FLIGHT MANUAL

SPARTAN MODEL 12

REPORT No. SAC-1001

SPARTAN AIRCRAFT COMPANY

TULSA, OKLAHOMA

July 12, 1945

MODEL SPECIFICATION

M-12 "EXECUTIVE"

26 PAGES

3 DRAWINGS

Prepared By John A. Venable

Approved By W. F. Stewart

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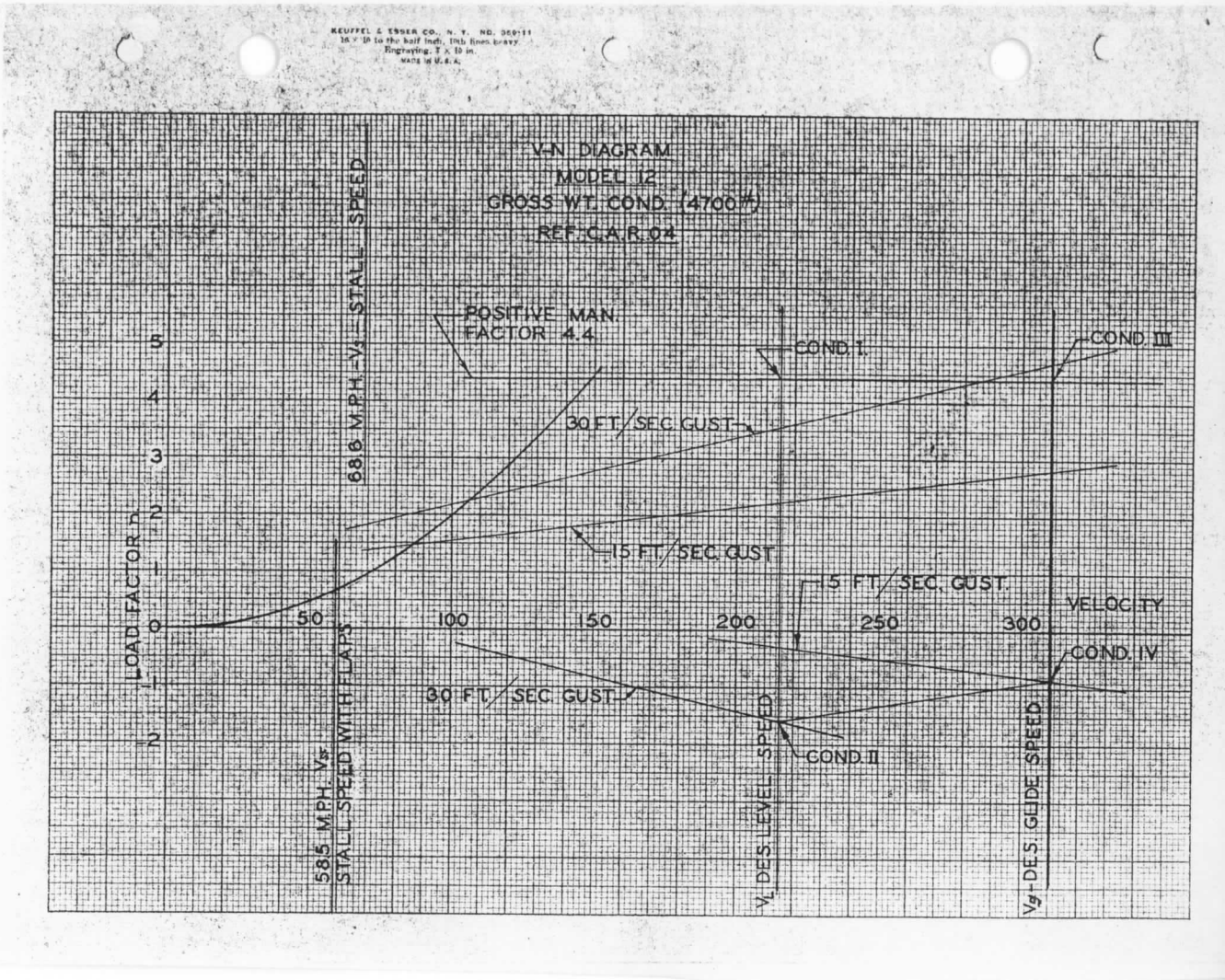
V-N DIAGRAM
MODEL 12
GROSS WT. COND. (4700#)
REF. C.A.R. 04
POSITIVE MAN. FACTOR 4.4
COND. I
COND. III
COND. IV
COND. II
30 FT./SEC. GUST
15 FT./SEC. GUST
15 FT./SEC. GUST
30 FT./SEC. GUST
68.6 M.P.H. = V_{s1} STALL SPEED
58.5 M.P.H. V_{s0} STALL SPEED WITH FLAPS
V_L DES. LEVEL SPEED
V_g - DES. GLIDE SPEED
LOAD FACTOR n
VELOCITY
5
4
3
2
1
0
-1
-2
50
100
150
200
250
300

I. INTRODUCTION

This Specification with its appendices and the publications listed in section I, is the basis for the design and the construction of this airplane.

1.1 TYPE AND MODEL

1.11 Basic type.....personal plane

1.13 Model Designation.....Model-12 "Executive"

1.14 Number of places (total).....5

1.15 Engine

Number.....1

Name and Type.....Pratt & Whitney "Wasp Jr." Model SB-3 - Radial Air Cooled - 9 Cyl. - Direct Drive.

1.17 Design criteria.....Applicable Portions of Civil Air Regulations and Related Manuals.

1.2 PURPOSE

To provide transportation for executive personnel.

1.3 AIRPLANE SUMMARY

1.31 General description

The Model 12 is a single engine, low wing all metal monoplane. It is of the 5 place type.

1.32 Design features

Wings and Surfaces - Full Cantilever
Landing Gear - Retractable Tricycle Type
General Structure - All metal semi-monocoque, stressed skin.

II. REQUIREMENTS

2.1 GENERAL

This detail specification is subject to change as recommended by the C.A.A. and as research and manufacturing reveal desirable changes.

2.2 APPLICABLE SPECIFICATIONS

The minimum requirements as revealed in CAR and CAM 04. and related suggestions of the CAA, are all applicable.

2.3 APPLICABLE APPENDICES

All appendices as found in last section are applicable.

2.4 MATERIALS AND WORKMANSHIP

2.41 Materials and Workmanship are in accordance with applicable sections of CAR 04.4 and in keeping with High Grade Standards of Commercial Aircraft Practice.

2.5 METHOD OF INSPECTION AND TESTS

2.51 Methods of inspection and tests are in accordance with applicable sections of CAR 04. and Inspection Handbook, Chapter X, of the C.A.A.

2.6 FLIGHT TESTS

2.61 Flight tests are in accordance with C.A.A. requirements as set forth in Chapter X of the Inspection Handbook.

III. CHARACTERISTICS

3.1 PERFORMANCE

3.11 Guaranteed Performance is based upon a gross weight of 4700 pounds and is as shown by the following:

Maximum Speed at Sea Level with 400 H.P.... 215 MPH

Design Flap Speed ..... 125 MPH

Cruising Speed at 6,000 ft. with normal rated power ..... 203 MPH

Minimum Speed (without power at sea level.. 60 MPH

Landing Speed ..... 60 MPH

Endurance at Cruising Speed, at approx. 10,000 ft. altitude, and 150 gals. of fuel. 3.24 Hrs

Service Ceiling ..... 24,090'

Time to climb to Service Ceiling ..... 44 Min.

Take-off distance to clear a 50 ft obstacle ..... 1055 Ft.

Ground Run (With Flaps at 15° ..... 663 Ft.

3.1 PERFORMANCE (Cont'd.)

3.12 Guarantee Conditions

All performance figures listed are for International Standard Atmosphere.

Engine powers are determined by type certification specifications of engine used.

Specific fuel consumption is determined by use of a flowmeter.

Wing flap setting is selected to provide optimum performance.

Zero wind is assumed for all landing and take-off, using correction for observed wing.

Take-off and landing distance is based upon the use of a hard surfaced, level runway.

Gross Weight at take-off ..... 4700 lbs.

3.13 Airplane configuration for guarantee performance demonstrations.

Exterior finish -- Flush riveting is used in areas of high speed airflow - modified brazier riveting elsewhere - painted surface as required.

External protuberances .... radio antenna - No directional loop or housing, and pitot tube.

3.16 Performance curves.

See appendix.

3.2 AIRPLANE WEIGHT AND BALANCE

3.21 Primary load condition

Gross Weight .....4700 lbs.
Weight Empty .....2446 lbs.
Useful Load .....2254 lbs.

3.22 Structural design gross weight .....4700 lbs.

3.23 Performance demonstration gross weight .....4700 lbs.

3.24 Group Weight statement (Weight Empty)
(See tabulation in appendix.)

PIEDMONT AVIATION SERVICES INC

June 25, 1990

Re: NX21962

Aircraft was weighed at Piedmont Aviation Services, Inc. this date.

Nose gear weight - 1005 lbs.

Left main gear - 1040 lbs.

Right main gear - 1037 lbs.

Aircraft defueled and six gallons of oil on board.

(3082 lbs.)

Smith Reynolds Airport • P.O. Box 525 • Winston-Salem, NC 27102

SPARTAN MODEL 12
SERIAL NO 1
JUL 10, 1990

REFERENCE DATUM IS THE WING L.E. AT THE FUSELAGE

WHEEL	SCALE	TARE	WEIGHT	ARM	MOMENT
L. MAIN	1040.0		1040.0	43.3	44980.0
R. MAIN	1037.0		1037.0	43.3	44850.3
NOSE	1005.0		1005.0	-26.9	-27009.4
TOTAL	3082.0		3082.0		62820.9
EMPTY WEIGHT CG (ZERO FUEL, 6 GAL OIL)					20.4

FORWARD CG

AIRCRAFT EMPTY	ARM	WEIGHT	MOMENT
	20.4	3082.0	62820.9
FUEL 10 GAL	12.0	60.0	720.0
PILOT	22.0	170.0	3740.0
BAGGAGE	97.0	75.0	7275.0
TOTAL		3312.0	74555.9
CG			22.5

AFT CG

AIRCRAFT EMPTY	20.4	3082.0	62820.9
PILOTS	22.0	340.0	7480.0
FUEL 10 GAL	12.0	60.0	720.0
BAGGAGE	97.0	100.0	9700.0
TOTALS		3582.0	80720.9
CG			22.5

AFT CG

AIRCRAFT EMPTY	20.4	3082.0	62872.8
PILOTS	22.0	340.0	7480.0
FUEL 80 GAL	12.0	480.0	5760.0
PASSENGERS	57.0	498.0	28386.0
BAGGAGE	97.0	100.0	9700.0
TOTALS		4500.0	114198.8
CG			25.4

CG LIMITS ARE 22.5 IN. FWD TO 32 IN. AFT AT 4500 LB. MAX

Standard Airplane Equipment List

Item	Weight
Radio Transmitter Installation (50 Watt) Installed 6-20-47 MARK 5	~~39.00~~ 10 LBS
Radio Receiver Installation	~~12.75~~
Landing Light Installation	6.00
Constant Speed Propeller Installation (Governor Unit)	5.00
Propeller Spinner Installation	12.00
Exhaust Gas Analyzer Installation	5.43
Pressure Type Fire Extinguisher	18.00
Glass Shatter-Proof Windshield (Difference between glass and plexiglas)	14.00
Cylinder Head Temperature Gauge	1.50
Outside Air Temperature Gauge	1.00
Directional Gyro	4.00
Bank and Turn	2.00
Artificial Horizon	3.94
Fuel Pressure Warning Unit	5.00
Ash Trays	.51
Assist Handle	.23
First Aid Kit	2.30
Stabilizer Abrasion Shoes	2.50
Clock	1.00

Superceded July 10, 1990

3.26 Balance

Design gross weight C.G., Wheels up:
Aft L.E. M.A.C. ..... ____ % M.A.C.
Design gross weight, C.G.
Location, Wheels down Aft L.E. MAC ____ % M.A.C.
Extreme Forward position C.G. possible in flight (Wheels up, wheels down) Aft L.E. M.A.C. 14 % M.A.C.
Extreme rearward position C.G. possible in flight (Wheels up, wheels down(Aft L.E. M.A.C. 29 % M.A.C.

NOTE: The extreme permissible C.G. limits in flight will be 14 % M.A.C. forward and 29 % M.A.C. Aft

3.27 Unit loading

Wing loading 19.18

Power Loading (Take-Off Power) 10.44

3.3 AERODYNAMIC CHARACTERISTICS

3.31 Stability

The plane is stable about all three axes. In accordance with C.A.A. requirements for Type Certificate.

3.3 AERODYNAMIC CHARACTERISTICS (Cont'd.)

3.32 Control

The plane is designed to be easily and readily controlled, throughout the entire speed range.

3.4 DESIGN CRITERIA

The structural design gross weight of the airplane for all flight and take-off conditions is based on a gross weight of 4700 lbs., and as summarized in paragraphs 3.41 to 3.45 and the V_N diagram, assuming the airplane loaded as shown in 3.25 and balanced within the center of gravity range as noted in 3.26.

The design landing speed of the airplane shall be based on a gross weight of 4700 pounds, less the fuel and oil normally used to conduct the test.

3.41 Limit Maneuver Load Factors

Positive 4.40

Negative (Inverted flight) -2.281

3.42 Limit gust load criteria

The airplane is designed to withstand a gust condition up to 30 feet per second up to 215 MPH. (Indicated airspeed at sea level altitude).

3.43 Limit Landing factors 3.33 (Ground Landing)

3.44 Limit diving speeds.

Limit diving speed 315 , MPH I.A.S. at S.L. Alt. or 230% high speed.

3.45 V_n Diagram

See Figure 3

3.5 DIMENSIONS AND AREAS

Areas are determined by using the projected extended area method.

3.51 Wing Group

Airfoil section designation ..... Root	NACA 23015
Theoretical ..... Tip	NACA 23009
Areas, flaps retracted including Ailerons	245.0 Sq. Ft.
Span	39.0 Ft.
Root Chord	102 In.
Tip Chord	60.0 In.

Taper ratio	.5
Incidence	
Root	2° 40'
Tip	- 20'
Dihedral (50% chord line)	5° 30'
Sweepback (apparent - 25 50% chord line)	15' 29"
Aspect ratio	6.208
Mean Aerodynamic Chord	70.4318"
L.E. of M.A.C. location relative to L.E. of Root Chord	
Horizontal	29.8979" Aft
Vertical	3.533" Above
Flap area (total)	34.96'
Flap span	228.94"
Flap mean chord	21.82"
Maximum angular deflection	45°

3.52 Control Surfaces

Aileron area (total including 83.25 Sq.In of tab area on Rt. Aileron)	24.18 Sq.'
Angular deflection ... Up	25°
Down..	5°
Differential motion	25°
Horizontal tail surface area (Total, including _____ sq.in. of fuselage area)	38.86 Sq.Ft.
Span	164"
Maximum Chord	48"
Horizontal stabilizer area (total including _____ sq.in. of fuselage)	22.39 Sq.Ft.
Normal setting relative to longitudinal axis	0°
Elevator area (total, Including _____ sq. in. of tab area)	14.69 Sq.Ft.

Angular deflection.....Up 30°
Down 20°

Angular deflection, Elevator Tab.....Up
Down

Vertical Stabilizer Area..... 20.0 sq. ft.

Normal Setting..... 0°

Rudder Area..... 9.89 sq. ft.

Angular deflection.....right 30°
left 30°

Angular deflection, rudder tab.....right
left

3.53 Max. Cross Section.....Height 66.935 Ins.
Width 59.7 Ins.

3.54 Minimum Propeller Clearances

To ground, level landing.... 9.057"

To Engine Cowl..... 1 In.

3.6 ENGINE DATA

3.61 Name and Type of engine....Pratt & Whitney "Wasp Jr" Radial - Air colled - 9 Cyl. Direct Drive.

3.62 Engine manufacturers specification
Number... 2038
Dated... 4-1-44

3.63 Engine manufacturers designation.... SB-3

3.64 Propeller gear ratio.....Direct Drive

3.65 Supercharger gear ratio.....Impeller 10:1

3.66 Horsepower ratings

Normal-400 H.P. with 2200 R.P.M. at at. 5000 ft.

Take-off-450 H.P. with 2300 R.P.M. at sea level

3.7 PROPELLER DATA

3.71 Propeller type and manufacturer....Hamilton Standard Constant Speed

3.73 Diameter 8' 6". Number of Blades 2.

3.74 Hub No. 2D30-237. Blade No. 6101A-18.

3.75 Pitch limits - Min. 11° . Max. 26° .

IV. STRUCTURE

4.1 GENERAL

4.11 Materials and Method of Fabrication

Aluminum Alloy, Magnesium Alloy and Steel are all used in various parts of the structure as strength and weight make practicable. Fabrication is in line with the best recognized practice in commercial production.

4.12 Handling Attachments

4.121 Jacking

Two jack pads are located on the nose fork and on the lower end of each of the main struts.

4.122 Hoisting

Hoisting rings are located at the top side of the front wing fittings. The third hoist ring is in the upper rear section of the engine compartment.

4.123 Mooring

Wing tip mooring attachments are provided and are large enough for 1" cables or rope.

4.124 Towing

Tow rings are provided on the main landing gear struts at the axles. For nose wheel towing, the nose wheel axle is hollow to provide for insertion of tow bar.

4.13 Provisions for Drainage.

Drain holes are located along the trailing edge of all surfaces and in the belly of the ship, as recommended by the C.A.A.

4.14 Smoothness of Exposed, Exterior Skin and Joints

The exterior skin covering is principally flush riveted. The joints in the skin are mostly of the butt type.

4.15 Control Surface Bearings

All control surface bearings are of the anti-friction, pre-lubricated, sealed type.

4.16 Provisions for Service and Maintenance

Ease of servicing and maintenance are given all due consideration in the construction of this airplane. A minimum of time and effort is required to obtain ready access to parts needing attention.

4.2 WING GROUP

4.21 General Description

The wing is of two spar stressed skin construction and utilizes tension fields in the beams which carry approximately 75% of the lift load. Skin and spars form two torsion-resisting cells. Drag loads are carried by the skin, stringers and ribs.

4.22 Type of Joints

Butt joints are used throughout the wing structure where skin thickness exceeds .032 of an inch. Lap joints are used elsewhere.

4.24 Materials and Method of Fabrication

The basic wing structure is made from Aluminum Alloy sheet material except for the tip which is Magnesium.

4.25 Center Section

The center section of the wing is built up as a unit and then the front and rear spars are bolted longitudinally to the Fuselage bulkheads with shear bolts.

4.27 Outer Wing Panels

The outer wing panel is a cantilever unit, attached to the cemter section by two tension bolts on the rear spar and one tension and one shear bolt on the front spar.

4.28 Wing Tips

The wing tips are small and simply constructed. They are attached with machine screws and are easily removable for inspection.

4.29 Aileron

4.291 Description
Ailerons are metal covered. They are built up entirely of sheet metal construction and are attached to the rear wing beam with a continuous hinge.

4.292 Operational Characteristics
The Ailerons are operated by means of push-pull tubes actuated from bell-cranks inside of wing.

4.293 Static, Dynamic and Aerodynamic Balance
The Ailerons have static and dynamic but not aerodynamic balance.

4.284 Tab
An electrically operated trim tab, controllable from the Pilot's seat, is provided on the right hand Aileron.

4.210 Flaps

Two flaps extend from the centerline of the Airplane outboard. They are of all metal construction and are composed of ribs, skin and stiffeners.

4.210 Flaps - Continued

The flaps are actuated by an electric motor from a single point attachment at the center line of the airplane and are attached with piano hinges.

4.3 TAIL GROUP

4.31 General Description

The fixed tail surfaces are full cantilever and are rigidly attached to the fuselage shell. They are of single beam construction and have removable tips. The fixed surfaces are easily removable from the fuselage.

4.33 Type of Attachments

The Stabilizer is rigidly attached to the fuselage by machine screws. The fin, in addition to being attached with machine screws, has two tension type fittings on the rear beam.

4.34 Material and Method of Fabrication

Aluminum and Magnesium Alloys are riveted to form an efficient structure.

4.35 Horizontal Stabilizer

The horizontal Stabilizer is of monospar, stressed skin construction. It is attached by machine screws.

4.36 Elevator

The elevator has a metal framework with stressed skin metal covering. It is operated by a single push-pull tube. The elevator is statically, dynamically and aerodynamically balanced.

4.361 Tabs

Two electrically operated trim tabs (one on each elevator) are provided and are controlled from the Pilot's compartment.

4.37 Vertical Fin

The vertical fin is of monospar, stressed skin construction. It is attached to a horizontal bulkhead in the fuselage and torsion is transferred through angles bolted to the skin. In addition, two tension type fittings are provided on the rear beam.

4.38 Rudder

The rudder is a metal framework with stressed metal skin covering. The rudder is actuated by means of a short push-pull tube which in turn is cable connected to the rudder pedals. The rudder has static, dynamic and aerodynamic balance.

4.381 Tab

An electrically operated trim tab, controllable from the Pilot's compartment, is provided.

4.4 BODY GROUP

4.41 General Description

The body group is of the conventional arrangement for single engine cabin type planes.

4.42 Fuselage Structural Shell

The fuselage is of semi-monocoque all metal design.

4.43 Materials and Method of Fabrication

The fuselage shell is fabricated from a combination of aluminum alloy sheet bulkheads, skin and extruded section stringers.

4.44 Interior Arrangement

There are two forward seats for the Pilot and a passenger (or co-pilot). Provision for three additional passengers is made in the rear seat. Back of the rear seat, and accessible to the rear seat passengers, is a baggage compartment. The radio compartment is aft of the baggage compartment.

4.46 Windshield

The main windshield is comprised of two curved panels of Plexiglas with provision for an optional windshield of shatter-proof laminated plate glass. A small top panel of compound curvature is provided which is of optional colored plexiglas. An additional complete pane of clear plexiglas is provided, as optional equipment, with an airspace between it and the windshield. This latter equipment serves for defrosting and insulating purposes.

4.61 Vision

Above average visibility is obtained for this type of airplane.

4.47 Windows

Ample vision is provided for all passengers through large windows on both sides of the passenger compartment. The panes are of clear plexiglas material and additional panes of plexiglas are provided, as optional equipment, for insulating, sound proofing and defrosting purposes.

4.48 Doors and Emergency Exits

One large door is provided on the left side and as optional equipment, this door may be equipped with pull releases for the hinges. Also, as optional equipment, an emergency door, opposite the main door, may be installed, equipped with pull type releases.

4.49 Flooring

The basic floor structure is of corrugated aluminum alloy sheet. The top surface is of smooth sheet material integrally fabricated to the base corrugated structure. The floor covering is of light weight pyramided synthetic material especially manufactured for this application.

4.410 Bulkheads, Partitions and Doors (Interior)

The opening to the baggage compartment from within is just back of the rear seat. Bulkheads are as shown in Fig. 1.

4.411 Steps and Walkways

A builtin retractable step and a walkway on the left wing leads to the cabin entry door. A walkway is provided on the right wing for convenience of service.

4.5 ALIGHTING GEAR

4.51 General Description

The landing gear is the tricycle type, fully retracting and fully enclosed. It has two main (rear) wheels and a nose wheel.

4.52 Materials and Method of Fabrication

The landing gear structure is of conventional welded steel construction.

4.53 Main Alighting Gear

4.531 Shock Strut

A single oleo type shock strut is provided to each wheel.

4.532 Wheel, Brake, and Tire

Wheel	7.50 x 10
Brakes	Hydraulic
Tire	
Standard	7.50 x 10
Optional	8.50 x 10

4.533 Retracting and Extending Mechanism

The retracting and extending mechanism is driven by an electric motor. Torque tubes drive a worm gear at each strut. The gear is fully retractable and provision is made for manual operation in emergencies. The gear is fully irreversable under load and no latch pins or up and down locks are required.

4.534 Fairings and Doors

Fairings and doors are flush with surface when closed and are operated by the landing gear actuating motor.

4.535 Brake operating mechanism

Optional heel or toe controlled hydraulic brakes are provided.

4.54 Nose Alighting Gear

4.541 Shock Strut

A single oleo type shock strut is provided.

4.542 Wheel and Tire

Wheel 16 x 5.80 x 8.50 (for low profile)
Tire 16 x 5.80 x 8.50 (low profile)

4.543 Retracting Mechanism

Same as Main Gear

4.544 Fairings and Doors

Same as Main Gear

4.545 Shimmy Damper

An external hydraulic shimmy damper is provided.

4.56 Skid

A skid pad is provided at the tail for use in tail down landing.

4.57 Parking Brakes and Controls

A conventional lock type parking brake handle is conveniently located for use by Pilot.

4.6 ENGINE SECTION

4.61 General Structure

The engine section is the conventional single engine type.

4.62 Provisions for Replacement, service and maintenance

Accessibility and maintenance are considered of prime importance on this airplane. Ease of removal of all accessories, strainers, magneto s service, etc. is provided for.

4.63 Materials and Method of Fabrication

Cowling ---- Aluminum Alloy Sheet material riveted and spot welded.
Stainless steel exhaust deflector plates are provided.

4.63 (Cont.)

Engine Mount --- Chrome molybdenum Steel Tubing fabricated by welding.

4.64 Firewall

The firewall is .018" stainless steel backed up by a 2" thickness of fibre-glass insulation.

4.65 Access Doors

Adequate flush type access doors to provide for oil filling, etc., are provided with simple fasteners that require no hand tool (screw driver, etc.) to open.

4.66 Method of Engine Mount Attachment

The engine mount is attached by approved rubber vibration absorbers at both the engine and firewall.

4.68 Engine Cowling

The engine cowling consists of a rubber mounted nose section and a quickly detachable rear accessory section. The nose section is in segments to remove past the propeller. The rear section is also in segments and forms a cantilever assembly which is attached at the firewall ring.

V. POWER PLANT

5.1 ENGINE

5.11 Installation

Very particular attention has been paid to the installation of the engine. Each part is carefully installed to insure proper functioning throughout the system as a whole.

5.2 ENGINE ACCESSORIES

5.21 Carburetor Air Intake System

Cold air is taken in from the front side of the engine cooling baffles. Hot air

5.21 (Cont)

is taken from muff that surrounds the exhaust manifold system. The mixing valve receives air from both of these ducts and the temperature of the air entering the carburetor is manually controlled by the Pilot.

5.3 ENGINE CONTROL SYSTEM

The engine controls consist of the throttle, propeller control, carburetor heat control and mixture control. These are operated from the instrument panel. The spark remains in the advanced position and needs no control.

5.4 PROPELLER INSTALLATION

A constant speed, two bladed, metal propeller is used. A control on the instrument panel, similar to the throttle, operates the pitch mechanism.

5.5 STARTING SYSTEM

A direct cranking electric starter is provided.

5.6 COOLING SYSTEM

The engine is air cooled and is equipped with pressure type cooling baffles.

5.7 LUBRICATING SYSTEM

The standard oil tank capacity is 8 U.S. Gallons. The oil tank is located forward of the firewall and is mounted in place with padded straps. A 7" diameter oil cooler is provided for temperature control. This cooler is located inside of the engine cowl and its air intake is through a duct which extends ahead and through the engine cooling baffles. The oil tank is easily filled from the left side of the plane, without removing any of the engine cowling.

5.8 FUEL SYSTEM

The standard installation holds 132 U.S. Gallons. As an optional arrangement, a total of 154 U.S. Gallons can be provided. In all airplanes a separate tank is provided for 87 octane fuel which is used during take-off and landing.

5.8 FUEL SYSTEM (Cont.)

Tanks are of the latest fuel cell type, giving the maximum in gallons per pound of tank material. An electric type fuel gauge registers the fuel supply on the instrument panel. All filler caps are plainly marked and easily accessible and so arranged that tanks may be rapidly and easily filled.

An engine driven fuel pump is used to bring the fuel from the tanks to a selector valve which is manually controlled by the Pilot. The fuel goes from this valve to the unit which contains the electric motor driven pump and a by-pass valve. From there it goes to the engine driven fuel pump and is forced on to the carburetor. The carburetor air valve is provided with a drain tube which carries off any excess fuel occuring from flooding the carburetor by over use of the primer. The primer pump is located on the instrument panel and is manually operated by the Pilot.

VI. INSTRUMENT INSTALLATION

6.1 INSTRUMENT PANEL

The instrument panel has the instruments carefully located to the Pilot's convenience. The flight instruments are grouped on a floating panel supported by rubber bushings. The source of illumination for the instruments is indirect with direct light available when needed to read maps, etc.

Provision is made for installing additional instruments.

(For detail listing of instruments, see equipment list in Appendix).

6.2 INSTRUMENT LINES AND CONNECTIONS

The airspeed indicator and sensitive altimeter operate from direct lines. All other instruments are electrically operated except the oil and manifold pressure gauges.

VII. SURFACE CONTROLS

7.1 GENERAL DESCRIPTION

This airplane is equipped with fully functioning dual controls except for brakes which are on left-hand side only. This includes two control wheels and two sets of rudder pedals. Control is of the conventional three control type.

7.2 FLIGHT CONTROLS

7.21 Elevator

The elevator is controlled by the forward and backward motion of either of the wheel type controls.

7.22 Rudder

Conventional rudder pedals are provided.

7.23 Aileron

The ailerons are controlled by the rotary motion of the control wheels.

7.24 Trim Tab Controls

The trim Tab Controls on the rudder and elevator are electrically controlled by push buttons on the control column wheels. The electrical push buttons for the aileron trim tab control is located on the instrument panel.

7.3 WING FLAP CONTROLS

The wing flaps are controlled by an electric switch easily accessible to the Pilot.

VIII. HYDRAULIC SYSTEM

8.1 GENERAL DESCRIPTION

In this model, only the brakes are hydraulically operated and the brake hydraulic system is of the conventional type.

IX. ELECTRICAL SYSTEM

9.1 GENERAL DESCRIPTION

The electrical system utlizes an engine driven generator and a 12 Volt battery.

9.2 LIGHTING

9.21 Exterior

This airplane is optionally equipped with conventional landing and position lights. The landing lights are housed in the wing leading edge. Provision is made for a red passing light as optional equipment.

9.22 Interior

The instrument panel is well lighted with non-glare lights and individual cabin lights are installed.

9.23 Singalling and Warning Devices

9.231 Alighting Gear Warning

A sound device becomes operative when the throttle is closed and the wheels are not down.

9.232 Fuel Pressure Warning

As optional equipment a red light on the instrument warns the Pilot when fuel pressure becomes low.

9.3 WIRING

Conduits, Wiring and Accessories are in accordance with ANC Specifications.

9.3 ELECTRICAL DRIVES

Aileron Trim Tab
Flaps
Elevator Trim Tabs
Rudder Trim Tab
Landing Gear Retracting and Extending Mechanism
Starter
Wobble Pump

9.5 BONDING AND SHIELDING

Bonding and shielding of electrical installations is provided as is necessary for the proper functioning of Radio Equipment.

X. COMMUNICATION EQUIPMENT

10.1 RADIO COMMUNICATING

Provision is made for a full complement of conventional radio equipment up to and including a 150 Watt transmitter and a three band receiver. Provision is also made for installation of radio equipment on the aft side of the baggage compartment doors which open forward into this compartment. Thus the radio is easily accessible for inspection and maintenance.

10.2 RADIO NAVIGATING

Provision is made for an automatic direction finder. As an additional aid to blind flying, a marker beacon receiver is provided for.

10.3 ANTENNAE

Provision is made for a loop (directional), a trailing, and a transmitting antenna. The latter is located on the belly of the plane.

XI. FURNISHINGS

11.1 PASSENGER ACCOMMODATIONS

The airplane is full 5-place. Two seats forward and adequate seating for three aft, is provided. Individual safety belts are standard equipment.

The best grade of upholstery is used in the cabin and provision is made for complete soundproofing and thermal insulation. In rear portion of the cabin provision is made for curtains of the slide type, at all windows.

A convenient luggage rack as well as provision for drinking water, radio headphone outlets, magazine holders and ash trays is made.

11.2 EMERGENCY EQUIPMENT

11.21 Parachutes
Provision is made for built-in seat type parachutes as optional equipment.

11.22 Fire Extinguishers
Both a pressure type and a portable fire extinguisher are provided.

11.23 First Aid Kit
A first aid kit is provided.

11.24 Flares, etc.
Provision is made for flares and the release

11.24 Flares, Etc. (Cont)

mechanism is located in the Pilot's compartment as required by the CAA.

XII. AIR CONDITIONING EQUIPMENT

12.1 TEMPERATURE CONTROL

In the cabin heating system the heat source is the air that goes through the large engine cooler, thus eliminating the danger of carbon monoxide.

12.2 CIRCULATION CONTROL

The pressurized type of forced fresh air circulation is used. While on the ground the air is circulated in the cabin by means of an engine driven blower.

XIII. ICE ELIMINATION

13.1 GENERAL DESCRIPTION .

Provision is made for ice elimination by means of a windshield wiper, de-icer on wings and a propeller de-icing system.