLASSIFIED

on signals of short duration but nullifies steady signals. The integrator also supervises transverse accelerometer signals when the landing gear is selected down.

Yaw Rate

88. The yaw rate signal produced by the yaw rate gyro is of a magnitude and phase appropriate to the rate and direction of yawing motion. Since the gyro signal is proportional to rate of yaw rather than to displacement of the aircraft, comparatively quick corrective action by the rudder can be achieved before the displacement becomes significant. If, in straight and level flight or during turning movements, the yaw rate signal is the result of transient yawing motion, it is applied through the various summing points to the servo amplifier to effect a corrective movement of the rudder. As the aircraft returns to its original attitude, yaw rate signals of the opposite phase are produced which cause the deflection of the rudder in the opposite direction to prevent overshoot. Steady state yaw rate signals will cause an initial deflection of the rudder but, due to the action of the integrator, the rudder will be returned to its original position by the feed-back signal.

Aileron Position

89. An aileron position signal is produced when the ailerons are moved to commence a turn or to maintain stability. The position of the ailerons is translated by a transducer into an electrical signal, the magnitude and phase of which is dependent on the degree and direction of aileron movement. Note that, as the transducer signal is the product of aileron position differential, the simultaneous up deflection of the ailerons at high altitude will not result in a signal from the transducer. See also para 51. The transducer signal is applied through the various summing points to the servo amplifier to effect the deflection of the rudder in the direction appropriate to turn the aircraft and overcome adverse yawing moment resulting from aileron movement.

90. If the aileron position transducer signal is the result of a commanded turning manoeuvre or of an applied aileron trim, the signal will be, in effect, a steady state signal. Therefore, as with a steady state yaw rate signal, the integrator action will cause the rudder to be returned to its original position after the initial deflection or short term co-ordination. Transducer signals resulting from the positioning of the ailerons by the sensing circuit will continually position the rudder to provide co-ordination as required by the corrective movements of the ailerons. As the signals originated by the sensing circuit are of relatively short duration, they will not be nulled due to the operating time lag of the integrator.

Transverse Acceleration

91. Slip or skid in any flight attitude results in a signal originated by the transverse accelerometer being supplied to the servo amplifier to produce a corrective movement of the rudder. As the sideslip motion is eliminated by the applied correction, the output of the transverse accelerometer correspondingly decreases so permitting the servo feed-back signal to decrease the deflection of the rudder.

92. When the landing gear is selected down, certain circuit changes are effected to by-pass the major portion of the transverse accelerometer signal to the summing point of the yaw rate and aileron position signals. This action subjects the accelerometer signal to supervision by the integrator which nullifies the signal. By this means, the pilot can introduce sideslip without opposition from the yaw axis channel as the accelerometer signals resulting from intentional sideslip will be nullified by the integrator. The portion of the accelerometer signal which is not by-passed tends to maintain stability in the axis.

ARROW 1 SERVICE DATA

Aileron Position - Pitch Rate

93. The simultaneous command of a large rate of roll and degree of pitch would introduce an adverse yawing moment. The signal which is the product of aileron position and pitch rate is utilized in the yaw axis to counteract this condition. The magnitude of this signal is directly proportional to the aileron position commanded and degree of pitch. The signal supplements the short term rudder co-ordination signal, so increasing the deflection of the rudder in relation to the attitudes commanded. As this signal is not supervised by the integrator, rudder deflection is applied until the command signals are cancelled.

94. With the exception of the aileron position and pitch rate signal the operation of the emergency mode system is identical with that of the normal mode system. The change-over from the normal mode to the emergency mode is effected by the operation of a rudder monitor which initiates the operation of certain electrical circuits of the rudder dual differential servo and results in the illumination of the roll and/or pitch axis disengage indicator light on the master warning system panel. The operation of the emergency yaw damper system is indicated by the illumination of the yaw emergency damper operative indicator, also located on the master warning system panel. The operation of the rudder dual differential servo is described in Service Data Ref. No. 35.

95. Note that when the rudder monitor is operated, the pitch axis and roll axis damper circuits are also disengaged. See the Pitch Axis and the Roll Axis Disengage Circuits.

Rudder Monitor

96. The rudder monitor circuit includes a sideslip switch i.e. the beta vane in the nose boom and two transverse accelerometers which are located 13 feet and 40 feet, respectively, forward of the aircraft's centre of gravity. The sideslip switch is set to open and interrupt the normal mode system supply if the sideslip angle exceeds ten degrees. This function is primarily for low airspeeds in which condition a small acceleration may correspond to a large angle of sideslip.

97. The action of the accelerometers is such that one detects direction of sideslip and other yawing acceleration. If yawing acceleration is sensed which tends to reduce sideslip the change-over circuit will operate at a transverse acceleration value of approximately ± 0.6 'g' at the centre of gravity. Conversely, if the yawing acceleration is such that it tends to increase sideslip the changeover circuit will operate at the relatively lower transverse acceleration values of ± 0.2 'g'. This configuration is necessary due to the fact that in co-ordinated manoeuvres relatively large values of transverse and yawing accelerations are required for which the monitor must make provision.

Rudder Feel, Trim and Hinge Moment Limitation

98. A trim circuit is provided to permit the rudder to be trimmed to compensate for steady state yawing motion resulting from asymmetric flight or other causes. The circuit is controlled by a trim switch located in the front cockpit and consists of an actuator fitted as an integral component of the rudder rear quadrant assembly. Operating the trim switch results in the actuator moving the linkage of the rudder hydraulic jack control valve. The movement of the rudder by the trim circuit does not effect the positioning of the rudder bar.

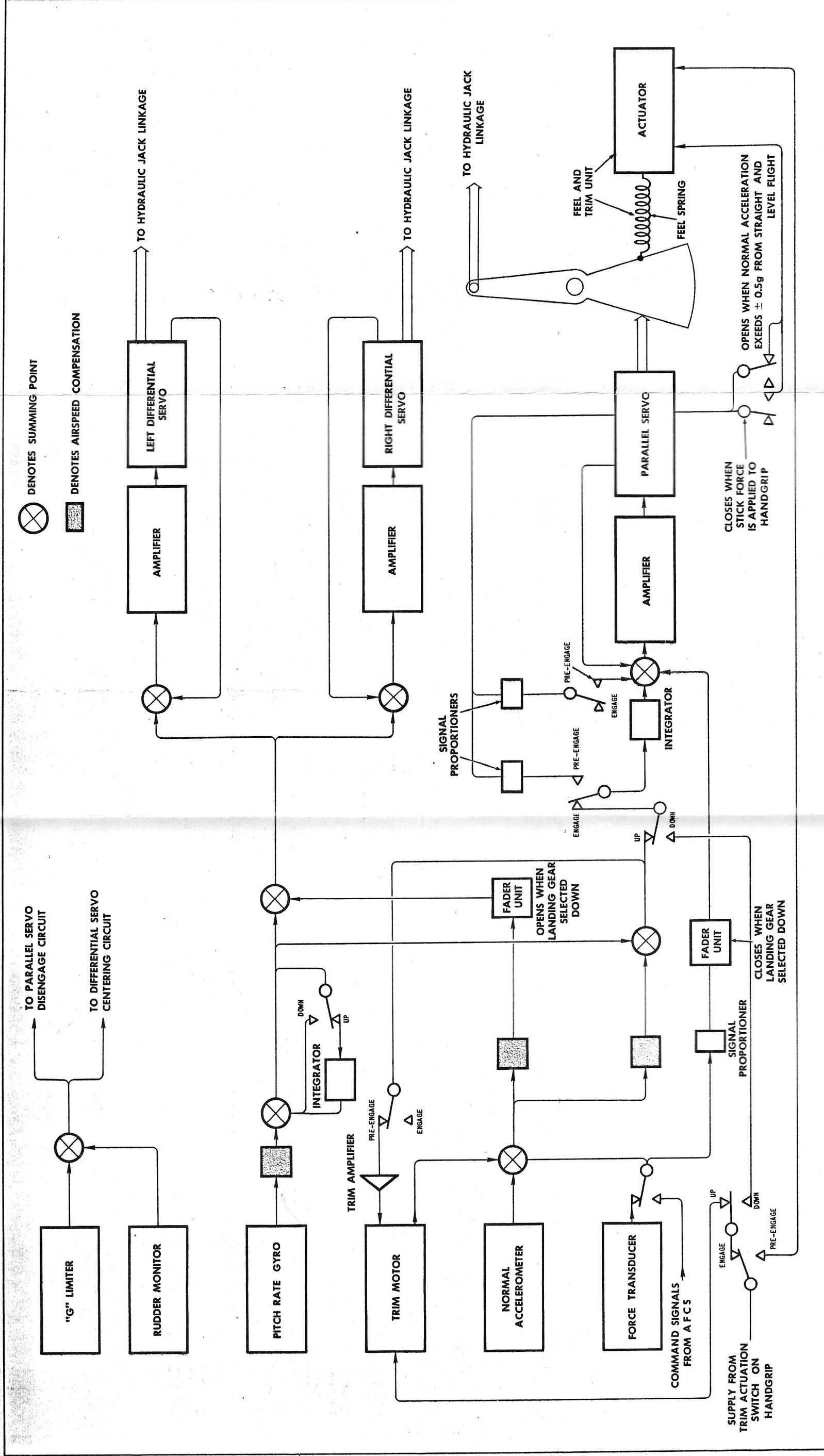
99. In addition to the trim actuator, the rudder rear quadrant assembly incorporates a rudder feel and hinge moment limitation system. This system functions automatically and its action is to decrease the rudder movement for a given force on the rudder bar in proportion to increasing airspeed. This is done to counteract the increased sensitivity of the rudder at high airspeeds.

CONFIDENTIAL

ARROW 1 SERVICE DATA

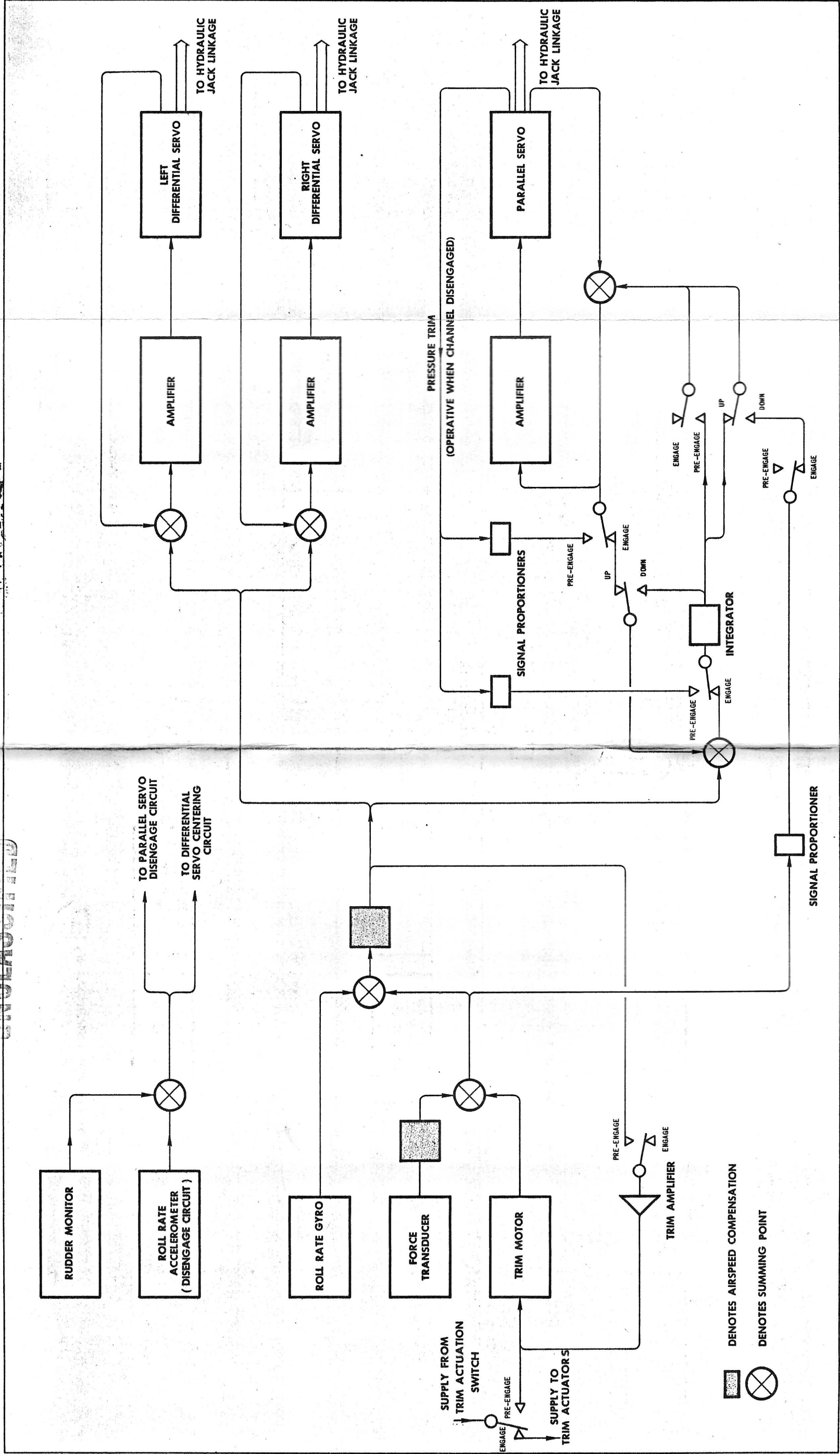
100. The operation of the trim circuit and the hinge moment limitation system are described fully in Service Data Ref. No. 15.

ARROW 1 SERVICE DATA



7M1-5501-1

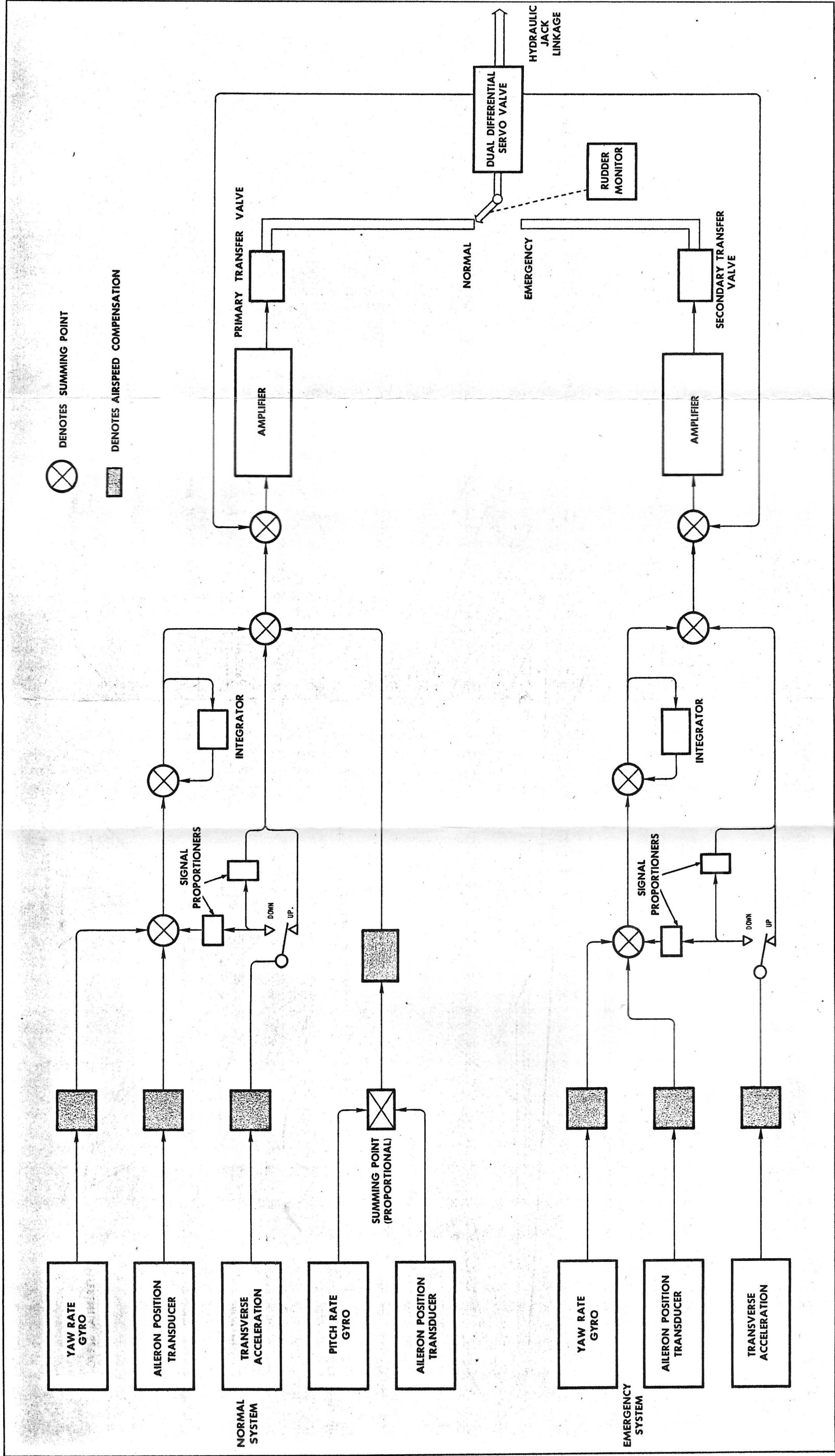
FIG. 1 PITCH AXIS BLOCK DIAGRAM



7N1-5502-1

FIG. 2 ROLL AXIS BLOCK DIAGRAM

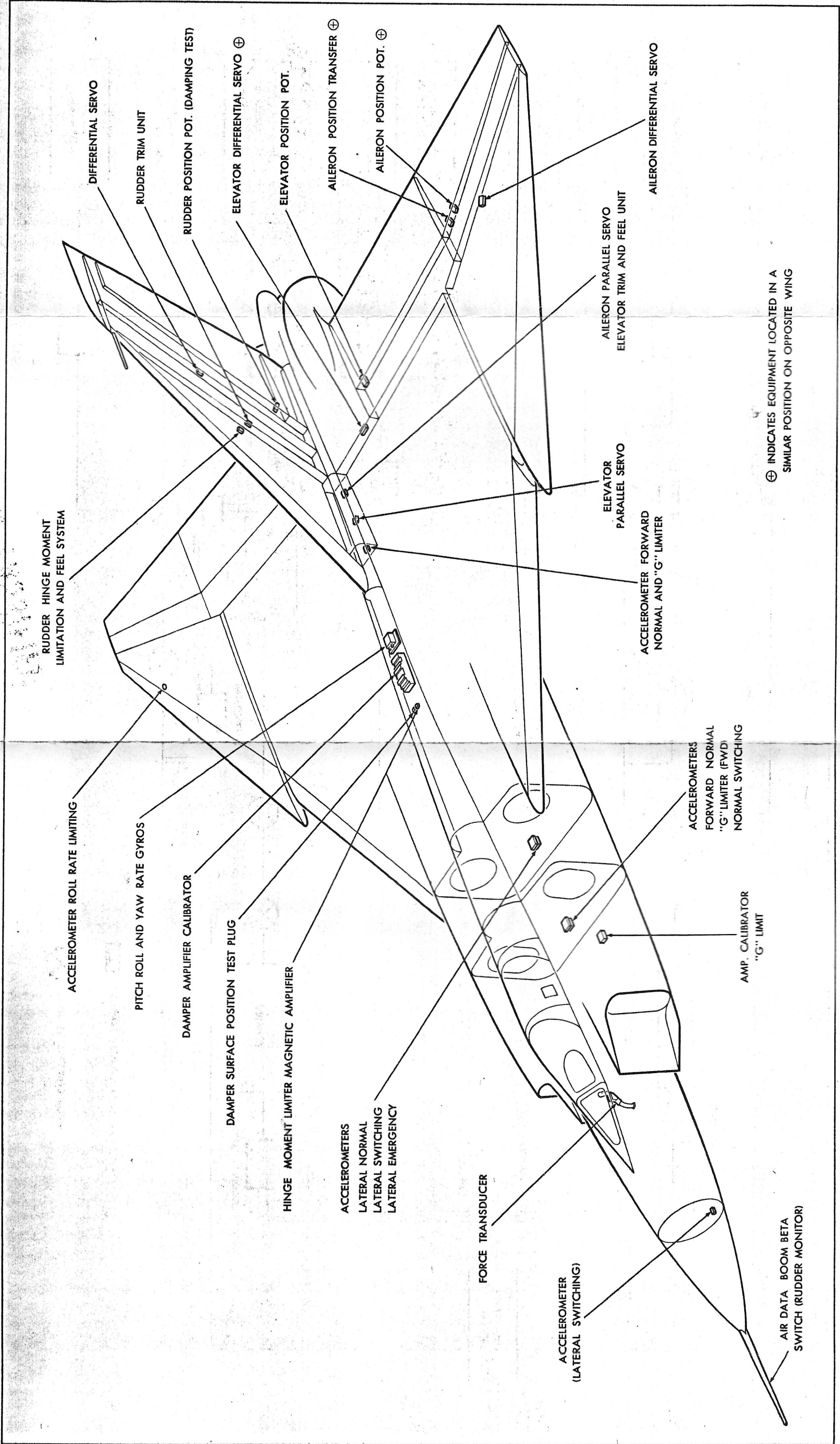
ARROW 1 SERVICE DATA



7M1-5503-1

FIG. 3 YAW AXIS BLOCK DIAGRAM

ARROW 1 SERVICE DATA
UNCLASSIFIED



TM-5504-1

FIG. 4 LOCATION OF DAMPER SYSTEM COMPONENTS

UNCLASSIFIED

ARROW 1 SERVICE DATA

SECTION 14

SPEED BRAKES

HYDRAULICS

(This data supersedes previous issue dated 6 Dec 56)

1 APR 58

CONFIDENTIAL

ARROW 1 SERVICE DATA

UNCLASSIFIED

LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

SPEED BRAKES - HYDRAULICS

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Speed Brakes Jacks	1
Speed Brakes Selector Valve	1
Expansion Couplings	1
INSPECTION (To be issued later)	
FUNCTION TESTING	3
REMOVAL AND INSTALLATION	
General	4
Speed Brakes Jacks	5
Speed Brakes Selector	5
EQUIPMENT LIST	7

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Speed Brakes - Schematic	2
2	Speed Brakes Hydraulic Component Layout	3
3	Expansion Coupling	4

ARROW 1 SERVICE DATA

CONFIDENTIAL
UNCLASSIFIED

DESCRIPTION

GENERAL

1 The speed brake hydraulic circuit receives hydraulic power from the utility hydraulic power circuit. A solenoid operated selector valve directs fluid to operate two speed brake jacks located on the underside of the fuselage, one on each side of the duct bay.

2 A three position switch located on the inboard power lever provides selection of the speed brakes to IN or OUT or to a 'hold' position. The unmarked 'hold' selection is the centre position on the switch and permits the speed brakes to be stopped at any intermediate position between IN and OUT.

3 Provision is made for the speed brakes to blow back on all selections should the air load on the speed brakes become excessive.

4 Stainless steel pipelines which incorporate expansion couplings are secured to the jacks by swivel joints. The swivel joints allow the hydraulic lines at the jacks to swivel and the expansion couplings compensate the lines for up and down movement of the jacks when the speed brakes are operated. The hydraulic lines leading to each jack are secured to static sections on two of the swivel joints.

SPEED BRAKES JACKS

5 The speed brakes jacks are of the single cylinder double-acting type, and are controlled by the speed brakes selector valve. Retraction of the jacks lowers the speed brakes.

SPEED BRAKES SELECTOR VALVE (Fig 1)

6 The speed brakes selector valve is operated by an 'in' solenoid and an 'out' solenoid, each controlled by the three position switch on the inboard power lever.

7 When an IN selection is made, the 'in' solenoid is energized and the 'out' solenoid

remains de-energized. The resultant repositioning of the 'in' solenoid valve connects the No. 1 piston chamber to return and system pressure in the No. 2 piston chamber repositions the spool valve compressing the spring in the No. 1 piston chamber. This connects the system pressure to both sides of the speed brakes jacks. Due to this pressure acting on a larger piston area on the 'in' side of the jack than on the 'out' side, and the airload on the speed brakes, the speed brakes close.

8 When an OUT selection is made, the 'out' solenoid is energized and the 'in' solenoid remains de-energized. The resultant repositioning of the 'out' solenoid valve connects the No. 2 piston chamber to return, and pressure in the No. 1 piston chamber repositions the spool valve compressing the spring in the No. 2 piston chamber. This connects the system pressure to the jacks 'out' line and opens the jacks 'in' line to return. The pressure fluid retracts the speed brakes jacks and extends the speed brakes.

9 When a 'hold' selection is made both solenoids are de-energized and pressure is directed to both piston chambers. This causes the spool valve to assume a central position and trap fluid in the 'out' end of the piston, hydraulically locking the jack piston against blow back of the speed brakes. The opposite end of the jack is connected to return.

10 A relief valve in the selector valve is fitted between the speed brake 'out' line and return, and is set to open at a differential pressure of 4350 - 4400 psi. Should the airloads on the speed brakes become excessive the relief valve opens to permit blow back of the speed brakes to a position where the airloads balance the hydraulic force.

EXPANSION COUPLINGS (Fig 3)

11 Expansion couplings, fitted in the lines at each jack, compensate for varying line lengths due to up and down movement of the speed brakes jacks during operation of the speed brakes. The couplings are hydraulically balanced units and have a total compensation range of one inch.

ARROW 1 SERVICE DATA

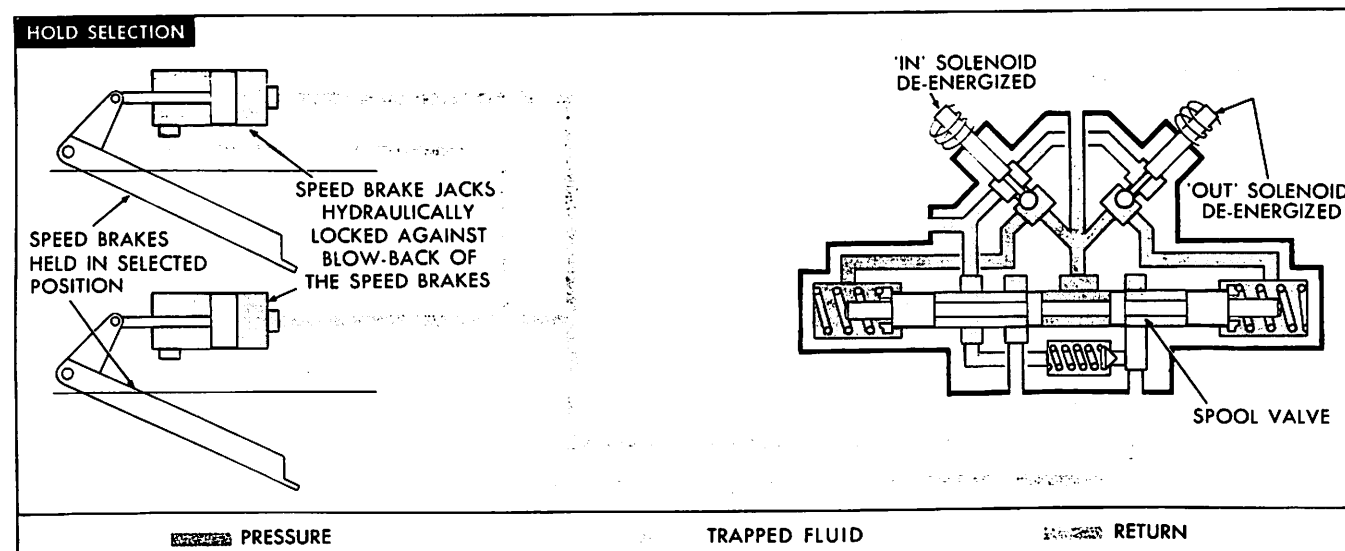
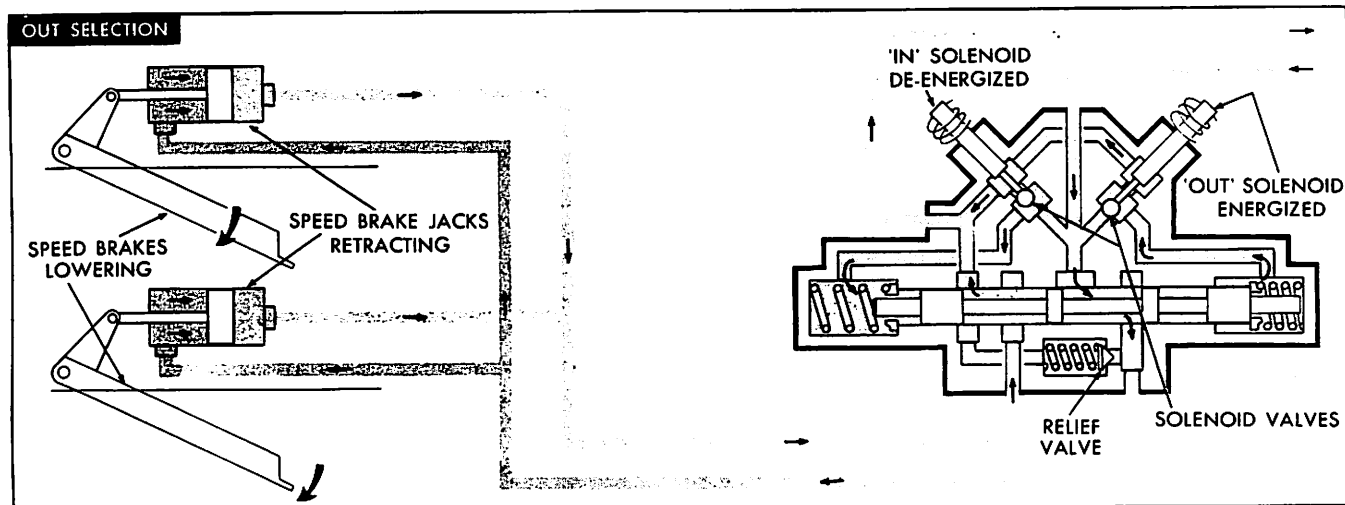
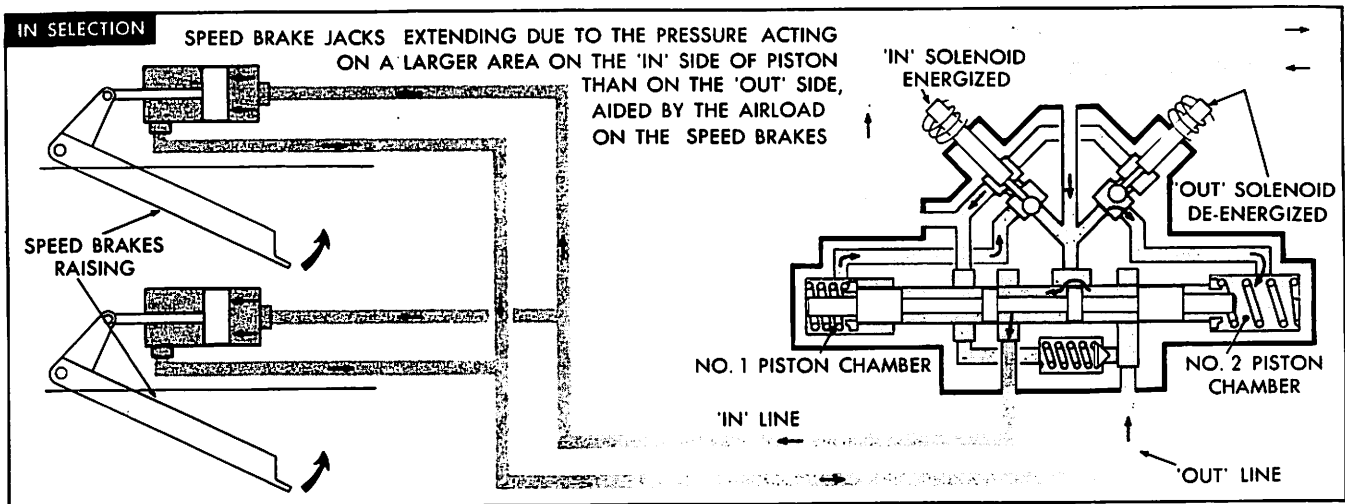
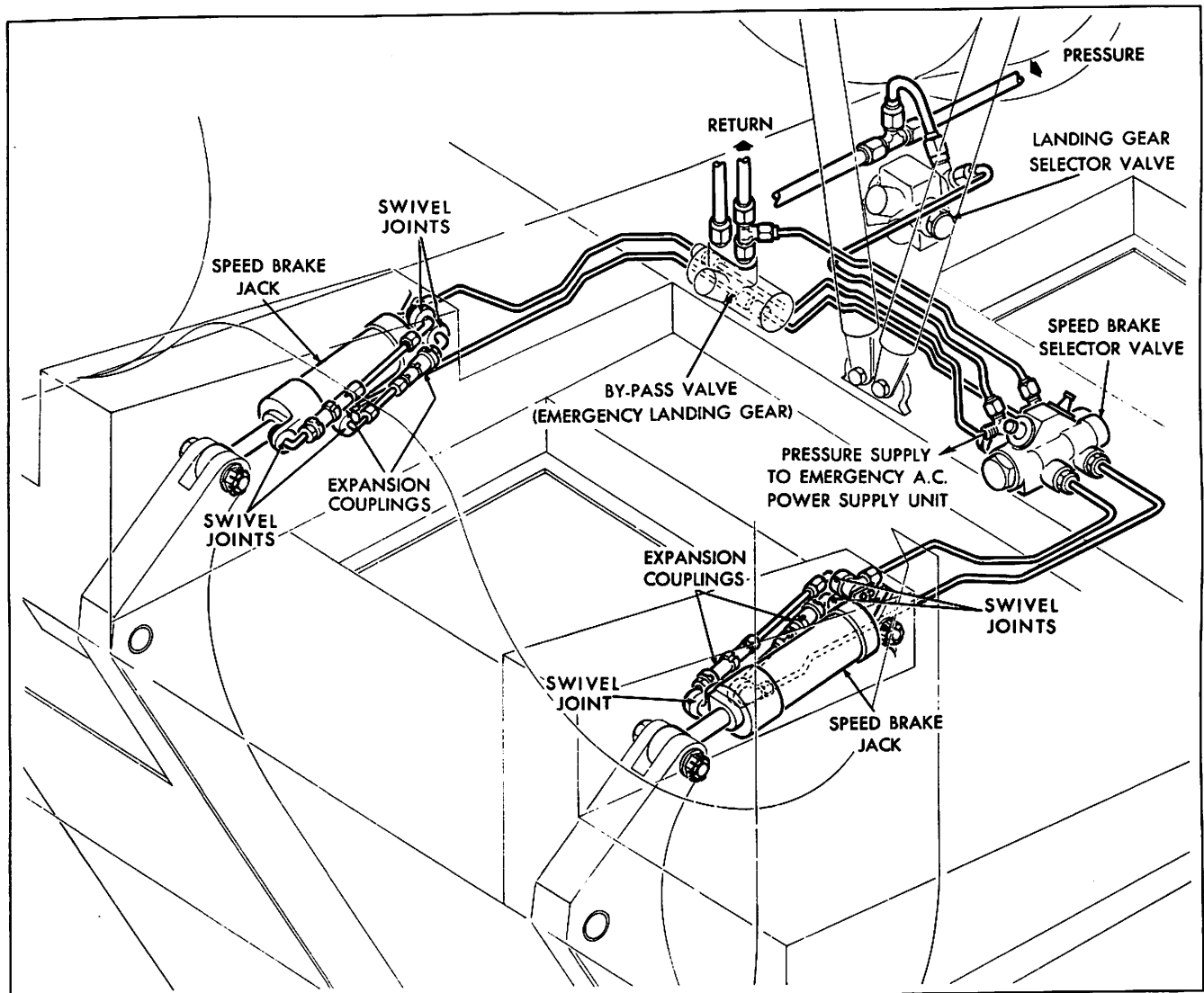


FIG. 1 SPEED BRAKES - SCHEMATIC

ARROW 1 SERVICE DATA



7M1-2307-2

FIG. 2 SPEED BRAKES HYDRAULIC COMPONENT LAYOUT

FUNCTION TESTING

12 For the purpose of the following instructions, it is assumed that the utility hydraulic power circuit is fully serviced and functioning correctly, and that the hydraulic test machine trailer and the electrical ground power supply are connected to the aircraft. See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

13 To function test the speed brakes proceed as follows:

(a) Select mode 2 on the hydraulic test machine trailer control panel, start the auxiliary pump and adjust the low pressure adjustment controls to obtain a low pressure gauge reading of 50 psi at each gauge. Ensure that the needles on the vacuum gauge on the control panel stay within the safety range.

(b) Start the hydraulic test machine trailer main pumps by depressing the main pump starter button. Adjust the pump volume control to obtain a flow rate of 5 gpm from each pump and adjust the high pressure gauge outlet valves to obtain a reading on each high pressure gauge of 4,000 psi.

ARROW 1 SERVICE DATA

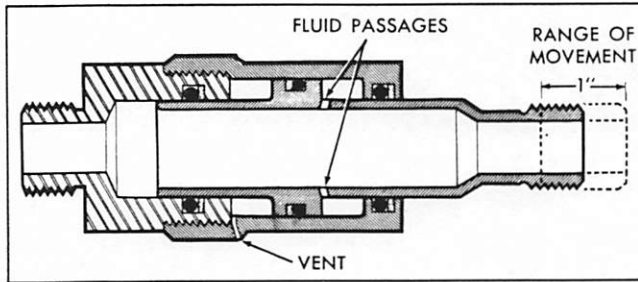


FIG. 3 EXPANSION COUPLING

(c) Rig the speed brakes and connect the jacks to the speed brakes as laid down in Arrow 1 Service Data - Section 11 - Flying Controls Mechanical.

NOTE

The speed brakes may be operated slowly during the rigging operation by reducing the flow rate of the hydraulic test machine trailer mainpumps as required for the period of the rigging operation.

(d) Operate the speed brakes first IN and then OUT for five complete cycles by selecting appropriately on the three position switch. Check for smooth operation of the speed brakes and check that the operating time for each direction is as follows:

(1) Full OUT to IN - 3-1/2 to 4-1/2 seconds.

(2) IN to full OUT - 3 to 4 seconds.

(e) Select IN on the speed brakes three position switch and revert the switch to 'hold' twice during the retraction of the speed brakes at two independent intermediate positions. Check that the speed brakes hold simultaneously with each 'hold' selection, and that the angles of the speed brakes are synchronized to within 15° of each other. This can be checked by placing an inclinometer on the bottom skin of the speed brakes to measure and compare the angular setting of one speed brake with the other, at each of the intermediate positions.

(f) Select OUT on the speed brakes three position switch, and revert the switch to 'hold'

twice during the extension of the speed brakes at two independent intermediate positions. Check that the speed brakes hold simultaneously with each 'hold' selection, and that the angles of the speed brakes are synchronized to within 15° of each other.

(g) Select IN on the speed brakes three position switch and revert the switch to 'hold', to stop the speed brakes at approximately their half open position. Measure the angle of each brake using an inclinometer.

(h) Recheck the angle of each speed brake after a five minute period. Each speed brake must not have drooped more than 5° from its initial measurement.

(j) Operate the speed brakes fully in by selecting IN on the three position switch.

(k) Switch off the hydraulic test machine trailer main pumps and auxiliary pump, relieve the system pressure by depressing the high pressure button on the control panel and turn the mode selector OFF. Disconnect the hydraulic test machine trailer couplings.

REMOVAL AND INSTALLATION

GENERAL

14 Before commencing removal of any speed brake circuit hydraulic components or lines, all utility hydraulic system pressures must be released as described in Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

15 When removing the components or lines, it is not necessary to drain the complete system if blanking unions are fitted to the ports immediately after disconnection. The blanks must remain in position until immediately before refitment to prevent any foreign matter from entering the system.

16 When reconnecting the hydraulic lines in the speed brake circuit, all flareless fitting nuts must be torqued to a value of 150-200 pounds-inches.

ARROW 1 SERVICE DATA

SPEED BRAKES JACKS

17 To remove a speed brake jack proceed as follows:

(a) Remove the electrical equipment access panels.

(b) Remove the emergency alternator (for removal of the LH speed brake only). See Arrow 1 Service Data - Section 20 - Utility Hydraulics - Power Circuit.

(c) Remove the side panel immediately inboard of the jack.

(d) Operate the speed brakes to the fully out position.

(e) Release the system pressure. See para 14.

(f) Remove the two bolts securing the top rear swivel joint to its attachment bracket. Remove the attachment bracket.

(g) Disconnect the hydraulic line from the static connection on the top rear swivel joint.

(h) Remove the two bolts securing the top front swivel joint to the jack and remove the top line assembly complete with the front swivel joint packing plate by raising the joints just clear of the jack and withdrawing in a forward direction. Blank off the four ports.

(j) Remove the two bolts securing the bottom front swivel joint to its attachment bracket.

(k) Disconnect the hydraulic line from the static connection on the bottom front swivel joint.

(m) Remove the two bolts securing the bottom rear swivel joint to the jack and remove the bottom line assembly complete with the rear swivel joint packing plate by raising the line just clear of the jack and withdrawing in a forward direction. Blank off the four ports.

(n) Remove the bolt securing the jack piston rod-end to the speed brake lever arm, and lower the front end of the jack to rest on the structure below.

(p) Remove the bolt securing the jack to the jack rear attachment bracket. Raise the rear of the jack to clear the rear attachment bracket and withdraw the jack.

18 The installation procedure is the reverse of that given for removal. The following points must be observed during installation:

(a) The two bolts securing each swivel joint to the jack must be wire locked together using AN995-NC47 lockwire.

(b) The bolt securing the jack to its rear attachment bracket must be torqued to a value of 1300-1500 pounds-inches.

(c) The bolt securing the jack rod-end to the speed brake lever arm must be torqued to a value of 1300-1500 pounds-inches.

SPEED BRAKES SELECTOR VALVE

19 To remove a speed brake selector valve proceed as follows:

(a) Remove the electrical equipment access panels and the hydraulic equipment access panel.

(b) Remove the left hand ground fault relay. See Arrow 1 Service Data - Section 37 - Electrical System - Power Supplies.

(c) Release the system pressure. See para 14.

(d) Remove the two hydraulic line fairleads immediately forward of the oil-to-fuel heat exchanger.

(e) Remove the fairlead to the left of the speed brake selector valve.

(f) Disconnect the quick disconnect couplings in the hydraulic lines to the emergency alternator.

(g) Disconnect the speed brake selector valve electrical connection.

(h) Disconnect the eight hydraulic lines at the speed brake selector valve.

UNCLASSIFIED

ARROW 1 SERVICE DATA

(j) Remove the four attachment bolts securing the speed brake selector valve.

(k) Withdraw in turn the hydraulic lines flareless couplings from the selector valve and slide the selector valve aft to remove.

(m) Blank off all ports.

20 The installation procedure is the reverse of that given for removal. The following points must be observed during installation:

(a) Tee pieces must be fitted at the pressure and return inlets of the selector valve.

(b) The four attachment bolts must be wirelocked together using AN995-NC47 lockwire.

ARROW 1 SERVICE DATA

SPEED BRAKES - HYDRAULICS

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-1956-7	Jarry Hydraulics 3126	Jack - Speed brakes	2
7-1956-13	Weston Hydraulics 14130	Valve - Speed brake selector	1
7-1956-35	Dowty Equipment XP 3052	Coupling - Expansion	4
7-1956-31	Barco Mfg. Co. 10-51115	Joint - Swivel	4
7-1956-33	Barco Mfg. Co. 10-51114	Joint - Swivel (LH Jack)	2
7-1956-34	Barco Mfg. Co. 10-51190	Joint - Swivel (RH Jack)	2

CF-105 SERVICE DATA

FUEL SYSTEM

15

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	5
Tank Pressurization	5
Fuel Transfer	6
Engine Feed	7
Refuelling	7
Defuelling	8
FUNCTION TESTING	(To be issued later)
INSPECTION	(To be issued later)
COMPONENT SERVICE DATA	
Cell - Fuel No. 1	9
Cell - Fuel No. 2	11
Filter - Hot Air	13
Valve - Differential Air Pressure Regulator	15
Flow Limiter (Differential Regulator)	17
Flow Limiter (Fuselage Tank Supply)	19
Valve - Differential Air Relief	21
Valve - Absolute Air Pressure Regulator	23
Flow Limiter (Absolute Regulator)	25
Valve - Absolute Air Relief	27
Valve - Servo Pressure Regulator	29
Valve - Air/No-Fuel - Upper	31
Valve - Air/No-Fuel - Lower	33
Valve - Negative 'G' and Low Level Air Admission	35
Valve - Air Release	37
Unit - Flow Proportioner	39
Valve - Fuel/No-Air	41
Pump - Fuel Transfer	43
Valve - Fuel Pressure Regulator	45
Switch - Low Level Warning	47
Pump - Fuel Booster	49
Valve - Booster Pump By-pass	51
Valve - Fuel Feed Control	53
Adaptor - Refuelling	55
Cap - Refuelling Adaptor	57
Valve - Gate Manually Operated	59
Valve - Refuelling Shut-off	61
Valve - Two Way Shut-off	63
Valve - Two Way Shut-off and By-pass	65
Valve - Level Sensing	67
Valve - Fuel and Condensate Drain (Fuselage Tanks)	69

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Fuel System - Fuel Flow Schematic	3
2	Fuel System - Tank Pressurization Schematic	4

CONFIDENTIAL

CF-105 SERVICE DATA

CF-105 SERVICE DATA
COMPONENT DATA SHEET

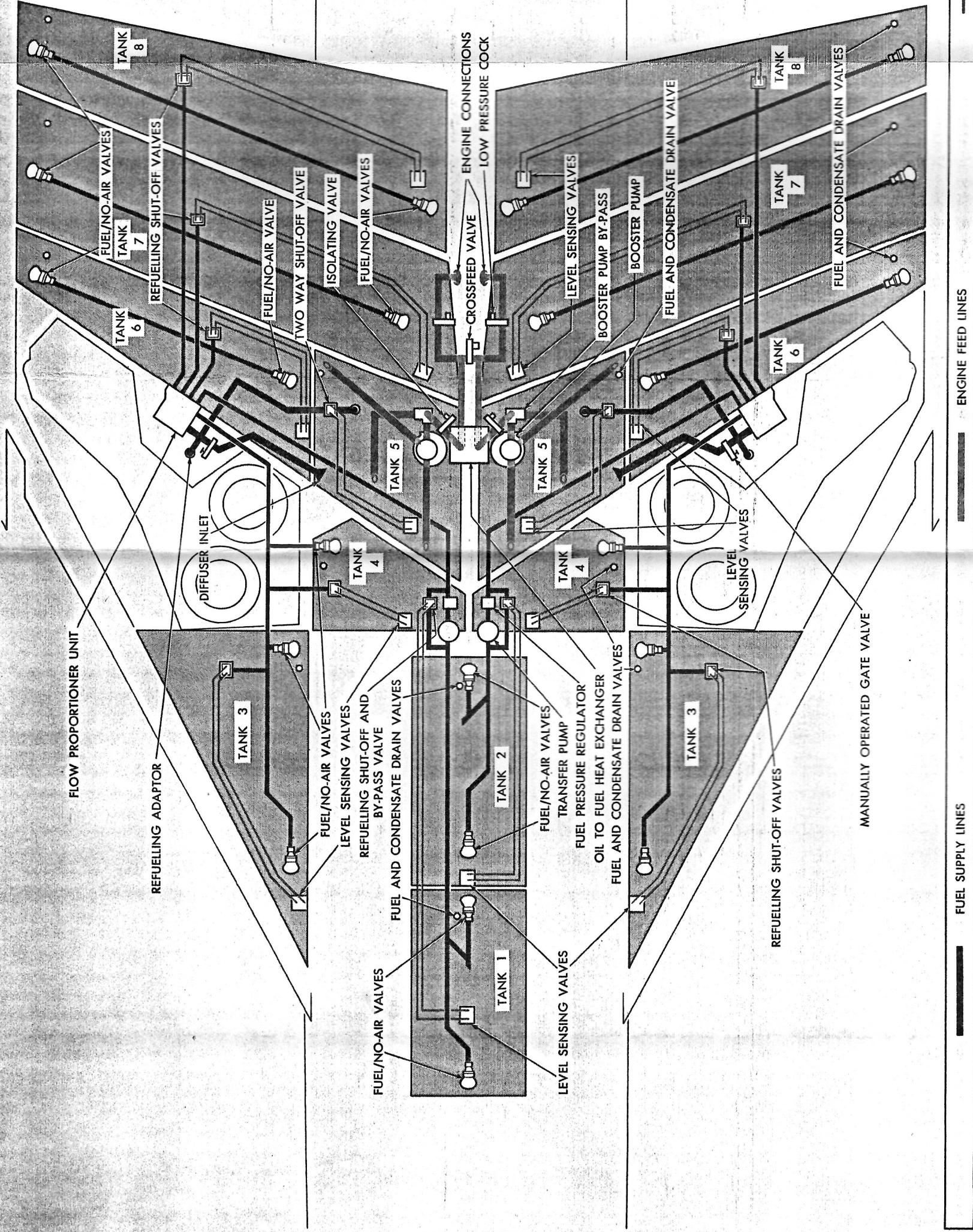


FIG. 1 FUEL SYSTEM - FUEL FLOW SCHEMATIC

CF-105 SERVICE DATA
COMPONENT DATA SHEET

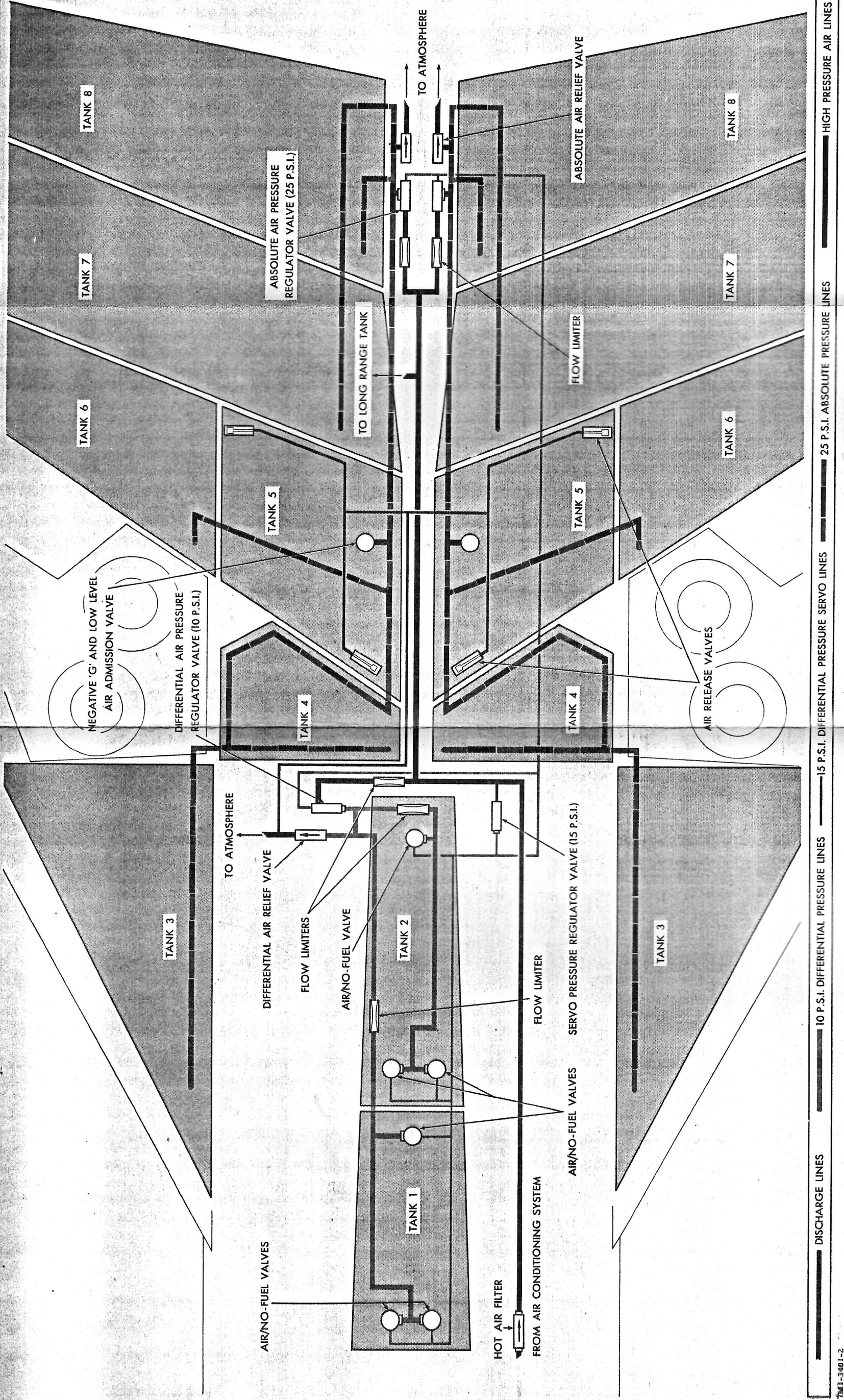


FIG. 2 FUEL SYSTEM - TANK PRESSURIZATION SCHEMATIC

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM		AIRCRAFT EFFTY	REF. NO.
FUEL SYSTEM			25201	16
DESCRIPTION				
General				
1. Fuel is contained in 14 tanks, two being installed in tank bays in the centre fuselage and six built integrally with each side of the inner wing. The fuselage tanks are of rubber cell type. The forward fuselage tank is Tank 1 and the aft fuselage tank is Tank 2. The wing tanks at each side are numbered 3, 4, 5, 6, 7 and 8. Each Tank 5 is a collector tank. The fuel passes from each collector tank to its respective engine. Provision is made for fitting a single long range tank below the fuselage. 2. The quantity of fuel in each side of the system is registered on two gauges in the front cockpit. The total capacity of internally carried fuel is 2544 gallons (3064 U.S.) 19,433 lbs. The capacity of the long range tank is 500 gallons (602.5 U.S.) 3,900 lbs. Tank Pressurization 3. Fuel is transferred into the collector tanks by air pressure tapped off the air conditioning system, downstream of the air-to-air heat exchanger. The pressure in the fuselage tanks is controlled to 10 psi differential by a differential pressure regulator. The pressure in the wing tanks is controlled to 25 psia by an absolute pressure regulator. 4. To prevent over-pressurization of the tanks in case of failure of a pressure regulator, each regulator has a flow limiter fitted at its inlet which limits the airflow to slightly above the normal maximum demand. A relief valve fitted at each regulator outlet relieves the excess pressure. 5. The pressure regulators and relief valves are fitted with override solenoids operated by the master refuelling switch on the master refuelling panel. This permits air in the tanks to be displaced by the incoming fuel, during refuelling, and also prevents further air from entering the tanks if a ground air supply is connected. 6. A flow limiter is fitted in the supply line to each fuselage tank to limit loss of air through a damaged tank thereby maintaining pressure to the undamaged tank. Flow limiters are not required in the wing tank supply lines, as these lines are sized to restrict air loss in the event of a damaged tank. 7. Air/no-fuel valves are fitted at each of the air pressure inlets to each fuselage tank to prevent fuel from entering the pressurization lines. 8. A servo supply regulated to 15 psi differential is tapped off the high pressure line to operate the air/no-fuel valves and also supply the servo pressure to operate the pressure regulators which close off the air supply during refuelling.				
ISSUE	1			
DATE	29 Oct 56			

9. To prevent fuel vaporization, a negative G and low level air admission valve admits air into the tank when the tank pressure falls below 11 psia due to a drop in fuel level.

10. Two air release valves in each collector tank allow air in excess of 14 psi absolute to be released from the collector tank when transfer resumes after being temporarily suspended. The air release valves automatically suspend air release if the collector tank pressure falls below 13 psi absolute.

Fuel Transfer

11. Fuel is transferred from the left hand wing storage tanks and the aft fuselage tank into the left hand collector tank. Fuel is transferred from the right hand wing storage tanks and the forward fuselage tank into the right hand collector tank.

12. Tank pressurization forces fuel through fuel/no-air valves in each wing storage tank and each fuselage tank into transfer lines to flow proportioner units. The fuel/no-air valves prevent pressurization air from entering the transfer lines.

13. An electrically driven transfer pump and a fuel pressure regulator is fitted in the transfer line from each fuselage tank to raise the fuel pressure from the fuselage tanks to a regulated pressure of 25 psi absolute to match the transfer delivery from the wing storage tanks. In the event of failure of a transfer pump, fuel is allowed to by-pass the pump through a two way shut-off and by-pass valve and the FUEL PROP light on the master warning panel in the pilot's cockpit is actuated on by a pressure differential switch which is fitted in parallel with the pump.

NOTE

As there is only one FUEL PROP light, two PRESS TO TEST buttons are fitted on the master refueling panel to allow the ground crew to establish which pump has failed.

14. The flow proportioner units meter fuel from each transfer line to the collector tanks in amounts proportionate to the tank capacities. In this way, all tanks empty at the same time, ensuring a minimum C of G shift during consumption of fuel. Each flow proportioner unit incorporates an electric motor-operated by-pass, which operates automatically in the event of jamming or seizure of the vanes. Each by-pass is controlled by a low level switch in its respective collector tank. The low level switches also control the FUEL PROP light and two LOW LEVEL lights on the master warning panel.

ISSUE	1							
DATE	29 Oct 56							

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM		SUB-SYSTEM		AIRCRAFT EFFTY	REF. NO.
FUEL SYSTEM (Cont'd)				25201	16

15. The flow proportioners have a lock-on feature which keeps the by-pass open once it has been signalled. The lock-on is automatically released when the aircraft power is switched off and the aircraft or ground power is switched on again. A mechanical indicator on each flow proportioner unit indicates the by-pass 'open' and by-pass 'closed' positions.

Engine Feed

16. An engine driven booster pump is fitted in each collector tank to boost fuel delivery to the engines. Each booster pump is provided with an automatic priming device to dispel air and vapour from the fuel. By-pass valves are fitted in parallel with each pump to permit fuel to feed directly to the engines by a combination of collector tank pressure, gravity and suction from the engine pumps, should the booster pump fail. The booster pumps increase the delivery pressure to a minimum of 15 psi above collector tank pressure.

17. Fuel flow to the engines passes through an oil to fuel heat exchanger and is controlled by five electrically operated valves. Two of these valves are isolating valves, two are low pressure cocks and the remaining valve is a crossfeed valve. The crossfeed valve opens when a crossfeed selection is made and one of the isolating valves shuts off the inoperative side of the system. The low pressure cocks may be closed during ground servicing by two ground servicing switches located on the forward accessories panel in the nose landing gear well.

Refuelling

18. The aircraft is pressure refuelled through two refuelling adaptors, located one in each main landing gear well. Access to each refuelling adaptor is through a refuelling access door. The action of opening the access door closes a manually operated gate valve in the transfer line to the collector tank, permitting fuel flow into the collector tank through a separate refuelling line. The access door must be closed after refuelling, to re-open the transfer line to the collector tank. A micro-switch actuated by the door latch brings on the FUEL PROP light on the master warning panel to warn the pilot before take-off if either access door has been left open.

19. When the tanks are full, or when the desired level has been reached during partial refuelling, fuel flow is automatically cut off by a refuelling shut-off valve in each wing storage tank, by a two way shut-off valve in each collector tank, and by refuelling shut-off and by-pass valves for the fuselage tanks. A level sensing valve mounted at the top of each tank controls the shut-off valves.

20. A master refuelling panel is located on the underside of the duct bay, access to which is through a refuelling access door. This panel incorporates a master refuelling switch and a refuelling selector switch. The master refuelling switch has two positions, ON and OFF AND DEFUEL. An ON selection eliminates tank pressurization and permits venting of the tanks during refuelling. It also brings on the tank signal lights. See para 22. An OFF AND DEFUEL selection overrides all

ISSUE	1						
DATE	29 Oct 56						

refuelling switches and lights. To guard against the master switch being inadvertently left on at the end of the refuelling operation, the switch is provided with a guard which prevents the access door from closing when the switch is on.

21. The refuelling selector switch has two positions, PARTIAL and FULL REFUEL. The PARTIAL selection causes the flow proportioner by-pass to be motored closed and fuel is delivered in proportionate amounts to the tanks. The FULL REFUEL selection causes the flow proportioner by-pass to be motored open, allowing the tanks to fill at random rates.

22. A refuelling control and signal panel, fitted outboard of the refuelling access door in each main landing gear well, incorporates a REFUEL CONTROL switch which controls the flow into the tanks on the respective sides of the system. It also incorporates a green signal light for each tank which goes out when refuelling is taking place, and comes on when refuelling is terminated. The operation of the level sensing and shut-off valves may be pre-checked immediately after the commencement of refuelling by switching the REFUEL CONTROL switch to its two positions and observing the signal lights.

Defuelling

23. The aircraft is defuelled through the refuelling adaptor in each main landing gear well. Defuelling from the wing storage tanks and the fuselage tanks is effected by tank pressurization through the transfer lines assisted by suction from the tender pumps. An external source of air pressure is necessary to pressurize the tanks to achieve this.

24. Defuelling from the collector tanks which are not pressurized by air, is by suction through the two way shut-off valves. As the level in the collector tank drops, air is admitted through the negative 'G' and low level air admission valves to take the place of the displaced fuel.

25. The refuelling master switch remains in the OFF AND DEFUEL position for defuelling, therefore no selection is necessary. Residual fuel may be drained through residual fuel and condensate drain valves located at the bottom of each tank.

ISSUE	1							
DATE	29 Oct 56							

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Cell - Fuel No. 1		REF. NO. 16-1	
AVRO PART NO. 7-1754-5		MANUFACTURER Dominion Rubber		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To contain fuel and fuel system components.							
LOCATION Centre fuselage above armament bay.							
ACCESS Gained by removing the dorsal fairing - six latches and the tank access panel - 36 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Cell - Fuel No. 2		REF. NO. 16-2	
AVRO PART NO. 7-1754-6		MANUFACTURER Dominion Rubber		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To contain fuel and fuel system components.							
LOCATION Centre fuselage above armament bay.							
ACCESS Gained by removing the dorsal fairing - six latches and the tank access panel - 36 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

101-3433-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Filter - Hot Air		REF. NO. 16-3	
AVRO PART NO. 7-1654-7		MANUFACTURER Purolator Products		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To prevent particles of foreign material from entering fuel tank pressurization system.							
LOCATION Centre Fuselage - upper armament bay.							
ACCESS Accessible in armament bay, with missile pack lowered.						MEN X MINUTES	
REPLACEMENT PROCEDURE Locate the filter in position at its mounting. Insert four mounting bolts. Connect two "Wig-o-Flex" couplings. Interchangeable component.						MEN X MINUTES	

INSPECTION Remove filter element and clean.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE "Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Differential Pressure Regulator		REF. NO. 16-4	
AVRO. PART NO. 7-1600-8		MANUFACTURER Aviation Electric		MAN'F'R'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To maintain fuselage fuel tank air pressure at 10 psig.							
LOCATION At Sta. 500 near the bottom skin of the inner wing.							
ACCESS Gained through the electrics access panel - 44 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the valve and insert the two attachment bolts. Connect one 1/4 inch line. Connect two "Wig-o-Flex" couplings. Interchangeable component.						MEN X MINUTES	

INSPECTION Check for security, damage, corrosion and leaks.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE "Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Flow Limiter (Differential Regulator)		REF. NO. 16-5	
AVRO PART NO. 7-1654-199		MANUFACTURER Le Clair Engineering		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE : KNOWN-							
ESTIMATED- 500 hours							
FUNCTION Limits air flow in fuselage fuel pressurization system to within the capabilities of the differential pressure relief valve in the event of a failed regulator.							
LOCATION In the duct bay - aft of Sta. 485, near wing bottom skin.							
ACCESS Gained through electrics access panel - 74 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect two "Wig-o-Flex" couplings. Interchangeable component.						MEN X MINUTES	

[illegible]

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Flow Limiter (Fuselage Tank Supply)		REF. NO. 16-6	
AVRO PART NO. 7-1662-8		MANUFACTURER Le Clair Engineering		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To prevent complete loss of pressurization by limiting the flow of air to a damaged fuel cell.							
LOCATION In No. 2 fuselage fuel cell.							
ACCESS Accessible in No. 2 fuselage fuel cell. Remove the dorsal fairing - six latches. Remove the tank access panel - 36 screws. Remove structural tie bars as required - two bolts each.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect two "Wig-o-Flex" couplings. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools .									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Differential Air Relief		REF. NO. 16-7	
AVRO PART NO. 7-1656-5		MANUFACTURER Canadian Pratt and Whitney		MAN'FR'S PART NO. HS/503993-2		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION Safety valve (10.5 psi) and remote controlled dump valve for fuselage tanks.							
LOCATION Sta. 492 at bottom of fuselage.							
ACCESS Accessible through the electrical access door by removing 42 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert four attachment bolts. Connect two flared tube couplings. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

701-3013-2-0

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Absolute Air Pressure Regulator		REF. NO. 16-8	
AVRO PART NO. 7-1600-20		MANUFACTURER Aviation Electric		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To maintain wing fuel tank pressure at 25 psia.							
LOCATION Sta. 670 near bottom skin of inner wing.							
ACCESS Gained through No. 3 Service door - 26 camlocs .						MEN X MINUTES	
REPLACEMENT PROCEDURE Attach two 1/4 inch couplings . Attach the regulator to its mounting bracket by two bolts . Connect two electrical leads. Connect two "Wig-o-Flex" couplings . Interchangeable component .						MEN X MINUTES	

INSPECTION		MEN X MINUTES							
Check for security, damage, corrosion and leaks.									
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Air conditioning unit. Air pressure gauge.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Flow Limiter (Absolute Regulator)		REF. NO. 16-9	
AVRO PART NO. 7-1656-227		MANUFACTURER Le Clair Engineering		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Limits air flow in the wing fuel pressurization system to within the capabilities of the absolute air pressure relief valve in the event of a failed regulator.							
LOCATION Sta. 663 - near wing bottom skin.							
ACCESS Gained through No. 3 service door - 36 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect two "Wig-o-Flex" couplings. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
Check security of connections.									
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Absolute Air Relief		REF. NO. 16-10	
AVRO PART NO. 7-1656-4		MANUFACTURER Hamilton		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Acts as a safety valve and remote controlled dump valve in the wing tank pressurization system.							
LOCATION In the Engine Bay - Sta. 674.16, 27 inches below wing bottom skin.							
ACCESS Accessible through No. 3 Service door - 36 carlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the four attachment bolts. Attach the four-way fittings. Attach fuel pressurization pipe. Connect six "Wig-o-Flex" couplings. Connect four bonding jumpers. Connect one electrical lead.						MEN X MINUTES	

INSPECTION Check for security, damage, leakage and corrosion.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE "Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Servo Pressure Regulator		REF. NO. 16-11	
AVRO PART NO. 7-1654-144		MANUFACTURER Airesearch		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Regulates the control air supply at 15 psig to the air/no-fuel valves. Regulates a supply of air at 15 psig to the differential regulator valve and absolute regulator valves for override purposes.							
LOCATION In the duct bar at Sta. 485.							
ACCESS Gained through the electrics access door - 74 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Install the valve, attach two nuts. Connect three air lines (5/16 inch dia. two flared and one flareless). Interchangeable component.						MEN X MINUTES	

INSPECTION Check for security, damage, corrosion and leakage.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Air pressure gauge.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Air/No-Fuel - Upper		REF. NO. 16-12	
AVRO PART NO. 7-1654-21		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To prevent the entry of fuel into the fuel system air pressurization lines.							
LOCATION Inside fuselage fuel tanks, two valves at the top of each tank.							
ACCESS Accessible through fuselage tank access panel. Remove dorsal fairing - six latches. Remove tank access panel - 36 screws. Remove structural tie bars as required - two bolts each.						MEN X MINUTES	
REPLACEMENT PROCEDURE Install the valves and secure by the four attachment nuts. Connect the pressurization air line "Wig-o-Flex" coupling. Connect the flared tube coupling in the control air line. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Air/No-Fuel - Lower	REF. NO. 16-13
AVRO PART NO. 7-1654-22	MANUFACTURER		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-	500 hours
FUNCTION To prevent the entry of fuel into the fuel system air pressurization lines.					
LOCATION Inside fuselage fuel tanks, one valve at the bottom of each tank.					
ACCESS Accessible through the fuselage tank access panels. Remove the dorsal fairing - six latches. Remove tank access panel - 36 screws. Remove one structural tie bar - two bolts.					MEN X MINUTES
REPLACEMENT PROCEDURE Install the valve and secure by the four attachment nuts. Connect the pressurization air line "Wig-o-Flex" coupling. Connect the flared fitting coupling in the control air line. Refuel the aircraft. Interchangeable component.					MEN X MINUTES

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM	COMPONENT Valve - Negative "G" and Low Level Air Admission	REF. NO. 16-14
AVRO PART NO. 7-1662-7	MANUFACTURER Hymatic	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE : KNOWN- ESTIMATED- 500 hours				
FUNCTION Admits air pressure to collector tanks when fuel transfer from wing and fuselage tanks is interrupted, as during inverted flight or by action of negative "G" on fuel in wing and fuselage tanks.				
LOCATION Inside collector tank, on bottom skin.				
ACCESS Valve - Gained through access panel in top skin of inner wing - 29 screws. Locknut and line disconnect - Through electric's access panel - 44 camlocs.				MEN X MINUTES
REPLACEMENT PROCEDURE Position the valve inside the tank. Secure the locking ring at outside of tank. Connect the pipeline coupling. Refuel aircraft. Interchangeable component.				MEN X MINUTES

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

TM 1-3413-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Air Release		REF. NO. 16-15	
AVRO PART NO. 7-1600-19		MANUFACTURER Manning, Maxwell and Moore		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Serves as a means of permitting air to escape from the collector tank, preventing the displacement of fuel.							
LOCATION In the collector tanks. Forward inboard and aft outboard.							
ACCESS Gained through the access panels in the wing top skin. Forward valve gained through the forward access panel - 29 screws. Aft valve gained through the outboard access panel - 29 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the four attachment bolts. Connect the overboard drain. Interchangeable component.						MEN X MINUTES	

INSPECTION							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS Excessive fuel venting from duct bay flame trap during engine running, may indicate malfunction of the air release valve. Disconnect air release valve vent line at the flame trap to determine source of fuel.									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Unit - Flow Proportioner		REF. NO. 16-16	
AVRO PART NO. 7-1662-2		MANUFACTURER Eclipse Pioneer		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE : KNOWN-							
ESTIMATED- 500 hours							
FUNCTION To proportion the flow of fuel into and out of the individual fuel tanks.							
LOCATION On the front face of the main spar.							
ACCESS Gained through hinged door in underside of wing - 48 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the four manifold attachment bolts. Connect three fuel line "Wig-o-Flex" couplings. Connect the electrical connection to the shut-off valve and by-pass valve. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Fuel/No-Air	REF. NO. 16-17
AVRO PART NO. 7-1600-45	MANUFACTURER Aero Supply and Flight Refuelling		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours					
FUNCTION To prevent ingress of fuel system pressurization air into the fuel transfer lines.					
LOCATION Two in No's 1, 2, 3, 6, 7 and 8 fuel tanks. One in No 4 fuel tank.					
ACCESS Fuel/No-Air valves in the wing tanks are access- ible through access panels in the wing top skin as follows:- No 3 tank aft - 45 screws. No 3 tank forward - 36 screws. No 4 tank - 58 screws. No's 6, 7 and 8 tanks - 29 screws. Fuel/No-Air valves in fuselage tanks - remove dorsal fairing - six latches, tank access panels and tie bars as required.			MEN X MINUTES		
REPLACEMENT PROCEDURE Insert the four attachment bolts. Connect one "Wig-o-Flex" coupling. Connect one electrical lead. Refuel the aircraft. Interchangeable component.			MEN X MINUTES		

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Pump - Fuel Transfer	REF. NO. 16-18
AVRO PART NO. 7-1656-115,116	MANUFACTURER Hydroaire	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN-		ESTIMATED- 500 hours			
FUNCTION Used in the fuel transfer lines from the fuselage tanks to equalize pressures at the inlets to the fuel transfer flow proportioners.					
LOCATION In the duct bay, lower wing skin Sta. 492.0 to 497.0.					
ACCESS Accessible through electrics access door - 74 camlocs.					MEN X MINUTES
REPLACEMENT PROCEDURE Attach the pressure regulating valve. Insert four attachment bolts. Connect two "Wig-o-Flex" couplings. Connect one electrical connector. Install the air release valve vent line from LH collector tank to tee. Refuel the aircraft. Interchangeable component.					MEN X MINUTES

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Fuel Pressure Regulator		REF. NO. 16-19	
AVRO PART NO. 7-1656-117		MANUFACTURER Schulz		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To regulate the output of the fuselage fuel transfer pumps to 25 psia.							
LOCATION In duct bay, downstream of fuselage fuel transfer pumps.							
ACCESS Accessible through electrical access panel - 74 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Mount the valve on the transfer pump and secure the four attaching nuts. Refit and connect the "Wig-o-Flex" coupling. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

7M1-3423-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Switch - Low Level Warning		REF. NO. 16-20	
AVRO PART NO. 7-1654-213		MANUFACTURER Minneapolis - Honeywell		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION On receiving a fuel low level warning signal from the liquid level sensor in the collector tank, the switch actuates a warning light in the cockpit and the fuel flow proportioner by-pass valve, moving it to the open position.							
LOCATION On the main accessory panel E5 armament bay.							
ACCESS Accessible in missile bay with missile pack lowered. Drop panel from forward mounts by removing forward pip pins.						MEN X MINUTES	
REPLACEMENT PROCEDURE Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Pump - Fuel Booster		REF. NO. 16-21	
AVRO PART NO. 7-1662-583 and 584		MANUFACTURER Pesco Products - Borg Warner		MAN'FR'S PART NO. X023234-010 and 011		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To provide sufficient pressure at the inlet to the engine fuel pump to suppress boiling of the fuel and subsequent vapour lock.							
LOCATION Inside LH and RH collector tanks - inner wing.							
ACCESS Gained through access panel in top skin of inner wing, over collector tank - 92 x 5/16 inch bolts. Booster pump drive accessible through the hydraulic access door - 52 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Mount the pump on the attachment studs and secure with three 3/8 inch nuts. Connect the pump intake couplings. Connect the pump discharge coupling. (Connect three "Wig-o-Flex" couplings). Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION Check for security and leakage.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE "Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Booster Pump By-pass		REF. NO. 16-22	
AVRO PART NO. 7-1662-671		MANUFACTURER Essex		MAN'F'R'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To permit engine feed around pump in the event of pump failure.							
LOCATION Inside collector tank, near booster pump.							
ACCESS Gained through booster pump access panel in top skin of inner wing - 92 x 5/16 inch and four 1/4 inch bolts.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the valve. Connect the "Wig-o-Flex" coupling at outside of collector tank. Insert the three attachment bolts inside collector tank. Connect the two remaining "Wig-o-Flex" couplings. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Fuel Feed Control	REF. NO. 16-23
AVRO PART NO. 7-1600-61		MANUFACTURER General Controls	MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours					
FUNCTION		Serves as a positive remotely controlled method of closing a fuel line against flow in either direction. One valve is used as a low pressure cock in the fuel supply line to each engine. One valve is used as an isolating valve in the fuel supply line to each engine to isolate the inoperative side of the system during crossfeed. One valve is used as a crossfeed valve.			
LOCATION		In the duct bay - Sta. 550.			
ACCESS Gained through the hydraulics access door - 52 camlocs.					MEN X MINUTES
REPLACEMENT PROCEDURE Secure 12 x 5/16 inch cap screws. Connect electrical lead. Interchangeable component.					MEN X MINUTES

INSPECTION Check for security, damage, corrosion and leakage.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Adaptor - Refuelling		REF. NO. 16-24	
AVRO PART NO. 7-1662-447		MANUFACTURER Flight Refuelling		MAN'FR'S PART NO. 07-01-050		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Serves as the aircraft ground pressure refuelling connections.							
LOCATION One in each main landing gear wheel well.							
ACCESS Accessible through fuel proportioner access door in main landing gear wheel well - 48 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the eight 3/16 inch attachment bolts. Connect one "Wig-o-Flex" coupling. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION Check for security, damage and leakage.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Cap - Refuelling Adaptor		REF. NO. 16-25	
AVRO PART NO. 7-1662-471		MANUFACTURER Flight Refuelling		MAN'FR'S PART NO. 07-01-060		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION Provides a dust cap and a secondary seal for the pressure refuelling adaptor.							
LOCATION On the pressure refuelling adaptor - main landing gear wheel wells.							
ACCESS Accessible through refuelling access panel in main wheel wells - two latches.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect the safety chain to hook MS29523-1. Fit the cap by revolving it 1/4 turn in a clockwise direction. Secure the bayonet type latch. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
Check for security, damage and sealing efficiency.									
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Gate Manually Operated		REF. NO. 16-26	
AVRO PART NO. 7-1662-775		MANUFACTURER General Controls		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To isolate the collector tank transfer line during refuelling and defuelling and to direct fuel through the refuelling/defuelling line.							
LOCATION Adjacent to flow proportioners on the front face of the main spar.							
ACCESS Gained through the hinged door in underside of inner wing - 48 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Insert the four attachment bolts. Connect two "Wig-o-Flex" couplings. Connect door link. Interchangeable component.						MEN X MINUTES	

INSPECTION Check operation of valve. Check linkage for wear and correct adjustment. Check for security.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE "Wig-o-Flex" tools.									
REMARKS The valve is operated by the refuelling access door.									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Refuelling Shut-off	REF. NO. 16-27
AVRO PART NO. 7-1600-11	MANUFACTURER Schulz	MAN'F'R'S PART NO. 7-355-1-2		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours					
FUNCTION To control the admission of fuel to its respective tank during pressure refuelling.					
LOCATION Inside No's 3, 4, 6, 7 and 8 tanks.					
ACCESS Accessible through access panels in top skin of inner wing. No. 3 tank - outboard access panel - 62 screws. No. 4 tank - outboard access panel - 58 screws. No's. 6, 7 and 8 tanks centre access panel - 29 screws each.					MEN X MINUTES
REPLACEMENT PROCEDURE Insert the four attachment bolts. Connect the "Wig-o-Flex" coupling. Connect two 1/4 inch servo bleed lines. Connect the bonding jumper. Connect the electrical lead. Refuel the aircraft. Interchangeable component.					MEN X MINUTES

INSPECTION							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Two Way Shut-off		REF. NO. 16-28	
AVRO PART NO. 7-1600-37		MANUFACTURER Schulz		MAN'FR'S PART NO. 7-355-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To close off refuelling as each collector tank becomes full. To open to reverse flow during suction defuelling from the collector tank.							
LOCATION Inside each collector tank.							
ACCESS Gained through access panel in the top of each collector tank - 58 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the valve and secure with four attachment bolts. Attach one electrical connection. Connect two level sensing pipelines. Connect the "Wig-o-Flex" coupling. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Two Way Shut-off and By-pass		REF. NO. 16-29	
AVRO PART NO. 7-1656-121		MANUFACTURER Schulz		MAN'FR'S PART NO. 7-355-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION Admits fuel to a fuselage tank while acting under the control of the tank level sensing valve. Permits flow in the reverse direction to allow fuel transfer from the tank to by-pass the transfer pump in the event of pump malfunction.							
LOCATION Duct bay - mounted on bulkhead at Sta. 478.00.							
ACCESS Accessible through electrics access door - 74 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Locate the valve on the bulkhead mounting and secure the four attachment nuts. Attach the three 1-3/4 inch "Wig-o-Flex" couplings and the fuel transfer pipe section. Connect the bonding jumpers. Assemble the two servo bleed lines. Connect one electrical connection. Refuel the aircraft. Interchangeable component.						MEN X MINUTES	

INSPECTION							MEN X MINUTES		
Check for security, corrosion, damage and leakage.									
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
Electric ground power unit. Refuelling tender. B4 stand.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
"Wig-o-Flex" tools.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Level Sensing		REF. NO. 16-30	
AVRO PART NO. 7-1600-12		MANUFACTURER Schulz		MAN'F'R'S PART NO. 2-355-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		500 hours	
FUNCTION To operate tank fuel shut-off valves.							
LOCATION Inside each fuel tank.							
ACCESS				Wing - Gained through panel in top skin of inner wing - 29 to 42 screws each panel, varying according to location. Fuselage - Remove dorsal fairing over fuselage tank - six latches. Remove tank access panel - 36 screws, and at least one fuselage tie rod - two bolts.			
REPLACEMENT PROCEDURE				Insert the four attachment bolts. Connect two 1/2 inch level sensing lines. Connect one electrical connector. Refuel the aircraft. Interchangeable component.			
				MEN X MINUTES			

INSPECTION								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power unit. Refuelling tender. B4 stand. Wing protection mats.									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM FUEL SYSTEM		SUB-SYSTEM		COMPONENT Valve - Fuel and Condensate Drain (Fuselage Tanks)		REF. NO. 16-31	
AVRO PART NO. 7-1656-8		MANUFACTURER Auto Valve Inc.		MAN'F'R'S PART NO. 1550-B		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To provide a means of draining condensate from a fuel cell.							
LOCATION Bottom skin of fuselage - Sta. 388.							
ACCESS Flush with fuselage bottom skin.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position valve in housing. Fit the snap ring. Interchangeable component.						MEN X MINUTES	

INSPECTION								MEN X MINUTES	
Drain condensate. Check for signs of valve leakage.									
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
.25 inch O.D. push tube six inches in length.									
REMARKS									
ISSUE	1								
DATE	29 Oct 56								

UNCLAS

ARROW 1 SERVICE DATA

AIR CONDITIONING AND PRESSURIZATION

17

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Normal Operation	1
Defect Warning	7
Emergency Operation	9
Engine Bleed Air Manifolds	9
Engine Bleed Air Shut-off Valves	10
Engine Bleed Air Quick Disconnects	11
Engine Bleed Air Ducting	11
Pressure Reducing and Non-return Valves	12
Air-to-air Heat Exchanger	12
Main Shut-off Valve	12
Main Shut-off Valve Operation	12
Air-to-water Heat Exchanger	12
Cooling Turbine and Fan Unit	12
Ground Connection	12
Cabin and Equipment Temperature Control Valves	20
Temperature Control Shut-off Valve	20
Flow Augmentor and Shut-off Valve	20
Cabin Shut-off and Non-return Valve	20
Radar Nose Shut-off Valve	20
Ram Air Valves	21
Cabin Pressurization Control Operation	21
Cabin Pressure Safety Valve Operation	23
INSPECTION (To be issued later)	
FUNCTION TESTING	
General	25
Air Conditioning Ground Tests	25
Engine Bleed Air Shut-off Valve Test	27
Pressure Reducing and Non-return Valve Test	27
Main Shut-off Valve Test	27
Pressure Relief Valve Test	27
Temperature Control Shut-off Valve Test	28
Cabin and Equipment Temperature Control Systems Test	28
Defog Control Test	29
Cabin Shut-off and Non-return Valve Test	29
Cabin Pressurization Ground Tests	29
Cabin Pressure Test	29
Cabin Pressurization Control Test	30
Cabin Pressure Dump Control Test	30

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
Cabin Pressure Safety Valve Test	30
Procedure on Completion of Pressure Tests	31
REMOVAL AND INSTALLATION	
Cooling Turbine and Fan Unit Removal	31
Cooling Turbine and Fan Unit Installation	32
Air-to-water Heat Exchanger Removal	32
Air-to-water Heat Exchanger Installation	32
Air-to-air Heat Exchanger Removal	32
Air-to-air Heat Exchanger Installation	33
FAULTS AND REMEDIES	34
EQUIPMENT LIST	36

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Component Layout	3
2	Air Conditioning and Pressurization - Normal Operation	4
3	Equipment Bay Component Layout	5
4	Pressurization Graph	7
5	Air Conditioning and Pressurization - Emergency Operation	8
6	Engine Bleed Air Manifold	9
7	Engine Bleed Air Shut-off Valve - Schematic	10
8	Engine Bleed Air Quick Disconnect	11
9	Marman J-11 Coupling	12
10	Engine Bleed Air Ducting	13
11	Pressure Reducing and Non-return Valve	14
12	Air-to-air Heat Exchanger Installation	15
13	Main Shut-off Valve - Schematic	16
14	Air-to-water Heat Exchanger Installation	17
15	Cooling Turbine and Fan Unit	18
16	Marman Channel Band Coupling	19
17	Ground Connection	19
18	Flow Augmentor and Shut-off Valve	21
19	Cabin Pressure Control - Schematic	22
20	Cabin Pressure Safety Valve - Schematic	24
21	Cabin Pressure Control - Component Layout	26

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The air conditioning system uses air bled from the high pressure compressor unit of each engine. The system provides conditioned air for the cabin, fuel tank pressurization, low pressure pneumatic system and the liquid oxygen converter. The cabin is pressurized to a maximum differential of 4.5 - 5 psi and the temperature is controlled to provide a range of 40°F - 80°F. Conditioned air is also provided for maintaining the pressurized and non-pressurized electrical and electronic equipment at a temperature of 75°F - 85°F. An emergency system is provided to maintain a supply of cooling air to the essential electrical equipment under emergency conditions. Air discharged from the cabin is used to control the temperature and ventilate the missile bay.

2 The air conditioning system has three major components, an air-to-air heat exchanger which uses the ram airstream to cool the air bled from the engines, an air-to-water heat exchanger which further cools the air by heat transfer to distilled water, and a cooling turbine and fan unit. Incorporated in the system are various types of air valves and controllers served by thermostats and sensors, which maintain the selected conditions at varying aircraft airspeeds and altitudes. The system cannot be operated normally while the aircraft is on the ground, as the cooling efficiency of the air-to-air heat exchanger is dependent on the forward motion of the aircraft for supplying ram air.

3 Four manual electrical controls fitted on the RH console in the front cockpit provide HEAT OFF and TEMP CONTROL selections for the temperature shut-off valve, NORM-OFF-EMERG selections for the main air supply, DUMP or CABIN PRESS for the cabin air dump control and ON or OFF selections for the DEFOG switch. A temperature control rheostat enables the pilot to adjust the cabin temperature between COOL and WARM. A three position ENG BLEED AIR switch fitted on the RH forward console provides selection LH OFF-NORMAL-RH OFF. This switch allows one engine bleed air shut-off valve to be closed should a fault occur in the system.

4 To permit ground testing and to maintain the electronic equipment in an operational condition at a safe temperature while the aircraft is on the ground, provision is made for cool air to be supplied at low pressure through an external ground connection which is attached to the aircraft by a quick disconnect.

NORMAL OPERATION (Fig 3)

5 The bleeds from the LH and RH engines to the air-to-air heat exchanger are identical and commence at the engine bleed air manifold, which takes air from two positions on the high pressure compressor casing. The temperature of the air delivered to the manifold varies from 140°F to 920°F and the pressure varies from 30 psi to 300 psi according to flight conditions.

6 Engine bleed air from each compressor is ducted through a shut-off valve and a quick disconnect to a pressure reducing and non-return valve. The pressure reducing and non-return valve is a pneumatically actuated butterfly valve, sensitive to upstream and downstream pressure. The valve regulates the system pressure to a maximum of 85 psi and also functions as a non-return valve. See para 38.

7 From the pressure reducing and non-return valve, the bleed air is passed through an additional non-return valve to the air-to-air heat exchanger for initial cooling. A branch duct from the RH engine duct is led off at this point to supply hot air for cabin and equipment air temperature control.

8 Leakage of air from the bleed air ducts or a pressure rise above 120 psi downstream of the pressure reducing and non-return valve, is indicated for each duct by a warning light in the front cockpit. The defective duct can be isolated by closing the appropriate engine bleed shut-off valve. The valves are controlled by a switch in the front cockpit. See para 3. To prevent interrupting the supply of air for fuel tank pressurization, only one valve can be closed at any time. See para 27.

9 The air-to-air heat exchanger provides initial cooling of the bleed air by transferring heat to the cooling ram air flow. See para 26.

ARROW 1 SERVICE DATA

The bleed air from each engine enters the heat exchanger through a separate inlet to combine into a single flow. The cooled air is discharged from the heat exchanger through two outlet ducts. One outlet supplies air to the fuel pressurization system, and the other delivers air through the system main shut-off valve to the air-to-water heat exchanger for further cooling.

10 A pressure relief valve set to relieve at 100 psi is fitted in the line to the fuel pressurization system. This valve prevents pressure surges to the fuel system when the main air shut-off valve is closed on selecting the air supply switch to emergency. The fuel pressurization system is described in Arrow 1 Service Data - Section 15 - Fuel System.

11 A pneumatically actuated shut-off valve is fitted between the air-to-air heat exchanger and the air-to-water heat exchanger and is the air conditioning system main shut-off valve. The valve is controlled from the front cockpit by the three position AIR SUPPLY switch which is marked NORM-OFF-EMERG. With the switch selected to NORM the valve is open and the system is in full operation. In this selection the degree of valve opening is controlled by a pneumatic temperature sensor and a rate sensor. See para 45. The valve is closed on selection to OFF or EMERG and also on connection of the ground supply to the aircraft. See para 56. Air from the main shut-off valve is ducted to the air-to-water heat exchanger.

12 The air-to-water heat exchanger consists of a water tank having a usable capacity of 12 gallons (14.4 U.S.) of distilled water in which is immersed a heat exchanger. See para 49. The bleed air passes through the heat exchanger and heat from the air is transferred to the water. The water boils and the steam is allowed to escape from the tank to atmosphere by a vent positioned at the front upper surface under normal flight conditions and a rear stack pipe vent under negative 'g' conditions. Both vents are connected to an outlet in the dorsal fin. The outlet is covered by a hinged flap which opens to allow the steam to escape. Loss of water under negative 'g' or dive conditions is prevented by a disc type non-return valve fitted

to the front vent. The rear vent projects to the bottom of the tank and vents the steam under these conditions.

13 From the air-to-water heat exchanger the air is led for further cooling to a cooling turbine and fan unit. See para 54. The cooling turbine and the fan each have a separate housing and are mounted on a common shaft to form a single unit. The air cooled by the air-to-water heat exchanger drives the turbine which drives the fan. The energy extracted from the air by this operation further lowers its temperature. The fan assists the passage of the ram air through the heat exchanger and the exhaust from the fan is ducted overboard at the dorsal fin outlet.

14 Under certain flight conditions the temperature of the air at the turbine outlet could become very low. An excessive quantity of hot air would then be required to meet the demands of the temperature controlled air supplies. A temperature sensor fitted in the turbine outlet controls the main shut-off valve to regulate the air flow through the turbine and prevent the temperature falling below 0°F. A decrease in air flow raises the turbine outlet temperature. See para 45.

15 A cabin temperature control valve and an equipment temperature control valve provide a supply of temperature controlled air to the cabin and to the equipment areas. The two control valves, see para 60, receive engine bleed air from downstream of the two non-return valves. See para 7. A branch duct tapped from the RH engine supply, before it enters the air-to-air heat exchanger inlet manifold, supplies hot air to the valves. In the event of failure of the RH engine a cross-feed of hot air from the LH engine passes through the heat exchanger inlet manifold to the control valves. The RH non-return valve prevents a loss of air through the defective engine. See fig 3. The mixture of hot and cold air is then ducted to the cabin and the equipment areas and is controlled to maintain the cabin temperature at 40°F - 80°F, as selected by the temperature control in the front cockpit, and the equipment air automatically at approximately 80°F.

ARROW 1 SERVICE DATA

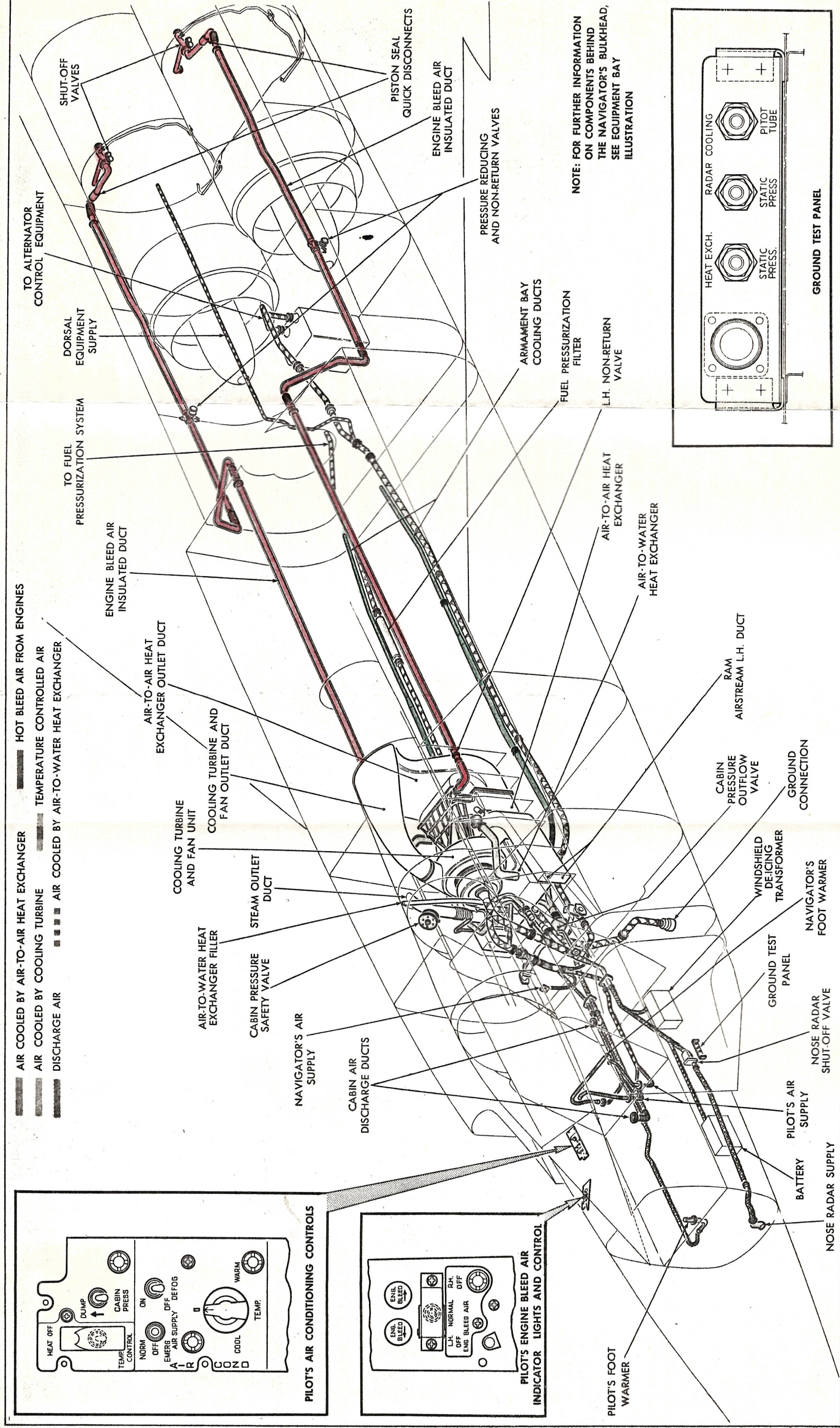


FIG. 1 COMPONENT LAYOUT

7M-2705-5

ARROW 1 SERVICE DATA

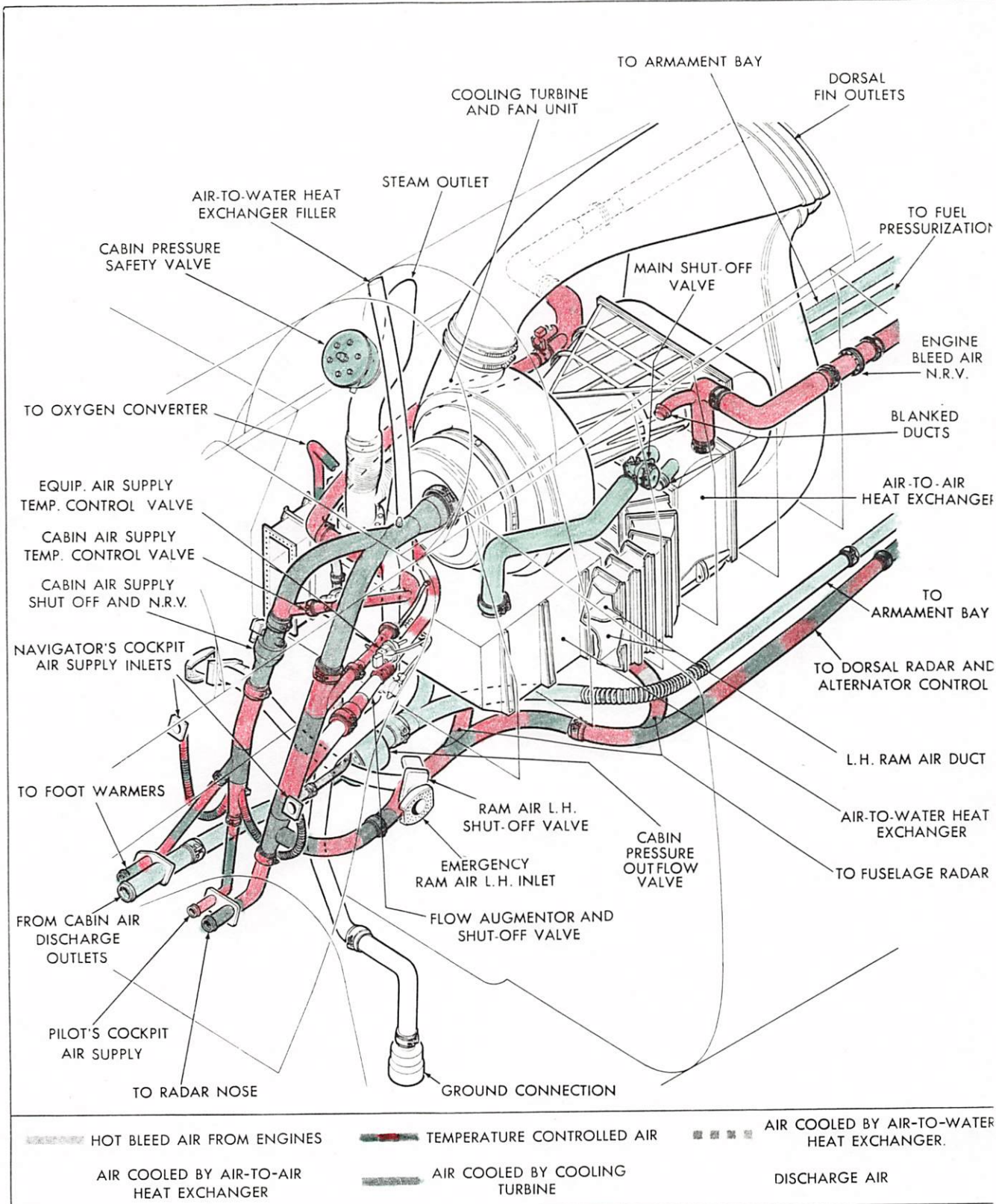


FIG. 2 EQUIPMENT BAY COMPONENT LAYOUT

ARROW 1 SERVICE DATA

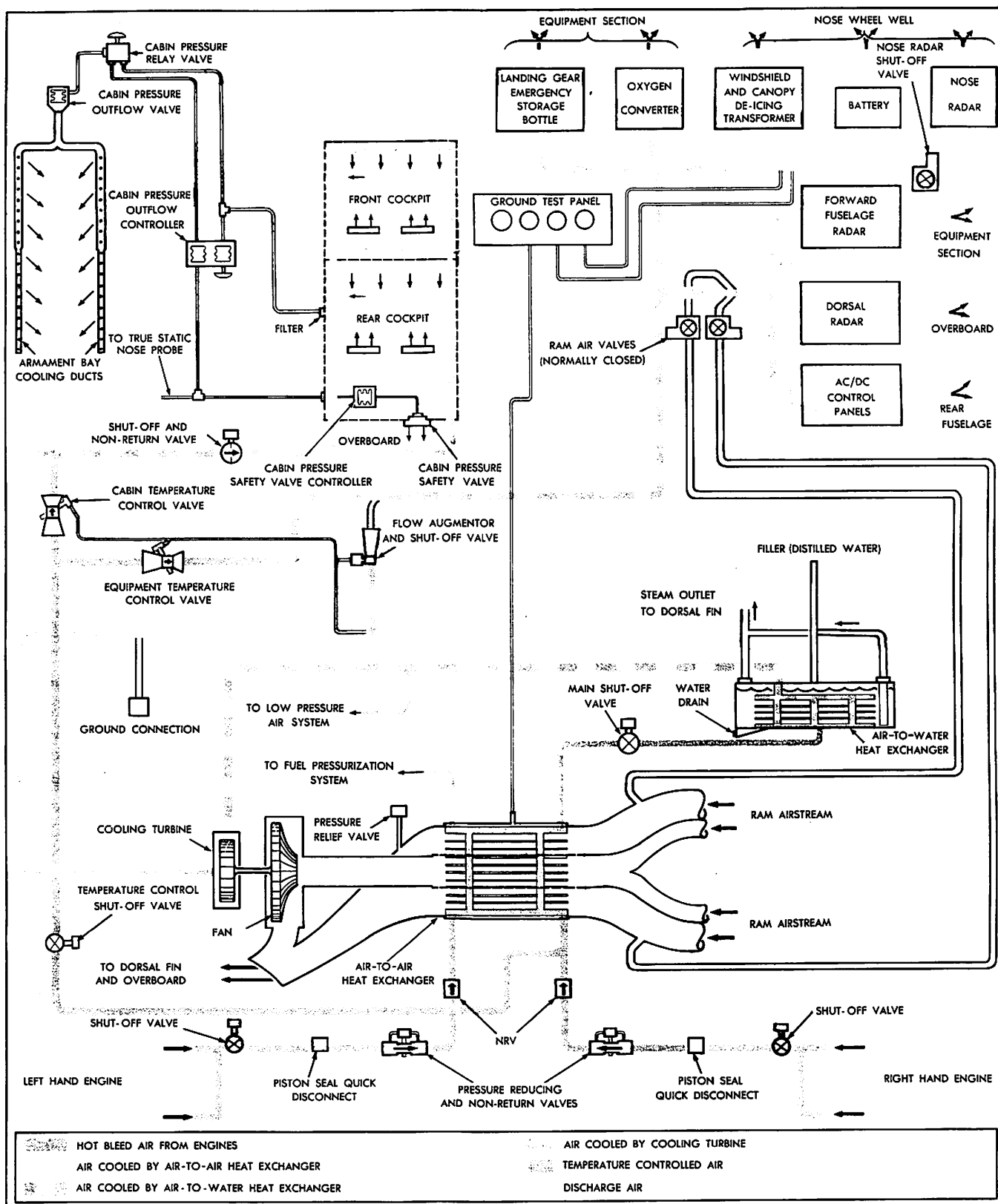


FIG. 3 AIR CONDITIONING AND PRESSURIZATION - NORMAL OPERATION

ARROW 1 SERVICE DATA

16 A shut-off valve is installed in the hot air supply duct to the temperature control systems. A switch in the front cockpit allows the valve to be closed and the hot air supply to be shut off in the event of failure of one of the temperature control systems.

17 A DEFOG switch is also fitted in the front cockpit and when switched ON reselects the cabin temperature controller to allow the cabin inlet temperature to rise to approximately 90°F and disperse cabin fog.

18 As a safety precaution, thermostats are fitted in the cabin and equipment supply ducts. The thermostats will close the respective temperature control valve if the temperature exceeds 240°F in the cabin air supply duct or 100°F in the equipment supply duct. The cabin air supply system returns to normal operation when the temperature drops to 100°F in the duct. The equipment air supply system returns to normal when the temperature drops to 60°F in the equipment supply duct. The thermostats provide an emergency form of temperature control.

19 The mixed and conditioned air is led to the cabin through a shut-off and non-return valve. See para 68. The shut-off valve is electrically actuated and is controlled by an air flow shut-off relay in the landing gear electrical circuit. The valve is partially closed when the landing gear is down, to conserve the limited supply of conditioned air, under low air speed and taxiing conditions, for the equipment areas. The restricted flow of air to the cabin provides ventilation. The non-return feature of the valve prevents a rapid loss of cabin pressure in the event of system supply failure or on closing of the main shut-off valve.

20 The supply is led into the cabin through six separate inlets, two on each seat bulkhead and one to a foot warmer in each cockpit.

21 Cabin pressure is regulated by a cabin pressure outflow valve installed in the cabin discharge air duct. The outflow valve provides a variable restriction to the discharge air and is controlled by a relay valve and a controller, using true static air pressure from a pressure head on the air data boom as a reference. See

para 72. From the outflow valve the discharge air is ducted through two perforated ducts, to condition and ventilate the armament bay.

22 The cabin is unpressurized up to 10,000 feet. Pressure increases linearly with altitude from 10,000 feet until a differential of cabin to atmospheric pressure of 4.5 - 5 psi is reached at 60,000 feet, giving a cabin altitude of 22,500-24,500 feet. See fig 4. Cabin pressure altitude is indicated by an altimeter installed in the pilot's cockpit.

23 A cabin pressure safety valve is mounted on the rear cockpit bulkhead and is controlled by a controller installed in the rear cockpit. The valve relieves excess cabin pressures in case of failure of the normal cabin pressure control. The valve also functions as a cabin pressure dump valve and opens when the cabin pressure switch in the front cockpit is selected to DUMP. See para 78. An inward relief valve is fitted to admit air into the cabin if the cabin pressure falls below ambient pressure.

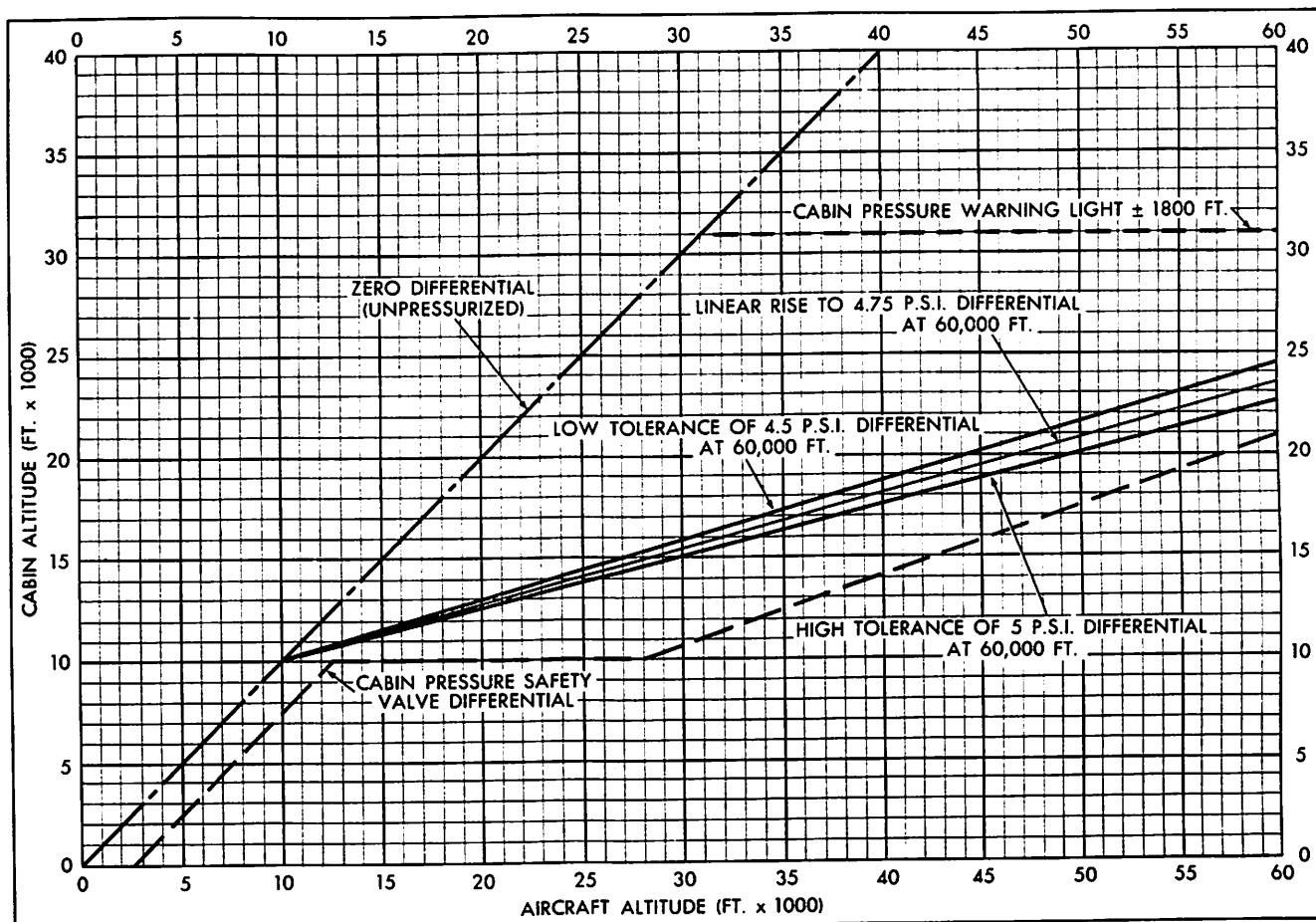
24 The mixed and conditioned air for the equipment areas is ducted from the equipment temperature control valve to a 'Y' duct to which a combined flow augmentor and shut-off valve is fitted. See para 65. The flow augmentor allows air tapped from the turbine inlet duct to supplement the air flow to the equipment areas if the pressure differential between the turbine inlet and the equipment supply duct falls below 70 psi. During taxiing and low airspeed conditions the temperature of the air from the air-to-water heat exchanger is too high for equipment cooling and the shut-off valve is selected closed by the airflow shut-off relay in the landing gear electrical circuit.

25 Conditioned air is ducted to the radar nose during normal operation of the system. When the air supply switch is selected to EMERG a shut-off valve in the radar nose supply duct is closed. See para 29. Conditioned air is also supplied to the following:

(a) The liquid oxygen converter, discharging to the equipment section.

(b) The battery, discharging to the nose wheel well.

ARROW 1 SERVICE DATA



7M1-2706-4

FIG. 4 PRESSURIZATION GRAPH

(c) The windshield and canopy de-icing transformer, discharging to the nose wheel well.

(d) The forward fuselage radar, discharging to the equipment section.

(e) The dorsal area electronics, discharging overboard.

(f) The alternator control, discharging to the rear fuselage.

(g) The landing gear emergency air bottle, discharging to the equipment section.

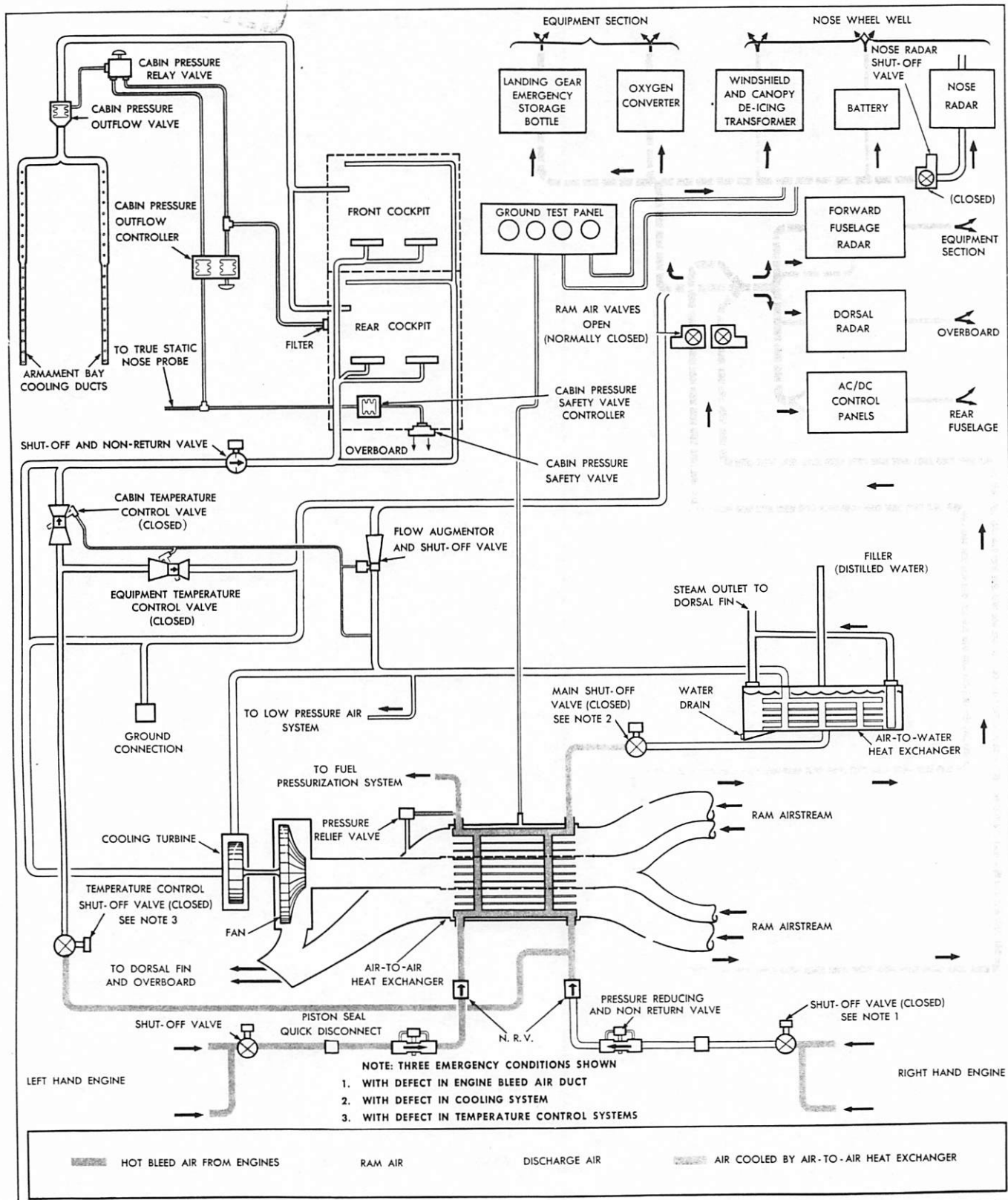
26 Ram air, provided by the forward motion of the aircraft, is taken from ducts formed between the front fuselage outer skin and the engine air intake ramps. The ram airstream

provides cooling air for the air-to-air heat exchanger. After passing through the heat exchanger, part of the ram airstream is ducted directly overboard at the dorsal fin outlet. The remainder is drawn through the fan section of the cooling turbine and fan unit to absorb the energy from this unit before passing overboard at the dorsal fin outlet.

DEFECT WARNING

27 To indicate to the pilot that a section of the system is defective, one of the warning lights on the master warning panel and an amber master warning light are illuminated to indicate a cabin pressure failure, an air conditioning failure or an equipment air overheat condition. Defects in the engine bleed air ducts are indicated on a separate panel. See fig 1.

ARROW 1 SERVICE DATA



7M1-2702-5

FIG. 5 AIR CONDITIONING AND PRESSURIZATION - EMERGENCY OPERATION

ARROW 1 SERVICE DATA

28 The CABIN PRESS and a master warning indicator are illuminated through an aneroid switch if cabin altitude exceeds 31,000 feet. If the temperature rises to above 80°F in the cooling turbine outlet duct due to a fault in the cooling system, the AIR COND FAIL and a master warning indicator are illuminated through a thermostat in the cooling turbine outlet duct. An EQUIP OVERHEAT and a master warning indicator are illuminated through a thermostat in the equipment air supply duct if the temperature in the duct exceeds 100°F.

EMERGENCY OPERATION (Fig 5)

29 Selection of the air supply switch in the

front cockpit to EMERG opens two ram air valves, which allow ram air to pass through ducting into the equipment air supply ducts to cool the essential equipment. See para 71. As the equipment cooling air requirements are in excess of the ram air supply, with the switch in the EMERG position the radar nose supply is shut off by an electrically actuated shut-off valve. See para 70. High airspeeds have the effect of raising the temperature of the ram air too high for equipment cooling, consequently airspeed must be reduced prior to selecting the air supply switch to EMERG.

ENGINE BLEED AIR MANIFOLDS (Fig 6)

30 The bleed air is tapped from two points

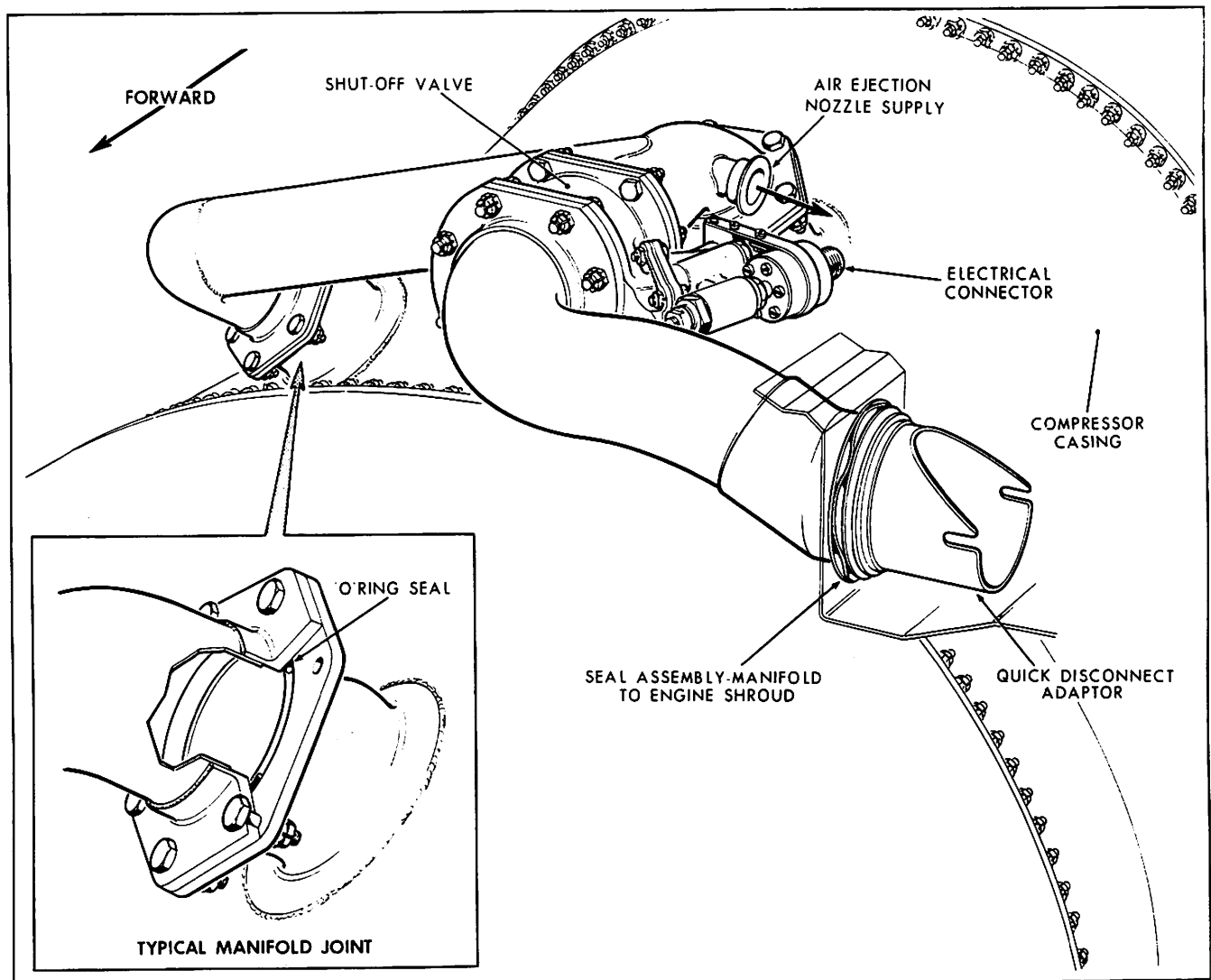


FIG. 6 ENGINE BLEED AIR MANIFOLD

ARROW 1 SERVICE DATA

on the high pressure compressor casing on each engine by a manifold. The manifold combines the two supplies into a single flow which is led to a shut-off valve. From the shut-off valve the air is led through the engine shroud to a quick disconnect adaptor. The joints between the manifold sections, the shut-off valve and the engine casing are formed by bolted flange joints sealed by metallic 'O'-rings.

31 The manifold sections and the shut-off valve are installed on the engine prior to fitting

the engine shroud. To prevent a leakage of cooling air between the manifold sections and the engine shroud the joint is sealed by a spring-loaded metal sealing ring.

ENGINE BLEED AIR SHUT-OFF VALVES (Fig 7)

32 A switch in the front cockpit marked LH OFF-NORM-RH OFF controls both engine bleed air shut-off valves. With the switch moved to the LH OFF or RH OFF position a

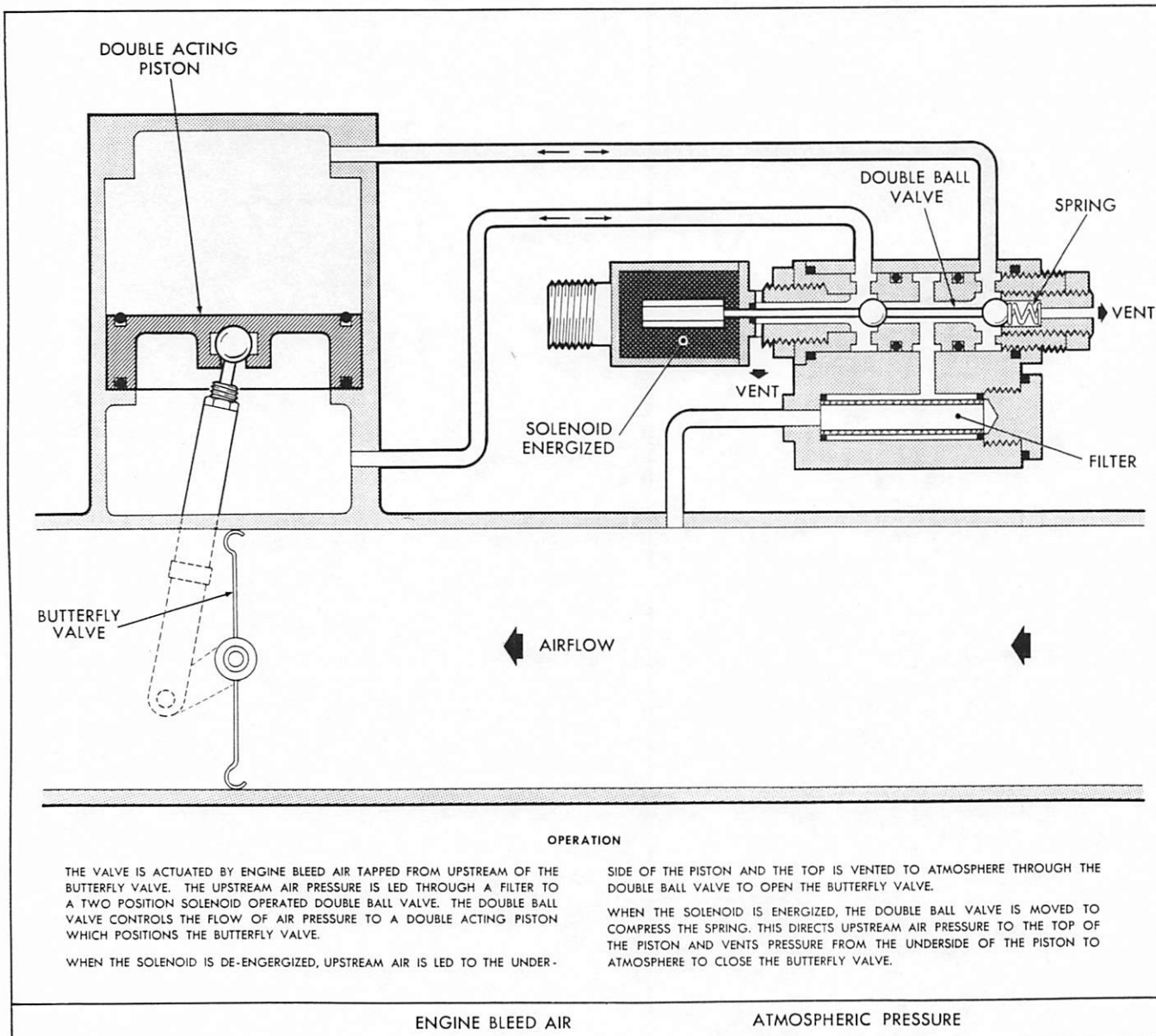


FIG. 7 ENGINE BLEED AIR SHUT-OFF VALVE SCHEMATIC

ARROW 1 SERVICE DATA

solenoid operated control valve in the applicable valve is energized to allow upstream air pressure to move an actuator and close the valve. The solenoid is de-energized with the switch in the NORM position and upstream air pressure moves the actuator to open the valve. With no air pressure, the valve remains in the last selected position.

33 The valve is attached to the manifold by bolts, studs and nuts through a flange at each side of the valve, the joints being sealed by metallic 'O'-rings. Upstream air pressure for the actuator is fed to the valve through internal passages.

ENGINE BLEED AIR QUICK DISCONNECTS (Fig 8)

34 A quick disconnect is fitted at the take-off point on each engine manifold to facilitate engine changing. The quick disconnects are of the piston ring type and each consists of a short elbow duct which is inserted into the engine manifold. After insertion, the elbow is rotated through 90° and lugs on the elbow and manifold adaptor engage to lock the assembly. The elbow is then connected to the main airframe ducting by a Marman J-11 type coupling. See fig 9.

35 Three piston rings are fitted to the elbow to form a seal with the engine manifold. The rings are installed with the gaps offset approximately 120° from each other and are compressed in a retainer to facilitate insertion of the elbow. During insertion of the elbow the piston ring retainer is forced along the elbow to release the rings in the manifold. The retainer remains on the elbow between the manifold and a bearing sleeve. The elbow is located and supported in the manifold by two lugs on the bearing sleeve, and is free to rotate within the bearing sleeve. The joint between the elbow and the engine tunnel is sealed by a moulded rubber seal.

ENGINE BLEED AIR DUCTING (Fig 10)

36 The ducting from the engine bleed air manifolds to the air-to-air heat exchanger is

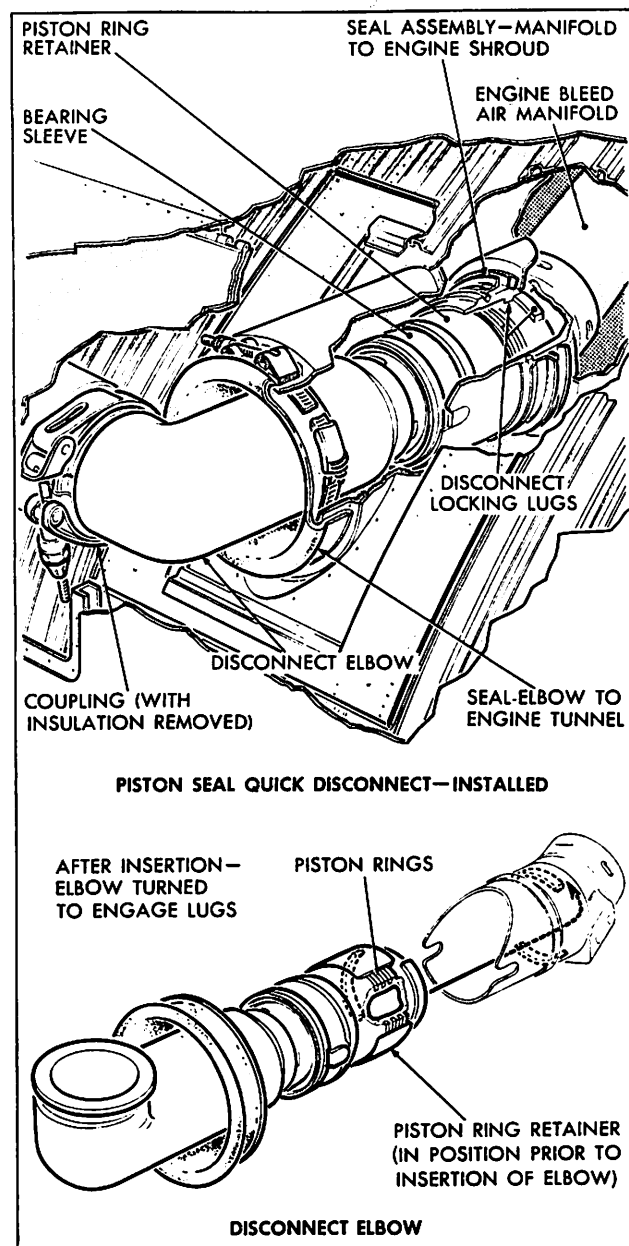
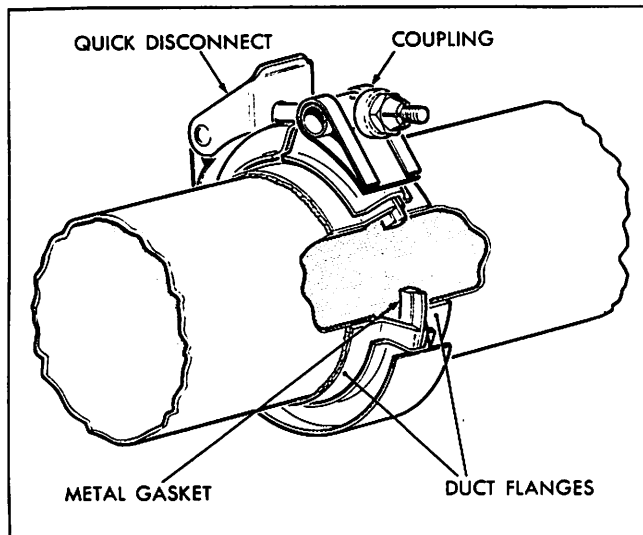


FIG. 8 ENGINE BLEED AIR QUICK DISCONNECT

of stainless steel construction and is insulated to prevent damage to the surrounding aircraft structure and equipment. The insulation consists of layers of insulating material separated by aluminum foil, the whole assembly being covered by a stainless steel foil covering. The insulation is integral with each duct section with one end free to move along the duct to allow for differential expansion. Insulation of the couplings and valves is achieved by

ARROW 1 SERVICE DATA



7M1-2713-1

FIG. 9 MARMAN J-11 COUPLING

removable sections of insulation consisting of layers of insulating material separated by aluminum foil and covered by stainless steel foil. The sections are connected by wire lacing. Vents are fitted to the outer covers of the insulation to equalize the internal and external pressures.

37 The duct sections are coupled by bolted flange joints sealed by metallic 'O'-rings. Marman J-11 clamps support and connect the valves to the duct flanges, the joints being sealed by metal gaskets. See fig 9. To allow for heat expansion, short lengths of the ducting are made flexible and the ducting assembly is attached to the aircraft structure by short individual tracks and rollers.

PRESSURE REDUCING AND NON-RETURN VALVES (Fig 11)

38 A pressure reducing and non-return valve is fitted in each engine bleed air duct at station 524, to reduce the engine bleed air pressure to 85 psi and to prevent air pressure backing up in the event of supply pressure failure. Two Marman J-11 couplings support and connect the valve to the duct flanges. Upstream and downstream pressures connect to the valve through external piping. The valve is uninsulated but short lengths of detachable insulation cover the two couplings.

AIR-TO-AIR HEAT EXCHANGER (Fig 12)

39 Ram air is utilized to provide initial cooling of the engine bleed air in an air-to-air heat exchanger installed in the air conditioning bay at station 292. It is attached to the frame at station 292 by two bolts and to the upper inboard longeron by two adjustable struts. It is insulated on the exposed surfaces to prevent excessive heat transfer to the surrounding structure and equipment.

40 The engine bleed air enters the heat exchanger through two inlets at the top rear of the casing and discharges through three outlets at the top front of the casing. A pressure tapping, also at the top front supplies air pressure data to the ground test panel in the nose landing gear bay.

41 Ram cooling air from the ram air inlet ducts is led into the front of the heat exchanger through a transition duct. After passing through the heat exchanger the air is led overboard at an outlet in the dorsal fin by two insulated ducts. One duct supplies air to the fan section of the cooling turbine and fan unit, before being ducted overboard, the other duct exhausting the air directly overboard. The ram air exhaust ducts are insulated on the outer surface by a layer of insulating material held in position by wire gauze.

MAIN SHUT-OFF VALVE (Fig 13)

42 The main shut-off valve is a pneumatically actuated butterfly type shut-off valve fitted at the air-to-air heat exchanger outlet to the air-to-water heat exchanger. It is supported and connected to the heat exchanger and the duct by two Marman J-11 couplings and the joints are sealed by metal gaskets.

43 The valve is controlled by the AIR SUPPLY switch in the front cockpit marked NORM-OFF-EMERG. With the switch in the OFF or EMERG selections, the valve closes. The valve also closes when the ground supply connector is connected into the aircraft coupling.

ARROW 1 SERVICE DATA

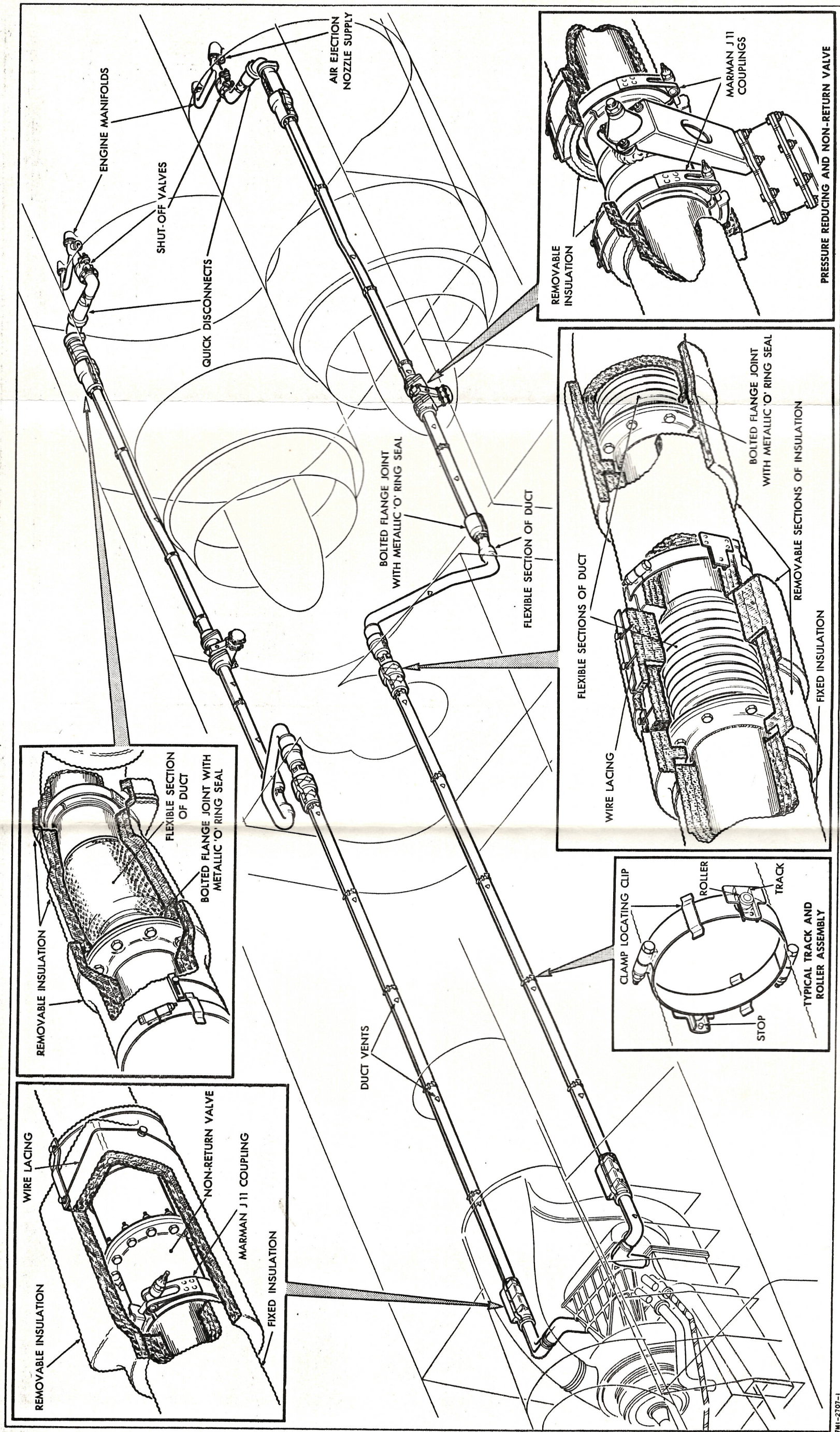
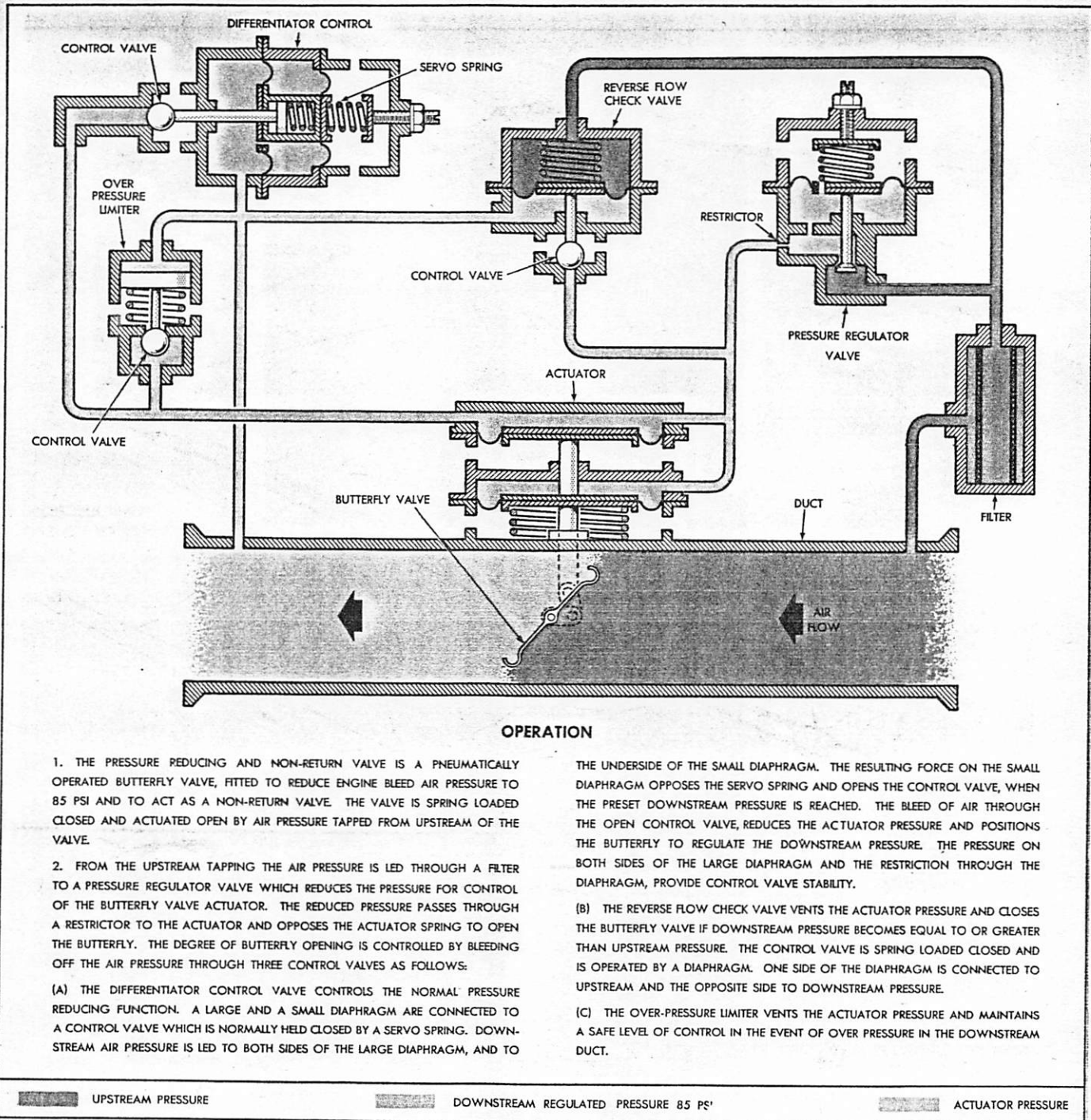


FIG. 10 ENGINE BLEED AIR DUCTING



7M1-2709-3

FIG. 11 PRESSURE REDUCING AND NON-RETURN VALVE

44 With the air supply switch selected to NORM the degree of opening of the main shut-off valve is pneumatically controlled by a temperature sensor and a rate sensor. The temperature sensor limits the cooling turbine minimum outlet temperature to 0°F

by controlling the mass air flow into the turbine. The rate sensor limits the rate of pressure increase at the cooling turbine inlet. The valve is spring-loaded to the closed position and actuated open by servo air pressure.

ARROW 1 SERVICE DATA

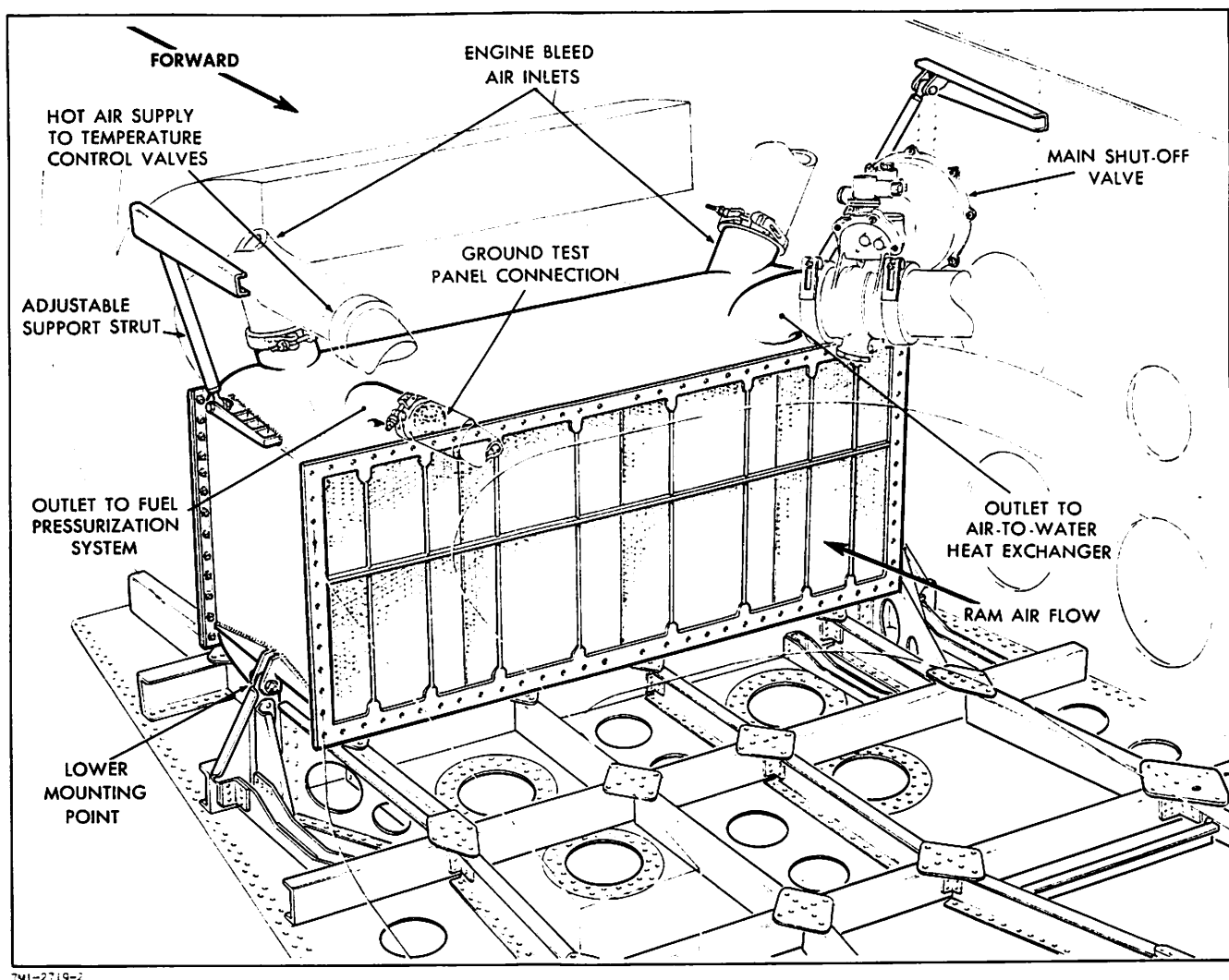


FIG. 12 AIR-TO-AIR HEAT EXCHANGER INSTALLATION

MAIN SHUT-OFF VALVE OPERATION (Fig 13)

45 Main supply air pressure, from upstream of the main shut-off valve, is led through a filter to a solenoid operated valve. When the solenoid is de-energized, by selection of the AIR SUPPLY switch in the front cockpit or by connection of the ground air supply, the upstream air pressure is shut off and the butterfly valve is held closed by the spring.

46 When the solenoid is energized, upstream air pressure is led to a pressure regulator to provide a servo pressure relatively insensitive to atmospheric pressure variations. This is achieved by bleeding air to atmosphere through

two orifices 'A' and 'B'. The resultant pressure between the orifices is used as a control pressure and is led to the underside of the regulator diaphragm through orifice 'C'. The top of the diaphragm is open to atmosphere. Orifice 'C' restricts the flow of air to and from the regulator diaphragm to prevent fluctuation. The diaphragm positions a poppet valve in the regulator to provide a regulated servo pressure. The servo pressure is led through orifice 'D' to the top of the butterfly valve actuator diaphragm to oppose the spring and open the valve.

47 If the temperature at the cooling turbine outlet falls below 0°F, servo pressure is bled off to atmosphere through a half ball valve in

ARROW 1 SERVICE DATA

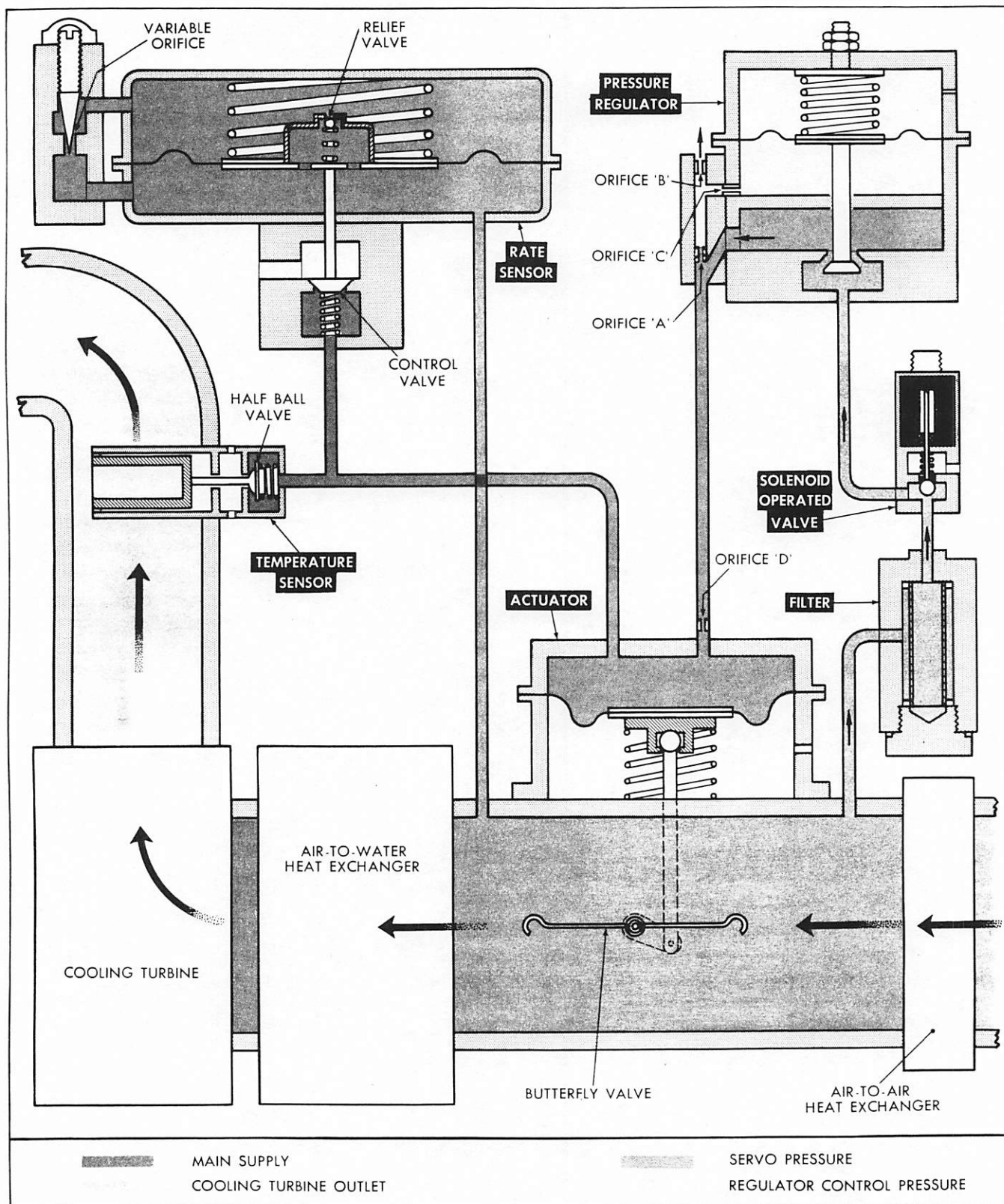


FIG. 13 MAIN SHUT-OFF VALVE - SCHEMATIC

ARROW 1 SERVICE DATA

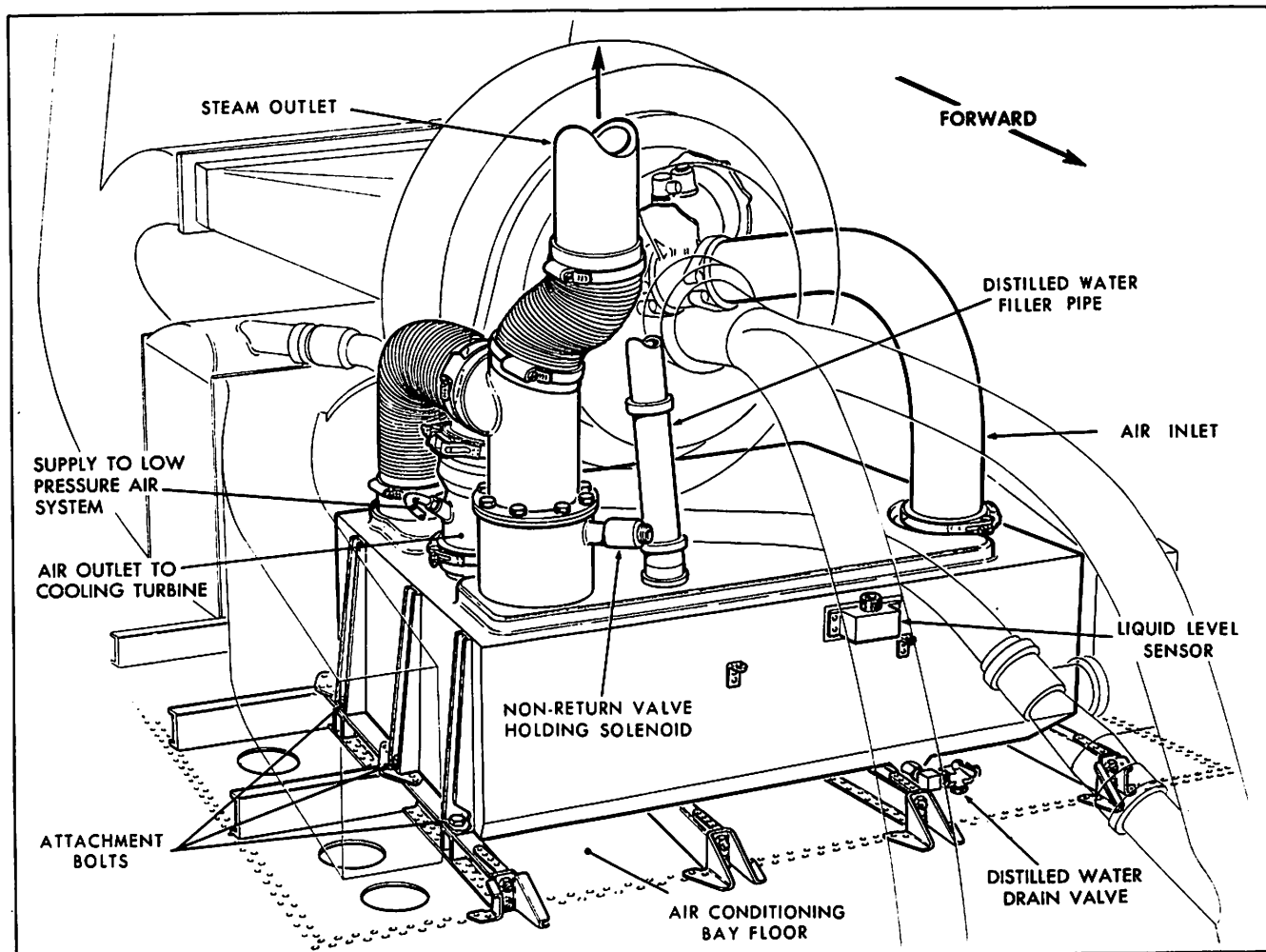
the temperature sensor to partially close the butterfly valve. The sensor consists of two concentric tubes with the outer tube having a higher coefficient of expansion than the inner. As the temperature drops the inner tube contracts less than the outer tube. This action opens the half ball valve. A bleed hole in the butterfly valve provides a restricted flow of air through the system to maintain the temperature sensor above 0°F under low ambient temperature conditions with the butterfly valve closed. This ensures that the half ball valve remains closed under these conditions to allow the servo pressure to build up and open the butterfly valve when selected.

48 Servo pressure is also bled off through the rate sensor to control the butterfly valve and limit the rate of pressure rise at the

turbine inlet. A rapid increase in pressure downstream of the butterfly valve is sensed by the rate sensor diaphragm which opens the control valve and allows the butterfly valve to close. A controlled bleed through a variable orifice in the rate sensor gradually equalizes the pressures on the diaphragm to close the control valve and re-open the butterfly valve at an acceptable rate. A relief valve in the rate sensor diaphragm allows a rapid release of air pressure from the top of the diaphragm when the butterfly valve is closed. This prevents possible damage to the rate sensor.

AIR-TO-WATER HEAT EXCHANGER (Fig 14)

49 The air-to-water heat exchanger consists of a heat exchanger immersed in a tank of distilled water. Air from the air-to-air



7V1-2718-2

FIG. 14 AIR-TO-WATER HEAT EXCHANGER INSTALLATION

ARROW 1 SERVICE DATA

heat exchanger after passing through the main shut-off valve, enters the air-to-water heat exchanger and transfers a proportion of the heat to the water. The water boils and the steam passes overboard.

50 The heat exchanger is mounted on the air conditioning bay floor at station 268 directly below the cooling turbine and fan unit and is attached to the floor by six bolts. The air inlet is on the rear upper surface and the outlet at the front. Incorporated in the outlet duct to the cooling turbine and fan unit is a short flexible section of duct and the connection for the air supply to the low pressure air system.

51 A distilled water filler connection is incorporated in the RH side of the cabin rear arch and is connected to the heat exchanger by a pipe. The level of the water is checked by a dipstick graduated in two scales which is inserted in the filler pipe. The lower scale enables the level to be checked with the water in a liquid state and a scale on the upper end of the stick provides an indication of the ice surface when the water is frozen. During cold weather, the heat exchanger is filled with hot distilled water to ensure that the correct level is reached, but the system will operate if the water is frozen.

52 Two steam outlet vents are positioned at the front and rear of the heat exchanger and are connected by flexible and rigid ducting to a single outlet on the RH side of the cabin rear arch. The outlet is covered by a hinged flap.

53 Under negative 'g' or dive conditions loss of water is prevented by a spring-loaded disc type non-return valve fitted to the front vent. The rear vent projects to the bottom of the tank to vent the steam under these conditions. The non-return valve is balanced by a spring to close if the aircraft assumes a large nose up or nose down attitude or is subjected to negative 'g'. A holding solenoid locks the valve open until the water reaches a liquid level sensor installed near the top front of the tank, when the lock is withdrawn. During a climb, the holding solenoid holds the valve open to allow the steam to escape. To prevent the lock being withdrawn during taxiing the circuit

is isolated when the weight of the aircraft is on the wheels, by a micro-switch on the RH main landing gear torque links.

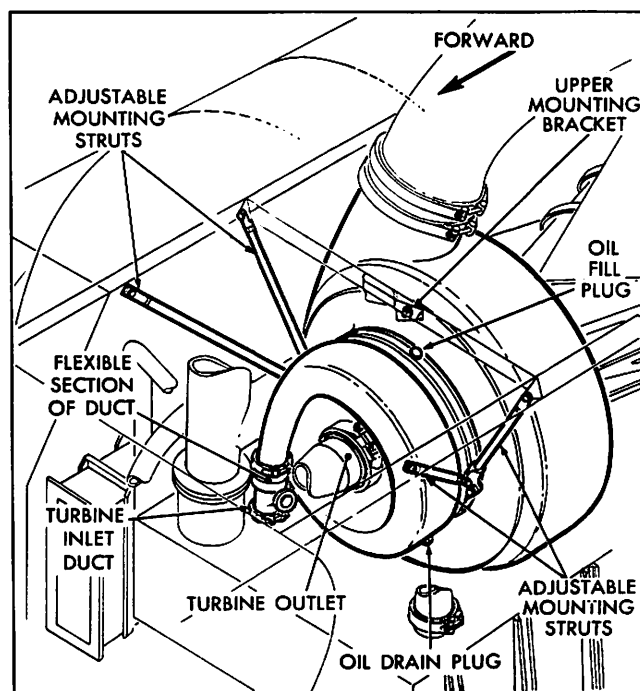
COOLING TURBINE AND FAN UNIT (Fig 15)

54 To complete the cooling cycle the air from the air-to-water heat exchanger is expanded through a cooling turbine before passing into the system. The pressure and temperature drop across the turbine releases energy which is transferred to the fan and passed overboard in the fan exhaust air.

55 The unit is supported on each side by V-struts from the fuselage upper inboard longerons and is located at the forward end by attachment to a bracket on the shear panel of the cabin rear arch. Insulation, covered by stainless steel foil and formed in two half shells covers the complete unit, the shells being held in position by wire lacing.

GROUND CONNECTION (Fig 17)

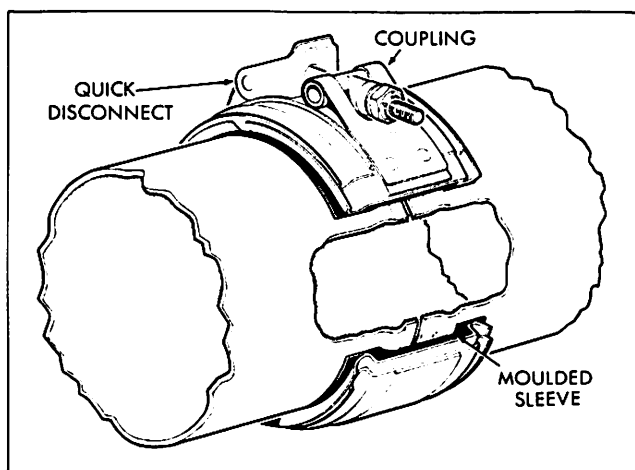
56 During ground operation and function testing, conditioned air is ducted to the cabin



7M1-2705-2

FIG. 15 COOLING TURBINE AND FAN UNIT

ARROW 1 SERVICE DATA



7M1-2712-1

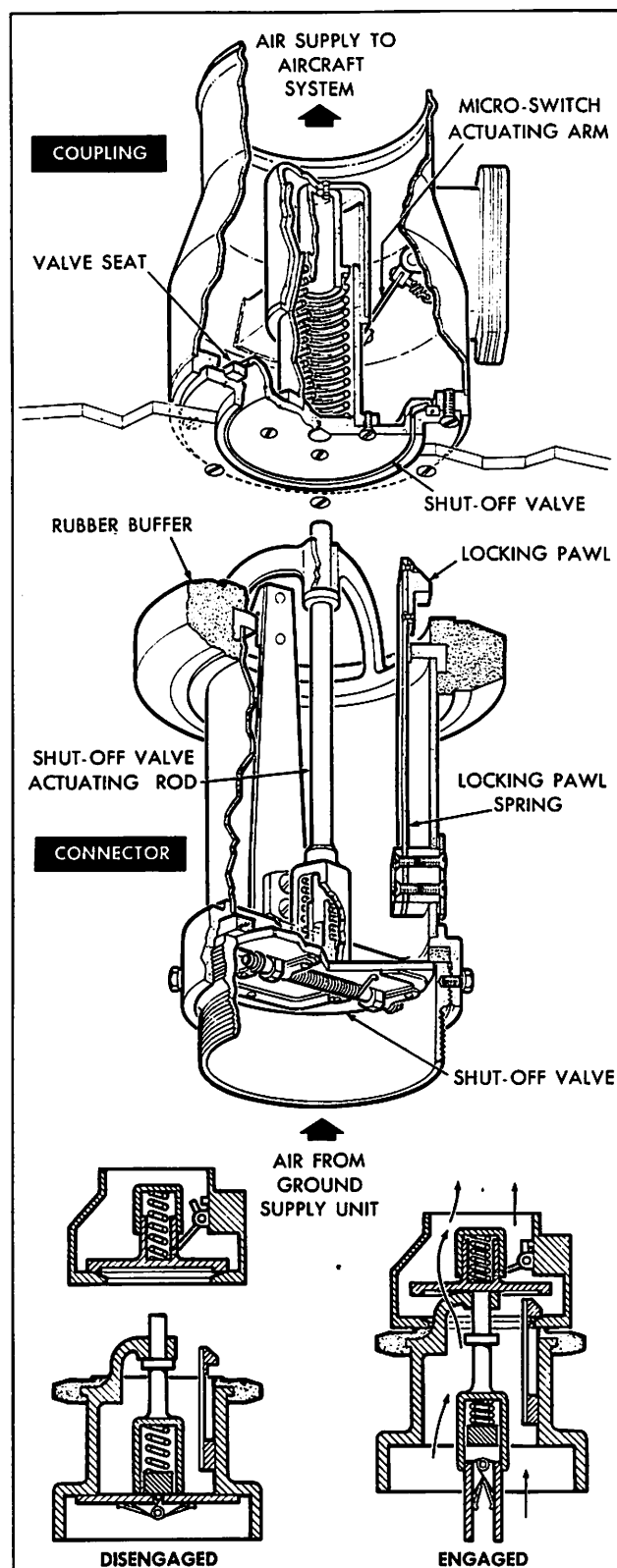
FIG. 16 MARMAN CHANNEL BAND COUPLING

and equipment supply duct through a coupling fitted externally on the underside of the aircraft. A connector fitted to the ground supply unit flexible hose is pushed into the aircraft coupling to make the connection. Three spring-loaded locking pawls in the connector hold it in position.

57 Disconnection is achieved by pulling on the connector with sufficient force at an angle of 45° or more from the vertical. A shut-off valve in the aircraft coupling closes the orifice and lies flush with the aircraft skin. Disconnection is automatic if the aircraft moves off with the hose connected. A shut-off valve in the connector also closes on disconnection from the aircraft.

58 A micro-switch fitted to the aircraft coupling is actuated on inserting the ground supply connector to energize an external supply control relay. This relay opens the cabin shut-off and non-return valve to ventilate the cabin and also isolates the AIR SUPPLY switch to de-energize the main shut-off valve solenoid. This maintains the main shut-off valve closed and prevents the engine bleed air from feeding back into the air conditioning ground supply.

59 The coupling is attached to an adaptor plate which is fastened to the underside of the LH engine air intake at station 242. It is connected to the aircraft ducting by a Marman channel band coupling. See fig 16.



7M1-2714-1

FIG. 17 GROUND CONNECTION

ARROW 1 SERVICE DATA

CABIN AND EQUIPMENT TEMPERATURE CONTROL VALVES

60 The temperature of the cabin and equipment air supplies are regulated by two valves which are each controlled by a temperature control unit and temperature sensitive resistors in the air ducts. The cabin temperature can be selected by the pilot to any temperature between 40°F and 80°F by a temperature selector rheostat in the front cockpit. The valves regulate the amount of hot air bled from the engines to be mixed with the cooled air from the cooling turbine outlet.

61 Air is tapped from the inlet of the cooling turbine to actuate the control valves, each valve being controlled by a proportional solenoid operated valve. The control valves are spring-loaded closed, the degree of opening being regulated by the position of the solenoid valve which controls the air pressure in the actuator.

62 Each valve is supported and connected to the ducts by two Marman J-11 couplings, the joints being sealed by metal gaskets.

TEMPERATURE CONTROL SHUT-OFF VALVE

63 The temperature control shut-off valve is an electrically actuated valve installed in the hot air supply duct to the temperature control systems. The valve is controlled by a two position switch in the front cockpit. The normal position is marked TEMP CONTROL. The switch is moved to the HEAT OFF position to close off the hot air supply to the control systems.

64 The valve is supported and connected to the ducts by two Marman J-11 couplings, the joints being sealed by metal gaskets.

FLOW AUGMENTOR AND SHUT-OFF VALVE (Fig 18)

65 To maintain sufficient flow of air to the equipment areas under conditions of low air flow, the flow augmentor allows air tapped from the cooling turbine inlet duct to supplement the air flow to the equipment areas if the pressure differential between the turbine inlet and the equipment supply duct falls below 70 psi.

66 The flow augmentor consists of a poppet valve spring-loaded open but held closed under normal operating conditions by the pressure differential acting across the valve. A butterfly type shut-off valve mounted upstream of the flow augmentor, is actuated by a pneumatic actuator controlled by a solenoid valve. The actuating air pressure is tapped from the cooling turbine inlet duct. During taxiing and low air speed conditions the temperature of the air from the air-to-air heat exchanger is too high for equipment cooling and the shut-off valve is selected closed, when the landing gear is lowered, by the airflow shut-off relay in the landing gear electrical circuit.

67 The valve is supported and connected to the ducts by a Marman J-11 coupling at the inlet and a Marman channel band coupling at the outlet.

CABIN SHUT-OFF AND NON-RETURN VALVE

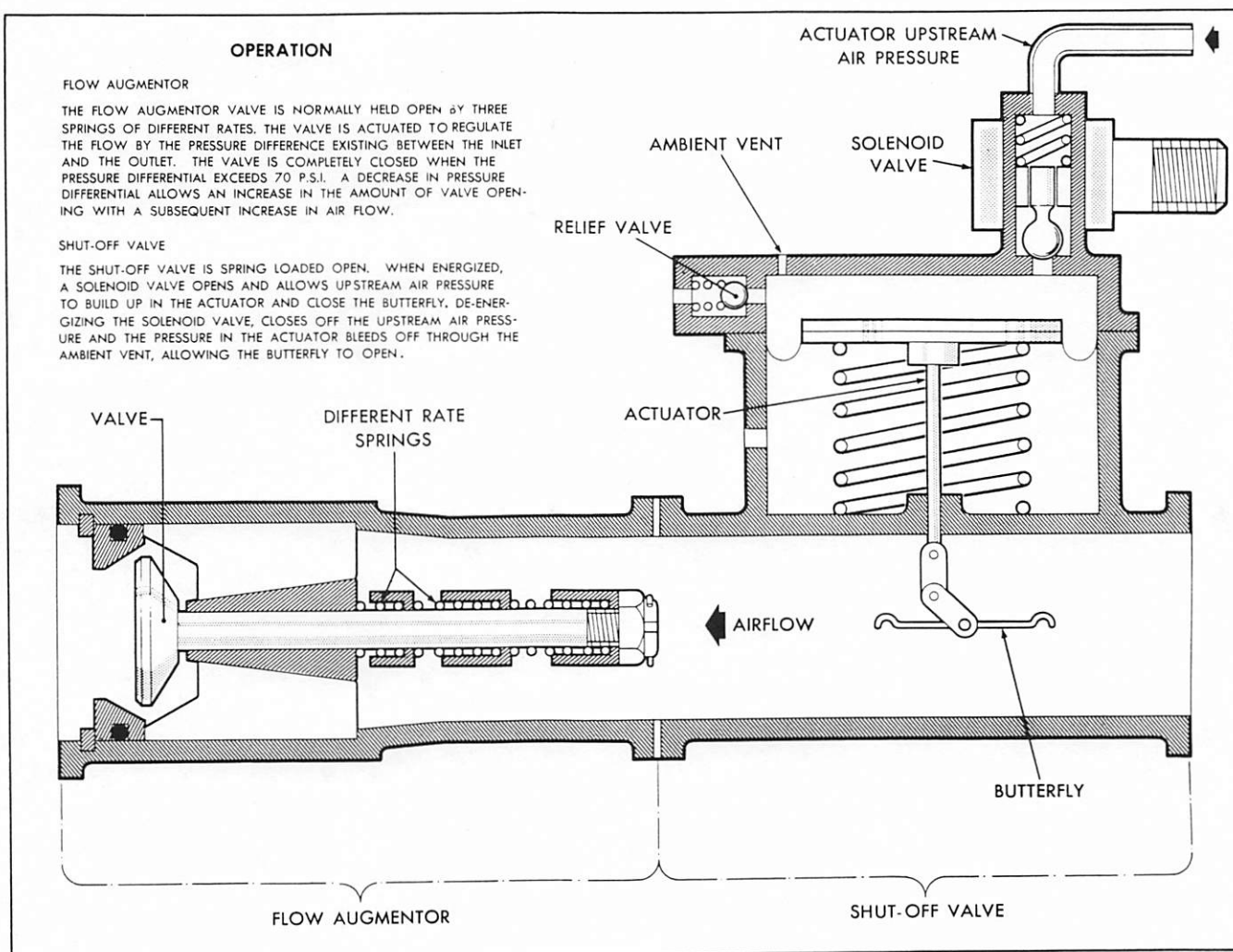
68 The cabin shut-off and non-return valve consists of an electrically actuated butterfly type shut-off valve and a non-return valve installed in a common housing. It is installed in the cabin air supply duct and is supported and connected to the ducting by two Marman channel band couplings.

69 The shut-off valve is partially closed by the airflow shut-off relay when the landing gear is lowered. When the landing gear is raised the valve is fully open. The non-return valve closes in the event of system supply failure, or on closing of the main shut-off valve, to prevent a rapid loss of cabin pressure.

RADAR NOSE SHUT-OFF VALVE

70 To close off the supply of air to the radar nose when an emergency selection is made on the air supply switch in the front cockpit, an electrically actuated gate type shut-off valve is installed in the radar nose supply duct at station 178 on the LH side of the nose landing gear bay. It is mounted between two duct flanges and is held in position by four bolts through the flanges, the joints being sealed by 'O'-rings positioned in grooves in the sealing faces of the valve.

ARROW 1 SERVICE DATA



7MI-2710-2

FIG. 18 FLOW AUGMENTOR AND SHUT-OFF VALVE

RAM AIR VALVES

71 To control the supply of emergency cooling air from the air-to-air heat exchanger ram air ducts to the equipment supply ducts, two electrically actuated gate type shut-off valves are installed. Each valve is installed on an adaptor rivetted to the inboard face of the ram air duct. The valve is mounted between a flange on the adaptor and a flange on the supply duct by four bolts, the joints being sealed by 'O'-rings.

CABIN PRESSURIZATION CONTROL OPERATION (Fig 19)

72 Cabin air enters the controller through a restrictor. The air is discharged from the

controller to atmosphere through a valve, the position of which is controlled by an absolute capsule and a differential capsule. The capsules are connected to the valve through a beam. With an increase in altitude the absolute capsule expands to close off the valve. The differential capsule is connected internally to true static and contracts to open the valve when control chamber exceeds static pressure. The position of the valve regulates the pressure in the controller case.

73 From the controller case the pressure is led to the top of the diaphragm assembly in the relay valve. The lower side of the diaphragm assembly is connected to cabin pressure. Approximate static pressure is

ARROW 1 SERVICE DATA

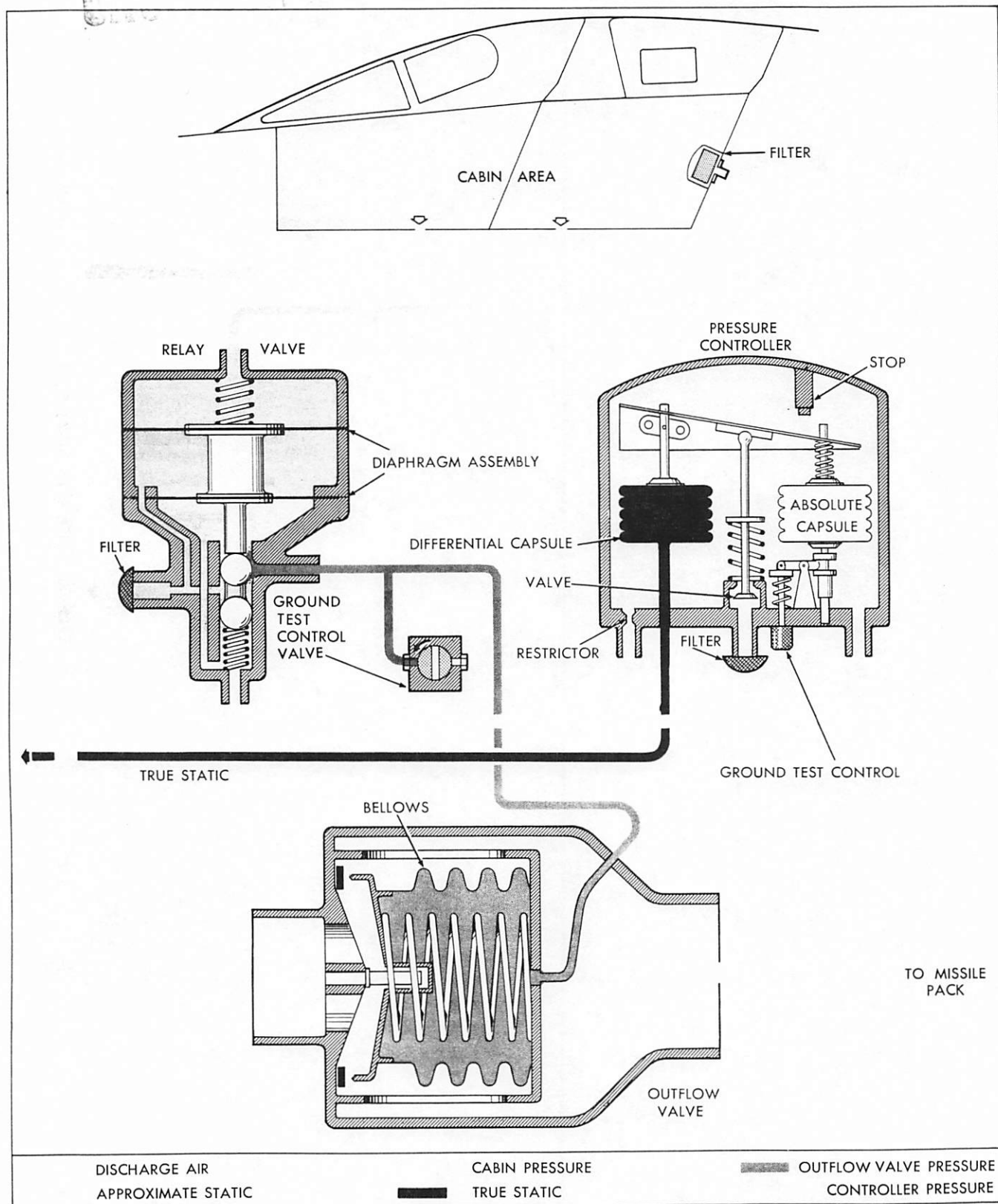


FIG. 19 CABIN PRESSURE CONTROL - SCHEMATIC

ARROW 1 SERVICE DATA

connected to the space between the diaphragms to ensure control stability. The diaphragm assembly controls a double ball type piston valve. The upper ball controls the flow of cabin pressure, and approximate static, to and from the outflow valve bellows. The lower ball seals and balances the valve assembly.

74 The resulting air pressure from the relay valve on the inside of the outflow valve bellows tends to close the outflow valve. Closing of the outflow valve increases the resistance to the discharge of cabin air and pressurizes the cabin.

75 The system operates in three stages as follows:

(a) Up to 10,000 feet cabin air enters the controller case through the restrictor and is vented to atmosphere through the valve in the controller. The valve provides no resistance to flow so the controller pressure is below cabin pressure which is only slightly above atmospheric. With this pressure on the relay valve upper diaphragm, the upper ball allows a direct flow of air between the outflow valve bellows and approximate static. The outflow valve therefore offers no resistance to the discharge of cabin air.

(b) At 10,000 feet the absolute capsule has expanded sufficiently to throttle the control valve and give an increase in controller pressure. This increase in pressure is transmitted to the relay valve upper diaphragm which repositions the upper ball to allow a bleed of cabin air to approximate static, and the resultant pressure is passed to the outflow valve. The increase in pressure tends to close the outflow valve and build up the pressure in the cabin. The increase in cabin pressure compresses the differential capsule in the controller and effects a balance with the absolute capsule to regulate the control pressure according to the rate of climb. The controller pressure and the cabin pressure acting on the relay valve diaphragms position the ball valve to proportion cabin and approximate static pressures to provide a control pressure for the outflow valve. During a climb, the absolute capsule continues to expand and increases the cabin pressure,

the rate of increase being adjusted by the compression of the differential capsule with the increase in cabin pressure.

(c) At 60,000 feet further expansion of the absolute capsule is prevented by the beam contacting a stop. The controller pressure is then controlled by the differential capsule which positions the valve to provide a differential pressure in the cabin of 4.75 psi at all altitudes above 60,000 feet.

76 If the cabin pressure fluctuates as the result of a sudden change in the rate of air flow through the cabin, the relay valve diaphragm assembly will move the double ball valve and adjust the pressure to the outflow valve bellows to correct the cabin pressure fluctuation.

77 Fitted to the controller is a ground test control which, when rotated to the ground test position, lifts the absolute capsule assembly against the stop. Cabin pressure is then maintained at 4.75 psi differential by the differential capsule. To override the controller completely and close the outflow valve, a manual ground test control valve is installed which, when opened, allows cabin pressure to flow directly into the outflow valve bellows. This maintains the outflow valve closed.

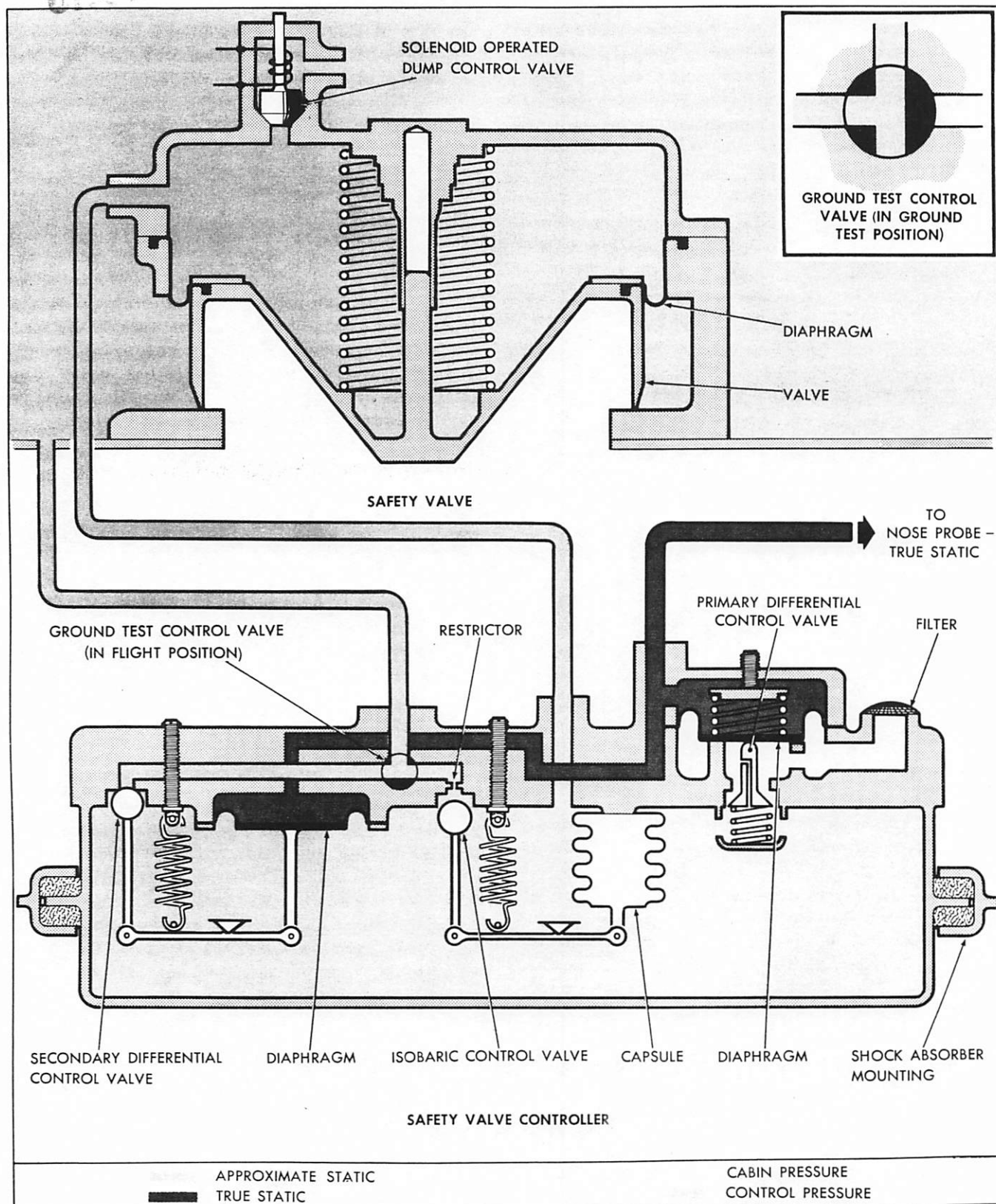
CABIN PRESSURE SAFETY VALVE OPERATION (Fig 20)

78 The safety valve is held closed by a spring and by control pressure from the controller acting on a diaphragm. The valve is opened when cabin pressure exceeds the combined spring and control pressure. A solenoid operated dump control valve, when energized, vents the control pressure to atmosphere and allows the safety valve to open and dump the cabin pressure to atmosphere.

79 Cabin air pressure is regulated by the controller to provide control pressure for the operation of the safety valve. Three valves actuated by cabin pressure and true static pressure regulate the control pressure to provide pressure relief in three stages as follows:

(a) Up to 12,500 feet. Cabin air enters the controller through the open primary differential control valve and is vented to atmosphere

ARROW 1 SERVICE DATA



7M1-2715-1

FIG. 20 CABIN PRESSURE SAFETY VALVE - SCHEMATIC

ARROW 1 SERVICE DATA

through a restrictor. The restrictor causes a build up of pressure in the controller which is transmitted to the safety valve to assist the spring in maintaining the valve closed. The primary differential control valve is spring-loaded open and actuated closed by a diaphragm. One side of the diaphragm is connected to true static pressure and the other side to cabin pressure. When cabin pressure exceeds static pressure by 1 psi, the diaphragm closes the valve and cabin air flows into the controller only through the orifice in the valve. This causes a drop in pressure in the controller which allows the safety valve to open and relieve cabin pressure to atmosphere.

(b) From 12,500 feet to 28,500 feet. The isobaric control valve is progressively closed by the expansion of a sealed capsule unit with increasing altitude. At 12,500 feet the valve has closed sufficiently to commence throttling the flow of air to atmosphere through the restrictor. This produces an increase in control pressure which is transmitted to the safety valve to permit the safety valve to open only if cabin altitude exceeds 10,000 feet. The primary differential valve is closed when cabin differential exceeds 1 psi.

(c) Above 28,500 feet. The isobaric control valve is completely closed and cabin pressure is led directly through the closed primary differential control valve to the safety valve. A secondary differential control valve is spring-loaded closed and actuated open by a diaphragm. One side of the diaphragm is connected to true static and the other side to control pressure. If cabin pressure exceeds 5.4 psi differential, the diaphragm opens the control valve and bleeds off control pressure to atmosphere. This causes a pressure drop to the safety valve which opens to maintain cabin pressure at 5.4 psi.

80 To pressure test the cabin on the ground, the ground test control is rotated through 90°. This shuts off the flow of control pressure to atmosphere through the isobaric control valve and the restrictor. The controller then permits cabin pressure to build up to 5.4 psi when the secondary differential control valve will control the pressure in the safety valve.

FUNCTION TESTING

GENERAL

81 Function testing of the air conditioning and pressurization system is divided into two sections:

(a) Air conditioning ground tests. This is carried out to check the flow rate, temperatures and pressures at various points in the system with the engines providing the supply. See paras 82 - 95.

(b) Cabin pressurization ground tests. These are carried out to check the operation of the cabin pressure outflow valve system, the operation of the cabin pressure safety valve system and the leak rate from the cabin. An external source of air pressure is required for these tests. See paras 96 -102.

AIR CONDITIONING GROUND TESTS

82 To facilitate ground testing of the air conditioning system, three temperature sensors, a pressure connection and a pitot static assembly are permanently installed in the aircraft ducting. The temperature sensors are located one downstream of each of the two air temperature control valves and one in the cooling turbine outlet duct. The pressure tapping is taken from the outlet casing of the air-to-air heat exchanger. The pitot static assembly for the flow rate measurement is located in the radar nose supply duct. A ground test panel located on the LH side of the nose wheel well is fitted with disconnects and is the connecting point between an air conditioning test unit and the aircraft test points.

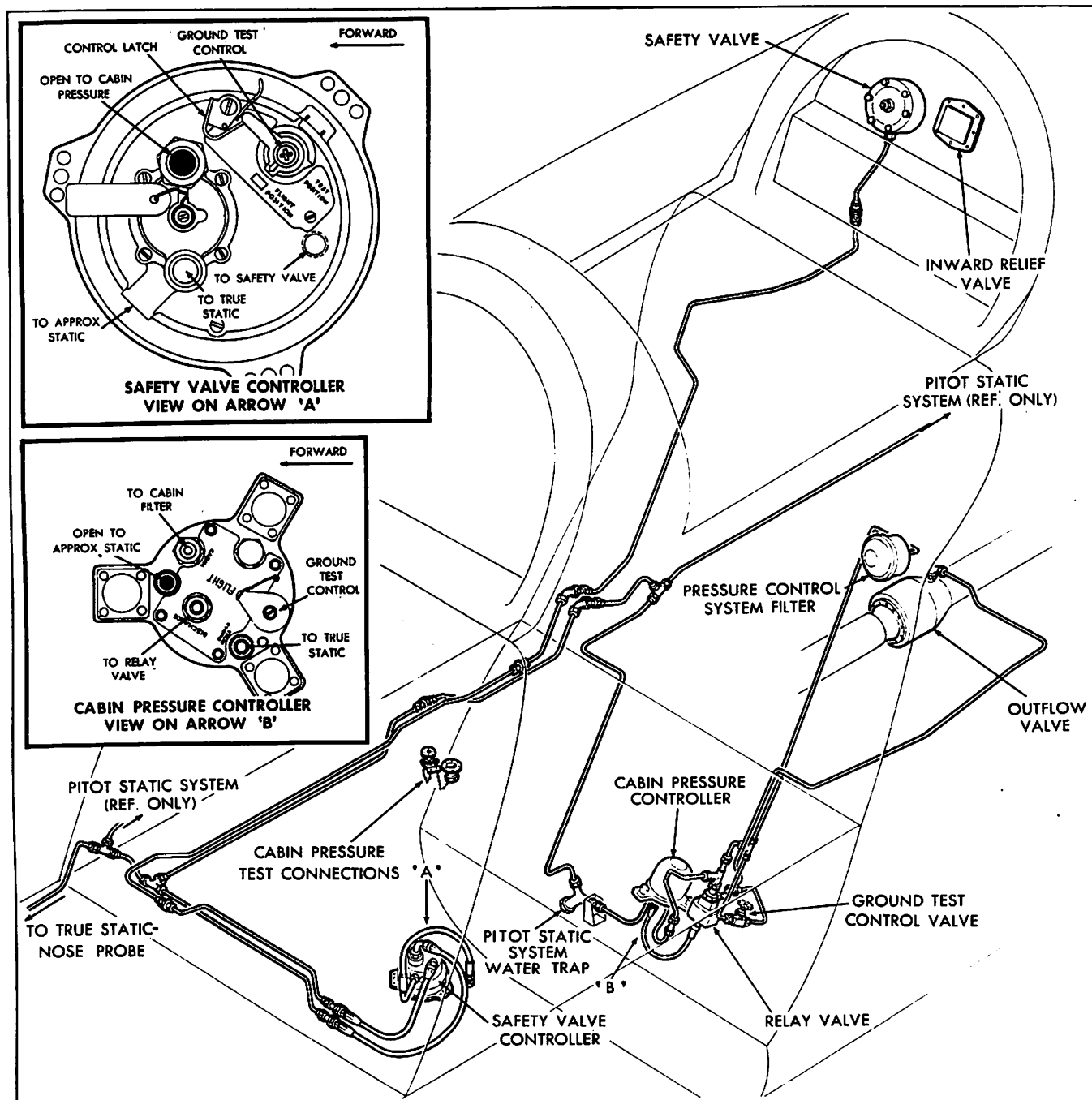
83 The air conditioning test unit contains the following components:

(a) A pressure gauge, to indicate the pressure of the engine bleed air downstream of the pressure reducing and non-return valves.

(b) A temperature gauge, connected through a four position switch, which can be selected to indicate the temperature at any of the three temperature sensors.

(c) An ambient temperature gauge.

ARROW 1 SERVICE DATA



7M1-2705-1

FIG. 21 CABIN PRESSURE CONTROL - COMPONENT LAYOUT

(d) An air flow indicator, to indicate the flow of air to the radar nose.

(e) A master switch.

84 The ground test equipment is connected to the aircraft ground test panel through

electrical cables and flexible hoses approximately 50 feet long. This enables the ground crew to stand well clear of the aircraft when the engines are running.

85 A ground test switch for the air conditioning system is installed on panel E1 in the nose

ARROW 1 SERVICE DATA

landing gear bay. It is spring-loaded to the normal flight position. When selected to the TEST position a relay in the electrical circuit is actuated. This opens the cabin shut-off valve and de-energizes the flow augmentor shut-off valve solenoid to allow the flow augmentor to operate.

86 During the air conditioning system tests with the engines running, the external ground supply must be disconnected to permit full operation of the aircraft systems.

87 The procedure for ground running the engines is described in Arrow 1 Service Data - Section 23 - Power Plant.

ENGINE BLEED AIR SHUT-OFF VALVE TEST

88 To test the operation of the engine bleed air shut-off valves and control, proceed as follows:

- (a) Connect the air conditioning ground test unit to the aircraft.
- (b) Select all the air conditioning controls in the front cockpit to normal.
- (c) To test the RH valve run the RH engine at military RPM and the LH engine at ground idle. The pressure indicated on the ground test panel from upstream of the air-to-air heat exchanger should be 77-87 psig.
- (d) Select the ENG BLEED AIR switch in the front cockpit to RH OFF. The pressure indicated on the ground test panel should fall to 8-20 psig. Return the ENG BLEED AIR switch to NORMAL and the pressure indicated on the ground test panel should rise to 77-87 psig.
- (e) To test the LH valve run the LH engine at military RPM and the RH engine at ground idle and repeat the test as described in para 88 (c) and (d) with the ENG BLEED AIR switch selected to LH OFF.
- (f) On completion of the tests, shut down the engines and disconnect the air conditioning ground test unit.

PRESSURE REDUCING AND NON-RETURN VALVE TEST

89 To test each pressure reducing and non-return valve, connect the air conditioning ground test unit to the aircraft and run the appropriate engine at military RPM. The pressure indicated upstream of the air-to-air heat exchanger on the air conditioning ground test unit should be 77-87 psig. On completion of the test, shut down the engine and disconnect the ground test unit.

MAIN SHUT-OFF VALVE TEST

90 To check the operation of the main shut-off valve proceed as follows:

- (a) Select the air conditioning ground test switch on E1 panel in the nose landing gear bay to the TEST position. Select NORM on the air conditioning AIR SUPPLY switch in the front cockpit.
- (b) Run one or both engines at military RPM and check for a pronounced flow of air from the cockpit air inlets.
- (c) Select the AIR SUPPLY switch to OFF and check for a definite reduction in flow from the cockpit inlets.
- (d) Select the AIR SUPPLY switch to EMERG and check that the flow from the cockpit inlets remains at the same reduced flow as in para 90 (c).
- (e) Return the AIR SUPPLY switch to NORM and check for a positive increase in flow.
- (f) Shut down the engines and return the air conditioning ground test switch to the normal position.

PRESSURE RELIEF VALVE TEST

91 To test the operation of the pressure relief valve, proceed as follows:

- (a) Connect the air conditioning ground test unit to the aircraft and select the master switch on the unit to OFF.

ARROW 1 SERVICE DATA

(b) Select all cockpit air conditioning controls to the normal positions.

(c) Run one or both engines at military RPM and note the pressure indicated on the air conditioning test unit. This should be 77-87 psig.

(d) Select the air conditioning AIR SUPPLY switch from the NORM to the EMERG position. The pressure indicated on the ground test unit should be 90-100 psig after approximately five seconds.

(e) Return the AIR SUPPLY switch to NORM, shut down the engines and disconnect the ground test unit.

TEMPERATURE CONTROL SHUT-OFF VALVE TEST

92 To check the operation of the temperature control shut-off valve proceed as follows:

(a) Connect the air conditioning ground test unit to the aircraft. Switch the master switch on the unit to ON.

(b) Select all the air conditioning controls in the front cockpit to the normal positions.

(c) Run one engine at 80% military RPM.

(d) Select the temperature test control on the ground test unit to position No. 2 and read the temperature. This should be 75-58°F.

(e) Select the temperature control shut-off valve switch in the cockpit to the HEAT OFF position.

(f) The temperature indicated on the ground test unit gauge should drop to -10° to +10°F after approximately five seconds.

(g) Return the temperature control shut-off valve switch to the TEMP CONTROL position. The temperature on the ground test unit gauge should return to 75-85°F. Shut down the engine and disconnect the ground test unit.

CABIN AND EQUIPMENT TEMPERATURE CONTROL SYSTEMS TEST

93 To check the operation of the cabin and equipment temperature control systems, proceed as follows:

(a) Connect the air conditioning ground test unit to the aircraft, switch the unit master switch to ON and the TEMP TESTS switch to position No. 1.

(b) Select all the air conditioning controls in the front cockpit to the normal positions and the ground test switch on panel E1 in the nose landing gear bay to TEST.

(c) Operate one or both engines at military RPM.

(d) Turn the temperature selector in the front cockpit to the fully COOL selection and observe the cockpit inlet temperature on the ground test unit gauge. The temperature should be 35-45°F after about five seconds.

(e) Rotate the TEMP TESTS switch on the ground test unit to position No. 2 and note the equipment supply temperature. It should be 75-85°F.

(f) Return the TEMP TESTS switch on the ground test unit to position No. 1. Select the fully WARM position on the temperature selector in the front cockpit and note the temperature indicated on the ground test unit gauge. The peak temperature should not exceed 150°F and the final stabilized temperature should be 75-85°F.

(g) Select position No. 2 on the TEMP TESTS switch on the ground test unit and note the equipment supply temperature remains at 75-85°F.

(h) Return the TEMP TESTS switch on the ground test unit to position No. 1 and the front cockpit temperature selector to fully COOL. The cabin air inlet temperature should again stabilize at 35-45°F after a few seconds.

(j) Shut down the engines, disconnect the ground test unit and release the ground test switch on E1 panel to the normal position.

ARROW 1 SERVICE DATA

DEFOG CONTROL TEST

94 To function test the operation of the defog control in the front cockpit, proceed as follows:

- (a) Connect the air conditioning ground test unit to the aircraft, select the unit master switch to ON and the TEMP TESTS control to position No. 1.
- (b) Select all the air conditioning controls in the front cockpit to the normal positions and the temperature selector to fully COOL.
- (c) Select the ground test switch on panel E1 in the nose landing gear bay to TEST.
- (d) Operate one or both engines at military RPM.
- (e) Note the cabin inlet temperature on the ground test unit and when stabilized at 35-45°F select the defog switch in the front cockpit to DEFOG.
- (f) The indicated temperature on the ground test unit should stabilize at 85-95°F after a few seconds.
- (g) Return the defog switch to OFF and note that the temperature on the ground test unit returns to a stabilized temperature of 35-45°F, after a few seconds.
- (h) Shut down the engines, disconnect the ground test unit and release the ground test switch in the nose landing gear bay.

CABIN SHUT-OFF AND NON-RETURN VALVE TEST

95 To test the operation of the cabin shut-off and non-return valve, proceed as follows:

- (a) Set all the air conditioning controls in the front cockpit to normal.
- (b) Run one engine at military RPM. There should be no appreciable flow from the air inlets in the front cockpit.

(c) Select the air conditioning ground test switch on E1 panel in the nose landing gear bay to the TEST position. A definite increase in airflow from the cockpit inlet should be felt indicating that the valve has opened.

(d) Release the air conditioning ground test switch on E1 panel in the nose landing gear bay. The rate of flow from the cockpit inlet should decrease, indicating that the valve has closed.

(e) Shut down the engine.

CABIN PRESSURIZATION GROUND TESTS

96 To check the leak rate from the cabin and test the operation of the pressure control systems, the following equipment is required:

- (a) A cabin leakage tester which utilizes an outside source of air pressure to inflate the canopy seals and pressurize the cabin. It also contains the controls and instruments necessary to determine the cabin leak rate and to control and indicate the cabin pressure.
- (b) A canopy locking actuator. This is attached to the pilot's canopy locking mechanism to enable the canopy to be locked and unlocked from outside the cabin.
- (c) A cabin pressure test panel which is connected into the aircraft electrical system to enable the locking actuator and the cabin pressure safety valve dump control to be operated from outside the cabin.
- (d) A jumper wire, connected into the electrical system, to override the pilot's canopy locking handle micro-switch and enable the canopy to be actuated closed with the locking handle in the 'locked' position.

97 Two ground test connections are fitted to the underside of the navigator's cockpit floor and are accessible in the nose wheel well. The connections provide a connecting point between the cabin leakage tester and the cabin.

CABIN PRESSURE TEST

98 To pressure test the cabin proceed as follows:

ARROW 1 SERVICE DATA

(a) Lock the navigator's canopy by reaching through the navigator's canopy latch access panel on the pilot's rear bulkhead.

(b) Attach the locking actuator to the pilot's canopy locking mechanism and make electrical connections from the actuator to terminals 5 and 6 of terminal strip E32 located on the RH side of the pilot's cockpit.

(c) Place the pilot's canopy latch lever in the 'locked' position.

(d) Connect the jumper wire between terminals 1 and 3 of terminal strip E32.

(e) Connect the air supply to the leakage tester, and the leakage tester supply and pressure lines to the cabin pressure test connections. Connect the canopy seal supply from the leakage tester to the low pressure air filter and moisture drain point.

(f) Connect the cabin pressure test panel to terminals 15 and 16 of terminal strip E2, to the canopy seal circuit breaker on E1 panel and to the cabin pressure safety valve dump solenoid located on the safety valve.

(g) Connect the electrical ground power supply to the aircraft and place the electrical master switch ON.

(h) Select the control on the cabin pressure controller to the 'ground test' position and the cabin pressure control ground test valve to GROUND. Select the TEST POSITION on the cabin safety valve controller.

(j) Select CANOPY OPEN on the cabin pressure test panel.

(k) Close the pilot's canopy by operating the external canopy actuation switch.

(m) Select CANOPY LOCK on the cabin pressure test panel.

(n) Inflate the canopy seals to a pressure of 20 psi through the cabin leakage tester.

(p) Build up and regulate the cabin pressure using the cabin leakage tester.

(q) When the cabin pressure gauge on the leakage tester shows a pressure of 4.75 psi and is neither rising nor falling, read the cabin leak rate from the flow meter. The maximum acceptable leak rate is 42.5 cfm at 70°F.

NOTE

If the air temperature is above or below 70°F when the leak rate is checked, a correction must be made using the chart installed adjacent to the flow meter.

CABIN PRESSURIZATION CONTROL TEST

99 To test the cabin pressure outflow valve and controls proceed as follows:

(a) Select the control on the cabin pressure controller to the 'ground test' position and the cabin pressure control ground test valve to FLIGHT. Select the TEST POSITION on the cabin pressure safety valve controller.

(b) Pressurize the cabin as described in para 98 (a) to (g) and (j) to (p) until the cabin pressure outflow valve relieves. This should occur between 4.5 and 5 psi and will be indicated when no further rise in cabin pressure is obtained with a continued increase in cabin flow rate.

CABIN PRESSURE DUMP CONTROL TEST

100 To test the cabin pressure dump control, proceed as follows:

(a) Pressurize the cabin to 4.5 psi as described in para 98 (a) to (p).

(b) Select the dump switch on the cabin pressure test panel to DUMP and check that the cabin pressure falls to ambient in a maximum time of 7 seconds.

(c) Select the dump switch on the cabin pressure test panel to OFF.

CABIN PRESSURE SAFETY VALVE TEST

101 To test the cabin pressure safety valve and controller proceed as follows:

ARROW 1 SERVICE DATA

(a) Select the control on the cabin pressure controller to the 'ground test' position and the cabin pressure control ground test valve to GROUND.

(b) Select TEST POSITION on the cabin safety valve controller.

(c) Pressurize the cabin as described in para 98 (a) to (g) and (j) to (p) until the safety valve relieves. This will be indicated when no further rise in cabin pressure is obtained with a continued increase in cabin flow rate. This should occur between 5.25 and 5.75 psi.

PROCEDURE ON COMPLETION OF PRESSURE TESTS

102 On completion of the tests, proceed as follows:

(a) Ensure that all cabin pressure is released by closing the inlet valve and opening the dump valve on the cabin leakage tester and allowing the cabin pressure to fall gradually.

(b) Release the canopy seal pressure by closing off the canopy seal regulator valve on the cabin leakage tester and tripping the canopy seal circuit breaker on E1 panel. Reset the circuit breaker.

(c) Select the canopy switch on the cabin pressure test panel to the CANOPY OPEN position.

(d) Open the pilot's canopy by operating the canopy external actuation switch.

(e) Select the electrical master switch OFF.

(f) Disconnect the electrical ground power supply.

(g) Return the canopy latch handle to the 'canopy open' position. Disconnect and remove the pilot's canopy locking actuator.

(h) Remove the jumper wire from terminals 1 and 3 of terminal strip E32.

(j) Disconnect the cabin leakage tester pipelines from the aircraft. Replace the blanking cap and plug on the cabin ground test connections and the low pressure air filter and moisture trap drain plug and wirelock.

(k) Disconnect the electrical leads from the cabin pressure test panel to terminal strip E2, the cabin pressure safety valve dump solenoid and panel E1.

(m) Select the control on the cabin pressure controller to the FLIGHT position and wirelock. Select the cabin pressure control ground test valve to FLIGHT and wirelock. Select the control on the cabin pressure safety valve controller to the FLIGHT POSITION and ensure that the control is positively locked.

REMOVAL AND INSTALLATION

COOLING TURBINE AND FAN UNIT REMOVAL

103 To remove the cooling turbine and fan unit, proceed as follows:

(a) Remove the dorsal fairing at the rear of the navigator's canopy by releasing six latches.

(b) Remove the fan exhaust duct by disconnecting the rubber sleeve connection at the forward end of the duct and the two support struts at the rear.

(c) Remove the air conditioning bay upper access panel by removing 56 screws.

(d) Disconnect the rubber sleeve connection at the fan inlet and remove the 24 bolts at the fan inlet duct rear joint. Break the seal at the duct rear joint by lowering the forward end of the duct. Slide the duct approximately 1/2 inch toward the LH side of the aircraft to disengage the hinge pins at the lower edge of the rear joint. Remove the duct from the aircraft.

(e) Disconnect the couplings at the turbine inlet and outlet connections.

(f) Remove the upper section of the cooling turbine and fan unit insulating blanket.

(g) Remove the nut from the cooling turbine and fan unit upper mounting bracket stud.

ARROW 1 SERVICE DATA

(h) Support the unit and remove the flat headed pin from the lower end of each pair of adjustable mounting struts. Remove the unit from the aircraft.

COOLING TURBINE AND FAN UNIT INSTALLATION

104 The procedure for the installation of the cooling turbine and fan unit is the reverse of that given for the removal. During installation new gaskets must be installed at all joints.

105 The top attachment stud should be packed with washers AN960-516 between the unit and the mounting bracket to align the air-to-water heat exchanger air outlet duct with the turbine inlet flange.

106 The flexible section of the duct between the air-to-water heat exchanger and the turbine must be compressed at least 0.10 inch and have a minimum of 0.06 inch of further compression remaining on installation of the cooling turbine and fan unit. The degree of compression is adjusted by packing under the mounting brackets of the air-to-water heat exchanger.

AIR-TO-WATER HEAT EXCHANGER REMOVAL

107 To remove the air-to-water heat exchanger proceed as follows:

- (a) Remove the cooling turbine and fan unit as described in para 92.
- (b) Remove the air inlet duct between the system main shut-off valve and the heat exchanger by disconnecting two couplings.
- (c) Remove the distilled water filler pipe.
- (d) Remove the steam outlet flexible ducts and 'T' connecting duct from the heat exchanger.
- (e) Disconnect the electrical connectors from the liquid level sensor and the non-return valve holding solenoid.
- (f) Drain the distilled water through the heat exchanger drain valve. Access to the valve is gained through the air conditioning bay lower access panel.

(g) Remove the six bolts attaching the heat exchanger to the air conditioning bay floor.

(h) Lift the heat exchanger from the aircraft.

AIR-TO-WATER HEAT EXCHANGER INSTALLATION

108 The procedure for installing the air-to-water heat exchanger is the reverse of that given for the removal. On installation, the steam outlet 'T' connecting duct is sealed to the heat exchanger by assembling wet with Haldite sealing compound. The height of the heat exchanger is adjusted to obtain the correct compression of the flexible section of the air outlet duct by packing under the heat exchanger mounting brackets. See para 106. During installation new gaskets must be installed at all duct joints.

AIR-TO-AIR HEAT EXCHANGER REMOVAL

109 To remove the air-to-air heat exchanger proceed as follows:

- (a) Remove the dorsal fairing at the rear of the navigator's canopy by releasing six latches.
- (b) Remove the cooling turbine and fan unit fan exhaust duct by disconnecting the rubber sleeve connection at the forward end of the duct and the two support struts at the rear.
- (c) Remove the air conditioning bay upper access panel by removing 56 screws.
- (d) Remove the transverse beam and strut from the air conditioning bay.
- (e) Disconnect the rubber sleeve connection at the cooling turbine and fan unit fan inlet and remove the 24 bolts at the fan inlet duct rear joint. Break the seal at the duct rear joint by lowering the forward end of the duct. Slide the duct approximately 1/2 inch toward the LH side of the aircraft to disengage the hinge pins at the lower edge of the rear joint. Remove the duct from the aircraft.

ARROW 1 SERVICE DATA

(f) Remove the two engine bleed air inlet ducts which connect to the heat exchanger.

(g) Remove the temperature control shut-off valve.

(h) Remove the main shut-off valve.

(j) Disconnect the ground test panel connection at the heat exchanger.

(k) Disconnect the fuel system pressurization supply line connection at the heat exchanger.

(m) Remove the bolts securing the ram air inlet transition duct to the heat exchanger.

(n) Disconnect the struts securing the outlet end of the ram air exhaust duct.

(p) Disconnect the heat exchanger support struts. Attach the sling and support the heat exchanger.

(q) Remove the two lower attachment bolts and lift the heat exchanger, complete with the ram air outlet ducts, from the aircraft.

AIR-TO-AIR HEAT EXCHANGER INSTALLATION

110 The procedure for the installation of the air-to-air heat exchanger is the reverse of that given for the removal. During installation new gaskets must be installed at all joints.

ARROW 1 SERVICE DATA

FAULTS AND REMEDIES		
FAULT	PROBABLE CAUSE	REMEDY
AIR COND FAIL warning light on	Malfunction of the warning system	Check the system and replace the defective unit.
	Cooling turbine and fan unit rotor seized.	Replace the unit.
	Water level in the air-to-water heat exchanger low	Replenish.
	Malfunction of the turbine outlet temperature control system	Check the system and replace the defective unit.
EQUIP O'HEAT warning light on	Malfunction of the warning system	Check the system and replace the defective unit.
	Malfunction of the equipment temperature control system	Check the system and replace the defective unit.
CABIN PRESS warning light on or cabin altitude too high	Malfunction of the warning system	Check the system and replace the defective component.
	Main shut-off valve failed in the closed position	Check the system and replace the defective unit.
	Cabin pressure control system failed	Check the system and replace the defective component.
	Cabin pressure safety valve system failed	Check the system and replace the defective component.
	Excessive leak rate from the cabin.	Carry out a leak test of the cabin and rectify the leaks.
Cabin temperature incorrect	Malfunction of cabin temperature control system	Check the system and replace the defective component.

ARROW 1 SERVICE DATA

EQUIPMENT LIST			
AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-2254-3	Airesearch E-106482	Flow Augmentor and Shut-off Valve	1
7-2252-1	Normalair Canada Ltd. 511710	Valve - Outflow - Cabin Pressure	1
7-2252-24	Normalair Canada Ltd. 511720	Controller - Cabin Pressure	1
7-2252-316	Normalair Canada Ltd. 511831	Filter - Cabin Pressure Control	1
7-2252-278	Normalair Canada Ltd. 512610	Valve - Pressure Relay (Cabin Pressure Control)	1
7-2252-328	Airesearch 102250	Valve - Safety Cabin Pressure	1
7-2252-329	Airesearch 102220	Controller - Cabin Safety Valve	1
7-2252-403	Airesearch 103156	Valve - Inward Relief	1
7-2254-12	Surface Combustion Corp. SK6424	Heat Exchanger - Air-to-water	1
7-2254-1	Airesearch 201970	Cooling Turbine and Fan Unit	1
7-2254-6	Airesearch 83940	Heat Exchanger - Air-to-air	1
7-2252-201	Transco Products Ltd. 2520-23	Valve - Shut-off - Radar Nose	1
7-2256-5	Airesearch 108298	Valve - Pressure Reducing and Non-return	2
7-2254-579	Normalair Canada Ltd. 514120	Valve - Non-return - Engine Bleed Air	2
7-2252-3	Transco Products Ltd. 3020-6	Valve - Ram Air	2
7-2254-4	Airesearch 104588	Valve - Non-return and Shut-off - Cabin	1

ARROW 1 SERVICE DATA

EQUIPMENT LIST (Cont'd)			
AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-2252-18	Normalair Canada Ltd. 512340	Connection - Ground Supply	1
7-2252-11	Hamilton Standard (Canadian Pratt and Whitney) HS 506337	Valve - Temperature Control	2
7-2295-55	Airesearch 105596	Valve - Shut-off - Engine Bleed Air	2
7-2254-2251	Normalair Canada Ltd. 514370	Valve - Pressure Relief (Fuel Pressurization)	1
7-2254-2445	Barber Colman DYLZ 6601	Valve - Temperature Control Shut-off	1
7-2254-2395	Airesearch 106464	Valve - Main Shut-off	1
7-2254-2397	Airesearch 106031	Rate Sensor	1
7-2254-2391	Airesearch 107799	Temperature Sensor - Pneumatic	1

CF-105 SERVICE DATA

ELECTRICAL SYSTEM

AIR CONDITIONING

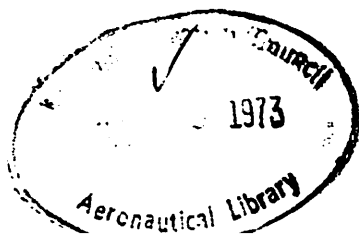
18

TABLE OF CONTENTS

TITLE	Classification cancelled/changed to.....	PAGE
SYSTEM SERVICE DATA	by authority of..... (date).....	
DESCRIPTION	Signature..... Rank.....	
General		3
System Controls		3
Turbine Outlet Air Temperature Regulation Circuit		4
Cabin Temperature Regulation Circuit		4
Equipment Area Temperature Regulation Circuit		6
Emergency Operation Control Circuits		7
Flow Augmentor Valve Control Circuit		7
Inlet Pressure and Temperature Sensing Circuit		7
Calibration and Maintenance Circuits		8
Rain Repellent System Control Circuit		8
Cabin Pressure Warning Circuit		8
Cabin Pressure Relief Circuit		8
Oxygen Contents Circuit		9
FUNCTION TESTING	(To be issued later)	
INSPECTION	(To be issued later)	
COMPONENT SERVICE DATA		
Panel E18		13
Turbine Outlet Temperature Control Unit		15
Turbine Outlet Temperature Sensor		17
Cabin Temperature Control Unit		19
Cabin Inlet Duct Temperature Sensor		21
Cabin Outlet Duct Temperature Sensor		23
Cabin Temperature Selector		25
Equipment Area Temperature Control Unit		27
Equipment Area Temperature Sensor		29
Thermostat - Equipment Area Overtemperature		31
Thermostat - Equipment Area Overtemperature		33
Pressure Switch, Engine Bleed - LH and RH		35
Thermostat, Engine Bleed Line Leakage - LH and RH		37
Thermostat, Engine Bleed Line Leakage - LH and RH		39
Thermostat, Engine Bleed Line Leakage - LH and RH		41
Air Conditioning Test Switch		43
Thermostat - Rain Repellent System		45
Cabin Aneroid Switch		47
Oxygen Quantity Gauge		49

LIST OF ILLUSTRATIONS

Fig 1	Air Conditioning System Schematic	11
-------	---	----



209133

IFIDENTIAL

CF-105 SERVICE DATA

CLASSIFIED

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFFTY	REF. NO.
ELECTRICAL	AIR CONDITIONING	25201	11-14
DESCRIPTION General 1. The electrical circuits of the air conditioning system regulate the temperature of certain areas, initiate emergency operation, or facilitate the calibration and maintenance of the system. Other circuits included under the air conditioning system are the oxygen contents circuit, the rain repellent system control circuit and the pressure safety valve dump control and pressure warning circuits for the cabin. 2. The temperature regulation circuits control the temperature of the cooling turbine outlet air, the cockpits and the equipment areas. The cooling turbine outlet air temperature is automatically prevented from exceeding a lower limit of -30°F. The temperature of the air supply to the cabin is automatically maintained at any manually selected temperature between 40°F and 80°F. The temperature of the air supply to the equipment area is automatically limited to a temperature of 80°F. The equipment area covers the following components: (a) Electronic equipment in the nose. (b) Electronic equipment in the fuselage. (c) Electronic equipment in the dorsal area. (d) Aircraft battery. (e) Alternator control and transformer-rectifier units. (f) Oxygen converter. (g) Landing Gear emergency air storage bottle. (h) Windshield de-icing transformer. System Controls 3. The controls for the air conditioning system are mounted on the air conditioning panel E18 located in the front cockpit in the RH console. The controls and their functions are as follows: (a) AIR SUPPLY switch. The air supply switch is marked NORMAL-OFF-EMERGENCY. When the switch is set to the OFF position, the engine bleed air supply to the temperature regulated areas is shut off by a main air control valve. When the switch is selected to the NORMAL position, the turbine outlet temperature regulation circuit controls the degree to which the main air control valve is opened. Selecting the EMERGENCY position provides cooling only for equipment which is considered essential for flight safety.			
ISSUE	1		
DATE	30 May 57		

UNCLASSIFIED

- (b) TEMP selector. The temperature selector permits any desired cabin temperature between the extremes of COOL and WARM to be selected and maintained.
- (c) DEFOG switch. The defog switch overrides the cabin temperature regulation circuit and initiates the operation of a defog circuit to prevent fog forming in the cockpit when the air in the cockpit is humid and the inlet air is cool.
- (d) RAIN REPELLENT switch. The rain repellent switch permits hot, high pressure air to be directed onto the windscreen.
- (e) CABIN PRESS. switch. The cabin pressure switch permits the release to atmosphere of the cabin pressure air.

Turbine Outlet Air Temperature Regulation Circuit

- 4. The turbine outlet air temperature regulation circuit limits the temperature of the cool air discharge from the turbine to a minimum of -30°F.
- 5. The circuit consists of a temperature modulator unit and a temperature-sensitive resistor operating in conjunction to control the degree to which the main air control valve is opened. Increase in the airflow through the main control valve, which is fitted in the supply line from the air-to-air heat exchanger to the air-to-water heat exchanger, results in a decrease in the temperature of the turbine outlet air.
- 6. The regulation circuit is operative when power is on the primary a-c bus bars but it does not assume control over the main air control valve until the air supply switch is selected to NORMAL. This selection provides a d-c supply to the modulator unit for the operation of the main air control valve.
- 7. The temperature-sensitive resistor is fitted in the cool air outlet and forms part of a resistor network incorporated in the modulator unit. Also incorporated in the modulator unit are a bridge balance sensing circuit and two relays. The bridge balance sensing circuit is connected across the bridge and controls the energizing of the two relays. One relay effects the opening and the other relay the closing of the main air control valve.
- 8. Initially, the balance point of the network is adjusted to result in a turbine outlet air temperature of -30°F. The resistance of the bridge at this setting becomes the reference point. As the resistance of the temperature sensitive resistor is proportional to the duct air temperature, an increase or decrease in the turbine outlet air temperature unbalances the bridge. The bridge balance circuit detects the unbalanced condition and, via one of the two relays, effects the opening or closing of the main air control valve to a degree necessary to restore the balance of the bridge.

Cabin Temperature Regulation Circuit.

- 9. The cabin temperature regulation circuit automatically regulates the air supply to the cabin to maintain any temperature selected on the cabin temperature selector rheostat. The rheostat is marked COOL at one end of its travel and WARM at the other end. This represents a temperature range of from 40°F to 80°F. A mark at the centre point of the travel represents a temperature of 60°F. The circuit is operative when power is on the a-c primary bus bars.

ISSUE	1							
DATE	30 May 57							

CF-105 SERVICE DATA

SYSTEM DATA SHEET

UNCLASSIFIED

SYSTEM	SUB-SYSTEM	AIRCRAFT EFFTY	REF. NO.
ELECTRICAL	AIR CONDITIONING	25201	11-14
10. The regulation circuit can be overridden by selecting the defog switch to ON. This action unbalances the circuit to permit the cabin temperature to rise to 90°F. 11. The conditioned air supply to the cabin is composed of cool air from the cooling turbine regulated by hot air bled from the RH engine. In the event of the RH engine bleed air failing, hot air is supplied by the LH engine via the hot side of the air-to-air heat exchanger. The supply of hot air is regulated by a cabin temperature control valve. The control valve is spring-loaded to the closed position and is opened by servo air pressure which is controlled by a solenoid. The degree of valve opening is proportional to the current being passed through the solenoid. 12. The solenoid current is controlled by a temperature control unit, the pilot's temperature selector rheostat and two temperature sensitive resistors, one in the cabin inlet duct and the other in the cabin outlet duct. 13. The temperature control unit incorporates a number of fixed and variable resistors for calibrating the circuit, an amplifying vacuum tube circuit, and a regulating triode. 14. A resistor network, consisting of the temperature selector rheostat, the two temperature sensitive resistors and the fixed and variable resistors in the temperature control unit, controls the input to the amplifying tube circuit. The output of the amplifying tube is fed to the grid of the regulating triode to control the plate current of this tube. The plate current of the regulating triode controls the current in the solenoid of the cabin temperature control valve. 15. The cabin temperature selected on the selector rheostat is maintained by the temperature sensitive resistors. If the temperature increases or decreases above that which was selected, the resistor network becomes unbalanced. This action results in a decrease or increase in the current flow in the solenoid of the cabin temperature control valve, thus opening or closing the control valve to a degree necessary to regain the balance of the network. 16. Selecting the defog switch ON isolates the outlet duct temperature sensitive resistor and the cabin temperature selector rheostat. This raises the cockpit inlet air temperature to 90°F and it is maintained at this temperature by the inlet duct temperature sensitive resistor. 17. If at any time the cabin inlet air temperature reaches 140°F, a thermostat, fitted in the inlet duct, interrupts the power supply to the cabin temperature control valve solenoid, and the control valve automatically cuts off the hot air supply. The thermostat re-establishes the power supply when the temperature drops to 100°F. 18. A shut-off valve fitted in the cabin inlet duct is open when the landing gear is locked up. When the landing gear is in any other position the valve is partially closed in order to ensure that sufficient cooling air pressure is available for the equipment area, as the system pressure is reduced during low engine rpm. A limit switch, incorporated in the valve, interrupts the close field circuit before the valve is fully closed.			
ISSUE	1		
DATE	30 May 57		

CONFIDENTIAL

19. The supply to the close field of the shut-off valve is completed when an air-flow shut-off relay is energized. This action transfers a supply circuit from the open field to the close field of the valve. The airflow shut-off relay is energized when the landing gear is unlocked and the nose gear door-up relay is de-energized, the supply circuits being completed through the relay-open contacts.

20. An additional function of the airflow shut-off relay, when energized, is to operate the solenoid override circuit of the flow augmentor valve, see Flow Augmentor Valve Control Circuit, para 31. The supply circuit to the airflow shut-off relay coil is routed via an air conditioning ground-test switch. This switch is normally closed and its primary function is to override, for testing purposes, the solenoid circuit of the flow augmentor valve. The cabin shut-off valve is provided with a separate override circuit.

21. The cabin shut-off valve override circuit is connected to the open field of the valve. The circuit is completed when the external air control relay is energized by the act of connecting an external air supply line to the system. See Calibration and Maintenance Circuits, para 39.

Equipment Area Temperature Regulation Circuit

22. The temperature of the air in the equipment area is limited to 80°F. Due to the impracticability of controlling the temperature of the air supply to each component, control is exercised on only one portion of the supply line. This control point is at the entry to the nose air inlet line.

23. The circuit is operative automatically when power is on the a-c primary bus bars.

24. With the exception that only one temperature-sensitive resistor is used for control purposes, the regulation circuit is identical to the cabin temperature regulation circuit.

25. The circuit is calibrated to produce a peak temperature of 80°F at a point near the equipment area main air supply line entry into the air distribution line. At the calibrated temperature the resistance of the temperature-sensitive resistor causes a certain voltage to be supplied to the amplifier in the temperature control unit. This in turn, results in the equipment area temperature control valve being opened to a certain degree.

26. If the temperature at the nose inlet line increases above the calibrated temperature, the resulting change in voltage drop across the temperature-sensitive resistor effects the closing of the control valve to a degree necessary to restore the balance of the network.

27. If the air temperature increases to 100°F, two thermostats fitted near the temperature-sensitive resistor are actuated. One thermostat, fitted in the equipment temperature control valve supply circuit, opens and causes the control valve to close. The other thermostat closes to complete an indicator circuit in an annunciator unit which provides an indication to ground personnel that an overheat condition has occurred. When the temperature drops to 60°F, the thermostats revert to normal but the annunciator indicator circuit remains locked until it is manually reset.

ISSUE	1							
DATE	30 May 57							

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFFTY	REF. NO.
ELECTRICAL	AIR CONDITIONING	25201	11-14
Emergency Operation Control Circuits. 28. Emergency cooling is initiated by selecting the air supply switch to EMERGENCY. This action energizes a control relay which opens the ram air gate valves and closes the radar nose inlet line gate valve and main air control valves. When the ram air gate valves are open, ram air is permitted to enter the equipment area air distribution line. 29. The control relay, in the unenergized condition, completes a supply circuit from the main d-c bus to the close field of the ram air gate valves and the open field of the radar nose inlet line gate valve. Flow Augmentor Valve Control Circuit. 30. When the aircraft is flying at high altitudes or when the engine rpm are low, the bleed air delivery pressure decreases to a point where the efficiency of the system is reduced. When this occurs, a pneumatically operated flow augmentor valve opens to permit air from the air-to-water heat exchanger to by-pass the cooling turbine and enter the equipment area supply line. 31. A solenoid operated circuit is incorporated in the flow augmentor valve which effects the closing of the valve when the landing gear is in any position other than locked up. This action prevents excessively hot air from entering the equipment area supply line. The circuit is operative when the air flow shut-off relay (see Cabin Temperature Regulation Circuit) is energized by a circuit completed through the relay-open contacts of the nose door-up relay of the landing gear circuits. 32. A normally-closed ground-test switch is fitted in the supply circuit of the air-flow shut-off relay. This switch permits the solenoid circuit to be overridden to facilitate checking the operation of the flow augmentor valve. Inlet Pressure and Temperature Sensing Circuit. 33. A pressure-temperature sensing circuit is incorporated in the bleed line from each engine. If the bleed air pressure exceeds 120 psi or, due to leakage, the temperature within the bleed line insulation rises to 350°F - 400°F the circuit effects the closing of a bleed air shut-off valve. The circuits are interconnected by a LH and a RH interlock relay which prevents both circuits operating at the same time. 34. Each pressure and temperature sensing circuit consists of a pressure switch, three parallel-connected thermostats and a shut-off valve. 35. The pressure switch is fitted in the bleed line downstream of the pressure reducing valve. This valve restricts the bleed air pressure to 85 psi. If the pressure increases to 120 psi, the pressure switch operates and closes the shut-off valve. 36. The thermostats are positioned close to cut-outs in the insulation of the bleed air line. If, due to leakage of the bleed line, the ambient temperature rises to 350°F - 400°F, one or more of the thermostats close. This action completes a supply circuit			
ISSUE	1		
DATE	30 May 57		

to close the shut-off valve.

37. When an interlock relay is energized, it completes a lock-on indication circuit in the annunciator unit. This provides an indication of the failure to ground personnel.

Calibration and Maintenance Circuits.

38. Each of the three regulated areas incorporates a thermocouple fitted at a critical point of the relevant supply line. The circuit of each thermocouple terminates at a connector on the air conditioning ground test panel. This facilitates the connection of temperature gauges for temperature calibration purposes.

39. Cooling air from an external source can be connected to the system by means of a ground-test connection. Incorporated in the connection is a micro-switch which is closed by the act of connecting the external supply line. This micro-switch, when closed, completes a supply circuit from the main d-c bus to energize an external supply control relay. This relay effects the following operations:

- (a) Opens the cabin shut-off valve.
- (b) Closes the main air control valve.
- (c) Isolates the air supply switch to prevent the main air control valve from being selected open while the ground supply is connected.

40. The external supply control relay acts as an override and the affected circuits will automatically revert to the normal position when the external supply is disconnected.

Rain Repellent System Control Circuit.

41. Hot, high pressure air ducted from the air-to-air heat exchanger is directed onto the windscreens to act as a rain repellent. The air supply is controlled by a shut-off valve operated by the rain repellent switch. Selecting the switch to ON opens the shut-off valve.

42. A thermostat is fitted in the supply line and acts as an override circuit to close the shut-off valve when the air temperature exceeds 250°F.

Cabin Pressure Warning Circuit.

43. If the cabin altitude exceeds 31,000 feet $\pm$ 1,800 feet, an amber coloured CABIN PRESS indicator located on the master warning system indicator panel and an amber coloured master indicator on the main instrument panel are illuminated. The circuit is completed by the closing of an aneroid switch which derives a power supply from the main d-c bus.

Cabin Pressure Relief Circuit.

44. When required, the cabin pressure can be released by selecting the cabin pressure switch to DUMP. This energizes a solenoid which opens the cabin pressure safety valve and releases the air pressure to atmosphere.

ISSUE	1							
DATE	30 May 57							

CF-105 SERVICE DATA

SYSTEM DATA SHEET

UNCLASSIFIED
CONFIDENTIAL

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		AIRCRAFT EFFTY 25201		REF. NO. 11-14	
Oxygen Contents Circuit. 45. The volume of liquid oxygen contained in the oxygen converter is indicated, as a percentage of the maximum, on a gauge located in the front cockpit on the RH console. The circuit is operative when power is on the main d-c and primary a-c bus bars. A flag marked OFF is visible in the indicator when the circuit is in-operative. The indicator is controlled by a transmitter and a capacitance sensing device which is fitted to the oxygen converter.							
ISSUE	1						
DATE	30 May 57						

ISSUE	1							
DATE	30 May 57							

781-3013-2-1

CF-105 SERVICE DATA

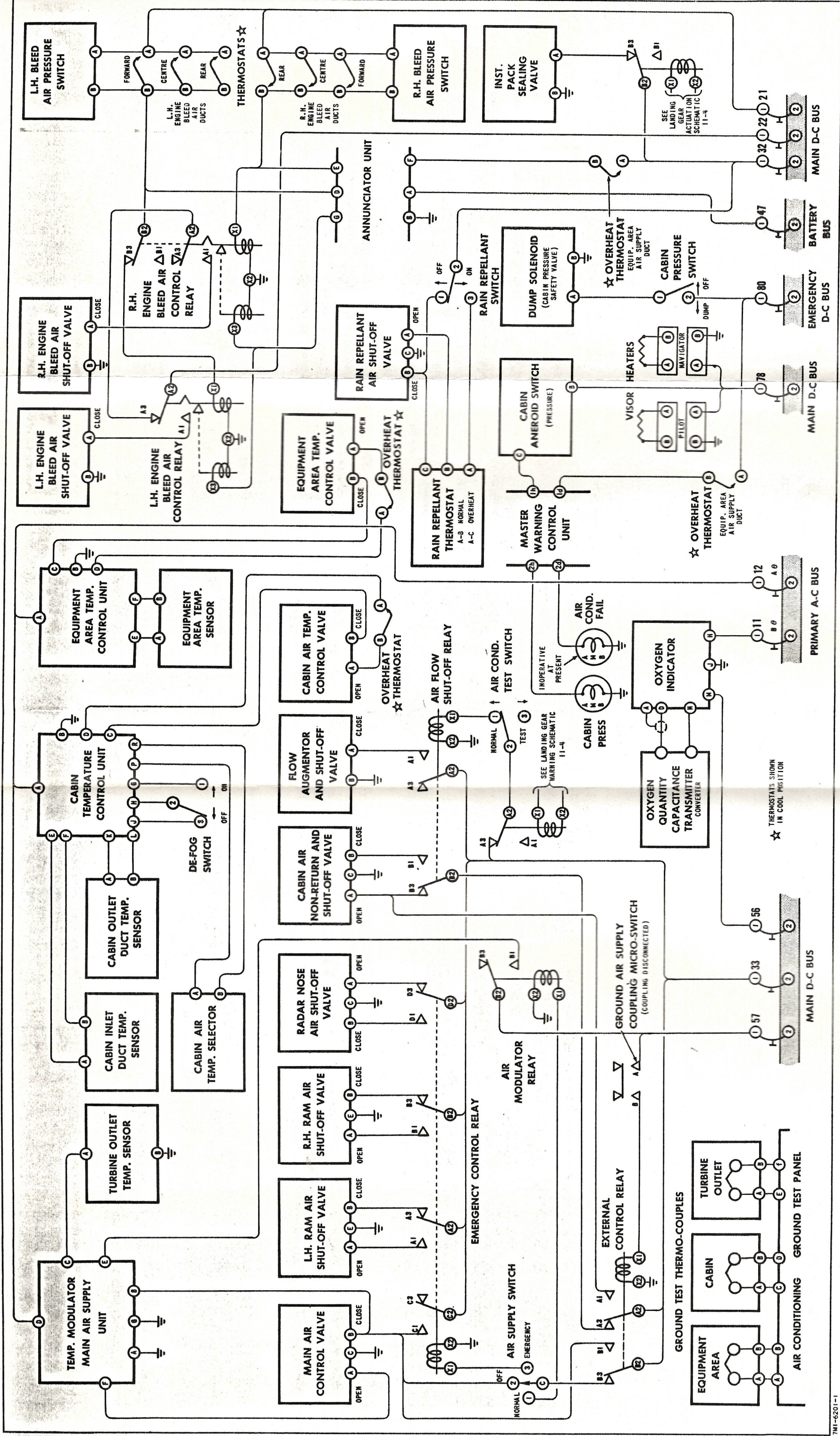


FIG. 1 AIR CONDITIONING SYSTEM - SCHEMATIC

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Panel E18		REF. NO. 11-14-1	
AVRO PART NO. 7-1252-82		MANUFACTURER Avro Aircraft		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION		To mount the following switches: (a) Temperature Selector Rheostat (b) Air Supply Switch (c) Defog Switch (d) Dump Switch (e) Rain Repellent Switch					
LOCATION		Front Cockpit, RH console.					
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure circuit wiring. Fit and secure the panel to the console - five screws.						MEN X MINUTES	

INSPECTION		Operate the switches and check that their action is neither rought nor sluggish. Operate the temperature selector rheostat and check that the action is not rough and that the knob is securely pinned. Check that the circuit wiring is connected correctly and securely.							
		MEN X MINUTES							
FUNCTIONAL CHECKS									
		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Turbine Outlet Temperature Control Unit		REF. NO. 11-14-2	
AVRO PART NO. 7-2254-348		MANUFACTURER AiResearch		MAN'FR'S PART NO. 45958		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To limit the cooling turbine outlet temperature to a minimum of -30°F by altering the degree to which the main air control valve is opened or closed, thus increasing or decreasing the airflow to the turbine inlet.							
LOCATION Compartment aft of rear cockpit bulkhead and forward of station 292.							
ACCESS Unobstructed, when the dorsal fairing aft of the rear cockpit is removed - six latches.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the controller in its mounting tray and turn the quick fastener in a clockwise direction until the unit is secured. Fit and secure one electrical connector. Connect and secure one bonding lead.						MEN X MINUTES	

CLASSIFIED

INSPECTION Check that the unit is securely and properly mounted. Check that the electrical connector and the bonding lead are securely and properly connected.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Turbine Outlet Temperature Sensor		REF. NO. 11-14-3	
AVRO PART NO. 7-2254-349		MANUFACTURER AiResearch		MAN'FR'S PART NO. 30050-10		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION The sensor, which has an inverse temperature/resistance characteristic, forms a variable resistance leg of a resistor network incorporated in the turbine outlet control unit.							
LOCATION Air conditioning bay - fitted in the duct at the cooling turbine outlet.							
ACCESS Unobstructed, when an access panel secured by 76 screws is removed from the bottom fuselage aft of the rear cockpit bulkhead and an attached antenna is disconnected.						MEN X MINUTES	
REPLACEMENT PROCEDURE Screw the sensor into the duct boss until secure. Fit and secure one electrical connector. Reconnect antenna and refit access panel - 76 screws.						MEN X MINUTES	

INSPECTION		Check that the unit is securely and properly fitted. Check that the electrical connector is securely and properly connected.								MEN X MINUTES	
FUNCTIONAL CHECKS										MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT											
SPECIAL TOOLS TO REMOVE OR SERVICE											
REMARKS											
ISSUE	1										
DATE	30 May 57										

CF-105 SERVICE DATA COMPONENT DATA SHEET

UNCLAS CONFIDENTIAL

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Cabin Temperature Control Unit		REF. NO. 11-14-4	
AVRO PART NO. 7-2252-14		MANUFACTURER Hamilton Standard		MAN'FR'S PART NO. 503704		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours.							
FUNCTION To maintain the cabin temperature constant, at a selected temperature between 40°F and 80°F, by altering the degree to which the cabin temperature control valve is opened or closed. Also incorporates a defog circuit which permits the cabin temperature to rise to 90°F.							
LOCATION Compartment aft of rear cockpit bulkhead and forward of station 292.							
ACCESS Unobstructed when the dorsal fairing aft of the rear cockpit is removed - six latches.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the controller in its mounting and secure - four 3/16 inch bolts. Fit and secure one electrical connector.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly mounted. Check that the connector is securely and properly connected.								MEN X MINUTES	
FUNCTIONAL CHECKS								MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Cabin Inlet Duct Temperature Sensor		REF. NO. 11-14-5	
AVRO PART NO. 7-2252-12		MANUFACTURER Hamilton Standard		MAN'FR'S PART NO. HS 98071		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION The sensor, which has an inverse temperature/resistance characteristic, forms a variable resistance leg of a resistor network incorporated in the cabin temperature control unit.							
LOCATION Air conditioning bay at station 230 - fitted in the cabin air inlet duct.							
ACCESS Remove an access panel secured by 76 screws from the bottom fuselage aft of the rear cockpit bulkhead, and disconnect an attached antenna.						MEN X MINUTES	
REPLACEMENT PROCEDURE Screw the sensor into the duct boss until secure. Fit and secure one electrical connector. Reconnect antenna and refit access panel - 76 screws.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly fitted. Check that the electrical connector is securely and properly connected.		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Cabin Outlet Duct Temperature Sensor		REF. NO. 11-14-6	
AVRO PART NO. 7-2252-12		MANUFACTURER Hamilton Standard		MAN'FR'S PART NO. HS 98071		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION The sensor, which has an inverse temperature/resistance characteristic forms a variable resistance leg of a resistor network incorporated in the cabin temperature control unit.							
LOCATION Air conditioning bay, fitted in the cabin exhaust duct.							
ACCESS Remove an access panel secured by 76 screws from the bottom fuselage aft of the rear cockpit bulkhead, and disconnect an attached antenna.						MEN X MINUTES	
REPLACEMENT PROCEDURE Screw the sensor into the duct boss until secure. Fit and secure one electrical connector. Reconnect antenna and refit access panel - 76 screws.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly fitted. Check that the electrical connector is securely and properly connected.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Cabin Temperature Selector		REF. NO. 11-14-7	
AVRO PART NO. 7-2252-151		MANUFACTURER Hamilton Standard		MAN'FR'S PART NO. HS 506400		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To enable the cabin temperature to be selected manually within a temperature range of from 40°F to 80°F.							
LOCATION Front Cockpit, RH console, air conditioning panel E18.							
ACCESS Remove panel E18 from the console - five screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the selector unit in panel E18 and secure with lock washer and nut supplied. Fit and secure the knob pointer to the selector spindle - two 6/32 inch Allen screws. Fit and secure one electrical connector. Fit and secure panel E18 to the console - five screws.						MEN X MINUTES	

INSPECTION Check that the selector unit is securely and properly fitted. Operate the rheostat, check that the action is smooth throughout the travel, and that the knob is securely pinned.							MEN X MINUTES	
FUNCTIONAL CHECKS							MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT								
SPECIAL TOOLS TO REMOVE OR SERVICE								
REMARKS								
ISSUE	1							
DATE	30 May 57							

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Equipment Area Temperature Control Unit		REF. NO. 11-14-8	
AVRO PART NO. 7-2252-16		MANUFACTURER Hamilton Standard		MAN'FR'S PART NO. 503703		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours							
FUNCTION To limit the equipment area temperature to 80°F by altering the degree to which the equipment area temperature control valve is opened or closed.							
LOCATION Compartment aft of rear cockpit bulkhead.							
ACCESS Unobstructed when the dorsal fairing aft of the rear cockpit is removed - six latches.						MEN X MINUTES	
REPLACEMENT PROCEDURE Position the controller in its mounting and secure - four 3/16 inch bolts. Fit and secure one electrical connector.						MEN X MINUTES	

INSPECTION		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Equipment Area Temperature Sensor		REF. NO. 11-14-9	
AVRO PART NO. 7-2252-12		MANUFACTURER Hamilton Standard		MAN'FR'S PART NO. HS 98071		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION The sensor, which has an inverse temperature/resistance characteristic, forms the variable resistance leg of a resistor network incorporated in the equipment area temperature control unit.							
LOCATION Air conditioning bay at station 185, fitted in the nose air inlet supply line.							
ACCESS Unobstructed, fitted on the LH side of the nose wheel well.						MEN X MINUTES	
REPLACEMENT PROCEDURE Screw the sensor into the duct boss until secure. Fit and secure one electrical connector.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly fitted. Check that the electrical connector is securely and properly connected.		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Thermostat - Equipment Area Overtemperature		REF. NO. 11-14-10	
AVRO PART NO. 7-2250-128		MANUFACTURER United Controls		MAN'FR'S PART NO. G-337-1B		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To open at a temperature of 100°F and interrupt the supply circuit to the equipment area temperature control valve which will be spring-returned to the closed position. The thermostat closes when the temperature drops to 60°F.							
LOCATION Nose air inlet line in nose wheel well at station 185.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Screw the thermostat into the duct boss until secure. Fit and secure one electrical connector.						MEN X MINUTES	

INSPECTION UNGLASS Check that the unit is securely and properly fitted in the boss. Check that the electrical connector is securely and properly connected.		MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
SPECIAL TOOLS TO REMOVE OR SERVICE			
REMARKS			
ISSUE	1		
DATE	30 May 57		

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Thermostat - Equipment Area Overtemperature		REF. NO. 11-14-11	
AVRO PART NO. 7-2250-129		MANUFACTURER United Controls		MAN'FR'S PART NO. G 337-1C		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION To close and complete a supply circuit to an overtemperature indicator in the annunciator unit if the air temperature in the nose inlet line exceeds 100°F. The thermostat opens when the temperature drops to 60°F. The annunciator indicator must be reset manually.							
LOCATION Nose air inlet line in nose wheel well at station 185.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Screw the thermostat into the duct boss until secure. Fit and secure one electrical connector.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly fitted in the duct boss. Check that the electrical connector is securely and properly connected.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Pressure Switch, Engine Bleed - LH and RH		REF. NO. 11-14-12	
AVRO PART NO. 7-2256-189		MANUFACTURER Parmatic Engineering Ltd.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To close and complete a supply to the bleed line air shut-off valve and the annunciator unit, if subjected to pressure in excess of 120 psi $\pm$ 5 psi.							
LOCATION Station 524, near the engine bleed pressure reducing valve - LH and RH.							
ACCESS Disconnect the main landing gear door jack and secure the door in the closed position, then remove an access panel on the outside skin of the aircraft - 36 3/16 inch screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure the unit to a mounting clamp bracket - two bolts. Connect and secure one pipeline. Fit and secure one electrical connector. Refit the access panel - 36 3/16 inch screws. Re-secure the main landing gear door jack.						MEN X MINUTES	

INSPECTION Check that the unit is securely clamped. Check that the electrical connector is securely and properly connected.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Thermostat, Engine Bleed Line Leakage - LH and RH		REF. NO. 11-14-13	
AVRO PART NO. 7-2250-126		MANUFACTURER United Controls		MAN'FR'S PART NO. G-337-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To close and complete a supply circuit to the bleed line air shut-off valve and the annunciator unit if the temperature within the bleed line insulation rises to 350°F - 400°F.							
LOCATION Mounted adjacent to the engine bleed line at station 635 - LH and RH.							
ACCESS Remove a panel marked Air Conditioning Manifold Access at station 634 - 27 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the thermostat in its mounting and secure with retaining nut supplied. Fit and secure one electrical connector. Refit the access panel - 27 screws.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly mounted. Check that the electrical connector is fitted securely and properly.		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Thermostat, Engine Bleed Line Leakage - LH and RH		REF. NO. 11-14-14	
AVRO PART NO. 7-2250-126		MANUFACTURER United Controls		MAN'FR'S PART NO. G-337-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To close and complete a supply circuit to the bleed line air shut-off valve and the annunciator unit if the temperature within the bleed line insulation rises to 350°F - 400°F.							
LOCATION Mounted adjacent to the engine bleed line at station 536 - LH and RH.							
ACCESS Disconnect the main landing gear door jack and secure the door in the closed position, then remove an access panel on the outside skin of the aircraft - 36 3/16 inch screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the thermostat in its mounting and secure with retaining nut supplied. Fit and secure one electrical connector. Refit access panel - 36 3/16 inch screws. Re-secure main landing gear door jack.						MEN X MINUTES	

INSPECTION UNCLASSIFIED Check that the unit is securely and properly mounted. Check that the electrical connector is fitted securely and properly.		MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
SPECIAL TOOLS TO REMOVE OR SERVICE			
REMARKS			
ISSUE	1		
DATE	30 May 57		

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Thermostat, Engine Bleed Line Leakage - LH and RH		REF. NO. 14-15	
AVRO PART NO. 7-2250-126		MANUFACTURER United Controls		MAN'FR'S PART NO. G-337-1		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To close and complete a supply circuit to the bleed line air shut-off valve and the annunciator unit if the temperature within the bleed line insulation rises to 350°F - 400°F.							
LOCATION Mounted adjacent to the engine bleed line at station 303 - LH and RH.							
ACCESS Remove dorsal fairing aft of rear cockpit bulkhead by unlatching six latches. Remove fan exhaust duct. Remove an access panel in air conditioning bay roof - 57 3/16 inch screws. Remove non-return valve access panel on side of air conditioning bay - 12 screws.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit the thermostat in its mounting and secure with retaining nut supplied. Fit and secure one electrical connector. Reverse access procedure.						MEN X MINUTES	

INSPECTION Check that the unit is securely and properly mounted. Check that the electrical connector is fitted securely and properly.							MEN X MINUTES	
FUNCTIONAL CHECKS							MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT								
SPECIAL TOOLS TO REMOVE OR SERVICE								
REMARKS								
ISSUE	1							
DATE	30 May 57							

CF-105 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Air Conditioning Test Switch	REF. NO. 11-14-16
AVRO PART NO.	MANUFACTURER Cutler - Hammer	MAN'FR'S PART NO. 8804 K12		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To open the cabin air shut-off valve and close the flow augmentor valve for ground-test purposes.					
LOCATION Mounted on E3, forward accessory panel, which is located on the RH side of the nose wheel well at station 130, approximately.					
ACCESS Unobstructed.					MEN X MINUTES
REPLACEMENT PROCEDURE Mount the switch on the panel and secure using the lock ring, shakeproof washer and nuts provided. Connect and secure the electrical wiring to the switch terminals.					MEN X MINUTES

UNCLASSIFIED

INSPECTION Check that the switch is securely and properly mounted. Check the toggle operation making sure that the action is smooth and positive.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Thermostat - Rain Repellent System		REF. NO. 11-14-17	
AVRO PART NO. 7-2254-2141		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION		To transfer the supply from the open field to the close field of the rain repellent system shut-off valve if the temperature of the air in the system supply duct exceeds 250°F. After operation, the thermostat closes when the temperature drops to 200°F, thus re-opening the shut-off valve.					
LOCATION		In the duct tapped into the line between the main air control valve and the air-to-water heat exchanger.					
ACCESS		Remove dorsal fairing aft of rear cockpit bulkhead by unlatching six latches. Remove fan exhaust duct. Remove an access panel in air conditioning bay roof - 57 3/16 inch screws.				MEN X MINUTES	
REPLACEMENT PROCEDURE		Position the thermostat in the duct and secure by locking the clamp. Fit and secure one electrical connector. Reverse access procedure.				MEN X MINUTES	

INSPECTION Check that the unit is securely clamped. Check that the electrical connector is securely and properly connected.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL	SUB-SYSTEM AIR CONDITIONING	COMPONENT Cabin Aneroid Switch	REF. NO. 11-14-18		
AVRO PART NO.	MANUFACTURER Milttron Corp.	MAN'FR'S PART NO. 415-10-19	AIRCRAFT EFFECTIVITY 25201		
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours					
FUNCTION To close and complete a warning indication circuit when the cabin pressure altitude is at 31,000 feet $\pm$ 1,800 feet.					
LOCATION Rear cockpit at station 210, under instrument panel.					
ACCESS Unobstructed.			MEN X MINUTES <table border="1"> <tr><td></td><td></td></tr> </table>		
REPLACEMENT PROCEDURE Position the unit in its mounting and secure - two screws, washers and nuts. Fit and secure one electrical connector.			MEN X MINUTES <table border="1"> <tr><td></td><td></td></tr> </table>		

INSPECTION Check that the unit is securely and properly mounted. Check that the electrical connector is securely and properly connected.		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM AIR CONDITIONING		COMPONENT Oxygen Quantity Gauge	REF. NO. 11-14-19
AVRO PART NO. 7-1252-12	MANUFACTURER		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours	
FUNCTION To provide an indication, as a percentage of the maximum, of the volume of liquid oxygen in the oxygen converter.					
LOCATION Front Cockpit, RH console, oxygen panel E22.					
ACCESS Unobstructed.					MEN X MINUTES
REPLACEMENT PROCEDURE Fit and secure circuit wiring to gauge. Fit and secure one pipeline. Fit and secure panel to the console - six screws.					MEN X MINUTES

INSPECTION Check that the gauge is securely mounted. Check that the electrical wiring and the pipeline are securely and properly fitted.		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
REMARKS									
ISSUE	1								
DATE	30 May 57								

ARROW 1 SERVICE DATA

19

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Anti-g Suits	1
Canopy Seals	1
Instrument Pack Seals	2
INSPECTION (To be issued later)	
TESTING AND SERVICING	
General	6
Testing the Non-return Valve	6
Testing the Canopy Seal Circuit	7
Testing the Anti-g Suits Circuit	8
Testing the Instrument Pack Seals Circuit	9
COMPONENT SERVICE DATA	
Filter and Moisture Trap	11
Valve - Canopy Seal Control	13
Valve - Anti-g Suit Regulating	15
Seal - Canopy LH Pilot's	17
Seal - Canopy RH Pilot's	19
Seal - Canopy LH Navigator's	21
Seal - Canopy RH Navigator's	23
Valve - Non-return	25
Valve - Instrument Pack Seal Control	27
Seal - Instrument Pack Forward	29

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Low Pressure Air System - Schematic	1
2	Low Pressure Air System	2
3	Anti-g Suit Regulating Valve - Schematic	3
4	Ratio of Suit Pressure to Positive "G" Loading	4
5	Canopy Seals	5
6	Solenoid Operated Control Valve - Schematic	6
7	Operation of Instrument Pack Seals	7
8	Instrument Pack Forward Seal	9
9	Filter and Moisture Trap	10

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The low pressure air system supplies low pressure air to the canopy seals, instrument pack seals, and the crew member's anti-g suits. The air is tapped from the inlet side of the air conditioning system cooling turbine at a pressure of 18-85 psi and is then passed through a non-return valve and a filter and moisture trap.

2 The air is led from the filter and moisture trap to the control valve for the canopy seals, the control valve for the instrument pack seals and the crew's anti-g suit regulating valves.

ANTI-G SUITS

3 The air supply for the crew member's anti-g suits is led from the filter and moisture trap to the anti-g suit regulating valves located on the RH side of the rear bulkhead in each cockpit. A pressure reducing valve and a relief valve are incorporated in each anti-g suit regulating valve. From the anti-g valve air is supplied through a flexible hose to the aircraft section of the composite leads disconnect on each ejection seat. The crew member's anti-g suit flexible hose is connected to the

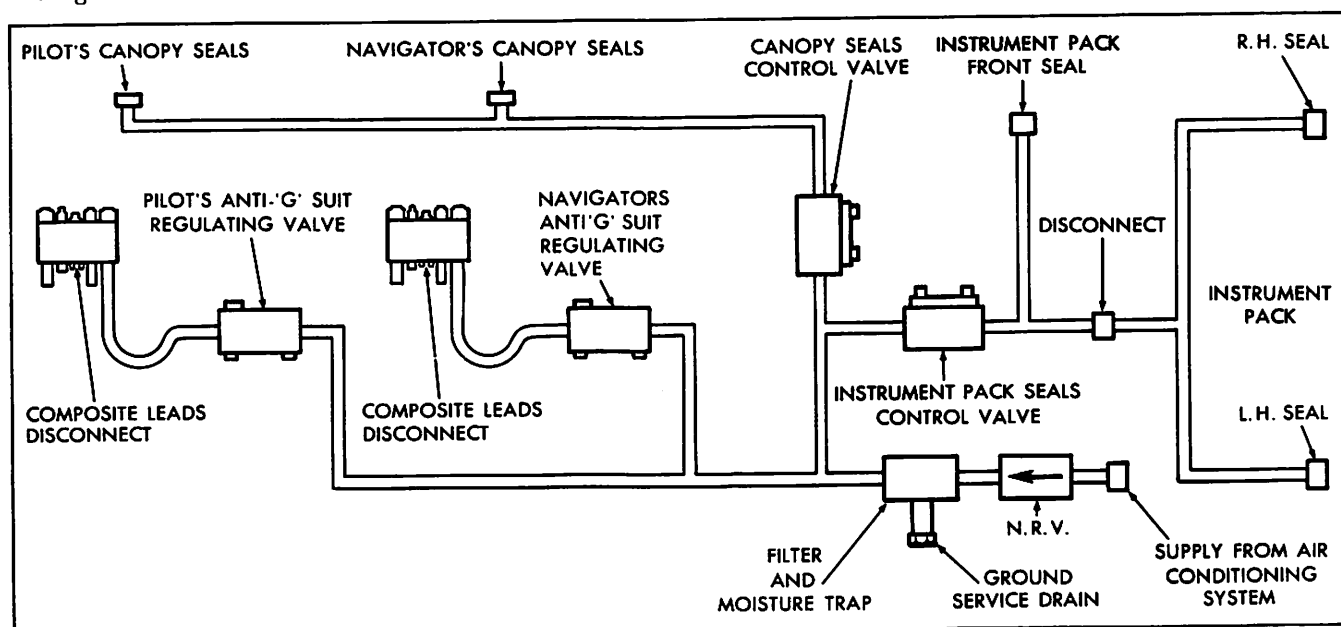
crew member's section of the composite leads disconnect.

4 The operation of the anti-g regulating valve is shown on fig 3. The amount of air pressure supplied to the suit in ratio to positive "g" loading is shown in fig 4.

CANOPY SEALS (Fig 5)

5 The canopy seals are fitted in channels around the sealing faces of the four canopy half shells. When the seals are inflated a square section, grooved bead on each seal is forced into contact with the cockpit and windshield sealing faces to provide a pressure tight joint. Where the two half sections meet on the centre line, the seal bead is removed from the RH seal to provide a smooth surface for the LH seal bead.

6 Air to inflate the seals is supplied from the filter and moisture trap through a solenoid operated control valve. The solenoid operated control valve incorporates a pressure reducing valve, set at 18-22 psi, a non-return valve and a pressure relief and exhaust valve. Air is supplied to the seals when the control valve solenoid is energized by the closing of two micro-switches, one operated by the locking movement of each canopy locking handle. Unlocking either handle will deflate all four seals

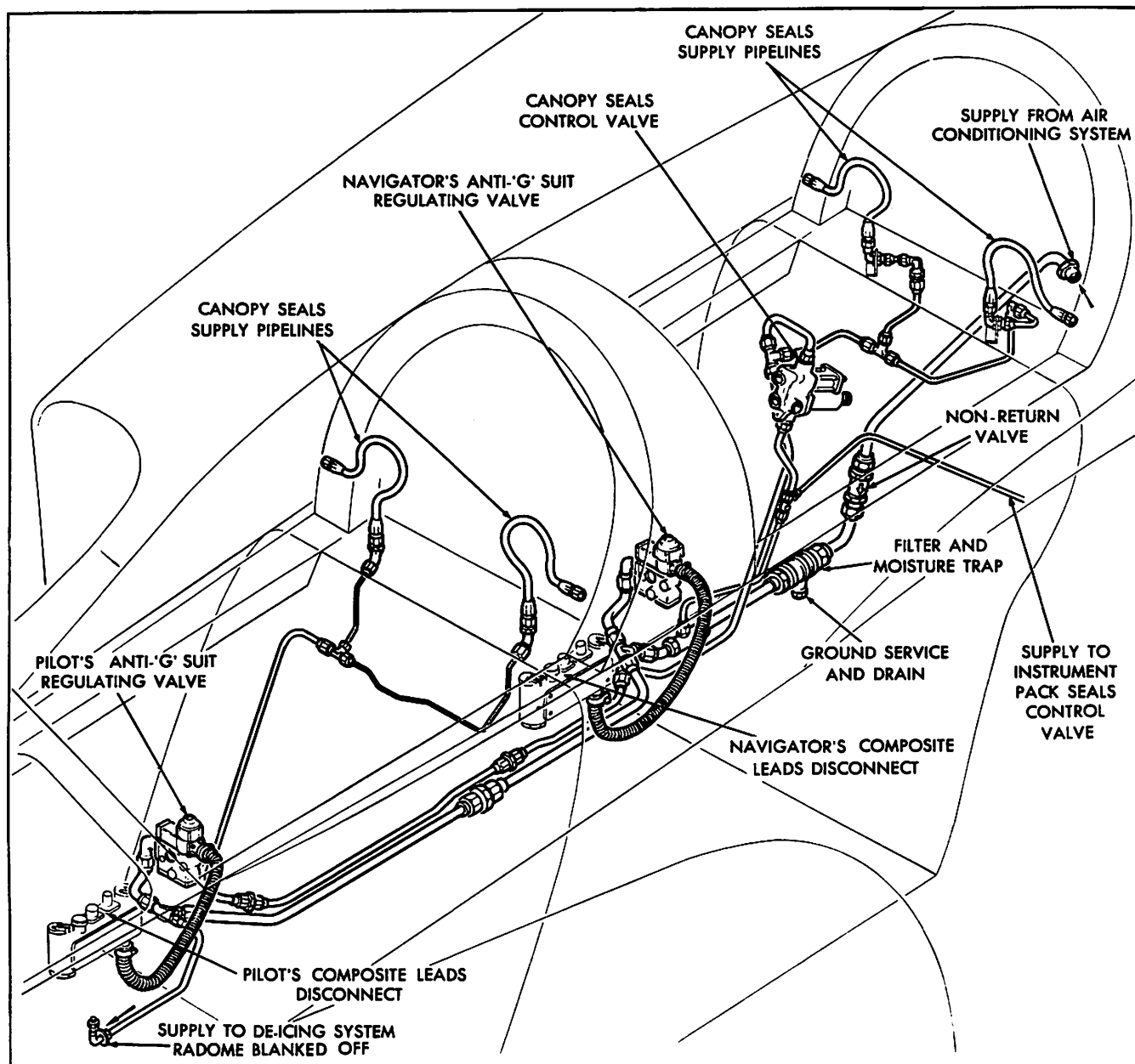


7M1-2801-3

FIG. 1 LOW PRESSURE AIR SYSTEM - SCHEMATIC

ARROW 1 SERVICE DATA

UNCLASSIFIED



7M1-2803-

FIG. 2 LOW PRESSURE AIR SYSTEM

by venting them to atmosphere. For the operation of the solenoid operated control valve see fig 6. For a description of the electrical circuit see Arrow 1 Service Data - Section 33 - Canopies - Electrics.

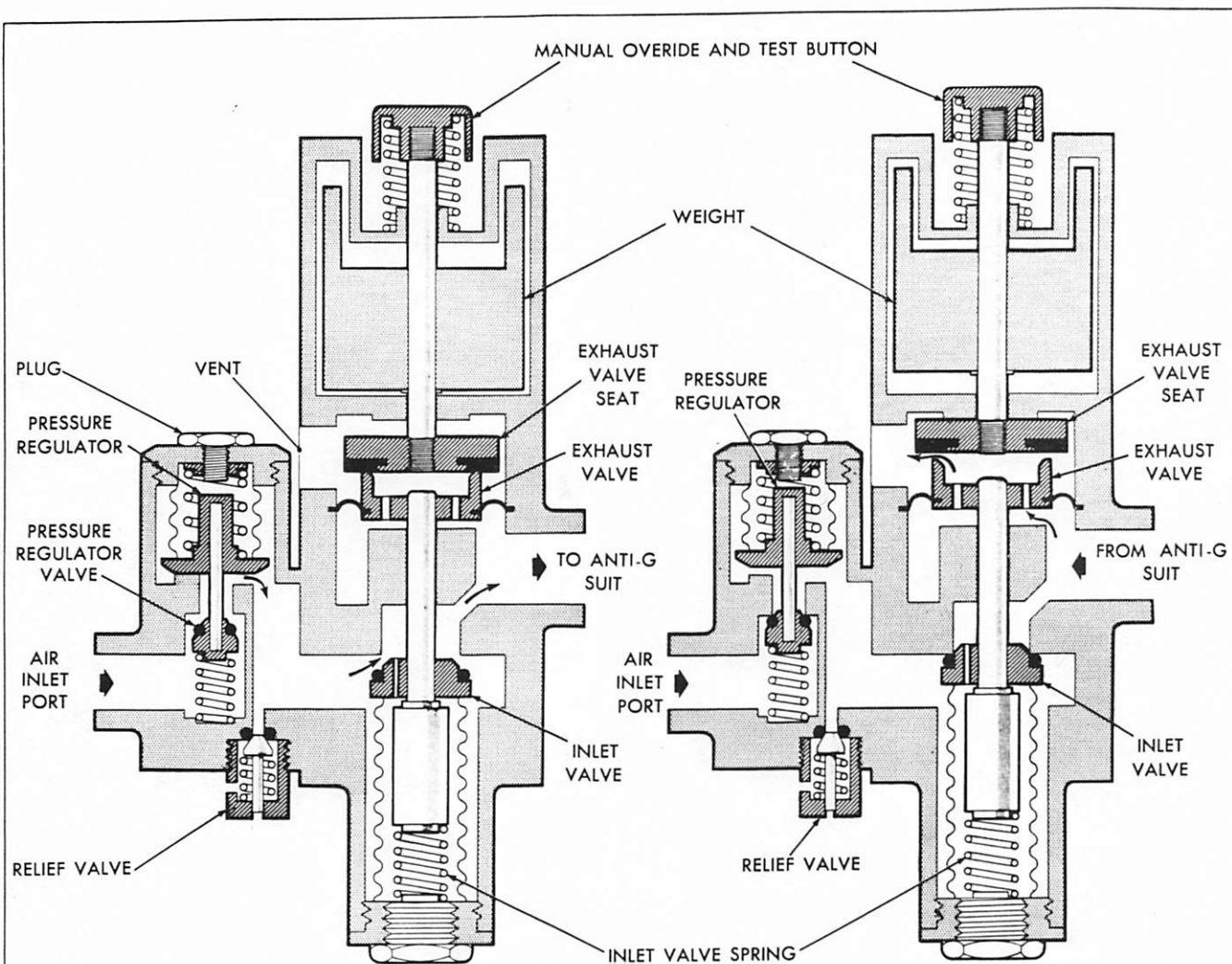
INSTRUMENT PACK SEALS

7 The instrument pack seals are designed to provide an air seal and to compensate for clearance variations between the instrument

pack and the aircraft structure, when the aircraft is subjected to varying "g" conditions during flight. See fig 7.

8 The instrument pack side seals consist of teflon-covered, rubber-padded alloy springs projecting upwards from the upper outboard edges of the instrument pack. The springs make contact with contoured faces along the lower edges of the armament bay. Inflatable

ARROW 1 SERVICE DATA

**SUIT INFLATING**

1. AIR ENTERS THE AIR INLET PORT AT A PRESSURE OF 18 TO 85 PSIG AND FLOWS PAST THE PRESSURE REGULATOR VALVE. THE PRESSURE REGULATOR IS VENTED THROUGH THE SLACK THREAD OF THE PLUG AND MAINTAINS A PRESSURE OF 9 TO 11 PSIG AT THE INLET VALVE.
2. WHEN A POSITIVE LOAD IN EXCESS OF 1.5-1.8G CAUSES THE WEIGHT TO DESCEND, THE EXHAUST VALVE CLOSSES AND FORCES THE CENTRAL ROD DOWNWARDS, OPENING THE INLET VALVE. AIR FLOWS THROUGH THE INLET VALVE TO THE ANTI-G SUIT AND TO THE UNDERSIDE OF THE EXHAUST VALVE SEAT. THE G LOAD IMPOSED ON THE WEIGHT AND THE AIR PRESSURE ACTING ON THE UNDERSIDE OF THE EXHAUST VALVE SEAT, POSITION THE INLET VALVE TO SUPPLY THE ANTI-G SUIT WITH PRESSURE IN RATIO TO THE G LOADING.

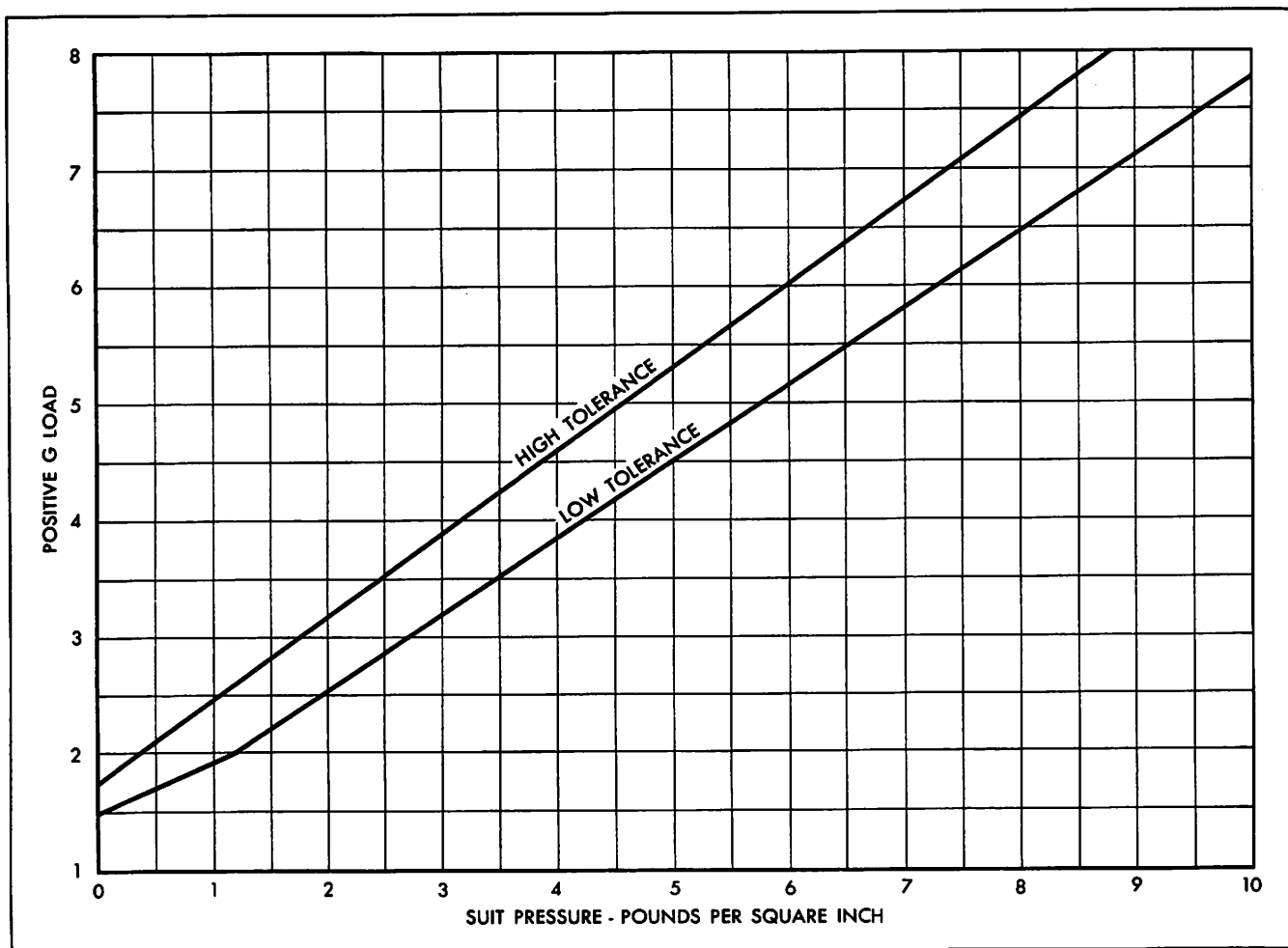
SUIT EXHAUSTING

3. WHEN THE G LOAD IS REMOVED, THE WEIGHT RISES UNDER THE ACTION OF THE INLET VALVE SPRING AND THE AIR PRESSURE ACTING ON THE UNDERSIDE OF THE EXHAUST VALVE SEAT. THIS ACTION CLOSSES THE INLET VALVE, WHICH SHUTS OFF THE AIR SUPPLY TO THE SUIT AND OPENS THE EXHAUST VALVE. THE ANTI-G SUIT IS VENTED TO ATMOSPHERE THROUGH THE OPEN EXHAUST VALVE.
4. THE RELIEF VALVE RELIEVES EXCESS PRESSURE WITHIN THE VALVE IN THE EVENT OF FAILURE OF THE PRESSURE REGULATOR.

TWI-280R-1

FIG. 3 ANTI-G SUIT REGULATING VALVE - SCHEMATIC

ARROW 1 SERVICE DATA



7M1-2809-1

FIG. 4 RATIO OF SUIT PRESSURE TO POSITIVE "G" LOADING

tubes mounted inboard of the springs inflate when the aircraft leaves the ground and maintain close contact between the springs and the contoured faces on the lower edges of the armament bay.

9 The instrument pack forward seal (see fig 8) consists of a teflon-covered, rubber-padded spring projecting aft from the lower edge of a beam at station 292 which makes contact with a contoured sealing surface on the lower front edge of the instrument pack. The seal follows the lateral contour of the lower skin at the forward end of the armament bay. An inflatable tube mounted above the seal spring inflates when the aircraft leaves the ground and maintains close contact between the seal spring and the sealing surface on the front of the instrument pack.

10 The three seals are inflated by air pressure supplied from the filter and moisture trap through a solenoid operated control valve. The two side seals receive air through a flexible hose connecting a union on the front face of the instrument pack with the solenoid operated control valve. This flexible hose is connected to the instrument pack when the pack is installed in the aircraft. The solenoid operated control valve is actuated by a micro-switch on the RH main landing gear torque link. When the weight of the aircraft is removed from the landing gear the control valve is actuated and supplies air to the instrument pack seals. For the operation of the solenoid operated control valve see fig 6. For a description of the electrical circuit see Arrow 1 Service Data - Section 18 - Air Conditioning - Electrics.

ARROW 1 SERVICE DATA

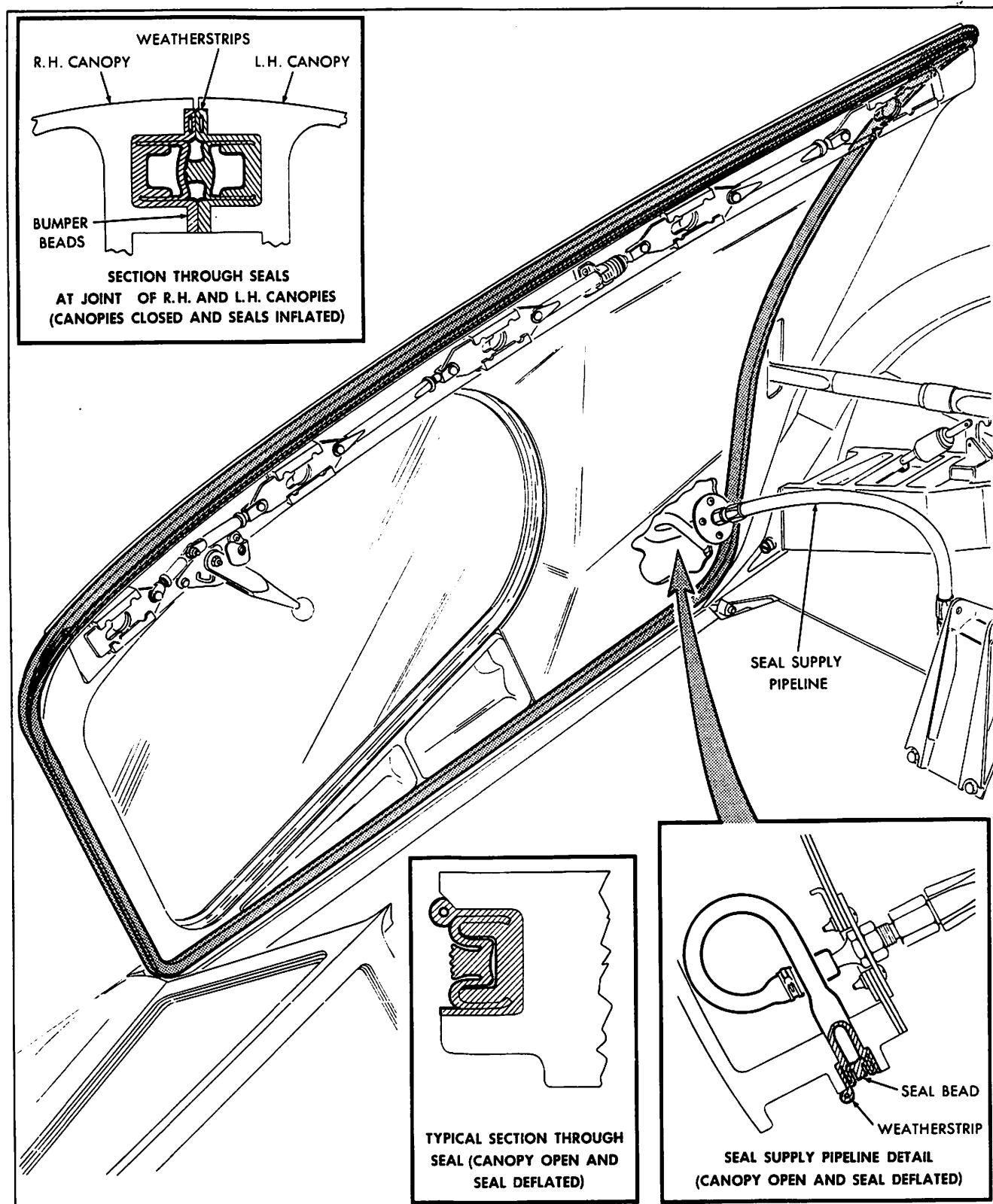
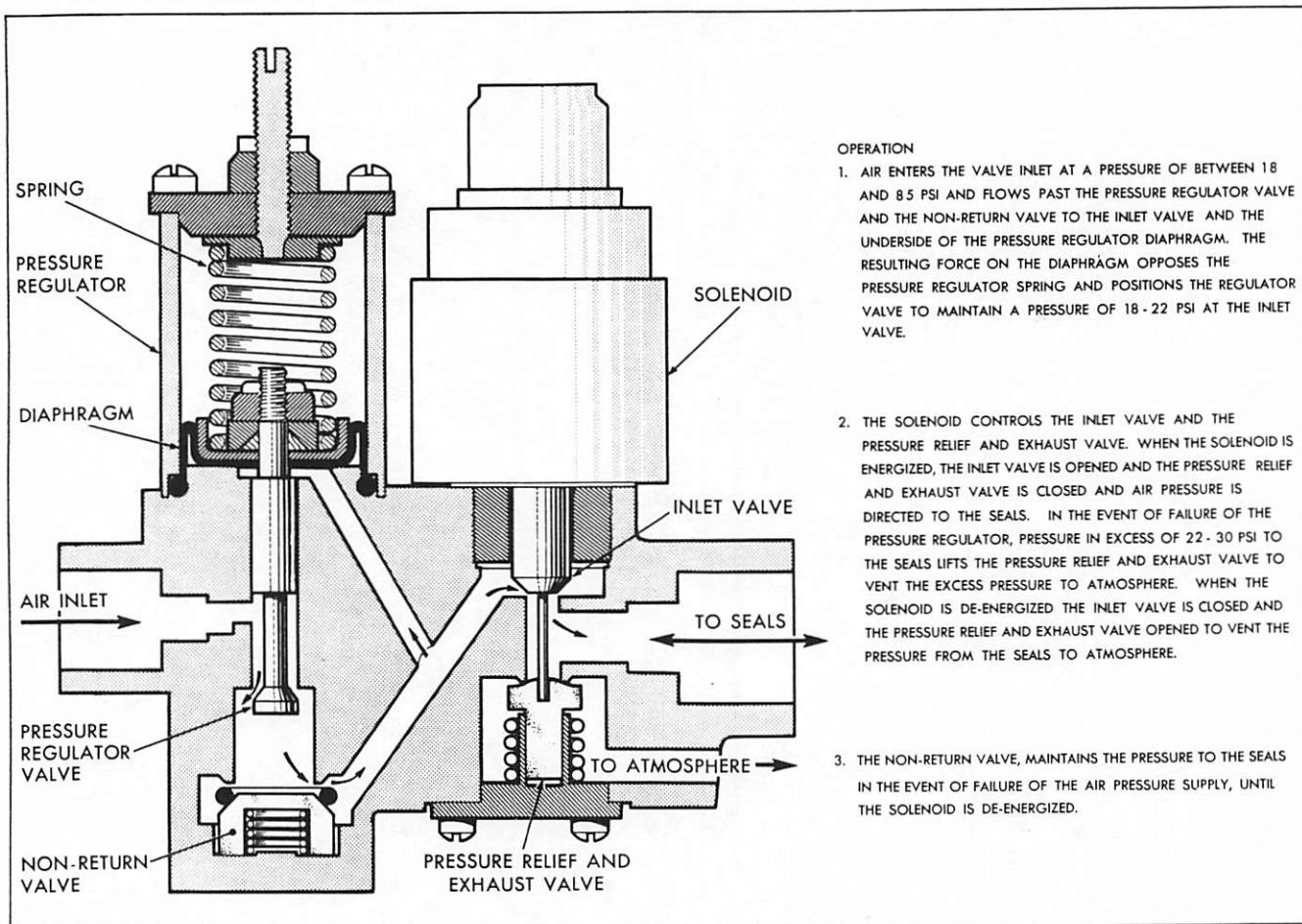


FIG. 5 CANOPY SEALS

ARROW 1 SERVICE DATA



7M1-2R05-2

FIG. 6 SOLENOID OPERATED CONTROL VALVE - SCHEMATIC

TESTING AND SERVICING

GENERAL

11 The following equipment is required to carry out the function test:

- (a) An outside source of air pressure capable of supplying 50 psi.
- (b) A pressure gauge, 0-50 psi.
- (c) Various adaptors to connect the pressure gauge into the system.
- (d) An AC electrical ground power unit.

TESTING THE NON-RETURN VALVE

12 To test the non-return valve, proceed as follows:

- (a) Remove the drain plug from the filter and connect the outside source of air pressure.
- (b) Pressurize the system to 50 psi.
- (c) Remove the pressure line from the inlet side of the non-return valve.
- (d) Use a soapy water solution to check that there is no leakage past the non-return valve.
- (e) Reconnect the pressure line to the inlet of the non-return valve.
- (f) Remove the outside source of air pressure and replace the drain plug.
- (g) Remove all soapy water solution and clean the non-return valve.

ARROW 1 SERVICE DATA

TESTING THE CANOPY SEAL CIRCUIT

13 To test the canopy seal circuit, proceed as follows:

(a) Connect the AC electrical ground power unit to the external supply connection on the aircraft.

(b) Disconnect the anti-g suits pressure line at the forward end of the tee connection to the canopy seals pressure line. Blank off the tee. See fig 2.

(c) Disconnect the instrument pack seals

pressure line at the tee connection to the canopy seals pressure line and blank off the tee. See fig 2.

(d) Disconnect the flexible hose to the rear cockpit right hand canopy seal at its connection to the canopy.

(e) Couple the 0-50 psi pressure gauge to the flexible hose, in place of the canopy seal.

(f) Remove the drain plug from the filter and connect the outside source of air pressure to the drain fitting of the filter.

(g) Switch the master electrical switch ON.

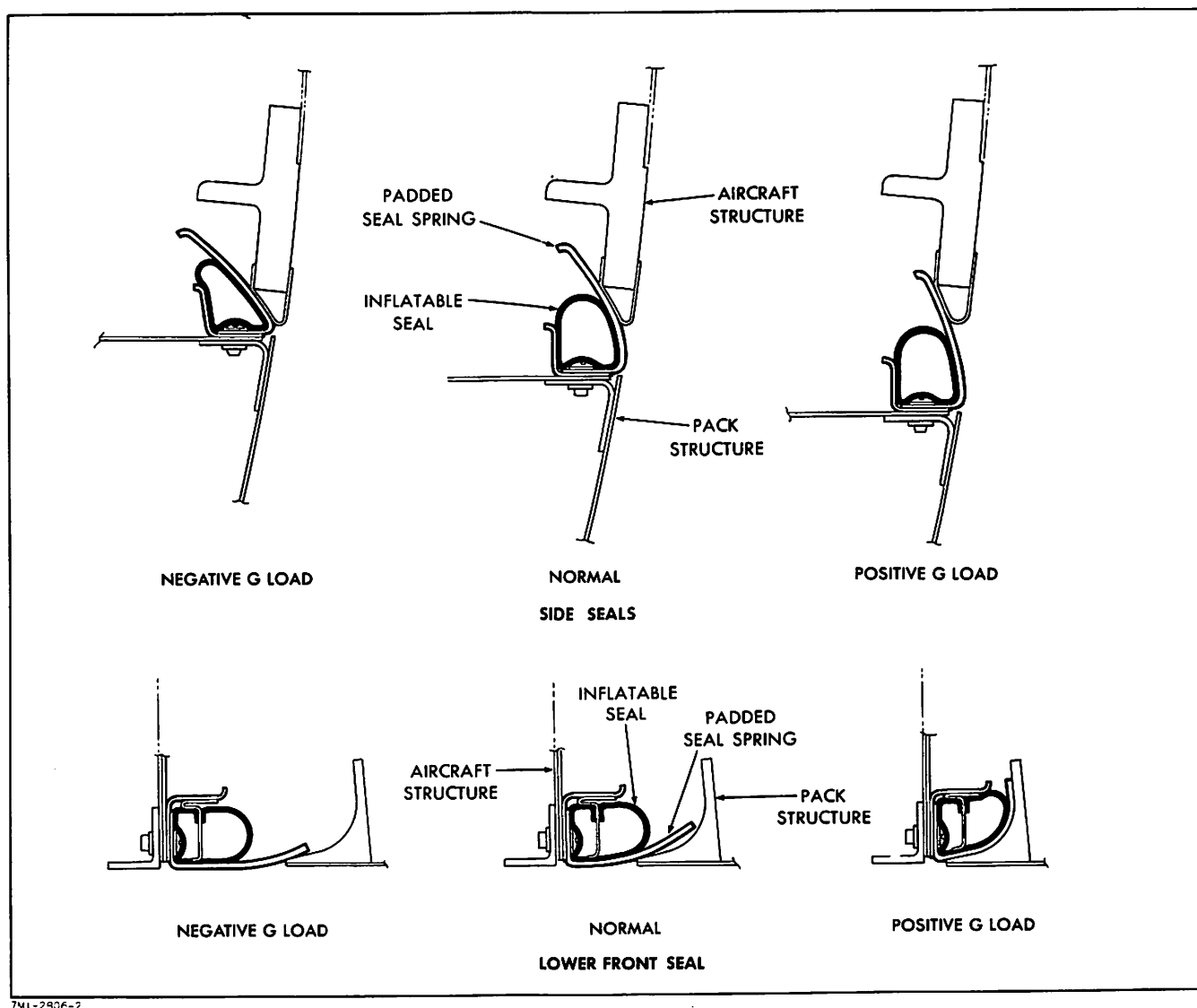


FIG. 7 OPERATION OF INSTRUMENT PACK SEALS

ARROW 1 SERVICE DATA

- (h) Close and lock both canopies.
- (j) Pressurize the system to 50 psi.
- (k) Check that the pressure gauge reads 18-22 psi. This will indicate that the pressure regulator in the control valve is functioning correctly.
- (m) Shut off the outside source of air pressure.
- (n) Check all joints in the canopy seals circuit with a soapy water solution. If any leaks are detected, correct the leak and repeat the test.
- (p) Allow the system to stand for 15 minutes and check that the pressure drop is not more than 3 psi.
- (q) If the pressure drop exceeds 3 psi proceed as follows:
 - (1) Remove the gauge and reconnect the rear cockpit right hand flexible hose.
 - (2) Pressurize the system as detailed in sub-paras (f), (g), (h) and (j) and shut off the outside source of air pressure.
 - (3) Disconnect the pressure supply line from the canopy seal control valve inlet port and connect the pressure gauge to the inlet port.
 - (4) Allow the system to stand for 15 minutes, and check the canopy seal control valve exhaust port for leakage. A pressure build up on the gauge or leakage at the exhaust port indicates malfunctioning of the canopy seal control valve. If there is no build up of pressure on the gauge, or leakage at the exhaust port, the leakage is in the canopy seals.
 - (5) Repeat the leakage test with the pressure gauge connected to each of the other three seal supply flexible hoses in turn until the leaking seal or seals are isolated.
- (r) If no leakage is detected by the test detailed in sub-para (p), proceed as follows:
 - (1) Reconnect the rear cockpit right hand

canopy seal supply flexible hose to the canopy. Disconnect any one of the other three flexible hoses and couple the gauge to the hose.

- (2) Repeat the test detailed in sub-paras (f) to (p), excluding sub-para (n). A leak rate of more than 1 psi above that occurring with the pressure gauge on the rear cockpit right hand canopy seal indicates that the rear cockpit right hand canopy seal is defective.
- (s) Exhaust the air pressure in the system by opening the canopies. Remove the pressure gauge and reconnect the flexible hose.
- (t) Switch the master electrical switch OFF, and disconnect the ground power unit.
- (u) Remove the outside source of air pressure and replace the drain plug in the hot air filter. Remove the blanking plugs and reconnect the instrument pack seals pressure line and the anti-g suits pressure line.
- (v) Remove all soapy water solution and clean the joints.

TESTING THE ANTI-G SUITS CIRCUIT

14 To test the anti-g suits circuit proceed as follows:

- (a) With a suitable adaptor, connect the pressure gauge to the anti-g suit outlet port on the rear cockpit ejection seat composite leads disconnect.
- (b) Remove the drain plug and connect the outside source of air pressure to the drain fitting of the filter.
- (c) Pressurize the system to 50 psi.
- (d) Check all joints throughout the anti-g suits system with a soapy water solution. If any leaks are detected, correct the leaks and repeat the test.
- (e) Depress the manual override on the top of the anti-g valve and check that the pressure gauge registers 8.75 to 10.5 psi.
- (f) Repeat the procedure for the front cockpit anti-g valve.

ARROW 1 SERVICE DATA

(g) Depressurize the system and remove the pressure gauge.

(h) Remove the outside source of air pressure and replace the drain plug in the filter.

(j) Remove all soapy water solution and clean the joints.

TESTING THE INSTRUMENT PACK SEALS CIRCUIT

15 To test the instrument pack seals circuit, the instrument pack must be installed in the aircraft. For details of installation and removal of the instrument pack see Arrow 1 Service Data - Section 48 - Instrument Pack.

16 To test the instrument pack seals control valve and forward seal, proceed as follows:

(a) Disconnect the flexible hose connection at the forward face of the instrument pack and connect the pressure gauge to the flexible hose.

(b) Remove the drain plug from the filter and connect the outside source of air pressure to the drain fitting of the filter.

(c) Connect the AC electrical ground power unit and switch the master electrical switch ON.

17 To energize the solenoid of the pack seals control valve it is necessary to override the RH main landing gear torque link micro-switch. This is achieved by operating the GRND TEST SAFETY OVERRIDE switch located on the refuel and test panel forward of the LH speed brake. The GRND TEST SAFETY OVERRIDE switch also energizes the fuel transfer pumps. To prevent the pumps from operating, remove the limiters numbered 27 through 32, marked TANK NO. 1 PUMP and TANK NO. 2 PUMP on panel E20 located forward of the RH speed brake. Then proceed as follows:

(a) Pressurize the circuit to 50 psi.

(b) Check that the pressure gauge reads 18-22 psi. This will indicate that the pressure regulator in the control valve is functioning correctly.

(c) Shut off the outside source of air pressure.

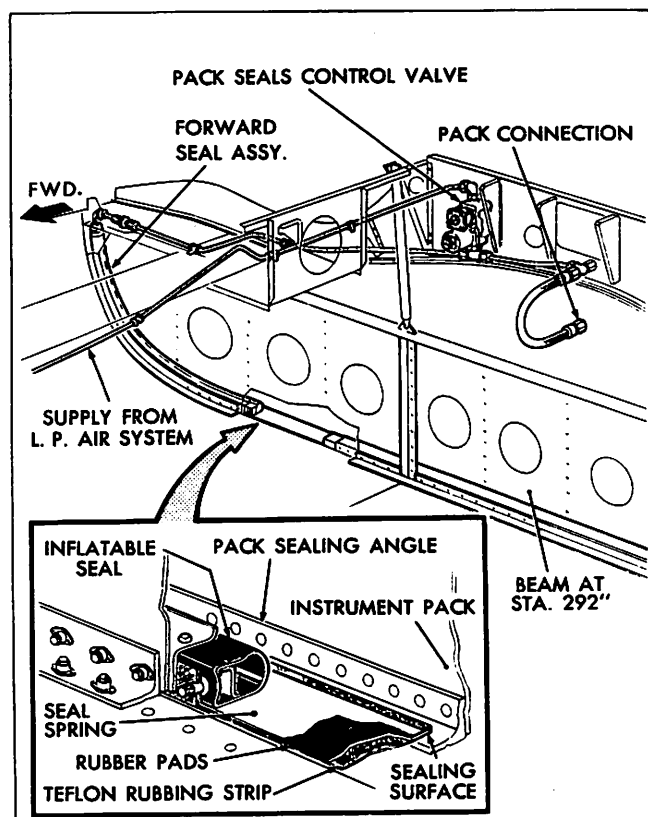
(d) Check all joints in the circuit for leaks, using a soapy water solution. If any leaks are detected, correct the leaks and repeat the test.

(e) Pressurize the system to 50 psi and shut off the outside source of air pressure.

(f) Allow the system to stand for 15 minutes and check that the pressure drop does not exceed 3 psi.

(g) If the pressure drop is more than 3 psi, remove the pressure gauge from the flexible hose and blank off the flexible hose.

(h) Repressurize the circuit to 50 psi and shut off the external source of pressure. Disconnect the pressure inlet line from the pack seals control valve.



7M1-2804-1

FIG.8 INSTRUMENT PACK FORWARD SEAL

ARROW 1 SERVICE DATA

(j) Connect the pressure gauge to the inlet port of the pack seals control valve.

(k) Allow the system to stand for 15 minutes, and check the pack seals control valve exhaust port for leakage. A build up of pressure on the gauge or leakage from the exhaust port indicates a faulty control valve. If there is no build up of pressure on the gauge, or leakage at the exhaust port, the leakage is in the forward pack seal.

(m) When the seals control valve and the forward pack seal are working correctly, remove the gauge and reconnect the pipelines.

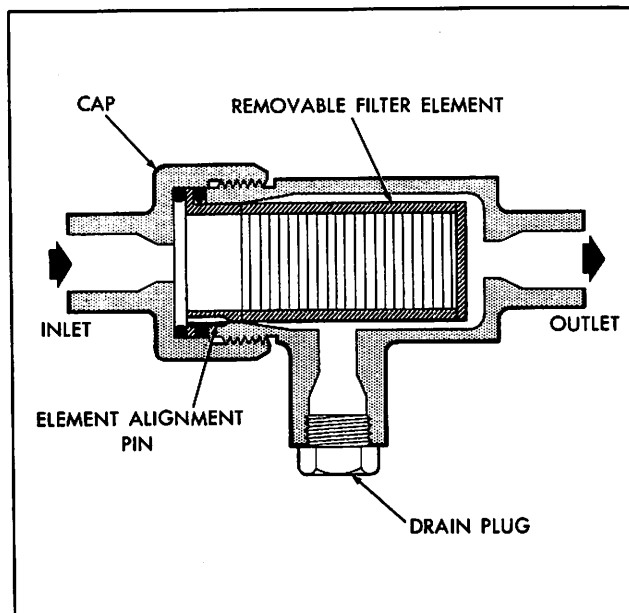
(n) Disconnect the pipeline from the pack seals control valve to the forward pack seal at the tee union on the control valve, and connect the pressure gauge to the tee union. See fig 8.

(p) Pressurize the system to 50 psi and shut off the outside air pressure supply.

(q) Allow the system to stand for 15 minutes and note that the pressure drop does not exceed 3 psi.

(r) If the pressure drop exceeds 3 psi, vent the system by switching the GRND TEST SAFETY OVERRIDE switch to NORM and remove the instrument pack. Blank off one pack seal and install the instrument pack.

(s) Repeat the pressure test to determine which pack seal is leaking.



7M1-2807-1

FIG. 9 FILTER AND MOISTURE TRAP

(t) Vent the circuit by switching the GRND TEST SAFETY OVERRIDE switch to NORM. Switch the master electrical switch to OFF. Disconnect the electrical ground power unit.

(u) Remove the outside source of air pressure and replace the drain plug in the drain fitting.

(v) Remove the pressure gauge and reconnect the pipeline to the pack seals control valve.

(w) Remove all soapy water solution and clean the joints.

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Filter and Moisture Trap	REF. NO. 18
AVRO PART NO. 7-1852-13	MANUFACTURER Aircraft Porous Media Inc.		MAN'FR'S PART NO. ACG 21-2	AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 Hours	
FUNCTION To remove impurities and moisture from air supply.					
LOCATION Sta. 245.0 aft of Navigator's bulkhead.					
ACCESS Remove equipment access panel between stations 224.0 and 255.0 (76 x 3/16 inch screws). Disconnect antenna attached to panel.					MEN X MINUTES
REPLACEMENT PROCEDURE Place clamp on filter. Place filter in position. Insert 3/16 inch screw in clamp. Connect two 5/8 inch diameter pipe connections.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Remove drain plug, bleed water and remove sediment.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Valve - Canopy Seal Control		REF. NO. 18	
AVRO PART NO. 7-1852-14		MANUFACTURER Surface Combustion		MAN'FR'S PART NO. 30 C 98		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN-				ESTIMATED- 1500 Hours			
FUNCTION To reduce and control electrically, supply of air to inflate canopy seals.							
LOCATION Aft face Navigator's bulkhead.							
ACCESS Remove equipment access panel under fuselage between Sta. 224.0 and 255.0 by removing 76 x 3/16 inch screws. Disconnect antenna attached to panel. Remove H. P. nitrogen storage bottle.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place valve in position. Insert three attachment bolts. Connect two pipelines. Connect one electrical connector.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Check for security, damage and corrosion.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
Compressed air unit.		
Pressure gauge, 0-50 psi.		
AC Electrical ground power unit.		
Cockpit access stand.		
B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Valve - anti-g suits Regulating		REF. NO. 18	
AVRO PART NO. 7-1852-12		MANUFACTURER Alar Products Inc.		MAN'FR'S PART NO. 5503		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 Hours			
FUNCTION To admit air to the Pilot's and Navigator's anti-g suits at the proper pressure according to varying degrees of positive normal acceleration.							
LOCATION Forward face of Pilot's and Navigator's seat bulkhead.							
ACCESS Accessible on forward face of Pilot's and Navigator's bulkhead in cockpits.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place in position on mounting bracket. Insert three mounting bolts. Connect two pipe lines.						MEN X MINUTES	

CONFIDENTIAL

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Check for security, damage and cleanliness.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
Compressed air unit. Cockpit access stand. Pressure gauge, 0-50 psi.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Seal - Canopy LH Pilot's		REF. NO. 18	
AVRO PART NO. 7-1053-101		MANUFACTURER B. F. Goodrich Co.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION Forms an airtight seal around canopy sections when canopy is closed and seals are inflated with air.							
LOCATION LH Pilot's canopy.							
ACCESS Accessible when canopy is open.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place seal in groove in canopy. Connect seal hose to adaptor. Attach canopy seal hose adaptor plate to canopy with four screws. Connect supply hose to adaptor.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for signs of wear, check for security.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Compressed air unit. Cockpit access stand. Pressure gauge 0-50 psi. B.4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Seal - Canopy RH Pilot's	REF. NO. 18
AVRO PART NO. 7-1053-102		MANUFACTURER B. F. Goodrich Co.		MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE:		KNOWN-		ESTIMATED-	
FUNCTION Forms an airtight seal around canopy sections, when canopy is closed and seals are inflated with air.					
LOCATION RH Pilot's canopy.					
ACCESS Accessible when canopy is open.					MEN X MINUTES
REPLACEMENT PROCEDURE Place seal in groove in canopy. Connect seal hose to adaptor. Attach canopy seal hose adaptor plate to canopy with four screws. Connect supply hose to adaptor.					MEN X MINUTES

ARROW 1 SERVICE DATA

INSPECTION Check for signs of wear, check for security.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Compressed air unit. Cockpit access stand. Pressure gauge, 0-50 psi. B.4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Seal - Canopy LH Navigator's		REF. NO. 18	
AVRO PART NO. 7-1053-121		MANUFACTURER B. F. Goodrich Co.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION Forms an airtight seal around canopy section, when canopy is closed and seal is inflated with air.							
LOCATION LH Navigator's canopy.							
ACCESS Accessible when canopy is open.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place seal in groove in canopy. Connect seal hose to adaptor. Attach canopy seal hose adaptor plate to canopy with four screws. Connect supply hose to adaptor.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for signs of wear, check for security.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Compressed air unit. Cockpit access stand. Pressure gauge, 0-50 psi. B.4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Seal - Canopy RH Navigator's		REF. NO. 18	
AVRO PART NO. 7-1053-122		MANUFACTURER B. F. Goodrich Co.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION Forms an airtight seal around canopy section when canopy is closed and seal is inflated with air.							
LOCATION RH Navigator's Canopy.							
ACCESS Accessible when canopy is open.						MEN X MINUTES	
REPLACEMENT PROCEDURE Place seal in groove around canopy. Connect seal hose to adaptor. Attach canopy seal hose adaptor plate to canopy with four screws. Connect supply hose to adaptor.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for signs of wear, check for security.	MEN X MINUTES	
FUNCTIONAL CHECKS		MEN X MINUTES
GROUND HANDLING AND GROUND TEST EQUIPMENT Compressed air unit. Cockpit access stand. Pressure gauge, 0-50 psi. B.4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Valve - Non-return		REF. NO. 18	
AVRO PART NO.		MANUFACTURER Parker Aircraft Co.		MAN'FR'S PART NO. 111-565122		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 Hours			
FUNCTION To prevent a feed back of air pressure to the air conditioning system.							
LOCATION Aft of navigator's cockpit at station 255.							
ACCESS Remove equipment access panel at station 224-255 76 x 3/16 inch screws. Disconnect antenna attached to panel.						MEN X MINUTES	
REPLACEMENT PROCEDURE Hold valve in position and connect 2 5/8 inch pipelines. (Check flow direction of valve).						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check valve for security and general condition.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Compressed air unit. B. 4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Valve- Instrument Pack Seal Control		REF. NO. 18	
AVRO PART NO. 7-1852-14		MANUFACTURER Surface Combustion		MAN'FR'S PART NO. 30 C 98		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 Hours			
FUNCTION To reduce and control electrically the supply of air to the instrument pack seals.							
LOCATION Forward face of beam at station 296.							
ACCESS Open electronics access door, 33 Camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Attach valve to beam with 3 bolts. Connect 3 pipelines to valve. Connect electrical connector to receptacle on valve.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Check valve for security, damage and corrosion.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
Compressed air unit. AC Electrical ground power unit. Pressure gauge, 0-50 psi. B.4 access stand		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

UNCLASSIFIED

SYSTEM LOW PRESSURE AIR		SUB-SYSTEM		COMPONENT Seal - Instrument Pack, Forward		REF. NO. 18	
AVRO PART NO. 7-1854-21		MANUFACTURER B. F. Goodrich Co.		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION To provide a seal between the armament bay and instrument pack.							
LOCATION Lower rear face of beam at Sta. 292.							
ACCESS Accessible when instrument pack is removed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Attach seal to beam (approximately 130 rivets). Connect seal to 2 end fittings (2 clamps). (Use adhesive EC-1300L to cement seal to end fittings).						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION	MEN X MINUTES	
Check seal visually for damage and security. Carry out pressure check.		
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT		
Compressed air unit. Pressure gauge, 0-50 psi. B.4 access stand. Electrical ground power unit.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

SECTION 20

UTILITY HYDRAULICS

POWER CIRCUIT

(This data supersedes previous issue dated 28 Nov 56)

1 NOV 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

UTILITY HYDRAULICS POWER CIRCUIT

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Engine Driven Pumps	1
Pressure Regulator	1
Surge Damping Accumulator	2
Pressure Filter	4
System Accumulator	4
Pressure Control Valve	4
Emergency Brake Accumulators	4
Compensator	4
Return Filter	6
Fluid Temperature Control	7
By-Pass Control Valve	7
Thermal By-pass Valve	7
Oil-to-air Heat Exchanger	7
Oil-to-fuel Heat Exchangers	7
Low Fluid Temperature	7
Intermediate Fluid Temperature	8
High Fluid Temperature	8
System Pressure Relief Valve	8
Manual Dump Valve	8
Ground Test Connections	8
Self-sealing Couplings	8
Temperature Gauge	8
Pressure Switches	8
Pressure Gauges	10
Emergency AC Power Supply Unit	10
TESTING AND SERVICING	
General	10
Hydraulic Test Stand	10
Operation of the Test Stand	12
Accumulator Charging	13
Checking the Accumulators for Leaks	13
Surge Damping Accumulator Charging	14
Priming the Power Circuit	14
Topping up the Utility Hydraulic System	15
Topping up the Compensator with Accumulators Hydraulically Discharged	16
Topping up the Compensator with Accumulators Hydraulically Charged	16
EQUIPMENT LIST	17

ARROW 1 SERVICE DATA

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Power Circuit - Schematic	iii
2	Power Circuit - Component Layout	2
3	Pressure Regulator	3
4	Pressure Control Valve	5
5	Compensator	6
6	Fluid Temperature Control Circuit	9

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The utility hydraulic power circuit supplies fluid to the landing gear, speed brakes, wheel brakes and nose wheel steering circuits at a pressure of 4000 psi. It also supplies fluid to the wheel brakes emergency circuit and the compensators of the power circuit and flying controls hydraulic systems at a reduced pressure of 1500 psi. The return side of the utility hydraulic system is maintained at a pressure of 90 psi by a compensator in the power circuit.

2 From the compensator, fluid is supplied to two engine driven pumps at a pressure of 90 psi. The pumps discharge the fluid through a pressure regulator to a pressure filter. Downstream of the filter the fluid pressurizes a system accumulator and is also directed through a pressure control valve to pressurize two emergency brake accumulators. The pressure control valve reduces the system pressure to 1500 psi for the emergency wheel brakes circuit, the power circuit compensator and the flying control hydraulics compensators.

3 When the pressure in the system reaches 4200 psi the pressure regulator functions to pass the excess fluid from the pumps through a by-pass control valve to return. The return line between the pressure regulator and the by-pass control valve incorporates a surge damping accumulator. A fluid temperature control circuit regulates the fluid temperature in the power circuit so that the maximum fluid temperature at the engine driven pump inlet ports does not exceed 230°F. The fluid temperature control circuit consists of the by-pass control valve, a thermal by-pass valve, an oil-to-air heat exchanger and two interconnected oil-to-fuel heat exchangers. See para 24.

4 The fluid returning from the utility hydraulics sub-systems passes directly through the return filter to the compensator which acts as a reservoir for the fluid and also pressurizes the return side of the system to 90 psi. See para 18.

5 The power circuit also incorporates a pressure relief valve, various pressure switches and gauges together with a manual dump valve, two self-sealing couplings and two ground test connections.

6 The utility hydraulic system can be operated through temperatures ranging from -65°F (-54°C) to 250°F (121°C) with local hot spots reaching 275°F (135°C). The maximum temperature in the system is controlled by heat exchangers.

7 All pipeline connections are of the flareless type, the fatigue characteristics of which are superior to the flared type of fittings. Stainless steel pipelines incorporating swivel and expanding joints are used to allow for movement of the components and to compensate for temperature variations. No flexible hoses are used in the pressure side of the system.

ENGINE DRIVEN PUMPS

8 The two engine driven pumps are of the constant delivery type. One pump is mounted on the forward face of each engine driven accessories gearbox in the engine bay.

9 Each pump is connected to the accessories gearbox drive by a coupling shaft which in turn is connected to a drive shaft in the pump. The drive shaft is mounted in a bearing assembly within the pump housing and its inner end is connected with nine connecting rods and pistons housed within a cylinder block. The cylinder block and piston assembly are inclined at 30° to the drive shaft to provide the pumping action. The top of the cylinder block accommodates an adaptor with an inlet and a delivery port.

10 Fluid enters the inlet port of each pump from the compensator at a pressure of 90 psi and after passing into the cylinder block is discharged by the pistons, at high pressure, through the delivery port to the pressure regulator.

PRESSURE REGULATOR (Fig 3)

11 The pressure regulator is mounted in the engine bay at Station 591 and performs the following functions:

ARROW 1 SERVICE DATA

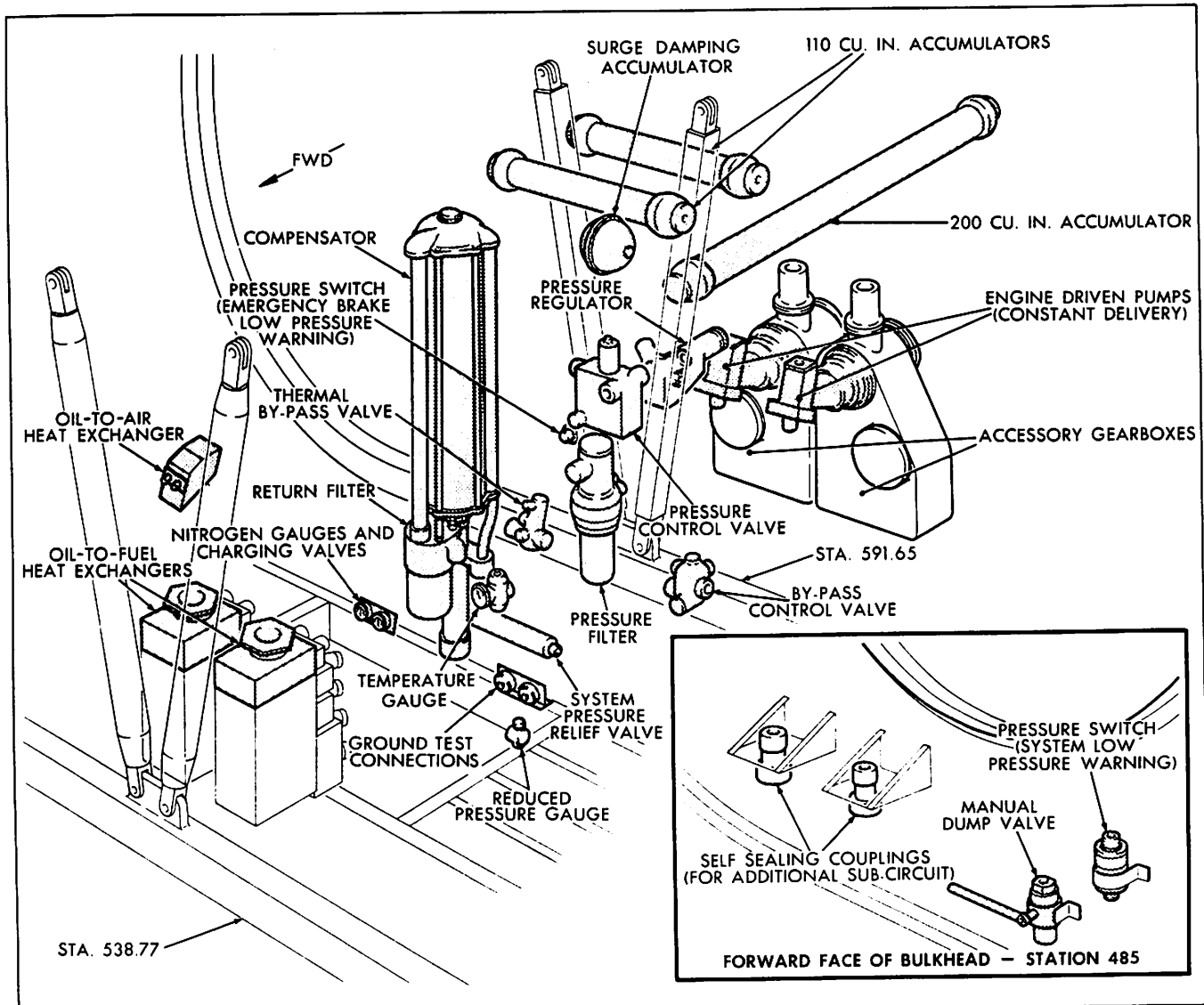


FIG.2 POWER CIRCUIT COMPONENT LAYOUT

(a) Regulates the hydraulic pressure in utility hydraulic system and by-passes the fluid to return, when the system pressure reaches 4200 psi. The regulator is set above the system working pressure of 4000 psi to compensate for pressure losses occurring in the system during the operation of the components.

(b) Reduces the output pressure of the engine driven pumps to 350 psi when the various circuits are inoperative. This relieves the pumps of continuous high pressure and minimizes heat generation.

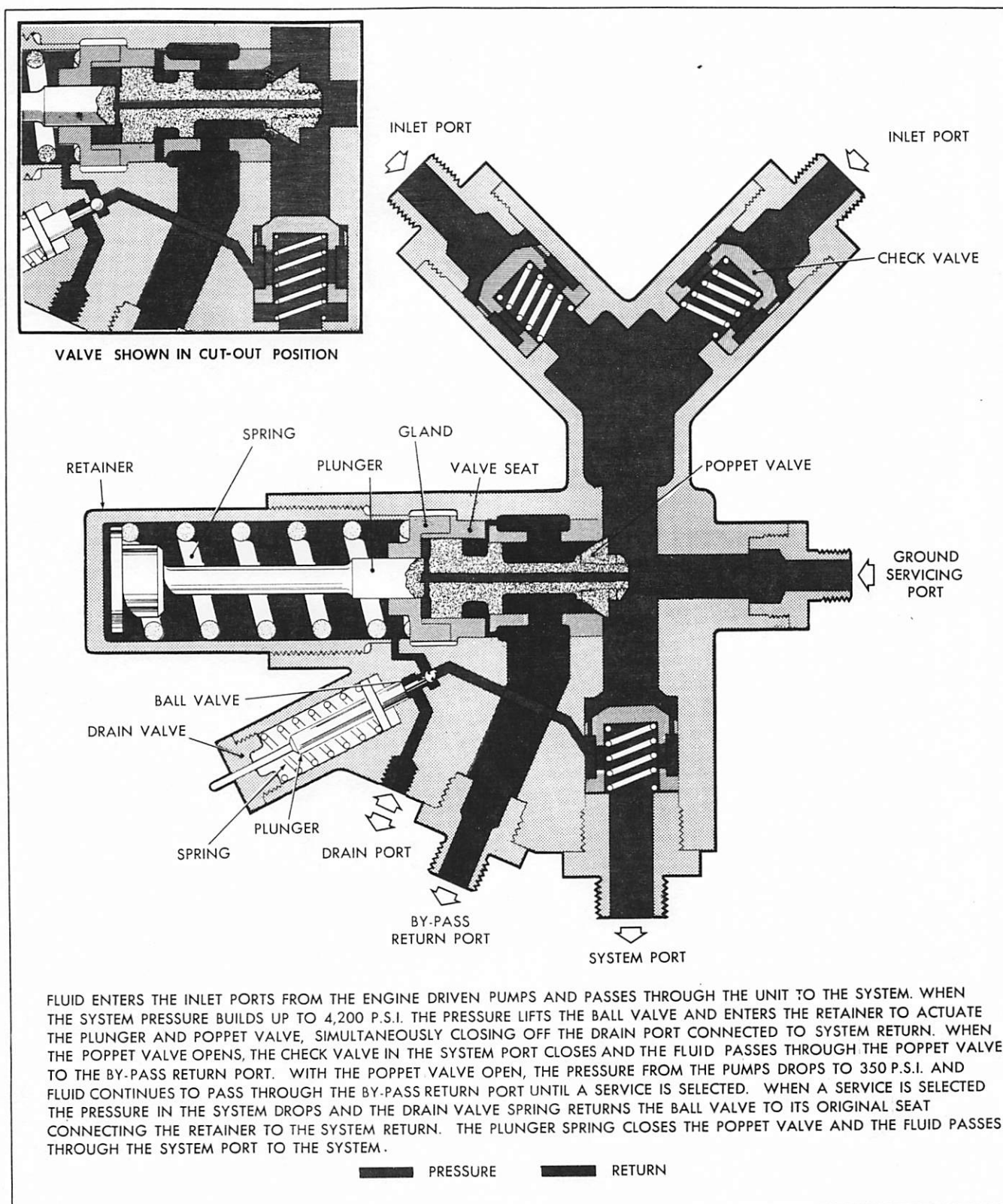
(c) Cuts in to supply fluid to the system when pressure downstream of the system pressure port drops to 350 psi below the cut-out pressure.

(d) Isolates the pumps when the hydraulic test stand is connected to the ground test connections or when failure of the engine driven pumps occurs.

SURGE DAMPING ACCUMULATOR

12 A surge damping accumulator is mounted on the front of the 'V'-strut at Station 591 and

ARROW 1 SERVICE DATA



7142-3406-1

FIG. 3 PRESSURE REGULATOR

ARROW 1 SERVICE DATA

is located in the return line between the pressure regulator and the by-pass control valve. This accumulator damps out pressure surges created in the return line when the pressure regulator cycles. The spherical accumulator houses a corrugated diaphragm, one side of which is connected to return and the other charged with nitrogen to an initial pressure of 125 psi. A nitrogen charging valve for the unit is located at the bottom of the 'V'-strut.

PRESSURE FILTER

13 The pressure filter is mounted below the pressure control valve on the 'V'-strut at Station 591 in the duct bay and is located in the pressure line downstream of the pressure regulator.

14 The filter has a rated flow of 33 gpm (40 U.S.) and consists of a head, a bowl and a filter element. The head incorporates a by-pass valve and two cut-off valves. The by-pass valve opens, when a pressure differential of 45-55 psi occurs between the filter inlet and outlet, to allow the fluid to by-pass the element. This would occur if the element became blocked. The cut-off valves seal the inlet and outlet ports and prevent loss of fluid when the bowl is unscrewed from the head. The filter element is housed within the bowl and is located by a retaining ring.

SYSTEM ACCUMULATOR

15 The 200 cu. in. system accumulator is mounted between Station 591 and 644 and is located in the circuit downstream of the pressure filter. This accumulator stores and stabilizes the system main pressure and prevents excessive cycling of the pressure regulator. It is of the floating piston type and is charged with nitrogen to an initial pressure of approximately 3000 psi. When the system is in operation it is charged hydraulically by the engine driven pumps to a pressure of 4000 psi. A combined nitrogen charging valve and pressure gauge for the accumulator is located at Station 572 and is accessible through the hydraulic equipment access panel.

PRESSURE CONTROL VALVE (Fig 4)

16 The pressure control valve is mounted on the 'V'-strut in the duct bay at Station 591

and is located in the pressure line to the sub-systems. The control valve performs the following functions:

- (a) Relieves excess system pressure into the return line through a service pressure relief valve. This valve operates in conjunction with a system pressure relief valve in the event of pressure regulator failure.
- (b) Reduces the system pressure to 1500 psi for the reduced pressure lines to the emergency wheel brakes circuit and the compensators of the power circuit and flying controls hydraulic systems.
- (c) Relieves excess pressure in the reduced pressure lines through a reduced pressure relief valve.
- (d) Prevents the pressure from the two emergency brake accumulators from discharging into the main pressure supply line by means of a check valve fitted in the system pressure port of the control valve.

EMERGENCY BRAKE ACCUMULATORS

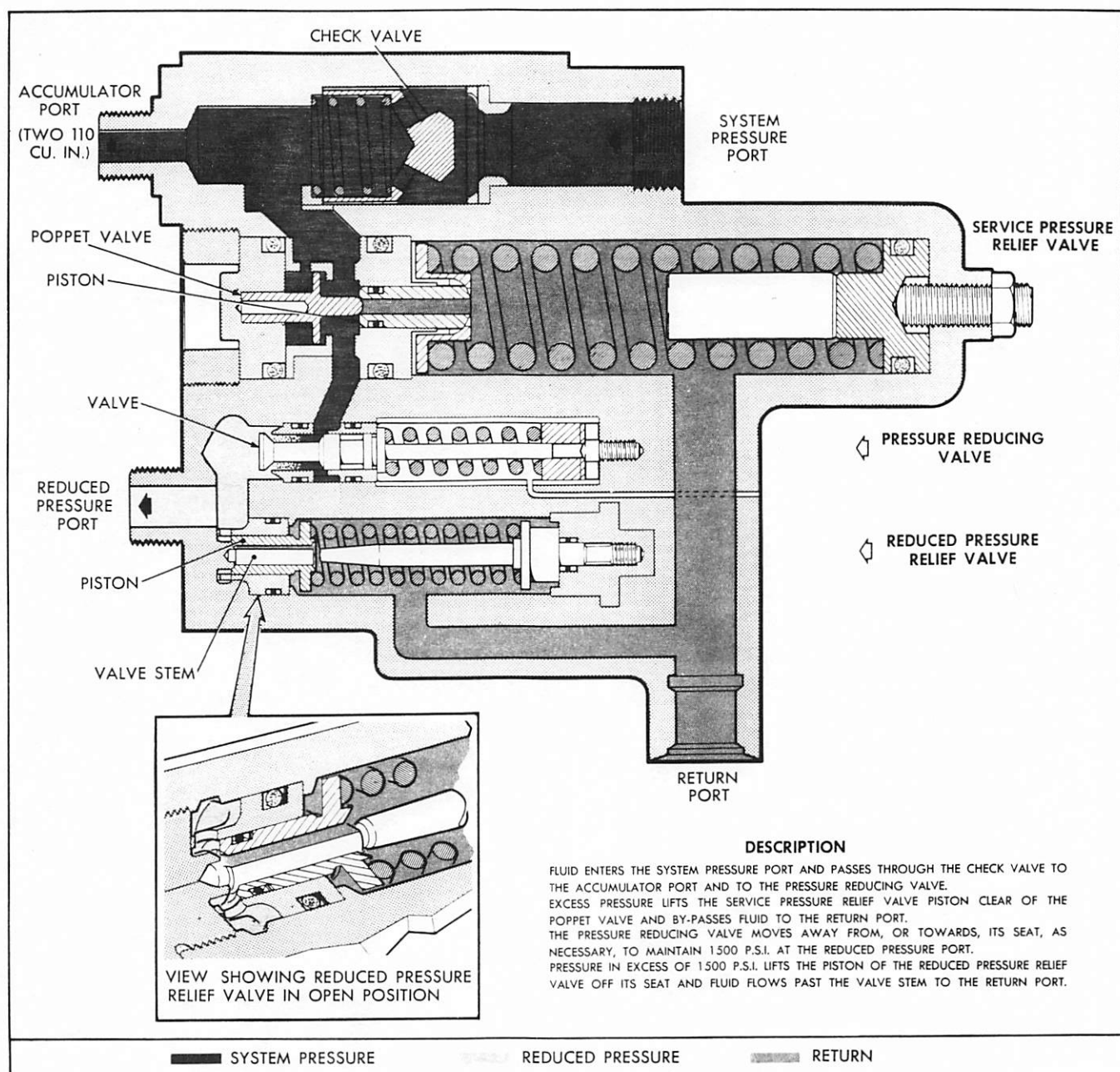
17 Two emergency brake accumulators are located at the front and rear of the 'V'-strut in the duct bay at Station 591 and provide a reserve supply of pressure for the emergency wheel brakes circuit, when the engine driven pumps are inoperative. These accumulators are of the floating piston type and are charged with nitrogen to an initial pressure of approximately 1500 psi. When the system is in operation they are charged hydraulically by the engine driven pumps to 4000 psi. A combined nitrogen charging valve and pressure gauge for both accumulators is located at Station 572 and is accessible through the hydraulic equipment access panel.

COMPENSATOR (Fig 5)

18 The compensator is located in the duct bay at Station 575 and performs the following functions:

- (a) Acts as a reservoir of variable volume compensating for the fluid requirements of the various components during their operation and for absorbing volumetric changes in the fluid due to temperature variation.

ARROW 1 SERVICE DATA



7M1-2004-2

FIG. 4 PRESSURE CONTROL VALVE

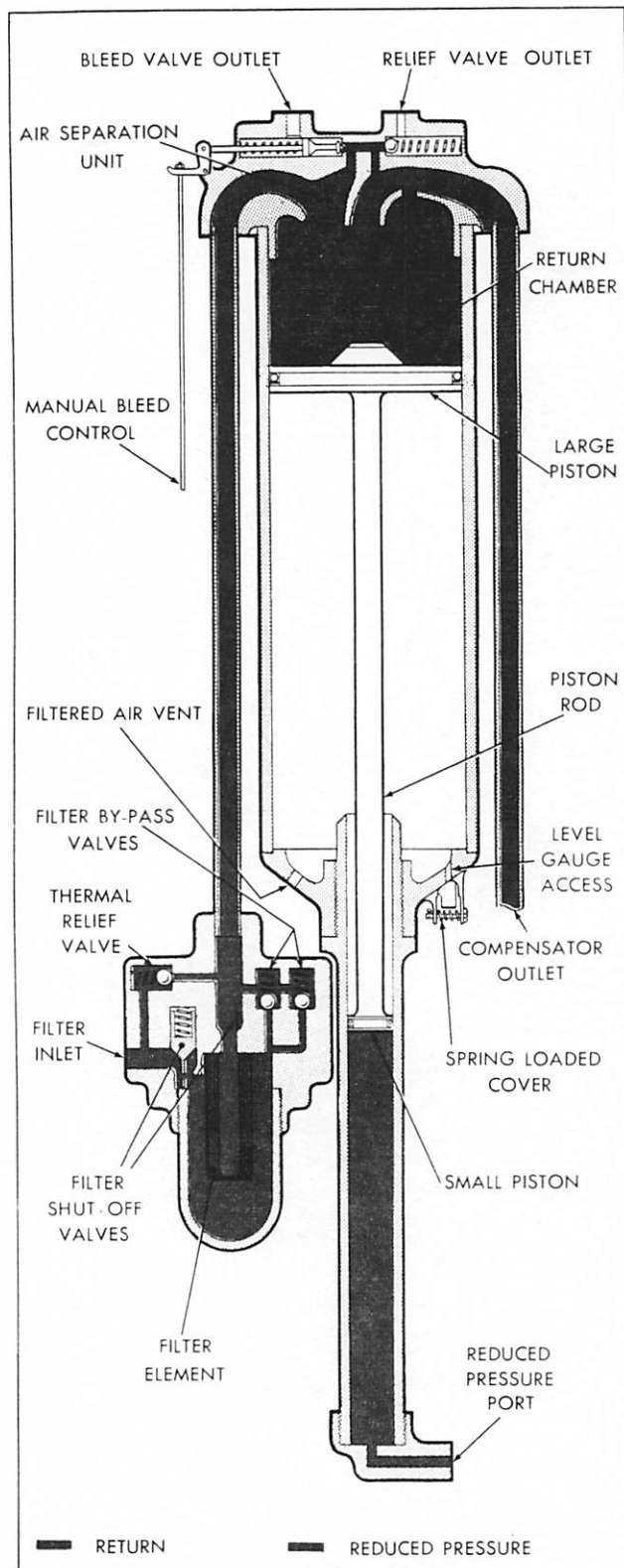
(b) Maintains a steady pressure of 90 psi on the return side of the utility hydraulic system to ensure a constant supply of fluid to the engine driven pumps.

(c) Maintains a static pressure of 90 psi over the return circuit when the two emergency brake accumulators are sufficiently charged and the engine driven pumps are inoperative.

(d) Provides a means of trapping air and bleeding it from the system through an air separation unit and a manually operated bleed valve located in the head of the compensator.

19 The single pressurized compensator replaces the conventional reservoir. The unit consists of two vertically opposed pistons connected by a common piston rod. The effective

ARROW 1 SERVICE DATA



7H1-2005-2

FIG. 5 COMPENSATOR

area of the lower and smaller piston is 6% of that of the upper and larger piston. Hydraulic fluid at 1500 psi, from the pressure control valve, acts on the underside of the small piston and produces an opposing pressure of 90 psi on the fluid in the upper section of the compensator. This pressure is also maintained, when the engine driven pumps are not operating, by the emergency brake accumulators provided these are sufficiently charged.

20 During the operation of the sub-systems in the utility hydraulic system, movement of the pistons compensates for volumetric changes occurring in the return fluid due to operation of the hydraulic components and variation in fluid temperature.

21 The head of the compensator incorporates an air separation unit consisting of a relief valve and a manually operated bleed valve. The relief valve relieves any excess fluid should the system be overfilled. The bleed valve permits air which has accumulated in the air separation unit to be bled off into the aircraft overboard drain line during ground servicing. The bleed valve is operated by a spring-loaded rod on the side of the compensator. A sight gauge in the overboard drain line provides a visual check to ensure that all air is dispelled from the compensator.

22 During ground servicing the fluid content of the compensator is determined by measuring the position of the larger piston. This is achieved by inserting a compensator level gauge through a hole in the lower end cap. The level gauge is calibrated in °F and is used in conjunction with a temperature gauge installed on the return line to the compensator. See para 43.

RETURN FILTER (Fig 5)

23 The return filter is mounted on the compensator and consists of a filter head, a bowl and a filter element. The filter head incorporates two by-pass valves and two cut-off valves. The by-pass valves allow the fluid to by-pass the element if it becomes blocked. The cut-off valves seal the inlet and outlet ports and prevent loss of fluid when the bowl is unscrewed from the head. The filter element is housed within the bowl and is located by a retaining ring.

ARROW 1 SERVICE DATA

FLUID TEMPERATURE CONTROL (Fig 6)

24 The greater part of the aircraft flying time is spent with the various sub-systems of the utility hydraulics inoperative. In order to minimize the heat generated within the power circuit during these periods, a fluid temperature control circuit is installed between the pressure regulator and the return filter. This circuit restricts the fluid temperature at the engine driven pump inlet ports to a maximum of 230°F (110°C).

25 The components of the fluid temperature control circuit consist of a by-pass control valve, a thermal by-pass valve, an oil-to-air heat exchanger and two interconnected oil-to-fuel heat exchangers.

BY-PASS CONTROL VALVE (Fig 6)

26 The by-pass control valve is located in the duct bay at Station 591 and incorporates two poppet valves, one of which is thermostatically operated.

27 The control valve has four ports consisting of an inlet port and three outlets. The inlet port is connected to the return port of the pressure regulator. One outlet is connected to the inlet side of the engine driven pumps, another to the oil-to-air heat exchanger and the third to the thermal by-pass valve.

28 The thermostatic element within the unit contacts a valve stem having an integral poppet valve located mid-way along the stem. The opposite end of the stem locates in a recess in the valve housing and carries a spring-loaded flow divider poppet valve. This valve is free to slide along the valve stem and is spring-loaded by a spring fitted between the flow divider poppet valve and the integral poppet valve.

THERMAL BY-PASS VALVE (Fig 6)

29 The thermal by-pass valve located in the duct bay at Station 591 incorporates two poppet valves, one of which is thermostatically operated.

30 The by-pass valve has five ports comprising an inlet from the by-pass control valve, an inlet from the oil-to-air heat exchanger, an outlet into the return line to the compensator, an outlet from the oil-to-fuel heat exchangers and an inlet to the oil-to-fuel heat exchangers.

31 The thermostatic element within the unit incorporates an integral poppet valve. When the element expands this poppet valve contacts the stem of another poppet valve which is spring-loaded by a spring fitted between the back of the valve and the valve body. The element is located in a mixing chamber within the valve body. The mixing chamber mixes the fluids, entering at varying temperatures, before passing it through a check valve in the outlet port located adjacent to the chamber.

OIL-TO-AIR HEAT EXCHANGER

32 An oil-to-air heat exchanger installed below the RH engine air intake provides cooling for the hydraulic oil. The heat exchanger is located in the system between the by-pass control valve and the thermal by-pass valve.

OIL-TO-FUEL HEAT EXCHANGERS

33 Two oil-to-fuel heat exchangers located in the equipment bay provide additional cooling for the hydraulic fluid at the higher temperature range. These heat exchangers are a section of the two multiple heat exchangers which also provide cooling for the flying control hydraulic oil, the engine oil and the gear-box oil.

34 The two heat exchangers are interconnected and oil flow through the two units is controlled by the thermal by-pass valve.

LOW FLUID TEMPERATURE (Fig 6)

35 At fluid temperatures below 100°F (38°C) the high viscosity of fluid in the core of the oil-to-air heat exchanger prevents passage of fluid through the unit. The fluid opens the flow divider valve and flows through the open poppet valve in the by-pass control to the inlet side of the engine driven pumps.

ARROW 1 SERVICE DATA

INTERMEDIATE FLUID TEMPERATURE
(Fig 6)

36 When the fluid temperature reaches 100°F (38°C) the thermostatic element in the by-pass control valve expands, closing the poppet valve. This increases the spring loading of the flow divider poppet valve, causing a slight increase in pressure in the return line which overcomes the flow divider poppet valve spring and passes the fluid to the thermal by-pass valve. Simultaneously, this increased pressure initiates a small flow of fluid through the oil-to-air heat exchanger. When the fluid temperature has reached 213°F (100°C), an estimated one third of the total flow of fluid through the by-pass control is passing through the heat exchanger to the thermal by-pass valve.

37 Fluid entering the thermal by-pass valve from the by-pass control valve flows into the mixing chamber. Fluid entering the valve after being cooled by the heat exchanger also flows into the mixing chamber through the integral poppet valve of the thermostatic element. The fluid leaves the mixing chamber passing through the check valve in the outlet port and into the return line to the compensator.

HIGH FLUID TEMPERATURE (Fig 6)

38 When the fluid temperature reaches 230°F (110°C) the thermostatic element in the thermal by-pass valve expands, closing the poppet valve and opening the spring-loaded poppet valve. Fluid from the oil-to-air heat exchanger, at a reduced temperature, flows through the spring-loaded poppet valve and is directed through the oil-to-fuel heat exchangers where it is cooled still further before flowing into the thermal by-pass valve again at an inlet port adjacent to the mixing chamber. The cooled fluid mixes with the hot fluid flowing direct from the by-pass control valve and flows through the check valve in the outlet port to the compensator.

SYSTEM PRESSURE RELIEF VALVE (Fig 1)

39 A system pressure relief valve is located at Station 579. Should failure of the pressure regulator occur, the relief valve will open to

relieve the excess pressure in the system to return. This relief valve operates in conjunction with the service pressure relief valve in the pressure control valve. The two valves are necessary to manage the high flow rates of the pumps.

MANUAL DUMP VALVE

40 A manual dump valve is located on the forward face of the bulkhead at Station 485 and is provided to release the main system pressure to return during ground servicing. Access to the manual dump valve necessitates removal of the instrument pack.

GROUND TEST CONNECTIONS

41 Two self-sealing ground test connections are located at Station 572 for the connection of the hydraulic test stand for priming and function testing the utility hydraulic system.

SELF-SEALING COUPLINGS

42 Two self-sealing couplings are located on the forward face of Station 485 for the connection of an additional sub-circuit in the missile pack, if fitted.

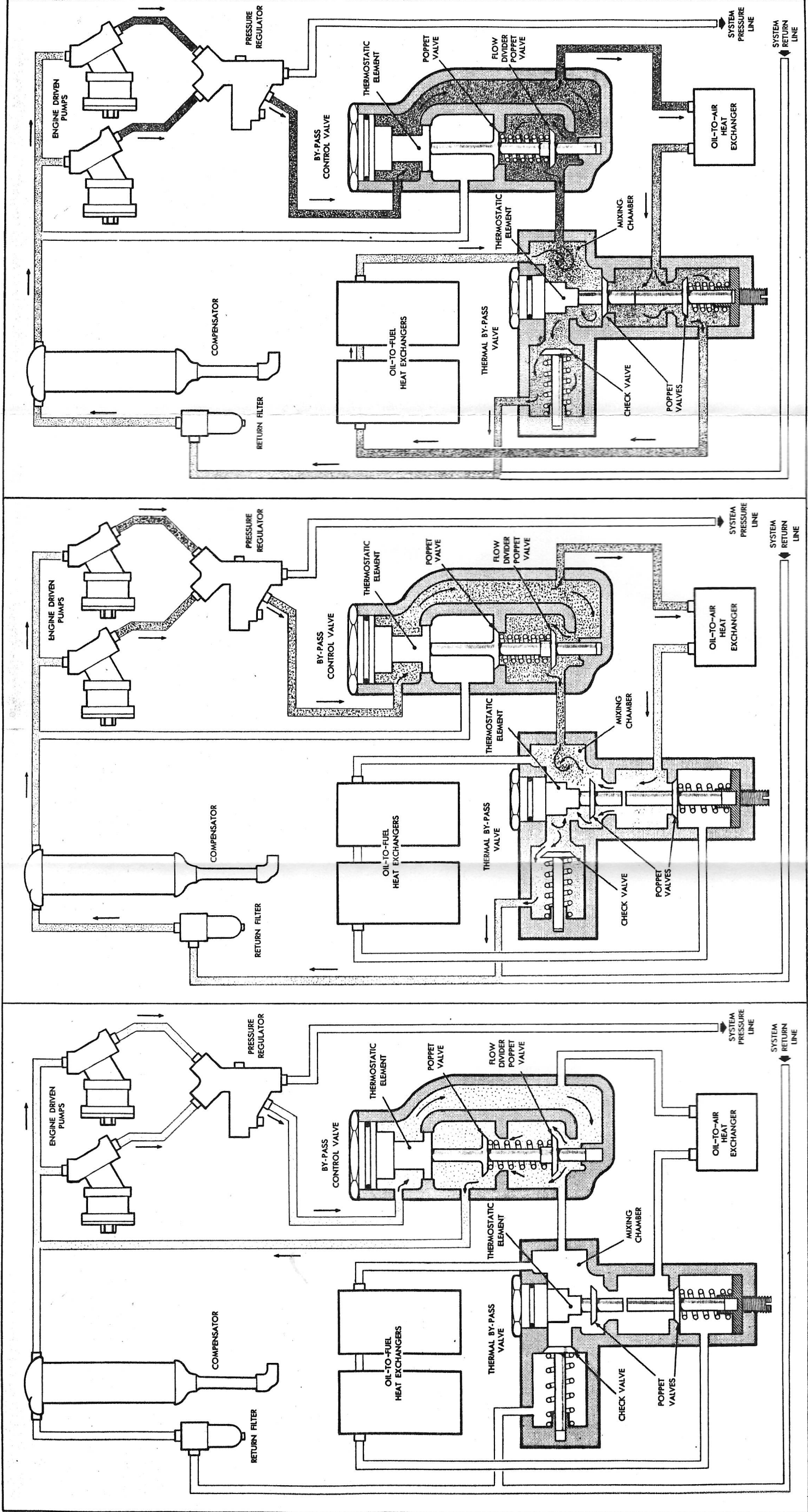
TEMPERATURE GAUGE

43 A temperature gauge is located at Station 591 to indicate the fluid temperature in the return line to the compensator. The temperature gauge is clamped to the pipe and is not in direct contact with the fluid. The temperature reading is taken when checking the contents of the compensator and is used in conjunction with the compensator level gauge.

PRESSURE SWITCHES

44 A low pressure warning switch is located at Station 485 and is installed in the main pressure line to the various sub-circuits. The switch is connected with an amber warning light on the MASTER WARNING PANEL in the pilot's cockpit. The warning light is marked UTIL HYD and illuminates if the pressure in the system falls below 1000 psi.

ARROW 1 SERVICE DATA



FLUID TEMPERATURE BELOW 100 °F

FLUID TEMPERATURE 100°F - 230°F

FLUID TEMPERATURE ABOVE 230 °F

LOW TEMPERATURE

HIGH TEMPERATURE

FIG.6 FLUID TEMPERATURE CONTROL CIRCUIT

186-34

ARROW 1 SERVICE DATA

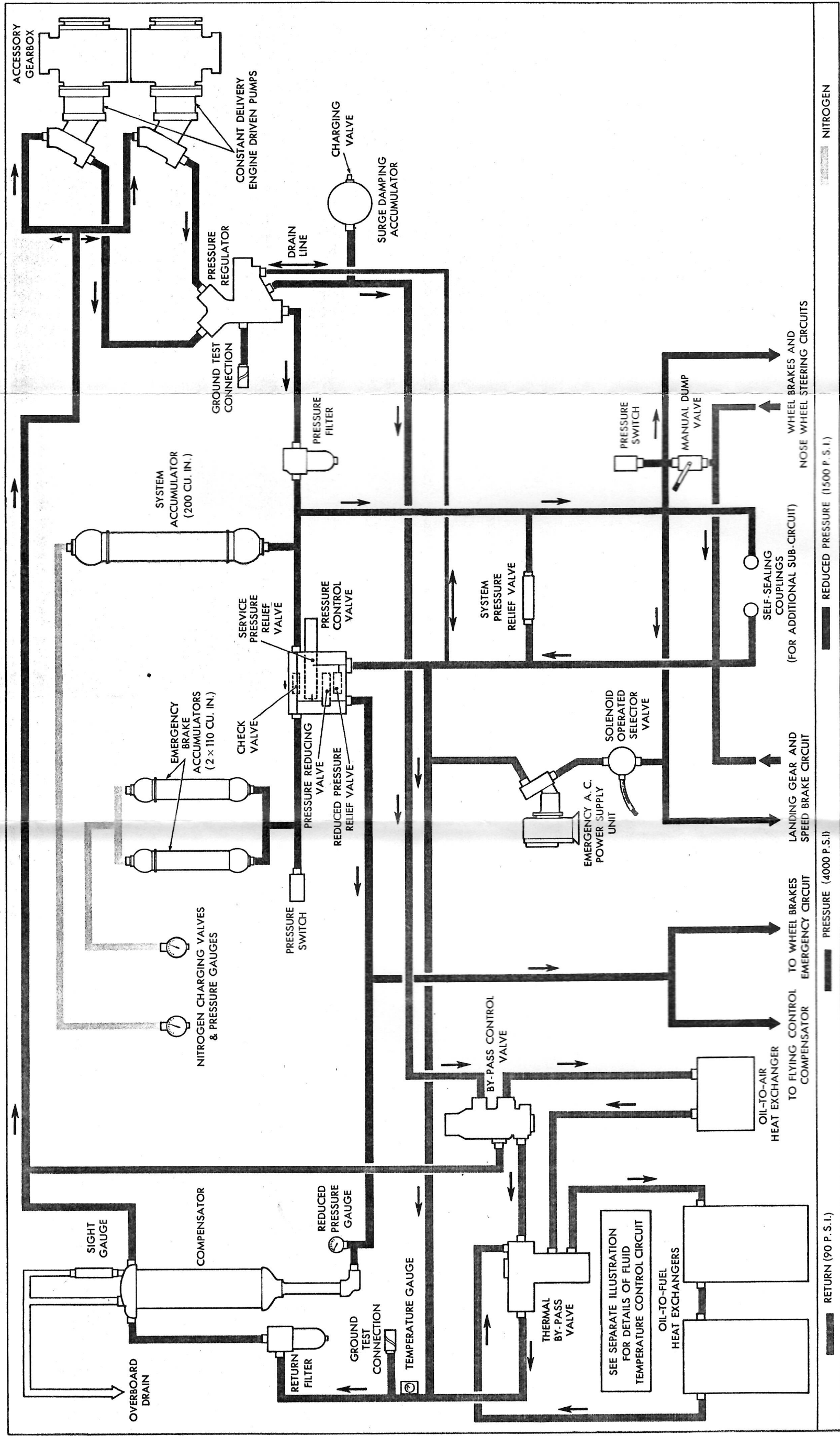


FIG.1 POWER CIRCUIT - SCHEMATIC

UNCLASSIFIED

ARROW 1 SERVICE DATA

45 An emergency brake low pressure warning switch is located on the 'V'-strut at Station 591 and is installed downstream of the check valve in the pressure control valve. The switch is connected with an amber warning light on the MASTER WARNING PANEL. The warning light is marked EMERG BRAKE HYD and illuminates if the pressure in the two emergency brake accumulators falls below 1600 psi.

PRESSURE GAUGES

46 A pressure gauge is located at Station 572 and is fitted in the reduced pressure line to allow this pressure to be checked during ground servicing and testing.

47 The combined nitrogen charging valves and pressure gauges for the system and the emergency brake accumulators are fitted as a pair at Station 572. The right-hand gauge is the system accumulator pressure gauge. A pressure/temperature chart is attached to the aircraft structure beneath each gauge and these are employed to determine the correct charging pressure in relation to the system temperature.

48 The gauges and charging valves are accessible through the hydraulic equipment access panel.

EMERGENCY AC POWER SUPPLY UNIT

49 The power circuit is utilized to operate an emergency AC power supply unit should failure of the main AC power supply occur. The emergency AC power supply unit is located in the duct bay at Station 509 and is a self-contained unit consisting of an emergency alternator, a hydraulic motor and a solenoid operated selector valve. When the main AC power supply fails the selector valve is opened automatically, allowing hydraulic pressure from the main pressure line to drive the hydraulic motor which, in turn, drives the emergency alternator. The selector valve is automatically closed by micro-switches when the weight of the aircraft is on the main landing gear.

TESTING AND SERVICING

GENERAL

50 The following procedures detail the priming, function testing and servicing of the utility hydraulic power circuit. For servicing, maintenance and adjustment of the components in the sub-systems reference should be made to the following sections of the Arrow 1 Service Data.

Section 4 - Main Landing Gear

Section 5 - Nose Landing Gear

Section 6 - Landing Gear Hydraulics

Section 7 - Wheel Brakes Hydraulics

Section 8 - Nose Wheel Steering
Hydraulics

Section 14 - Speed Brakes Hydraulics

51 A hydraulic test stand, a system filler and bleeder and a H.P. compressed air/nitrogen trailer are necessary for priming, function testing and servicing.

52 If the aircraft is supported by the landing gear, the landing gear selector must be in the DN position and ground locks must be fitted to each leg and wheel door prior to connecting the hydraulic test stand to the aircraft.

HYDRAULIC TEST STAND

53 The hydraulic test stand is used to prime, bleed and function test the utility and flying control hydraulic systems. The unit is electrically operated and incorporates two separate hydraulic circuits, designated No. 1 and No. 2. Each circuit is capable of supplying hydraulic fluid to the aircraft systems at a pressure of 4000 psi at flow rates of up to 20 gpm through two pairs of hoses. The circuits may be combined to supply fluid at a pressure of 4000 psi with a total flow rate of 40 gpm through one pair of hoses. The pressure and flow rate of the fluid delivered to the aircraft systems may be varied by adjusting the controls on the unit.

54 Each circuit comprises the following major components: a main pump, a compensator, an oil cooler, a pressure filter and a return filter. The main pumps are electrically

ARROW 1 SERVICE DATA

CONFIDENTIAL

driven and are of a variable stroke and pressure. The oil cooler operates in conjunction with a thermal switch which switches on a cooling fan when the temperature of the return fluid from the aircraft system rises above 70°F. Should the fluid temperature rise above a predetermined danger mark on the test stand temperature gauge another thermal switch automatically shuts down the main pumps.

55 The test stand also incorporates a single auxiliary pump, a reservoir and a nitrogen charged accumulator. The auxiliary pump is electrically driven and must be in operation before the main pumps can be started. The large capacity reservoir is used to refill the fluid in the aircraft systems and is also utilized to displace most of the air from the aircraft systems when these are being primed. The accumulator is fitted in the pressure line which supplies pressure fluid to two pressure reducing valves. Reduced pressure from these valves is supplied to the compensators in the stand. The reduced pressure may be varied during function testing by the low pressure adjustment on the test stand control panel.

56 The hydraulic circuits in the test stand are coupled to the aircraft systems by four hoses which are numbered 1 to 4 and arranged as follows:

- Hose No. 1 - Return Inlet - Circuit No. 1
- 2 - Pressure Outlet - Circuit No. 1
- 3 - Return Inlet - Circuit No. 2
- 4 - Pressure Outlet - Circuit No. 2

57 The hydraulic test stand incorporates a control panel divided into three sections consisting of the Circuit No. 1 and Circuit No. 2 controls and a central control panel which is common to both circuits. The central panel mounts a mode selector which provides a selection of any one of four modes which perform the following functions:

(a) Mode 1 - Filling and priming the aircraft utility hydraulic system by means of the auxiliary pump and with No. 1 and 2 hoses connected to the utility hydraulic ground test connections.

(b) Mode 2 - Function testing the utility hydraulic system with No. 1 and 2 hoses connected to the aircraft and both main pumps supplying the aircraft system through No. 2 hose.

(c) Mode 3 - Filling and priming the flying controls hydraulic system. Both "A" and "B" circuits of this system are primed simultaneously by the auxiliary pump with all four hoses connected to the flying controls hydraulics ground test connections on the aircraft.

(d) Mode 4 - Function testing the flying control hydraulic system with both circuits operating and supplying fluid to the aircraft through the four hoses. This mode is also used to prime and function test the nose wheel steering circuit of the utility hydraulic system. When this operation is carried out the flying controls hydraulic "B" system is pressurized in order to obtain full range of movement on the nose wheel steering. In this case No. 1 and 2 hoses are connected to the utility hydraulic ground test connections and hoses No. 3 and 4 are connected to the flying control hydraulics "B" system ground test connections.

58 The central panel also incorporates the main and auxiliary pump switches together with a vacuum gauge, two outlet valve override switches, three pressure dump selectors and a group of circuit breakers.

59 The control panels for Circuit Nos. 1 and 2 are identical, each having a low and high pressure gauge, a bleed button and sight glass, a low pressure adjustment and a flow indicator. The bleed button and the sight glass are employed when bleeding the aircraft systems to check that the fluid returning from the aircraft is air-free. The low pressure adjustment provides the means of adjusting the pressure in the return side of the aircraft system. This pressure is indicated on the low pressure gauge. Located in front of each circuit control panel is the main pump flow control and the pressure control. These controls provide adjustment of the flow rate and the delivery pressure of the fluid to the aircraft systems. The flow rate is shown by a flow indicator, and the delivery pressure on a high pressure

ARROW 1 SERVICE DATA

gauge. The flow rate and the delivery pressure may be pre-set before starting the main pumps by adjusting the controls to give a pre-determined reading on the flow indicator and on the high pressure gauge.

60 To the left and right of the control panel are two mechanically operated pointers which indicate the fluid level in each of the test stand compensators.

61 An electrical power supply of 550 volt/3 phase/60 cycle is required to operate the unit. Operating instructions in all four modes are contained on the instruction plate attached to the unit in front of the control panel.

OPERATION OF THE TEST STAND

Mode 1

62 This mode is used for priming the utility hydraulic system. To operate the test stand in this mode proceed as follows:

- (a) Check the contents of the reservoir and refill, if necessary.
- (b) Check that the mode selector is OFF.
- (c) Connect hoses Nos. 1 and 2 to the utility hydraulic ground test connections.
- (d) Connect the test stand to a convenient 550 volt/3 phase/60 cycle electrical power supply.
- (e) Check that the shut-off valves to the low and high pressure gauges are open.
- (f) Turn the mode selector to 1.
- (g) Select the No. 1 circuit outlet valve override switch to VALVE OPEN.
- (h) Start the auxiliary pump.
- (j) Check that the vacuum gauge needles are within the safety limits. The danger area is indicated by a red line on the dial face.
- (k) Function the appropriate sub-system until air-free fluid appears in the No. 1 circuit sight glass when the bleed button is pulled.

- (m) Stop the auxiliary pump.
- (n) Turn the mode selector to OFF.
- (p) Function test the appropriate sub-system as detailed for Mode 2.

Mode 2

63 This mode is used to function test the various sub-systems of the utility hydraulic system with the exception of the nose wheel steering circuit. To operate the test stand in this mode proceed as follows:

- (a) Check the contents of the reservoir and refill, if necessary.
- (b) Check that the mode selector is OFF.
- (c) Connect hoses Nos. 1 and 2 to the utility hydraulic ground test connections.
- (d) Connect the test stand to a convenient 550 volt/3 phase/60 cycle electrical power supply.
- (e) Check that the shut-off valves to the low and high pressure gauges are open.
- (f) Turn the mode selector to 2.
- (g) Select the No. 1 circuit outlet valve override switch to VALVE OPEN.
- (h) Start the auxiliary pump.
- (j) Check that the vacuum gauge needles are within the safety limits.
- (k) Wait until the low pressure warning lamp on the No. 1 circuit panel goes out and then check the level of the compensator in the test stand by the visual indicator.
- (m) Pull the bleed button and check that the fluid in the sight glass is air-free.
- (n) Adjust the low pressure adjustment to give a reading of 50 psi on the low pressure gauge.

ARROW 1 SERVICE DATA

(p) Pre-set the main pump pressure and flow controls to give the required fluid pressure and flow rates.

(q) Start the main pumps.

(r) Function the appropriate sub-systems, and periodically pull the bleed button to check that the fluid in the sight glass is air-free.

(s) Stop the main pumps and the auxiliary pump.

(t) Press the low and high pressure dump valve, turn the mode selector to OFF and select the No. 1 circuit outlet valve override switch to CLOSED.

(u) Disconnect the hoses from the aircraft.

(v) Check the fluid level of the aircraft compensator and refill, if necessary. See para 75.

Mode 3

64 This mode is used to prime the flying controls hydraulic system. For operation in this mode see Arrow 1 Service Data - Section 12 - Flying Control Hydraulics.

Mode 4

65 This mode is used to function test the flying controls hydraulic system and to prime and function test the utility hydraulic nose wheel steering circuit. The priming and function testing of the nose wheel steering hydraulics is described in Arrow 1 Service Data - Section 9 - Nose Wheel Steering Hydraulics. For operation in this mode, see Arrow 1 Service Data - Section 12 - Flying Control Hydraulics.

ACCUMULATOR CHARGING

66 The compressed air/nitrogen trailer is required to recharge the system accumulator and the emergency brake accumulators in the power circuit. The combined pressure gauges and charging valves together with the temperature/pressure charts for these accumulators are located at Station 572 and are accessible through the hydraulic equipment access panel. To charge the accumulator proceed as follows:

(a) Check the fluid temperature as indicated on the system temperature gauge.

(b) Operate the manual dump valve at the rear of the armament bay, or if the instrument pack is installed, operate the speed brakes until the hydraulic pressure in the system is discharged.

(c) To discharge the hydraulic pressure in the emergency brake circuit, operate the wheel brakes until no further reduction in pressure is evident on the left-hand pressure gauge at Station 572.

(d) Note the nitrogen pressure reading on the pressure gauges.

(e) Referring to the pressure/temperature charts below each gauge, read off the correct charging pressures in relation to the system temperature for each accumulator and charge the accumulators to these pressures. The system accumulator will be charged to approximately 3000 psi and the emergency brake accumulators to approximately 1500 psi.

(f) Allow an interval of one hour and re-check the pressure readings. Adjust the pressures if necessary.

(g) Pressurize the hydraulic system and allow the pressure to remain for 15 mins.

(h) Relieve the hydraulic pressure, as described in (b) and (c) and check the pressure gauge readings.

(j) If a discrepancy exists in the two readings in (f) and (h) check for leaks as described in para 67.

CHECKING THE ACCUMULATORS FOR LEAKS

67 To check the accumulators for leaks proceed as follows:

(a) Ensure that the accumulator is charged with nitrogen to the correct pressure and the hydraulic system is pressurized. See para 66.

ARROW 1 SERVICE DATA

(b) Check all joints in the nitrogen line for leaks using a solution of mild soap and water. Leaks will be indicated by bubbles.

(c) Correct any leaks by tightening the joint to the maximum acceptable torque value. If leaks are still evident after the maximum torque has been applied, a replacement pipe must be fitted.

68 Internal hydraulic fluid leakage of the accumulator may be traced by releasing a portion of the nitrogen charge through a piece of clean white cloth or absorbent paper and noting any contamination by hydraulic fluid. Internal leaks will necessitate replacement of the defective accumulator.

SURGE DAMPING ACCUMULATOR CHARGING

69 The charging valve for the surge damping accumulator is located at the bottom of the 'V'-strut at Station 591 and is accessible through the hydraulic equipment access panel. To charge the accumulator proceed as follows:

(a) Operate the manual dump valve or the speed brakes to discharge the hydraulic pressure in the system.

(b) Operate the wheel brakes to discharge the hydraulic pressure in the emergency brake circuit thereby discharging the pressure in the return side of the circuit.

(c) Using a suitable pressure gauge, check the nitrogen pressure in the accumulator.

(d) Connect the compressed air/nitrogen trailer to the charging valve and recharge the accumulator to 125 psi.

PRIMING THE POWER CIRCUIT

70 To prime the utility hydraulics power circuit, including the engine driven hydraulic pumps and emergency AC power supply unit, proceed as follows:

(a) Check that the system and emergency brake accumulators are charged to their correct nitrogen charging pressures. If necessary, recharge these accumulators as described in para 66.

(b) Connect the hydraulic test stand to the utility hydraulic ground test connections and operate the unit with a Mode 1 selection as described in para 62. During this operation hold the manual dump valve open to allow the air in the circuit to pass from the pressure line to the return line and then back to the test stand. Continue this operation until air-free fluid appears in the No. 1 circuit sight glass when the bleed button is pulled.

(c) Disconnect the test stand from the aircraft.

(d) Prime the engine driven hydraulic pumps by removing the filling plug from each pump and filling the pumps with hydraulic fluid. To do this, fit a suitable hose and adaptor to the hydraulic system filler and bleeder. Replace and lock the filling plugs.

(e) Prime the hydraulic motor of the emergency AC power supply unit employing the same procedure as described in (d).

(f) Connect the hydraulic system filler and bleeder to the return connection of the utility hydraulic ground test connection.

(g) Fill the utility hydraulic compensator to the correct level. See para 75.

(h) Operate the manual bleed control on the compensator until air-free fluid appears in the sight glass in the aircraft overboard drain line.

(j) Re-check the compensator level and recharge if necessary.

(k) Disconnect the filler and bleeder from the aircraft.

(m) With the manual dump valve held open, motor both engines for approximately 30 secs to bleed the air from the hydraulic lines to and from the engine driven hydraulic pumps.

(n) Connect the aircraft hydraulic system test stand to the aircraft.

(p) Pre-set the main pump pressure and flow controls on the test stand to give a pressure of 500 psi and a total flow rate of 1.5 gpm.

ARROW 1 SERVICE DATA

(q) Operate the test stand with a Mode 2 selection as described in para 63.

(r) Slacken the hydraulic connections at the following components and bleed the air from the single hydraulic lines. Retighten the connections when air-free fluid flows from the lines.

(1) The system and emergency brake accumulators.

(2) The pressure switches located at Station 485 and on the 'V'-strut at Station 591.

(3) The flying control and utility hydraulic compensators at the 1500 psi hydraulic pressure inlets.

(4) The three landing gear up-lock release jacks and the seven door up-lock release jacks.

(5) The three landing gear down-locks.

(s) Adjust the main pump pressure and flow controls on the test stand to give a pressure of 4000 psi and a total flow rate of 20 gpm.

(t) Bleed the air in the emergency AC power supply unit as follows:

(1) Select the master electrical switch to ON.

(2) Select the alternators to OFF.

(3) Disconnect the AC ground electrical supply from the duct bay receptacle, if connected.

(4) Connect the DC ground electrical supply to the receptacle on the nose leg.

(5) Select and hold the test override switch to TEST for a few seconds. This opens the solenoid operated selector valve on the emergency AC power supply unit and permits the hydraulic fluid to operate the hydraulic motor thereby bleeding the air from the unit.

(6) Return the switches to their original positions.

(u) Adjust the main pump pressure controls to give a pressure of 4500 psi.

NOTE

This sets the main pump pressure above the cut-out pressure of the pressure regulator.

(v) Run the test stand to allow the hydraulic pressure to operate the pressure regulator and to allow the fluid temperature to build up and pass the fluid through the fluid temperature control circuit. Continue to run the test stand until air-free fluid appears in the No. 1 circuit sight glass when the bleed button is pulled.

(w) Disconnect the test stand from the aircraft.

(x) Refill the aircraft compensator to the correct level as described in para 75.

71 For priming and bleeding the landing gear circuit see Arrow 1 Service Data - Section 6 - Landing Gear Hydraulics.

72 For priming and bleeding the wheel brakes circuit see Arrow 1 Service Data - Section 7 - Wheel Brakes Hydraulics.

73 For priming and bleeding the nose wheel steering circuit see Arrow 1 Service Data - Section 8 - Nose Wheel Steering Hydraulics.

74 For priming and bleeding the speed brakes circuit see Arrow 1 Service Data - Section 14 - Speed Brakes Hydraulics.

TOPPING UP THE UTILITY HYDRAULIC SYSTEM

75 The utility hydraulic compensator is normally topped up with the system and emergency brake accumulators hydraulically discharged. This is carried out when the instrument pack is removed and access to the manual dump valve is available. During Between Flight inspections or when the instrument pack is installed, the system may be topped up with these accumulators hydraulically charged.

ARROW 1 SERVICE DATA

To differentiate between these conditions the compensator level gauge, which is inserted in the bottom of the compensator, incorporates a RED scale which is used when the accumulators are DISCHARGED and a WHITE scale which is used when the accumulators are CHARGED. Each scale is calibrated in degrees Fahrenheit and must correspond with the reading of the temperature gauge located in the return line to the compensator.

TOPPING UP THE COMPENSATOR WITH ACCUMULATORS HYDRAULICALLY DISCHARGED

76 To top up the compensator with the accumulators hydraulically DISCHARGED, proceed as follows:

- (a) Remove the hydraulic equipment access panel.
- (b) Operate the compensator manual bleed control until an air-free flow of fluid appears in the sight glass of the overboard drain line.
- (c) Operate the manual dump valve to discharge the hydraulic pressure from the system accumulator.
- (d) Operate the wheel brakes until the hydraulic pressure is discharged from the emergency brake accumulators.
- (e) Check the nitrogen pressure in the system and emergency brake accumulators. If necessary, recharge the accumulators as described in para 66.
- (f) Note the reading on the fluid temperature gauge.

(g) Insert the compensator level gauge through the hole in the bottom of the compensator housing until it contacts the bottom of the large piston. Move the sliding window on the level gauge until it contacts the bottom of the compensator.

(h) Check the reading on the RED scale opposite the FULL mark at the bottom of the level gauge sliding window.

(j) The level gauge reading and the temperature gauge reading should correspond. If the compensator requires topping up, the figure corresponding to the reading on the temperature gauge will be level with, or above, the REFILL marking on the sliding window.

(k) To top up the compensator, connect the hydraulic system filler and bleeder to the return connection of the ground test couplings and charge the compensator until the correct level is obtained.

(m) Remove the compensator level gauge and disconnect the hydraulic system filler and bleeder.

(n) Replace the hydraulic equipment access panel.

TOPPING UP THE COMPENSATOR WITH ACCUMULATORS HYDRAULICALLY CHARGED

77 The procedure for topping up the compensator with the accumulators hydraulically charged is similar to the procedure detailed in para 76 with the exception that the white scale of the compensator level gauge is used in lieu of the red scale.

ARROW 1 SERVICE DATA

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-1958-21	Vickers Inc. PF 96-3915-30Y-S387	Pump - Constant Delivery	2
7-1958-51	Electrol Inc. EA1146	Regulator - Pressure	1
7-1956-23	Parmatic Eng. 11202	Filter - High Pressure 40 gpm	1
7-1958-12	Sprague	Accumulator - 200 cu. in.	1
7-1958-14	Vinson A70155	Valve - Pressure Control	1
7-1958-177	Sprague	Accumulator - 110 cu. in.	2
7-1958-185	Vickers Inc. AA14007-E	Accumulator - Spherical Surge - Damping	1
7-1956-353	AiResearch 150775	Valve - By-pass Control	1
7-1956-383	AiResearch 150755	Valve - Thermal By-pass	1
7-1956-37	Loud	Compensator - Single Pressurized	1
7-1956-377	AiResearch	Heat Exchanger - Oil-to-Air	1
7-3258-35	Meletron 1460SW-2000-242	Switch - Pressure Type 1 (System)	1
7-3258-17	Meletron 1460SW-1400-243	Switch - Pressure Type 2 (Emerg. Brake)	1
7-3258-29	Aviation Electric AE425-1-A	Gauge - Reduced Pressure	1
7-1994-12	Vinson A50044	Valve - Manual Dump	1
7-1958-16	Vickers Inc. EA50269	Valve - Pressure Relief	1
CS-G-108	Prencos Eng.	Gauge - Sight Bleed	1
CS-V-104	Kenyon Type 1189	Valve - Combined Gauge and Nitrogen Charging	2
7-1956-567	Vickers Inc. EA50209	Emergency AC Power Pack - Hydraulically Driven	1
7-1956-569	Marotta 209643	Valve - Solenoid-operated Selector	1
7-3258-327	Powerlite Devices	Gauge - Temperature	1

ARROW 1 SERVICE DATA

SECTION 21

PITOT STATIC SYSTEM

(This data supersedes previous issue dated 5 Mar 1957)

15 FEB 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General... ..	1
Nose Pressure Head System... ..	1
Vertical Stabilizer Pressure Head System	3
INSPECTION (To be issued later)	
FUNCTION TESTING	
General... ..	3
Pressure Test - Nose Pressure Head System	3
Pressure Test - Vertical Stabilizer Upper Pressure Head System	3
Pressure Testing the System Piping	4
Draining the Water Traps	4
COMPONENT SERVICE DATA	
Pressure Head - Pitot Static - Vertical Stabilizer	5
Sensor - Relative Wind and Air Pressure - Nose	7

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Pitot Static System - Schematic	1
2	Pitot Static System - Installation	2

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 Three pressure heads are fitted to the aircraft to supply pitot and static air pressures to the various instruments, controllers and transducers.

2 The pressure heads are installed one on the forward end of the air data probe on the radome, and the other two on masts attached to the leading edge of the vertical stabilizer.

3 The lower pressure head on the vertical stabilizer is for flight test instrumentation data only. The supplies from the other two pressure heads are not interconnected.

4 The pressure heads on the vertical stabilizer are identical and each provides both

pitot and static pressures. The pressure head on the nose probe provides two sources of static pressure in addition to pitot pressure. The pressure heads are electrically heated to prevent ice formation.

5 Water traps are fitted at the lower points in the system piping to trap and permit drainage of condensation.

NOSE PRESSURE HEAD SYSTEM

6 The pitot and two static pressures from the nose pressure head are transmitted through plastic hoses in the radome to connect with the rigid piping in the radar nose. The rigid pipelines connect with the components through short lengths of flexible hose.

7 Pitot pressure from the nose pressure head is transmitted to the following components:

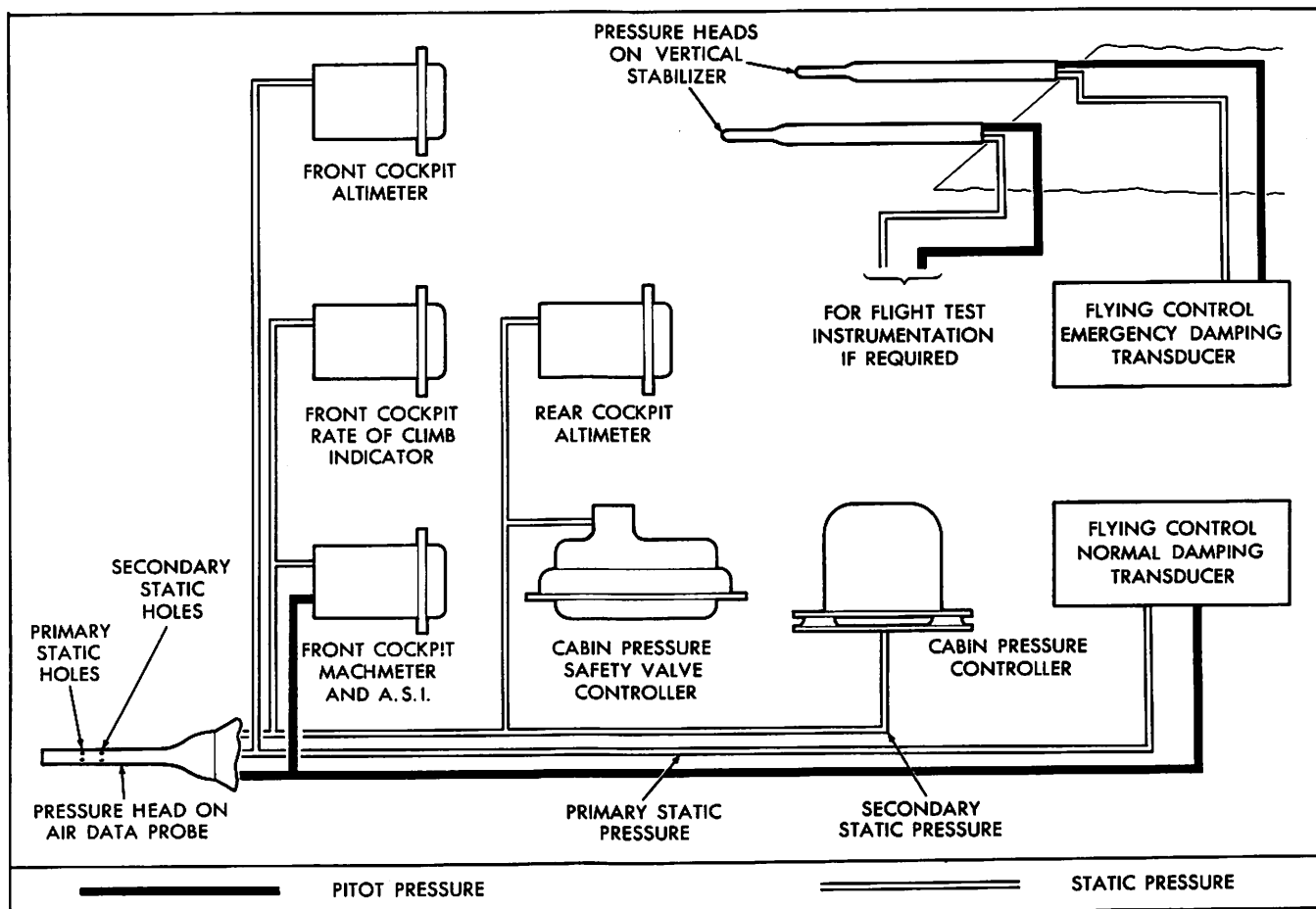


FIG. 1 PITOT STATIC SYSTEM - SCHEMATIC

ARROW 1 SERVICE DATA

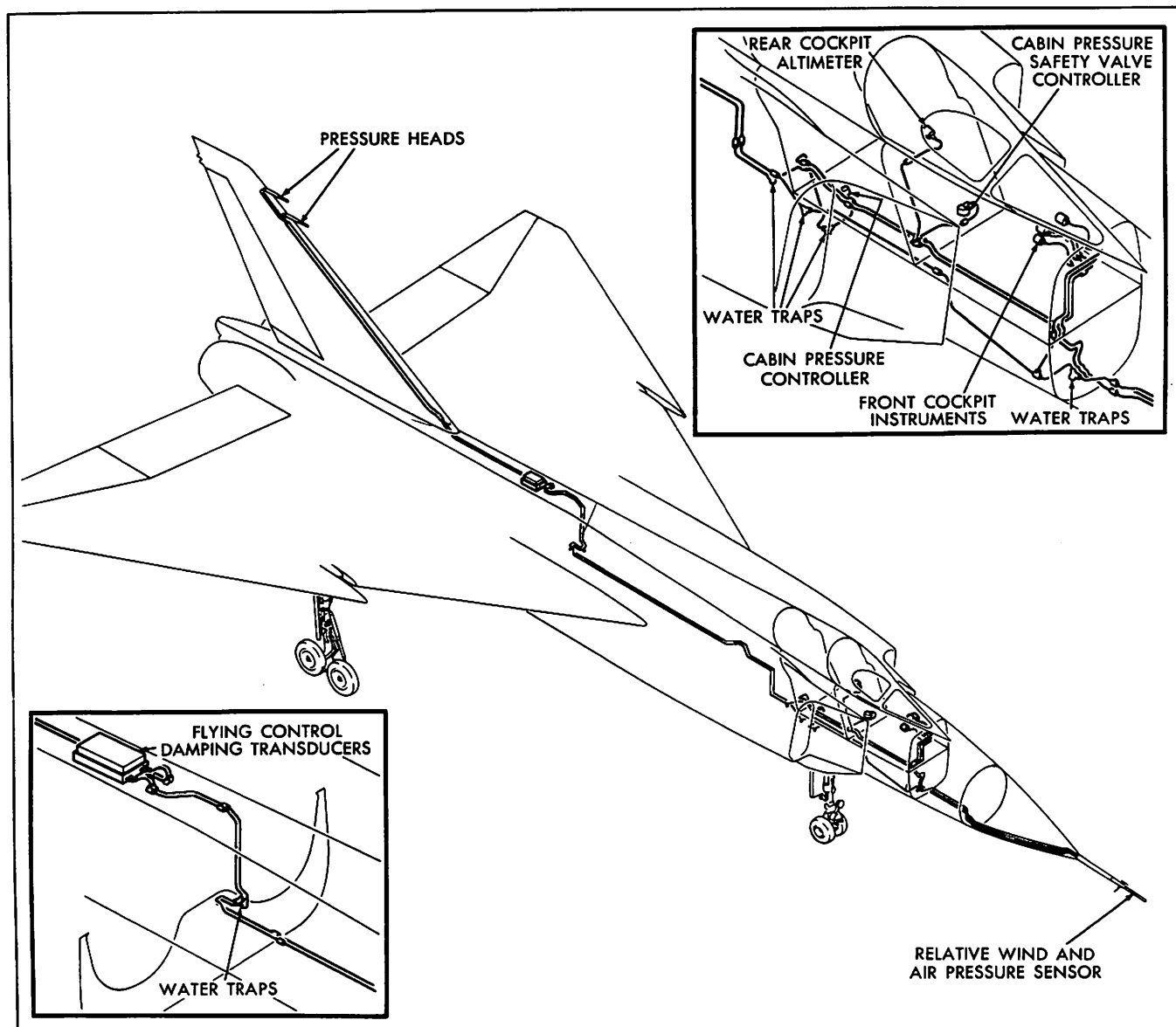


FIG.2 PITOT STATIC SYSTEM - INSTALLATION

(a) Front cockpit machmeter and airspeed indicator.

(b) Flying control normal damping transducer.

8 The nose probe provides a primary static pressure and a secondary static pressure. Primary static pressure is transmitted to the following components:

(a) Front cockpit altimeter.

(b) Flying control normal damping transducer.

9 Secondary static pressure is transmitted to the following components:

(a) Front cockpit machmeter and airspeed indicator.

(b) Front cockpit rate of climb indicator.

(c) Rear cockpit altimeter.

ARROW 1 SERVICE DATA

- (d) Cabin pressure controller.
- (e) Cabin pressure safety valve controller.

VERTICAL STABILIZER PRESSURE HEAD SYSTEM

10 The pitot and static pressures from the vertical stabilizer upper pressure head are transmitted through pipelines, enclosed in tubular conduits in the vertical stabilizer leading edge, to the flying control emergency damping system transducer located under the dorsal fairing.

FUNCTION TESTING

GENERAL

11 Each section of the system is tested individually for leaks. A Sprague Type MB-1 test set is connected to the inlet holes on the pressure heads through adaptors and lengths of flexible hose.

NOTE

The system must be tested for leaks if any point in the system is disturbed.

PRESSURE TEST - NOSE PRESSURE HEAD SYSTEMS

12 To pressure test the nose pressure head pitot system, proceed as follows:

- (a) Connect the pressure line from the Type MB-1 test set through an adaptor to the pitot inlet on the nose probe pressure head.
- (b) Close the pressure vent valve and open the pressure source valve on the test set. Apply pressure to the system by means of the test set pressure hand pump until the airspeed indicator in the front cockpit indicates 300 knots.
- (c) Hold the pressure for one minute. The drop in indicated airspeed over this period should not exceed 10 knots.
- (d) Open the test set vent valve to release the pressure and remove the adaptor from the pressure head.

13 To pressure test the nose pressure head primary static system, proceed as follows:

- (a) Attach an adaptor to the forward set of static holes on the nose pressure head and connect the adaptor to the vacuum line from the test set.
- (b) Set the altimeter in the front cockpit to read zero.
- (c) Close the vacuum vent valve, open the vacuum source valve and apply a suction with the vacuum hand pump until the altimeter in the front cockpit indicates 1,000 feet.
- (d) Hold the suction for one minute. The drop in indicated altitude should not exceed 150 feet. The instrument should be gently tapped during this test to minimize frictional effect.
- (e) Release the depression by opening the vacuum vent valve and remove the adaptor from the pressure head.

14 To pressure test the nose pressure head secondary static system, proceed as follows:

- (a) Attach the adaptor to the rear set of static holes on the nose pressure head and connect the adaptor to the vacuum line from the test set.
- (b) Repeat the test carried out in para 13(b) to (e) using the altimeter in the rear cockpit to indicate the depression.

PRESSURE TEST - VERTICAL STABILIZER UPPER PRESSURE HEAD SYSTEM

15 To pressure test the vertical stabilizer upper pressure head pitot system proceed as follows:

- (a) Connect an ASI into the pressure line from the MB-1 test set and connect the pressure line through an adaptor to the pitot inlet of the vertical stabilizer upper pressure head.
- (b) Close the pressure vent valve and open the pressure source valve on the test set. Apply a pressure to the system by means of the test set pressure pump until the ASI indicates 300 knots.

ARROW 1 SERVICE DATA

(c) Hold the pressure for one minute. The drop in indicated airspeed over this period must not exceed 10 knots.

(d) Open the test set vent valve to release the pressure and remove the adaptor from the pressure head.

16 To pressure test the vertical stabilizer upper pressure head static system, proceed as follows:

(a) Attach an adaptor to the pressure head to connect the static holes in the pressure head to the vacuum line from the test set.

(b) Set the altimeter on the test set to read zero.

(c) Close the vacuum vent valve, open the vacuum source valve and apply a suction with the test set vacuum pump until the altimeter reads 1,000 feet.

(d) Hold the suction for one minute. The drop in indicated altitude should not exceed 150 feet. The instrument should be gently tapped during this test to minimize frictional effect.

(e) Release the depression by opening the vacuum vent valve and remove the adaptor from the pressure head.

PRESSURE TESTING THE SYSTEM PIPING

17 To test the system piping for leaks, proceed as follows:

(a) Disconnect the components connected to the section of the system being pressure tested and blank off all disconnected pipelines.

(b) Connect the MB-1 test set through an adaptor and flexible hose to the applicable inlet on the pressure head and apply a pressure to the system until the machmeter on the test set indicates Mach 2.

(c) Apply an approved leak-finding solution at any joint which is suspected of leaking.

(d) Open the test set vent valve to release the pressure and disconnect the adaptor from the pressure head.

(e) Remove the blanking adaptors from the disconnected pipelines and reconnect the pipelines to the components.

(f) Carry out a pressure test on the applicable section of the system as described in para 12-16.

DRAINING THE WATER TRAPS

18 The water traps should be drained of moisture at the periods specified. To drain the traps remove the drain plugs and allow the moisture to drain. When draining is complete, replace the drain plugs and wire lock. Pressure test the system as described in para 12-16.

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PITOT STATIC		SUB-SYSTEM		COMPONENT Pressure Head - Pitot Static - Vertical Stabilizer		REF. NO. 18	
AVRO PART NO. 7-1850-47		MANUFACTURER Aero Research Inst.Co		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 500 hours			
FUNCTION To provide pitot and static pressures to the emergency flying control damping transducer.							
LOCATION On the leading edge of the vertical stabilizer.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect two pipe connections. Connect one electrical connection. Insert the pressure head into the mast on the vertical stabilizer. Fit six screws to attach the pressure head.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security and damage. Check the operation of the pressure head heater. Check that the pressure head cover is installed.	MEN X MINUTES	
FUNCTIONAL CHECKS	MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power unit. Pitot static test set. Pressure head cover. Aerostand 4G/1230.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM PITOT STATIC		SUB-SYSTEM		COMPONENT Sensor - Relative Wind and Air Pressure - Nose		REF. NO. 18	
AVRO PART NO. 7-1851-21		MANUFACTURER Buffalo Inst. Corp.		MAN'F'R'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-			
FUNCTION To provide one pitot and two static sources of pressure for the aircraft instruments and transducers. Provides relative wind data.							
LOCATION On the forward end of the air data probe.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE With the radome removed - Pass the electrical leads and pressure pipelines from the sensor through the air data probe. Insert the sensor into the probe and fit six screws. Connect three electrical connections and three pipelines in the radome.						MEN X MINUTES	

ARROW 1 SERVICE DATA

INSPECTION Check for security and damage. Check that the pressure head cover is installed. Check the operation of the pressure head heaters.	MEN X MINUTES	
FUNCTIONAL CHECKS		
GROUND HANDLING AND GROUND TEST EQUIPMENT Electrical ground power unit. Pitot static test set. Pitot tube cover. B4 access stand.		
SPECIAL TOOLS TO REMOVE OR SERVICE		
REMARKS		

ARROW 1 SERVICE DATA

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-2154-14	Aro Equipment Corp. - 21102	Converter - Liquid Oxygen	1
7-2154-15	Aro Equipment Corp.	Tray - Liquid Oxygen Converter Mounting	1
7-2152-11	Aviation Electric Ltd. - AE419	Disconnect - Composite Leads	2
	AN6033	Valve - Double non-return	2
7-2152-63	Aviation Electric Ltd. - 1602732	Cylinder - Emergency Oxygen	2
7-2152-15	Aviation Electric Ltd. - X-815653	Valve - Emergency Oxygen Starting	2
	Firewel Co. Inc. - F2400-11	Regulator	2
	Firewel Co. Inc. - F17130-1	Valve - Pressure Reducing	2
	Firewel Co. Inc. - F50825-3	Tester - Flow	2
	Essex Mfg. Co. - 199000	Coupling - Oxygen Supply Quick Disconnect	1
	Essex Mfg. Co. - 256000	Coupling - Overboard Vent - Quick Disconnect	1

54

ARROW 1 SERVICE DATA

SECTION 22

OXYGEN SYSTEM

(This data supersedes previous issue dated 27 May 57)

1 JUN 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE

PAGE NO.

DATE

PAGE NO.

ARROW 1 SERVICE DATA

OXYGEN SYSTEM

TABLE OF CONTENTS

TITLE	PAGE
SYSTEM SERVICE DATA	
DESCRIPTION	
General	1
Normal Operation	1
Emergency Operation	1
Liquid Oxygen Converter	1
Liquid Oxygen Converter Operation	4
Composite Leads Disconnect	4
Regulator	7
Emergency Oxygen Cylinder	7
Emergency Oxygen Starting Valve	7
Pressure Reducing Valve	8
INSPECTION (To be issued later)	
TESTING AND SERVICING	
Filling the Liquid Oxygen Converter	8
Liquid Oxygen Converter Function Test	9
Charging the Emergency Oxygen Cylinders	9
Pressure Testing the System	9
REMOVAL AND INSTALLATION	
General	10
Liquid Oxygen Converter Removal	10
Liquid Oxygen Converter Installation	11
Liquid Oxygen Converter Mounting Tray	11
Composite Leads Disconnect	11
Emergency Oxygen Starting Valve	11
Emergency Oxygen Cylinder	12
Regulator	12
Pressure Reducing Valve	12
FAULTS AND REMEDIES	13
EQUIPMENT LIST	15

UNCLASSIFIED

ARROW 1 SERVICE DATA

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Oxygen System - Schematic	2
2	Liquid Oxygen Converter - Installation	3
3	Liquid Oxygen Converter - Schematic	5
4	Oxygen System - Installation	6
5	Emergency Oxygen Starting Valve - Schematic	8

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The normal oxygen requirements for the pressure masks and pressure suits of both crew members, are supplied by a 5 litre 70 psig liquid oxygen converter. A pressure demand regulator, fitted under each seat pan, controls the pressure and flow to each mask and pressure suit according to altitude. An emergency high pressure gaseous oxygen system is fitted to each seat for use while descending after ejection at high altitude or in case of failure of the normal supply.

NORMAL OPERATION (Fig 1)

2 Liquid oxygen is stored and converted to gaseous oxygen in the liquid oxygen converter. The gaseous oxygen is supplied at a pressure of 70-100 psig to two composite leads disconnects, one fitted on the RH side of each seat. From each composite leads disconnect the oxygen is led through a double non-return valve to the oxygen regulator. The outlet on the regulator is connected to the composite leads disconnect to supply the oxygen mask and pressure suit.

3 The supply from the composite leads disconnect is led through a flexible hose to a pressure gravity valve fitted to the front of the pressure suit. This valve distributes the oxygen through three outlets. One outlet is integral with the attachment fitting and supplies the pressure suit. The remaining two outlets are connected by flexible hoses to the pressure mask and the anti-g suit. The pressure mask, pressure suit and anti-g suit are supplied with oxygen at the same pressure. The anti-g suit is also pressurized independently, under conditions of positive 'g', with air pressure from the anti-g valve. This air supply is led through the composite leads disconnect and a second flexible hose to the pressure gravity valve. The pressure gravity valve maintains oxygen pressure to the anti-g suit when no air pressure is being supplied from the anti-g valve and also prevents air from the anti-g system feeding back into the oxygen system.

EMERGENCY OPERATION (Fig 1)

4 An emergency oxygen supply system is fitted to each seat. It consists of an 'L'-shaped high pressure oxygen cylinder fitted under the seat pan and connected to a starting valve on the back of the seat. The cylinder is charged to a pressure of 1800 psig and the flow of oxygen to the system is started through the starting valve. The flow may be started manually by pulling a manual starting knob located on the LH side of the seat, or operated automatically on ejection of the seat by a static line connected to the aircraft structure. From the starting valve the oxygen is led to a pressure reducing valve and reduced to 70 psig before being led into the normal oxygen system at the double non-return valve.

LIQUID OXYGEN CONVERTER (Fig 2)

5 The liquid oxygen converter is a self-contained, quick detachable unit, mounted on a tray. The liquid is contained in a spherical, double-walled, vacuum insulated container with a liquid capacity of 5 litres. Conversion of the oxygen from the liquid to the gaseous state, and pressurization of the converter and the system, is effected by the controlled evaporation of the liquid in two evaporating coils.

6 The converter unit slides on to a mounting tray fitted in the aircraft. The unit is held in position on the tray by a lip at the forward end and a thumb screw and locking plate at the rear. Four vibration isolators and four damping units support the tray and limit the transfer of shock and vibration to the converter. Quick disconnect couplings connect the pressure supply, overboard vent and the electrical quantity gauge leads on the converter to the aircraft systems. The pressure supply quick disconnect coupling is self-sealing on both the aircraft and the converter sides of the coupling. Condensation from the converter collects in the mounting tray and is drained into the air conditioning system at the air-to-water heat exchanger steam outlet duct.

7 Two quantity gauges are installed, one in each cockpit. They are electrically actuated from a sensing element in the converter to

ARROW 1 SERVICE DATA

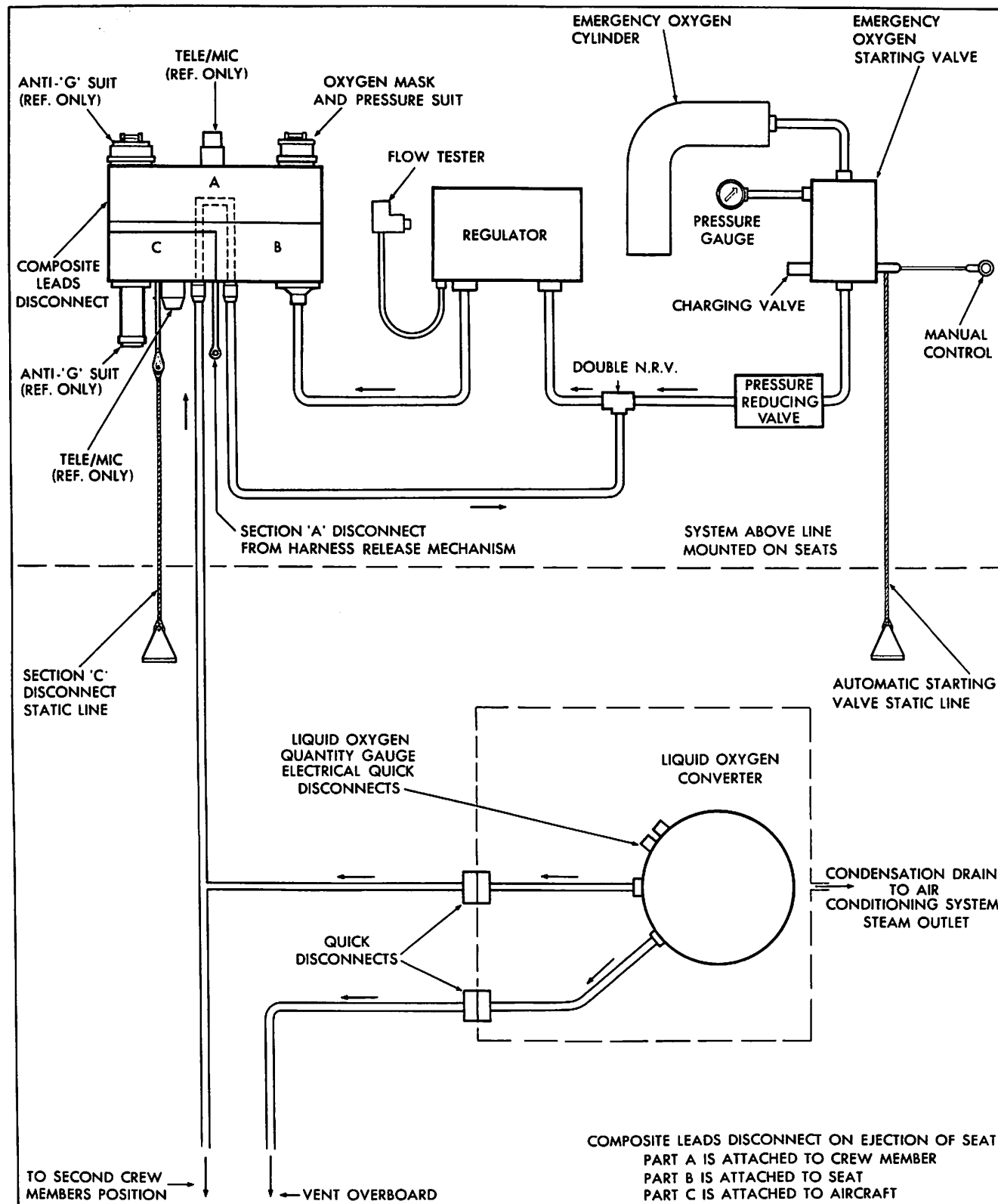
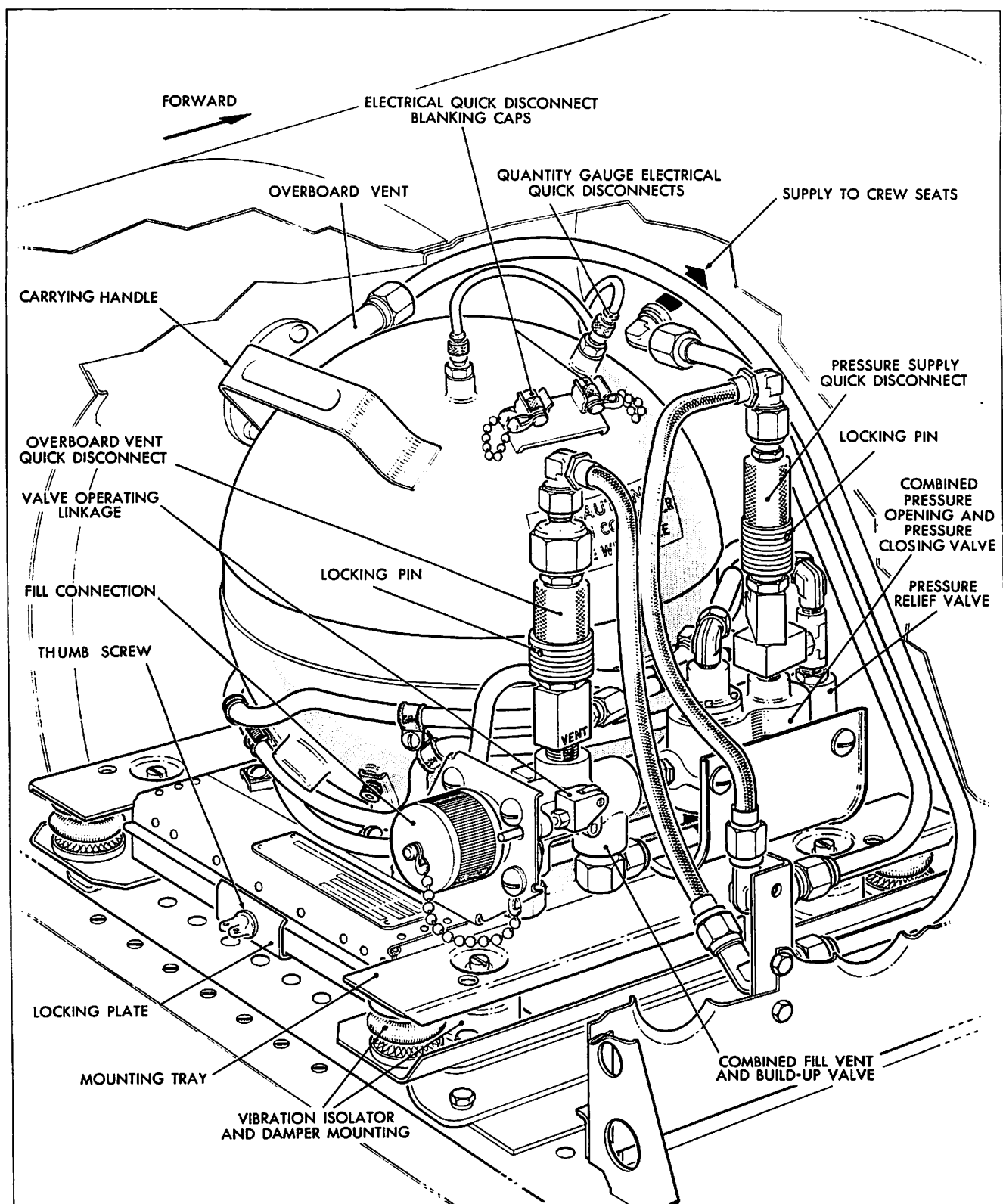


FIG. 1 OXYGEN SYSTEM - SCHEMATIC

ARROW 1 SERVICE DATA



7M1-3703-3

FIG. 2 LIQUID OXYGEN CONVERTER - INSTALLATION

ARROW 1 SERVICE DATA

indicate the volume of liquid in the converter in litres. See Arrow 1 Service Data - Section 35 - Instruments.

8 Warm air from the air conditioning system equipment supply is directed over the converter to maintain it at approximately 80°F and ensure that sufficient heat is available to vaporize the liquid and warm the gas to a breathable temperature under all ambient conditions.

LIQUID OXYGEN CONVERTER OPERATION (Fig 3)

9 The converter is removed from the aircraft for filling. A filling adaptor on the storage container fill line connects with the combined fill, vent and build-up valve on the converter. Connection of the adaptor positions the valves to allow liquid oxygen to enter the container and gaseous oxygen to vent to atmosphere. The fill valve is operated by an internal probe on the filling adaptor while the vent and build-up valves are operated by the filling adaptor through an external linkage. Disconnection of the adaptor on completion of the filling process, closes the fill and vent valves and opens the build-up valve.

10 With the build-up valve open, liquid oxygen flows from the container into the build-up coil where it evaporates. The gaseous oxygen passes through the pressure closing valve and build-up valve to build up a pressure in the converter. When the pressure reaches 75 psig the pressure closing valve closes and prevents any further flow of liquid into the build-up coil.

11 At this point, which is reached approximately five minutes after completion of the filling process, the converter can be fitted into the aircraft and connected to the system. On demand from the system, the liquid will flow through the non-return valve to evaporate in the warm-up coil at a rate sufficient to maintain the required flow and pressure to the aircraft system. A pressure differential of 4-7 psi is required to open the non-return valve.

12 A pressure of 75 psig is maintained in the converter by the pressure closing valve

which opens if converter pressure falls below 75 psig to allow liquid to flow into the build-up coil, evaporate, and build up the pressure. Due to the pressure drop across the non-return valve this provides a pressure of approximately 70 psig to the aircraft system.

13 If no demand is made on the converter or the converter is not installed in the aircraft, the pressure will continue to rise slowly due to unavoidable evaporation of the liquid in the container. When the pressure in the container reaches 82 psig, the pressure opening valve will open, equalizing the pressure on each side of the non-return valve which closes under the influence of the spring. With the non-return valve closed, liquid is prevented from flowing into the warm-up coil. Any continued pressure build-up in the converter due to unavoidable evaporation is relieved at 100 psig by a relief valve which vents the excess pressure overboard through the quick disconnect.

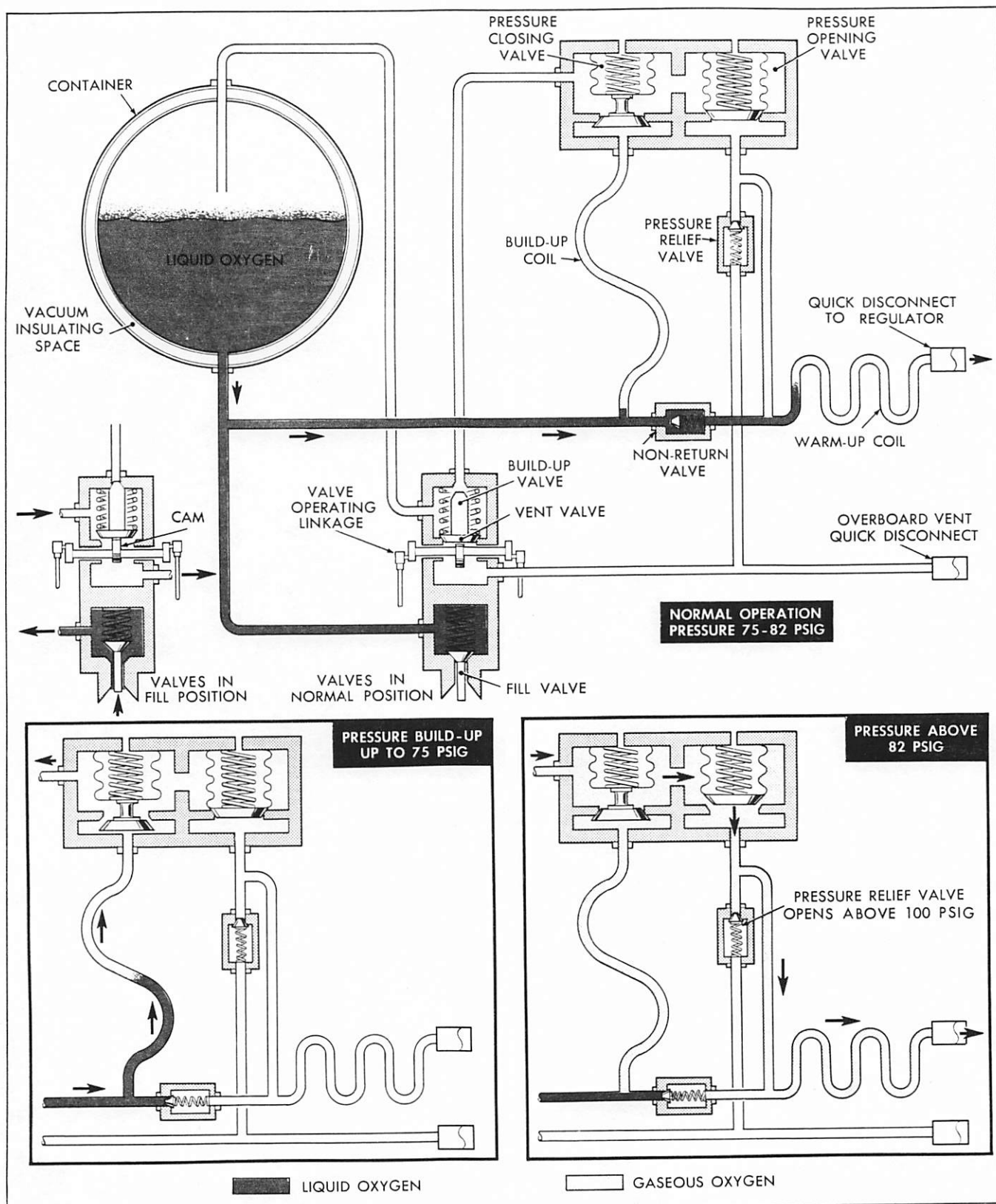
14 If a demand for gaseous oxygen is made when the pressure opening valve is in the open position, the pressure in the converter will drop as gaseous oxygen is drawn off until the valve closes at approximately 82 psig. A continued decrease in pressure in the system will allow the non-return valve to open when the system pressure is 4-7 psi below the pressure in the converter. This provides a degree of economy by ensuring that a maximum quantity of the gaseous oxygen converted during a standby period is used before any further flow of liquid into the warm-up coil occurs. With the non-return valve open, liquid oxygen will flow into the warm-up coil to maintain the flow and pressure to the system.

COMPOSITE LEADS DISCONNECT (Figs 1 and 4)

15 From the converter, oxygen is fed to a composite leads disconnect, one of which is fitted on the RH side of each seat. This component consists of three quick disconnect sections annotated 'A', 'B' and 'C', and performs the following functions:

(a) Forms a common point for connecting to the aircraft all services required by the crew member. These services include the

ARROW 1 SERVICE DATA



7MI-3702-2

FIG. 3 LIQUID OXYGEN CONVERTER - SCHEMATIC

ARROW 1 SERVICE DATA

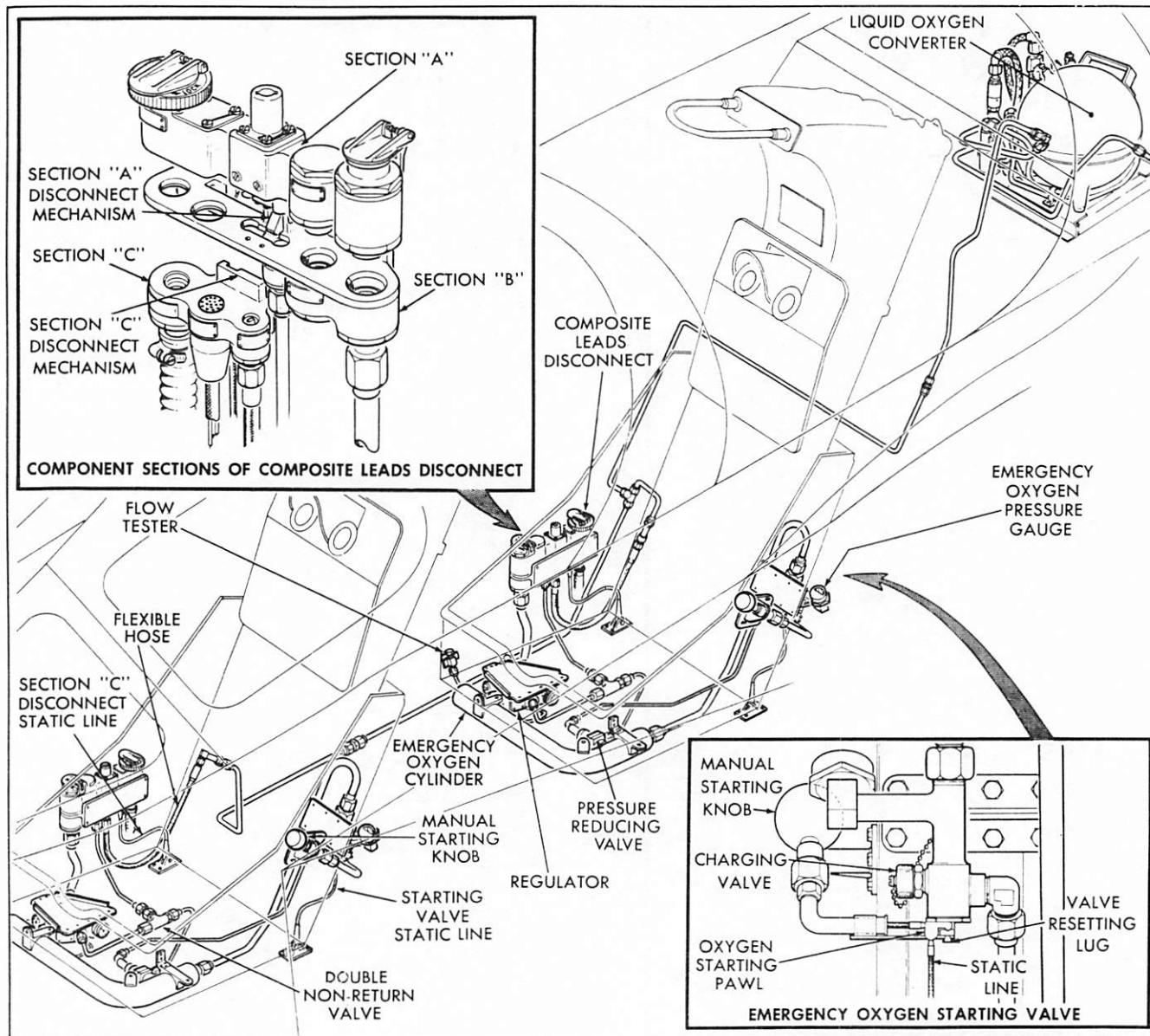


FIG. 4 OXYGEN SYSTEM - INSTALLATION

pressure breathing oxygen mask and pressure suit which are supplied from the oxygen system. Connections are also provided for the tele/mic leads and low pressure air to the anti-g suit.

(b) On ejection of the seat from the aircraft, automatically disconnects all services except emergency oxygen to the crew member.

(c) After ejection, automatically disconnects the emergency oxygen on separation of the seat from the crew member during descent.

16 Section 'B' forms the basis of the component and incorporates a mounting bracket through which the component is attached to the seat. Section 'C' is mounted on the under side of section 'B' and is held in position by a quick disconnect mechanism. Section 'C' is released by a static line connected to the aircraft structure which actuates the quick disconnect mechanism on ejection of the seat from the aircraft.

17 Section 'A' is mounted on the top of

ARROW 1 SERVICE DATA

section 'B' to which it is attached by a quick disconnect mechanism. The mechanism is operated through a mechanical linkage from the ejection seat harness release mechanism to disconnect section 'A' when the seat is released from the crew member.

18 The normal oxygen supply, the tele/mic supply and the low pressure air from the anti-g valve are led into section 'C' through flexible hoses and leads. The oxygen supply passes from section 'C', through section 'A' to the outlet connection on section 'B'. The tele/mic and the low pressure air from the anti-g valve are led through section 'C' to the outlet connections for the crew members equipment on section 'A'. The regulated oxygen supply from the regulator enters the composite leads disconnect through section 'B' and is led to the oxygen mask and pressure suit connection on section 'A'.

19 Rubber seals are fitted at the joints between each section to prevent leakage of the oxygen and low pressure air supplies. A shut-off valve is installed in the oxygen line in section 'C'. This valve prevents a loss of oxygen from the converter, when section 'C' of the composite leads disconnect is disconnected on removal of the seat for maintenance purposes. The shut-off valve closes automatically as section 'C' is disconnected from section 'A'. A second shut-off valve is installed in the outlet to the mask and pressure suit and is opened automatically on connection of the crew members mask and suit flexible hose adaptor. This valve prevents a loss of oxygen when a crew position is unoccupied.

REGULATOR

20 A pressure demand regulator is fitted on the underside of each seat to reduce and regulate the pressure and supply 100% oxygen under all conditions for the oxygen mask and pressure suit.

21 Gaseous oxygen is supplied to the regulator from the liquid oxygen converter through the composite leads disconnect and the double non-return valve at a pressure of 70-100 psig. The emergency supply is led from the emergency starting valve through the pressure

reducing valve and the double non-return valve to be supplied to the regulator at a pressure of 70 psig.

22 Up to a cabin altitude of approximately 40,000 feet, the regulator provides a small positive safety pressure to prevent inward leakage of air into the mask. Above 40,000 feet, a pressure of 2.7 - 2.9 psia is supplied to the mask to provide pressure breathing and to pressurize the pressure suit.

23 A flow tester is installed on the RH forward side of the seat and is connected to the regulator. A continuous bleed of 50-60cc/min of oxygen provides a reference pressure for the operation of the regulator and is exhausted through the flow tester. When the tester button is depressed, a pressure of 1.125 - 1.625 psig is supplied at the regulator outlet for test purposes.

24 A relief valve, set to relieve at 3 - 3.5 psig, is fitted in the outlet section of the regulator to relieve excess pressures to the mask and pressure suit in the event of a regulator defect.

EMERGENCY OXYGEN CYLINDER

25 An 'L'-shaped cylinder of approximately 50 cu in capacity is fitted under each seat pan to supply the emergency oxygen system. The cylinder is charged with gaseous oxygen to a pressure of 1800 psig. The flow of oxygen into the system is started by a starting valve which is connected to the cylinder by piping.

EMERGENCY OXYGEN STARTING VALVE

26 The emergency oxygen starting valve is fitted to the back of each seat and comprises a starting valve, a charging valve and a pressure gauge. The mechanically actuated starting valve can be actuated by pulling of a manual starting knob located on the LH side of the seat, or by a static line when the seat is ejected. The charging valve is accessible from the LH side of the seat. See fig 4. The pressure gauge provides an indication of the oxygen pressure in the emergency cylinder. For the operation of the valve see fig 5.

ARROW 1 SERVICE DATA

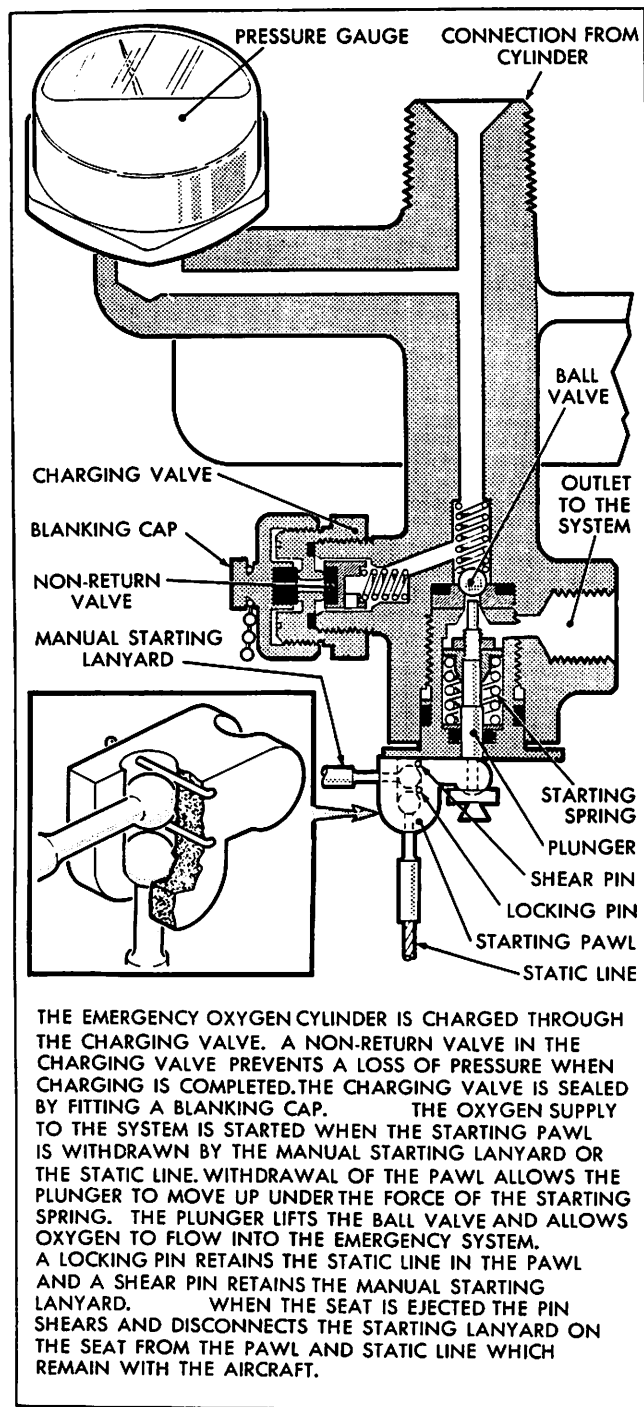


FIG. 5 EMERGENCY OXYGEN
STARTING VALVE - SCHEMATIC

PRESSURE REDUCING VALVE

27 Oxygen is supplied from the starting valve to a pressure reducing valve installed

under each seat pan. This valve reduces the emergency supply pressure of 1800 psig to 70 psig before supplying it to the double non-return valve in the normal oxygen supply line to the regulator.

TESTING AND SERVICING

FILLING THE LIQUID OXYGEN
CONVERTER

28 The liquid oxygen converter is removed from the aircraft for filling. It should be filled from a 50 gallon liquid oxygen storage trailer in a liquid oxygen facility. For the storage and handling of liquid oxygen see EO 20-115-9A.

29 To fill the converter proceed as follows:

- (a) Remove the converter from the aircraft as described in para 37 and install on the filling tray.
- (b) Ensure that there is sufficient liquid oxygen in the liquid oxygen storage trailer to fill the converter.
- (c) Check for freedom of operation of the storage trailer pressure relief valves by functioning manually.
- (d) Build up a pressure of 20 - 30 psig in the storage trailer and purge the fill line.

CAUTION

Do not pressurize the storage trailer above 50 psig.

- (e) Remove the blanking cap from the fill connection on the converter and connect the storage trailer fill line adaptor to the converter fill connection.

- (f) Slowly open the fill and drain valve on the storage trailer to allow liquid to enter the converter. Continue filling until liquid oxygen flows from the converter vent connection.

- (g) Close the fill and drain valve and open the vent valve on the storage trailer.

ARROW 1 SERVICE DATA

(h) Disconnect the fill line from the converter and replace the blanking caps on the converter fill connection and the fill line adaptor.

(j) Remove the converter from the filling tray and place in storage or install in the aircraft. After installation in the aircraft carry out a function test as described in para 30.

LIQUID OXYGEN CONVERTER FUNCTION TEST

30 To test the liquid oxygen converter after installation proceed as follows:

(a) Install a full liquid oxygen converter in the aircraft as described in para 38.

(b) Connect an AC electrical ground power unit to the aircraft and switch ON the master electrical switch in the front cockpit.

(c) Check that the liquid oxygen quantity gauges in both cockpits indicate 5 litres.

(d) Switch OFF the master electrical switch and check that the power off warning flags on both quantity gauges read OFF.

(e) Connect an oxygen mask to each composite leads disconnect in turn and check that gaseous oxygen is available and that a positive pressure is supplied to the mask. Depress the button on the flow tester on each seat and check that an increased flow and pressure are available at the mask.

CHARGING THE EMERGENCY OXYGEN CYLINDERS

31 The emergency oxygen cylinders are charged in the aircraft from a ground charging unit consisting of high pressure storage cylinders mounted on a trailer. A flexible transfer hose, equipped with a quick disconnect adaptor, is used to connect the storage cylinders to the emergency oxygen cylinder charging valves.

32 To charge each emergency oxygen cylinder, proceed as follows:

(a) Purge the transfer line on the ground charging unit by momentarily opening the ground charging valve. Avoid drip trays containing oil or hydraulic fluid when purging the transfer line.

(b) Check that the pawl is installed in the emergency oxygen starting valve.

(c) Remove the blanking cap from the emergency oxygen cylinder charging valve located on the emergency oxygen starting valve on the LH side of the crew seat.

(d) Attach the transfer hose quick disconnect adaptor to the emergency oxygen charging valve.

(e) Open the charging valve on the ground charging unit and charge the cylinder to 1800 psig as indicated by the gauge fitted to the emergency oxygen starting valve.

(f) Close the valve on the ground charging unit and disconnect the transfer line from the charging valve.

(g) Replace the blanking cap on the charging valve.

(h) Allow 10 minutes for the emergency cylinder to cool then recharge if the pressure has dropped below 1800 psig.

PRESSURE TESTING THE SYSTEM

33 To pressure test the oxygen system complete, proceed as follows:

(a) Remove the liquid oxygen converter. See para 37.

(b) Connect a supply of oxygen, regulated to 100 psig, to the liquid oxygen converter supply disconnect.

(c) Check for leaks, with an approved leak finding solution, all pipe connections and the high pressure oxygen joints of the composite leads disconnect on each seat. There must be no leakage from any pipe connection or high pressure seal.

ARROW 1 SERVICE DATA

NOTE

A combined total leakage of 0.005 litres/min is permitted from the low pressure oxygen joint and the shut-off valve in the mask and suit outlet adaptor. If the leakage is considered excessive the complete composite leads disconnect should be removed and bench tested.

(d) Disconnect the oxygen supply from the liquid oxygen converter supply disconnect.

34 Due to the inaccessibility of the oxygen system installed on the ejection seats, the seats must be removed and the system on the seats tested independently. Remove both ejection seats as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5.

35 To pressure test the system on each seat, proceed as follows:

(a) Disconnect the emergency supply inlet on the double non-return valve.

(b) Connect a supply of oxygen, regulated to 100 psig, to the oxygen inlet on section 'C' of the composite leads disconnect.

(c) Check the pipe connections between the composite leads disconnect and the regulator in the normal system for leaks, using an approved leak finding solution. Also check the open connection of the emergency oxygen inlet on the double non-return valve. No leakage is permitted.

(d) Disconnect the external supply from the inlet on section 'C' of the composite leads disconnect. Reconnect the emergency oxygen supply inlet connection to the double non-return valve.

(e) Disconnect the normal oxygen supply inlet at the double non-return valve.

(f) Check that the emergency oxygen gauge indicates 1800 psig.

(g) Start the emergency oxygen supply by operating the manual starting knob.

(h) Check all pipe connections in the emergency oxygen system for leaks, using an approved leak finding solution. Also check the open connection of the normal supply inlet at the double non-return valve. No leakage is permitted.

(j) Reconnect the normal oxygen supply inlet at the double non-return valve. Reset the starting valve by refitting the starting pawl.

(k) Recharge the emergency oxygen cylinders as described in para 31.

(m) Refit the ejection seats as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5.

NOTE

A total overall leakage of 0.5 litres/min is permitted from the oxygen regulator at normal operating temperatures and pressures. If the leak rate is considered excessive, the regulator should be removed from the seat and bench tested.

REMOVAL AND INSTALLATION

GENERAL

36 On installation of a component, pipe threads should be smeared with a light coating of lubricant, anti-seize and sealing, Spec. MIL-T-5542B, RCAF Ref. 34A/127 on the first three threads of the male portion only.

WARNING

If oxygen makes contact with oil, grease or any material containing oil or grease, spontaneous combustion and explosion will result. Keep oil and grease away from all oxygen apparatus and ensure that hands and clothing are clean.

LIQUID OXYGEN CONVERTER REMOVAL

37 To remove the liquid oxygen converter, proceed as follows:

ARROW 1 SERVICE DATA

(a) Remove the dorsal fairing aft of the navigator's cockpit.

(b) Disconnect the pressure supply, overboard vent and electrical quantity gauge bayonet type quick disconnects from the converter.

(c) Place the electrical quick disconnect blanking caps in position on the electrical connections on the converter.

(d) Release the thumb screw and locking plate at the rear of the converter and lift the converter clear of the mounting tray.

LIQUID OXYGEN CONVERTER INSTALLATION

38 To install the liquid oxygen converter proceed as follows:

(a) Slide the converter forward on to the mounting tray to engage with the lip at the forward end of the mounting tray and tighten the locking plate thumb screw at the rear.

(b) Remove the blanking caps from the electrical connections and place in the retaining clips.

(c) Connect the pressure supply, overboard vent and electrical quantity gauge quick disconnects.

NOTE

The pressure supply and overboard vent quick disconnects are fully engaged when the locking pins on each male section are visible through the inspection holes in the female section.

(d) Replace the dorsal fairing.

(e) Carry out a function test of the converter as described in para 30.

LIQUID OXYGEN CONVERTER MOUNTING TRAY

39 To remove the liquid oxygen converter mounting tray, proceed as follows:

(a) Remove the liquid oxygen converter as described in para 37.

(b) Remove the air conditioning cooling turbine and fan unit outlet duct and remove the air conditioning bay upper access panel.

(c) Disconnect the condensation drain connection from the bottom of the mounting tray.

(d) Remove the four mounting bolts attaching the tray to the shear panel of the rear arch and remove the tray from the aircraft.

40 The procedure for installing the liquid oxygen converter tray is the reverse of that given for the removal.

COMPOSITE LEADS DISCONNECT

41 To remove the pilot's or navigator's composite leads disconnect proceed as follows:

(a) Remove the ejection seat as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5. During this operation section 'C' of the composite leads disconnect remains in the cockpit.

(b) Disconnect the supply quick disconnect on the liquid oxygen converter.

(c) Remove section 'C' from the cockpit by disconnecting the anti-g suit flexible hose, the normal oxygen supply inlet flexible hose, the static line and the tele/mic leads.

(d) Disconnect the two oxygen lines and the mechanical disconnect linkage to section 'B' of the composite leads disconnect.

(e) Remove the four screws attaching the composite leads disconnect to the seat and remove the component.

42 The procedure for installing the pilot's or navigator's composite leads disconnect is the reverse of that given for the removal. After installation, pressure test the oxygen system and check for leaks at the composite leads disconnect.

EMERGENCY OXYGEN STARTING VALVE

43 To remove the emergency oxygen starting valve from the pilot's or navigator's ejection seat, proceed as follows:

ARROW 1 SERVICE DATA

(a) Remove the ejection seat as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5.

(b) Discharge the emergency oxygen cylinder by disconnecting the outlet connection on the starting valve and operating the starting valve manual control.

(c) Disconnect the inlet connection.

(d) Remove the three screws, nuts and washers attaching the starting valve to the seat bracket and remove the valve.

44 The procedure for installing the emergency oxygen starting valve is the reverse of that given for the removal. After installation pressure test for leaks at the starting valve connections and recharge the emergency oxygen cylinder.

EMERGENCY OXYGEN CYLINDER

45 To remove the emergency oxygen cylinder from the pilot's or navigator's ejection seat proceed as follows:

(a) Remove the ejection seat as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5.

(b) Disconnect the outlet connection from the starting valve and operate the starting valve manual control to discharge the cylinder.

(c) Disconnect the outlet connection on the cylinder.

(d) Remove the five bolts and screws attaching the oxygen cylinder to the seat and remove the cylinder.

46 The procedure for installing the emergency oxygen cylinder is the reverse of that given for the removal. After installation pressure test for leaks at the cylinder connection and recharge the cylinder.

REGULATOR

47 To remove the regulator from the pilot's or navigator's ejection seat proceed as follows:

(a) Remove the ejection seat as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5.

(b) Disconnect the inlet and outlet connections and the connection from the flow tester.

(c) Remove the four screws attaching the regulator mounting place to the seat and lift the assembly clear of the seat.

(d) Remove the one bolt and the one screw attaching the plate to the regulator.

48 The procedure for installing the oxygen regulator is the reverse of that given for removal. After installation, pressure test for leaks at the regulator connections.

PRESSURE REDUCING VALVE

49 To remove the pressure reducing valve from the pilot's or navigator's ejection seats proceed as follows:

(a) Remove the ejection seat as described in Arrow 1 Service Data - Section 31 - Ejection Seat MK C5.

(b) Disconnect the inlet and outlet connections on the pressure reducing valve.

(c) Unscrew the knurled cap from the mounting end of the pressure reducing valve.

(d) Remove the two screws attaching the valve to the mounting bracket.

(e) Remove the valve from the seat and refit the cap.

50 The procedure for installing the pressure reducing valve is the reverse of that given for removal. After installation pressure test for leaks at the pressure reducing valve connections.

ARROW 1 SERVICE DATA

FAULTS AND REMEDIES

FAULT	PROBABLE CAUSE	REMEDY
No oxygen pressure at the mask connection of the composite leads disconnect.	The build-up and vent valve in the converter stuck in the vent position. The supply quick disconnect coupling to the converter not fully connected. Section 'C' of the composite leads disconnect not connected.	Replace the converter. Reconnect. Reconnect.
Excessive and continuous venting at the overboard vent.	Defective converter.	Replace the converter.
Excessive loss of oxygen during stand-by period without excessive venting at the overboard vent.	The shut-off valve in one of the composite leads disconnect mask connections not seating correctly. Leakage from the oxygen pipelines and components. Leakage of oxygen from joints on the converter.	Replace the composite leads disconnect. Pressure test the system. Rectify the leak. Replace the converter.
Incorrect supply pressure from the regulator.	Regulator failed. Low supply pressure from the converter.	Replace the regulator. Replace the converter, and bench test the defective converter.
Relief valve on the regulator blowing continuously.	Regulator failed.	Replace the regulator.
Loss of emergency oxygen pressure.	Defective starting valve. External leakage from the pipelines and connections.	Replace the starting valve. Pressure test the system and rectify the leak.

ARROW 1 SERVICE DATA

FAULTS AND REMEDIES (Cont'd)

FAULT	PROBABLE CAUSE	REMEDY
Section 'A' of the composite leads disconnect does not lock to section 'B'.	Operating linkage out of adjustment. Locking mechanism worn or damaged.	Adjust the fork-end connection. Replace the composite leads disconnect.
Section 'C' of the composite leads disconnect does not lock to section 'B'.	Locking mechanism worn or damaged.	Replace the composite leads disconnect.

ARROW 1 SERVICE DATA

SECTION 23

POWER PLANT

(This data supersedes previous issue dated 2 May 1958)

1 OCT 58

CONFIDENTIAL

ARROW 1 SERVICE DATA
LIST OF REVISIONS

DATE	PAGE NO.	DATE	PAGE NO.
------	----------	------	----------

ARROW 1 SERVICE DATA

POWER PLANT

TABLE OF CONTENTS

TITLE	PAGE
DESCRIPTION	
General	1
Engine Suspension	1
Engine Lateral Alignment	3
Engine Cooling	4
Air Ejection System	6
Engine Oil System	6
Pressure Ratio System	9
Ground Running Safety Precautions	10
INSPECTION	
(To be issued later)	
FUNCTION TESTING	
General	14
Motoring the Engine	14
Pre-test Procedure	15
Engine Starting and Ground Testing	15
Unsatisfactory Starts	17
Unsatisfactory Start Procedure	17
Operating Temperatures	17
Depreservation	17
REMOVAL AND INSTALLATION	
General	18
Power Plant Removal	18
Power Plant Installation	22
POWER PLANT BUILD UP	
Removing an Engine from its Storage Container	23
Installing the Engine on the Mobile Work Stand	23
Fitting the Afterburner to the Engine	23
Fitting Power Plant Components to the Engine	25
Engine Fuel System	25
Constant Speed Unit	27
Alternator	27
Nose Fairing and Engine Adaptor Ring	27
Engine Air Conditioning System	27
Pressure Ratio System	29
Air Ejection System	29
De-icing System	29
Oil Tank and Drain	29
Oil Breather Pipes	30

ARROW 1 SERVICE DATA

TABLE OF CONTENTS (Cont'd)

TITLE	PAGE
Oil Tank Filler and Overflow Pipes	30
Engine Shroud Brackets	30
Engine Input and Bevel Gearboxes and Engine Air Turbine Starter	30
Constant Speed Drive Disconnect Couplings	30
Fuel Control Coupling	31
Miscellaneous Attachments and Components	31
Engine Suspension Struts	31
EQUIPMENT LIST	32

LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Engine Suspension	iii
2	Engine Suspension - Front Inboard	iv
3	Engine Suspension - Front Outboard	1
4	Engine Suspension - Rear Inboard	2
5	Engine Suspension - Rear Outboard	2
6	Engine Lateral Alignment Fitting	3
7	Engine Cooling, Ground Running and Airspeeds Below Mach 0.5	4
8	Engine Cooling, Airspeeds Above Mach 0.5	5
9	Engine Transverse Fireseal	6
10	Engine Shroud and Nose Fairing	7
11	Air Ejection System	8
12	Engine Oil System	9
13	Pressure Ratio System	10
14	Jet Wake and Intake Danger Areas	11
15	Engine Run-up Base	12
16	Engine Run-up Tie Down Bar	13
17	Engine Disconnect Points - Outboard	19
18	Engine Disconnect Points - Inboard	20
19	Engine Change Stand and Rails	21
20	Engine Mobile Work Stand	24
21	Engine Build Up - LH Side of RH Engine	26
22	Engine Build Up - RH Side of RH Engine	28

ARROW 1 SERVICE DATA

DESCRIPTION

GENERAL

1 The first ARROW 1 aircraft is powered by two Pratt and Whitney YJ75-P3 gas turbine engines with afterburners. Subsequent ARROW 1 aircraft will be powered by two Pratt and Whitney YJ75-P5 series engines with afterburners. Modification of the first aircraft to the P5 series engines will take place after the P3 engines have completed 100 hours running time. Engines of both series develop approximately 15,500 lb thrust without afterburning and 23,800 lb thrust with afterburner operating.

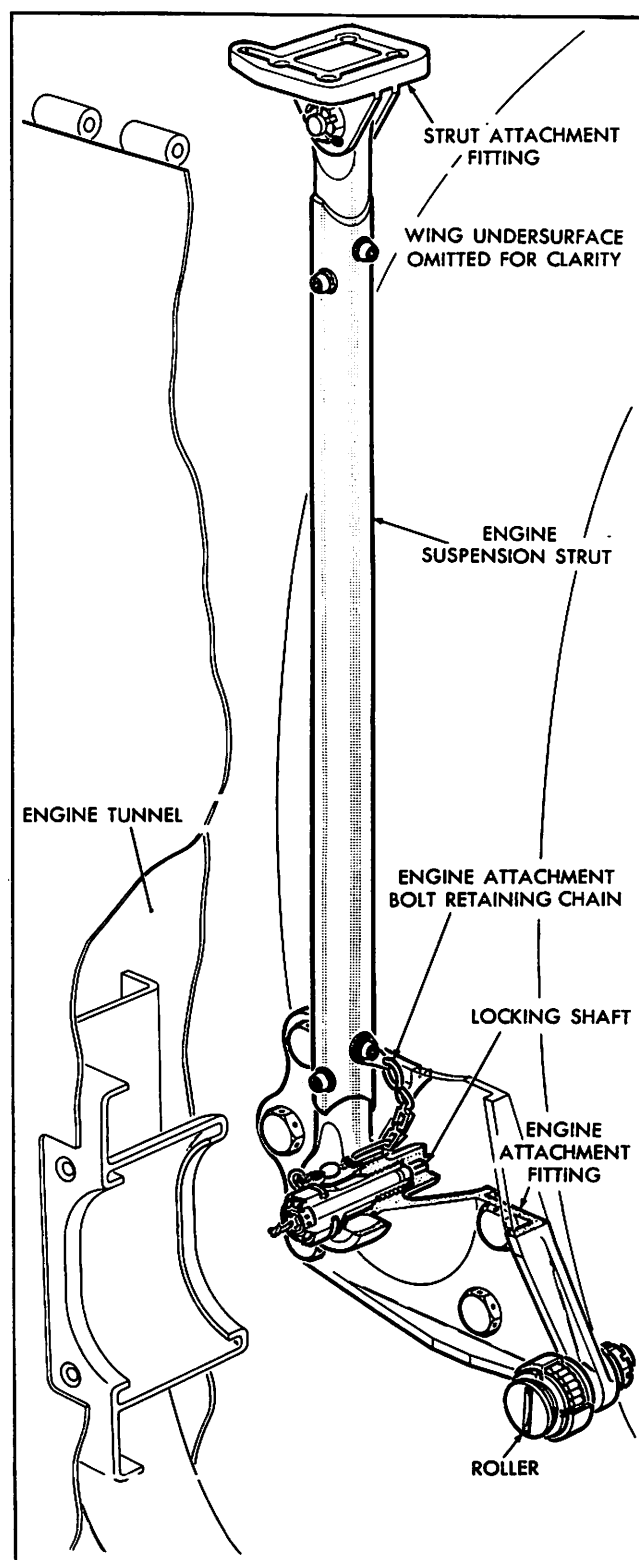
2 The engines are mounted in two tunnels located in the rear fuselage. The engine installation allows for engine expansion and is so designed that the engine is unaffected by airframe structural flexing.

ENGINE SUSPENSION (Fig 1)

3 Each engine is attached to three suspension struts and a common thrust beam. The suspension struts and thrust beam are secured to attachments on the lower surface of the inner wing.

4 The engine thrust is transmitted through the front inboard attachment to the thrust beam and aircraft structure. See fig 2. The front inboard attachment consists of a ball fitting, a hinged clamp and a transverse trunnion. The ball fitting is attached to the engine compressor casing and, with the engine installed, is secured in the clamp. The clamp is made in two halves. The rear half is hinged at the top and is locked to the front half by a bolt at the bottom. A lever and a retaining catch are provided to open the clamp and maintain it open during engine removal and installation. The RH and LH clamps are mounted on the transverse trunnion which is attached to the lower end of the thrust beam.

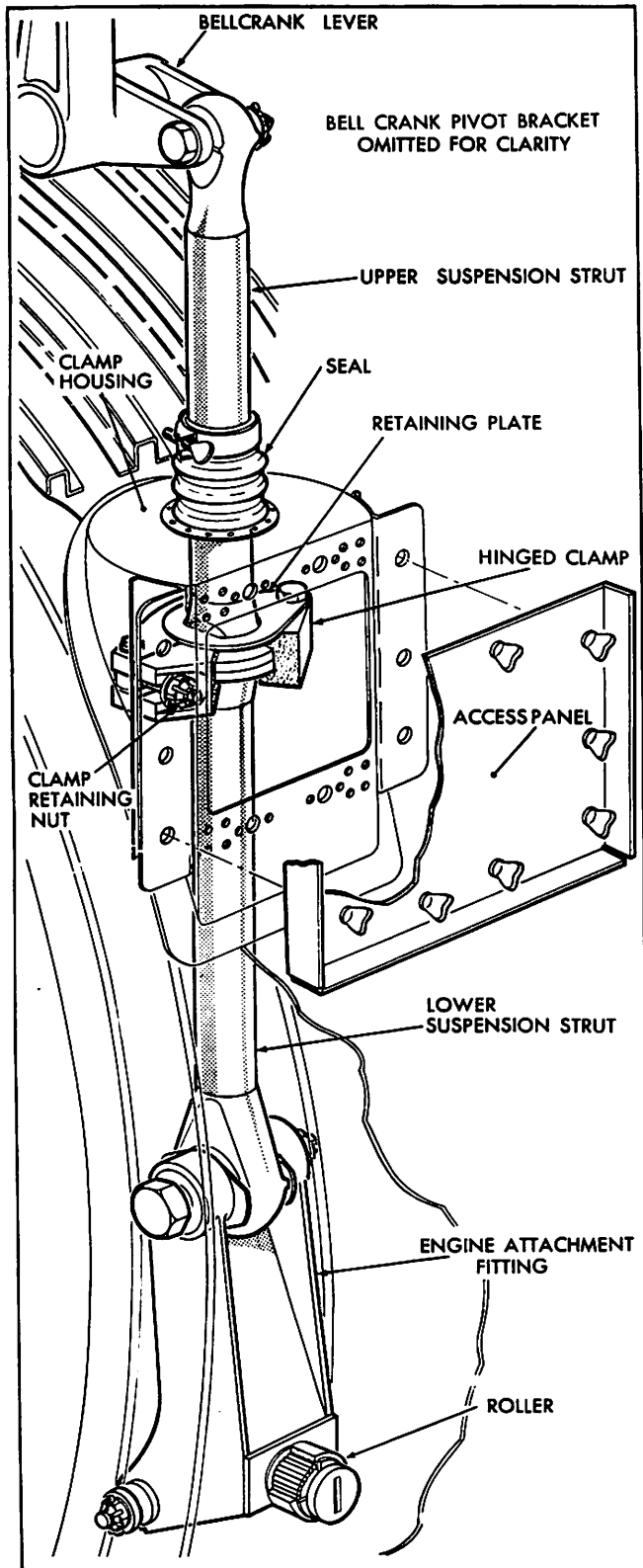
5 The engine front outboard attachment (fig 3) consists of a suspension strut attached at its upper end to a fitting on the lower surface of the wing, and at its lower end to an engine attachment fitting. Both ends of the strut have spherical bearings. The lower engine attachment bolt is wirelocked to a locking shaft inserted through the bolt and into the engine fitting.



7M1-3212-2

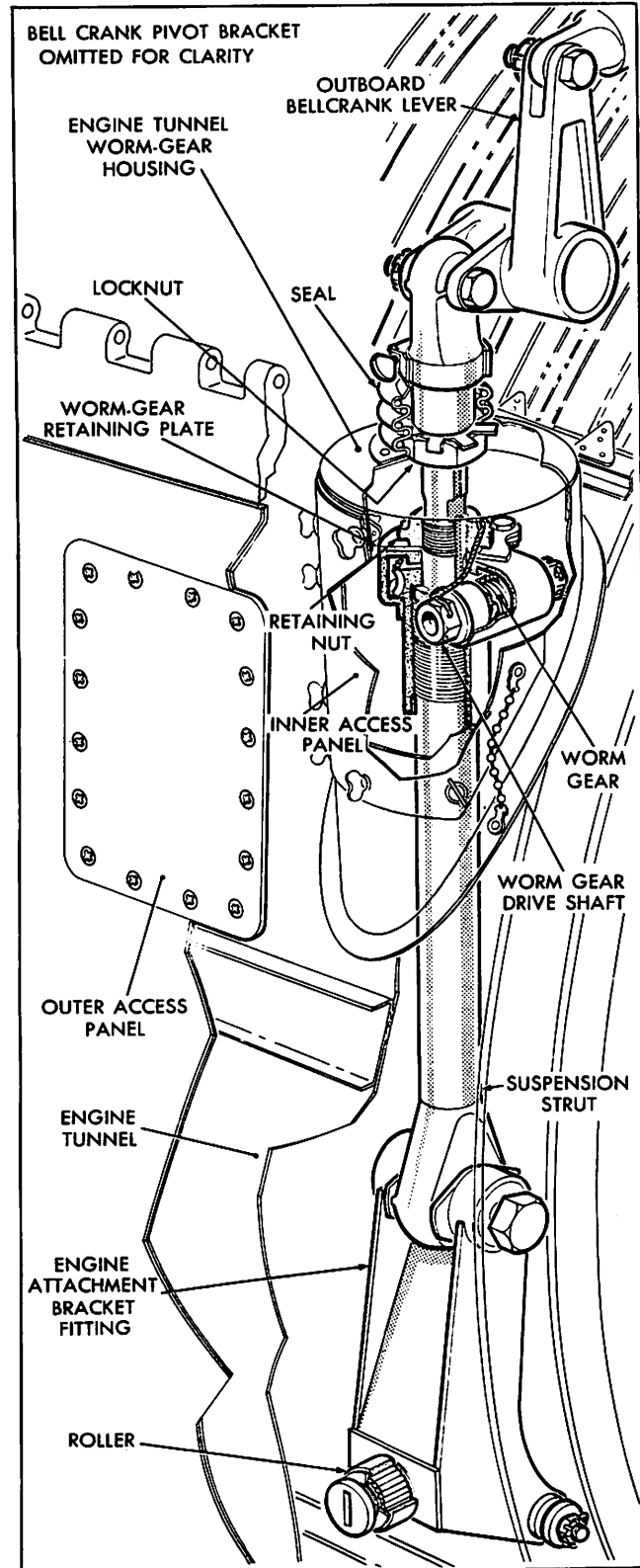
FIG. 3 ENGINE SUSPENSION
FRONT OUTBOARD

ARROW 1 SERVICE DATA



7MI-3211-3

FIG. 4 ENGINE SUSPENSION - REAR INBOARD



7MI-3213-1

FIG. 5 ENGINE SUSPENSION - REAR OUTBOARD

ARROW 1 SERVICE DATA

6 The inboard and outboard rear suspension struts, (figs 4 and 5) are connected together by two bellcranks and a cross arm. This arrangement permits vertical alignment of the engine by adjustment of the length of the outboard strut only. Spherical bearings at each end of both suspension struts allow for engine expansion. Seals fitted to the upper part of each suspension strut isolate the engine tunnel from the hydraulic and equipment bay.

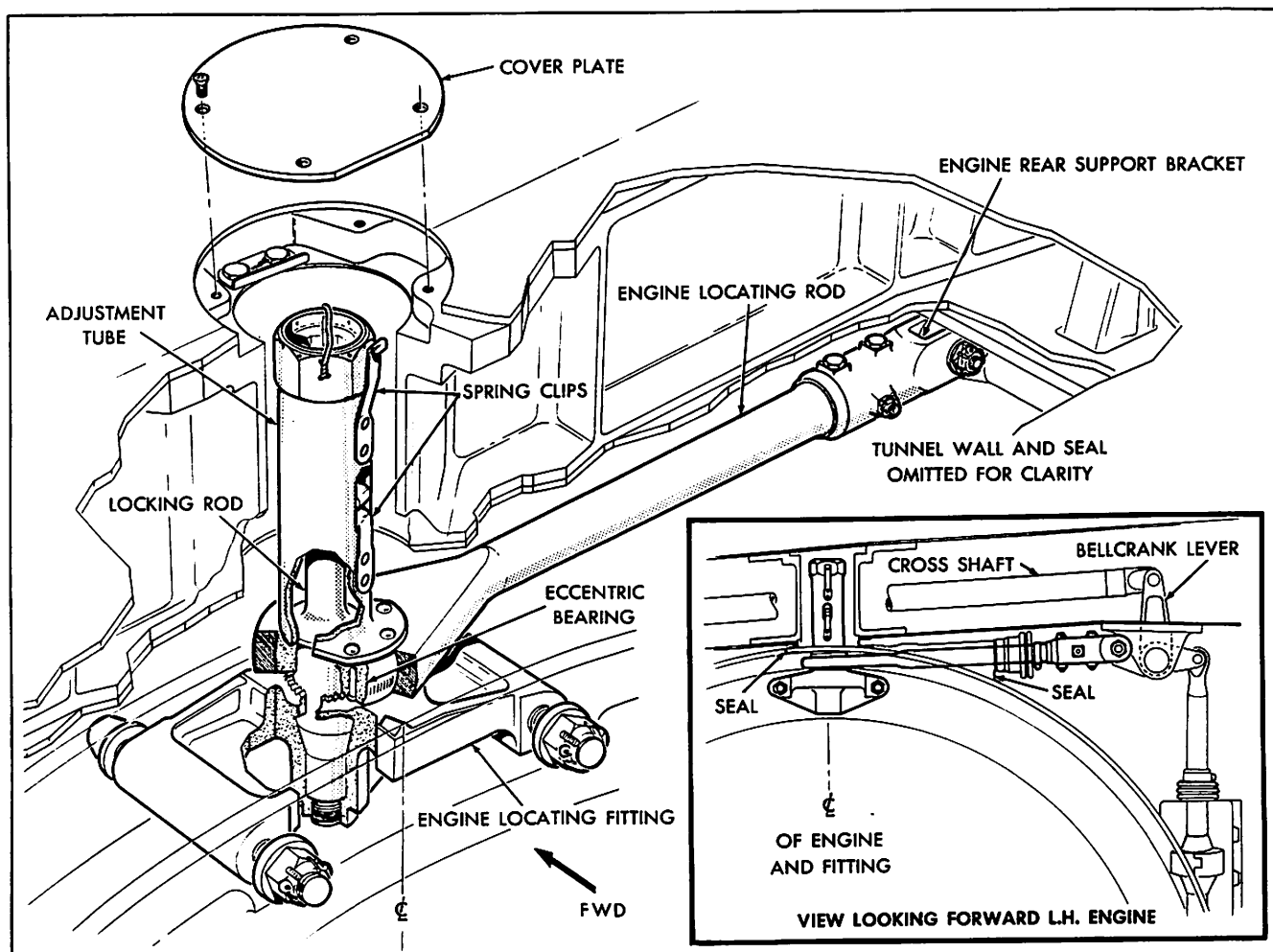
7 To facilitate removal and installation of the engine the rear inboard strut is made in two sections locked together by a hinged clamp. A retaining plate retains the clamp on the upper section of the strut when the clamp is released.

8 The outboard strut is also constructed

in two sections with a long tubular worm gear driven nut on the upper section, and the lower section threaded to fit into the nut. A worm gear drive shaft affords a means of rotating the nut which provides the adjustment for raising and lowering the engine in the tunnel. Turning the worm gear shaft in an anti-clockwise direction raises the engine. The nut is disengaged from the lower section of the strut for engine removal.

ENGINE LATERAL ALIGNMENT (Fig 6)

9 The rear section of the engine is secured to the aircraft structure by a transverse rod. The rod has spherical bearings fitted to both ends to allow for engine expansion. It is attached to the rear inboard suspension fitting



7MI-3214-2

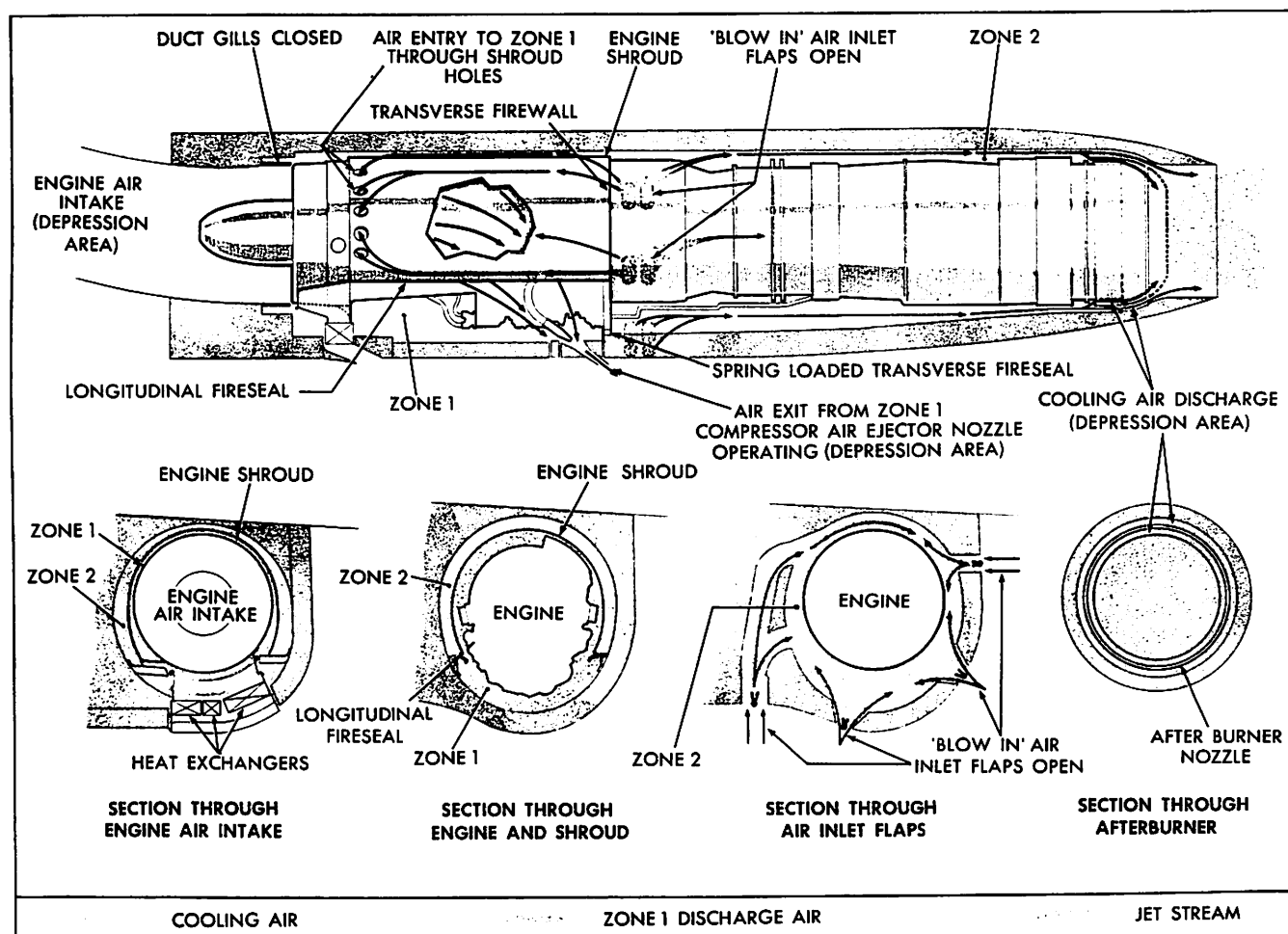
FIG.6 ENGINE LATERAL ALIGNMENT FITTING

ARROW 1 SERVICE DATA

on the undersurface of the wing and is secured to the engine fitting by means of an eccentric bearing. The bearing is serrated on its lower surface and mates with matching serrations on the engine fitting. Positioning of the bearing on the serrations adjusts the lateral location of the engine in the tunnel. An adjustment tube riveted to the bearing allows the bearing to be turned after removal of an access panel on the wing upper skin. A rod, fitted inside the tube and screwed into the engine fitting, clamps the bearing to the engine fitting after the adjustment is completed. Two spring clips attached to the tube and a plate bolted to the structure provide a means of retaining the locking rod in the disengaged position and also securing the assembly clear of the engine during engine removal and installation.

ENGINE COOLING (Figs 7 and 8)

10 Each engine is fitted with a transverse firewall and a titanium engine shroud. The engine shroud encloses the forward upper section of the engine and the transverse firewall is fitted around the forward combustion chamber casing and mates with the rear end of the engine shroud. The airframe seals comprise a longitudinal fireseal on each side of the engine tunnel which aligns with the lower edges of the shroud and a spring-loaded transverse fireseal which aligns with the transverse firewall. The firewalls and fireseals serve to isolate the engine fuel and oil system components on the forward part of the engine from the engine hot end and afterburner. Cooling air enters through holes in the forward end of



7M1-3202-3

FIG. 7 ENGINE COOLING, GROUND RUNNING AND AIRSPEEDS BELOW MACH 0.5

ARROW 1 SERVICE DATA

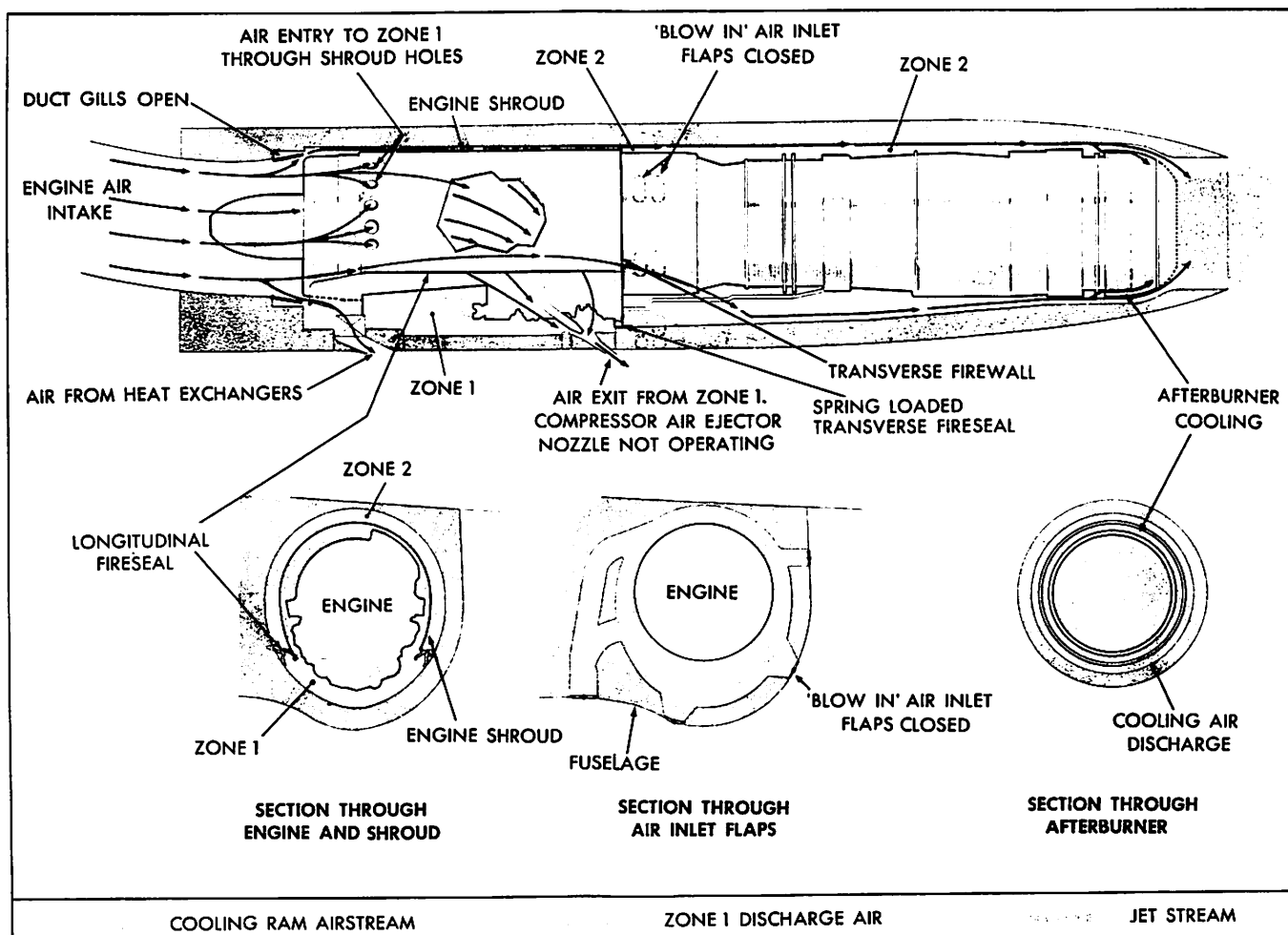


FIG. 8 ENGINE COOLING, AIRSPEEDS ABOVE MACH 0.5

the shroud and ventilates through a hole in the engine access panel No. 2. The transverse fireseal (fig 9) is a retractable spring sealing member which can be retracted or extended manually for engine installation or removal. Two release cables with integral swaged balls and keyhole slotted retaining brackets enable the fireseal to be locked in the retracted position.

11 The engine cooling system provides for the varying cooling requirements under all conditions from ground running to maximum aircraft speed. During ground running and at low aircraft speeds a depression exists in the engine air intake, see fig 7. This causes duct gills fitted forward of the engine intake to close, and all air entering the intake passes through the engine. The depression within the air intake

operates a pressure switch which actuates an air ejection control valve. This valve directs compressor bleed air to an ejector nozzle located forward of the transverse firewall. The nozzle ejects a stream of high pressure air through a vent in engine access panel No. 2. The venturi effect caused by the air ejection nozzle together with a similar effect at the afterburner nozzle, create a depression in the forward and rear ends of the engine tunnel. This depression causes blow-in air flaps to open and allow air at atmospheric pressure to enter the engine tunnel. The depression at the air ejection nozzle draws air forward and through holes in the forward end of the engine shroud to cool the engine compressor and ventilate the forward section of the engine to atmosphere. This area beneath the engine shroud and forward of the transverse firewall

ARROW 1 SERVICE DATA

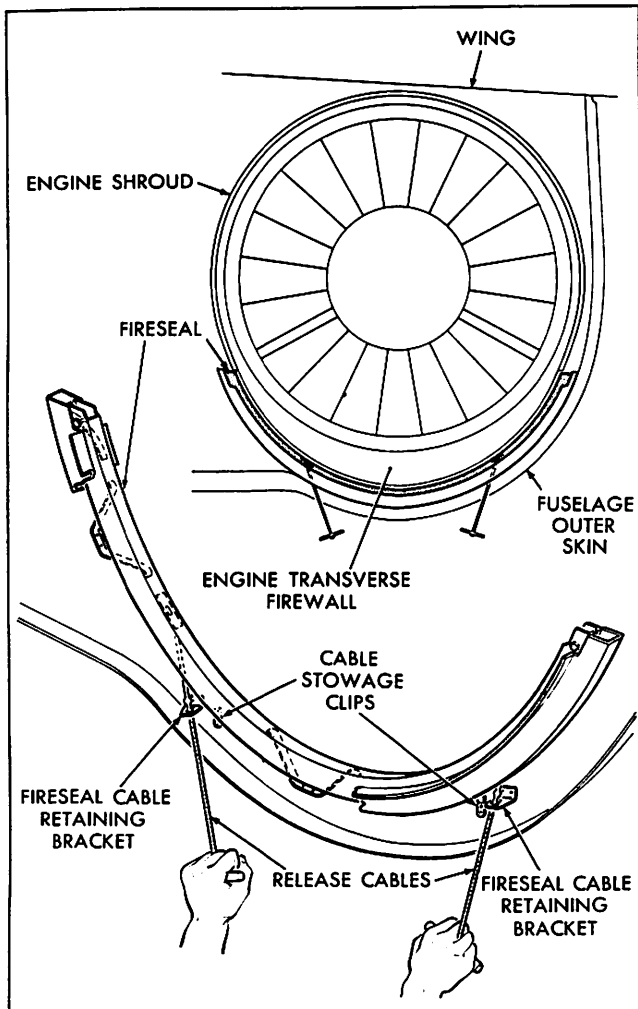


FIG. 9 ENGINE TRANSVERSE FIRESEAL

is designated Zone 1. The depression at the afterburner nozzle draws cooling air rearward to cool the hot end of the engine. This area above the engine shroud and to the rear of the transverse firewall is designated Zone 2.

12 At air speeds above Mach 0.5 ram air in the engine air intake opens the duct gills, and approximately 15% of the ram air passes through the gills to cool the forward and rear sections of the engine, see fig 8. Ram air is also directed through the heat exchangers located below the engine air intake.

13 A nose fairing (fig 10) is provided to enclose an alternator and a constant speed drive unit mounted on the engine front pad. It is constructed to supply cooling air for the

alternator and hot air for de-icing both the alternator and the nose fairing. The fairing is divided into forward and rear sections. The forward section comprises a porous steel nose skin, a ram air duct and two diaphragm type relief valves. The rear section contains two hot air ducts that vent into the forward section.

14 In flight, ram air flows through the ram air duct and into the rear section to cool the alternator. The cooling air is discharged through outlet vents at the rear of the fairing. When icing conditions prevail an anti-icing valve supplies hot air from the compressor bleed through the two hot air ducts to heat the porous nose skin. A portion of the hot air in the forward section is drawn through the ram air duct orifices to de-ice the alternator. The relief valves in the front section of the nose fairing relieve any excess air pressure back to the rear section and through the outlet vents.

AIR EJECTION SYSTEM (Fig 11)

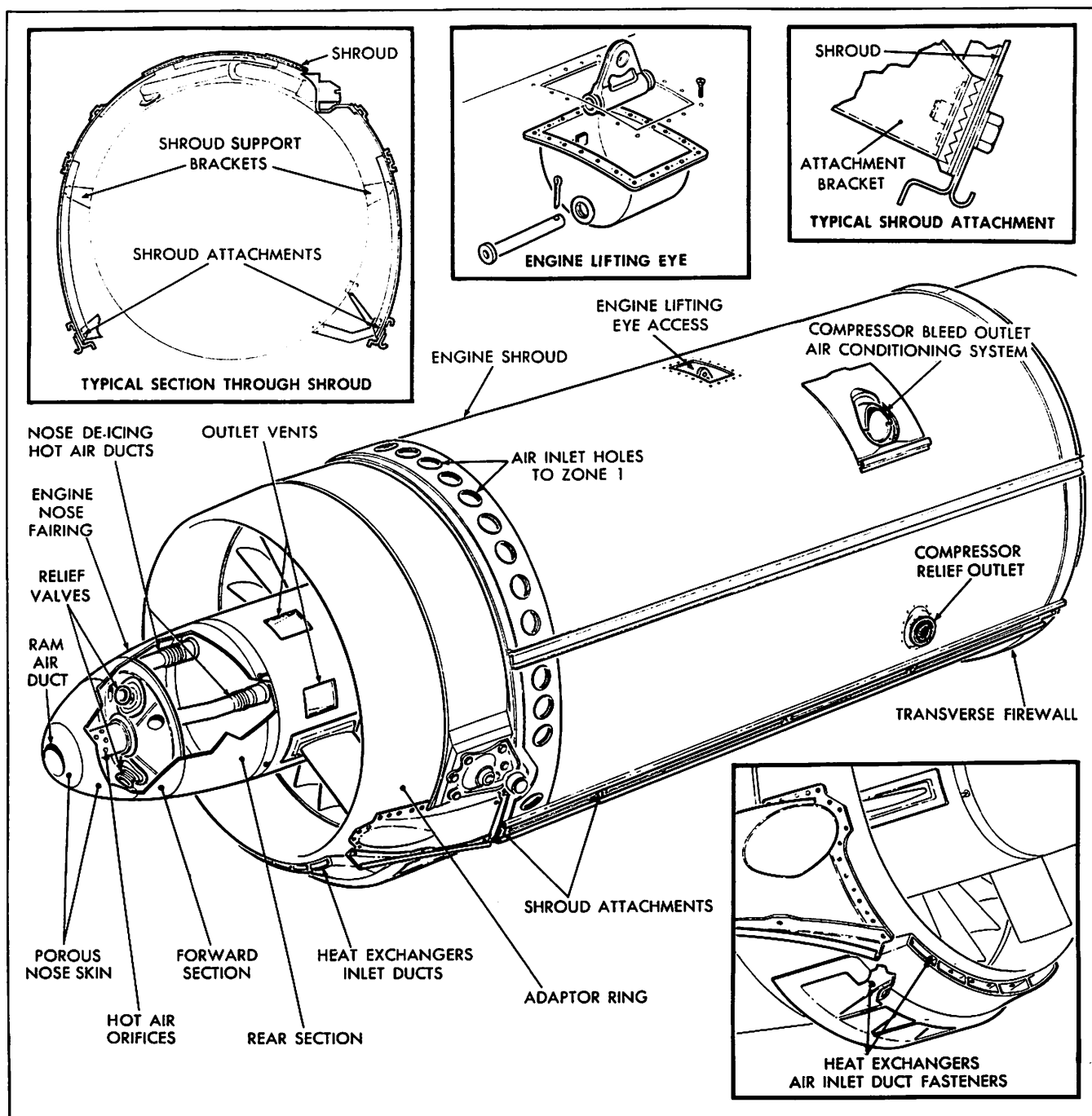
15 The air ejection system provides a flow of cooling air over the forward part of the engine and is designed to operate during ground running and in flight at speeds below Mach 0.5. See para 11.

16 The air ejection system consists of a pipeline tapped into the air conditioning bleed manifold, an electrically actuated butterfly type ejector valve, a differential pressure switch and a discharge nozzle. The differential pressure switch senses the pressure differential between the engine air intake duct and ambient conditions and supplies electrical power to actuate the ejector valve. When the valve is open high pressure air is ejected from a nozzle on the end of the pipeline through a vent hole in engine access panel No. 2. The venturi effect set up by the air jet creates a depression around the forward section of the engine, drawing in cooling air through the blow-in flaps and through holes in the forward part of the engine shroud. See para 11.

ENGINE OIL SYSTEM (Fig 12)

17 The engine oil is contained in a saddle type tank fitted on top of the engine compressor case. The tank is replenished by pumping the

ARROW 1 SERVICE DATA



7M1-3205-5

FIG. 10 ENGINE SHROUD AND NOSE FAIRING

oil into an oil filler connection located under the engine compressor casing. An overflow valve is fitted adjacent to the filler connection to indicate when the tank is full. The oil tank can be drained by opening a manually operated oil drain valve located on the LH side of the engine below the oil tank.

18 The engine oil is cooled by two oil-to-fuel and one oil-to-air heat exchangers. The oil is pumped from the engine to the oil-to-air heat exchanger located below the engine intake adaptor ring. This heat exchanger is equipped with a relief valve which permits the oil to by-pass the heat exchanger during cold starting

ARROW 1 SERVICE DATA

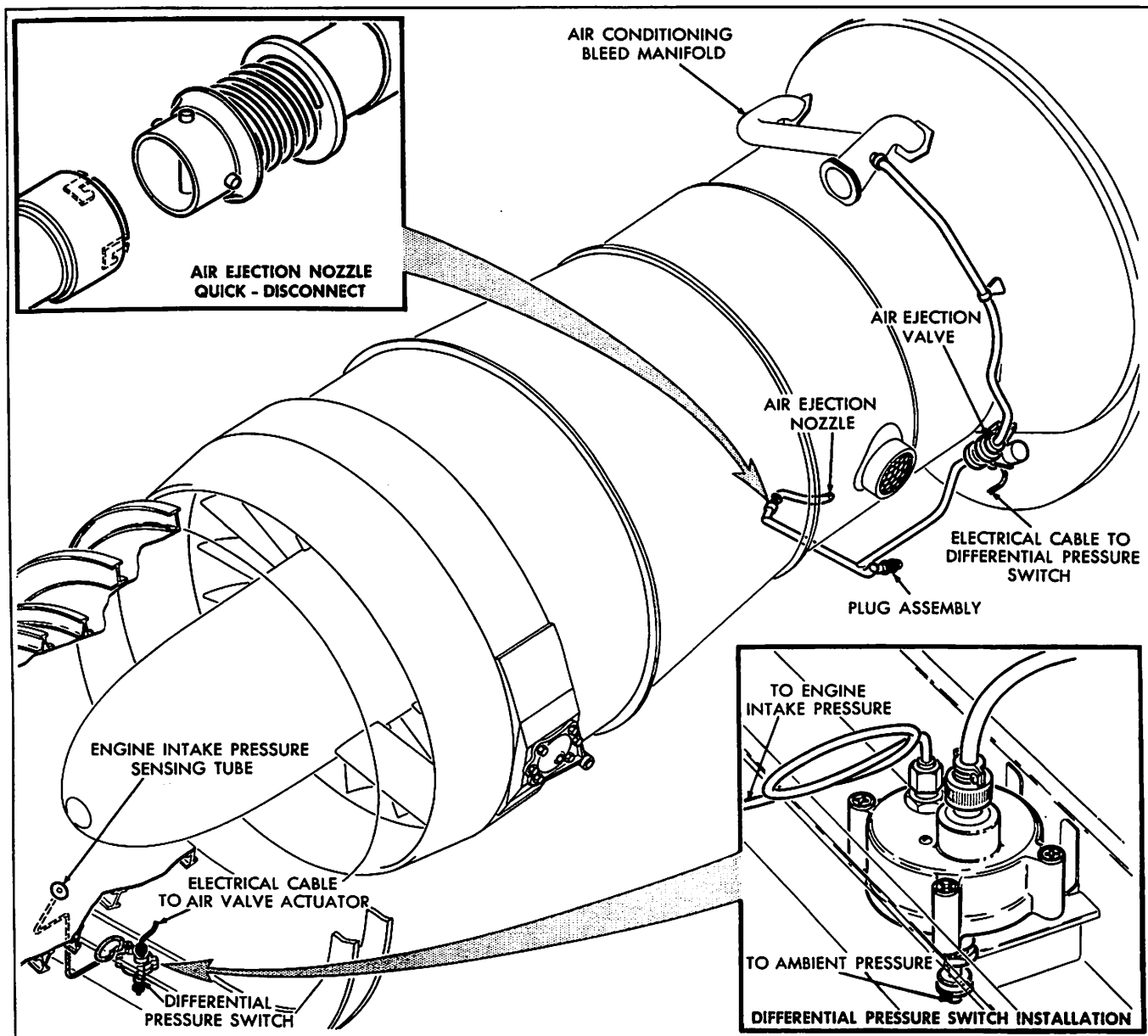


FIG. 11 AIR EJECTION SYSTEM

or in the event of the heat exchanger becoming choked.

19 From the oil-to-air heat exchanger the oil is passed to an oil-to-fuel heat exchanger fitted in the equipment bay. Oil flow through this component is controlled by a solenoid operated by-pass valve. The valve is normally open, permitting the oil to by-pass the heat exchanger. It automatically closes when the afterburner is in operation and the oil flows

through the heat exchanger. This heat exchanger is a section of a combination heat exchanger which provides cooling for the utility hydraulics, flying control hydraulics, accessories drive oil, and engine oil. The engine oil is finally cooled by an oil-to-fuel heat exchanger fitted on the LH side of the engine behind the oil tank.

20 The latter oil-to-fuel heat exchanger and the oil tank are both engine components.

ARROW 1 SERVICE DATA

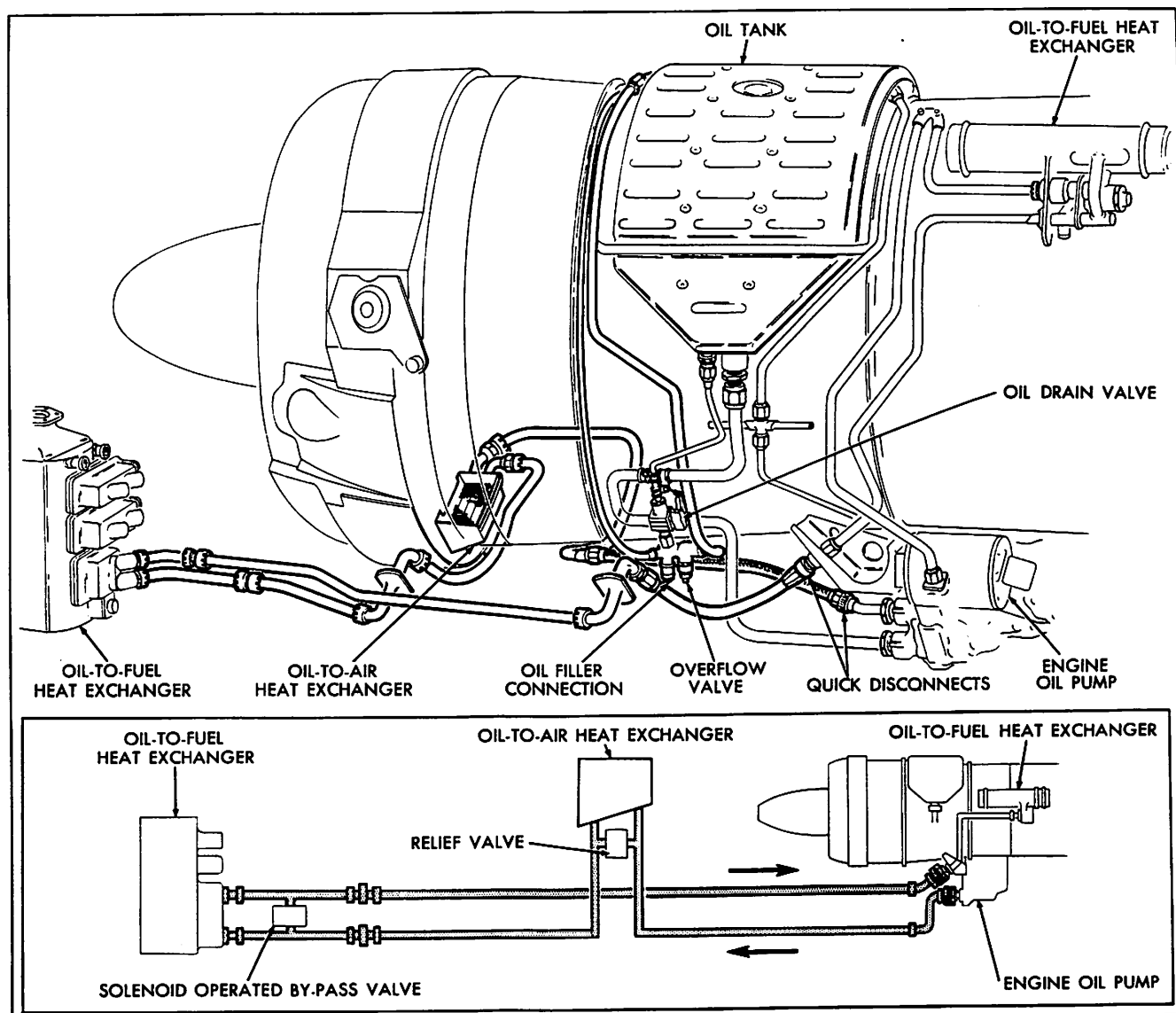
21 When the engines are not operating, the oil supply in the engine oil tank will drain into the engine gearbox section. Because of this it is possible to overfill the engine oil system and subsequently overpressurize the system when the engines are started. To eliminate this the engine oil tank must only be topped up immediately following a flight or a ground run. If an oil tank is suspected of being overfilled the engine must be started and ground run with the overflow drain valve in the open position. The valve must be closed after a short period of ground

running or when oil ceases to be discharged from the overflow valve.

PRESSURE RATIO SYSTEM (Fig 13)

22 The pressure ratio system senses the pressure differential between the engine intake and the turbine outlet and transmits this to an electrical indicator in the cockpit. The indicator reading is used to compute the engine thrust.

23 The system consists of a pressure ratio transducer located between the tunnels in the engine bay. This unit is connected by pipelines



7M1-5219-1

FIG. 12 ENGINE OIL SYSTEM

ARROW 1 SERVICE DATA

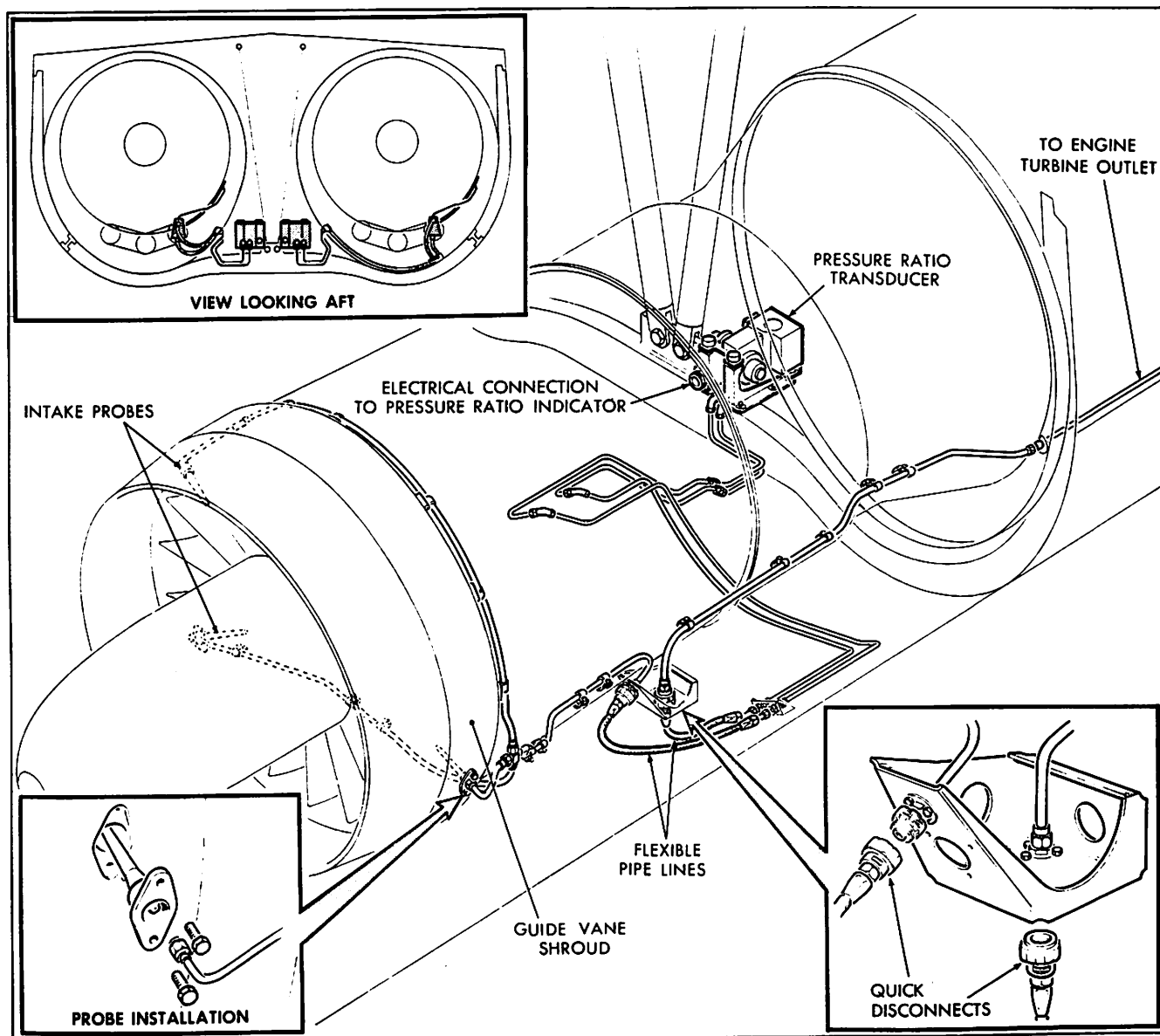
to pressure probes in the engine intake and turbine outlet. Flexible pipelines and quick-disconnects connect the engine pipelines to the pipelines on the structure.

GROUND RUNNING SAFETY PRECAUTIONS

24 In addition to normal jet aircraft ground running safety precautions, extra care should be exercised when observing the danger area around the intake and jet wake. See fig 14. Ear protectors should be worn at all times

and ground test equipment placed as far as is practicable from the aircraft.

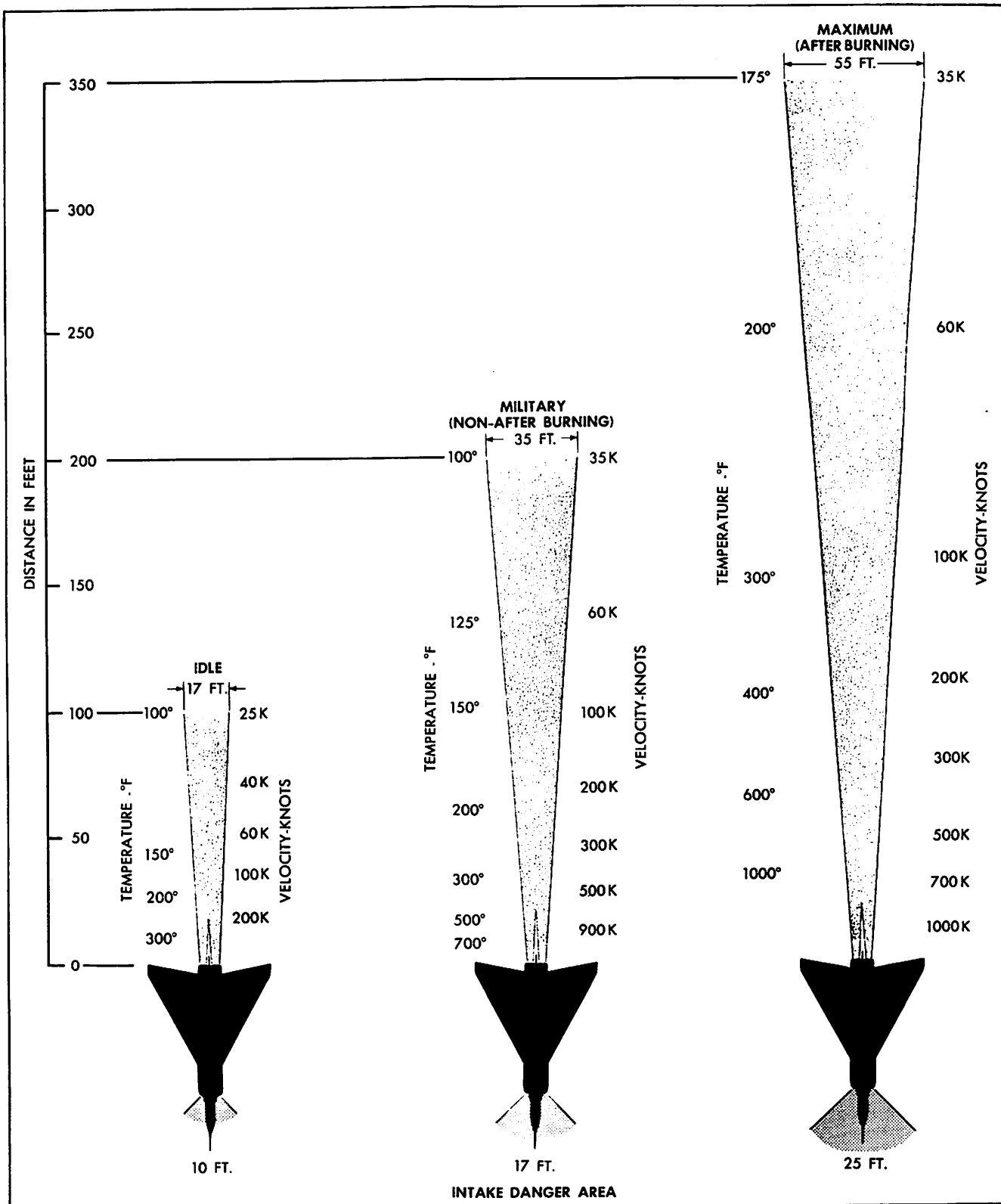
25 When carrying out high power ground runs the aircraft must be located on a running up base. This is equipped with two ground picket points and two concrete curbs with steel facings. The aircraft main wheels are positioned in the curbs and each main landing gear leg is secured to a picket point with a steel tie bar. Threaded end fittings provide the tie bar with adjustment for length. See figs 15 and 16.



TM-5208-4

FIG. 13 PRESSURE RATIO SYSTEM

ARROW 1 SERVICE DATA



7MI-3216-1

FIG. 14 JET WAKE AND INTAKE DANGER AREAS

ARROW 1 SERVICE DATA

26 An engine compressor relief valve vents a hot air blast from an oval shaped louvre in the side of the fuselage, just aft of the landing gear. Personnel and equipment should be kept at least five feet away from this area. On YJ75-P5 installations the compressor relief actuator will be rendered inoperative.

27 Interphone communication is necessary between the ground equipment operator and the occupant of the pilot's cockpit. In the event of an internal engine fire, the engine should be motored with the power levers OFF and all fuel and start switches OFF, until the fire is extinguished.

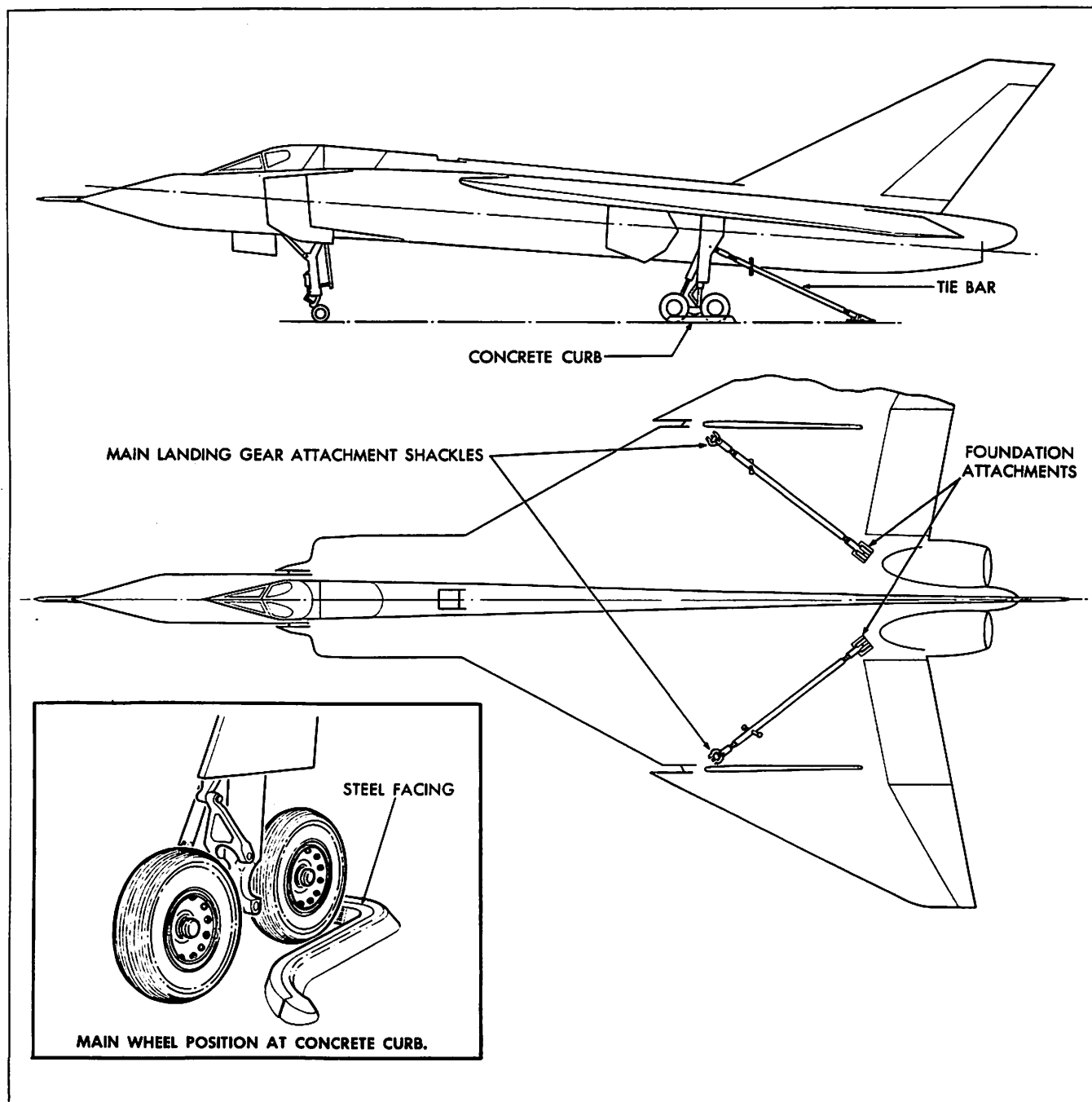


FIG. 15 ENGINE RUN-UP BASE

ARROW 1 SERVICE DATA

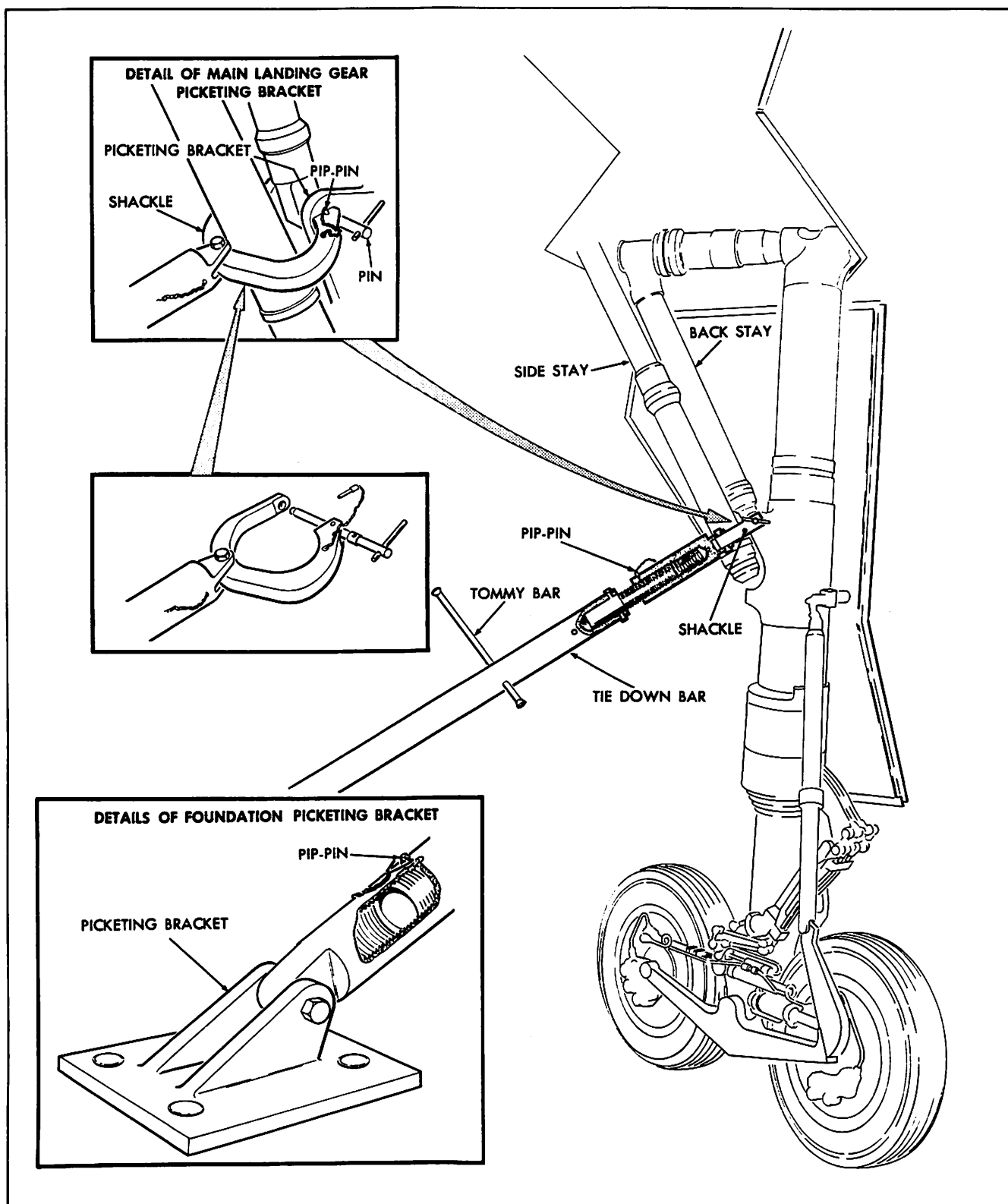


FIG.16 ENGINE RUN-UP TIE DOWN BAR

ARROW 1 SERVICE DATA

FUNCTION TESTING

GENERAL

28 Ground equipment for starting the engines is installed on a self-propelled mobile unit. The unit is equipped with a gas turbine compressor, an electrical power plant for DC supply, an electrical AC supply, two flexible air starter hoses, an electrical power cable, a grounding cable and intercom equipment for communication between the occupant of the aircraft cockpit and ground personnel. Wiggins lanyard operated couplings provide a quick-disconnect between the ground starting equipment and the aircraft ground service connections.

29 The electrical cables and air hoses of the ground starting supply unit are connected to the aircraft as follows:

(a) The electrical AC supply is connected to the ground service connection located in the lower duct bay.

(b) The electrical DC supply and intercom are connected to the ground service connection on the nose leg.

(c) The engine starter air supply hoses are connected to the engine starter connections which are accessible through the LH and RH engine access doors No. 1.

(d) The grounding cable is connected to the static ground line on the aircraft main landing gear.

30 When starting the ground starting supply unit the following sequence should be followed:

(a) Start up the electrical AC generator. This unit is driven from the vehicle motor.

(b) Start up the gas turbine compressor.

(c) Ensure that the electrical AC and DC power outputs are indicating correctly on the gauges.

(d) Select the intercom to the desired selection.

31 The aircraft should be anchored to the test running site as shown in figs 15 and 16. The anchorage is fixed directionally and the aircraft cannot be oriented to the prevailing wind. The engine should not be trimmed if a strong cross wind is prevailing. The trim speed of each individual engine is stamped on the engine data plate by the manufacturer, and entered in the relative engine log book. Reference to this data is necessary when trimming the engine.

MOTORING THE ENGINE

32 Lubrication and cooling of the fuel system components is accomplished by the movement of fuel, so fuel must be supplied to all fuel system components whenever the engine is rotated.

33 To motor the engines proceed as follows:

(a) Remove all aircraft covers, intake boards and exhaust boards.

(b) Check that the landing gear selector is in the DN position.

(c) Check that the ground locks are fitted to the nose and main landing gears.

(d) Connect up the ground starting unit as in para 29.

(e) Check that the L.P. fuel cock selectors in the front cockpit are ON.

(f) Select the master electrical switch ON.

(g) Set the power lever to the OFF position.

(h) Select the fuel selector switch to NORMAL.

(j) Start the ground starting unit. See para 30.

(k) When starter air supply is available, depress and hold the appropriate cockpit engine start switch in the RESET position for a period not exceeding thirty seconds and then release to the OFF position. The N2 compressor will rotate to approximately 1200 rpm and with the release of the starter switch will gradually run down.

ARROW 1 SERVICE DATA

NOTE

Three consecutive motorings of 30 seconds duration are permitted after which a cooling period of at least 5 minutes must be allowed to cool the engine air starter.

PRE-TEST PROCEDURE

34 The following procedure should be adopted prior to engine starting:

- (a) Remove all aircraft covers, intake boards and exhaust boards.
- (b) Check that the landing gear selector is in the DN position.
- (c) Check that the ground locks are fitted to the nose and main landing gears.
- (d) Connect up the ground starting unit as in para 29.
- (e) Ensure that the master switch on the refuelling panel located on the underside of the duct bay is selected to the OFF position.
- (f) Ensure that the L.P. fuel cock switches in the front cockpit are selected ON.
- (g) Ensure that the manually operated gate valves in the main wheel bay are in the VALVE OPEN position.
- (h) Check that all equipment not required for engine starting is switched OFF.
- (j) Inspect the area beneath the intakes for cleanliness.

ENGINE STARTING AND GROUND TESTING

35 For ground running safety precautions see paras 24 - 27. To start the engine proceed as follows:

- (a) Select the aircraft master electrical switch ON.

- (b) Check that the fuel control, normal/emergency switch is selected to NORMAL and the ENG EMERG FUEL light is out.

- (c) Select the power levers to OFF.

- (d) Indicate to the ground supply operator that the engine is ready for starting. The ground supply operator will advise over intercom when air pressure is available.

- (e) On receipt of the ready to start instruction from ground supply operator, move the appropriate power lever to the IDLE position and immediately select the engine start switch to the ON and release the switch. The engine should light up within 20 seconds and immediately accelerate to the idling speed.

36 The following checks should be observed during the light up period:

- (a) Check that the OIL PRESS and ENG FUEL PRESS lights are out.
- (b) Check that all systems warning lights on the master warning panel are out.
- (c) Check that the exhaust discharge temperature does not exceed 600°C.
- (d) Check that the alternator is on and that the AC FAIL indicator light is out.

37 The following checks should be carried out with the engine at the initial idling stage:

- (a) Check, by means of the intercom, with the ground observer that the air ejector nozzle is operating. This will be indicated by visual discharge of air from the nozzle.
- (b) Check with the ground observer that the accessories gearboxes oil pressure gauges are indicating a minimum pressure of 45 psi.
- (c) Check that the OIL PRESS and ENG FUEL PRESS lights remain out.
- (d) Check pressure ratio indication.
- (e) Check that the exhaust discharge temperature has stabilized at approximately 340°C.

ARROW 1 SERVICE DATA

CAUTION

The engine must be shut down immediately if any system is suspected of malfunctioning and the cause investigated before proceeding with subsequent checks.

38 After progressively advancing the power control lever to the military rated position, carry out the following checks:

NOTE

The running time at this rating must not exceed a maximum of 5 minutes and the exhaust discharge temperature must not exceed 600°C.

(a) Observe that the OIL PRESS and ENG FUEL PRESS indicating lights remain out.

(b) Check exhaust discharge temperature.

(c) Check pressure ratio indication.

39 When the exhaust discharge temperature has stabilized with the power lever at the military rated position, check the afterburner operation as follows:

NOTE

The time in afterburner must not exceed 30 seconds.

(a) Depress the power lever and check that afterburner light up occurs. Light up will be accompanied by a momentary increase in exhaust discharge temperature.

(b) Check that the AFTERBURNER light is illuminated. If the light is not illuminated shut down and investigate.

(c) Check that the exhaust discharge temperature returns to 605°C. If the temperature rise does not return to 605°C, shut the engine down and investigate.

(d) Check the pressure ratio indication.

(e) Retard the power lever to the minimum afterburner range position and lift the lever to discontinue afterburning. Check that discontinuation is normal.

(f) Retard the power lever progressively to IDLE and allow the discharge temperature to stabilize.

40 To check the operation of the emergency fuel system, switch the fuel selector switch from NORMAL to EMERG and proceed as follows:

(a) Check that the ENG EMERG FUEL warning light is illuminated.

(b) Advance the power lever to the military rated position.

CAUTION

When operating in EMERGENCY the exhaust discharge temperature is controlled by power lever movement. For this reason it is necessary to advance the power levers slowly and observe the exhaust discharge temperature gauge for signs of overheating.

(c) Check that the exhaust discharge temperature does not rise above 600°C.

(d) Check the pressure ratio indication.

(e) Check that the OIL PRESS and ENG FUEL PRESS lights remain out.

(f) Progressively retard the power lever toward the IDLE position, selecting the fuel control switch to RESET just before the IDLE position is reached. Hold the fuel switch to RESET for 5 seconds before allowing the switch to spring to the NORMAL position and note that the ENG EMERG FUEL warning light goes out.

(g) With the power lever at IDLE allow the installation to cool until the normal exhaust discharge temperature of approximately 340°C is attained.

ARROW 1 SERVICE DATA

CAUTION

Whenever the engine has been operated at a high rating for an appreciable length of time, it must be allowed to run at IDLE for approximately 5 minutes prior to shut down.

- (h) Note fuel quantity gauge indication.
- (j) Shut down, by lifting the power lever and moving it to the OFF position.
- (k) Check the N2 compressor run down time. This should be approximately 90 seconds.
- (m) Check with the ground observer that the fuel dump valve has opened.

UNSATISFACTORY STARTS

41 Hot Start - This condition is indicated by the exhaust discharge temperature exceeding 600°C (1112°F) when the engine is started.

42 No Start - The engine does not light up within 20 seconds. This condition is indicated by failure of the exhaust discharge temperature to rise and no sound indicating fuel ignition.

43 False Start - After light up has occurred the RPM fails to increase to the idle speed. If a rise in the exhaust discharge temperature occurs the power levers must be selected to OFF before the temperature limits are exceeded.

UNSATISFACTORY START PROCEDURE

44 If an unsatisfactory start occurs, the engine must be cleared of any unburned fuel in order to minimize the fire hazard on subsequent re-starting. This is accomplished by motoring the engine with the power levers OFF. See para 32. A fuel drainage period of at least 30 seconds must be allowed before attempting another start.

45 Three consecutive starts are permissible after which a cooling period of 5 minutes duration is necessary before attempting a

further starting cycle. This cooling period protects the engine starter from overheating. A motoring or engine clearing period must be counted as equivalent to one start.

OPERATING TEMPERATURES

46 Operating Condition	Normal Turbine Discharge Temp.
Maximum - Afterburner	605°C (1121°F)
Military	600°C (1112°F)
IDLE	340°C (644°F)
Starting	600°C (1112°F)
Acceleration	605°C (1121°F)

DEPRESERVATION

47 Engines that have been inhibited for long term storage should be depreserved prior to engine starting. The procedure for depreserving an engine installed in an aircraft is as follows:

- (a) Fill the engine oil tank with lubricating oil to Specification No. MIL-L-7808.
- (b) Place a suitable five gallon container under the pressurizing and dump valve overboard drain.
- (c) Disconnect the dump signal line at the pressurizing and dump valve. Leave the signal line and dump valve fitting open to atmosphere. Install a suitable plug to the open end of the dump signal line to prevent dumping of fuel.
- (d) Disconnect the afterburner manifold fuel supply line at the afterburner fuel control outlet and install a No. 16 to No. 6 pipeline reducer to restrict the flow. Provide another five gallon container under the free end of this line.
- (e) With the L.P. fuel cock OPEN, the fuel selector switch set for NORMAL, and the power lever in the maximum AFTER-BURNER position, motor the engine over as per para 33.

ARROW 1 SERVICE DATA

(f) When at least one gallon of fluid has been obtained from the overboard dump line, and two gallons from the afterburner, lift the power lever to the military rated position.

(g) Move the fuel selector switch to EMERG.

(h) After 30 seconds, move the power lever to the IDLE position and re-select the fuel selector to NORMAL.

(j) Close the power lever and disengage the ground starter unit.

NOTE

Rotation of the compressors should be limited as per the note following para 33.

(k) Remove the plug from the dump signal line and reconnect the signal line to the pressurizing and dump valve fitting.

(m) Remove the pipeline reducer from the afterburner meter outlet and reconnect the fuel supply line.

(n) Disconnect the afterburner igniter valve fuel supply line from the afterburner fuel control and allow any residual fluid to drain.

(p) Reconnect the afterburner igniter valve fuel supply line.

(q) Remove the preservation tags and make the appropriate entry in the engine records.

REMOVAL AND INSTALLATION

GENERAL

48 The removal and installation procedure for the LH and RH power plants is similar except for a few engine service connections which are handed. Prior to removing and installing a power plant the aircraft must be supported on jacks. See Arrow 1 Service Data - Section 1 - General Information.

49 The aircraft should be raised on the jacks until the following measurements are obtained.

(a) The vertical distance between the under-surface of the wing, adjacent to the jacking pad, and the floor must be 109 - 110 inches.

(b) The vertical distance between the under-surface of the front fuselage, adjacent to the jacking pad, and the floor must be 88 - 89 inches.

POWER PLANT REMOVAL (Figs 17, 18 and 19)

50 To remove a power plant from the aircraft proceed as follows:

(a) Remove the relevant engine nacelle and stinger.

(b) Disconnect the afterburner fuel drain from the engine removal door, withdraw the hinge pins from the door, and remove the door.

(c) Install the engine inboard and outboard guide rails in the brackets in the engine bay and secure each guide rail to its location with the thumbscrews provided.

(d) Move the power plant and change stand into position and by means of the change stand hydraulic jacks, align the guide rails with the stand. Install the connecting pin. See fig 19.

(e) Lock the rear of the change stand in position with the ground locks.

(f) Lower the No. 1 and No. 2 engine access doors and remove the No. 1 service panel.

51 Disconnect the engine service disconnects (see fig 17) on the outboard side of the engine as follows:

(a) The following connections on the mounting bracket attached to the engine gearbox:

(1) Two pressure ratio line connections.

(2) The engine oil line connection from the heat exchanger.

(3) The air pressure line to the accessories gearbox oil system.

(4) The electrical disconnect.

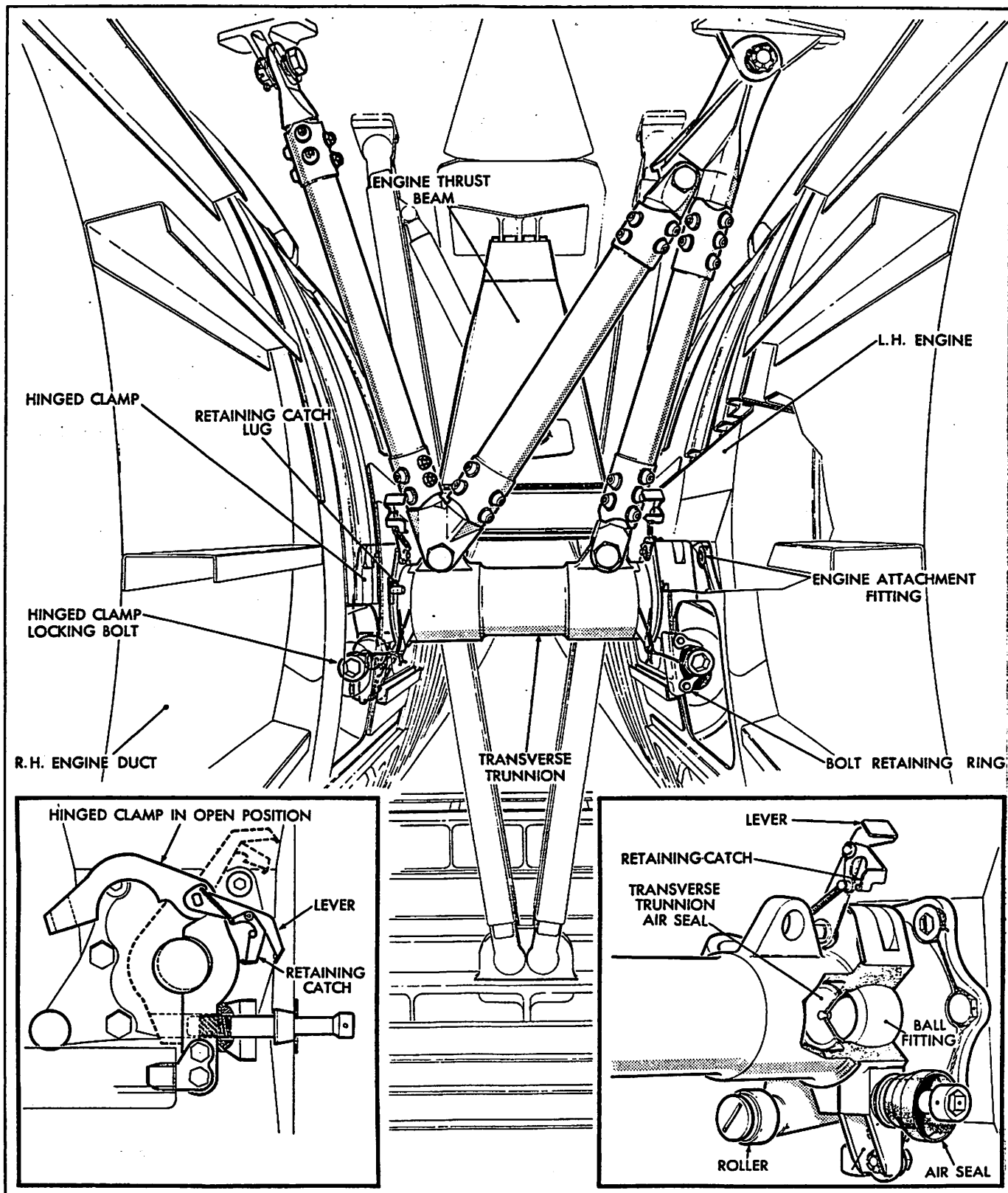
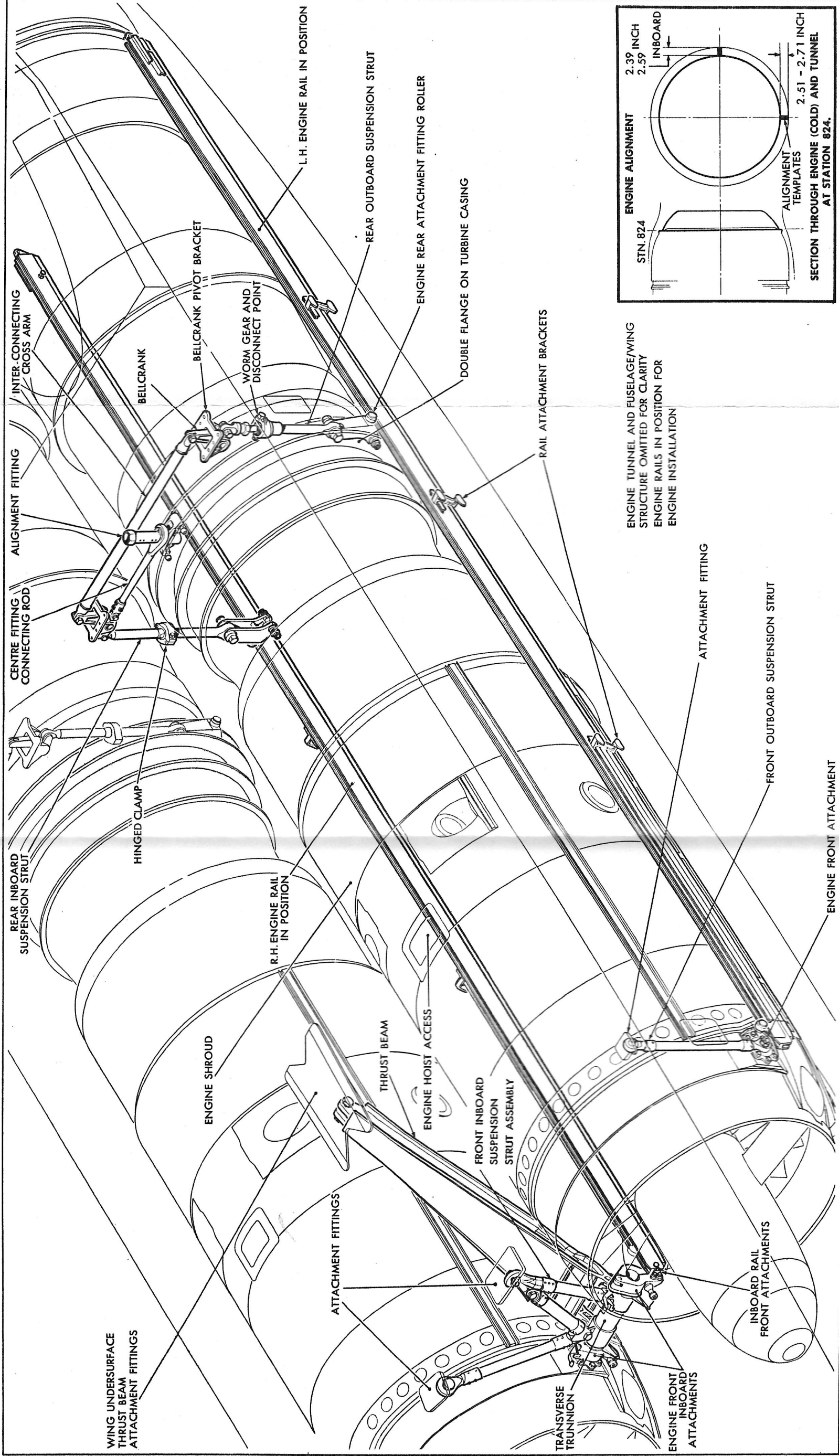


FIG. 2 ENGINE SUSPENSION - FRONT INBOARD

ARROW 1 SERVICE DATA



7M1-3203-3

FIG. 1 ENGINE SUSPENSION

186-981

ARROW 1 SERVICE DATA

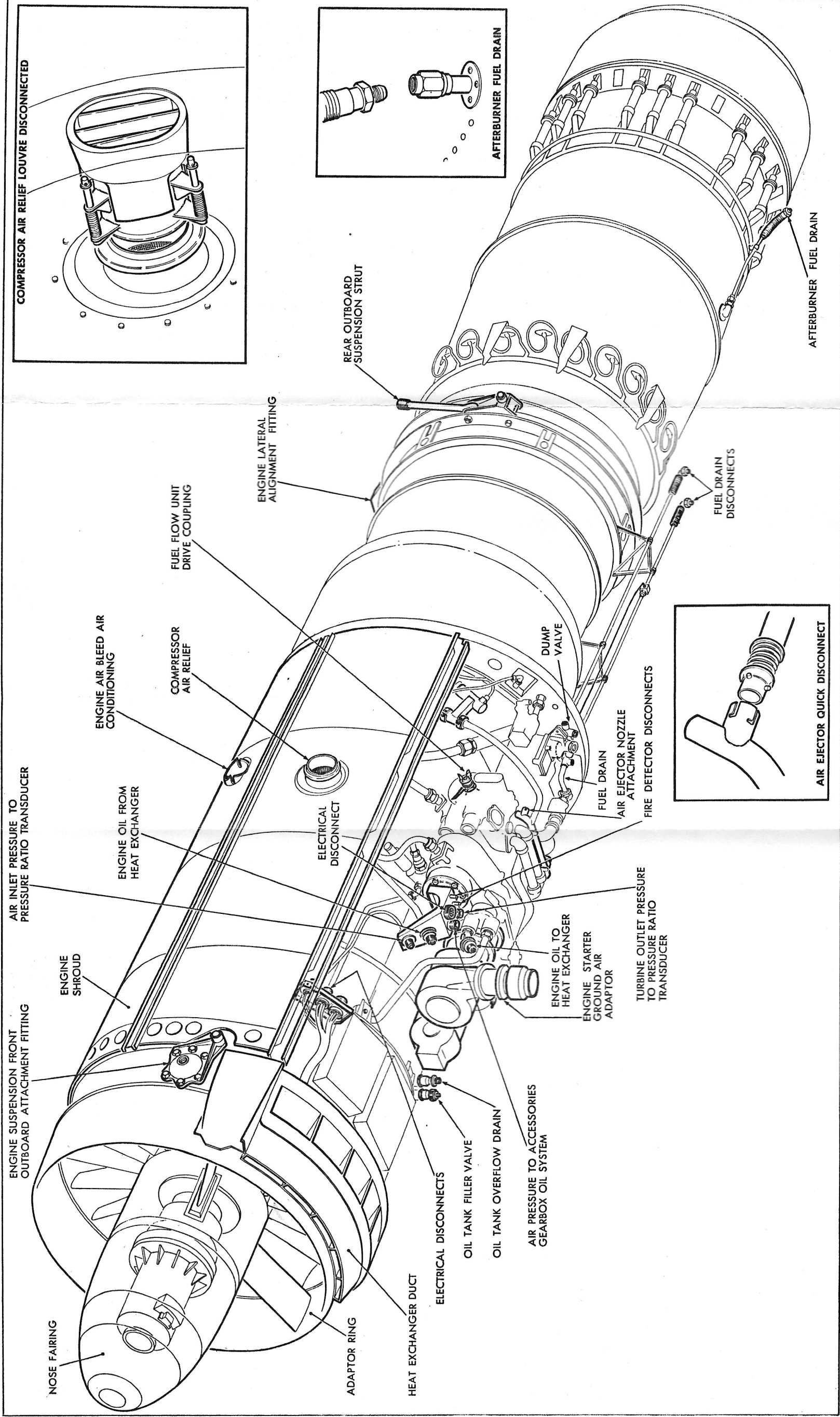
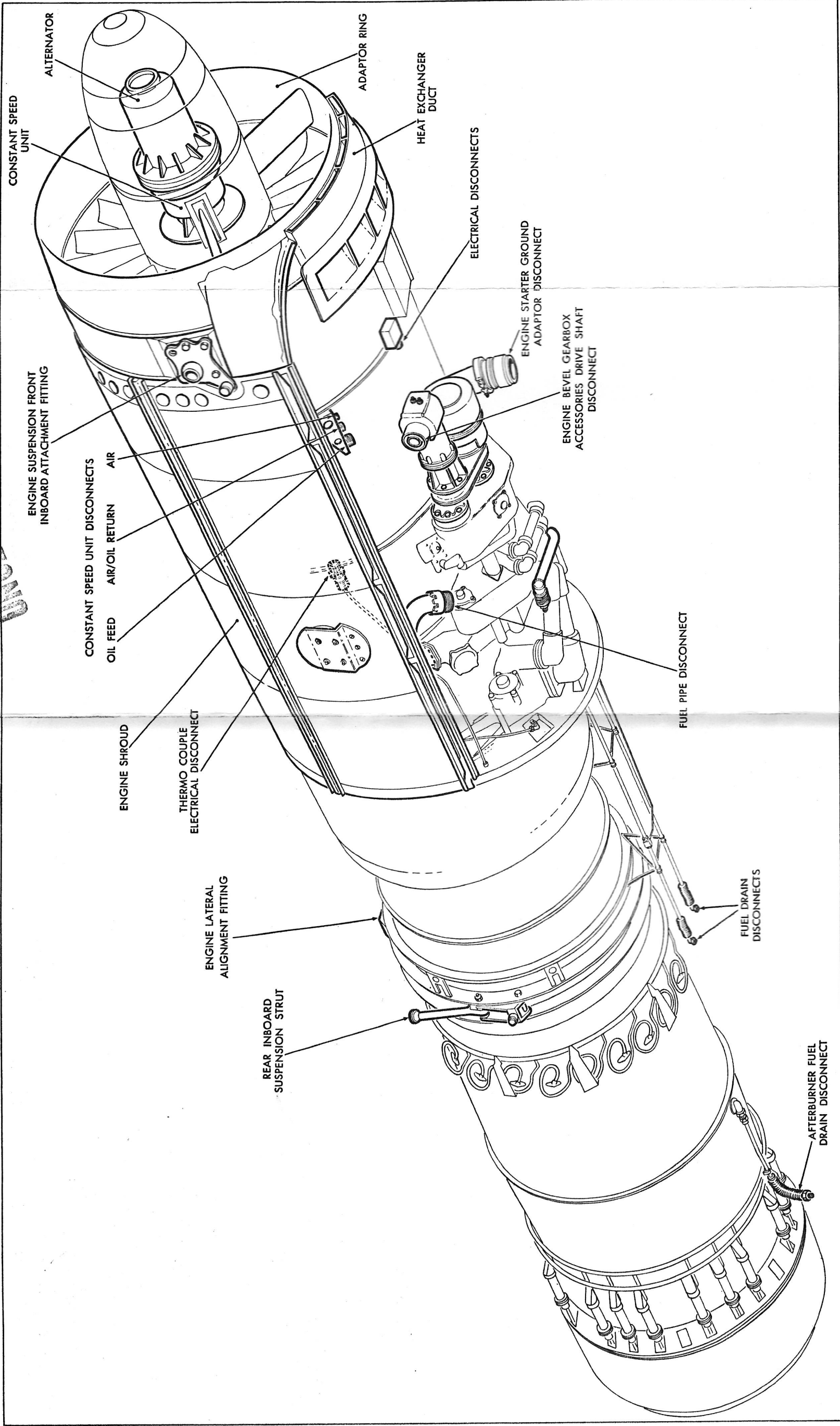


FIG. 17 ENGINE DISCONNECT POINTS - OUTBOARD

7N1-5204-3

UNCLASSIFIED

UNCLASSIFIED



7M1-3217-4

FIG. 18 ENGINE DISCONNECT POINTS - INBOARD

ARROW 1 SERVICE DATA

UNCLASSIFIED

- (5) The two fire detector disconnects.
- (b) The engine oil line to the heat exchanger.
- (c) The three electrical disconnects on the bracket attached to the compressor casing.
- (d) The fuel flow unit drive coupling. (RH engine inboard).
- (e) The air ejector nozzle and the engine starter air adaptor.
- (f) The compressor air relief louvre.
- (c) Rear inboard suspension strut. See para 6 and 7.
- (d) Lateral alignment fitting. See para 9.
- 56 With all engine services and the engine suspension disconnected, withdraw the power plant from the aircraft as follows:
- (a) Connect the engine-to-stand attachment, on the engine change stand, to the power plant at the afterburner duct joint.
- (b) Winch the power plant onto the change stand.

- 52 Disconnect the service disconnects (see fig 18) on the inboard side of the engine as follows:
- (a) The constant speed unit air and oil lines at the quick disconnect bracket.
- (b) Three electrical connections at the electrical quick disconnect bracket.
- (c) The fuel inlet pipe Wig-O-Flex coupling. (RH engine outboard).
- (d) Remove the bevel gearbox drive shaft. See Arrow 1 Service Data - Section 30 - Accessories Drives and Gearboxes.
- (e) The fuel drain lines at the quick disconnect connections.
- (f) The thermocouple electrical disconnect.
- 53 Retract the transverse fireseal. See fig 9.
- 54 Disconnect the engine bleed air quick disconnect. See Arrow 1 Service Data - Section 17.
- 55 Remove the five engine suspension access panels and disconnect the engine suspension in the following sequence:
- (a) Front inboard suspension strut. See para 4.
- (b) Front outboard suspension strut. See para 5.
- (c) Rear inboard suspension strut. See para 6 and 7.
- (d) Lateral alignment fitting. See para 9.
- 56 With all engine services and the engine suspension disconnected, withdraw the power plant from the aircraft as follows:
- (a) Connect the engine-to-stand attachment, on the engine change stand, to the power plant at the afterburner duct joint.
- (b) Winch the power plant onto the change stand.
- (c) Remove the connecting pins from the change stand and guide rails.
- (d) Move the change stand and engine clear of the airframe structure.
- (e) Remove the guide rails from the engine bay and stow them in the rail stowage brackets on the engine change stand.

POWER PLANT INSTALLATION

- 57 The procedure for installing a power plant is the reverse of that given for removal. The following additional details must be carried out during installation:
- (a) Lubricate the engine suspension in accordance with Arrow 1 Service Data - Section 3.
- (b) The afterburner nozzle must be aligned concentrically with the engine nacelle as shown in fig 1. This is achieved by adjusting on the lateral alignment fitting and the rear outboard suspension strut.
- 58 The suspension bolts must be torqued as follows:
- (a) Front inboard hinged clamp locking bolt 1400 - 1600 in lb.
- (b) Front outboard strut, lower bolt 800 - 1000 in lb.
- (c) Rear inboard clamp retaining nut 100 - 140 in lb.

ARROW 1 SERVICE DATA

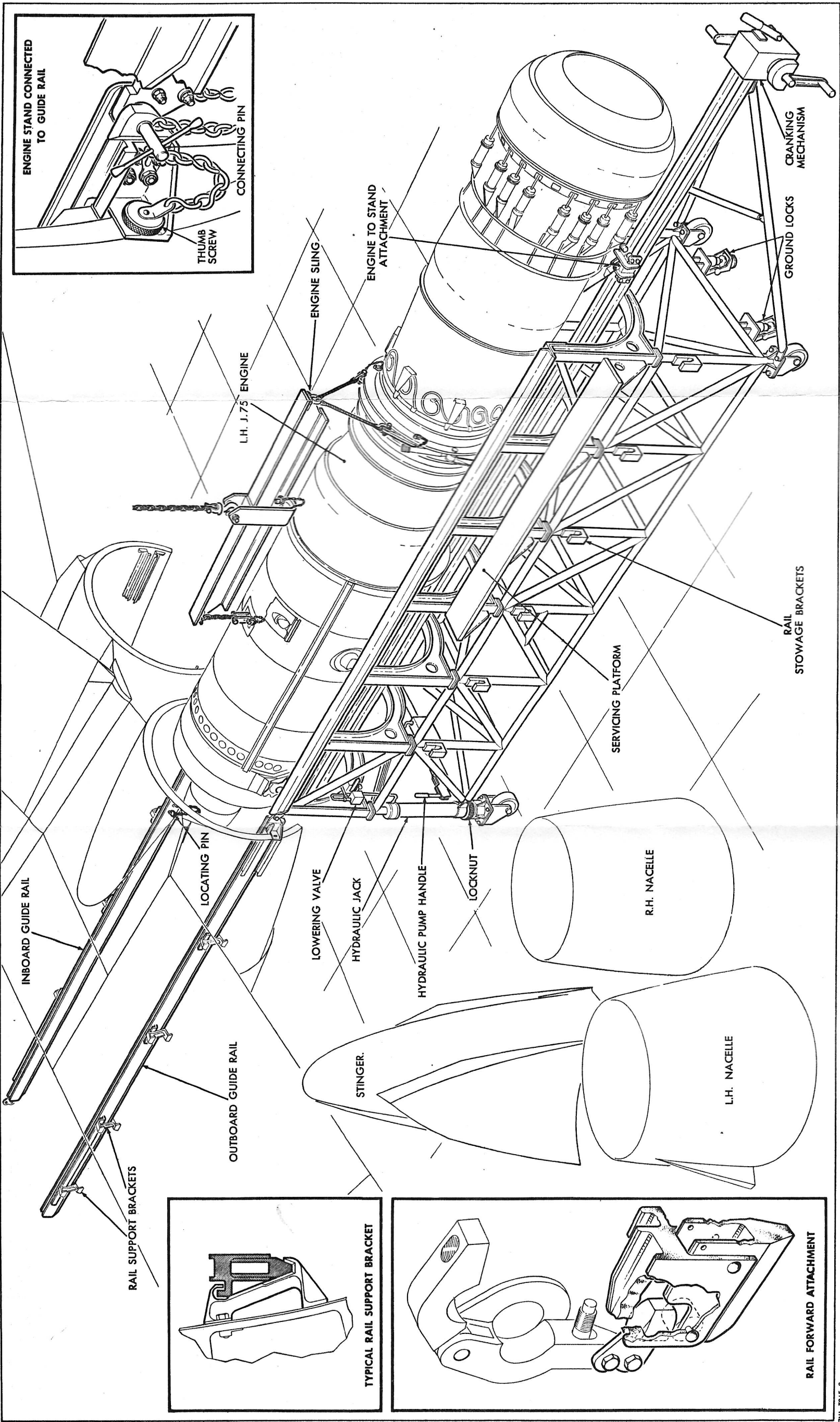


FIG. 19 ENGINE CHANGE STAND AND RAILS

ARROW 1 SERVICE DATA

(d) Rear outboard retaining nut 1200 - 1500 in lb.

(e) Lateral alignment fitting locking rod 1000 - 1200 in lb.

(f) Rear outboard suspension strut retaining nut 1200 - 1500 in lb.

POWER PLANT BUILD UP

REMOVING ENGINE FROM STORAGE CONTAINER

59 Engines are shipped and stored in special metal containers with the container pressurized with air to 5 psi.

CAUTION

The air pressure must be relieved before the container is opened, by removing the core from the air valve located at the end of the container.

60 To remove the engine from the container proceed as follows:

(a) Remove the bolts, nuts and washers securing the upper and lower halves of the container.

(b) Attach the engine sling to the four lifting points on the upper half of the container and remove it by means of a hoist. It must be lifted straight up until it is clear of the engine.

(c) Install the engine lifting eye and housing assembly to its location on top of the compressor intermediate case. See fig 10.

(d) Attach the engine sling to the lifting eye and to the two rear attachment pins on the turbine exhaust casing.

(e) Remove the four front, engine to container mounting bolts.

(f) Remove the two rear, engine cradle to container bolts.

(g) Raise the engine straight up and clear of the container.

(h) Remove all loose engine equipment from the container.

(j) Remove the front and rear engine container cradles from the engine and install the engine on the mobile work stand. See para 61.

INSTALLING THE ENGINE ON THE MOBILE WORK STAND (Fig 20)

61 The mobile work stand is provided to facilitate power plant build-up. To install the engine in the stand proceed as follows:

(a) Install the engine front inboard and outboard mounting plates to the compressor inlet guide vane casing. Install the engine-to-work-stand adaptor to the outboard mounting plate. Torque the mounting plate bolts to 450 - 500 in lb and wirelock.

(b) Install the inboard and outboard rear engine-to-work-stand adaptors on the engine turbine exhaust case and torque the bracket attachment bolts to 125 - 170 in lb.

(c) Lower the engine on to the mobile work stand and lock the work stand mounting housings.

(d) Remove the engine sling.

(e) Install the rear engine centre locating fitting to its location on the top of the engine turbine exhaust casing and torque the attachment bolts to 400 - 450 in lb.

FITTING THE AFTERBURNER TO THE ENGINE

62 The afterburner is stored and shipped in a metal container which is pressurized to 5 psi.

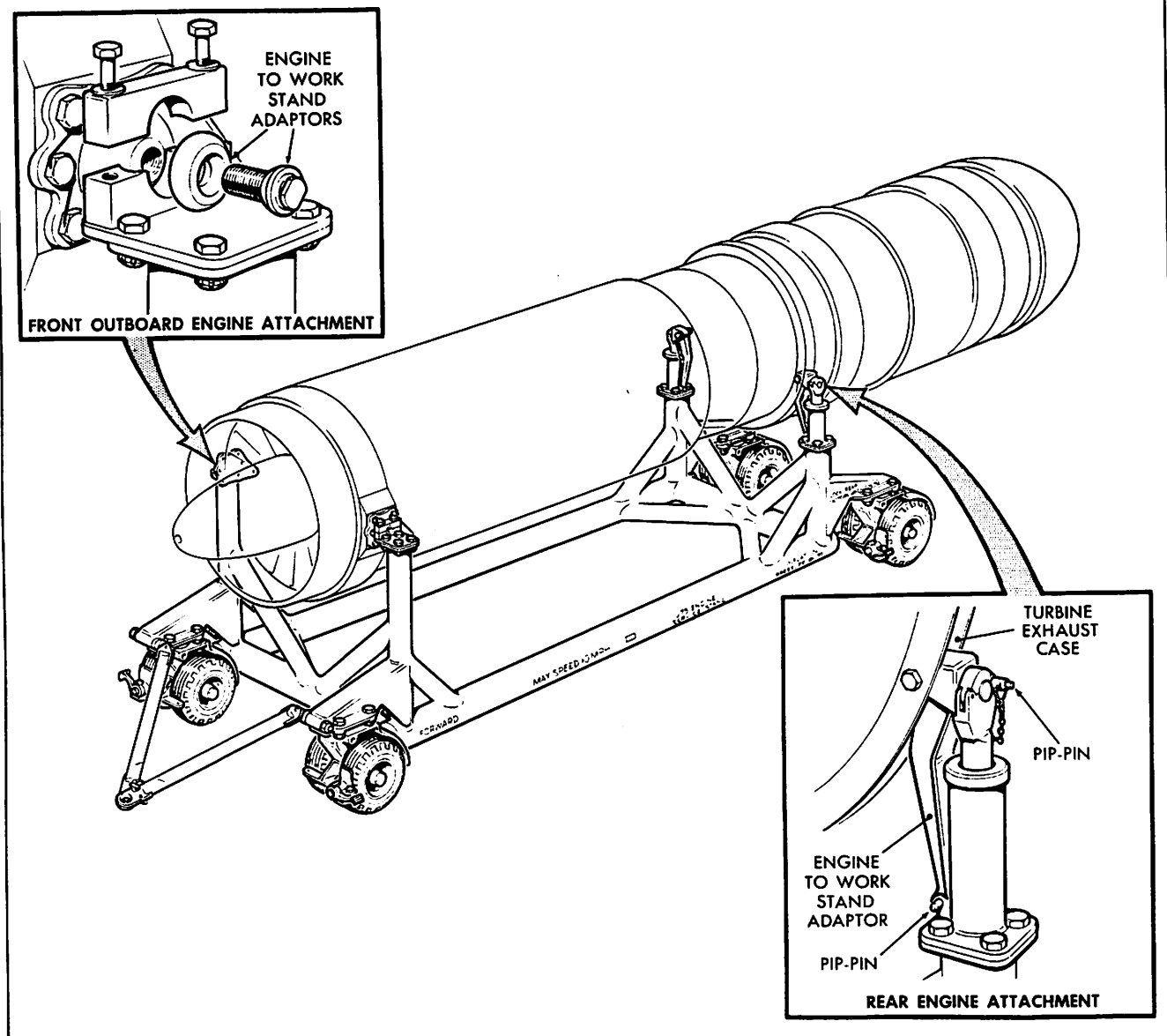
CAUTION

The air pressure must be relieved before the container is opened, by removing the cone from the air valve.

63 To remove the afterburner from the storage container and fit it to the engine, proceed as follows:

ARROW 1 SERVICE DATA

- (a) Remove the bolts, nuts and washers securing the upper and lower halves of the container and remove the upper half of the container.
- (b) Attach a lifting and trunnion bracket to each side of the afterburner nozzle and attach the sling to the spools of the brackets.
- (c) Remove the container-to-afterburner bulkhead fastening bolts. Fit an additional sling to the afterburner bulkhead.
- (d) Using two hoists, lift the afterburner assembly together with the bulkhead, clear of the container and lower to the floor level with the bulkhead resting on the floor.
- (e) Install the lifting and trunnion clamp around the afterburner front duct, locating it just aft of the reinforcing band.
- (f) Detach the container bulkhead.
- (g) Remove the bolts from the afterburner front-to-rear duct joint.



7M1-3227-1

FIG. 20 ENGINE MOBILE WORK STAND

ARROW 1 SERVICE DATA

ENCLOSURE

(h) Detach the afterburner front duct from the rear duct and lower the rear duct and nozzle assembly onto the build up stand. Place the front duct with the rear flange downward onto a stand.

(j) Move the clamp to a position just aft of the front duct front flange and install the two lifting brackets.

(k) Lift the front duct to a horizontal position and remove the front cone section.

(m) Install the front cone section on the engine.

(n) Install the front duct on the engine and remove the clamp and brackets.

(p) Bolt the rear cone section in position. Connect the fuel supply tube to the afterburner fuel manifold.

(q) Bolt the afterburner rear duct and nozzle to the front duct and connect the air supply tubes.



Remove the warning tag and lockwire holding the afterburner nozzle in the open position.

FITTING POWER PLANT COMPONENTS TO THE ENGINE (Figs 21 and 22)

64 To build up the J75 P5 engine to a complete power plant before installation in the aircraft the following assemblies must be installed:

- (a) Engine lifting eye and housing.
- (b) Fuel system piping and drains.
- (c) Constant speed unit and alternator.
- (d) Nose fairing.
- (e) Air conditioning manifolds.
- (f) Engine pneumatic system.

(g) Air ejection system.

(h) Oil system piping.

(j) Engine shroud brackets.

(k) Accessories drive gearboxes and engine starter.

(m) Engine quick disconnects.

(n) Fuel control drive coupling.

(p) Heat exchanger air intake duct.

(q) Engine adaptor ring.

(r) N1 and N2 tachometer generators.

(s) Fire detector element.

(t) Engine shroud. See fig 10.

(u) Engine mounting brackets and suspension struts. See figs 12 and 13.

(v) Electrical wiring.

ENGINE FUEL SYSTEM (Figs 21 and 22)

65 To install the engine fuel system pipelines and drains proceed as follows:

- (a) Remove the afterburner drain pipe attachment fitting from the afterburner.
- (b) Assemble the union and washer to the drain pipe attachment fitting.
- (c) Re-assemble the drain pipe attachment assembly to the afterburner drain with the outlet facing aft.
- (d) Lubricate the drain pipe clamp attachment bolts with anti-seize grease MIL-C-5544 and install the afterburner drain pipe assembly.
- (e) Install two pipe support brackets to the locations on the lower combustion chamber outer case flange and the turbine exhaust case flange.

ARROW 1 SERVICE DATA

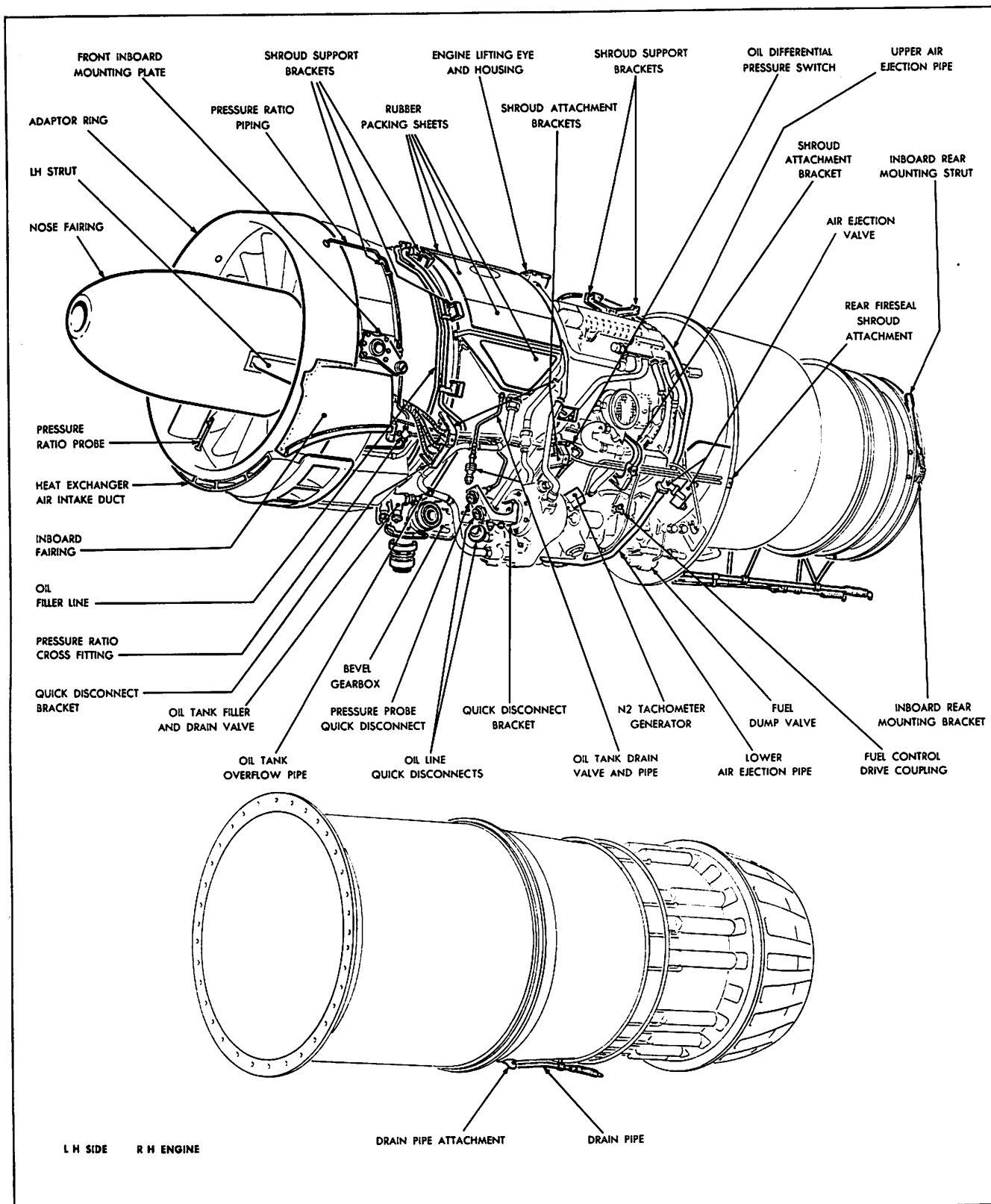


FIG. 21 ENGINE BUILD UP - LH SIDE OF RH ENGINE

ARROW 1 SERVICE DATA

(f) Install three sections of drain piping, two sections to the dump valve and one section to the afterburner supply nozzle drain on the rear fire seal.

(g) Assemble the Tee piece and short pipe-to-adaptor section.

(h) Clamp the drain pipes to the front and rear support brackets.

(j) Install the engine main fuel inlet pipe assembly and the 'O'-ring seal. Wirelock the bolts.

CONSTANT SPEED UNIT (Fig 22)

66 To install the constant speed unit on the engine proceed as follows:

(a) Remove the blanking plates from the engine front accessory drive adaptor and from the constant speed unit. Drain inhibitor oil from the constant speed unit. Flush and prime the unit with oil specification MIL-L-7808.

(b) Install the gasket to the engine front accessory drive adaptor.

(c) Install the constant speed unit and the shroud attachment plate to the front accessory drive adaptor and secure with nuts and washers.

ALTERNATOR (Fig 22)

67 To install the alternator on the constant speed unit proceed as follows:

(a) Remove the blanking plate from the alternator and secure the alternator to the constant speed unit with nuts and washers.

(b) Fit the front shroud attachment plate to the studs together with two brackets for attaching the electrical wiring.

(c) Install the constant speed unit shroud.

NOSE FAIRING AND ENGINE ADAPTOR RING (Figs 21 and 22)

68 To install the nose fairing and engine adaptor ring proceed as follows:

(a) Install ten spacers to the nose fairing mounting studs on the front accessories drive adaptor.

(b) Install the rear section of the nose fairing assembly to the mounting studs and secure with ten nuts.

(c) Install the engine adaptor ring to the engine guide vane shroud attachment points.

(d) Install the RH strut assembly to the rear nose fairing assembly and engine adaptor ring with sealing 'O'-rings at each end of the tube joints.

(e) Bolt up the RH strut and end fitting, sealing the lower end of the strut with sealant PR 1421.

(f) Install the LH strut assembly with electrical cables assembled, to the nose fairing and adaptor ring. Seal the lower end of strut with sealant PR 1421.

(g) Assemble the forward section of the nose fairing assembly to the aft section.

ENGINE AIR CONDITIONING SYSTEM (Figs 21 and 22)

69 To assemble the air conditioning manifold and shut-off valve to the engine proceed as follows:

(a) Assemble the two engine manifolds to the air shut-off valve. Ensure that the gaskets are fitted to the flanged joints between the manifolds and the valve.

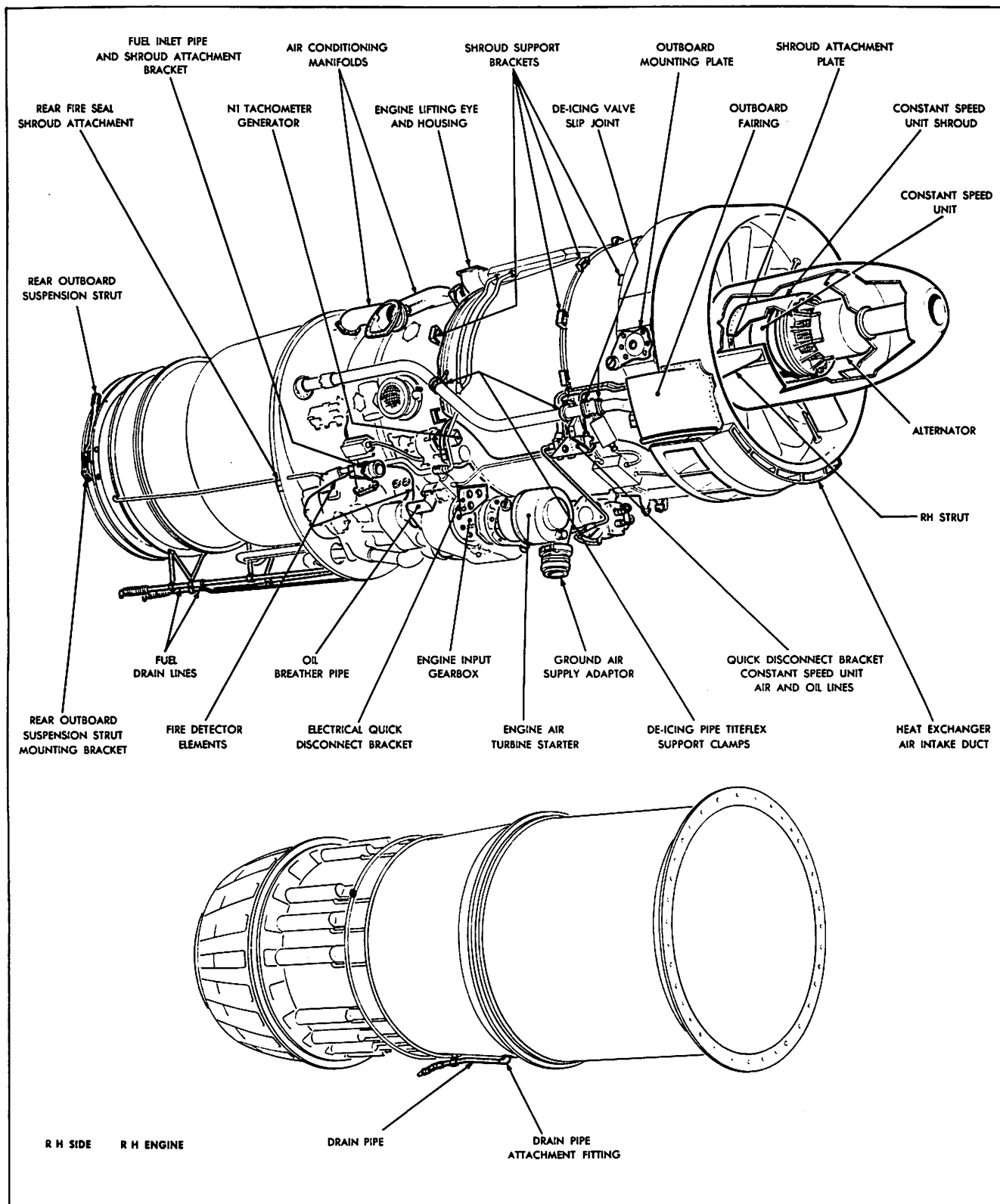
(b) Torque the air shut-off valve manifold joint nuts to 100 - 140 in lb.

(c) Blank off the coupling end with a suitable blank to withstand the pressure.

(d) Proof pressure test the manifold and shut-off valve assembly using an air supply regulated to a pressure of 520 psi.

(e) Remove the manifold assembly from the pressure testing rig and remove the blanking plate from the coupling end.

ARROW 1 SERVICE DATA



7M1-3229-1

FIG. 22 ENGINE BUILD UP - RH SIDE OF RH ENGINE

ARROW 1 SERVICE DATA

(f) Remove the blanking plates from the engine air conditioning locations at the top of the engine diffuser case.

(g) Install the manifold and air shut-off valve assembly to the engine, using gaskets at the flange joints.

(h) Torque the manifold/engine flange bolts to 100 - 140 in lb. Wirelock the bolts at the coupling flange.

PRESSURE RATIO SYSTEM (Figs 13 and 22)

70 To install the pressure ratio transducer piping and probes proceed as follows:

(a) Remove the existing engine generator drive cover pad from the LH engine gearbox drive and install the Avro supplied cover assembly complete with the quick disconnect mounting bracket.

(b) Assemble the four quick disconnect couplings to the mounting bracket.

(c) Install the Pratt and Whitney supplied pressure ratio probes to the engine adaptor ring and turbine discharge case locations.

(d) Install all piping and the special cross fitting to the pressure probes located in the adaptor ring and turbine discharge casing. Connect the piping to the two quick disconnect couplings on the bracket. Secure the pipelines with clamps.

AIR EJECTION SYSTEM (Figs 11 and 21)

71 To install the air ejection system proceed as follows:

(a) Install the top pipeline assembly to the air conditioning manifold, using Marman couplings. Torque the Marman coupling bolts to 130 in lb.

(b) Install the air ejection valve to the top pipeline.

(c) Install the bottom pipeline to the air ejection valve and attach the two brackets on the pipe to the engine. Torque the Marman coupling bolts to 130 in lb.

DE-ICING SYSTEM (Fig 22)

72 Before installing an engine the de-icing pipe must be removed and reworked to prevent fouling on installation. Also, if an engine is being installed in the LH side, the complete de-icing system must be removed from the LH side of the engine, and installed in the corresponding position on the LH side.

73 To rework the pipe, proceed as follows:

(a) Disconnect the pipe at both ends, and remove the pipe.

(b) Rework the flange at the forward end of the pipe. Sufficient material must be removed from that position of the flange furthest from the engine, to prevent fouling when the engine is installed.

(c) Replace the pipe on the required side of the engine, see para 72.

(d) Support the pipe as required by Titeflex clamps in two places. Torque the clamp bolts to 20 - 25 in lb.

OIL TANK AND DRAIN (Fig 21)

74 Before installation, bond four rubber packing sheets to the oil tank using Dow Corning C271 bonding compound, then proceed as follows:

(a) Remove the existing oil tank drain valve and retain. Install a pipe union to the oil tank using the original washer if serviceable.

(b) Assemble the drain pipe to the engine oil tank union.

(c) Assemble the original drain valve to the lower end of the drain pipe and install the cap to the drain valve outlet.

(d) Wirelock the drain valve arm in the valve closed position.

(e) Secure the pipeline by clamping to the main oil line.

ARROW 1 SERVICE DATA

OIL BREATHER PIPES (Fig 22)

75 To install the oil breather pipes proceed as follows:

- (a) Remove the blanking cover from the engine breather outlet. Retain the gearbox-to-breather flange joint gasket.
- (b) Install the front and rear breather pipe sections.
- (c) Clamp the two pipe sections together with the breather outlet projecting towards the air ejection vent.
- (d) Secure the two pipeline clamps to the brackets on the engine.

OIL TANK FILLER AND OVERFLOW PIPES (Fig 21)

76 To install the oil tank filler and drain valve together with the piping proceed as follows:

- (a) Install the valve body to the compressor casing flange.
- (b) Install the filler and overflow pipes to the oil tank and drain valve body assembly.

ENGINE SHROUD BRACKETS (Figs 21 and 22)

77 To install the engine shroud mounting brackets proceed as follows:

- (a) Secure the engine shroud support brackets to the engine.
- (b) Locate the serrated plate to each side of the engine rear fire seal and secure with rivets.
- (c) Install the eight shroud attachment brackets to the engine.

ENGINE INPUT AND BEVEL GEARBOXES AND ENGINE AIR TURBINE STARTER (Figs 21 and 22)

78 To install the engine input and bevel gearboxes and engine air turbine starter proceed as follows:

- (a) Remove two blanking plates from the engine gearbox and install the gaskets in position.
- (b) Remove the blanking plates from the engine input gearbox. Flush and prime it with oil, MIL-L-7808.
- (c) Lubricate the driving splines of the input gearbox with grease MIL-G-3278 and install to the engine drive pad.
- (d) Secure the input gearbox with nuts and spring washers.
- (e) Remove the blanking plates from the engine bevel gearbox, flush and prime with oil MIL-L-7808, and lubricate the drive splines with grease MIL-G-3278.
- (f) With the gasket in position, install the bevel gearbox to the input gearbox and secure with nuts and spring washers.
- (g) Flush inhibitor from the air turbine starter and lubricate with oil MIL-L-7808. Lubricate the drive splines with grease MIL-G-3278.
- (h) Install the gasket to the input gearbox air turbine starter joint and fit the air turbine starter. Secure it with nuts and spring washers.

CONSTANT SPEED DRIVE DISCONNECT COUPLINGS (Fig 22)

79 To install the constant speed drive quick disconnect couplings proceed as follows:

- (a) Assemble the support bracket to the right hand side of the compressor casing and attach the three quick disconnect couplings.
- (b) Assemble the three pipes running from the couplings to the adaptor ring RH strut end fitting.
- (c) Assemble the oil differential pressure switch to the oil sump adaptor.
- (d) Assemble piping and connections to the pressure switch and the quick disconnect mounted on the bracket.

ARROW 1 SERVICE DATA

- (e) Install the engine oil tube assembly between the support bracket and engine.

FUEL CONTROL COUPLING (Fig 21)

80 Fit the drive coupling to the fuel flow control unit threaded shaft and torque the nut to 30 - 40 in lb. Wirelock the nut.

MISCELLANEOUS ATTACHMENTS AND COMPONENTS (Figs 21 and 22)

81 The following miscellaneous components must be attached to the engine:

- (a) Install the heat exchanger air intake duct to the engine adaptor ring.
- (b) Install the engine adaptor ring outboard fairing brackets to the engine adaptor ring and assemble the fairing to the brackets.
- (c) Install the engine adaptor ring inboard fairing brackets to the engine adaptor ring and assemble the fairing to the brackets.
- (d) Install the N2 tachometer generator to the tachometer drive pad located at the rear LH side of the engine gearbox.
- (e) Install the engine fire detection element.

- (f) Install the shroud on the engine and attach it by ten securing bolts.

- (g) Secure the engine slinging eye housing to the shroud. See fig 10.

- (h) Install Marman clamps to the inboard and outboard air bleed assemblies and the engine shroud.

ENGINE SUSPENSION STRUTS

82 Prior to the installation of the engine in the airframe install the suspension struts as follows:

- (a) Install the rear inboard and outboard engine suspension strut mounting brackets. Torque the bolts to 450 - 500 in lb.
- (b) Install the rear inboard and outboard engine lower suspension struts to the respective attachment brackets. Torque the strut attachment bolts to 2300 - 2500 in lb.
- (c) Lubricate the strut attachment bolts with anti-seize grease to specification MIL-C-5544 and the suspension strut spherical bearings with molybdenum disulfide and oil to specification MIL-M-7866 and oil MIL-L-7870A.

ARROW 1 SERVICE DATA

EQUIPMENT LIST

AVRO PART NO.	MANUFACTURER AND PART NO.	NOMENCLATURE	QUANTITY IN SYSTEM
7-2995-6	Airesearch - 350 500	Air Turbine Starter	1
7-1895-41	Barber Colman 5639-1	Air Ejection Control Valve	1
7-1856-11	Century Electronics & Instrument Co.	Differential Pressure Switch	1
7-1095-1265	Roylyn Inc.	Oil Filler and Drain Valve	1
7-1095-75	Avro Aircraft Ltd.	Engine Shroud	1
7-1095-311	Avro Aircraft Ltd.	Adaptor Ring	1
7-1095-357	Avro Aircraft Ltd.	Nose Fairing Assembly	1
7-1095-791	Avro Aircraft Ltd.	Heat Exchanger Air Intake Duct	1
7-1095-75	Avro Aircraft Ltd.	Engine Lifting Eye	1
7-1095-947	Avro Aircraft Ltd.	Forward Mounting Plate Inboard	1
7-1095-921	Avro Aircraft Ltd.	Forward Mounting Plate Outboard	1
7-1025-43	Avro Aircraft Ltd.	Forward Mounting Strut Outboard	1
7-1095-857	Avro Aircraft Ltd.	Rear Engine Bracket	2
7-1095-321	Avro Aircraft Ltd.	Rear Centre Engine Suspension	1
7-1025-55	Avro Aircraft Ltd.	Rear Upper Engine Suspension	1
7-2995-5	General Electric	Constant Speed Drive Unit	1