CF-105 SERVICE DATA

Utility Hydraulics System
Wheel Brakes Circuit

CONFIDENTIAL

CF-105 SERVICE DATA

UTILITY HYDRAULICS SYSTEM

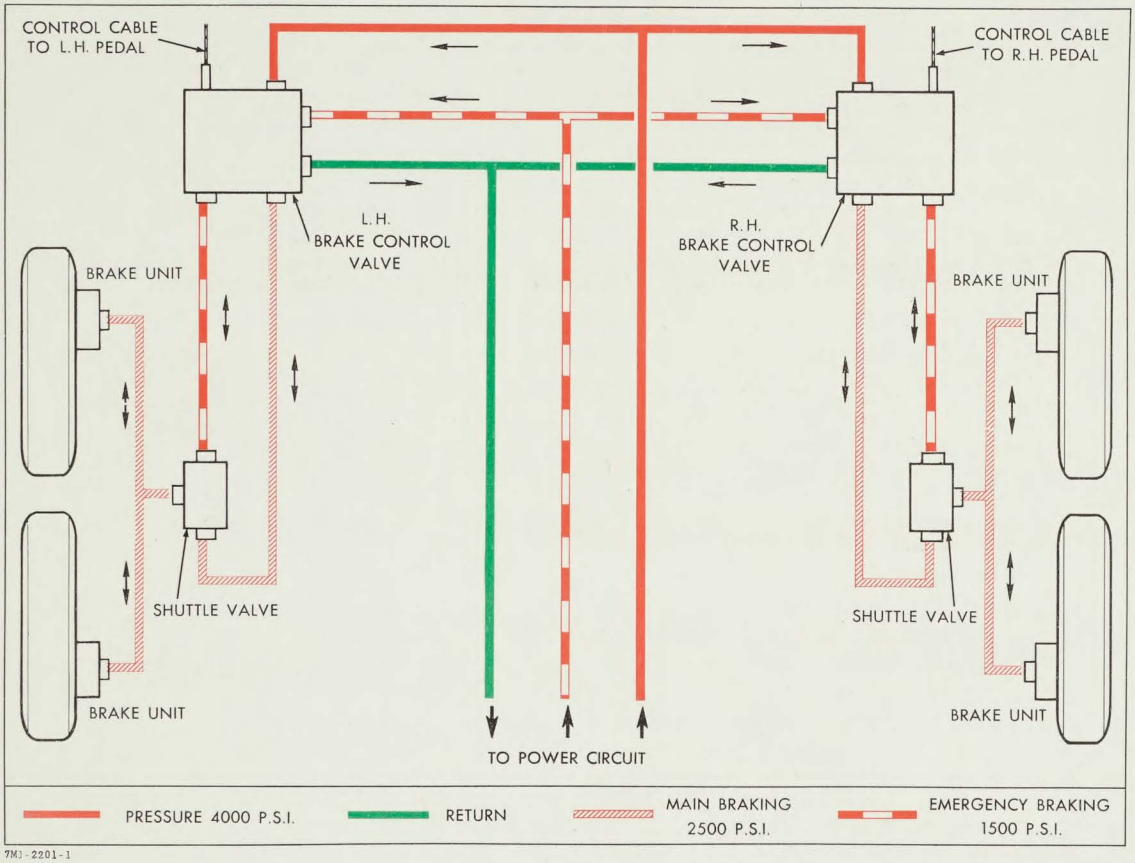
WHEEL BRAKES CIRCUIT

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

TMI-3413-2-1

CF-105 SERVICE DATA



7MJ-2201-1

FIG. 1 WHEEL BRAKES - SCHEMATIC

7MI-5913-2-2

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	25201	19-3

DESCRIPTION

General

1. The wheel brakes circuit consists of a normal braking system and an emergency braking system. The emergency system takes over automatically from the normal system whenever the pressure to the normal system drops below 1000 psi. The brakes are automatically applied during retraction of the landing gear.

2. Each pair of brake units on the main landing gear is operated independently by control valves in the armament bay. Differential and proportional braking is obtained by foot pressure on a brake pedal on each of the pilot's rudder pedals. The brake pedals are mechanically connected to the control valves by cable runs. For parking, the brake pedals can be held in the on position by depressing the brake pedals, pulling a handle on the instrument panel marked PARKING, and releasing the brake pedals before releasing the parking brake handle.

3. Two warning lights on the pilot's right hand console are operated by pressure switches in the power circuit. One, marked UTIL HYD, warns the pilot that the emergency braking system is coming into operation and the other, marked EMERG BRAKE HYD, warns the pilot that the emergency brake pressure has failed or has been exhausted. A limited number of brake applications can be obtained after the engines have been shut down, from the charge in the accumulators in the power circuit.

4. Steel pipelines incorporating swivel and expanding joints are used to allow movement of the landing gear.

Brake Control Valves

5. Fluid from the power circuit main pressure line at pressures up to 4000 psi and from the power circuit reduced pressure line at pressures up to 1500 psi is delivered to each of the two brake control valves.

6. Two spring operated spool valves, one for normal braking and one for emergency braking are contained in each control valve. A pressure operated spring-loaded spool valve is also installed in each control valve to automatically change over from normal to emergency, or from emergency to normal, according to the pressure of the fluid in the power circuit.

7. When the pressure in the power circuit is above 1000 psi the change-over valve is held by fluid pressure in the normal braking position, allowing pressure fluid from the main pressure line in the power circuit to be delivered to the normal brake valve. From the normal brake valve pressure fluid at pressures up to 2500 psi is delivered into the main brake pipeline.

8. If the pressure in the main pressure line of the power circuit falls below 1000 psi, the pressure operated change-over valve is moved by spring pressure to the emergency braking position, allowing pressure fluid from the reduced pressure line in

the power circuit to be delivered to the emergency brake valve. From the emergency brake valve, fluid at pressures up to 1500 psi is delivered into the emergency brake pipeline.

9. A solenoid valve, operated by a micro-switch on the main landing gear, is also installed in each control valve to operate the main braking system when the landing gear is being retracted. When the solenoid valve is energised, pressure fluid operates the main brake valve and applies the wheel brakes.

Shuttle Valves

10. From each control valve a main brake pipeline and an emergency brake pipeline is led to a shuttle valve on the rear brake torque rod of each main landing gear. The shuttle valve prevents fluid in the operative system from entering the non-operative system.

Brake Units

11. From the shuttle valves, brake pressure fluid is delivered to triple cylinder, multiple disc, brake units. Pressure is applied by pistons having a spring loaded return to overcome the pressure of the return fluid when braking pressure is released.

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	Valve - Brake Control	19-3-1

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1954-11	Hydra-Power	HP 402100	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

To apply hydraulic pressure to the wheel brakes.

LOCATION

In the armament bay, station 469.

ACCESS | MEN X MINUTES

Unobstructed when missile pack is removed.

REPLACEMENT PROCEDURE | MEN X MINUTES

Install with four attachment bolts.
Connect the electrical cable.
Connect the cable from the rudder pedal.
Connect the six hydraulic pipelines.
Prime the system.

INSPECTION	MEN X MINUTES	
Check for security, damage, cracks, corrosion and leaks.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.
Electrical ground power circuit.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	8 Dec 56								

7WI-3913-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	Valve - Shuttle	19-3-2

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1992-107	Hydra-Power	HP 51800	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours

FUNCTION

To supply emergency pressure to the brakes on failure of the normal system.

LOCATION

Rear brake torque rod.

ACCESS

Unobstructed.

MEN X MINUTES

REPLACEMENT PROCEDURE

Install with two bolts.
Connect three hydraulic lines.

MEN X MINUTES

TM1-3413-2-5

INSPECTION	MEN X MINUTES	
Check for security, damage, cracks, corrosion and leaks.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	8 Dec 56								

7M1-3413-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	Unit - Brake	19-3-3

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1092-15	Goodyear	PD 732	25201

OVERHAUL LIFE: KNOWN- ESTIMATED-

FUNCTION

To reduce aircraft speed on the ground.

LOCATION

On main undercarriage leg.

ACCESS

Unobstructed when wheels are removed.

MEN X MINUTES

REPLACEMENT PROCEDURE

MEN X MINUTES

Install brake unit on the axle.
Connect brake link to the back plate.
Replace wheel.

TMI-3933-2-5

INSPECTION	MEN X MINUTES
Check brakes for leaks, overheating and wear. Check brake clearances.	

FUNCTIONAL CHECKS	MEN X MINUTES

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	8 Dec 56								

TWT-3913-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	Assembly - Swivel	19-3-4

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1992-25			25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours

FUNCTION

To connect hydraulic supply lines on aircraft structure to line on main landing gear leg.

LOCATION

Upper end main landing gear leg.

ACCESS

Unobstructed.

MEN X MINUTES

REPLACEMENT PROCEDURE

Install four bolts securing assembly to brackets on airframe structure and leg.
Connect hydraulic pipelines.
Prime the system.

MEN X MINUTES

7M1-3413-2-5

INSPECTION	MEN X MINUTES	
Check for leakage and security.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	8 Dec 56								

7M1-3413-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	WHEEL BRAKES	Fitting - Trombone	19-3-5

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1992-21	Dowty		25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours

FUNCTION

Sliding joint in brake hydraulic lines.

LOCATION

On main landing gear leg.

ACCESS — MEN X MINUTES

Unobstructed.

REPLACEMENT PROCEDURE — MEN X MINUTES

Connect the fitting to the landing gear leg.
Connect four hydraulic lines.
Prime the system.

TM1-3413-2-5

INSPECTION	MEN X MINUTES	
Check for damage, wear, security and leakage.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	8 Dec 56								

TM1-3413-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	Valve - Speed Brakes Selector	19-4-2

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1956-13	Weston Hydraulics	14130	25201

OVERHAUL LIFE: KNOWN– ESTIMATED– 500 hours

FUNCTION

To direct flow of hydraulic fluid to the speed brake jacks.

LOCATION

In the fuselage, station 538.

ACCESS — MEN X MINUTES

Through hydraulic access panel - 52 camlocs.

REPLACEMENT PROCEDURE — MEN X MINUTES

Attach the valve to the mounting with four bolts.
Connect six hydraulic pipelines.
Connect one electrical connector.
Prime the system.

TM1-3413-2-5

CF-105 SERVICE DATA

SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	25201	19-4

DESCRIPTION

General

1. Pressure fluid from the power circuit is delivered via a selector valve to two speed brake jacks, which operate two speed brakes located on the underside of the fuselage.

2. Steel pipelines incorporating swivel and expanding joints are used to allow movement between the speed brake jacks and the aircraft structure.

Speed Brakes Selector Valve

3. A solenoid operated selector valve, controlled by a three position switch marked OUT, HOLD and IN, on the inboard throttle lever, controls the flow of pressure and return fluid between the power circuit and the speed brake jacks.

4. A relief valve in the selector valve, set to open at a differential pressure of 4200 psi allows the speed brakes to blow back on all selections of the selector valve, should the airload on the speed brakes become excessive.

Speed Brake Jacks

5. The speed brake jacks are of the single cylinder double-acting type. Extension of the jacks retracts the speed brakes.

6. When the speed brakes are selected OUT, pressure fluid is directed to the rod end of each jack and the opposite end is connected to return.

7. When the speed brakes are selected IN, pressure fluid is directed to both ends of each jack, utilizing differential pressure on the piston and the airload on the speed brakes, to close the speed brakes.

8. On a HOLD selection, the rod end of each jack is closed to form a hydraulic lock and the opposite end is connected to return.

ISSUE	1							
DATE	6 Dec 56							

TM1-3413-2-3

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	Jack - Speed Brakes	19-4-1

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1956-7	Jarry Hydraulics		25201

OVERHAUL LIFE: KNOWN– ESTIMATED– 500 hours

FUNCTION

To operate speed brakes.

LOCATION

In the fuselage, station 485-510.

ACCESS

Through electrical access panel - 44 camlocs and plate inboard of the jack - 24 screws.

MEN X MINUTES

REPLACEMENT PROCEDURE

MEN X MINUTES

Install the attachment bolts.
Connect swivel elbows with two attachment bolts.
Prime the system.

TM 1-3413-2-5

INSPECTION	MEN X MINUTES	
Check for security, damage, cracks, corrosion and leaks.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	6 Dec 56								

TM1-3413-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	Valve - Speed Brakes Selector	19-4-2

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1956-13	Weston Hydraulics	14130	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

To direct flow of hydraulic fluid to the speed brake jacks.

LOCATION

In the fuselage, station 538.

ACCESS | MEN X MINUTES

Through hydraulic access panel - 52 camlocs.

REPLACEMENT PROCEDURE | MEN X MINUTES

Attach the valve to the mounting with four bolts.
Connect six hydraulic pipelines.
Connect one electrical connector.
Prime the system.

TM1-3913-2-5

INSPECTION	MEN X MINUTES	
Check for security, damage, cracks, corrosion and leaks.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	6 Dec 56								

7MI-3913-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	Coupling - Expansion	19-4-3

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1956-35	Dowty	XP 3052	25201

OVERHAUL LIFE: KNOWN- ESTIMATED- 500 hours

FUNCTION

To compensate for extension and contraction of hydraulic lines.

LOCATION

On speed brake 'up' and 'down' lines.

ACCESS

MEN X MINUTES

Through electrical access door - 44 camlocs, and plate inboard of the jack - 24 screws.

REPLACEMENT PROCEDURE

MEN X MINUTES

Connect the coupling to the swivel fitting on the jack.
Connect the hydraulic pipeline. (Hold flats on the coupling with a wrench to prevent turning).
Prime the system.

TMI-3413-2-5

INSPECTION	MEN X MINUTES	
Check for leaks.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	6 Dec 56								

TM1-3413-2-6

CF-105 SERVICE DATA

COMPONENT DATA SHEET

SYSTEM	SUB-SYSTEM	COMPONENT	REF. NO.
UTILITY HYDRAULICS	SPEED BRAKES	Fitting - Swivel	19-4-4

AVRO PART NO.	MANUFACTURER	MAN'F'R'S PART NO.	AIRCRAFT EFFECTIVITY
7-1956-31 7-1956-33	Barco Mfg. Co.	10-51091 10-51093	25201

OVERHAUL LIFE: KNOWN– ESTIMATED– 500 hours

FUNCTION

To transfer fluid between two parts having movement relative to each other.

LOCATION

On speed brake jack.

ACCESS

MEN X MINUTES

Through electrical access panel - 44 camlocs and plate inboard of the jack - 24 screws.

REPLACEMENT PROCEDURE

MEN X MINUTES

Install with two attachment bolts.
Connect hydraulic pipeline/s.
Prime the system.

TM1-3413-2-5

INSPECTION	MEN X MINUTES	
Check for security, leaks and damage.		

FUNCTIONAL CHECKS	MEN X MINUTES	

GROUND HANDLING AND GROUND TEST EQUIPMENT

Hydraulic ground test rig.

SPECIAL TOOLS TO REMOVE OR SERVICE

REMARKS

ISSUE	1								
DATE	6 Dec 56								

TMI-5913-2-6

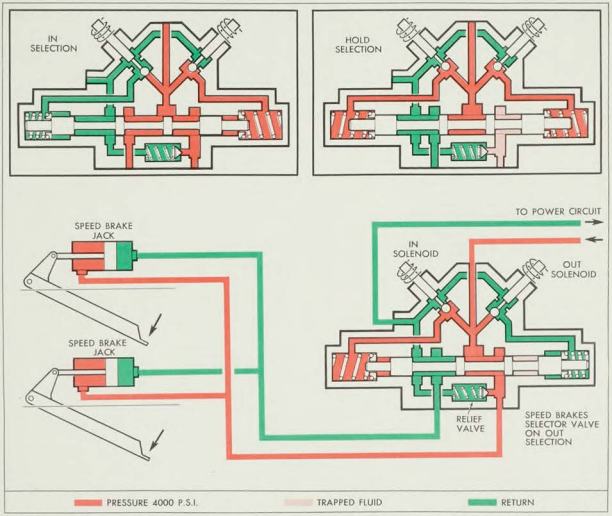


FIG. 1 SPEED BRAKES — SCHEMATIC