

BEECHCRAFT MODEL D18S NAVIGATION TRAINER
FOR
ROYAL CANADIAN AIR FORCE

Detail Specification 131
December 29, 1950
Revised: March 13, 1951

Beech Aircraft Corporation
Wichita 1, Kansas

AIRPLANE, TWIN-ENGINE: TRANSPORT

A. APPLICABLE SPECIFICATIONS

A-1. The following publications of the issue specified herein are applicable to, and form a part of, this specification:

Civil Aeronautics Requirements

Engine Manufacturer's Model Specification
AN-2035, dated 6 November 1945 and
revised 16 June 1948

Propeller Manufacturer's Detail Spec. No. 906
dated 29 May 1939

B. TYPE

B-1. This specification covers the following airplane:

Designer's Name and Model No. - Beechcraft D18S

U. S. Army Type Designation - Airplane, Navigation Trainer

Model AT-7

Number of places - Five

Number of engines - Two

B-2. This airplane will be equipped with the following engines:

Name and Type	- Pratt & Whitney Wasp Jr.
AAF Designation	- R985-AN14B
Eng. Mfg. Spec. No.	- Pratt & Whitney, AN2035

Horsepower or Thrust Ratings:

Normal	<u>450</u>	Altitude	<u>2300</u>	R.P.M.	<u>2300</u>
Military	- - -	Altitude	- - -	R.P.M.	- - -
War Emergency	- - -	Altitude	- - -	R.P.M.	- - -
Take-Off	<u>450</u>	Altitude	<u>3500</u>	R.P.M.	<u>2300</u>

Propeller Gear Ratio (direct drive)

B-3. This airplane will be equipped with two blade propellers as specified in Paragraph E-3, Page 20.

B-4. The tactical mission of the airplane is the training of Navigators.

C. MATERIAL AND WORKMANSHIP

C-1. Material and workmanship shall be in accordance with best commercial practices.

D. GENERAL REQUIREMENTS

D-1. The Navigation Trainer airplane covered by this specification is designed and constructed in accordance with the publication listed in Section A of this specification, and as hereinafter set forth. The entire airplane is winterized in accordance with Beech Specification G.S. 373. The airplane is painted and marked in accordance with R.C.A.F. EO 05-1-2U.

E. DETAIL REQUIREMENTS:

E-1. Performance, Crew, Equipment, and Furnishings

The performance, crew, equipment, and furnishings shall conform to the following:

E-1a. Performance with design useful load:

	<u>Guaranteed</u>
High Speed at 5000 feet with 392 horsepower mph	215.0
Operating Speed at 5000 feet with 272 horsepower mph	190.0
Total Range at average cruising speed with 286 gallons fuel miles	1200
Service Ceiling feet	20000
Time to Climb to 10,000 feet minutes	11.0
Take-off over 50-ft. obstacle from hard surface runway (11° flap) feet	1800
Land over 50-ft obstacle within ft.	1800

E-1a(1). Additional Performance (Not Guaranteed)

Maximum altitude for level flight on single engine ft.	8000
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E-1a(2). Performance Curves

Performance curves are shown on Pages 6 and 7.

E-1a(3). The performance specified herein is based on the specific fuel consumptions specified in Specification No. AN-2035 which are to be used during the Model Test of the engine.

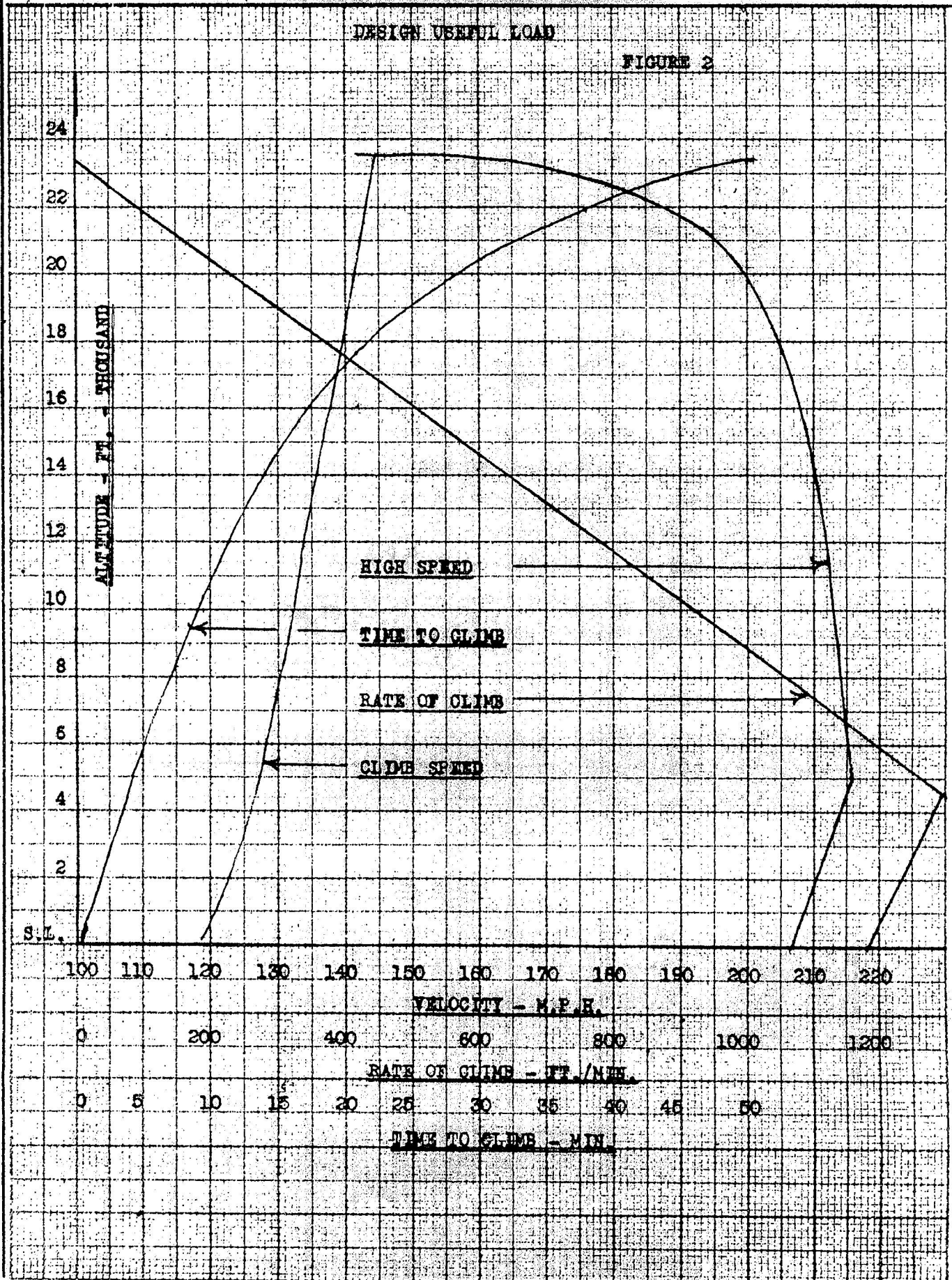
E-1a(3)(a). The horsepower, speed, and specific fuel consumption of the engines for all performance ranges shown on Figure 3 at 5000 feet.

POWER	SPEED	S.F.C.
400	216	.640
300	198	.547
270	190	.527
240	182	.510
200	170	.503
130	141	.574

PERFORMANCE AT ALTITUDE - 2 ENGINE

DESIGN USEFUL LOAD

FIGURE 2

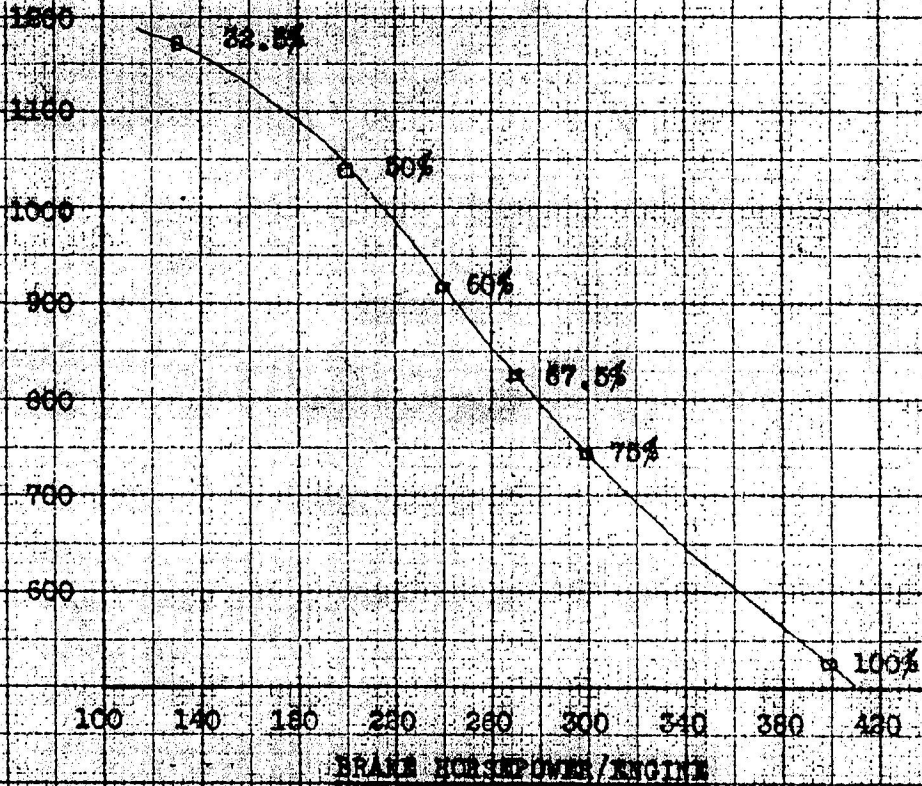


RANGE PERFORMANCE AT 5000 FT. - DESIGN USEFUL

LOAD - 208 GAD

Figure 8

RANGE - MILES



E-1b. Crew

Pilot, or Pilot and Co-pilot (Dual controls are provided although it is not necessary to have a Co-pilot to operate the airplane.)

E-1c. Armament

There are no armament requirements applying to this airplane.

E-2. Airplane

E-2a. Airplane Weight and Balance:

E-2a(1). Design Loading (See Group Weight Statement following)

E-2a(2). Alternate Loadings

The number of passengers and the amount of gasoline and equipment may be varied as long as the gross weight of the airplane does not exceed 8750 pounds. Balance must coincide with paragraph E-2a(4). A sample alternate loading is shown on Pages 10, 11 and 12.

E-2b Aerodynamics

The aerodynamic characteristics shall satisfy the requirements of the Civil Aeronautics Authority for approved type airplanes.

E-2c Flight Test

The airplane shall be flight tested for compliance with this specification at the contractor's plant.

E-2d Structures

E-2d(1) Criteria for Design

E-2d(1)(a) Design Gross Weight for Stress Analysis Purposes 9000 lbs

E-2d(1)(b) Limit Flight Load Factors

E-2d(1)(b)(1) Limit Maneuver Load Factors

Positive 3.363 Negative 1.345

E-2d(1)(b)(2) Limit Gust Load Factors

E-2d(1)(b)(2)(a) Design Gross Weight

Positive 3.001 Negative 1.001

E-2d(1)(b)(2)(b) Minimum Flying Weight (Gust)

Positive 3.600 Negative 1.600

E-2d(1)(c) Limit Take-off and Landing Factors

E-2d(1)(c)(1) Land Plane or Ground Take-offs and Landings 3,000

E-2d(1)(c)(2) Sea Plane or Water Take-offs and Landings -

Not applicable to this specification

E-2d(1)(d) Designed diving speed, 285 mph; maximum permissible diving speed, 257 mph (223 knots).

GROUP WEIGHT STATEMENT

The group weight statement will be computed when the optional equipment is finally determined.

E-2e. Detail Design

E-2e(1) Wing Group

E-2e(1)(a) Airfoil Section Designation

Root 23020 Tip 23012 (last full rib)

E-2e(1)(b) Dimensions:

Wing Area 349 sq. ft.

Span 47'8"

Root Chord (theoretical at \bar{c} of fuselage) 135.116"

Tip Chord (theoretical at outer end of tip) 42"

Taper Ratio (plan form) 3.217 to 1

Incidence, root 3.922°

Tip 0.384° = .384°

Dihedral (at 25% of this chord aft of l.e.) 6°

Sweepback (at 25% of the chord aft of l.e.) 7°5'

Maximum Rib Spacing 19.870"

Main Spar Location (%chord aft of l.e.) 25%

Rear Shear Beam Location (% chord aft of l.e.) 77%

Aspect Ratio 6.35

Mean Aerodynamic Chord, Length 96.639"

Location of l.e. m.a.c. relative to main spar
10.4737" ahead
(91.527" aft of datum)

E-2e(1)(c). Wing Construction

E-2e(1)(c)(1). Center Section

The primary structure of the center section consists of a single triangular steel tubular spar. This spar carries the fittings for the engine mount, the landing gear, and the outer panel main spar. It is heat-treated to a tensile strength of 180,000 lbs/sq. in. The rest of the center

E-2e(1)(c)(1). Center Section (Continued)

Section structure consists of 24STAL Alclad ribs and bulkheads, 24STAL Alclad smooth skin covering, and 24ST extruded stringers. The rear spar is 24STAL Alclad, and is merely a shear beam. It carries the two inner flap hinges. Removable panels of skin are provided over the gasoline tanks. The leading edge, with the exception of the ribs is flush riveted.

E-2e(1)(c)(2). Outer Wing Panel

The outer wing panel is constructed entirely of metal. The main spar consists of welded, heat-treated steel tubing to a point about half-way out from the root to the tip. The steel and aluminum alloy spar gradually absorbs the bending loads in the skin, until at the root, it carries the entire bending load. To be conservative, it is designed to take the entire bending moment through its entire length. The remaining structure consists of 24STAL Alclad ribs; 24ST extruded stringers, and 24 STAL Alclad smooth skin. The rear spar is 24STAL Alclad, and is merely a shear beam. An aluminum alloy fitting is bolted to the outer panel spar near the tip to provide for mooring of the airplane. This fitting will accommodate a 3/4" rope and will restrain the airplane without damage in a wind of 75 mph. The leading edge, with the exception of the ribs, is flush riveted.

E-2e(1)(c)(3). Wing Tip

The wing tip is detachable from the main outer panel. Its construction is similar to the outer wing panel.

E-2e(2) Control Surfaces

E-2e(2)(a)

Ailerons:

Area 22.842 sq. ft.
Angular Movement $37\frac{1}{2}^{\circ}$ up, 20° down
Differential Motion $17\frac{1}{2}^{\circ}$
Distance from plane of symmetry to centroid of aileron area 166.24"

Type of Balance—Static and dynamic balance, in accordance with the provisions of the Handbook of Instructions for Airplane Designers, is secured by lead strips placed along the leading edge, which is forward of the hinge axis. Aerodynamic balance is also secured due to the location of the hinge axis.
The coefficient of dynamic balance is -4.16 for the R.H. aileron and 05.57 for the L.H. aileron.

Tab - One left aileron only, area 0.427 sq. ft.

E-2e(2)(b).

Horizontal Tail Surfaces:

Area 65.4 sq. ft.
Span 15'0"
Max, Chord 5'10"

Distance from design gross weight c.g. to 1/3 maximum chord point 242.78", 252% m.a.c.

Stabilizer:

Area 38.18 sq. ft.
Normal setting 2° negative to longitudinal axis.
Angular Movement None

Elevator:

Area 27.22 sq. ft.
Angular Movement Up 35° , Down 25°

Type of Balance Inset hinge type. The dynamic balance coefficient is 9.78 for the R.H. half of the elevator and 0.85 for the L.H. half.

Tabs - Two tabs are used, at approximately the center of each half of the elevator span. Area - 2.22 sq. ft.

E-2e(2)(c). Vertical Tail Surfaces:

Fins

Area - Two at 8.15 ea., total 16.30 sq. ft.

Normal setting - both fins, straight forward.

Angular movement - none.

Rudder

Area, Two at 8.64 sq. ft. each, total 17.28 sq. ft.

Angular movement - Right 25°, Left 25°.

Type of Balance - Inset hinge type. The chord of the balance is increased somewhat near the top and lead is added here to provide complete static balance. The dynamic balance coefficients are - 1.45.

Tab

One on each rudder - Area - .85 sq. ft. ea.

E-2e(2)(d). Construction of Control Surfaces:

The movable control surfaces are constructed of 24STAL Alclad Aluminum alloy, fabric covered. All surfaces have a box type of spar, and are suitably reinforced at cutouts. As much of the spar as possible is placed ahead of the hinge line to provide static and dynamic balance with a minimum of weight. Ribs are stamped from sheet and riveted to the spar. The fixed tail surfaces are constructed entirely of aluminum alloy. They each have two spars of 24STAL Alclad, the rear spar being used to attach the hinges. The spars are backed up at all hinge attachment points with heavy backing plates which in turn are attached to reinforcements under the skin, distributing the hinge loads over a very wide area. Ribs are 24STAL Alclad, stringers are 24ST extrusions on the stabilizer, and 24STAL Alclad channels on the fins. Covering is 24STAL Alclad, except on the tips of the fins, where it is 24SOAL Alclad heat treated to 24STAL Alclad because of easier forming. Ball bearings are used on the elevator and rudder hinges. The ailerons are attached to the wing with stainless steel piano hinge.

E-2e(3). Control System

Controls are installed for use of both pilots. The elevator control columns are mounted near the wall of the pilot's compartment where they do not interfere with the pilot's legs. Aileron control is with a wheel on the top of the column. One set of rudder pedals is provided on each side of the cockpit. Toe type brakes are provided for both the pilot and co-pilot. The elevator tab is controlled by a wheel on the right hand side of the pilot's seat. The rudder tab is controlled by a crank on the roof of the cockpit and the aileron tab by means of a wheel on the control panel. All tab controls rotate in a natural direction to produce the desired motion of the airplane. All control surfaces are operated by a combination of cables, bell cranks, and push pull tubes. All pulleys are ball bearing.

E-2e(4). Lift and Drag (Increasing Devices)

E-2e(4)(a). Type (Discussion)

A balanced aileron type flap is used to increase both lift and drag on landing. The design of the flap is such that it gives a sufficient amount of drag to permit steep gliding approaches, yet the drag is not so high that power is necessary for smooth landings, nor is it necessary to land the airplane on its wheels at high speed to guard against too rapid loss of speed. The construction of the flap is similar to the other movable surfaces and is fabric covered. The flap is operable either electrically or manually.

E-2e(4)(b). Dimensions and Movements:

Flap span (each) 116"

Chord: Root 27-17/32, tip 19-1/32"

Area - Two at 14.06, total 28.12 sq. ft.

Travel - 45° down only.

E-2e(4)(c) Effect on Aerodynamic Characteristics

The flaps lower the landing speed approximately 5 mph and increase the drag enough to permit steep approaches. The balance of the airplane is not affected by the position of the flaps. They may be raised at any time regardless of the speed without danger of stalling the airplane, as the airplane accelerates faster than the lift decreases when the flaps are raised. The airplane will take-off with the flaps full down, in case the pilot forgot them or decided to take-off immediately after landing.

E-2e(5) Body Group (Description and Discussion)

The cabin interior is arranged for the training of navigators. Two student seats are installed on the right hand side of the airplane, fitted with tables of adequate size and instrumentation as described in Section E-6a(4). A suitable map case shall be provided for both student stations.

An instructors seat is located on the LH side of the cabin approximately between the student seats. It is not intended to be occupied for take-off and landing.

A plastic astrodome with fittings to accommodate the astro compass and sextant is installed in the cabin roof adjacent to the first crew station.

The sidewalls and ceiling are upholstered with 77-02 Antrim flight fabrics color 202 green. The cockpit and cabin chairs shall be upholstered with green leather. The floor is covered with linoleum.

A flare chute is provided for dropping flare floats or smoke floats.

Soundproofing shall be provided in accordance with the BEECHCRAFT Commercial Standard which is basically a sprayed on coat of sound deadner plus a suspended fiberglas blanket.

E-6a(4). (Continued)

All seats except the instructor's seat are high strength seats to resist crash loads of approximately 20 g's. Inertia reels are fitted to the pilots seats and BEEHCRAFT type shoulder harness to the students seats.

E-2e(5)(a). Fuselage

Maximum cross section (inside): Height 60", Width 52"

Type of Construction - The fuselage structure is entirely of aluminum alloy. 24STAL Alclad bulkhead rings, 24ST extruded stringers, and 24STAL Alclad skins are used. The loads from flight and landing conditions are carried to the fuselage by the steel center section spar. Because this spar carries all bending loads from the wings and center section, it is not necessary to carry any bending loads through the bottom fuselage skin. The vertical and twisting loads from the steel spar are carried into the side fuselage skin by means of a truss built up of heavy 24STAL Alclad angles, 24STAL Alclad sheet, and stringer sections. This truss distributes the wing loads throughout the first three stations of the fuselage behind the main spar. The bottom skin gradually transfers any load it may be carrying into these heavy angles.

E-2e(6). Nacelles, Engine Mounts, and Cowlings

The engine mounts are welded steel tubing construction, and are attached to the steel center section structure at three points. Load shock absorbing bushings of large capacity are used at these points. The NACA cowling is in two pieces and may be quickly removed. The upper half of the NACA cowl extends to the firewall, and there is no flap on the top of the cowl. Behind the lower half of the NACA cowl are two removable pieces of engine cowling. A stainless steel air-tight diaphragm fits around the crankcase of the engine and extends out to the NACA cowl on top, and to the engine cowl on the bottom. By this means, the accessory compartment is completely isolated from the heat of the cylinders and exhaust stacks.

E-2e(7). Lighting Gear

The landing gear is of the conventional type with two main wheels forward and a tail wheel. All wheels are retractable. The tail wheel is full swiveling through 360° and may be locked in the straight forward position for cross wind take-offs, landings and taxiing. All shock absorbers are hydraulic, with the taxiing loads taken by compressed air. The stroke of the shock absorbers is ten inches. Retraction is accomplished electrically in four seconds. The landing gear may also be retracted mechanically in case of failure of the electric mechanism.

E-2e(7)(a). Main Landing Gear

Type of Gear	Retractable
Tread	12' 11"
Control System	Electric and Manual

E-2e(7)(b) Auxiliary Gear

Type of Gear	Retractable
Control System	Electric and Manual

E-2f Materials - Finishing and Processes - The finished color scheme for the external surfaces or parts of this airplane shall be in accordance with best commercial practices.

E-3 Propeller Installation - Propellers conforming to the following and having the following characteristics shall be installed.

Hub Manufacturer's Name Hamilton Standard Propeller Company

Model No. 22D30

Propeller Manufacturer's Name Hamilton Standard Propeller Company

Design No. 6533A-21 (Square Tip)

Type - Full Feathering Hydromatic

Diameter 8.25 feet

Number of Blades two

Setting of blade angle at 42 inch station 13 to 86 degrees

Propeller Blade Alcohol Anti-Icer Feed Shoes are to be installed in accordance with RCAF-EO-15-30A-6A/1.

Minimum clearance:

In plane of each propeller disc to ground, level landing, 10 in. To fuselage, nine inch
Normal to plane of each propeller disc:
To engine cowl at max. pitch, 1/4 in.
To leading edge of wing, 40 to 58 in.

E-3a The propellers are manufactured in accordance with Hamilton Standard Specification Number 906, dated 29 May 1939.

E-3b Equipment and Furnishings - The equipment specified in Appendix "A" of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-4 Power Plant Installation - The army oil dilution system is installed, and hopper type oil tanks. Adequate carburetor pre-heat is supplied to prevent carburetor ice formation.

E-4 Power Plant Installation (Continued)

Quick connecting plugs are used at the firewall on all electrical lines. All fuel and oil lines are solid lines with standard hose connections. The engine controls are flexible type push pull controls.

The power plant plumbing forward of the firewall shall be equipped with fireproof hose and quick disconnect fittings in accordance with RCAF Drawing A-4005.

In the event these lines or fittings are unavailable, the standard BEECHCRAFT installation shall apply.

E-4a This airplane will be equipped with two BEECHCRAFT guaranteed (re-manufactured to zero hours) Military Surplus Pratt & Whitney Wasp Jr. engines of the following designation:

R985-AN14B, Specification AN 2035

E-4b Lubrication System

One oil tank with hopper is provided for each engine. An oil cooler, with manually controlled shutters and pressure relief bypass valve is provided. An oil dilution system is installed. The pressure relief bypass valve may be operated manually in order to bypass the radiator for a quick warm-up.

E-4c Cooling System

An NACA cowl is provided for each engine, incorporating pressure type baffles. The accessories compartment is cooled by air taken in at the leading edge of the wings and directed through the oil radiator into the accessories compartment. In this way when the weather is cold

E-4c. Cooling System (Continued)

and the oil radiator is not being used, the accessories compartment is given an opportunity to warm up to a satisfactory temperature for the functioning of all parts. This is particularly important in the case of the propeller governor which may freeze up or become sluggish at a low temperature.

E-4d Fuel System

The engine driven fuel pumps are mounted on the engine, but are so located that they are below the level of the fuel in the tanks in level flight with the wing tanks approximately half full. An adequate sump and drain are provided in all tanks. The four wing fuel tanks are connected to tank and engine selector valves, and then to the hand fuel pumps. A fuel strainer is located on each firewall. The engine-driven fuel pumps contain built-in bypass and relief valves. The four wing fuel tanks are all built into the center section and may be removed by removing panels in the top center section skin. A suction cross feed system is to be provided to permit the fuel from the four wing tanks and nose tank to be used by one engine.

E-4e Engine Control System

The engine controls are arranged to provide for an increase in rpm for opening the cowl flaps and oil shutters, and for enriching the mixture, by a forward movement of the controls.

E-4f Exhaust System

An exhaust collector system made of 18-8 stabilized stainless steel is used. All cylinders discharge into the collector ring and the exhaust is carried through a tail pipe to a point underneath the leading edge of the wing where it is discharged into the atmosphere. Cabin heat is secured by a straight stainless steel intensifier tube inside of the tail pipe. This intensifier tube may be easily removed for inspection. A bypass is provided to provide a flow of air through the intensifier tube when no heat is being used in the cabin. Carburetor heat is secured by stainless steel muffs on the outside of the collector ring.

E-4g Engine Air Intake System

The cold air for the engine is taken in from immediately behind the propeller close to the bottom of the cowl at the leading edge through two ducts in the carburetor. On the carburetor is a casting with a

E-4g. Engine Air Intake System - (Continued)

valve to regulate the quantity of hot or cold air as desired. The amount of preheat will be at least sufficient to raise the temperature of the carburetor air 90° when the engines are operating at 60% rated power.

E-4h. Supercharger Installation

No external supercharger is used.

E-4i. Vacuum Pump Installation

One vacuum pump is installed on each engine. The lines from these pumps are tied together to provide the vacuum supply for the instruments. Suitable check valves and warning lights are provided so that in the case of a failure of one engine or pump or line, the other pump continues to supply the instruments and an indicator light lights showing which pump is in operation. Each pump has ample capacity to supply all the instruments. An individual oil separator is provided for each vacuum pump.

E-4j. Engine Driven Accessory Gear Drive

There are no engine-driven accessories other than those enumerated under E-4i and E-4j.

E-4k. Equipment and Furnishing

The equipment specified in Appendix "A" of this specification will be installed in the quantity and under the conditions set forth in Section H.

E-5. Armament Installation - No armament is installed.

E-6. Equipment Installation

E-6a. Instruments and Navigation Installation

E-6a (1) Instruments

E-6a(1)(a) Instrument Board Installation

The main instrument board consists of a single panel of aluminum alloy occupying the entire space in front of the pilot's compartment, from the level of the windshield downwards approximately 13-3/4 inches. It is approximately 45-3/4 inches wide at its widest portion. The main panel is supported by 9 Lord rubber shock mounting bushings in accordance with best commercial practice. The panel can be tilted back for accessibility by removing 5 screws from the face of the panel. Below the main instrument board are located two sub-panels approximately 30° tilted downwards towards the pilot. These sub-panels are used for installation of certain instruments, switches, and circuit breakers.

E-6a(1) (b) Instrument Arrangement on Board

E-6a(1)(b)(1) Flight Instruments

The flight instruments specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H. The compass is installed in approximately the center of the panel, and the other flight instruments are grouped in two groups for the pilot and copilot respectively, with the engine instruments in the center of the panel. The airspeed indicator is calibrated in knots.

E-6a(1)(b)(2) Engine Instruments

The engine instruments specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6a(2) Navigation - The navigation instruments specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6a(3) Miscellaneous Instruments

The miscellaneous instruments specified in Appendix C of this specification are installed in the quantity and under the conditions set forth in Section H.

E-6a(4) Navigation Equipment

A shock mounted instrument board is provided for the first navigator's station. It shall contain:

- Air Speed Indicator
- British G IV B Master Indicator (Part of C-2 Gyrosyn System)
- Sensitive Altimeter
- Electric Outside Air Thermometer

An air position indicator shall be mounted on Number Five Bulkhead above the first student's table.

The second navigator's station is provided with a B-3 driftmeter directly to the right of the chair. A B-5 driftmeter shall be installed behind the chair. Stowage for the Mark 9A sextant and case and for the astro compass and case is located on the shelf supporting the B-3 driftmeter adjacent to the second student navigator's chair.

Duplicate controls for the radio compass and a shock mounted panel containing the Azimuth indicator and DRC Step-by-Step Repeater are provided at the second student's station.

All three stations in the cabin are provided with intercommunication equipment, and the pilot will be provided with a switch which fulfills the "call" functions in the same fashion as the "call position of the three jack boxes in the cabin.

E-6b Electrical Installation

E-6b(1) Accessory Power Plants

No accessory power plants are installed.

E-6b(2) Generators

The generators specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6b(2)(a) Regulator - Generator Voltage

The generator voltage regulators specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6b(2)(b) Relay Switch - Generator Control

The generator control relay switches specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6b(3) Batteries

The batteries specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H. They are 12-volt batteries.

E-6b(4) Starters

The starters specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6b(5) Lighting

E-6b(5)(a) Landing Lights

The landing lights specified in Appendix C shall be installed in the quantity and under the conditions set forth in Section H. These landing lights are mounted in the bottom surface of the wings, are retractible, and are flush with the surface when retracted. Their position

E-6b(5)(a) Landing Lights (Continued)

is in front of the wing flap to prevent aileron buffeting when the landing lights are extended.

E-6b(5)(b) Navigation Lights

The lamp assemblies specified in Appendix C of this specification shall be installed in the quantity and under the conditions set forth in Section H.

E-6b(5)(c) Passing Lights

No passing light is installed.

E-6b(5)(d) Main Cabin Lights

The dome lights specified in Appendix C of this specification will be installed in the quantity and under the conditions set forth in Section H. Two flush type lamp assemblies are built into the roof of the main cabin to illuminate the cabin. Adjustable draftsman's type lamps with controlling rheostats are provided for both student navigator's tables.

E-6b(5)(e) Baggage Compartment Lights

Baggage compartment lights specified in Appendix C of this specification will be installed in the quantity and under the conditions set forth in Section H. A lamp assembly with an individual switch is provided in each baggage compartment for the illumination of the baggage compartment.

E-6b(5)(f) Instrument Panel Lights

Three fluorescent cockpit lights are installed to light the pilot's instrument panel. The BEECHCRAFT standard map reading lights are fitted with red lenses. An adjustable, stowable map reading and trouble light shall be installed convenient to both pilots. A light with rheostat shall be recessed in to the apron of bulkhead Number Five for the purpose of illuminating the radio controls.

E-6b(6). Electric Fire Detection System

The Edison fire detection system shall be installed substantially per R.C.A.F. Drawing 12307.

E-6b(7). Switches

The switches specified in Appendix C of this specification will be installed in the quantity and under the conditions set forth in Section H.

E-6b(8). Electric Drive

E-6b(8)(a). Landing gear retraction and extension is accomplished by an Electric Specialities Company HCA-3, 24-volt motor, or equivalent. A disc overload clutch with 17 discs and 9 springs is adjustable for landing gear retracting torque limiting values. This clutch is designed to slip in case of landing gear limit switch failure, to prevent damage to the mechanism. The motor has a double field winding so that it is necessary to use only two Solenoid switches in order to reverse the motor. A dynamic brake contactor is used which limits the coast of the landing gear to a minimum.

E-6b(8)(b). Flap retraction and extension is accomplished by a Dumore Type KL 24-volt electric motor, or equivalent.

E-6b(9). External Power Receptacles, Fuel Nozzle Grounding Jacks, Rheostat Heated Clothing, Electrical Connectors,

Quick detachable connector plugs with screw retaining rings are used at the engine firewalls, wing roots, and tail structure to permit ready disassembly. Disconnect plugs are used throughout the airplane in electrical and radio wirings. Fuel nozzle grounding jacks are provided adjacent to fuel tank filler caps. No provisions are included for the use of heated clothing. An external power receptacle is provided on the left nacelle accessible from the ground.

E-6b(10) Cable and Wiring Installation

Where necessary, wiring is housed in solid or flexible conduit in accordance with highest grade commercial practice. The wires are numbered for easy identification of the wires.

E-6b(11) Signal Assembly - Retracting Gear Warning

A Signal Assembly, Landing Gear, (warning horn), is installed.

E-6b(12) Shielding and Bonding

In accordance with highest type commercial practice, all metal parts are riveted, bolted or bonded together with metal braid of appropriate size. All joints are soldered where practicable. Clamps are attached to fuel lines and other aluminum parts. The installation has been proved very satisfactory for radio reception in practice.

E-6b(13) Signal Assembly - Retracting Gear Indicating

Red and green landing gear position lights are provided. These lights indicate red for full retracted position of the landing gear and green for full extended position. No light shown during intermediate travel of landing gear. These lights can be dimmed for night flying by turning the lens.

E-6b(14) Circuit Breakers and Circuit Protectors

Circuit breakers and circuit protectors will be installed under the conditions and in the quantity set forth in Section H.

E-6b(15) Inverters

Inverters for the remote compass system and for the radio compass will be installed under the conditions and in the quantity set forth in Section H.

E-6b(16) Relays

This equipment will be installed in the quantity and under the conditions set forth in Section H.

E-6b(17) Rheostats and Resistors

This equipment will be installed in the quantity and under the conditions set forth in Section H.

E-6b(18) Meters

This equipment will be installed in the quantity and under the conditions set forth in Section H.

E-6b(19) Booster Coil or Interrupter Vibrator

This equipment will be installed in the quantity and under the conditions set forth in Section H.

E-6b(20) Filters

This equipment will be installed in the quantity and under the conditions set forth in Section H.

E-6c Miscellaneous Equipment Installation

E-6c(1) Windshield Wipers

The Marquette dual electric windshield wiper will be installed per Beech Drawing 437-180430.

E-6c(2) Defrosting and Defogging of Transparent Areas

E-6c(2)(a) By Heat

Defrosting of the pilot's windshield is accomplished by hot air from the heating and ventilating system directed against the windshield.

E-6c(2)(b) Astrodome

Provisions will be made in the top of the astrodome for exhaust ventilation.

E-6c(3) Cabin Heating and Ventilating

Adequate ventilation with temperature controlled air is provided. Fresh air (cold) is admitted through openings located in the leading edge of the wing roots, and distributed through the cabin through ducts on each side of the airplane above the window line. The direction and amount

of air available at each seat may be controlled by the passengers. Also, valves are provided by which the pilot may completely shut off the cold air flow in cold weather. Hot air is supplied through ducts near the floor which receive heated air from two seamless stainless steel intensifier tubes located in the exhaust tail pipes. The capacity of the heaters will be sufficient to maintain in flight, within compartments occupied by personnel, a temperature of 4.4° Centigrade with an outside free air temperature of -17.8° Centigrade, at 75% power at 5000 feet altitude. A special hot air duct with control valves supplies heated air to the inner surface of the windshield in front of the pilot for the purpose of de-icing the windshield.

E-6c(4) Ground Heating of Aircraft and Engines

The engine cowling system is designed to accommodate heating hoods for ground heating. The cabin heating system supplies a satisfactory amount of ground heating of the airplane interior.

E-6c(5) Fire Extinguishers

E-6c(5)(a) Hand Type

Two hand type fire extinguishers, Type A-2, are installed inside the airplane.

E-6c(5)(b) Fixed Type

An engine fire extinguisher, Type A-12, is installed.

E-6c(6) Emergency Escape Equipment

Emergency exit openings are placarded for use by the occupants. No other emergency escape equipment is included.

E-6c(7) Covers, Engine, Cockpit, and Turret

No engine, or cockpit covers are provided.

- E-6c(8) Covers, Wing, Form-Fitting - Not provided.
- E-6c(9) Water Containers - Not applicable to this airplane.
- E-6c(10) Drinking Cup Dispenser - Not applicable to this airplane.
- E-6c(11) Cargo Handling Equipment - Not applicable to this airplane.
- E-6c(12) Galley Equipment - Not applicable to this airplane.
- E-6c(13) Stowage Compartment - Not applicable to this airplane.
- E-6c(14) Special Tools

Special tools will be provided in the quantities and under the conditions set forth in Section H.

E-6c(15) Map Case Pocket

A map case pocket approximately 9 x 12 x 4 inches is provided for the storage of maps at a position convenient to the pilot.

E-6c(16) Airplane Data Case

An airplane data case is installed in the rear baggage compartment accessible from the cabin.

E-6c(17) Airplane Check List Holder

An airplane check list holder is furnished as specified in Section H.

E-6c(18) Rear Vision Mirrors - Not applicable to this airplane

E-6c(19) Jack Provisions and Equipment

Jack points on the airplane structure and mating jack pads are supplied for lifting the airplane.

E-6c(20) Hoisting Provisions and Equipment

Hoisting lugs are supplied for this airplane.

E-6c(21) Towing Provisions and Equipment

Provisions for towing are included in the design of the main landing gear.

E-6c(22) Mooring Provisions and Equipment

Fittings for mooring are included on the outer panel wing.

E-6c(23) Tow Target Provisions and Equipment

Not applicable to this airplane

E-6c(24) Aerial Pick-up Provisions and Equipment

Not applicable to this airplane

E-6c(25) Anti-Icer and Deicer Equipment

The airplane will be equipped with a propeller slinger ring system fed from a three gallon tank in the pilot's compartment by means of an electric pump. Inflatable type deicers for wings and horizontal stabilizer are provided.

E-6c(26) Equipment and Furnishings

The equipment listed in the Paragraph of E-6c shall be in accordance with drawings and specifications listed in Appendix C of this specification.

E-6d Oxygen Equipment Installation

No oxygen equipment is installed

E-6e Emergency Rescue Equipment Installation

E-6e(1) Pyrotechnic Equipment

An AN-M8 Pyrotechnic Pistol and M-1 Mount shall be located accessible to the pilot. (See Section E-2e(5))

E-6e(2) Safety Belts

Provisions are made on all seats except the instructors seat for the use of safety belts and shoulder harness.

E-6e(7). Message Pick-Up Assembly

Not applicable to this specification

E-6e(8). Flyers Relief Tube

Pilot relief tube equipment as specified in Appendix C of this specification is installed on the pilot's seat and in the toilet compartment.

E-6e(9). Chemical Lavatory

A chemical toilet is installed in the toilet compartment behind the main cabin.

E-7. Radio Installation - Extra Equipment

See Exhibit B attached. Anti-precipitation static antennae and discharge wicks (Fredrick Flader Inc.) are installed.

F. METHOD OF INSPECTION AND TESTS

F-1. Method of inspection and tests of airplanes conforming to the requirements of this specification shall be in accordance with the standards of manufacture and inspection maintained and incorporated by BEECHCRAFT on equipment currently manufactured for commercial sale.

G. PACKING AND MARKING

G. Not applicable as airplanes will be accepted at BEECHCRAFT factory for flight delivery by customer.

H. EQUIPMENT AND FURNISHINGS

H-1. The manufacturer will furnish, permanently install, and adjust for use, all items of equipment and furnishings listed in the appendices, except as noted.

H-2. To maintain production during the period of national emergency and material shortages, the Beech Aircraft Corporation reserves the right to install new or reconditioned surplus equipment in new BEECHCRAFT airplanes if required, such equipment being covered by the standard BEECHCRAFT warranties.

APPENDIX A

PROPELLER (WEIGHT EMPTY)

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
2	Propeller, Hamilton Standard Hydromatic consisting of:	
1	Hub	22D30
2	Blades	6533A-21
2	Governor	4B-2
<u>POWER PLANT (WEIGHT EMPTY)</u>		
2	Engine - Pratt & Whitney (Wasp Jr.)	R985-AN14B
2	Pump - Power Driven Fuel (Engine Driven)	TF900-1 (Thompson)
2	Pump - Engine Driven Vacuum	Type B-12
2	Separator - Air Pump Oil	Type 558, Model 1 Style A, (Eclipse)
2	Valve - Air Pump Suction Relief	AN61119-2
2	Cock, Oil Drain	K-1400 B-4 (Koehler)
1	Primer, Engine Type	401-2A (Parker)
4	Screen, Tank Outlet	2-1142-22 (Parker)
2	Cock, Fuel (for Tank & Engine Selection)	TC-15200-4 (Thompson)
2	Pump, Fuel, Hand Operated	D-11
2	Strainer, Fuel Line	Type C-2A
2	Oil Dilution Valve Solenoid	37D6210
2	Restricted Fitting 'Y'	AN4077-1
2	Cock - Oil Shut-Off - Parker	4115-3/4 D
4	Cock - Fuel Tank Drain	K-1700 B-2 (Koehler)

APPENDIX B

ARMAMENT

There are no armament items applicable to this
specification.

*to be
changed*

APPENDIX C

EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
INSTRUMENTS (Weight Empty)		
3	Altimeter - Pressure	644-183728
1	Clock - 7 Jewel Unlighted	644-183721
1	Compass - Pilot's	644-183722
3	Indicator - Airspeed	644-183725
1	Indicator - Turn & Bank (Vacuum)	644-183711
1	Indicator - Turn & Bank (Electric)	644-183716
2	Indicator - Rate-of-Climb	644-183724
2	Signal - Fuel Pressure	6800A
2	Tube - Pitot Airspeed	782-02
2	Volt-Ammeter	644-180804
2	Shunt - Ammeter	2C-26
1	Gage - Manifold Pressure - Dual	644-183714
2	Gage Unit - Electric Thermometer Engine	644-183715
2	Generator - Screw Mount Tachometer	868G-01
1	Indicator - Tachometer Dual	644-183713
1	Indicator - Dual Carburetor Air Thermometer	644-183719
2	Bulb - Resistance Thermometer (Short)	B2201
1	Indicator - Dual Thermocouple Head Temp. Thermometer	644-183729
2	Indicator - Thermometer	644-183710
2	Bulb - Thermometer	AN5525-1
1	Directional Gyro	644-183727

APPENDIX C

EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
<u>INSTRUMENTS (Con't)(Weight Empty)</u>		
1	Indicator - C-2 Gyrosyn Compass (Customer Furnished)	
1	Air Position Indicator (Customer Furnished)	
1	Gauge - Deicing Pressure	644-183795
1	Gyro-Horizon (Vacuum)	644-183726
1	Gyro-Horizon (Electric)	644-180830
1	Suction - Gauge	644-183718
1	Gauge, Fuel Level, Liquidometer	644-183723
2	Leads, Thermometer (Thermocouple)	B-11
1	Wing Flap Position Indicator	644-183799
2	Holder-Correction Card	644-183856
2	Holder-Correction Card	644-183858
1	Holder, Quad Correction Card	644-183857
1	Elevator Tab Position Indicator	644-183797
<u>ELECTRICAL (Weight Empty)</u>		
2	Battery 12 Volt	Willard AR-12-36
2	Coil - Induction Vibrator Starting	VJR24B-5
2	Regulator - Generator Voltage	94-32276-B
2	Relay - Generator Control Switch	94-32278-A
2	Generator	M-3
4	Switch, Magneto	
1	Switch, (Pitot Heat)	
2	Switch, (Signal Assem. Throttle Control)	
1	Switch, (Starter Control)	

APPENDIX C

EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
<u>ELECTRICAL (Weight Empty)(Con't)</u>		
2	Switch, Utility (Landing Lamp)	
2	Switch, Utility (Generator)	
1	Anti-Icer Pump	AN6100-1
1	Deicer Distribution Valve	Type 572, Model 1A, (Eclipse)
1	Windshield Wiper Motor	D12364
1	Fire Detector Relay - Edison	35884
24	Fire Detector Units - Edison	35534-3
2	Switch, Utility, Navigation Light	
1	Switch, Selector, Gasoline Gauge Yaxley	
1	Switch, Landing Gear Position	
2	Switches, Landing Gear Limit, WZ-R31 Micro Switch	
1	Switch, Flap Control	
2	Switches, Flap Limit, WZ-RQ41, Micro Switch	
2	Light Assy. - Electrically Retractable Landing	
1	Light Assy. - Right Wing Tip Position	
1	Light Assy. - Left Wing Tip Position	
2	Light Assy. - Tail Position	
1	Receptacle - External Power Source	
2	Relay - Solenoid Switch	B-4
2	Relay - Solenoid Switch	B-8A
1	Signal - Landing Gear Warning	

APPENDIX C

EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
ELECTRICAL (Weight Empty)(Con't)		
1	Signal - Landing Gear Warning	E-2
2	Starter	J-1
1	Lamp - 28 Volt, 50 C.P., S.C., Bay Base	S-11
2	Lamp - 3 Volt, 0.19 Amp., Kollsman Base	T-1 1/4
2	Lamp Assy. - Landing Gear Warning	
4	Lamp Assy., Cabin	
1	C-2 Gyrosyn Flux Valve (Customer Furnished)	656520
1	Amplifier - C-2A Gyrosyn (Customer Furnished)	664256
1	Inverter	AN3499-1
1	DRC Repeater (Customer Furnished)	
1	API Air Mileage Unit (Customer Furnished)	
1	Amplifier	MB7
1	MDI - (British)	
3	Lamp Assembly, Cabin Ceiling	Cowles No. 403
1	Lamp Assembly, Rear Baggage Compartment	Cowles No. 403
1	Lamp Assembly, Front Baggage Compartment	Cowles No. 403
2	Lamp Assembly, Cockpit	C-5
2	Lamp Assembly - Adjustable Goose-Neck with Rheostat	
1	Switch, Landing Gear Red Signal Light	
1	Switch, Landing Gear Green Signal Light and Warning Horn	
1	Switch, Landing Gear Retract Safety Switch	

APPENDIX C

EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
<u>ELECTRICAL (Weight Empty)(Con't)</u>		
2	Switches, Oil Dilution	
2	Lamp Assembly, Fuel Signal, Serale Light Co.	
1	Dynamic Braking Relay Landing Gear	6046H39 A
1	Dynamic Braking Relay, Flaps	CR2791Q100A3
Req'd	Circuit Breakers	
2	Switch, Utility, Cockpit Light	
1	Lamp (50 Candlepower Bulb)	
1	Flasher (Pacific-Bendix)	
<u>MISCELLANEOUS EQUIPMENT (Weight Empty)</u>		
1	Cabin Ladder	
2	Engine Log Books	
1	Airplane Log Book	
1	Beech Horsepower Calculator	
2	Shoulder Harness	NAF 1201-5
2	Extinguisher - Fire	A-2
1	Extinguisher - Two Discharge Line Fire	A-12
1	Kit - First Aid	
1	Casing - 14:50, Tail, Rayon or Nylon, 6-ply	
2	Casing - Landing Wheel 11:00 x 12, 8-ply Rayon or Nylon	
2	Inertia Reel - American Seating	
2	Beech Shoulder Harness and Safety Belt Combination	

APPENDIX C

EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
<u>MISCELLANEOUS EQUIPMENT (Weight Empty)(Con't)</u>		
1	Tube - 14:50, Tail	
2	Tube - 11:00 x 12	
1	Wheel Assembly - Hayes Industries	D-3-180-M
2	Wheel and Brake Assembly - Goodyear, PD-208 11:00 x 12 Wheel and 12.625 x 2.125 x 400/3 - 2.125 x 21.2 Integral Single Disc Brake	
1	Case, Data	
1	80-Gallon Auxiliary Nose Gas Tank	644-189620
1	Airplane and Engine Data Plate	
2	Pilot's Relief Tube Venturis	
2	Horn - Pilot's Relief Tube	
1	Pilot's Check List Holder	
2	Wing Deicer Boots	
2	Stabilizer Deicer Boots	
2	Windshield Wipers, Marquette	
1	Controls Lock	404-187050
1	Plastic Astrodome, Complete with Astro Compass Mount and Sextant Suspension	644-184790
1	Driftmeter	B-5
1	Driftmeter	B-3

APPENDIX D

RADIO EQUIPMENT

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
	<u>SCR-274 COMMAND SET</u>	
1	Range Receiver	BC-453B
1	Command Receiver	BC-454B
1	Command Receiver	BC-455B
1	Mounting (Three Receivers)	FT-221-A
1	Rack (Three Receivers)	FT-220-A
3	Adapter	FT-230A
3	Dynamotor (Receiver)	DM-32A
1	Remote Control (Bendix) or Remote Control	MR-9 - BC-450A
1	Transmitter (3-4 MC)	BC-696A
1	Transmitter (5.3-7 MC)	BC-458A
1	Mounting (Two Transmitters)	FT-227A
1	Rack (Two Transmitters)	FT-226A
3	Tuning Shaft (Approximately 20 feet)	MC-215
6	Coupling	MC-211A
1	Modulator	BC-456A
1	Dynamotor	DM-33A
1	Mounting (Modulator)	FT-225A
1	Antenna Relay	BC-442-A
1	Mounting (Antenna Relay)	FT-229A
1	Control Box	BC-451-A

APPENDIX D

RADIO EQUIPMENT (Continued)

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
<u>F-11 ISOLATION AMPLIFIER</u>		
1	Isolation Amplifier (ARC)	F-11
1	Mounting (ARC)	M-12A
1	Dynamotor (ARC)	D-10A
2	Relay (ARC)	14703
2	Rheostat	MP-5P
2	Speaker - Pilot's Compartment	S10340
3	Switch	3143J
<u>ILS</u>		
1	Glide Path Receiver	R89B
1	Control Box	BC-732
1	Mounting Glide Path Receiver	MT-28/ARN-5
1	Localizer Receiver	BC-733D
1	Mounting - Localizer Receiver	FT-293A
1	Cross Pointer Indicator	644-180827
1	Dynamotor	DM-53A
1	Di-Pole Antenna	AS-27A/ARN-5
<u>AN/ARN-7 RADIO COMPASS</u>		
1	Radio Compass Receiver	R5A/ARN-7
1	Loop - Automatic	LP-21
2	Control Box	CL/ARN-7
1	Azimuth Indicator	I82A
1	Azimuth Indicator	644-180817
1	Transfer Relay	EK-22K

APPENDIX D

RADIO EQUIPMENT (Continued)

<u>Quantity</u> <u>Minimum</u>	<u>Item</u>	<u>Type</u>
<u>AN/ARN-7 RADIO COMPASS</u>		
1	Loop Cord	CD-365
1	Mounting - Receiver	FT-213A
1	Inverter	MG-149F
1	Tuning Shaft 20 Feet Approximately	MC-124
<u>MN-53 MARKER RECEIVER</u>		
1	Marker Receiver	MN-53A
1	Mounting Receiver	MR-64A
1	Power Supply Dynamotor	MP-37B
1	Jewel and Holder	A 120196-1
1	Jewel and Holder	A 120196-2
1	Jewel and Holder	A 120196-3
<u>AF/ICA-67 VHF COMMAND</u>		
1	Transceiver Unit (Customer Furnished)	AF/UTA-68
1	Shockmount (Customer Furnished)	AF/ASM-69
1	Oak Switch	Model H
1	Antenna Mast	AN104B
<u>RC-36 INTERPHONE</u>		
1	Dynamotor	PE-86
1	Interphone Amplifier	EC-347
3	Jack Box	EC-1366
2	Range Filter	RC 210