REPORT NO. 1410

STINSON AIRCRAFT

DIVISION OF VULTEE AIRCRAFT, INCORPORATED

TYPE SPECIFICATION

MODEL 10A 1680 GROSS

FRANKLIN

Submitted by

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SECTION

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STINSON AIRCRAFT

DIVISION OF VULTEE AIRCRAFT, INC.

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INTRODUCTION

(1) The Stinson Aircraft Division of Vultee Aircraft Incorporated submits this specification covering the construction, performance and weight and balance of the subject model airplane, to serve as a source of authentic engineering data.

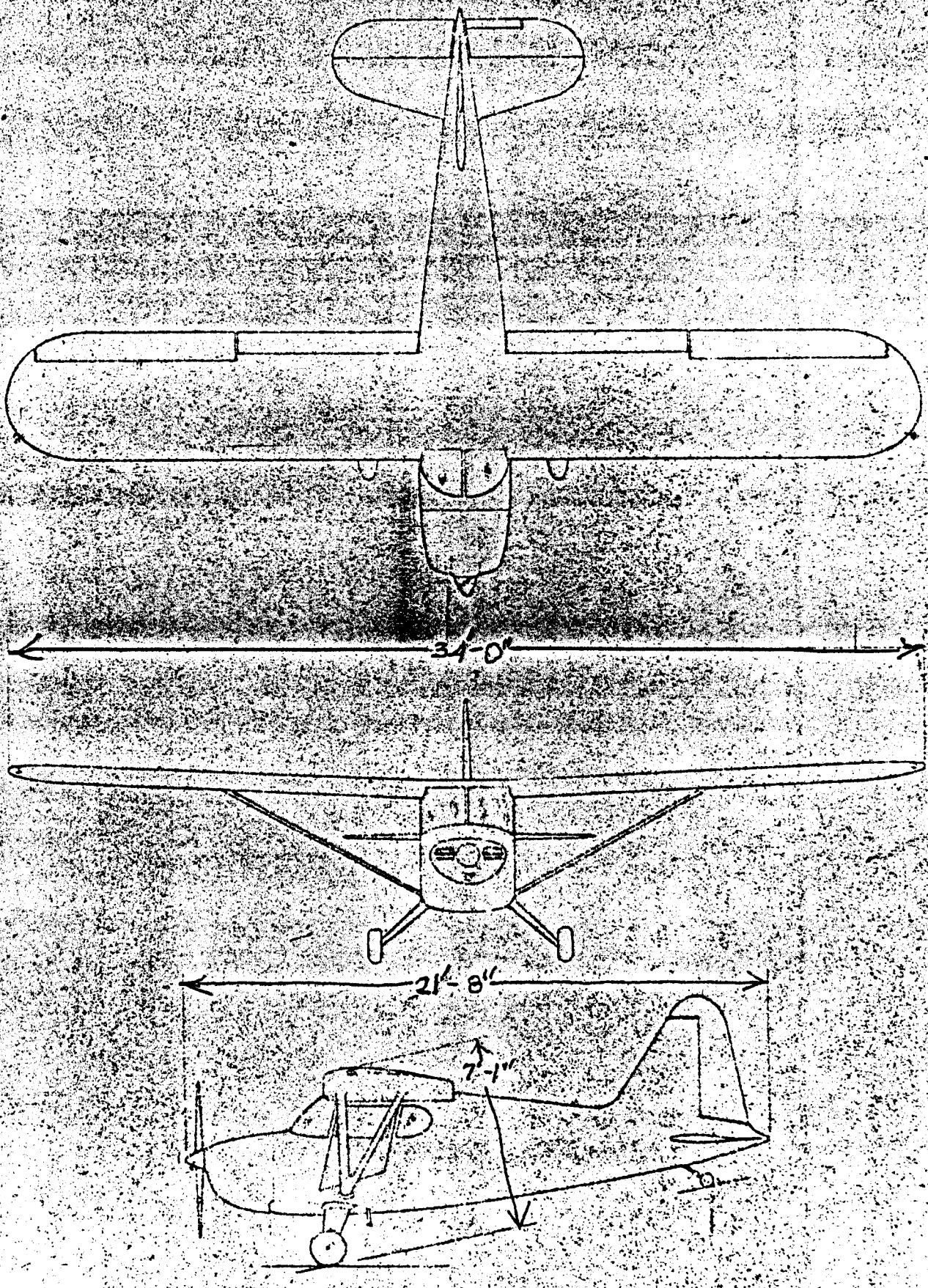
(2) The subject model airplane is manufactured in accordance with Civil Aeronautics Authority Approved Type Certificate No. 738 and conforms to the Airworthiness Requirements as required by Civil Air Regulations, Part 04.

(3) The Model 10A Stinson is a high wing, strut braced, cabin monoplane carrying a pilot and two passengers and is powered by a 90 horsepower engine manufactured by the Aircooled Motors Corporation under Approved Type Certificate No. 226.

(4) Materials, processes, finishes and workmanship are the equal or superior to high grade commercial practice.

STINSON AIRCRAFT

Division of Vultee Aircraft, Inc.



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GENERAL DATA

(1) Performance

Actual performance as determined from flight tests corrected to standard conditions.*

(a)	Power	90
(b)	Fuel (Gals.)	40
(c)	Service Ceiling (feet)	12600
(d)	Climb First Minute (feet)	456
(e)	Take-Off Run (feet)	705
(f)	Max. Speed at Sea Level (MPH)	108.8
(g)	Cruising Speed at Sea Level (MPH)	96.4
(h)	RPM for Cruising Speed at S.L.	2400
(i)	HP for cruising Speed at S.L.	79
(j)	Cruising Speed at Opt. Alt. (MPH)	100
(k)	Optimum Altitude (Ft.)	2900
(l)	Landing Speed (Flaps Ext.) (MPH)	47
(m)	Range at Cruising Speed - S.L. (Mi.)	590
(n)	Endurance Cruising Speed - S.L. (Hrs.)	6.10

* ± 3% variation due to engines and propellers.

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GENERAL DATA (Cont'd.)

(2) Weights & Balance

Weights of all items of standard and special equipment for the subject model airplane have been determined in the following pages. For any given airplane, the following limits may not be exceeded.

(a) Maximum Gross Weight — 1680 lbs.

(b) Maximum Forward C.G.

Aft of L.E. of wing	14.70 inches
Aft of L.E. of M.A.C.	25.35% M.A.C.

(c) Maximum Rearward C.G.

Aft of L.E. of Wing	19.00 inches
Aft of L.E. of M.A.C.	33.10% M.A.C.

(d) Normal Empty Weight C.G.

Aft of L.E. of Wing	15.95 inches

(3) Standard Weight Empty

GENERAL DATA (Cont'd.)

ITEM	MAKE & MODEL	WEIGHT	ARM	MOMENT
Power Plant:				
Engine - 90 H.P.	Franklin AC-199-E-2	190	-40.12	-7623
Propeller, Spinner & Hub	Sensenich 72DF48	12	-53.25	- 639
Carb. Air Heater & Cont.	Stinson	3	-35	- 105
Fuel Tank (2)	Stinson, 20 Gal.	30	22	660
Starter	Delco-Remy 1109651 1D5	15	-29	- 435
Altitude Mixture Control	Stinson	.5	-25	- 13
Instruments:				
Compass	Carwill	1.8	- 4	- 7
Altimeter	Aeromarine 520-N	.5	- 4	- 2
Tachometer	A.C. 1535288	1.2	- 4	- 5
Tachometer Shaft	---------	1.2	- 4	- 5
Airspeed	Aeromarine 540-N	.6	- 4	- 2
Oil Pressure	A.C. 1506026	.3	- 4	- 1
Oil Temperature	A.C. 1510928	.6	- 4	- 2
Fuel Level Indicator	King-Seeley	.3	- 4	- 1

Model 10A - Standard Equipment

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GENERAL DATA (Cont'd.)

(3) Standard Weight Empty

ITEM	MAKE & MODEL	WEIGHT	ARM	MOMENT
Furnishings:				
Fire Extinguisher - Hand	Pyrene C-21	7	21	147
Seats - Front (2) Parachute Type	Stinson	22	19	418
Rumble Seat (1)	Stinson	4	39	156
Safety Belts - Front (2)	Rusco AE-300	1.8	16	29
Safety Belt - Rear (1)	Rusco AE-300	.8	39	31
Rug		4.5	17	76
Cabin Heater	Stinson	1.5	-35	- 52
Special Paint - Army Green		8	55	440
Electrical:				
Battery - Under Pilot's Seat	12 Volt Exide 6TS-9-1	29.8	15	447
Battery Box & Cover	Stinson	1.2	15	18
Navigation Lights - Wing		.8	24	19
Navigation Lights - Tail		.3	200	60
Generator	Auto-Lite 12 Volt	12	- 28	-336
Starter Wiring & Switch		6	- 2	- 12
Shielding & Bonding (Airplane)		1	13	13
Radio Installation:				
Receiver - Complete	R.C.A. - Stinson	8	- 6	- 48
Antenna		1	44	44
Landing Gear:				
Wheels & Brakes (2)	Hayes Model 600 M	13.0	1	13
Tires & Tubes (2) 4 Ply Safety	Goodrich 6.00 x 6	15.0	1	15
Parking Brake		3	13	39
Tail Wheel & Tire	Goodrich 6.00 x 2 Solid	2	168	336
Steerable Tail Wheel Mechanism		1	155	155

Model 10A - Standard Equipment

GENERAL DATA (Cont'd.)

(4) Useful Load

ITEM	WEIGHT	ARM	MOMENT
Pilot	170	16	2720
Passenger - Front	170	16	2720
Passenger - Rear	170	39	6630
Baggage	24	39	936
Fuel - 40 Gals.	240	22	5280
Fuel, Min. for C.G. req. at take-off (8 Gals.)	48	22	1056
Oil, 8 Quarts	15	-41	-615

Model 10A - Useful Load

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GENERAL DATA (Contd.)

(5) Standard C.G. Locations - Special Equipment

	WEIGHT	ARM	MOMENT
WEIGHT EMPTY WITH STANDARD EQUIPMENT	1025	15.95	16348

Three-Place Airplane Minimum Useful Load:

Pilot & Passengers at 170 lb.	510
Min. Fuel (13 1/2 Gals.)	81
Oil (5 Qts.)	10
	601

Max. Allow. Gross Weight = 1680
Max. 3-Place Empty Wt. = 1680 - 601 = 1079
Max. 3-Place Special Equipment = 1079 - 1025 = 54 (Incl. Baggage)

With 20 Gal. Gasoline, Allow. Spec. Equipment = 54 - 39 = 15 (Incl. Baggage)

Structural considerations limit the load in the rear compartment to 194 lbs.

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DESIGN CRITERIA - STRUCTURES

(1) Limit Wing Load Factors:

(a) Maneuvering Limit Load Factors:

Positive 4.41 Negative 2.20

(b) Gust Limit Load Factors:

Design Gross Weight - Positive 3.39 Negative 1.39
Design Gross Weight with
Flaps Extended: - Positive 1.94 Negative .04

(c) Landing Limit Load Factors:

All Positions 3.33

(d) Limit Diving Speed 160 MPH 144 MPH Placarded

DETAIL DESIGN

(1) Wing Group:

(a) Airfoil Section: Root NACA 4412, Tip NACA 4412

(b) Dimensions:

Wing Area Gross	155 sq. ft.
Span	34 ft.
Root Chord	57 in.
Tip Chord	57 in.
Taper Ratio	1:1
Incidence: Root	$1^{\circ}52'$
Incidence: Tip (Rib No. 14)	
R.H.	$0^{\circ}37'$
L.H.	$0^{\circ}38'$
Dihedral (L.E.)	$2\frac{1}{2}^{\circ}$
Maximum Rib Spacing	13 in.

Spar Location:

Front Spar From L.E.	$8\frac{1}{2}$ in. (15% C)
Rear Spar From L.E.	36 in. (63% C)

Aspect Ratio 7.45

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DESIGN CRITERIA - DETAIL DESIGN (Contd.)

(1b) Wing Group - Dimensions (Contd.)

Mean Aerodynamic Chord, Length ..... 55.4 in
Location of L.E. M.A.C. Relative to Wing L.E. with Respect to Root Chord (Root Chord is 22.31 in. from Plane of Symmetry)

Horizontal 0.66 in., Vertical 3.305 in.

(2) Wing Construction

The wing structure consists of rectangular spruce spars with spruce reinforcements at the lift strut fittings; built-up 52S1/2H Aluminum Alloy Ribs; 4130 x Chrome Molybdenum steel tube compression struts, inboard of strut point, and 61ST Aluminum Alloy Tube compression struts outboard of strut point. The tie rods are of SAE 1045 Steel.

The leading edge of the wing from root to tip is covered with .016 in. 52SH Aluminum Alloy Sheet extending from the top of the front spar around the leading edge to a point aft of the leading edge radius on the lower surface.

The wing is covered with Grade A Aircraft fabric, the fabric is attached to the ribs with sheet metal screws.

All fittings are attached to the spars with standard AN bolts and, at points of high load, bushings are used through the spars to increase the bearing strength.

AN standard bolts are used for the attachment of the wing cellule to the fuselage.

Running Lights conforming to Civil Aeronautics Authority Specifications are provided in each wing tip.

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DESIGN CRITERIA - DETAIL DESIGN (Contd.)

(3) Ailerons

(a) Area 9.01 Sq. Ft. each

(b) Angular Movement: UP 25.7° DOWN 12.5°

(c) Differential Movement 2.06 : 1

(d) Distance from Plane of Symmetry to Centroid of Aileron Area 12 Ft.

(e) Type of Balance:

The ailerons are provided with aerodynamic balance of the slotted type forward of the hinge line. Static and Dynamic balance meets the requirements of the Civil Aeronautics Authority and is obtained by a steel bar in the nose of the aileron 16 inches inboard of the tip.

(4) Horizontal Tail Surfaces:

I Gross

(a) Area: 24.98 Sq. ft.
(b) Span: 112 In.
(c) Max. Chord: 43-5/32 In.
(d) Distance from Design Gross Weight C.G. to 1/3 Max. Chord Point 12.55 ft. (272% M.A.C.)

II Stabilizer

(a) Area: 14.22 Sq. ft.
(b) Normal Setting: -3.5° (Relative to Longitudnal axis)
(c) Angular Movements: None

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(4) Horizontal Tail Surfaces (Cont'd.)

III Elevator

(a)	Area	10.76 Sq.Ft.
(b)	Angular Movement	Up 21.6°, Down 28.9°
(c)	Balance	None
(d)	Tab	A controllable trim tab located at the root of the trailing edge of the left elevator only is provided.
	Area:	.765 Sq.Ft.
	Chord:	4 Inches
	Span:	27 3/4 Inches

(5) Vertical Tail Surfaces

I Fin:

(a)	Area:	8.41 Sq.Ft.
(b)	Normal Setting:	0°47' to the left
(c)	Angular Movement:	None

II Rudder

(a)	Area:	6.76 Sq.Ft.
(b)	Angular Movement:	Right and Left 14.7° from neutral
(c)	Type of Balance:	The upper portion of the rudder protrudes forward of the hinge line to supply satisfactory aerodynamic balance. A lead weight in the forward overhanging portion is installed to improve static balance. The static and dynamic balance is in accordance with the requirements of the C.A.A.
(d)	Tab:	None. A screw adjustment in one rudder rib changes its camber and serves as a trim tab. Adjustment can be made on the ground only.

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(6) Construction of Control Surfaces

I Ailerons:

The ailerons are of welded steel construction with fabric covering. All hinges are equipped with commercial ball bearings.

II Tail Surfaces

(a) Horizontal Stabilizer

The horizontal stabilizer is of wood construction with plywood covering. The stabilizer is rigidly attached to the fuselage by two 3/8 AN standard bolts through bushings welded into the fuselage and extending through the front stabilizer spar into self locking plate nuts secured to the rear face of the front spar.

Vertical bolts through the rear spar into a bracket on the fuselage complete the stabilizer attachment.

(b) Vertical Fin

The vertical fin is of welded steel tube construction, having two spars, tubular ribs, and an aluminum alloy leading edge fastened to the ribs with sheet metal screws. The surface is fabric covered with the same envelope which covers the remainder of the fuselage. The vertical fin is welded to the fuselage.

(c) Elevator

The elevator is of welded steel construction. A 1" O.D. torque tube along the leading edge, upon which the needle bearing hinges rotate, forms the spar. Ribs are of pressed steel and the trailing edge is an elliptical steel tube formed to the desired contour. This assembly is fabric covered.

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(6) Construction of Control Surfaces (Cont'd.)

(d) Elevator Tab:

The left hand side of the elevator at the inboard end is equipped with a trim tab of aluminum alloy and wood construction.

(e) Rudder:

The rudder is of welded steel construction. A 1 inch torque tube along the leading edge, upon which the two upper needle bearing hinges rotate, forms the spar. Ribs are of pressed steel and the trailing edge is an elliptical tube formed to the desired contour. The horn is of bent up sheet steel welded to the lower end of the rudder. The lower bearing is a commercial standard shouldered ball bearing.

(7) Control System

(a) Rudder Control Installation

Right hand and left hand pedals of each set are mounted on a common torque tube which are free to rotate on commercial ball bearings pressed into the ends of the torque tubes. The left hand set of pedals only has toe action brake controls connected to the master cylinders located below the floor, through a push tube and bellcrank. The right hand set of rudder pedals is easily removable.

(b) Control Column Installation

The control wheels are mounted on chromium plated, tubular shafts, which protrude from the instrument panel where they are supported by a micarta bushing. The forward end of the shaft is connected through a universal joint to the control column. The right hand control wheel is removable by taking out on 1/4 AN bolt, through the universal joint at the control column. The control column is fitted with commercial ball bearings where the assembly fastens to the support fittings and also at the wheel attachment shafts.

(c) Flap Control

The flap actuating control is of the manual type consisting of a hand lever located between the pilot's and passengers seats. The lever consists of a tubular handle, a sector and pawl, which locks the flap in any of three predetermined positions, and a pawl control to a button in the end of the handle.

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(7) Control System (Cont'd.)

(d) Elevator Tab

The elevator tab control in the cockpit consists of a handle which turns a deep grooved sheave. This unit also provides a tab position indicator of the visual type. The control between the fuselage and the tab is through a flexible shaft. The driven end of the shaft is connected to a sheave and stop assembly. A cable connects the rear sheave with the cockpit control. The driving end of the flexible control is connected to a screw and nut arrangement which actuates the tab horn.

(e) All fuselage controls are of the cable type except the elevator controls and as noted above. The elevator control, from the control column to the elevator horn, is of the push tube type. The forward tube from the control column to the bellcrank immediately aft of the cabin, likewise has commercial ball bearings in both end fittings, and slides through felt grommets secured to the fuselage structure, which reduce the column length.

(8) Lift and Drag Increasing Devices

(a) Type

The wings are provided with trailing edge flaps of the slotted type. The flaps are of welded steel construction with an aluminum alloy leading edge, the whole being fabric covered. The wings are provided with a fixed type leading edge slat. The slat is constructed of formed aluminum alloy ribs and aluminum alloy covering.

(b) Dimensions and Movements

The flap has an area of 6.11 sq.ft. each, a span of 81-3/8 in. and a chord of 11 5/16 in. The total movement of the flap is 33°. The slat has a span of 39 1/2 in. and a chord of 5 5/16 in. The slat is of the fixed type.

(c) Effect on Aerodynamic Characteristics

The effect of lift and drag increasing devices is to obtain the following, with as little adverse effect as possible, on the high speed:

1. To reduce landing speed
2. To increase glide angle
3. To decrease the distance necessary to clear an obstacle during landing and take-off.

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(9) Body Group

(a) Fuselage

The fuselage has a maximum cross section of 42 1/2 inches in width by 59 1/2 inches in height.

The fuselage is of conventional truss type construction of steel tubes welded together.

The cabin has a door on each side. Cabin windows and windshield are of a transparent plastic of commercial specification. The forward section of each door window is mounted so that it can be slid aft to provide for use of hand camera or improved downward vision.

Fairing strips of the fuselage are of wood "T" sticks secured to the fuselage by clips welded to the tubing.

(b) Engine Mount and Cowling

The engine mount is of welded S.A.E. 1025 steel tubing bolted to the fuselage and engine. A rubber mounting is provided at the engine to prevent engine vibration from reaching the airplane structure.

That part of the fuselage forward of the cabin doors is covered with aluminum alloy sheet. Stainless steel, of commercial specification, is used in the firewall.

The engine cowl is constructed of formed aluminum alloy sheet. It is made in four panels, the front or nose section is fastened to the engine through a steel frame secured to suitable studs. The lower panel is fastened with screws to the nose section and to stiffener channels on either side of the cowling. The upper sections are hinged along the upper center line of the engine compartment and are secured to the side stiffeners with a commercial type of easily operated fastener.

(c) Landing Gear

Type of gear: Fixed, cantilever.

Major Dimensions:

Tread:	7 ft. 0 inches
Wheel Size:	6.00 x 6
Brake Control:	Hydraulic

The main landing gear beam is a step tapered tube with fittings for attachment to the fuselage and socket for the axle attached by welding. The whole beam weld assembly is heat treated to 180,000 psi.

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DESIGN CRITERIA - DETAIL DESIGN (cont'd.)

(9c) Landing Gear (cont'd.)

Hayes Industries 6" wheel and Goodrich 6.00 x 6 four-ply tire and expander tube hydraulic brakes or commercial equivalent are installed.

The propeller clears the ground by thirteen (13) inches with the shock absorbers and tires in the static position.

The shock absorber is of the spring and oil type.

(d) Tail Wheel Installation

Type of Gear: Fixed
Major Dimensions: Wheel Size 6 x 2

The tail wheel is of the full swiveling steerable type, having a leaf spring bending member for shock absorption. The wheel is of commercial ball bearing type equipped with a solid Goodrich 6 x 2 tire or commercial equivalent.

(10) Propeller Installation

(a) A propeller conforming to the following and having the following characteristics is to be installed:

Hub: Supplied with engine
Blade Manufacturer's Name: Sensenich
Design Number: 72 DF 48
Type: Fixed Pitch, wood
Diameter: 72"
No. of Blades: Two
Approved Type Certificate No.: 734

(b) Minimum Clearances

In plane of propeller disc:

To ground, level landing, with shock absorbers and tires in static position: 12 inches

Normal to plane of propeller disc:

To engine cowl from point 10" from centerline of hub: 2-5/8 in.
To engine cowl at edge of hub: 5/8"
To leading edge of wing: 51½"

The propeller is manufactured in accordance with Civil Aeronautics Authority approved Type Certificate No. 734 and Production Certificate No. 1

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(11) Power Plant Installation

The power plant installation is so designed as to afford a maximum of accessibility for the engine, engine accessories, fuel system, oil system and all other parts related directly to the power plant installation.

It is possible to remove the engine without first removing any accessories attached to the engine.

This airplane is equipped with one Franklin Model 4AC-199-E-2 engine.

(12) Lubrication System

The lubrication system is an integral part of the engine. A blast tube extends from a grill in the nose cowl to the bottom of the crankcase to provide oil cooling. The integral tank has an eight quart capacity.

(13) Cooling System

The engine is aircooled. The cylinder air enters through two grills in the nose cowl, is directed over the cylinders and crankcase by pressure baffles, and is exhausted through a venturi shaped outlet that extends across the bottom of the firewall to approximately the lower longerons of the fuselage.

(14) Fuel System

(a) Fuel Tank

The fuel tanks are constructed of aluminum alloy with a total capacity of 40 gallons. Each tank sump has a capacity of one pint and has a removable drain plug which is accessible without removing any part of the airplane. The drain plugs are so located as to drain the sumps dry when the airplane is at rest with the tail wheel on the ground. Each tank is so designed that water will readily drain into the sump. The tanks are equipped with a small compartment around the fuel outlet that is equipped with flapper valves to prevent uncovering of the fuel outlet in violent skids either to the ground or in flight. The tanks are located in the wings of the airplane and are readily removable by releasing two straps on the top surface of each wing without removing any fabric, cover strips or inspection plates other than a portion of the lower wing root fillet for the disconnection of the fuel supply line.

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(14b) Fuel Lines

The fuel lines are made of 3/8 inches O.D. aluminum alloy tubes with C.A.A. approved rigid connections at points where relative movement of the component parts is not possible and with C.A.A. approved flexible hose connections and hose liners at points where relative motion of the component parts is to be expected.

(c) Fuel Selector Valve

A fuel selector valve in accordance with C.A.A. requirements is provided at the firewall with a remote control on the lower panel beside the throttle. A placard at the valve handle is provided and plainly labeled in the left tank, right tank, and "off" positions of the valve.

(d) Fuel Strainer

A fuel strainer conforming to C.A.A. requirements is located on the front face of the firewall. The strainer is so located as to prevent trapping of gasoline or the accumulation of fumes when the strainer is being cleaned or drained.

(15) Engine Control System

The throttle control is of the flexible casing push and pull type, and is provided with a friction adjustment.

The mixture control is of the flexible casing push and pull type.

The carburetor heat control is of the flexible casing push and pull type.

(16) Exhaust System

The exhaust manifold is constructed of SAE 1010 welded steel tubing except that inside the cabin heater shroud the tubing is SAE 1010 seamless steel tubing. The two side manifolds are manifolded together and the exhaust is discharged through a venturi bayonet outlet that serves as a silencer as well as reducing back pressure.

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(17) Engine Air Intake System

The cold air enters through a grill on the lower side of the engine cowl into a mixing chamber equipped with a controllable valve that is bolted to the carburetor. The hot air enters through a scoop aft of the cold air grill from where it is directed through a flexible aluminum tube to one end of a shroud over the right hand exhaust manifold. An aluminum tube carries the air from the opposite end of the shroud to the mixing chamber on the carburetor. The valve in the mixing chamber is so arranged that any combination of hot and cold air can be used. A one inch O.D. tube connects the hot air system just before the air enters the valve to the outside of the airplane to insure a flow of air through the shroud at all times in order to prevent the exhaust manifold from overheating inside the shroud.

(18) Instruments and Navigation Equipment

(a) The following instruments are supplied as standard equipment and mounted in a rigid panel in the center section of the instrument panel and are indirectly lighted:

Altimeter	Aeromarine 520-N
Tachometer	A.C. - 1535288
Airspeed	Aero Marine 540-N
Oil Pressure	A.C. - 1506026
Oil Temperature	A.C. - 1510928
Fuel Level Indicator	King-Seely

The compass is mounted in an individual housing on the center windshield support and contains its own light (Carwill Type 61).

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DESIGN CRITERIA - DETAIL DESIGN (Cont'd.)

(19) Electrical Installation

The electrical installation conforms to the best commercial practice. A single wire grounded system is used. Adequate fuses are supplied to protect all circuits and placed in a conveniently located fuse panel below the instrument panel on the left side of the cabin. Switches controlling the various circuits are located on plastic strips on both sides of the panel containing the instruments. A 12 volt battery (Exide 6TS-9-1) is the standard source of power. The following lights are standard:

Position Lights Compass Lights	1 Switch
Panel Lights	1 Switch

A third switch controls the fuel gage.

(20) Equipment and Furnishings

(a) All fabric surfaces are finished by the application of clear and Army green pigmented dope.

(b) The standard interior is trimmed and upholstered in laidlaw cloth. The painted surfaces are finished in a special metallic brown. The instrument panel is grained in quartered American Walnut. Rugs are supplied for both front and rear compartments of the cabin. Safety belts of approved type are provided for each passenger. Pilot and Co-Pilot seats are provided with a removable cushion for seat type parachutes.

(c) Ventilation is accomplished by two ducts in the root leading edge of each wing. Either front passenger may regulate the amount of air taken in by each duct. As special equipment, a heater is provided which utilizes the excess heat of the exhaust. Air is taken in through a grill in the nose cowl, passed around the exhaust stack and thence, either to the cabin or discharged to the outside, depending on the setting of a cabin controlled valve.

(d) Radio receiver equipment is standard. The receiver is mounted on the left hand side of the instrument panel. The RCA equipment operates off of the ships battery, and is operated off of an antenna located on the top of the ship.

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