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INTRODUCTION
SECTION 1

Introduction
The information contained in the BEECHCRAFT 33 series Shop Manual supplement comprises essential data on various items which apply specifically to the BEECHCRAFT 33 Series. Maintenance information on items not included here may be obtained by referring to the BEECHCRAFT Bonanza 35 Shop Manual.

Unless otherwise specified in the Shop Manual, the BEECHCRAFT Bonanza may be repaired in accordance with Federal Aviation Agency's "Aircraft Inspection and Repair" Manual A.C. 43.13-1A and "Aircraft Alterations", Manual A.C.43.13-2.

The wiring diagrams for airplane serials CD-1 through CD-1304, CE-1 through CE-612 and CJ-1 thru CJ-104 are contained within Section 6 of this Shop Manual.


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SUPPLEMENTARY PUBLICATIONS

Following is a list of publications providing servicing, overhaul and parts information on various components of the BEECHCRAFT 33 series which you may obtain to supplement the Shop Manual. In most instances, you should obtain the publications directly from the manufacturer or his distributor. Beech supplementary publications, available from Beechcraft Aero or Aviation Centers and International Distributors and Dealers. Those which are so available are listed in the current Publications Price List. Since a wide variety of radio equipment is available and because radio manufacturers normally supply parts and servicing manuals with each set, radio publications have not been included in the list.

As publications on additional components become available, they will be added to this list of publications.

NOTE

It shall be the responsibility of the owner/operator to ensure that the latest revision of publications referenced in this handbook are utilized during operation, servicing, and maintenance of the airplane.

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<tr>
<td>92-31498</td>
<td>Alternator Service Manual, Beech Aircraft Corporation</td>
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<td>98-36486</td>
<td>Overhaul Instructions for Vertical Display Engine Indicators used on BEECHCRAFT Bonanza series aircraft.</td>
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<td>92-30582</td>
<td>Servicing and Maintenance Instructions and Illustrated Parts Manual for: Main Wheel Assembly P/N 95-300001-1, -5, -6, -67 and -73. Nose Wheel Assembly P/N 95-32669 and P/N 95-32926.</td>
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<td>98-35012</td>
<td>Servicing Maintenance Instructions and Illustrated Parts Breakdown for the Main Wheel P/N 36-8001-3, Nose Wheel P/N 36-8002-1 and Brake Assembly P/N 36-8001-9.</td>
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<td>130376A</td>
<td>New-Matic B-4 Autopilot Operating Servicing Instructions, Beech Aircraft Corporation.</td>
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<td>New-Matic Autopilot Maintenance Instructions, Beech Aircraft Corporation.</td>
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<tr>
<td>98-35776</td>
<td>Maintenance Information and Illustrated Parts Breakdown for 35-380094 Landing Gear Motor.</td>
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SECTION 2

GENERAL INFORMATION
SECTION 2

General Information
Figure 2-1. Dimensions of Aircraft Models 33, A33, B33 and C33
Figure 2-2. Aircraft Dimensions; C33A, E33, E33A and E33C (without Kft 33-4002-3)
Figure 2-2A. Aircraft Dimensions; F33
Figure 2-2B. Aircraft Dimensions; G33, F33C (prior to CJ-52, except for CJ-39, without Kit 33-4002-3) and F33A prior to CE-316
Figure 2-2C. Aircraft Dimensions; E33C (with Kit 33-4002-3) and F33C (with Kit 33-4002-1 or -3)
Figure 2-2D. Aircraft Dimensions; F33A (CE-316 and after), F33C (CJ-39, CJ-52 and after without Kit 33-4002-1)
Figure 2-3. Wing Skin Plating

Legend for Figure 2-4

1. (.020)  
2. (.020)  
3. (.016)  
4. (.032)  
5. (.020)  
6. (.020)  
7. (.016)  
8. (.032)  
9. (.020)  
10. (.020)

11. (.125 Royalite)  
12. (.018)  
13. (.020)  
14. (.020)  
15. (.020)  
16. (.020)  
17. (.020)  
18. (.020)  
19. (.020)  
20. (.125 ABS#10 Plastic Sheet)
The skin thickness of the leading edge of the vertical stabilizer (Item 9) is .032 inch on E33C aircraft, serials of CJ-1 and after.

Figure 2-4. Fuselage Skin Plating (33, A33 and B-33)
Figure 2-5. Fuselage Skin Plating (C33 & C33A)
NOTE

POINTING HAND
DENOTES CHANGE

TS1171-1
TS1171-2
TS1176-2
50-590013

TS1222-3
LOWER FORWARD WING BOLT WRENCH (CD-1 thru CD-765)

TS1222-5
LOWER FORWARD WING BOLT WRENCH (CD-766 and after; CE-1 and after CJ-156 and after)

TS1171-2
LOWER FORWARD WING NUT TORQUE WRENCH ADAPTER (CD-1 thru CD-1304, CE-1 thru CE-927, CJ-1 thru CJ-155)

TK1817 922-2
LOWER FORWARD WING NUT TORQUE WRENCH ADAPTER (CE-927 and after; CJ-156 and after)

TS1222-5
UPPER FORWARD WING BOLT WRENCH (9/16 inch hex for NAS150 bolts used CD-1 thru CD-1304; CE-1 thru CE-400 except CE-394 and CE-395; CJ-1 thru CJ-30, and for 131780-1 bolts used CE-1305 and after; CE-494, CE-495, CE-401 and after; and CJ-31 and after)

TS1222-6
UPPER FORWARD WING BOLT WRENCH (1/2 inch hex for MS20010 bolts used interchangeable with NAS150 bolts CD-1286 thru CD-1304, and CE-377 thru CE-400 except CE-394 and CE-395)

TS1222-3
UPPER FORWARD WING BOLT WRENCH (5/8 inch hex for NAS152 bolts used interchangeably with 131780-1 bolts CD-1305 and after; CE-394, CE-395, CE-401 and after; and CJ-31 and after)

TS1171-1
or 50-590013
UPPER FORWARD WING BOLT TORQUE WRENCH ADAPTER (CD-1 thru CD-1304, CE-1 thru CE-400 except CE-394 and CE-395, CJ-1 thru CJ-30)

TS1171-2
UPPER FORWARD WING NUT TORQUE WRENCH ADAPTER (CE-394, CE-395, CE-401 thru CE-927; CJ-31 thru CJ-155)

TK1817 922-2
UPPER FORWARD WING BOLT TORQUE WRENCH ADAPTER (CE-928 and after; CJ-156 and after)

TS1222-5
UPPER AND LOWER AFT WING BOLT WRENCH

TS1171-1
or 50-590013
UPPER AND LOWER AFT WING NUT TORQUE WRENCH ADAPTER

P/N 810 33524000
RUDDER TRAVEL JIG

P/N 38-590015
TOW HANDLE

Figure 2-7. Special Tools
Figure 2-8. Fuselage Access Openings

1. ELEVATOR TRIM TAB ACTUATOR
2. ELEVATOR TRIM TAB CABLE
3. AFT FUSELAGE ACCESS

Figure 2-9. Empennage Lubrication

SAE NO. 20 EVERY 100 HOURS

SAE NO. 20 EVERY 100 HOURS
POWER PLANT

The 33 series airplanes prior to Serial CD-301 (and including CD-386 and CD-387) are powered by a Continental Motors Corporation IO-470-J, 6 cylinder, wet sump, fuel injection engine developing 225 horsepower at 2600 rpm for takeoff and continuous operation. The IO-470-K engine, installed on serials CD-1254 through CD-1255 (except for CD-386 and CD-387), is identical to the IO-470-J engine in all respects except in the design of the sump housing. Serials CD-1255 and after are powered by IO-470-N engines developing 260 horsepower at 2625 rpm for takeoff and continuous operation. Serials CE-1 through CE-345 (except for CE-324), and serials CJ-1 through CJ-30, are powered by the IO-520-B fuel injection engine which develops 285 horsepower at 2700 rpm at takeoff and continuous operation. Serials CE-324 and CE-346 through CE-815 and serials CJ-31 through CJ-148 are powered by the IO-520-BA engine, which differs from the IO-520-B engine only in the damper pins installed in the engine. Serials CE-816 and after and CJ-149 and after are powered by the IO-520-BB engine, which differs from the IO-520-BA engine in that it has an improved crankshaft and other changes related to the crankshaft. Engine maintenance and overhaul information may be obtained by referring to the applicable vendor publication.

FUEL INJECTION

The Continental Motors fuel injector is of the multi-nozzle continuous flow, manifold injection type, consisting of an engine-driven fuel pump, a fuel and air metering assembly, a fuel manifold valve, and a discharge nozzle for each engine cylinder. For a detailed description of the Continental fuel injector and its components, adjustments and maintenance procedures, consult the applicable vendor publication list in this manual.

CAUTION

Pressure adjustments on the engine-driven fuel pump should be made only by a Continental Authorized Service Station. Pump pressure and fuel flow are part of the basic injection system calibration.

STARTING AND SHUTDOWN OF ENGINE

Refer to the applicable Owner's/Pilot's Operating Manual for starting and shutdown procedures.

FUEL SYSTEM

CAUTION

Any time the fuel system is drained or a fuel cell is empty for any reason, air may enter the system. If the possibility that air has entered the system does exist, start and operate the engine on the ground until all air is removed from the system. Operate the engine for several minutes on each tank until proper engine operation is assured. Refer to the applicable Pilot's Operating Handbook and Airplane Flight Manual before starting and operating the engine.

SERVICING THE FUEL SYSTEM

Service the fuel cells of all 33 series airplanes, Serial CD-1 and after, with 80/87 octane fuel or the next higher rating: 33 series airplanes, Serial CE-1 and after, and CJ-1 and after, must be serviced with a fuel octane rating of 100LL, 100/130 or the next higher rating. The fuel cells on 33 and A33 airplanes consist of a 25-gallon (22-gallon usable) tank that is installed in the leading edge of each wing. An opening is provided in the leading edge for filling each tank. In addition to the main tank, the 33 and A33 airplanes may also have a 10-gallon auxiliary tank in each wing. The filler neck for the auxiliary fuel tank is located outboard and aft of the main fuel tank filler neck.

The 33 series airplanes, Serial CD-388 and after, CE-1 and after, and CJ-1 and after, may be equipped with either 25-gallon (22-gallon usable) or 40-gallon (37-gallon usable) fuel tanks. The location of the filler neck for either size tank is the same as the location of the filler neck for the main fuel tanks of the 33 and A33 airplanes. The 33 series airplane Serials CD-514 and after, CE-1 and after, and CJ-1 and after, that have the 40-gallon (37-gallon usable) tank installation, are also equipped with a
visual fuel gage at each filler neck to permit partial filling when maximum payload is desired. The tab end indicates 30 gallons of fuel and the tab slot denotes 35 gallons.

Inspecting and cleaning the fuel strainers is of utmost importance as a regular part of preventive maintenance. The frequency of inspecting and cleaning of the fuel filters will depend upon service conditions and fuel handling equipment and cleanliness. However, when operating in localities where there is an excessive amount of sand or dust, the strainers should be inspected at more frequent intervals. It is recommended that the fuel strainer located in the fuel selector tank valve be inspected and cleaned every 100 hours. Also the screen in the fuel injection control unit should be inspected and cleaned every 50 hours of operation and no later than 100 hours. Any fuel lines or fittings disconnected for maintenance purposes shall be capped. After inspection and cleaning procedures, the fuel system should be carefully checked for leakage.

FUEL CELL RESERVOIR

A fuel cell reservoir, incorporated in some of the fuel cells of the acrobatic airplanes provides an uninterrupted supply of fuel to the engine during slow rolls, uncoordinated maneuvers, fast turns, slips, etc. CJ-23 through CJ-30, 25-gallon (22-gallon usable), and CJ-23 through CJ-40, 40-gallon (37-gallon usable) non-baffled fuel cells are equipped with tank type reservoirs. CJ-31 and after, 25-gallon (22-gallon usable), and CJ-40 and after, 40-gallon (37-gallon usable) non-baffled fuel cells incorporate a con-collapsible reservoir. This reservoir is made of the same material as the fuel cell and has a special sponge core to retain its shape, and an extra long connector assembly for the pickup of fuel.

The fuel system non-collapsible reservoir is available for existing 25-gallon (22-gallon usable) or 40-gallon (37-gallon usable) non-baffled fuel cells of CJ-1 through CJ-30, CD-1 through CD-1234 and CE-1 through CE-389.

NOTE

The installation of this kit alone does not qualify an airplane for acrobatics.
OIL SYSTEM

SERVICING THE OIL SYSTEM

The 33 series aircraft, Serial CD-1 and after (IO-470 engine) are equipped with a 10 quart wet sump oil system. Aircraft Serial CE-1 and after and CJ-1 and after (IO-520 engine) are equipped with a 12 quart wet sump oil system. The oil filler cap is accessible through an access door located at the top left side of the engine cowl on aircraft prior to Serial CD-1235, CE-290, and CJ-26. On aircraft Serial CD-1235 and after, CE-290 and after, and CJ-26 and after, the oil filler cap is accessible by opening the left side of the engine cowl. To drain the engine sump, remove the right hand engine access plate and unscrew the sump drain plug in the right hand side of the engine crankcase. An oil drain trough may be used to convey the oil over the side. The oil and filter should be changed every 100 hours of engine operation on aircraft which are equipped with IO-520 engines and a full flow type oil filter. On all other 33 series aircraft equipped with IO-470 engines and an oil strainer, the oil should be changed every 20 to 30 hours of engine operation. While changing the old oil, the strainer should be removed from the oil pump housing and cleaned thoroughly. If sludge deposits are heavy, subsequent changes should be made at shorter intervals. Before draining the oil, run up the engine until the oil reaches operating temperature to assure complete draining of the oil. Suggested oil grades are listed herein, but requirements will vary with individual circumstances. The determining factor for choosing the correct grade of oil is the air inlet temperature observed during flight; inlet temperatures consistently near the maximum allowable indicate that a heavier oil is needed. When the average air temperature is at approximately 40°F, use the lighter oil.

<table>
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<tr>
<th>OUTSIDE AIR TEMPERATURE</th>
<th>RECOMMENDED VISCOSITY</th>
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<tbody>
<tr>
<td>Below 40°F</td>
<td>SAE 30</td>
</tr>
<tr>
<td>Above 40°F</td>
<td>SAE 50</td>
</tr>
</tbody>
</table>

For normal operation, any reputable brand of dewaxed straight mineral oil of aircraft quality should give satisfactory service. However, certain benefits may be derived from the use of detergent oils which are compounded to meet Continental Motors Corporation Specification MHS24A, especially when operating in extreme temperature ranges of high or low temperatures.

(refer to Continental Aircraft Engine Service Bulletin M58-8). Recommendations relative to transition from a straight mineral oil to a detergent oil, as outlined in Civil Aeronautics Administration “Power Plant Branch Report No. 1” titles “Evaluation of Aircraft Engine Field and Lubrication Oils”, apply to the use of Specification MHS24A detergent oil. It is advantageous to begin using this oil when the engine is new or has just been overhauled. However, if an engine has been using straight mineral oil for a considerable period of time prior to changing to MHS24A oil, it is generally agreed that the oil should be drained after five or ten hours of operation and the condition of the oil screen checked. If an abnormal amount of sludge is found, the oil should be replaced at approximately five hour intervals, until the condition of the screen appears normal.

On aircraft equipped with the IO-520 engine, the engine should be serviced with oil per Continental Motors Specification No. MHS24A only. However, a straight mineral oil may be used on all engines for the first 20 to 30 hours of engine operation in order to promote faster ring seating and oil control.

OXYGEN SYSTEM

SERVICING THE OXYGEN SYSTEM (OPTIONAL)

WARNING

Keep fire and sparks away and never smoke in the proximity of oxygen. Tools, equipment and hands must also be kept clean when servicing the oxygen system, since deposits of oil or other hydrocarbons are highly inflammable when exposed to high concentrations of oxygen. Furthermore, the presence of other foreign particles in the oxygen lines may result in leaks that will both exhaust the oxygen supply and present a fire hazard. As an additional safety precaution, use only the anti-seize compounds and leak-testing soaps recommended for breathing oxygen systems.

a. On earlier model Debonair (prior to CD-932), check cylinder pressure by slowly opening the shut-off valve on the oxygen console just forward and to the left of
<table>
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<tr>
<th>COMPANY</th>
<th>APPROVED</th>
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<tr>
<td>BP Oil Corporation</td>
<td>3/25/70</td>
<td>B/P Aero Oil D65/80</td>
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<tr>
<td>Castrol Limited</td>
<td>1/5/67</td>
<td>Grade 40, Castrolaero AD, Type III</td>
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<td>(Australia)</td>
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<td>Grade 50, Castrolaero AD, Type II</td>
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<tr>
<td>Continental Oil Company</td>
<td>11/15/60</td>
<td>*Conco Aero S No. 65 (SAE 30)</td>
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<td>*Conco Aero S No. 80 (SAE 40)</td>
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<td>Conco Aero S 10W30</td>
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<td>Delta Petroleum Company</td>
<td>10/21/70</td>
<td>Delta Avoil - Grades 30, 40 &amp; 50</td>
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<tr>
<td>Gulf Oil Corporation</td>
<td>8/7/58</td>
<td>*Gulfpride Aviation Series D</td>
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<tr>
<td>Humble Oil &amp; Refining Company</td>
<td>1/25/63</td>
<td>Esso Aviation &amp; Enco Aviation In Grades E65, E80, E100, E120 Grade A100</td>
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<td>Kendall Refining Company</td>
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<td>*Kendall Aviation Oil Type D</td>
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<td>Pennzoil Company</td>
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<td>Pennzoil Aircraft Engine Oil, Heavy Duty Dispersant, Grades 30, 40, 50</td>
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<td>*Aero Gray Band HD (SAE 40)</td>
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<td></td>
<td></td>
<td>*Aero White Band HD (SAE 30)</td>
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<tr>
<td></td>
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<td>Mobil (Aero Oil 60) Dispersant</td>
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<td>Mobil (Aero Oil 100) Aviation</td>
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<td>9/24/64</td>
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<td>Texaco Aircraft Engine Oil - Premium AD Grades 65, 80, 100</td>
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<tr>
<td>Union Oil Company of California</td>
<td>11/9/70</td>
<td>Union Engine Oil HD Grades 80 &amp; 100</td>
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The oils designated with an * are ash residue type oils. The balance of the oils are ashless.
the pilot seat. On later model Debonairs, Serial CD-932 and after, the cylinder pressure is connected directly to the pressure gage on the console.

CAUTION

Always open the shutoff valve slowly to prevent damage to the system.

b. Remove the access panel from the center of the partition located directly beneath the forward side of the pilot's and copilot's seats, then close the shutoff valves on both the cylinder and console.

c. Slide the pilot's seat slightly to the rear until the recharge outlet of the filler valve is clear, then remove the cap from the recharge outlet and connect the supply cylinder to the filler neck.

d. Open the cylinder shutoff valve and slowly fill the system to 1800 ± 50 psi at a temperature of 70°F. This pressure may be increased an additional 3.5 psi for each degree of increase in temperature; similarly for each degree of drop in temperature. Reduce the pressure for the cylinder by 3.5 psi.

e. Close the shutoff valve, disconnect the supply cylinder, replace the filler valve cap, and slide the seat forward to its normal position.

f. Slowly open the shutoff valve on the cylinder, leaving the console shut-off valve closed until the system is to be used.

AIR CONDITIONING SYSTEM
(CE-602 and after)

Servicing the air conditioning system consists of periodically checking the refrigerant level, checking compressor oil level, checking the compressor belt tension, and changing the system air filter. Recharge the system as outlined under CHARGING THE AIR CONDITIONING SYSTEM whenever the refrigerant level is low. Air has entered the system, or components carrying refrigerant are replaced. Refrigerant leaks may be detected by inspection with a flameless leak detector.

AIR CONDITIONING FUNCTIONAL TEST

With the engine running at 1,000 rpm and the system on, observe the sight glass. If refrigerant appears milky or bubbles appear charge the system as noted in CHARGING THE AIR CONDITIONING SYSTEM in this section. Check the system for leaks using a flameless leak detector.

CHARGING THE AIR CONDITIONING SYSTEM

When working on a refrigerant air cooling system, observe the following special servicing precautions.

WARNING

A face shield should be worn when servicing the lines: refrigerant, coming in contact with the eyes, can cause the loss of sight.

a. Remember, this is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

b. Whenever a line is disconnected, purge the entire system with a vacuum pump operating at the 125 micron level.

c. Use only refrigerant R-12. Other refrigerants, particularly those containing methyl chloride, will cause rapid deterioration of the aluminum compressor components.

d. When servicing the system with refrigerant, avoid smoking or working near an open flame. Refrigerant passing over an open flame will produce a highly toxic phosgene gas.

e. Hook the service unit to the connections located under the copilot's seat. When charging a completely purged system, charge with 2 pounds of refrigerant. After charging, the sight glass should be observed for bubbles or a milky appearance caused by an insufficient refrigerant level. If it is necessary to add refrigerant to a partially charged system, add refrigerant slowly until a satisfactory condition is observed through the sight glass.

CHECKING COMPRESSOR OIL LEVEL

The air conditioner compressor oil level should be checked by a qualified air conditioner service man if the refrigerant charge is lost (evidenced by oil loss). The air conditioner system requires 12-14 ounces of 500 viscosity oil (Texaco Capella C or equivalent) to maintain 4 ounces in the compressor.

Check the compressor oil level as follows:

a. Fabricate a dipstick by bending a wire to a 90° angle so that 1-1/2 inches of the wire will insert into the compressor.

Figure 2-10. Servicing Compressor
b. Paint the dipstick with a flat black paint. Allow sufficient time for paint to dry.

c. Start engine in accordance with the applicable Pilot's Operating Manual and run the air conditioner. Run air conditioning system for 15 minutes with the engine running at low rpm to allow oil to accumulate in the compressor. Observe engine operating limitations as noted in the applicable Pilot's Operating Manual. Shut down engine in accordance with the applicable Pilot's Operating Manual.

d. Relieve the air conditioner system pressure by loosening the compressor filler plug just enough to bleed off pressure slowly.

e. After the system pressure is relieved, remove the oil filler plug.

f. Insert dipstick through oil filler port, slowly rotate clutch shaft until the dipstick will insert to the bottom of the compressor.

g. Withdraw dipstick, oil should register on the dipstick 5/8 inch below filler port. Add oil as necessary, to obtain this measurement.

h. Install oil filler plug with O-ring and secure plug.

NOTE

Make sure that the O-ring is not twisted and that no dirt or particles are on the O-ring or seat. The plug should be snug. Do not overtighten plug.

i. Charge the air conditioning system as noted in CHARGING THE AIR CONDITIONING SYSTEM.

j. Check area around filler plug for leaks. If leaks exist, do not over tighten the filler plug. Remove the filler plug, as described in steps “c” and “d” and install a new O-ring. Secure the plug and recharge the system as noted in steps “h” and “i”.

COMPRESSOR BELT TENSION ADJUSTMENT

After 36 to 48 hours operating time, a new belt will stretch to its normal operating length. The belt tension should be checked at this time and adjusted (by tightening the adjustment bolt on the idler pulley bracket) so that a belt tension gage, placed at point midway between the idler pulley and the compressor will register a belt tension of 70 pounds or with a 0.13 inch deflection with 6.38 pounds load. After adjusting the belt tension, be sure the belt has ample clearance on all sides.

LANDING GEAR

SERVICING THE SHOCK STRUT

Initially the nose strut is filled with 500/550 cc hydraulic fluid and the main struts with 800 cc hydraulic fluid. (Use MIL-H-5606 hydraulic fluid).

a. After placing the airplane on jacks remove the air valve cap and depress the air valve core to allow the strut to fully compress.

WARNING

Do not unscrew the valve body assembly until all air pressure has been released, otherwise it may blow off, resulting in injury to personnel or damage to equipment.

b. Jack the strut 1/4 inch off the fully compressed position and block it in place. Slowly loosen the valve body assembly, making certain that all air has escaped before completely removing the valve body.

c. Fill the strut with MIL-H-5606 hydraulic fluid. Slowly extend the strut from the blocked position, then clean and reinstall the valve body assembly. Less valve core.

d. Compress strut completely to expel excess air and fluid. Then extend strut and install valve core.

e. Remove airplane from jacks.

f. With the airplane empty except for a full fuel load and oil, inflate the shock struts until 3 inches of the piston are exposed on each main gear and 3-1/2 inches are exposed on the nose gear.

CAUTION

If a compressed air bottle containing air under extremely high pressure is used, care should be taken not to overinflated the strut.

g. Rock the airplane gently to prevent sticking or binding the strut.
h. Remove all foreign material from the exposed piston of the shock strut with a cloth moistened with hydraulic fluid.

LUBRICATION OF LANDING GEAR UPLOCK ROLLERS (CD-1 through CD-1256, CE-1 through CE-349, CJ-1 through CJ-30)

Lubricate the uplock roller bearings with SAE 20 oil every 50 hours. Every 100 hours pack the bearings with grease MIL-G-23827, or at any time bearings are subjected to degreasing.

Every 100 hours clean the uplock rollers with solvent and lubricate them as follows:

a. Place the airplane on jacks, and partially retract the landing gear.

b. Remove the bolt attaching the uplock roller and the center hinge point of the "V" brace drag leg.

c. Remove the uplock roller bearing from the bolt.

d. Hold a finger over one end of the center bearing race of the uplock roller and place the fitting of the grease gun against the opposite end of the bearing, then pump grease into the bearing inner race. This will force grease into the bearing cavity through the hole in the inner race. Completely fill the bearing with MIL-G-23827 grease.

e. Reinstall the bolt attaching the uplock rollers at the center hinge point of the "V" brace drag leg. Check the uplock roller for free movement and a clearance of .010 to .020 inch between the roller and the uplock block. If this
clearance is not correct, the uplock must be adjusted as indicated under RIGGING THE LANDING GEAR in Section 3 of the Model 35 Shop Manual.

LUBRICATION OF LANDING GEAR UPLOCK ROLLERS (CD-1257 and after, CE-350 and after, CJ-31 and after, and earlier airplanes which have complied with S.I. 0448-211)

On these airplanes the bolt attaching the uplock rollers at the center hinge point of the "V" brace drag leg is a grease bolt with a grease fitting. Using a grease pressure gun filled with grease (MIL-G-23827), lubricate the uplock bearing through the grease fitting. This should be accomplished every 100 hours or any time that the bearings are subjected to degreasing.

NOTE

The grease fitting on the drag leg, directly above the uplock roller bearing, does not supply lubrication for the uplock roller bearing.

STATIC GROUND CABLE AND ADJUSTMENT (CD-1 through CD-1256, CE-1 through CE-310, CJ-1 through CJ-30)

The static ground cable attached to the nose gear is designed to discharge static electricity on touchdown and need not make contact with the runway as the charge will arc from the cable. The cable should not drag on the runway while taxiing as this may create considerable radio interference and lead to rapid wear of the ground cable.

The following adjustment to the static ground cable is recommended:

a. Inflate tires to correct air pressure (see SERVICING TIRES in this section).

b. Adjust the tip of the cable to provide 5.75 ± .12 inches of free cable between the attaching bolt and the bottom of the cable.

The cable should then be between 1/4 to 1/2 inch from the ground.

WARNING

Do not wrap or tie the static ground cable to the mud scraper, landing gear fork, axle or any other part of the landing gear. Interference between structure and wheel well may develop.

NOSE WHEEL SCRAPER (CD-1 through CD-1254, CE-1 through CE-348, CJ-1 through CJ-30)

The nose wheel clearance should be checked frequently to ensure that the scraper is not contacting the tire.

MAIN WHEEL JACKING

A main wheel jack adapter is included with each airplane prior to CE-317. The jack adapter is available as optional equipment on serial CE-317 and after, serials CD-1 and after, and serials CJ-1 and after. Before raising the airplane, be sure the shock strut is properly inflated to the correct height. If the strut is not inflated to the recommended height, it will be impossible to insert the jack adapter into the main wheel axle. A scissor type jack is recommended for individual wheel jacking. When lowering the airplane, caution should be exercised so the shock strut will not become compressed and force the landing gear door against the jack adapter.

CAUTION

Do not walk on the wing walk while the airplane is on the main wheel jack.

SERVICING TIRES

The nose wheel tire is a 5.00-5 4-ply tire. The main wheel tires are 6.00-6 6-ply prior to airplane serials CD-1258 and CE-301 and CJ-30. On airplane serials CD-1258 and after, CE-301 and after, the main wheel tires are 7.00-6 6-ply.

CAUTION

Tires that have picked up a fuel or oil film must be washed down as soon as possible with a detergent solution to prevent contamination of the rubber.

Maintaining proper tire inflation will help to avoid damage from landing shock and will minimize tread wear and aid in preventing tire rupture caused from running over sharp stones and ruts. When inflating the tires, inspect for cuts, cracks, breaks, and tread wear. The pressure of a serviceable tire that is fully inflated should not drop more than 4 percent over a 24-hour period.

TIRE PRESSURES

<table>
<thead>
<tr>
<th>SERIALS</th>
<th>NOSE GEAR</th>
<th>MAIN GEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to CD-1272,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CE-301 &amp; CJ-31</td>
<td>40</td>
<td>* 30</td>
</tr>
<tr>
<td>CD-1272 and after,</td>
<td></td>
<td></td>
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<tr>
<td>CE-301 and after,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and CJ-31 and after</td>
<td>40</td>
<td>33 to 40</td>
</tr>
</tbody>
</table>

* Airplane serials prior to CD-1272, CE-301 and CJ-31 using Cleveland wheels and brakes, inflate 33 to 40 p.s.i.
NOTE

Beech Aircraft Corporation cannot recommend the use of recapped tires. Recapped tires have a tendency to swell as a result of the increased temperature generated during takeoff. Increased tire size can jeopardize proper function of the landing gear retract system, with the possibility of damage to the landing gear doors and retract mechanism.

STORAGE

The storage procedures listed are intended to protect the airplane from deterioration while it is not in use. The primary objectives of these measures are to prevent corrosion and damage from exposure to the elements. Three types of storage are considered.

a. FLYABLE STORAGE - 7 to 30 days.

b. TEMPORARY STORAGE - up to 90 days.

c. INDEFINITE STORAGE

FLYABLE STORAGE - 7 TO 30 DAYS

a. MOORING - If the airplane cannot be placed in a hangar, tie down securely at the three points provided. Do not use hemp or manila rope. It is recommended a tall support be used to compress the nose strut and reduce the angle of attack of the wings. Attach a line to the nose gear.

b. ENGINE PREPARATION FOR STORAGE - Engines in airplanes that are flown only occasionally tend to exhibit cylinder wall corrosion much more than engines that are flown frequently.

1. Check for correct oil level and add oil if necessary to bring level to full mark.

2. Run engine at least five minutes at 1200 to 1500 rpm with oil and cylinder head temperatures in the normal operating range.

c. DURING FLYABLE STORAGE - Each seven days during flyable storage, the propeller shall be rotated by hand. After rotating the engine six revolutions, stop the propeller 60° or 120° from the position it was in.

WARNING

Before rotation of propeller blades, ascertain that the magneto switch is OFF, throttle in CLOSED position and mixture control is in the IDLE CUT-OFF position. Always stand in the clear while turning propeller.

1. Arrangements should be made to have the airplane flown at least 30 minutes each week in order to keep the internal parts of the engine lubricated. Ground running of the engine will not provide proper heating of the oil without possible damage to engine and components due to lack of air flow, and will result in condensation of moisture in the oil supply, increasing the possibility of cylinder/crankshaft rust.

d. FUEL CELLS - Fill to capacity to minimize fuel vapor and protect cell inner liners.

e. FLIGHT CONTROL SURFACES - Lock with internal and external locks.

f. GROUNDING - Static ground airplane securely and effectively.

g. PITOT TUBE - Install cover.

h. WINDSHIELD AND WINDOWS - Close all windows and window vents. It is recommended covers be installed over windshield and windows.

i. PREPARATION FOR SERVICE - Remove all covers and tape. Clean the airplane and give it a thorough inspection, particularly wheel wells, flaps, and control openings.

1. If the engine has a total time of more than 25 hours and the oil consumption has stabilized, drain the break-in oil after a ground warm-up and install oil per Tele-dyne Continental Motors Specification MHS-24A.

2. Preflight the airplane.

TEMPORARY STORAGE - 30 TO 90 DAYS

a. MOORING - See FLYABLE STORAGE.

b. ENGINE PREPARATION FOR STORAGE - Operate engine (Preferably in flight) until oil temperature reaches normal range. Drain oil supply from sump while engine is still warm and replace drain plug.

1. Fill sump to full mark on dipstick gauge with lubricating oil meeting the requirements of MIL-C-6529. Type II, which will mix with normal oil and provide protection against corrosion.

2. Remove top spark plug and atomize spray preservative oil (MIL-L-46002, Grade 1) at room temperature, through upper spark plug hole of each cylinder with piston in the down position. Rotate crankshaft as each pair of cylinders is sprayed. Stop crankshaft with no piston at top position, and thoroughly respray each cylinder. Reinstall spark plugs.

3. Apply preservative to engine interior by spraying the above specified oil (approximately two ounces) through the oil filler tube. Seal all engine openings exposed to the atmosphere using suitable plugs, or moisture resistant tape, and attach red streamers at each point. Affix a tag to the propeller in a conspicuous place with the following notation: DO NOT TURN PROPELLER - ENGINE PRESERVED. Seal the propeller blade spinner cutouts with tape.

d. FUEL CELLS - Fill to capacity to minimize fuel vapor and protect cell inner liners.

e. FLIGHT CONTROL SURFACES - Lock with internal and external locks.

f. GROUNDING - Static ground airplane securely and effectively.

g. PITOT TUBE - Install cover.

h. WINDSHIELD AND WINDOWS - Close all windows and window vents. It is recommended covers be installed over windshield and windows.

i. BATTERY - Remove and store according to standard practices.
i. PREPARATION FOR SERVICE

1. Remove all covers, tape, and tags. Clean the airplane and give it a thorough inspection, particularly wheel wells, flaps, and control openings. With bottom spark plugs removed, hand turn propeller several revolutions to clear excess preservative oil, then reinstall plugs.

2. Preflight the airplane and flight test.

INDEFINITE STORAGE

a. MOORING - See FLYABLE STORAGE

b. ENGINE PREPARATION FOR INDEFINITE STORAGE - Drain the engine oil and service with lubricating oil, MIL-C-6529. Type II.

1. Immediately after servicing with the corrosion preventive mixture, fly the airplane for a period of time not to exceed a maximum of 30 minutes.

2. It is recommended the propeller be removed and the engine removed from the airplane. The propeller shaft should be coated with preservative oil and wrapped with moisture proof material and tape.

NOTE

If engine is removed from the airplane a tail mooring stand must be used.

3. Remove the top spark plug from each cylinder and spray thoroughly with corrosion preventive mixture MIL-C-6529, Type II (221° to 250°F).

4. Install protek plugs in each of the top spark plug holes, making sure that each plug is blue in color when installed. Protect and support the spark plug leads with AN-4020-1 protectors.

5. Place a bag of desiccant in the exhaust pipes and seal openings with moisture resistant tape.

6. Seal cold air inlet to the heater mufh with moisture resistant tape.

7. Seal engine breather by inserting a protek plug in the breather hose and clamping in place.

8. Wrap engine with moisture proof material and tape after desiccant bags have been installed.

9. Attach a red streamer to each place on the engine where bags of desiccant are placed. Either attach red streamers outside of the sealed area with tape or to inside of sealed area with safety wire to prevent wicking of moisture into sealed area.

10. If the propeller has not been removed, affix a tag in a conspicuous place with the following notation: DO NOT TURN PROPELLER - ENGINE PRESERVED.

c. DURING INDEFINITE STORAGE - The cylinder protek plugs shall be inspected weekly. The plugs should be changed as soon as their color indicates unsafe conditions of storage. If the dehydrator plugs have changed color in one-half or more of the cylinders, all desiccant material on the engine should be replaced.

1. The cylinder bores should be resprayed with corrosion preventive mixture every six months or more frequently if bore inspection indicates corrosion has started. Replace all desiccant and protek plugs. Before spraying, the engine shall be inspected for corrosion as follows: Inspect the interior of at least one cylinder on the engine through a spark plug hole. If cylinder shows rust, spray cylinder corrosion preventive oil (MIL-C-6529, Type II) and turn prop over five or six times. Then respray. Remove the rocker box cover from the engine and inspect the valve mechanism.

d. PROPELLER - Coat blades with preservative oil and wrap with moisture proof material and tape. If propeller has been removed, coat all parts with preservative oil, wrap with protective material to exclude dust, and then tape.

e. FUEL CELLS - Drain fuel cells.

1. Flush, spray, or rub a thin coating of light engine oil on the inside liners of all fuel cells which have contained gasoline.

2. After 24 hours, remove cells and store according to standard practices. Do not remove or handle fuel cells until 24 hours after oil has been applied.

f. FLIGHT CONTROL SURFACES - Lubricate all flight control surface hinge pins, bearings, bell cranks, chains, control rods and quadrants and coat lightly with corrosion preventive compound (MIL-C-16173).

1. Lock with internal and external locks.

g. GROUNDING - Static ground airplane securely and effectively.

h. PITOT TUBE - Apply a thin coating of grease. Specification MIL-G-10924, and install cover.

i. WINDSHIELD AND WINDOWS - Close all windows and window vents and install covers over windshield and windows.

j. LANDING GEAR - Coat the extended portion of the shock struts with light weight oil.

k. TIRES - Install covers. Check air pressure periodically. Inflate as necessary.

l. WING FLAP TRACKS AND ROLLERS - Coat with corrosion preventive compound. Place flaps in retracted position.

m. BATTERY - Remove and store according to standard practices.

n. INSTRUMENT PANEL - Cover with barrier material and secure with tape.

o. SEATS - Install protective covers.

p. LANDING LIGHTS - Cover with barrier material and secure with tape.

q. STALL WARNING UNIT - Remove and store according to standard practices. Tape connections.

r. LOOSE TOOLS AND EQUIPMENT - Remove and store in a dry temperate room.

s. AIRFRAME - Cover static ports and all openings with barrier material and secure with tape to exclude rain, sun, and foreign matter.

PREPARATION FOR SERVICE

a. Remove all covers, tape, and tags from the airplane.
b. Remove all cylinder plugs and all paper, tape, and dehydrating agent used to preserve engine.

c. Drain corrosion preventive mixture and reservice with recommended lubricating oil. Per Teledyne Continental Motors MHS-24B.

d. Reinstall the propeller if it was removed. Rotate propeller to clear excess preservative oil from the cylinders.

e. Install the spark plugs, battery, and rotate propeller by hand through all compressions of the engine to check for liquid lock. Reinstall cowling and start engine in the normal manner.

f. Give the airplane a thorough cleaning, visual inspection and test fly the airplane.

BATTERY

CAUTION

Confirm 14 or 28 volt system before connecting external power.

SERVICING THE BATTERY

14 volt system (CD-1 and after; CE-1 thru CE-771, except CE-748; CJ-1 thru CJ-149)

On airplane serials CD-1 thru CD-387, a 12-volt, 33 ampere Reading R33 battery is located behind the firewall on the right hand side. Access may be obtained by raising the right hand engine cowl and unfastening the Dzus fasteners and opening the battery access door.

On airplane serials CD-388 and after, a 12-volt 33 ampere BEECHCRAFT 118649 battery is located on the right side of the engine compartment just forward of the firewall. Access for servicing is obtained by raising the right engine cowl and removing the battery box cover.

On serials CE-1 through CE-498, CE-511 and CE-512, a 12-volt, 35 ampere battery is provided to support the electrical system. Serials CJ-52 thru CJ-148, and CE-499 thru CE-771, except CE-511, CE-512, and CE-748 are provided with a new light weight, 12 volt, 35 ampere battery (P/N 36380025). The battery is located and accessible in the same manner as the BEECHCRAFT battery.

The battery should be maintained in a charged condition at all times and the water level should be checked at 25 hour intervals. Fill the battery with distilled water only. The Reading R33 battery should be filled to 1/4 inch above the separators. The BEECHCRAFT and other batteries should be filled to 1/2 inch above the separators. Avoid overfilling the battery since overflowing or spewing electrolyte may occur if battery is subjected to high temperature and/or high charging rate. Specific gravity must be kept within the prescribed limits on the battery box placard. The battery box is of acid-resistant construction and incorporates a vent line and a battery drain line which will carry any acid or hydrogen gas overboard.

28 volt system (CE-748, CE-772 and after; CJ-149 and after)

On serials CE-748, CE-772 and after and CJ-149 and after, a 24 volt, 110 ampere hour Teledyne battery is provided to operate the electrical system. The battery is located on the right side of the engine compartment, just forward of the firewall. The battery is accessible for servicing by raising the right engine cowl door and removing the battery box cover.

The battery should be maintained in a fully charged state at all times and the electrolyte level checked at regular intervals. Never add anything but distilled water when adjusting the electrolyte level in the battery. If electrolyte is added each time the level in the battery is low, a high concentration of sulfuric acid may cause dissolution of the plates. Under high temperature conditions this may be indicated by the presence of black particles in the electrolyte of the affected cells.

NOTE

Do not fill the battery over 3/8 inch above the separators. Only lead-acid equipment should be used when servicing lead-acid type batteries. Do not use tools that are used on nickel-cadmium batteries.

NOTE

Do not overfill the battery. When the battery cells are overfilled, water and acid will spill on the lower portions of the engine accessory section and lower fuselage. Neutralize the acid in any such spillage immediately with a water solution of sodium bicarbonate (baking soda).

BATTERY CHARGING

The battery should be charged at a rate that will not produce gassing or bubbling of the electrolyte. Monitor battery temperature during the charging cycle to ensure that cell temperature does not exceed 115°F. If the temperature reaches this limit, the rate of charge should be reduced. The manufacturer recommends charging the battery at a rate of 2 amperes until four consecutive hourly readings show no rise in specific gravity and voltage for each cell. Refer to the Service Manual (P/N GSM-1277) for additional information on the charging procedure recommended by the battery manufacturer (Teledyne Battery Products).
**BATTERY MAINTENANCE PROGRAM**

A systematic battery maintenance program should be established and carefully followed.

- **a.** The battery should be removed from the airplane for service.
- **b.** A log of the services performed on the battery should be maintained.
- **c.** The battery should be removed from the airplane and serviced after 100 flight hours or 30 days, whichever occurs first. If the ambient temperatures are above 90°F or the time between engine starts averages less than 30 minutes, the time between servicing should be reduced. During periods when the ambient temperature is below 32°F, the battery should be maintained in a fully charged state to prevent freezing. Particular attention should be given to maintaining correct specific gravity of the electrolyte. When water is added, the battery should be charged sufficiently to thoroughly mix the water with the electrolyte.
- **d.** The log of battery service performed should be evaluated to determine the need to service the battery at the above recommended intervals or to extend the intervals if justified. Accurate water consumption data is a valid barometer to use for adjustment of the servicing intervals.

**LIGHT BULB REPLACEMENT GUIDE (28 volt system) (CE-748, CE-772 and after) (CJ-149 and after)**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>BULB NUMBER</th>
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<tbody>
<tr>
<td>Alternator Out Light</td>
<td>327</td>
</tr>
<tr>
<td>Cabin Overhead Light</td>
<td>1864</td>
</tr>
<tr>
<td>Clock Light</td>
<td>267</td>
</tr>
<tr>
<td>Compass Light</td>
<td>327</td>
</tr>
<tr>
<td>Condenser Door Open Light</td>
<td>327</td>
</tr>
<tr>
<td>Courtesy Light</td>
<td>1864</td>
</tr>
<tr>
<td>Flight Compartment Flood Lights</td>
<td>313</td>
</tr>
<tr>
<td>Fuel Select Light</td>
<td>327</td>
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<tr>
<td>Instrument Post Lights</td>
<td>327</td>
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<tr>
<td>Instrument Wedge Lights</td>
<td>267</td>
</tr>
<tr>
<td>Landing Gear Intransit Light</td>
<td>327</td>
</tr>
<tr>
<td>Landing Gear Uplock Light</td>
<td>327</td>
</tr>
<tr>
<td>Landing Light</td>
<td>4596</td>
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<tr>
<td>Light Tray Assembly</td>
<td>267</td>
</tr>
<tr>
<td>Map Light</td>
<td>1495</td>
</tr>
<tr>
<td>Navigation Light (Tail)</td>
<td>A7512-24</td>
</tr>
<tr>
<td>OAT Light</td>
<td>327</td>
</tr>
<tr>
<td>Reading Light</td>
<td>303</td>
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<tr>
<td>Rotating Beacon (Lower)</td>
<td>D7080A5-24</td>
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<tr>
<td>Rotating Beacon (Upper)</td>
<td>D7080A1-24</td>
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<tr>
<td>Subpanel Post Lights</td>
<td>327</td>
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<tr>
<td>Strobe Light (Tail)</td>
<td>30-0815-1</td>
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<tr>
<td>Strobe Light (Wing)</td>
<td>30-1467-1</td>
</tr>
<tr>
<td>Tail Light</td>
<td>4596</td>
</tr>
</tbody>
</table>
ENGINE INSTRUMENTS

BEECHCRAFT Bonanzas (CE-350 through CE-408) are equipped with vertical readout engine instruments; operated electrically, lighted internally and installed in a box assembly which is installed in the instrument panel. A male connector attached to the rear of each instrument fits into a female connector attached to the rear of the box assembly. As the instrument is removed from the box assembly, the male connector is pulled from the female connector, removing the instrument from the electrical circuit.

REMOVAL AND INSTALLATION OF VERTICAL INSTRUMENTS

a. Remove the six screws holding the plastic instrument retainer plate to the box assembly and remove the plate.

b. Pull the desired instrument straight out.

c. Reinstallation may be accomplished in the reverse of the removal procedure.

NOTE

The EGT indicator must have the thermocouple leads removed from the back of the instrument after it has been pulled from the box assembly.

c. Adjust the control rod linkage so that the door pulls in snug against the opening.

NOTE

When adjusting the rod end linkage, keep rod end threads in bearing by observing threads through sight hole in the rod end.

d. Set the push-pull control in the pilot's compartment to the closed position.

e. Rig the push-pull control arm assembly, at the wheel well cover (right hand side), in the forward position so that the control rod will center over the arm hinge. A maximum of .06 inches forward of the arm hinge center is permissible. An amount greater than this maximum may cause the control to override center and lock.

f. Attach the control rod ball joint link to the arm assembly and pull the control to the full open position. The flap should open approximately 4 inches measured at the aft inboard end of the flap to the face of the exhaust stack flame shield.

FINISHES

The following list is included to be used as a reference should it become necessary to touch up or match an interior or exterior finish. Each paint is listed according to specific type and whether an exterior or interior paint.

Short cut masking jobs for your paint department are possible when you use pre-cut paint patterns and numbers. Stripe patterns and numeral patterns are available from the C.O. Dicks Co., 8850 Hubbell, Detroit 28, Michigan.

Their current listings include 4, 12, and 20 inch Call Numbers and Numerals. Time can be saved when using these patterns and a much neater final paint job can be expected.
# Paints

The document describes a list of paint colors and their corresponding part numbers. The list is divided into three sections: 

1. **Exterior Colors**
   - San Mateo Wheat
   - Black
   - Morning Glory Blue
   - Toreador Red
   - Sunshine Yellow
   - White
   - Beaver Brown
   - Castle Tan

2. **Interior Colors**
   - Castle Tan
   - Alpine Blue
   - Seminole Beige
   - Nairobi Pearl
   - White
   - Arctic Beige
   - Sandusky
   - Sable Brown
   - Turquoise
   - Pumpkin
   - Broadway Blue
   - Sun Beige
   - Sienna Gold
   - Torch Red
   - New Bronze
   - Instrument Black

3. **Vinyl Colors**
   - Alpine Blue
   - Chairman Gold
   - Chairman Red
   - Chairman Blue
   - Olive
   - Executive Brown
   - Parchment
   - Red Antique
   - Walnut
   - Blue Antique
   - Rawhide

4. **Day Glo Colors**
   - Fire Orange
   - Flash Green
   - Rocket Red
   - Lightning Yellow
   - Blaze Orange

The part numbers are listed next to each color.

---

2-12

(Exterior Colors)

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
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<tbody>
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<td>118684-135</td>
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<tr>
<td>Cadmium Red</td>
<td>118684-137</td>
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<td>Castle Tan</td>
<td>118684-139</td>
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<td>Beaver Brown</td>
<td>118684-141</td>
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<td>Pacific Blue</td>
<td>118684-143</td>
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<tr>
<td>San Mateo Wheat</td>
<td>118684-145</td>
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<tr>
<td>Sunshine Yellow</td>
<td>118684-147</td>
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<tr>
<td>Blueberry Blue</td>
<td>118684-149</td>
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<tr>
<td>Black</td>
<td>118684-151</td>
</tr>
<tr>
<td>Matterhorn White</td>
<td>118684-153</td>
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</tbody>
</table>

### ENAMEL (CD-772 thru CD-1199, CE-1 thru CE-248, CJ-1 thru CJ-13)

(Exterior Colors)

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<td>*Metallic Gold</td>
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*Effective CD-1007 thru CD-1199
and CE-2 thru CE-248

### ENAMEL (CD-1200 thru CD-1234, CE-249 thru CE-289, CJ-14 thru CJ-25)

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SECTION 3

System Description and Maintenance
ADJUSTMENT OF CABIN ENTRANCE DOOR AND LATCHES
(CJ-1 and after)

To ensure proper closing and sealing of the door, make the following adjustments:

a. If air leaks by the lower latch with the door completely closed and the door seals in good condition, loosen the four retaining screws in the edge of the door and move the latch tongue guide outboard to add tension on the latch tongue.
b. If air leaks by the upper latch, remove the top sill catch and remove washers from the back of the sill or file off the back of the sill to obtain a tighter fit.
c. Add thin shims under either hinge to raise or lower the aft portion of the improperly fitted doors.
d. Adjust the door latch mechanism as follows:

1. Remove the bolts securing the arm rest to the door and remove the arm rest.
2. Remove the screws securing the lower upholstery panel to the door frame.
3. Release the push-fasteners securing the upholstery panel in place and remove the panel. The push-fasteners may be released with a screwdriver modified by making a 90-degree bend near the end and cutting a notch in the end of the blade.
4. Working through the access hole below the inside handle, remove the two screws securing the link to the threaded latch tube. Turn the tube to the right to shorten or to the left to lengthen the latch bolt until properly adjusted, then reconnect the latch tube to the link with the two attaching screws.

NOTE
Changing the length of the latch tube will change the length of the wire or cable operating the upper lock latch.

5. With the inside handle in the locked position, check that the inside handle unlatches when the door is unlocked with the outside handle. To synchronize the handles, remove the small upholstery panel above the door window by removing the attaching screws and releasing the push-fasteners, then remove the nut and bolt on the door catch. To synchronize the handles, adjust the cable to the proper length by screwing the turnbuckle in or out.

LUBRICATION OF CABIN DOOR LATCHES

Lubricate the hinges, hinge pins, and all moving parts of the latch and quick release mechanism with MIL-G-21164 graphite grease as necessary for proper operation.

CABIN DOOR REMOVAL AND INSTALLATION

To remove the door, unsafety the wire securing the quick release (red) handle in place and straighten out the aluminum catch. Pull the handle that disengages the hinge pin retainers and remove the door.

CAUTION

Support the door carefully to avoid damaging the wing when the quick release frees the door.

To reinstall the door, position the door so that the hinge pins slide into the hinge slots. Then push in the quick release (red) handle until the retainers engage the holes in the hinge to lock the hinges in place around the hinge pins. Bend the aluminum catch back in place over the handle and secure the handle to the catch with one wrap of MS20995C47-5 lock wire.

DOOR QUICK RELEASE MECHANISM

The cabin door can be instantaneously jettisoned by a quick release mechanism in the event of an emergency. The quick release mechanism actuates the door latches through a lever and cam arrangement. To prevent accidental activation of the mechanism the red handle that actuates the release is secured to the escutcheon on the door by an aluminum catch and a single strand of safety wire. The wire breaks and the aluminum catch straightens out to release the handle when the latter is pulled. The cam on the lever to which the handle is attached then rotates to actuate the link that unlatches the upper and lower door latches. Simultaneously, an actuator on each end of the quick release lever rotates and, through interconnecting links withdraws the retainers that lock the upper and lower hinges in place around the hinge pins. This completely releases the door from the fuselage.

BALANCING CONTROL SURFACES

AILERON

BALANCING THE AILERON
(Figure 3-1)

When the aileron control surface is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge. After any repainting or repair, the finished surface should be check balanced to ensure that its static moment about the hinge line is within the prescribed limits. The painted aileron assembly must be nose-heavy by 0.2 to 1.5 inch-pounds. The static moment of the aileron is determined by multiplying the unbalanced weight of the aileron assembly times the perpendicular distance from the hinge center line to the center of gravity when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced control surface is 0.0 inch-pounds. A tail-heavy surface exhibits static underbalance. A nose-heavy surface exhibits static overbalance.
**CHECKING BALANCE**

The balance must be checked in a draft free area with the aileron completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, static wicks, and hinge bolts must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, they can be categorized under the following two headings:

a. Counterbalancing - The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the aileron assembly.

b. Actual Force Measurement - Measurement of the force applied by the aileron surface on a single support at a known distance from the center line of the hinge.

**EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING**

a. A stand with knife edge supports as illustrated in Figure 3-1. The knife edges must be in the same horizontal plane.

b. A paper cup or similar light weight container.

c. Approximately 1 pound of lead shot.

d. A certified beam balance weighing device calibrated in units of .01 pound or less.

e. A straight edge, ruler, and spirit level.

**BALANCING PROCEDURE**

**COUNTERBALANCING METHOD**

a. Locate the chord line by placing a straight edge at the inboard end of the aileron assembly so that one end is on the trailing edge and the other end is centered on the leading edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.

b. Fit the correct size bolts in the hinge brackets and mount the aileron on the knife edge supports. Ascertain that the aileron is free to rotate about the hinge line.

c. To determine if weight should be added or removed, suspend a paper cup from a point near the center of the aileron trailing edge. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 3-1. The cup must be free to hang vertically.

d. Add small quantities of lead shot to the cup until the aileron balances with the chord line level. Check this by holding the spirit level aligned with the marked chord line.

e. The distance “D” must be perpendicular to the hinge line. Measure “D” from the hinge line to the suspension point of the cup.

f. Remove the cup, contents, and string, then weigh them.

**NOTE**

Since any weighing error is magnified by the distance “D”, weighing is most important and must be done carefully on scales that are certified for accuracy.

g. Calculate the static balance as follows:

1. The weight of the cup and contents is designated by “W”.

2. The over or underbalance moment is designated by “M”.

3. $M = W \times D$

4. The following is a typical example of a balancing calculation: Assume the aileron is overbalance (nose-heavy) and the paper cup was suspended from the trailing edge. Assume that the aileron balances with the chord line level at $W = .150$ pound" and $D = 10.0$ inches", then ...

$$M = .150 \times 10.0$$

$M = 1.50$ inch-pounds. The product of “W x D”. In this instance, “M" is within the required static balance range and is therefore acceptable.

h. The painted aileron assembly must be nose-heavy by 0.2 to 1.5 inch-pounds. The center of gravity of the aileron is forward of the hinge center line causing the surface to be nose-heavy. Proper aileron balance is obtained by adding or removing lead rod at the leading edge of the aileron. The rod is 15/32 inch diameter and is installed in brackets attached to the leading edge of the aileron. When adding additional lead rod the maximum total of the length of the rod to be added is not to exceed 5 inches. Add additional rod at the center brackets.

**CAUTION**

When a lead rod is added to obtain correct balance, it must be installed securely with rivets. A loosely installed rod will vibrate and may cause an undesirable vibration of the surface.
Figure 3-1. Balancing the Aileron
ELEVATOR

BALANCING THE ELEVATOR
(Figure 3-2)

When the elevator control surface is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge. After any repainting or repair, the finished surface should be check balanced to ensure that its static moment about the hinge line is within the manufacturers prescribed limits. The complete elevator assembly, painted or unpainted, including the control arm and the tab control rod should not be tail-heavy over a maximum moment as noted:

12.0 inch-pounds on airplane serials prior to CD-1023.
7.8 inch-pounds on airplane serials CD-1023 and after, CE-1 and after and CI-1 and after.

The static moment is the total unbalanced weight of the elevator control surface multiplied by the perpendicular distance from its hinge center line to the center of gravity, when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced elevator control surface is 0.0 lb. A tail-heavy surface exhibits static underbalance. A nose-heavy surface exhibits static overbalance.

CHECKING BALANCE

The elevator balance must be checked in a draft free area with the elevator completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, tab push rod, static wicks, and hinge bolts must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, they can be categorized under the following two headings:

a. Actual Force Measurement - Measurement of the force applied by the elevator surface on a single support at a known distance from the center line of the hinge.

b. Counterbalancing - The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the elevator assembly.

CHECK BALANCE BY FORCE MEASUREMENT

The equipment required to perform the check balance by force measurement is as follows:

a. A stand with knife edge supports as illustrated in Figure 3-2. The knife edges should be in the same horizontal plane.

b. A certified beam balance calibrated in units of .01 lb, or less. The balance should have a flat weighing platform and its capacity should equal tare plus 2.0 lbs. minimum.

c. A support spindle similar to the illustration and levelling blocks, as required. (Blocks + spindle = tare).

d. A straight edge, rule and spirit level.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

Locate the chord line by placing a straight edge at the inboard end of the elevator so that one end is aligned with the center of the torque tube and the other end is centered on the trailing edge. Mark the chord line by grease pencil or other means on the rib. Remove the straight edge. Fit correct size bolts in the outboard and center hinge brackets and mount the elevator on the knife edges. Ensure that it is free to rotate about the hinge line. Support the trailing edge behind the center hinge point with a spindle resting on a levelled beam balance platform as illustrated. The spindle must be vertical throughout the balancing procedure. Hold a spirit level against the marked chord line and level it by extending or contracting the spindle, or by using blocks and shims under the spindle. Measure the perpendicular distance from the hinge center line to the point supported by the spindle. Ensure that the spirit level and rule are removed from the surface and read the reaction on the beam balance. Calculate the static underbalance moment “M” from the formula:

\[ M = D(R-T) \text{ inch-pounds} \]

where,

\[ D = \text{Perpendicular distance from the hinge center line to the spindle point (inches).} \]

\[ R = \text{Reaction (Pounds) read from the beam balance.} \]

\[ T = \text{Tare, i.e. spindle plus levelling blocks or shims on the scale platform (Pounds).} \]

EXAMPLE

D is 13.5 inches, R is 1.49 lb, and T = 1.00 lb.
M = 13.5 (1.49 - 1.00) = 6.6 inch-pounds
M is within the range which is satisfactory.

If M is not within the prescribed range, refer to step i under BALANCING PROCEDURE COUNTERBALANCING METHOD.

CHECK BALANCE BY COUNTER BALANCING

EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING BY COUNTER BALANCING

a. A stand with knife edge supports as illustrated in Figure 3-2. The knife edges must be in the same horizontal plane.

b. A paper cup or similar light weight container.

c. Approximately 2 pounds of lead shot.

d. A certified beam balance weighing device calibrated in units of .01 pound or less.

e. A straight edge, ruler, and spirit level.

BALANCING PROCEDURE COUNTER BALANCING METHOD

a. Locate the chord line by placing a straight edge at the inboard end of the elevator assembly so that one end is on the hinge center line and the other end is centered on the trailing edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.
b. Secure the trim tab in its neutral position with a small piece of masking tape.

C. Fit the correct size bolts in the hinge clevises and mount the elevator on the knife edge supports. Ascertain that the elevator is free to rotate about the hinge line.

d. To determine if weight should be added or removed, use a short length of small diameter string secured to the surface with a small piece of masking tape and the cup hanging vertically as illustrated in Figure 3-2. Slightly loosen the forward top screw on the elevator leading edge tip. Suspend a paper cup on the inboard side of the tip and wrap the string around the screw. Secure the string to the surface with a small piece of masking tape aft of the top forward screw and near the hinge center line as shown in Figure 3-2. The cup must be free to hang vertically.

CAUTION

Be certain the forward top screw on the elevator leading edge tip is secured after the elevator has been balanced.

e. Add small quantities of lead shot to the cup until the elevator balances with the chord line level. Check this by holding the spirit level aligned with the marked chord line.

f. The distance “D” must be perpendicular to the hinge line. Measure “D” from the hinge line to the suspension point of the cup.

gh. Remove the cup, contents, and string, then weigh them.

NOTE

Since any weighing error is magnified by the distance “D”, weighing is most important and must be done carefully on scales that are certified for accuracy.

h. Calculate the static balance as follows:

1. The weight of the cup and contents is designated by “W”.
2. The over or underbalance moment is designated by “M”.
3. M = W x D
4. The following is a typical example of a balancing calculation: Assume the elevator is underbalance (tail-heavy) and the paper cup was suspended from the horn. If the elevator balances with the chord line level at “W = 0.60 pound” and “D = 12.6 inches”, then...

M = 0.60 x 12.6

M = 7.6 inch-pounds. In this instance, “M” is within the required static balance range and is therefore acceptable.

i. The complete elevator assembly, painted or unpainted including the control arm and the tab control rod, must not be tail-heavy over a maximum as noted:

12.0 inch-pounds on airplane serials prior to CD-1023.

7.8 inch-pounds on airplane serials CD-1023 and after, CE-1 and after, and CJ-1 and after.

If the static balance does not comply, remove the elevator horn cover and add or remove solder to bring the elevator balance within required limits.

NOTE

Coat the weight with a corrosion preventative material such as zinc chromate primer to insulate the dissimilar metals. Replace the elevator horn cover and recheck the balance.
Figure 3-2. Balancing the Elevator
RUDDER

BALANCING THE RUDDER
(Figure 3-3)

When the rudder surface is being repainted, suspend it by the trailing edge so that excess paint will drain toward the leading edge. After any repainting or repair, the finished surface must be checked to ensure that its static moment about the hinge line is within the manufacturer’s prescribed limits. The complete rudder assembly, painted or unpainted including the control arm, should not be unbalanced by a maximum of 8.4 inch-pounds. The static moment of the rudder is determined by multiplying the unbalanced weight of the rudder assembly times the perpendicular distance from the hinge center line to the center of gravity when the chord line is horizontally level. The weight is measured in pounds and the distance in inches. The static moment of a 100 percent balanced rudder assembly is 0.0 inch-pounds. Tail heaviness indicates static underbalance while nose heaviness indicates static overbalance.

CHECKING BALANCE

The rudder balance must be checked in a draft free area with the rudder completely assembled in flying condition. All painting, including stripes and touch-up, must be completed. The tab, static wicks, and hinge bolts must be attached. The chord line must be horizontally level and the hinge line must be properly supported when the static moment is measured. Although many different methods of check balancing exist, they can be categorized under the following two headings:

a. Actual Force Measurement - Measurement of the force applied by the rudder surface on a single support at a known distance from the center line of the hinge.

b. Counterbalancing - The application of a known force or weight at a measured distance from the hinge line to counter the unbalance moment of the rudder assembly.

CHECK BALANCE BY FORCE MEASUREMENT

The equipment required to perform the check balance by force measurement is as follows:

a. A stand with knife edge supports as illustrated in Figure 3-3. The knife edges should be in the same horizontal plane.

b. A certified beam balance calibrated in units of .01 lb. or less. The balance should have a flat weighing platform and its capacity should equal tare plus 2.0 lbs. minimum.

c. A support spindle similar to the illustration and levelling blocks, as required. (Blocks + spindle = tare).

d. A straight edge, ruler, and spirit level.

BALANCING PROCEDURE FORCE MEASUREMENT METHOD

Locate the chord line by placing a straight edge at the inboard end of the rudder so that one end is aligned with the center of the torque tube and the other end is centered on the trailing edge. Mark the chord line by grease pencil or other means on the rib. Remove the straight edge. Fit correct size bolts in the outboard and center hinge brackets and mount the rudder on the knife edges. Ensure that it is free to rotate about the hinge line. Support the trailing edge behind the center hinge point with a spindle resting on a levelled beam balance platform as illustrated. The spindle must be vertical throughout the balancing procedure. Hold a spirit level against the marked chord line and level it by extending or contracting the spindle, or by using blocks and shims under the spindle. Measure the perpendicular distance from the hinge center line to the point supported by the spindle. Ensure that the spirit level and rule are removed from the surface and read the reaction on the beam balance. Calculate the static underbalance moment (M) from the formula:

\[ M = D(R-T) \text{ inch-pounds} \]

where,

\[ D = \text{Perpendicular distance from the hinge center line to the spindle point (inches).} \]

\[ R = \text{Reaction (Pounds) read from the beam balance.} \]

\[ T = \text{Tare, i.e. spindle plus levelling blocks or shims on the scale platform (Pounds).} \]

EXAMPLE

D is 13.8 inches, R = 1.49 lb. and T is 1.00 lb.
M = 13.8 (1.49 - 1.00); M = 6.8 inch-pounds.
M is within the range which is satisfactory.
If M is not within the prescribed range, refer to step h.
CHECK BALANCE BY COUNTER BALANCE.

CHECK BALANCE BY COUNTER BALANCING

EQUIPMENT REQUIRED TO PERFORM CHECK BALANCING BY COUNTER BALANCING

a. A stand with knife edge supports as illustrated in Figure 3-3. The knife edges must be in the same horizontal plane.

b. A paper cup or similar light weight container.

c. Approximately 2 pounds of lead shot.

d. A certified beam balance weighing device calibrated in units of .01 pound or less.

e. A straight edge, ruler, and spirit level.

BALANCING PROCEDURE COUNTER BALANCING METHOD

a. Locate the chord line by placing a straight edge at the lower closure rib of the rudder so that one end is aligned with the center of the torque tube while the other end is centered on the trailing edge. Mark the chord line with a suitable marker, such as a grease pencil, then remove the straight edge.

b. Fit the correct size bolts in the hinge brackets and mount the rudder on the knife edge supports. Ascertain that the rudder is free to rotate about the hinge line.
c. To determine if weight should be added or removed, suspend a paper cup from a point near the center of the rudder trailing edge if the balance is nose-down or near the center of the horn leading edge if the balance is tail-down. Use a short length of small diameter string secured to the surface with a small piece of masking tape as illustrated in Figure 3-3. The cup must be free to hang vertically.

d. Add small quantities of lead shot to the cup until the rudder balances with the chord line level. Check this by holding a spirit level aligned with the marked chord line.

e. The distance “D” must be perpendicular to the hinge line. Measure “D” from the hinge line to the suspension point of the cup.

f. Remove the cup, contents, and string, then weigh them.

NOTE

Since any weighing error is magnified by the distance “D”, weighing is most important and must be done carefully on scales that are certified for accuracy.

g. Calculate the static balance as follows:

1. The weight of the cup and contents is designated by “W”.
2. The over or underbalance moment is designated by “M”.

3. \( M = W \times D \)

4. The following is a typical example of a balancing calculation: Assume the rudder was slightly underbalance (tail-heavy) and the paper cup was suspended from the horn leading edge. If the rudder balances with the chord line level at “\( W = .65 \) pound” and “\( D = 12.5 \) inches”, then...

\[
M = .65 \times 12.5
\]

\[ M = 8.1 \text{ inch-pounds.} \]

In this instance, “M” is within the required static balance range and is therefore acceptable.

h. The complete rudder assembly, painted or unpainted, including the control arm must not be tail-heavy over a maximum of 8.4 inch-pounds. If the static balance does not comply, remove the weight in the rudder horn and add or remove solder to bring the rudder balance within required limits.

NOTE

Coat the weight with a corrosion preventative material such as zinc chromate primer to insulate the dissimilar metals. Replace the weight in the rudder horn and recheck the rudder balance.
Figure 3-3. Balancing the Rudder
CONTROL SURFACES

AILERON REMOVAL

a. Support the aileron and remove the two attaching screws from the top and bottom of each hinge bracket.
b. Pull the aileron straight away from the wing to avoid damage to the attaching areas.
c. Remove the screws attaching the bonding cables to the aileron.

AILERON INSTALLATION

a. Attach the bonding cables to the aileron.
b. Align the aileron with the hinge brackets. Be certain to install the aileron hinge brackets between the upper aileron skin and the lower reinforcing structure to which the nut plate is attached.
c. Install the upper and lower hinge bracket screws.
d. Pull the aileron in a direction straight away from the wing to assure that the hinge bracket is positioned properly. If any movement of the aileron is noted, recheck the positioning of all hinge brackets.
e. Connect the aileron tab push rod.

RIGGING THE AILERON CONTROL SYSTEM

Rig the aileron in accordance with the procedures outlined in the Model 35 Shop Manual with the following exceptions: with the bungee springs connected, rig the aileron system to a cable tension of 40 ± 5 pounds.

Effective serial CD-976 and after, an optional Stability Augmentation System is offered. Aircraft equipped with this system will not have the aileron control trimmer installed. Refer to Figure 3-5A in Model 35 Shop Manual for Stability Augmentation System.

ELEVATOR REMOVAL

a. Detach the tail cone, disconnect the tail navigation light and remove the tail cone.
b. Remove the tail section access doors on the left hand side of the aft fuselage.
c. Disconnect the elevator push-pull tubes from the elevator torque tube fittings.
d. Disconnect the elevator trim tab actuator rod at the actuator.
e. Remove the hinge bolts. Disconnect the elevator bonding cables and remove the elevator.

INSTALLATION OF ELEVATOR

a. Connect the elevator bonding cables and position the elevator on the stabilizer; then install the hinge bolts and nuts. Tighten and safely.
b. Connect the elevator trim tab actuator rod to the actuator.
c. Install the attaching nut at the inboard elevator hinge point and torque to 50-70 inch-pounds.
d. Connect the elevator push-pull tubes at the elevator torque tube fittings.
e. Connect the tail light wires and install the tail cone. Install the access doors.

RIGGING THE ELEVATOR CONTROL SYSTEM

a. Adjust the elevator down stop and push rods so that 14 to 16 degrees of travel are available from the neutral to the DOWN position. Maintain at least 1/8 inch distance between the aft edge of the bellcrank and the aft bulkhead (FS. 257.606).
b. Rig the cables to the tension shown on the rigging diagram, adjusting the cables so the control column has a 1/16 to 1/8 inch cushion when in the full forward position.
c. Adjust the up stop to obtain 24 to 26 degrees UP travel from the neutral position and tighten locknuts.
d. Employing a hand force gage on the control wheel, adjust the elevator down springs as follows: on Model 33 aircraft, 23 maximum pounds break out force at 15° DOWN elevator, 17 to 19 pounds force through NEUTRAL elevator, and 10 to 15 pounds force as 25° UP elevator is reached; on all Model A33, B33, C33, C33A, E33, E33A, E33C, F33, G33 and F33A (serials prior to CE-316) F33C, 17 plus 1, minus 0 pounds force through NEUTRAL elevator and 16.5 plus 0, minus 1 pound force as 25° full UP (.06 inch off of full up stop) elevator is reached; on Model F33A aircraft serials CE-316 and after, 17 plus 1, minus 1 pound force as 25° full UP (.06 inch off of full up stop) elevator is reached. The gage readings at NEUTRAL elevator and 25° (.06 inch off of full up stop) elevator must be taken while the control wheel is in motion. Adjust each spring by transferring the upper end to a spring attaching hole providing increased or decreased tension as applicable. The elevator system should have sufficient freedom to allow free return of the elevator from full UP to full DOWN.

NOTE

After rigging the elevator and the elevator trim tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim tab control wheel is moved toward the NOSE DOWN position, the elevator trim tab should move UP.

RIGGING THE ELEVATOR TRIM TAB

a. Place cabin control indicator in the neutral position.
b. Rig cables to the tension shown on the rigging diagram.
c. Place elevator in neutral position and adjust the trim tab push rod to bring the tab into the neutral position.
d. Adjust stops on cables to allow proper travel. Refer to Elevator Rigging Diagram for proper tab travel.
NOTE

After rigging the elevator and the elevator trim tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim tab control wheel is moved toward the NOSE DOWN position, the elevator trim tab should move UP.

ELEVATOR TRIM TAB ACTUATOR REMOVAL

a. Remove the access panel near the trailing edge of the horizontal stabilizer to gain access to the elevator trim tab actuator.
b. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.
c. Remove the access panel on the left hand side of the fuselage just forward of the horizontal stabilizer.
d. Remove the access panel near the leading edge of the horizontal stabilizer to gain access to the elevator trim tab actuator sprocket.
e. Remove the elevator as outlined in Section 3 of this Shop Manual under the heading ELEVATOR REMOVAL.
f. Disconnect the elevator trim tab cables at the turnbuckles in the aft fuselage. Secure the forward elevator trim tab cables to prevent them from unwinding at the universal.

cAUTION

Do not damage the cables. Use a material such as phenolic to protect the cables.
g. Remove the chain and cable assembly from the elevator trim tab actuator sprocket.
h. Remove the hardware attaching the elevator trim tab actuator to the horizontal stabilizer. Remove the actuator from the airplane.

NOTE

If the actuator is to be reinstalled, identify with a tag to ensure proper movement of the elevator tabs upon reinstallation of the actuators.

ELEVATOR TRIM TAB ACTUATOR INSTALLATION

WARNING

To ensure proper movement of the trim tabs, make sure that the RH actuator is installed on the right hand horizontal stabilizer and that the LH actuator is installed on the left hand horizontal stabilizer.

NOTE

After rigging the elevator and elevator trim tab control system, check for correct movement of the control surfaces with respect to the movement of the controls. When the elevator trim tab control wheel is moved toward the NOSE DOWN position, the elevator trim tab should move UP.

g. Install the access panel, located near the leading edge of the horizontal stabilizer.
h. Install the access panel, located near the trailing edge of the horizontal stabilizer.
i. Install the access panel on the left hand side of the fuselage, just forward of the horizontal stabilizer.
j. Connect the tail navigation light wire and install the tail cone.

ELECTRIC TRIM TAB ACTUATOR REMOVAL

a. Remove the access door on the fuselage just below the leading edge of the L.H. stabilizer.
b. Disconnect the actuator wire harness at the disconnect splices.
c. Disconnect the actuator cable at the turnbuckle. Tape the cable to the actuator to prevent unwinding of the cable.
d. Remove the three bolts securing the actuator to the bracket. The actuator may now be removed from the aircraft.

ELECTRIC TRIM TAB ACTUATOR INSTALLATION

Installation procedure is the reverse of the removal procedure. Tab rigging and cable tension are identical to the manually operated tab.
NEW TAB CABLE INSTALLATION

Note the position of the old cable in relation to the cable drum and forward end cable fittings. Install the new cable in the same positions.

MAGNETIC CLUTCH REMOVAL

(See Figure 3-3A)

a. Remove the lid from the clutch housing.
b. Loosen the setscrew in the clutch rotor and armature hubs.
c. Remove the motor from the clutch housing.
d. Slide the cable drum and shaft assembly from the clutch housing.
e. Remove the clutch from the clutch housing.

MAGNETIC CLUTCH INSTALLATION

Installation procedure is the reverse of the removal procedure. No lubrication is required. Tighten the clutch armature setscrew until there is no visible end play in the cable drum shaft. Slide the clutch rotor on the motor shaft to obtain .010 to .015 clearance between the friction surfaces of the clutch before tightening the setscrew. Stake both setscrews.

NOTE

With no visible end play in the cable drum shaft, the clutch faces must not make contact while the clutch is de-energized or damage to the clutch will result.

Figure 3-3A. Electric Trim Tab Actuator

ELECTRIC TRIM TAB ACTUATOR BRUSH WEAR LIMITS

14 VOLT SYSTEM (CE-1 thru CE-771 except CE-748; CJ-1 thru CJ-148)

Replace the brushes at intervals of 2000 operating hours.

28 VOLT SYSTEM (CE-748, CE-772 and after; CJ-149 and after)

Replace the brushes at intervals of 2000 operating hours.

MAGNETIC CLUTCH TORQUE TEST (14 volt system)

The following procedure should be performed any time the magnetic clutch is replaced.

a. Use a 14 vdc power source and connect the red electrical lead of the magnetic clutch to ground and the white electrical lead to the power source. Using a torque wrench, check that the clutch holds with 30 inch-pounds of torque applied at the actuator shaft.

b. If the static torque of the clutch is less than 30 inch-pounds, burn in the clutch as follows:

1. Find a metal plate of sufficient thickness for rigidity and large enough to fit in a vise with the actuator assembly attached. Anchor the plate in a vise and drill 3 holes in the plate to match the actuator mounting holes. Bolt the actuator to the plate.

2. Locate a blade type screwdriver or similar tool that will fit the shaft on which the cable drum is mounted.

3. Remove the handle from the screwdriver or fabricate a similar tool so that a low speed (approximately 450 rpm) ½ inch drill motor may be attached to the screwdriver or similar tool.

4. Secure the screwdriver in the ½ inch drill motor.

5. Remove the access plate from the clutch housing and blow the housing and clutch clean.

6. Using a regulated power source set at 7 to 8 volts dc, connect the red electrical lead of the clutch to ground the white electrical lead to the power source with alligator clips.

7. With the screwdriver in the slot in the drum shaft turn the drill motor on and run for 15 seconds. Turn the drill off and unclip the leads to the clutch.

8. Allow the clutch to cool for one minute before reattaching the lead for another fifteen second interval. Repeat the foregoing sequence until the clutch will hold 30 inch-pounds of torque as indicated in step "a" then blow the clutch and housing clean with compressed air. Install access plate on the clutch housing.

CAUTION

Exceeding the fifteen second burn-in periods may overheat and damage the magnetic clutch.
MAGNETIC CLUTCH TORQUE TEST (28 volt system)  
(CE-748, CE-772 and after, CJ-149 and after)

The following check should be performed any time the magnetic clutch is replaced.

a. Using a 28 vdc power source, connect the red lead of the magnetic clutch to ground and the white lead to the power source. Using a torque wrench, check that the clutch holds with 30 inch-pounds of torque applied at the actuator shaft.

b. If the static torque of the clutch is less than 30 inch-pounds, burn the clutch as follows:

   1. Find a metal plate of sufficient thickness for rigidity and large enough to fit in a vise with the actuator assembly attached. Anchor the plate in a vise and drill 3 holes in the plate to match the actuator mounting holes. Bolt the actuator to the plate.
   2. Locate a blade type screwdriver or similar tool that will fit the shaft on which the cable drum is mounted.
   3. Remove the handle from the screwdriver or fabricate a similar tool so that a low speed (approximately 450 rpm) 1/2 inch drill motor may be attached to the screwdriver or similar tool.
   4. Secure the screwdriver in the 1/2 inch drill motor.
   5. Remove the access plate from the clutch housing and blow the housing and clutch clean with clean dry air.
   6. Using a regulated power source set at 14 to 16 vdc, connect the red electrical lead of the clutch to ground and the white lead to the power source with alligator clips.
   7. With the screwdriver in the slot in the drum shaft turn the drill motor on and run for 15 seconds. Turn the drill off and unclip the leads to the clutch.
   8. Let the clutch cool for approximately one minute before reattaching the lead for another 15 second interval. Repeat the foregoing sequence until the clutch will hold with 30 inch-pounds of torque as indicated in step “a”, then blow the clutch and housing clean with clean dry compressed air. Install the access plate on the clutch housing.

RUDDER REMOVAL

a. Detach the tail cone, disconnect the tail navigation light wire and remove the tail cone.

b. Remove the tail section access doors on the left hand side of the aft fuselage.

c. Remove the four attach bolts from the rudder bell crank.

d. Disconnect the rudder hinges and rudder bond cable.

e. Remove the rudder.

RUDDER INSTALLATION

a. Place the rudder in position.

b. Connect the rudder hinges and bond pipe.

c. Install the rudder bell crank attach bolts (torque to 50 to 70 inch-pounds).

d. Install the access doors.

e. Connect the navigation light wires.

f. Install the tail cone.

RIGGING THE RUDDER CONTROL SYSTEM

a. Place rudder pedals in the aft position.

b. Install rig pin in the holes provided in the pilot's rudder pedals.

c. Rig cables to the tension shown on the Rudder Rigging Diagram. (Bellcrank is in zero position.)

d. Adjust rudder travel at the rudder bellcrank stops.

Refer to Rudder Rigging Diagram for rudder travel.

e. Adjust rudder pedal travel at the rudder pedal stops.

f. Make sure that rudder movement corresponds to the movement of the rudder pedals.

CAUTION

Exceeding the 15 second burn-in periods may overheat and damage the magnetic clutch.
<table>
<thead>
<tr>
<th>CABLES</th>
<th>CABLE TENSION</th>
<th>SURFACE TRAVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEVATOR</td>
<td>25 LBS +5 LBS AT -5 50°F</td>
<td>25° ± 1° UB 15° ± 1° DOWN</td>
</tr>
<tr>
<td></td>
<td>25 LBS +5 LBS AT &quot;UP&quot; ELEVATOR -5 50°F CABLE</td>
<td>CD-315 AND AFTER</td>
</tr>
<tr>
<td></td>
<td>20 LBS -5 LBS AT &quot;DOWN&quot; ELEVATOR -5 50°F CABLE</td>
<td></td>
</tr>
<tr>
<td>ELEVATOR TAB</td>
<td>15 LBS +5 LBS AT -0 50°F</td>
<td>10° ± 1° UP 21° ± 1° DOWN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10° ± 1° UP CE-1 AND AFTER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21° ± 1° DOWN CE-1255 AND AFTER</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

*Big cable to lowest permissible tension when the Beechcraft New-Matic Flight Control System is installed.*
Figure 3-4. Rudder Control System
The following graphs specify the correct maximum and minimum cable tension permissible for the flight control systems when rigged at temperatures varying from 0°F to 110°F. The horizontal scale on the graph designates the temperature in degrees Fahrenheit at which the control cables may be rigged, and the vertical scale designates the correct tension in pounds for each temperature reading. Cable tensions are based on 59°F Ambient Air Temperature.

![Temperature Cable Tension Graph](image)

**Figure 3-5. Effect of Temperature upon Cable Tension**

Issued: November, 1970
TEMPERATURE CABLE TENSION GRAPH
CE-316 AND AFTER

"UP" ELEVATOR CABLE MAXIMUM

"UP" ELEVATOR CABLE MINIMUM

INTENTIONALLY LEFT BLANK

TEMPERATURE CABLE TENSION GRAPH
CE-316 AND AFTER

"DOWN" ELEVATOR CABLE MAXIMUM

"DOWN" ELEVATOR CABLE MINIMUM

Figure 3-5A. Effect of Temperature upon Cable Tension
Figure 3-5B. Effect of Temperature upon Cable Tension
33, A33, B33 and C33 Standard Installation
- B33 and C33 Fuel Lines for 40 Gallon Fuel Cell
- B33 and C33 Tank Vents for 25 Gallon Fuel Cell
- 33 and A33 Standard Tank Vents
- 33 and A33 Auxiliary Tank Installation

Effective on Airplane Serials CD-640 and after

Effective on Airplane Serials CD-388 through CD-639

Effective on Airplane Serials prior to CD-388

Figure 3-6. Fuel System (CD-1 through CD-1254)
FUEL SYSTEM MAINTENANCE

CAUTION

Any time the fuel system is drained or a fuel cell is replaced, air may enter the system. If the possibility that air has entered the system does exist, start and operate the engine on the ground until all air is removed from the system. Operate the engine for several minutes on each tank until proper engine operation is assured. Refer to the applicable Pilot's Operating Handbook and Airplane Flight Manual before starting and operating the engine.

INSTALLATION OF VELCRO TAPE WITH REPLACEMENT OF FUEL CELLS (PRIOR TO CD-1235 AND CE-290)

Airplanes that have had or will have existing fuel cells replaced with spare fuel cells P/N 35-380135-1, 35-380135-2, 35-380135-3, and 35-380135-4 should install Kit No. 35-9009S in the fuel cell liner top, bottom, root rib and spar as described below and in Service Instructions No. 0365-281. Serials CD-1235 and after and CE-290 and after are delivered from the factory with the equivalent of Kit No 35-9009S installed.

a. Remove the fuel cell as described under FUEL CELL REMOVAL.

NOTE

Airplanes that have had any of the above fuel cells previously installed do not require complete removal of the fuel cell. Access covers and inboard fittings should be removed and the inboard end of the fuel cell pulled back far enough to allow installation of the Velcro tape.

b. Lightly sand the surface that the Velcro tape will be bonded to as shown in Figure 3-6A and clean the sanded surface with naphtha.

c. Activate the velcro by dipping it into methyl ethyl ketone and press the Velcro tape in place as shown in Figure 3-6A.

d. Position the fuel cell in place and press the Velcro pile and hook together pressing outward in the area of the Velcro tape.

e. Inspect the flapper valve for free movement under its own weight. If the flapper valve binds, work up and down by hand until it works freely.

NOTE

Before closing the zipper, inspect the fuel cell for any foreign material.

f. Close the zipper and refer to FUEL CELL INSTALLATION for further instructions for installing the fuel cell.

NOTE

Installation of Kit No. 35-9009S is required on a first time basis only for each fuel cell. Repeat installations of the kit are unnecessary when new fuel cells are installed.

INSPECTION OF MAIN FUEL CELL FLAPPER VALVE

On airplanes that are equipped with baffled main fuel cells, the flapper valves (metal or phenolic) should be
inspected periodically (Beech Aircraft recommends that the inspection be accomplished at each annual inspection) for freedom of operation and proper seating.

The inspection may be accomplished as follows:

a. Drain all fuel from the airplane.

b. Remove the rectangular access plate located just outboard of the fuselage on the upper skin of each wing leading edge.

c. Cut the safety wire and remove the attaching bolts from the fuel cell access plate.

NOTE
Clean the area around the access plate before removing the plate.

d. Remove the fuel cell access plate and open the zipper in the baffle.

e. Locate the flapper valve in the lower outboard section of the baffle and determine if the flapper valve is metal or phenolic.

f. If the flapper valve is metal, it should be inspected and repaired, if necessary, as described below.

1. Move the flapper valve element through its full travel. There should be no binding and the element should seat securely against the valve plate.

2. If the flapper element binds and/or does not seat properly, the flapper element arm can be straightened by placing a screwdriver between the arm and the element and pressing the element toward the closed position.

3. If after straightening the arm, the flapper element still binds and/or does not seat properly, the flapper element should be removed and replaced with a new flapper element assembly. The flapper element assembly may be replaced by removing the two attaching bolts from the upper part of the flapper valve. The same attaching parts should be used to install the new flapper element assembly. The new flapper element assembly should be inspected after installation to determine that the assembly did not receive damage during installation that could cause it to bind and/or not seat properly.

g. If the flapper valve is phenolic, it should be inspected and reworked, if necessary, as described below.

1. Move the flapper valve element through its full travel. There should be no binding and the element should seat securely against the valve plate.

2. If the flapper element binds and/or does not seat properly, the upper rear side of the flapper element may be binding against the valve plate.

3. The flapper valve element may be relieved from binding by filing a small radius on the upper rear side of the element.

NOTE
A shop towel saturated with light oil may be placed directly below the flapper valve to absorb the phenolic dust during rework.

4. After determining that the flapper valve is functioning properly, thoroughly wipe the area in the vicinity of the flapper valve with an oil saturated shop towel.
h. Clean the gasket contact area on the fuel cell and fuel cell access plate.

i. Close the zipper in the baffle.

j. Install a new gasket, and secure the fuel cell access plate in place.

k. Tighten the fuel cell access plate attaching bolts to a torque of 45 to 50 inch-pounds and safety wire.

l. Reinstall the rectangular access plate on the wing leading edge skin.

**INSPECTION OF THE FUEL CELL VENT LINES**

a. On the 33 and A33, and on the B33, C33, and E33 equipped with 25-gallon (22 gallon usable) fuel cells, plug the tank filler neck opening of the siphon break line and open the tank filler neck. Blow through the end of the vent line and check for air coming into the tank through the extended vent line.

b. The end of the fuel tank vent line should extend 1-3/4 inches below the lower surface of the wing skin and have a gradual curve forward 10 degrees from vertical. The end of the vent is scarfed at a 45° angle, facing forward. This ensures a positive vent pressure. Any configuration other than described herein may create a negative vent pressure, thus pulling the air, or air and fuel from the tank.

c. On airplanes equipped with the flush vent system, block the flush vent and blow into the vent adjacent to the flush vent. Open the tank filler cap and listen for air blowing into the tank. To check for obstructions in the siphon break and for proper operation of the check valve in the vent line outboard of the fuel tank, blow air into the siphon break vent on the underside of the wing, outboard of the main fuel tank, then check that air comes out of the vent and the flush vent.

**FUEL TRANSMITTER REPLACEMENT**

a. Turn off electrical power.

b. Drain and purge the fuel cells.

c. Remove the access door on the upper wing at station 98.854.

d. Disconnect the transmitter wiring.

e. Cut the safety wire and remove the transmitter support screws.

**NOTE**

Clean the area around the transmitter before removing the transmitter.

f. Remove the transmitter and gasket from the fuel cell.

g. Inspect the fuel cell for wrinkles or other obstructions that might impede transmitter float travel.

h. Set the new gasket and transmitter in position and ensure that the float is unrestricted through its full travel from stop to stop. The float arm may be bent, if necessary to provide clearance.

i. Install the transmitter support screws, torque to 25 inch-pounds and safety.

j. Connect transmitter wiring. Turn the power on and check the fuel gage for empty reading.

**NOTE**

If the gage does not read empty, reinspect all transmitters to ensure the float arm is on the down stop and the float clears the bottom of the fuel cell. Check all wiring for faulty connections.

k. Fill the tanks and check the fuel gage for full reading.

**FUEL CELL REMOVAL**

a. Drain and purge the fuel cells.

b. Remove the outboard fuel cell access plate and fuel quantity sensor. (The outboard fuel quantity sensor is installed only in the 80-gallon fuel system).

c. Remove the inboard access cover and fuel quantity sensor.
d. Disconnect all fuel and vent plumbing.

e. Unsnap the fuel cell and remove it through the outboard fuel cell access hole.

CAUTION

Tape the edge of the access hole to prevent damage to the fuel cell.

FUEL CELL INSTALLATION

CAUTION

Care should be taken when replacing fuel cells to ensure that the correct type fuel cell is used as a replacement. All 33 series airplanes except CJ-149 and after use baffled fuel cells. CJ-149 and after incorporates a fuel cell with a non-collapsible fuel cell reservoir in place of a baffled fuel cell. To avoid damage to the fuel cells, the fuel cell cavities MUST be clean of any debris before installing a replacement cell.

a. Return the fuel cell through the outboard fuel cell access hole and snap it into place.

CAUTION

Before closing the zipper, inspect the fuel cell for any foreign material. If the cell is not thoroughly clean, it should be cleaned with a lint-free cloth moistened in water, alcohol or kerosene. No other solvent should be used to clean the fuel cell.

b. Close the zipper in the fuel cell dam. Reinstall the filler adapter, flow line, quantity sensors, drain and access covers that were previously removed. Use new Gaskets.

c. Apply a thin film of Simonize wax to metal flow tubes as a lubricant. No other lubricant should be used.

Fuel Cell Nipple Clamp Torques

<table>
<thead>
<tr>
<th>Inside diameter (in) of nipple</th>
<th>Inch-pounds of torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>.25 thru .62</td>
<td>12 to 16</td>
</tr>
<tr>
<td>.75 thru 1.00</td>
<td>15 to 20</td>
</tr>
<tr>
<td>1.50</td>
<td>25 to 30</td>
</tr>
<tr>
<td>2.00</td>
<td>30 to 35</td>
</tr>
<tr>
<td>3.00</td>
<td>35 to 40</td>
</tr>
</tbody>
</table>

CAUTION

If replacement Goodyear fuel cells have clear/yellow nipples, torque the fuel cell nipple clamps to 25 ±5 inch-pounds.

FUEL QUANTITY INDICATOR CALIBRATION (CE-409 AND AFTER, CJ-52 AND AFTER)

EMPTY POSITION

a. Make certain the fuel cell is empty.
b. Remove the access cover from over the transmitter.

c. Disconnect the electrical wiring.

d. Remove the fuel quantity transmitter.

e. Bend the arm as required to get a correct reading on the indicator.

f. Install the transmitter.

g. Connect the electrical wiring.

h. Install the access cover.

FULL POSITION

a. Remove the glareshield from over the instrument panel.

b. Locate the two printed circuit boards located on the back of the instrument panel just to the left of center.

c. Locate the calibration screw in the back of each printed circuit board.

NOTE

Calibration should be done only with a bus voltage of 14.25 ± .25 or 28.25 ± .25 as applicable to the airplane system.

d. Calibrate the fuel quantity indicator as follows:

1. Ensure that the fuel tank that corresponds to the fuel quantity indicator being calibrated is full.

2. Turn the calibration screw in back of the corresponding circuit board until the needle on the fuel quantity indicator points to the "F" (full) mark.

e. Reinstall the glareshield.

ENGINE FUEL PUMP ADJUSTMENT

a. Tee into either the fuel pump outlet fitting or metering unit inlet fitting (whichever is more accessible) with an appropriate pressure gage and extended fuel line to observe fuel pump pressures. (This gage should be vented to atmosphere).

b. Adjust the engine idle speed to the specified RPM with the throttle plate adjusting screw, clockwise to increase, counterclockwise to decrease air.

c. Turn the fuel pump relief valve adjustment on the centerline of the pump, to obtain the pump pressure limits specified for idle RPM, clockwise to increase pressure, counterclockwise to decrease pressure.

d. Maintaining idle pump pressure and idle RPM, obtain the correct idle mixture with the adjustment provided at the metering unit. Optimum idle mixture exists if, upon leaning with the mixture control, an increase of 25 to 50 RPM is experienced.

NOTE

The preceding steps have provided the correct idle pump pressure, correct fuel flow and correct metering cam to throttle plate orientation.

NOTE

Do not adjust idle mixture without first determining that idle pump pressure is correct.

e. Advance to full throttle and maximum rated engine RPM to check pump pressure and nozzle (metered) pressures or flows.

NOTE

Nozzle pressure or flow values may be monitored by either the gage in the airplane or an auxiliary pressure gage tee'd into the fuel manifold valve pressure port.

Criteria for full throttle full rich adjustment of the fuel system should be specified nozzle pressure of flow values. Unmetered pump pressures at full throttle are included for reference only and may be used for troubleshooting the metering unit portion of the fuel system.

f. To obtain specified values of nozzle pressure or fuel flow at full throttle and rated RPM, turn the variable orifice adjusting screw (located on the side of the pump) clockwise to increase
FUEL FLOW CHART

All top end values are shown for rated RPM and manifold pressure.

<table>
<thead>
<tr>
<th>Engine</th>
<th>RPM Propeller</th>
<th>Unmetered or Pump Pressure (psi)</th>
<th>Metered or Nozzle Pressure (psi)</th>
<th>Fuel Flow Lbs./Hr.</th>
<th>Fuel Flow Gal./Hr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO-470-J, K and N</td>
<td>600</td>
<td>9-11</td>
<td>2.0-2.5</td>
<td>123-130</td>
<td>21-22</td>
</tr>
<tr>
<td>IO-470-J, K and N</td>
<td>2600</td>
<td>25-27</td>
<td>15.5-16.5</td>
<td>136-144</td>
<td>23-24</td>
</tr>
<tr>
<td>IO-470-B and BA</td>
<td>600</td>
<td>9-11</td>
<td>2.0-2.5</td>
<td>123-130</td>
<td>21-22</td>
</tr>
<tr>
<td>IO-520-B and BA</td>
<td>2700</td>
<td>28-31</td>
<td>15.5-16.5</td>
<td>136-144</td>
<td>23-24</td>
</tr>
</tbody>
</table>

pressure and counterclockwise to decrease pressure.

NOTE
If at static run-up, rated RPM cannot be achieved at full throttle, adjust nozzle pressure or flow slightly below limits, making certain specified values are achieved when rated RPM is achieved during takeoff roll.

NOTE
The procedure for adjusting fuel systems without variable orifice pumps (early IO-470 engines) is the same as above. However, all pressure values must be obtained with adjustment of the fuel pump relief valve only.

RESERVOIR INSTALLATION

Install the reservoir after the fuel cell is in the wing and before the access plate is installed. Installation may be accomplished as follows:

a. Tape the reservoir flapper valve shut before installing the reservoir.

b. Compress the reservoir (squeeze by hand) into a small circumference and pass it through the fuel access ring into the fuel cell.

c. Release the reservoir allowing it to assume its original shape.

d. Insert the connector assembly into the reservoir while tilting both the reservoir and connector assembly upward.

CAUTION
Care should be exercised to avoid cross threading the connector into the reservoir. Also avoid bending or distorting the fuel strainer which is attached to the end of the connector, for it may become entangled in the foam inside of the reservoir.

e. Thread the connector assembly into the reservoir until it will advance no further with threads freely engaged.

f. Tighten the nipple clamp.

g. Connect the fuel line to the connector assembly.

RESERVOIR REMOVAL

a. Remove the access panels from the wing as required to gain access to the reservoir.

b. Remove the tape from the flapper valve.

c. Remove the nipple clamp.

d. Remove the connector assembly by unscrewing it from the reservoir.

e. Compress the reservoir (squeeze by hand) into a small circumference and remove it through the fuel access ring in the wing surface.
Fuel System, CJ-1 and after
Figure 3-6C

h. Remove the tape from the flapper valve and check the valve for free play and good sealing.

i. Check to make sure the reservoir is positioned properly on the bottom of the fuel cell.

j. Close all access openings used for installing the reservoir.

FUEL CELL LEAK CHECK

a. Check the lower surface of the wing for evidence of fuel seepage, particularly around vents and drains.

b. If there is evidence of seepage, remove the access plates on the lower wing and inspect the area between the fuel cell and the wing skin for fuel seepage.

c. Check the fuel cell nipples to determine if material can be scraped off with a fingernail.

d. If the fuel cell has been repaired, drain and purge the cell.

e. Inspect the condition of the patch using a mirror and flashlight.

NOTE

If fuel seepage is noted and the fuel cells appear hard and brittle, if small cracks are apparent around vents, drain outlets or
interconnect nipples or if material can be scraped off the nipples with a fingernail, the fuel cell should be replaced. Fuel cells having repairs that show evidence of blisters or loose edges should also be replaced.

**CAUTION**

Bladder type fuel cells on airplanes which have been in service for extended periods may have become hard and brittle. These fuel cells should be checked very carefully. The inspection at this time could cause cracks in the material which in turn could cause fuel seepage.

f. If seepage from a fuel cell is confirmed, the age and general condition of the cell should be considered. Fuel cells that are pliable and are not hardened and have nipples that material cannot be scraped off with a fingernail may be considered repairable.

**NOTE**

Goodyear BTC-39 construction type fuel cells removed from the airplane for any reason MUST BE REPLACED and MUST NOT BE REPAIRED or REINSTALLED in the airplane.
1. Fresh Air Intake (Engine Baffle)
2. Fresh Air Intake (Nose)
3. Mixer Valve (Cold Position)
4. Overboard Vent
5. Heated Air
6. Heater Muffler
7. Fresh Air (R.H. Wing Root)
8. R.H. Forward Outlet
9. Defroster Control
10. Cabin Heat Control
11. Aft Outlet (R.H. Front Seat)
12. Aft Cabin Outlet
13. Fixed Exhaust (Below Baggage Door)
14. Overhead Fresh Air Outlet (Optional)
15. Fresh Air Intake (Serials CE-26 thru CE-248, CJ-1 thru CJ-13)
16. Fixed Exhaust (Fuselage Bottom)
17. Fresh Air Intake (Serials CE-1 thru CE-25)
18. Overhead Fresh Air Shutoff Control (Serials CE-26 thru CE-248, CJ-1 thru CJ-13)
20. Individual Overhead Fresh Air Outlets
21. Overhead Fresh Air Scoop and Diffuser Valve Control (Serials CE-1 thru CE-25)
22. Aft Cabin Heat Control
23. Vent Shutoff Control
24. Fresh Air (L.H. Wing Root)
25. L.H. Forward Outlet
26. Defroster
27. Overhead Fresh Air Shutoff Valve (Serials CE-26 thru CE-248, CJ-1 thru CJ-13)

Figure 3-8. Heat and Vent System (Serials CE-1 through CE-248; CJ-1 through CJ-13)
Figure 3-8A. Heat and Vent System (Serials CE-249 through CE-289; CJ-14 through CJ-25)

Issued: November, 1970
1. Fresh Air Intake (Engine Baffle)
2. Fresh Air Intake (Nose)
3. Mixer Valve (Cold Position)
4. Overboard Vent
5. Heated Air
6. Heater Muffler
7. Fresh Air (R. H. Wing Root)
8. R. H. Forward Outlet
9. Defroster Control
10. Cabin Heat Control
11. Aft Outlet (R. H. Front Seat)
12. Aft Cabin Outlet
13. Fixed Exhaust (Rear Of Hatshelf)
14. Overhead Fresh Air Outlet (Optional)
15. Fresh Air Intake
16. Fixed Exhaust (L. H. Side of Fuselage)
17. Overhead Fresh Air Shutoff Control
18. Overhead Adjustable Exhaust
19. Individual Overhead Fresh Air Outlets
20. Aft Cabin Heat Control
21. Vent Shutoff Control
22. Fresh Air (L. H. Wing Root)
23. L. H. Forward Outlet
24. Defroster
25. Overhead Fresh Air Shutoff Valve

* (CD-1256 and after)

** Removed at CJ-129 and after

Figure 3-8B. Heat and Vent System (Serial CE-290 thru CE-315; CJ-26 and after; CD-1255 and after)
1. Fresh Air Intake (Engine Baffle)
2. Fresh Air Intake (Nose)
3. Mixer Valve (Cold Position)
4. Overboard Vent
5. Heated Air
6. Heater Muffler
7. Fresh Air (R.H. Wing Root)
8. R.H. Forward Outlet
9. Defroster Control
10. Cabin Heat Control
11. Aft Outlet (R.H. Front Seat)
12. Aft Cabin Outlet
13. Fixed Exhaust (Rear of Hatshelf)
14. Overhead Fresh Air Outlet (Optional)
15. Fresh Air Intake
16. Fixed Exhaust (L.H. Side of Fuselage)
17. Overhead Fresh Air Shutoff Control
18. Overhead Adjustable Exhaust
19. Individual Overhead Fresh Air Outlets
20. Aft Cabin Heat Control
21. Vent Shutoff Control
22. Fresh Air (L.H. Wing Root)
23. L.H. Forward Outlet
24. Defroster
25. Overhead Fresh Air Shutoff Valve

** Removed at CE-679 and after

Figure 3-8C. Heat and Vent System (Serial CE-316 and after)
AIR CONDITIONING SYSTEM
(CE-602 and after)

The optional air conditioning system is a recirculating 12,000 BTU cooling system. The system is controlled by a switch on the fuel control panel and 2 pressure sensing switches. The circuit breaker, and switch which control the system are located on the fuel control panel (console) and placarded A/C CIR BKR or AIR COND OFF HI LO respectively.

At CE-748, CE-772 and after the circuit breaker was moved to the right hand sub panel.

The air conditioner is wired through the right landing gear uplock position switch, the left landing gear safety switch, and the normally closed full throttle switch. With the air conditioner operating on the ground the control circuit is wired through the left landing gear safety switch, which fully opens the condenser air scoop door located under the airplane. With the gear extended and the throttle fully opened, action of the full throttle switch will remove power from the compressor clutch coil, and drive the condenser scoop door closed. When the airplane is airborne and the landing gear is retracted, power is transmitted from the normally open contacts of the full throttle switch (actuated closed when the throttle is fully open) through the right landing gear uplock position switch (actuated closed when the gear is up and locked) through the normally open contacts of the door flight position limit switch (actuated closed when the gear is up and locked) through the normally open contacts of the door flight position limit switch (actuated closed when the condenser is retracted) to the condenser air scoop actuator. The actuator then operates to extend the condenser to the flight position. The limit switch, which is located at the aft end of the door, is no longer actuated at this position and power is then transferred to the compressor clutch coil, permitting operation of the compressor.

The entire air conditioning system is protected by a 30 amp circuit breaker. The compressor and condenser air scoop door have the added protection of a 10 amp fuse, located on the forward side of the firewall in front of the copilot. This allows the evaporator fan to be operated after the compressor has been removed from the system by a blown fuse.

On CE-602 through CE-771 except CE-748 the entire air conditioner system is protected by a 30 amp circuit breaker. The compressor and condenser air scoop door have the added protection of a 10 amp fuse. On CE-748, CE-772 and after the entire system is protected by a 10 amp circuit breaker. The compressor and condenser air scoop door are protected by two separate 5 amp fuses. The fuses are located on the forward side of the firewall in front of the copilot. This allows the evaporator fan to be operated after the compressor has been removed from the system by a blown fuse.

A light independent of the air conditioner circuit is actuated by the condenser air scoop door, through the left landing gear (nose gear on the 28 volt airplanes) uplock position switch normally closed contacts (closed with the landing gear extended) which will indicate a door open condition while the gear is extended.

The high pressure sensing switch (mounted on the right forward face of the front spar carry through) monitors the pressure of the refrigerant from the compressor to the expansion valve. The normally closed high pressure switch will actuate, causing an open circuit to the compressor clutch coil when the pressure in the line reaches 390 ± 10 psi, which disables the compressor. The high pressure switch automatically resets to the normally closed position when the refrigerant falls to a safe pressure. There is also a high pressure poppet relief valve, located on the forward side of the firewall, which will release the system if the pressure reaches 450 psi, and will reset again at 400 psi.

The low pressure switch, (mounted below the entrance door forward of the spar) normally open (actuated closed when the system is charged with refrigerant) senses system pressure. The switch closes, actuating the compressor clutch coil, when the line pressure exceeds 5 to 8 psi. The low pressure switch will prevent damage to the compressor should oil and/or refrigerant loss occur.

The condenser air scoop door under the airplane automatically opens when the air conditioner is turned on. On the ground the door opens to approximately 3 inches. In flight the door opens to approximately 3/4 + 1/4 = 0 inch. The air scoop door actuator limit switches are preset with no adjustment required.

The belt-driven compressor, which is coupled with a magnetic clutch, compresses the refrigerant to a high pressure, high temperature gas. This gas passes through the condenser where cooling air removes heat from the gas, condensing it to a liquid state. The liquid then passes through the expansion valve where it is metered into the evaporator at a rate of 55 psi, which allows most of the liquid to return to a gas. The heat required for evaporation is absorbed from cabin air passing over the evaporator coils. After passing through the evaporator, the refrigerant returns to the compressor at a reduced pressure.

MAINTENANCE OF AIR CONDITIONER

Servicing the air conditioning system consists of periodically checking the refrigerant level, checking compressor oil level and changing the system air filter. Recharge the system whenever the refrigerant level is low. Air has entered the system or components carrying refrigerant are replaced. Refrigerant leaks may be detected by inspection with flameless leak detector.
PRECAUTIONARY SERVICE MEASURE

Before any service is attempted which requires opening of refrigeration plumbing or units, the person doing the work should be thoroughly familiar with instructions on servicing the system. He should follow very carefully these instructions when performing the tasks that will maintain this system in a proper functioning order.

The major reasons for these measures are for safety and to prevent dirt and moisture from entering the system. Dirt contaminant may cause leaky valves or wear in the compressor. Moisture may not only freeze into ice at expansion valve, but can also cause the formation of hydrochloric or hydrofluoric acids in the system.

All precautions should be taken to prevent damage to fittings or connections. Even minute damage to a connection could cause it to leak. Any fittings getting grease or dirt on them should be wiped clean with a cloth dampened with alcohol. Do not use chlorinated solvents such as trichloroethylene for
Figure 3-8D. Air Conditioning System (CE-602 and after)
cleaning agent, for they are contaminants. If dirt, grease or moisture gets inside lines and cannot be removed, the lines will have to be replaced. Use a small amount of clean 500 viscosity refrigeration oil (Texaco Capella E or equivalent) on all line joints and dip the O-ring in this oil before assembling the joint. This will help in making a leak-proof joint.

**WARNING**

A face shield should be worn when servicing the lines: refrigerant, coming in contact with the eyes, can cause the loss of sight.

**CAUTION**

Insufficient torque, when tightening tubing connections, can result in loose joints and excessive torque can result in deformed joint parts. Either condition can result in refrigerant leakage.

When connecting aluminum fittings in the refrigerant system, torque all 5/8-inch fittings to 18 - 21 foot-pounds and all 1/2-inch fittings to 11 - 13 foot-pounds.

**NOTE**

The receiver-dryer is the last assembly to be connected. This is necessary to ensure maximum moisture protection of the refrigeration system.

For charging the air conditioner or checking the oil see Section 2.

**AIR CONDITIONING FUNCTIONAL TEST**

With the engine running at 1000 rpm and the system on, observe the sight glass, if refrigerant appears milky or bubbles appear charge the system as noted in CHARGING THE AIR CONDITIONING SYSTEM in Section 2. Check the system for leaks using a flameless leak detector.

**SYSTEM LEAK DETECTION**

A reduction of system cooling ability or the presence of bubbles in the refrigerant, may indicate a partial loss of refrigerant. Check for bubbles in the sight glass located under the copilot seat. The sight glass should be checked during operation at maximum available ambient and cabin temperatures. Streams of bubbles past the glass or foam in the glass indicates an inadequate refrigerant quantity. If a loss of refrigerant is suspected; an inspection of the system plumbing should be carried out to locate the source of the leak. Large leaks may be located by the appearance of oily spots where oil has been carried out by escaping refrigerant. Small leaks, which are much more difficult to locate, may be detected by detergent bubbles, or an electronic detector.

**COMPRESSOR BELT TENSION ADJUSTMENT**

After 36 to 48 hours operating time, a new belt will stretch to its normal operating length. The belt tension should be checked at this time and adjusted (by tightening the adjustment bolt on the idler pulley bracket) so that a belt tension gage, placed at a point midway between the idler pulley and the compressor will register a belt tension of 70 pounds or with a 0.13 inch deflection with 6.38 pounds load. After adjusting the belt tension, be sure the belt has ample clearance on all sides.

**COMPRESSOR BELT REMOVAL**

a. Open the engine cowling to gain access to the compressor belt.
   b. Loosen the adjustment bolt on the idler pulley bracket to remove tension on the compressor belt.
   c. Remove the compressor belt.

**COMPRESSOR BELT INSTALLATION**

a. Install the compressor belt over the compressor pulley, idler pulley and drive pulley.
   b. Tighten the adjustment bolt on the idler pulley bracket to increase tension on the compressor belt as stated in COMPRESSOR BELT TENSION ADJUSTMENT.
   c. Close the engine cowling.

**CONDENSER REMOVAL**

a. The condenser is located beneath the airplane aft of the main spar carry through.
   b. Remove the beacon light.
   c. Remove the fairing aft of the condenser.
   d. Disconnect the hoses at the condenser and cap the 4 openings.
   e. Remove actuator bolts.
   f. Remove the attach bolts.
   g. Remove the condenser.

**CONDENSER INSTALLATION**

a. Place the condenser in position.
   b. Secure condenser by the attaching bolts.
   c. Install the actuator bolt.
   d. Connect the hoses to the condenser.
   e. Install the fairing.
   f. Install the beacon light.

**CONDENSER CONTROL RIGGING**

The condenser is controlled by the electrical circuitry that controls the airscoop actuator. Check condenser for proper operation. If condenser fails to operate, check for open circuit between the PRESS AIR COOL switch and control actuator.
Figure 3-8E. Air Conditioning System Schematic
COMPRESSOR REMOVAL

a. Open the right engine cowling.
b. Remove electrical leads from compressor clutch terminals.

c. Disconnect refrigerant lines at the compressor. Cap refrigerant lines and compressor fittings.
d. Remove compressor belt as noted in COMPRESSOR BELT REMOVAL in this Section.
e. Remove the compressor mounting bolts and nuts and remove compressor.

WARNING

The air conditioning system is a high pressure system. When disconnecting a line, loosen the fittings just enough to bleed off pressure slowly, then disconnect the fitting.

c. Remove electrical leads from compressor clutch terminals.

COMPRESSOR INSTALLATION

a. Position compressor on the mounting bracket and install the attaching bolts and nuts.
b. Install compressor belt as noted in COMPRESSOR BELT INSTALLATION in this Section.
c. Adjust belt tension as noted in COMPRESSOR BELT TENSION ADJUSTMENT in this Section.
d. Remove caps from lines and compressor and install lines to the fittings on the compressor.
e. Install the electrical leads to the magnetic clutch.
f. Service the system with oil as noted in CHECKING COMPRESSOR OIL LEVEL in Section 2.
g. Charge the system with refrigerant as noted in CHARGING THE AIR CONDITIONING SYSTEM in Section 2.
h. Close the engine cowling.

VENTILATION BLOWER REMOVAL

a. Remove the pilot and copilot seats.
b. Remove the spar cover.
c. Disconnect the electrical leads from the motor.
d. Remove the bolts which attach the blower to the evaporator and remove the blower.

VENTILATION BLOWER INSTALLATION

a. Position the blower assembly on the evaporator.
b. Bolt the assembly to the evaporator.
c. Connect the electrical leads to the evaporator.
d. Install the spar cover.
e. Install the pilot and copilot seats.

EVAPORATOR REMOVAL

a. Remove the pilot and copilot seats.
b. Remove the filter cover and filter.
c. Remove the cover assembly from over the ducts.
d. Disconnect the drain tubes and remove the tape between the evaporator and ducts.
e. Remove the spar cover.
f. Remove the ducts.
g. Loosen the refrigerant inlet line connection just enough to allow all pressure to bleed off.
h. Remove the electrical leads from the motor.
i. Remove the refrigerant lines and cap the four openings.
j. Remove the bolts attaching the evaporator to the floor, and remove the evaporator.

EVAPORATOR INSTALLATION

a. Position the evaporator in the airplane and install the bolts attaching it to the floor.
b. Attach the refrigerant lines.
c. Attach the electrical connections to the motor.
d. Install the ducts, tape (No. 27 Minnesota Mining and Manufacturing Co.) the duct to the evaporator, and connect the drain tubes.
e. Install the spar cover.
f. Install the filter and filter cover.
g. Install the cover over the ducts.
h. Install the pilot and copilot seats.

EVAPORATOR FILTER REPLACEMENT

The evaporator filter should be replaced on condition. To gain access to the filter remove the screws in the filter cover.
<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>PROBABLE CAUSE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b. Obstructed to disconnected air duct.</td>
<td>b. Remove obstruction or repair.</td>
</tr>
<tr>
<td></td>
<td>c. Compressor clutch or belt slipping.</td>
<td>c. Repair or adjust.</td>
</tr>
<tr>
<td></td>
<td>d. Evaporator filter clogged.</td>
<td>d. Replace.</td>
</tr>
<tr>
<td></td>
<td>e. Refrigerant level low.</td>
<td>e. Leak-test and recharge.</td>
</tr>
<tr>
<td></td>
<td>b. Blower not functioning.</td>
<td>b. Repair.</td>
</tr>
<tr>
<td></td>
<td>c. Leak in system.</td>
<td>c. Leak-test and recharge.</td>
</tr>
<tr>
<td></td>
<td>d. Compressor valves inoperative.</td>
<td>d. Repair or replace.</td>
</tr>
<tr>
<td></td>
<td>b. Air in system.</td>
<td>b. Purge and recharge system.</td>
</tr>
<tr>
<td></td>
<td>c. Mount or compressor bolts loose.</td>
<td>c. Tighten.</td>
</tr>
<tr>
<td></td>
<td>d. Drive pulley loose.</td>
<td>d. Tighten.</td>
</tr>
<tr>
<td></td>
<td>b. Defective belt.</td>
<td>b. Replace.</td>
</tr>
<tr>
<td></td>
<td>c. Low refrigerant level.</td>
<td>c. Add refrigerant.</td>
</tr>
<tr>
<td></td>
<td>e. Defective compressor.</td>
<td>e. Replace.</td>
</tr>
<tr>
<td></td>
<td>b. Overcharged.</td>
<td>b. Correct refrigerant level.</td>
</tr>
<tr>
<td></td>
<td>c. Air in system.</td>
<td>c. Evacuate and recharge.</td>
</tr>
</tbody>
</table>
TROUBLESHOOTING
AIR CONDITIONING SYSTEM
(Continued)

TROUBLE  PROBABLE CAUSE  REMARKS
8. Excessive belt wear.  
a. Pulleys not in line.  a. Align pulleys.
b. Belt too tight.  b. Adjust or replace.
c. Pulley groove wrong size.  c. Replace.
d. Belt width wrong.  d. Replace.
a. Check all causes above.  a. Correct or replace.

BRAKES

BLEEDING BRAKES

NOTE
Pressure bleeding is the only procedure recommended. Electrical and gravity bleeding are acceptable alternatives only when pressure bleeding is impossible.

a. Remove back plate, pressure plate, and bleeder cap.
b. Rotate brake cylinder until bleeder screw is straight up.
c. Loosen bleeder screw approximately one half turn and bleed brakes according to standard shop practices.

NOTE
To avoid spilling brake fluid during bleeding, a piece of plastic tubing may be pressed over the bleeder screw.

d. Wipe brake fluid off brake cylinder.
e. Reassemble.

DETERMINING BRAKE LINING WEAR

The brake lining wear is indicated by the thickness of the linings. On Model 33, A33 and B33 airplanes prior to serial CD-640 except CD-625, CD-632, CD-637 and CD-638 that use the Cleveland brake installation, when a lining has worn to a thickness of 3/32 inch, it should be replaced. The brake disc should be replaced when worn to a thickness of .227 inch or less on airplane serials prior to CD-388, and on airplane serials CD-388 through CD-639 except CD-625, CD-632, CD-637 and CD-638 the brake disc should be replaced when worn to a thickness of .345 inch or less.

Airplane serials CD-625, CD-632, CD-637, CD-638 CD-640 through CD-1105, CE-1 through CE-172 are equipped with a ring disc type brake assembly. Replace the linings on this type of brake when the bottom of the brake housing is within 1/32 inch from the landing gear torque flange. When the thickness of the ring is .432 inch or less, replace the ring disc.

Airplane serials CD-1106 through CD-1271, CE-173 through CE-300 and CJ-1 and after are equipped with multi-disc brakes. Brake wear is determined by measuring the distance from the flat surface of the brake housing near the piston to the back of the pressure plate. The brake should be overhauled when the distance is .350 inch or more. Replace the rotating disc when their thickness is .104 inch or less. Replace the stationary disc when worn to a thickness of .100 inch or less. Replace the piston if the diameter is worn to .990 inch or less. Replace the pressure plate if worn to .150 inch or less.

Airplane serials CD-1272 and after and CE-301 and after are equipped with single disc brakes. The brake lining should be replaced before the metal back plate is exposed through the abrasive surface. This can be checked visually without disassembling the brake. The minimum allowable thickness for the abrasive surface is 3/32 inch above the rivet. The brake disc should be replaced when its thickness measures .330 inch.

TIRES

REPLACEMENT OF SIDEWALL INFLATION VALVE
(Prior to CD-635)

The U.S. Royal tubeless tire sidewall inflating valve used on the Model 33 airplanes can be replaced without removing the tire from the airplane. This short cut has been achieved by providing a 1/4-inch diameter hole in the clip end of later U. S. Royal inflating needle containers, through which the valve can be forced into the tire by means of a standard tire gage.

Replacement of the sidewall valve by this quicker method is described in the following procedural steps. If the new type U. S. Royal inflating needle container is not available, the older type can be reworked by dressing down the tapered end to obtain a hole of 1/4-inch diameter.
Set the parking brakes, install an airplane jack, and deflate the tire.

b. Raise the sidewall inflating valve head, grasp it with pliers, and pull the valve out of the tire.
c. Check the replacement valve by lubricating the inflating needle on the pad in the container and inserting the needle completely through the center of the valve.
d. Remove the lubrication pad from the inflating needle container and insert the replacement valve in the larger end of the container (head of valve out). Align the valve slot with the container clip to facilitate positioning the valve in the tire with the valve slot pointing toward the center of the wheel: this arrangement provides maximum valve service life.
e. Using a tire gage incorporating a plunger with a square or triangular tip, preferably square, work the valve down to the 1/4-inch diameter hole in the clip end of the container.
f. Lubricate the edge of the valve orifice in the tire with a small amount of cold patch rubber cement.
g. Position the container end and valve at the tire valve orifice, place a handkerchief or cloth over the head of the tire gage to protect the hand, and apply sufficient pressure on the gage to force the valve stem out of the container into the tire. (See illustration.) The sound of the valve shoulder being forced into the tire should be clearly audible.
h. Carefully work the container free of the valve head.
i. Check to see that the valve slot is pointing toward the center of the wheel for maximum valve service life.
j. Lubricate the inflating needle with the lubrication pad and insert the needle into the valve. Press and roll the inflating needle body against the valve to ensure proper seating.
k. Inflate the tire in the usual manner and remove the jack.

REPLACEMENT OF SIDEWALL INFLATION VALVE (CD-635 thru CD-813)
The sidewall inflating valve for the Nylon, tubeless tire used with the Goodyear brake installation, requires a replacement procedure different from that used for the tires covered in the preceding paragraph.

a. After lubricating the end of the inflating needle by pressing it against the glycerine-saturated pad in the case, lubricate the guide hole of the blue-colored valve with the needle.
b. Deflate the tire by inserting the lubricated end of the inflating needle into the guide hole of the valve with a rotary motion, taking care not to force the needle. If the needle does not enter easily, relubricate it and the guide hole of the valve.
c. After removing the valve core from the inflating needle to insure complete deflation of the tire, remove the tire from the wheel.
d. Cut off the inside shoulder of the defective sidewall valve with a pair of pincers or side-cutting pliers.

cAUTION

During this operation, use extreme care to avoid damaging either the tire liner or the sidewall rubber under the head of the valve, as any damage of the rubber in either of these areas may impair or destroy the air retention properties of the tire.

e. Working from the outside of the tire, raise the blue valve head until the valve can be pulled out of the tire with a pair of pliers.
f. Place a small amount of cold patch rubber cement into the valve hole on the tire and on the thicker part of the tapered portion of the replacement valve.
g. After wiping the cement from that part of the replacement valve projecting inside the tire, grasp the tapered end of the replacement valve between thumb and forefinger and, slowly rotating the valve to spread the rubber cement between the body of the valve and the valve hole in the sidewall of the tire, exert a strong steady pull until the head of the valve is seated in the recess provided for it on the outside of the tire.

h. Using pincers or side-cutting pliers, cut off the tapered extension of the replacement valve at a point just below the shoulder on the inside of the tire. When the tapered extension of the replacement valve has been cut off, the molded hole is visible at the center of the valve.

i. Inflate the tire in the usual manner and mount it on the wheel.

LANDING GEAR

EMERGENCY SPEED REDUCTION

In an emergency, the landing gear may be used to create additional drag. Should disorientation occur under instrument conditions, the lowering of the landing gear will reduce the tendency for excessive speed build-up. This procedure would also be appropriate for a non-instrument rated pilot who unavoidably encounters instrument conditions or in other emergencies such as severe turbulence.

NOTE

In event of emergency gear extension at speeds above normal extension speeds, inspect gear retract rods, and gear doors for damage or distortion before the next flight.

LUBRICATION OF LANDING GEAR UPLOCK ROLLERS

The uplock roller bearings should be lubricated with MIL-G-23827 grease, every 100 hours or any time that, while cleaning the wheel well, the bearings are subject to degreasing with solvent under pressure. The uplock bearing is now lubricated by means of a grease fitting installed in the uplock bearing bolt.

NOTE

The grease fitting on the drag leg, directly above the uplock roller bearing, does not supply lubrication for the uplock roller bearing.

RIGGING THE LANDING GEAR

Rigging the Bonanza 33 landing gear is the same as described in the BEECHCRAFT Bonanza 33 Shop Manual. However, at serials CD-1255 and after and CE-399 and after, the mechanical nose gear position indicator was deleted.

NOTE

Battery voltage is not sufficient to properly cycle the landing gear during rigging. On serials CE-748, CE-772 and after and CJ-149 and after, a 28.25 ± .25 volt auxiliary power unit capable of maintaining the initial setting within .25 volt during the extension and retraction cycles is recommended. On earlier serials use an auxiliary power supply capable of maintaining 14.25 ± .25 volts during the extension and retraction cycles.

NOTE

If the airplane is not equipped with an external power receptacle, a jumper cable can be used to connect the external power supply to the battery. Care should be taken to match polarities.

CAUTION

Excessive operation of the landing gear motor without proper cooling may cause damage to the motor. Allow a short period of time for cooling after each extension and retraction cycle.

SERVICING AND MAINTENANCE

Although similar in design to the landing gear used on older Bonanzas, the main landing gear installed on all Bonanza 33 airplanes and the nose landing gear strut installed on airplane serials CD-371 and after do not contain an internal stop. This modification affects the maintenance and servicing of the gear and necessitates the servicing precaution which follows.

The torque knees provide the extension stop for the lower shock absorber cylinder assembly. Do not attempt to remove the torque knees, the torque knee pins, or the bolt connecting the torque knees, when the airplane has been placed on jacks, without first deflating the shock absorber assembly. When they are disconnected the cylinder is free to slide out of the upper barrel assembly. It is permissible to remove and replace, or perform other maintenance to the torque knee assembly when the weight
of the aircraft rests on the struts. If the landing gear is removed from the airplane, the strut must be deflated before the torque knees, torque knee pins, or the connecting bolt may be disconnected or removed.

NOTE

Gear will not fit in gear well if torque knee is not correctly reassembled.

Do not attempt to interchange the upper and lower torque knees when replacing or reinstalling the knees. The cam, which holds the lower shock cylinder in the upper shock absorber, is cast to the lower torque knee. When the torque knees are correctly installed, and the strut is fully extended, the cam should contact the bevel on the lower shock absorber, stopping its downward travel.

NOTE

The welded steel truss, formerly used to secure the main landing gear to the wing structure on airplanes prior to serial CD-624, was replaced by a lighter, aluminum forging with bolted extrusions. The bushings installed at the attach points of the landing gear prior to this time required provisions for lubrication. The grease fittings provided to facilitate this lubrication have been removed from the present landing gear, since it is equipped with prelubricated press-in bushings that do not require such servicing. Other than this, all additional modifications made to standardize the landing gear were of a nature that necessitated no change in maintenance and servicing procedures.

REMOVING THE LANDING GEAR MOTOR

a. Remove the cabin front seat bottom(s).

b. Remove the access plate over the motor and disconnect the heater duct from the outlet.

c. Disconnect the electrical wiring at the landing gear dynamic brake relay.

d. Remove the three landing gear motor attaching bolts and remove the landing gear motor.

INSTALLING THE LANDING GEAR MOTOR

NOTE

The gearbox on the motor should be packed with approximately 1 ounce of grease MIL-G-81322 before the motor is installed on the actuator.

a. Position the motor on the actuator, and install the attaching bolts.

b. Safety the attaching bolts.

c. Connect the electrical wiring at the landing gear dynamic brake relay.

d. Connect the heater ducts, and install the access plate.

e. Install the cabin front seats.

LANDING GEAR SAFETY SYSTEM (OPTIONAL)

The optional landing gear safety system functions through the action of a solenoid in the landing gear position switch in conjunction with a three-position safety system switch, a relay and diode mounted on the front spar, two pressure switches mounted on the inboard side of the left main landing gear wheel well, and a microswitch located adjacent to the existing throttle position warning switch in the engine compartment.

Each pressure switch is connected into the pitot and static system. The pressure switch in the gear-up circuit is actuated by the pressure differential that exists between the pitot and static systems and will close with increasing pressure at approximately 90 mph. The pressure switch in the gear-down circuit will close with decreasing pressure at 120 mph. When the landing gear position switch is in the UP position and an air-speed of 90 mph has been attained, the pressure switch in the gear-up circuit closes and actuates a relay mounted on the front spar, thus completing the circuit and retracting the landing gear. A diode locks the relay in the closed position until the retraction cycle is completed. For the preceding to occur, however, the microswitch in the engine compartment must also be in the open position. This microswitch is actuated by the throttle control when the throttle is advanced sufficiently for the manifold pressure gage to register approximately 18 inches Hg. Conversely, if the throttle is retarded beyond
the position corresponding to approximately 18 inches Hg of manifold pressure, the microswitch will close. If at the same time the microswitch closes the airspeed has dropped below 120 mph, the resultant pressure differential between the pitot and static systems will actuate the pressure switch in the gear-down circuit. With both the microswitch and pressure switch closed, the current flow through the solenoid will cause the landing gear position switch to drop into the DOWN position, thus completing the gear-down circuit.

If the landing gear position switch is placed in the UP position while the landing gear safety system is in the ON position, the landing gears will retract only when the following conditions are mutually fulfilled:

1. The airplane must have attained an airspeed of at least 90 mph.
2. The throttle setting must have been advanced sufficiently to have produced a manifold pressure of approximately 18 inches Hg.

**NOTE**
The throttle switch is set at the factory to close when an approximate manifold pressure is produced at about 3000 feet of altitude. The approximate manifold reading for aircraft serials prior to CD-925 was 30 inches Hg and 18 inches Hg on aircraft serials thereafter. Airplane serials with the throttle switch set at the factory to 20 inches Hg may change to 18 inches Hg setting. Flight Manual Supplement P/N 35-364170-5, dated June 8, 1965 or later should be incorporated in the airplane if the manifold pressure is changed to 18 inches Hg.

By the same token, the landing gear automatically extends under the following conditions:

1. The airspeed must have dropped below 120 mph.
2. The throttle setting must have been retarded enough for manifold pressure to have dropped below approximately 18 inches Hg.

The safety system switch is a three position switch, with normally ON or OFF positions. The switch also contains a momentary or test position for checking that the system is functioning properly. When released from the test position, the switch returns to the ON position.

**SYSTEM MAINTENANCE AND ADJUSTMENT**

No maintenance is required for the landing gear safety system, other than replacing defective units or checking the electrical wiring for condition, security of attachment, and tightness of electrical connections. The switches are preset and adjustment will not normally be required; however, should the system fail to function properly, the following checks and adjustments may be accomplished:

**CHECK OF SYSTEM WITH SAFETY SWITCH IN TEST POSITION**

1. Place the throttle in the closed or retarded position.
2. Place the battery master switch ON. The landing gear circuit breaker may be either IN or OUT.
3. Place the landing gear safety system switch in the momentary full up (TEST) position. Noise or movement of the solenoid in the landing gear position switch indicates that the automatic landing gear extension part of the system is functioning properly. The on-off switch returns normally to the ON position unless the pilot intentionally places the switch in the OFF position.

**MICROSWITCH ADJUSTMENT**
The microswitch cannot be accurately adjusted on the ground. Before the microswitch is adjusted, it must be ascertained that the throttle warning horn switch is properly set (see this section for proper setting of the throttle warning horn switch). The microswitch may then be adjusted as follows:

1. With the airplane in flight, mark the throttle control at the control panel when the manifold pressure gage registers approximately 18 inches Hg.
2. With the airplane on the ground, move the throttle to the mark on the control panel just as it was when the mark was made while the airplane was in flight.
3. Adjust the microswitch until the cam clicks the switch closed with the throttle in the position indicated in the preceding step.

**PRESSURE SWITCH ADJUSTMENT**
The pressure switches are preset and will not normally require adjustment. Because of the built-in tolerance of these switches, they should not be tampered with unless radically out of adjustment, that is unless the switch in question fails to actuate at an airspeed within 2 mph above or below the setting recommended for it. Even then the system plumbing and electrical wiring should be checked to ascertain that the source of trouble is not something other than improper adjustment of the pressure switches.

1. Place the aircraft on jacks.
2. With the master switch ON, the landing gear circuit breaker ON, and the landing gear warning circuit OFF, advance the throttle to its maximum position.
3. Place the landing gear safety position switch in the ON position.

4. Place the landing gear position switch in the UP position.

5. Clamp a section of soft rubber tubing over the pilot head inlet, making certain that the connection is airtight.

6. Crimp the end of the tubing and roll it up until the airspeed indicator registers 90 mph. The landing gear will start retracting immediately if the pressure switch is properly adjusted.

**CAUTION**

To avoid rupturing the diaphragm of the airspeed indicator, the rubber tubing must be rolled SLOWLY.

7. If the landing gear failed to retract in the preceding step, turn the master switch OFF and adjust the pressure switch (upper switch of the two installed in the left main wheel well) as follows:

a. Secure the rolled up tubing so that it will hold the airspeed indicator reading at 90 mph.

b. Connect a continuity tester across the contacts of the pressure switch, then turn the adjustment screw until the switch closes at 90 mph on the airspeed indicator.

8. Turn the master switch ON and roll up the rubber tubing until the airspeed indicator registers 130 mph, then secure the tubing so that the airspeed indicator will hold that reading.

9. Retard the throttle.

10. Slowly bleed off pressure until the airspeed indicator registers 120 mph. The landing gear will extend immediately if the pressure switch is properly adjusted.

11. Should the landing gear fail to extend, turn the master switch OFF and adjust the pressure switch (lower switch of the two installed in the left main gear wheel well) as follows:

a. Secure the rolled tubing so that it will hold the airspeed indicator reading at 120 mph.

b. Connect a continuity tester across the contacts of the pressure switch, then turn the adjustment screw until the switch closes at the 120 mph reading on the airspeed indicator.

12. Turn the master switch ON and check the landing gear safety system through the complete cycle of operation.

**THROTTLE WARNING HORN ADJUSTMENT**

a. With the aircraft in flight, place the propeller control in low pitch and slowly pull the throttle control cut out until 12 to 14 inches of manifold pressure is indicated.

b. Mark the position of the throttle control.

c. After the aircraft has landed and with the engine shut down, position the throttle control at the mark made in step b.

d. Adjust the micro-switch at this position until the cam "clicks" the switch closed.

e. Secure the switch in this position.

**TESTING OF LANDING GEAR LIMIT SWITCHES**

It is of the utmost importance that the landing gear limit and brake limit switches operate in the correct sequence to prevent malfunction of the switches and possible damage to the component parts of the landing gear electrical circuit and to the wiring itself.

Use the following procedure for the testing of the switches. Switches are preset as to sequence of actuating. Special Tool 35-590063 (Box Assembly, Landing Gear Circuit Tester) may be used to set the switches. The tester incorporates three lights, six lead connections, placard and batteries. The six lead connections connect to the wiring on the landing gear limit switches as follows:

1. Down limit switch: Connect red wire on the left side of the tester to the normally closed connection marked on the switch. Connect the red wire on the right side of the tester to the common connection on the down limit switch. This is a normally closed switch and the light will be on. When the switch is actuated the light will go out.

2. Warning horn switch: Connect black wire on the left side of tester to the common connection on switch and black wire on right side of tester to the normally open side of the switch. This is a normally open switch and the light will be off. When the switch is actuated the light will come on.

3. Down brake switch: Connect white wire on the left side of tester to the normally closed connection on the switch and connect the white wire on the right side of the tester to the common connection on the down brake switch. This is a normally closed switch and the light will be on. When the switch is actuated the light will go off.

4. The down switches actuate in the following sequence: limit switch, warning switch and brake switch.

5. Up limit switch: Connect the red wire on the left side of tester to the normally open connection of the switch and connect the red wire on the right side of the tester to the common connection of the up limit switch. This is a normally open switch and the light will be off. When the switch is actuated the light will go on.
6. Up-brake switch: Connect the white wire on the left side of the tester to the normally closed connection of the switch and connect the white wire on the right side of the tester to the common connection of the up-brake switch. This is a normally open switch and the light will be off. When the switch is actuated, the light will come on.

7. The up-switches actuate in the following sequence: limit switch and then the brake switch.

8. Refer to adjustment of limit switches in the Model 35 Shop Manual if the switches are found to be out of adjustment.

LANDING GEAR POSITION LIGHT ADJUSTMENT

The landing gear position lights on the instrument panel are operated by the up indicator switches and down indicator switches on each gear.

Before making the following adjustments, place the airplane on jacks.

Main Gear: With the gear down and locked, adjust the down switch (located on the forward side of the main gear V-brace) so that the overtravel of the switch plunger is .050 inch after the switch is actuated to the ON position. With the gear in the full up position, adjust the up switch (located inboard of the forward side of the main gear V-brace) so that the overtravel of the switch plunger is .050 inch after the switch is actuated to the ON position.

Nose Gear: With the gear in the down and locked position, adjust the down switch (located on the right side of the wheel well) so that the overtravel of the switch plunger is .050 inch after the switch is actuated to the ON position. With the gear in the full up position, adjust the up switch (located on the right side of the wheel well) so that the overtravel of the switch plunger is .050 inch after the switch is actuated to the ON position. Check the instrument panel to be sure the indicator lights correspond to the gear position.

Recheck the switch adjustment and remove the airplane from the jacks.

NOTE

If the pressure pump has failed or operation of the instruments indicates a fluctuation of the system pressure or a decrease in the system pressure, check for excessive pressure, a partial restriction in the lines, a filter partially obstructed, or pressure loss resulting from loose connections. These conditions may be checked by: (1) removing the inline filter from the system and checking it for obstructions by comparing the resistance to flow with a new filter. Use a dry, low pressure air source (max. of 10 psi) for this test. If air flow resistance in the filter removed from the airplane exceeds that of the new filter by more than 1.0 psi, replace the filter. (2) Check all connections for tightness. (3) Check the lines for bends, kinks and excessive carbon. With the discrepancy repaired, or whenever any components are replaced in the pressure system, adjust the pressure system as follows:

CAUTION

Never use a pressure pump which has been dropped or mishandled. Never jam or force the pump onto the engine mounting pad.
Figure 3-8F. Pressure System Schematic

Figure 3-8G. 1J2-1 Intake Air Filter
PRESSURE SYSTEM ADJUSTMENT

a. Install a test gage (0-10 psi) at the "out" side of the pressure regulator. If the airplane is equipped with a BEECHCRAFT autopilot, an additional test gage (0-10 psi) should be installed in the turn coordinator supply line. (See Figure 3-8F.)

b. On airplanes without an autopilot, the pressure regulator should be adjusted to obtain a reading of 4.5 psi on the test gage at the pressure regulator with the engine operating at 2300 rpm. On airplanes equipped with an autopilot, the pressure regulator should be adjusted to obtain a reading of 5.0 +.0 -.5 psi on the test gage in the turn coordinator supply line with the engine operating at 2300 rpm and the autopilot ON. Normally, a pressure of 6.5 psi on the test gage at the pressure regulator is sufficient to obtain the 5.0 +.0 -.5 psi reading at the turn coordinator. Rotating the adjust screw on the pressure regulator clockwise increases pressure and counterclockwise decreases pressure.

CAUTION

Under no circumstances should the reading at the pressure regulator exceed 7.0 psi.

c. Locate the adjustable orifice (prior to CE-485 and CJ-52) on the LH side of the airplane forward of the instrument panel near the system filter and loosen the check nut. Rotate the orifice body (prior to CE-485 and CJ-52) to obtain a reading of 5.0 +.0 -.5 in Hg. on the gyro pressure indicator with the engine operating at 2300 rpm. Tighten the checknut. Check the gyro pressure indicator with the engine operating at 1500 rpm. The pressure should remain in the green arc at this speed.

d. After adjusting the orifice (prior to CE-485 and CJ-52) check the pressure on the test gages with the engine operating at 2800 rpm. If the pressure on these gages has been affected by the adjustment of the orifice, the pressure regulator should be replaced.

NOTE

Airplane serials CE-485 and after and CJ-52 and after, do not have the adjustable orifice. Pressure system adjustment for those airplanes will be the same as noted in steps "a" through "b".

e. Remove the test gages from the airplane.

NOTE

When the airplane is equipped with four air-driven gyro's and an air driven autopilot, it is necessary to have a higher capacity dry air pump in order to safely operate the gyro's and/or the autopilot system.

PRESSURE SYSTEM FILTERS

The pressure system has an air filter located between the gyro instruments and pressure regulator. This filter should be removed and replaced every 500 hours or sooner if conditions warrant. An additional air filter is provided at the ambient air inlet, located on the engine baffle. This filter should be removed every 100 hours and cleaned with solvent and blown dry with air pressure. The filter should be replaced every 500 hours or sooner if conditions warrant.

On airplane serials CE-452 and after and CJ-40 and after, and those prior airplanes that have complied with Service Instructions No. 0581-194, will have the new 1J2-1 filter installed (see Figure 3-8G) This filter should be replaced annually or every 300 to 500 hours service time, depending upon operating conditions. The filter element must not be subjected to solvents and must be replaced if this occurs. Always reinstall the filter cover with the opening facing down.
GYRO INSTRUMENT AIR FILTERS

REPLACING INSTRUMENT AIR FILTERS

The replacement of the air filter in gyro instruments is not considered disassembly, and usually may be accomplished without removing the instrument from the airplane. The frequency of cleaning or replacing air filters will depend upon service conditions; however, they should be replaced approximately every 100 hours of operation. It should be borne in mind, when operating in localities where there is an excessive amount of sand or dust in the air, that the filter should be inspected and, if necessary, replaced at more frequent intervals. Under extremely dusty conditions, it may be necessary to inspect the filter daily. A clogged filter reduces air flow and slows up the rotor, causing a loss of gyroscopic inertia and improper gyro indication.

To replace the filter assembly on the instrument, remove the air filter body-cover by taking out the four fillister-head machine screws. Lift out the snap ring which holds the filter in place, remove the filter, and replace it with a new one. Replace the air filter body-cover and gasket, securing them with the screws. If the air filter body-cover is not used, the filter may be removed by lifting the snap ring past the four protective lugs.

IGNITION

INSTALLATION AND TIMING OF MAGNETOS

It is assumed that the magnetos have been properly internally timed and points, adjusted per the applicable Bendix or Slick vendor publication. To adjust the magneto points, other than that specified in the applicable vendor publication manual, will alter the magneto "E gap" and cause a weak spark. This internal timing and point adjustment should not be made on the airplane. For inspection purposes the point gap may be checked when the cam follower is resting on the high point of the cam lobe. The magneto point gap should be as follows:

<table>
<thead>
<tr>
<th>Magnetos</th>
<th>Point Gap in Inches</th>
</tr>
</thead>
</table>
| Bendix S6RN-201 and S6RN-205 | main breaker .......... 0.018 ±0.006  
| | retard breaker (S6RN-201 only) .......... 0.018 ±0.006  
| Bendix S6RN-1201 and S6RN-1205 | main breaker .......... 0.016 ±0.003  
| | retard breaker (S6RN-1201 only) .......... 0.016 ±0.006  
| Slick 662 and 680 | No point gap  

MAGNETO POINT GAP IN INCHES

On the Bendix series magnetos, the internal timing and point adjustment should be made at the time of assembly or overhaul. (Bendix timing Kit No. 11-B135-1 is available for internal timing of the magneto.)

NOTE

For adjustment of contact opening and internal timing of Bendix magnetos, refer to Bendix for applicable manuals. Magneto contact assemblies should be checked after the first 25 and 50 hours operation and each 50 hours thereafter.

PREPARING THE MAGNETO FOR INSTALLATION ON THE ENGINE

BENDIX MAGNETOS

On Bendix magnetos, turn the magneto drive in the direction opposite to normal rotation (this keeps the impulse couplers from engaging) until the respective timing mark (viewed through the inspection hole) on the distributor gear is aligned with the divided casting line of the magneto housing. Now the magneto is ready to install on the engine and to fire number 1 cylinder.
SLICK MAGNETOS

On Slick magnetos, turn the magneto drive in the direction opposite to normal rotation (this keeps the impulse couplers from engaging) until the timing marks are aligned (as viewed through the inspection hole), and the timing pin is in place through the frame and rotor shaft. Now the magneto is ready to install on the engine and fire number 1 cylinder.

TIMING THE MAGNETO TO THE ENGINE

The engines should be timed as indicated by the following:

Continental Engine degrees BTC

<table>
<thead>
<tr>
<th>Model</th>
<th>Timing Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO-470-J</td>
<td>22 +0 -2</td>
</tr>
<tr>
<td>IO-470-K</td>
<td>22 +0 -2</td>
</tr>
<tr>
<td>IO-470-N</td>
<td>22 +0 -2</td>
</tr>
<tr>
<td>IO-520-B, IO-520-8A, IO-520-8B</td>
<td>22 +0 -2</td>
</tr>
</tbody>
</table>

The Continental IO-470 series engines and IO-520 series engines have factory installed timing marks. Even though these engines are equipped with timing marks, a positive top dead center (TDC) locator and timing disc may be used to time the magneto to the engine, or to check the accuracy of the engine timing marks.

WARNING

The magneto is grounded through the ignition switch; therefore, anytime the switch (primary) wire is disconnected from the magneto, the magneto is in a switch ON or HOT condition. Before turning the propeller by hand, disconnect all spark plug leads to prevent accidental firing of the engine.

CAUTION

The internal automatic grounding devices used on the original Scintilla S series magnetos have proven unreliable in service and current production magnetos do not have this feature. To be safe, treat all magnetos as hot whenever the ground lead is disconnected. To ground the magneto, connect a wire to the switch lead at the filter capacitor and ground the wire to the engine case.

a. To locate the compression stroke of number 1 cylinder, remove the lower spark plugs from each cylinder except number 1 cylinder. Remove the top plug from number 1 cylinder.

b. Place the thumb of one hand over the number 1 cylinder spark plug hole and rotate the crankshaft in the direction of normal rotation until the compression stroke is indicated by positive pressure inside the cylinder, lifting the thumb off the spark plug hole.

c. After locating the compression stroke of number 1 cylinder, locate the advanced firing position of number 1 cylinder by use of a timing disc and pointer or the factory installed timing marks on the engine.

NOTE

On IO-470 series engines, the external timing marks are located on a bracket attached to the starter adapter, with a timing mark on the alternator drive pulley as the reference point.

NOTE

ON IO-520 series engines, the timing marks are located on the alternator drive gear. Remove the plug in front of number 6 cylinder to observe the TDC and advance time marks.

In all cases, it must be definitely determined that the number 1 cylinder is at the correct firing position on the compression stroke, after the crankshaft is turned in its normal direction of rotation.

d. If a universal timing disc and pointer is to be used, install the TDC locator in the top spark plug hole of number 1 cylinder.

e. Slowly rotate the engine in the normal direction of rotation until the piston lightly touches the locator.

f. Install the timing disc on the propeller spinner and rotate the timing disc until 0° (TC) is located under the pointer.
g. Rotate the engine in the opposite direction to normal rotation until number 1 piston lightly touches the locator.

h. Note the reading on the timing disc. Now rotate the disc toward 0° (TC) until 1/2 of the reading noted is shown.

i. Remove the TDC locator from the spark plug hole.

j. Rotate the engine in the normal direction of rotation to the compression stroke of number 1 cylinder and until the pointer arrives at the number of degrees noted last in step "h" (1/2 of the first noted reading in step "h").
k. Rotate the timing disc until the pointer is positioned at 0° (TDC).

l. Rotate the engine opposite the normal direction of rotation to approximately 5° beyond the specified timing for the engine being timed.

m. Rotate the engine in the normal direction to the specified before top center (BTC) firing position (this is to remove gear backlash). Further movement of the engine should not be necessary until the magnetos are installed.

NOTE

Without turning the magneto coupling, hold the magneto in the position it will occupy when installed on the engine and check alignment of magneto drive coupling slot, and magneto impulse coupling lugs. If not aligned, pull engine gear out of mesh (but not out of the oil seal) and turn to alignment. Push gear back into mesh.

n. Place new gaskets on magneto flanges and install the magnetos carefully so drive coupling lugs mate with slots of drive bushings. Install holding washers, lockwashers and nuts, but tighten only enough to permit turning the magnetos for final timing, without looseness.

NOTE

The magnetos were prepared for installation, to fire number 1 cylinder, in PREPARING THE MAGNETO FOR INSTALLATION ON THE ENGINE in this section.

On Slick series magnetos check the distributor lead spring to make sure it is located in the center of the distributor shaft hole in the distributor bearing plate. Before removing the timing pin and reinstalling the distributor block housing on the magneto frame assembly, apply a drop of SAE 20 lubricating oil to the oilite bearings.

o. Install timing lights on the magnetos.

p. With the engine still positioned to fire number 1 cylinder at the specified BTC rotate the right magneto in the direction necessary to cause the points to just break open as indicated by the timing light.

q. Secure the right magneto.

r. Repeat steps "p" and "q" on the left magneto.

s. Recheck the magneto setting to confirm the + 0° - 2° has not been exceeded.

t. Turn the engine crankshaft a few degrees in the opposite direction to normal rotation and bring it back again until the advance timing mark is under the pointer on timing disc. At this point both timing lights should indicate, at the same time, that the magneto points opened.

u. If the timing lights do not respond at the same time, loosen the magneto that is either early or late and repeat the process outlined in step "p".

v. Remove the timing lights and reinstall the electrical leads to the magnetos.
PROPELLER

PROPELLER AND GOVERNOR ADJUSTMENT

Static RPM .................................................. 2600

Low Pitch .................. 11 ± .25 degrees at 33 inch station.
High Pitch .................. 26 ± .50 degrees at 33 inch station.


Low Pitch .................. 11.7 ± .2 degrees at 33 inch station.
Each blade within .2 degrees of the other.
High Pitch .................. 30 degrees minimum at 33 inch station.

NOTE
McCanauley propellers do not need to be installed in any particular position relative to crankshaft position.

McCanauley Propeller (Airplane Serial CD-662 and after). Approved as spares on aircraft prior to CD-662 that are equipped with IO-470-K engines.

Low Pitch .................. 12 ± .2 degrees at 30 inch station.
Each blade within .2 degrees of the other.
High Pitch .................. 29.5 degrees at 30 inch station.

McCanauley Propeller for IO-520B, IO-520-BA and IO-520-BB engines.

Low Pitch .................. 13.3° at the 30 inch station.
High Pitch .................. 29.2° at 30 inch station.

Hartzell propeller optional 3-blade for IO-520-B, IO-520-BA and IO-520-BB engines. Install propeller with one blade pointing down when number one cylinder is on top dead center. Torque AN8 installation bolts to 65 ± 5 foot pounds.

Low Pitch .................. 11.2° ± 0.3° at 30 inch station.
High Pitch .................. 30.8° at 30 inch station.

HIGH RPM SETTINGS

Improper static rpm settings may be due to many factors: the engine, ignition, tachometers, and fuel system should be checked before the governor settings are changed. If governor or propeller adjustment is required, refer to the applicable supplementary publication.

SUCTION RELIEF VALVE (VACUUM)

The suction relief valve may be adjusted as follows:

a. Start the engine and adjust the throttle to approximately 2,000 rpm.

b. Adjust the suction relief valve until the suction gage reads 5.5 inches Hg. on airplanes prior to CD-826, turn the adjusting screw clockwise to increase suction and counterclockwise to decrease it. On airplane serials CD-826 through CD-1118 and CE-1 through CE-179, turn the adjusting screw counterclockwise to increase or clockwise to decrease the suction setting.

NOTE
Refer to the Maintenance Instructions (Publication Number 130409) for the proper suction settings when the BEECHCRAFT New-Matic Flight Control System is installed.

STATIC AIR AND PITOT SYSTEM

STATIC AIR SYSTEM

Proper functioning of the static air system is vital to safety of flight, particularly on instrument flight, so the correct maintenance of this system, while relatively simple, is a procedure which should be followed religiously.
Figure 3-9. Pitot and Static System
The amount of attention required by the static system will depend largely on operating conditions. Extremes of humidity or precipitation, or dry, dusty conditions, should be signals for increased emphasis on static system checks, since both are favorable to accumulations of foreign matter in the ports and lines.

**CLEARING STATIC LINES**

Blow LOW pressure air through the lines from the disconnected line at the airspeed indicator to the static ports. Cover each static port separately when blowing to ensure that each line is clear. Instrument error could result if even one port is clogged with dust or foreign matter.

**CAUTION**

Never blow air through the line toward the instrument panel; to do so will seriously damage the instruments. Before blowing back through the line from the instrument panel, be sure that the instrument lines have been disconnected, so there is no possibility of air pressure reaching an instrument.

Drain the static air line by opening the access door on the side panel in the rear baggage compartment (prior to CD-1014), and removing the section of rubber hose. On later model aircraft, (CD-1014 and after, CE-1 and after), the rear baggage compartment bulkhead must be removed to gain access to the cap drain. The cap may be removed with an 11/16" wrench to allow the drainage of any water accumulation. Disconnect the line at the airspeed indicator and blow this line clear. On airplanes equipped with the optional emergency static air source, be sure that the valve is closed to prevent air being blown into the cabin; this operation may be done at the time of the 100 hour inspection of the airplane.

**NOTE**

Wax or polish applied to the static air buttons can cause wrong instrument readings. The static air buttons should be cleaned periodically with a cleansing solution to ensure that no film exists on the static air buttons.

Check the rubber hoses connecting the static air line to the instrument plumbing and the rubber hose (prior to CD-1014) or tygon tubing (CD-1014 and after) which forms the static air line drain, accessible through the inspection opening in the left side panel of the baggage compartment (prior to CD-1014), or removal of the rear baggage compartment bulkhead (CD-1014 and after and CE-1 and after). Hoses with outer surfaces checked or cracked, particularly at the bends or connecting points, or which have become hard, should be replaced. Replace defective hose only with Buna-S rubber hose, Federal Specification ZZ-T831, Grade B.

**NOTE**

On airplanes serial CD-1256 and after and CE-347 and after, the aluminum static lines are replaced by Poly-flo tubing. On serial CD-1256 and after and CE-350 and after, the rubber hoses that connect the static air line to the instrument tubing are replaced by Poly-flo tubing.

**PITOT SYSTEM**

A functional test of the pitot system can be made by using an observer in the cabin to watch the airspeed indicator while air pressure is built up artificially by using a section of soft rubber tubing as follows:

a. Clamp the rubber tubing over the pitot head inlet, making certain that the connection is airtight.

b. Crimp the end of the tubing and slowly roll it up until the airspeed indicator registers approximately 100 miles per hour.

**CAUTION**

To avoid rupturing the diaphragm of the airspeed indicator, roll up the rubber tubing slowly.

c. Secure the rolled up tubing so that it will hold the airspeed indicator reading.

d. If there is no decline in the reading after several minutes, there is no leak in the pitot system.

e. If a decline in the reading of the airspeed indicator is observed, check the pitot system plumbing for leaky hoses and loose connections.

**CAUTION**

Release the air pressure slowly by unrolling the rubber tubing; a sudden release of the air pressure may damage the airspeed indicator.

After the system is checked for leaks, the hose sections should be visually inspected for signs of deterioration. There are two sections of hose in the pitot system: one hose at the pitot mast, accessible by removing the inspection door adjacent to the mast; and the other hose behind the floating instrument panel which connects the pitot line to the airspeed indicator, accessible through the access door in the left side of the firewall. Replace defective hose only with hose meeting the specifications described for the static system.
ALTERNATORS

SERVICING THE 70 AMP ALTERNATOR (14 volt system)

A 70-ampere, 12-volt, gear-driven alternator is standard equipment on the C33A. The alternator is designed to maintain the full 70-ampere output at 1700 rpm, and supply 20 ampere at engine idle speed.

A fully transistorized electronic voltage regulator automatically adjusts alternator output to the required electrical load, including battery recharging. Charge or discharge of the battery is indicated by the ammeter in the engine gauge cluster. A zero reading, which is normal for cruising flight, indicates that the battery is fully charged and that alternator output has been adjusted by the voltage regulator to balance the load of the electrical equipment in use.

The alternator field circuit breaker is located on the right hand lower subpanel and the alternator output circuit breaker is installed on the left side of the nose wheel well cover.

A press-to-test overvoltage warning light on the instrument panel will come on, should the alternator be disconnected from the airplane bus by the overvoltage relay. If an overvoltage condition occurs, reset the overvoltage relay by turning the alternator OFF. If the overvoltage condition persists after the alternator is turned back ON, have the electrical system inspected and repaired. The precaution for servicing the 60 ampere alternator should also be observed for the maintenance of the 70 ampere alternator. Complete service information will be found in the manual, listed under the vendor publications list in this manual.

SERVICING THE 60 AMP ALTERNATOR (14 volt system)

The 60 ampere alternators are installed as optional equipment on airplanes, serials CD-910 through CD-1254 and as standard equipment on airplanes, serials CD-1255 and after. The alternator will supply all of the normal electrical power requirements, even under such adverse conditions as waiting for flight clearance with most of the accessory equipment in use. After the engine is started, the ammeter will indicate half or more on the charge side until the alternator has replaced the energy drawn from the battery during starting. The following precautions should always be observed to avoid damaging the alternator and wiring.

1. Be sure the battery master switch and alternator switch are turned OFF when repairs are being made to the alternator or voltage regulator.

2. If the ground service receptacle or booster batteries are used, the cables must be connected correctly: positive to positive and negative to negative. Diodes will be destroyed by reverse polarity connections.

3. If the airplane battery is ever removed or charged, be sure that the charger is correctly connected and that the battery is installed properly. Disconnect the ground cable at the battery before connecting the charger to the battery. Use a voltmeter to check battery terminal polarity.

4. Do not leave the master switch on when the airplane is parked for extended periods. By turning the switch off, you will prevent needless battery drain. The alternator switch must be turned OFF when the engine is not running.

5. If electrical accessory equipment is to be used for an exceptionally long time when the engine is not running, connect a ground power unit.

6. If at higher engine speeds the charge indicator shows a constant discharge, check the alternator (output control) circuit breakers. If the button is out, push it in to reset. If the circuit breaker button pops out again, have the electrical system inspected and repaired.

7. Never operate the alternator on open circuit with the rotor (field) coil energized, for the resultant voltages may burn the rotor coil or damage the diodes.

8. Never use a 115 volt test lamp to check the diodes, for they are not rated to withstand such high voltages.

9. Use only a rosin core solder for electrical connections; never an acid core solder which has a tendency to corrode.

ALTERNATOR (28 volt system) (CE-748, CE-772 and after) (CJ-149 and after)

On serials CE-748, CE-772 and after and CJ-149 and after a 28 volt 50 amp alternator is used as standard equipment although a 100 amp alternator may be installed optionally.

The alternator output is controlled by a transistorized voltage regulator/overvoltage relay. Current to excite the alternator field is normally derived from the airplane bus through a 10 amp switch/circuit breaker and the voltage regulator/overvoltage relay. The alternator is designed to have a small amount of residual magnetism. In the event the battery is discharges to the extent that it will not excite the alternator field, the residual magnetism is strong enough to excite the alternator field if all load is removed from the airplane electrical system until the bus is brought up to proper voltage. When attempting to start the alternator without battery current, turn off all electrical load and operate the engine at near cruise speed. In the event of alternator failure the alternator sensor will illuminate an annunciator light.

ALTERNATOR REMOVAL (CE-1 and after) (CJ-1 and after)

a. Access to the alternator is gained through the right hand cowl door and through the forward opening of the cowl.

CAUTION

The output terminal of the alternator is connected directly to the master battery relay. Make sure the battery switch is in the “OFF” position before removing the wires at the alternator or serious damage to the wiring harness and alternator may result from accidental grounding of the output stud.
b. Disconnect the electrical wiring harness from the alternator.

c. Remove the attaching bolts. Remove the alternator.

**ALTERNATOR INSTALLATION (28 volt system)**
*(CE-748, CE-772 and after) (CJ-149 and after)*

a. Install a new gasket on the alternator flange.

**CAUTION**

Do not force the alternator into position or damage to the alternator or drive gears could result. Care must be taken to assure that the alternator pilot enters the crankcase pilot bore squarely.

b. Position the alternator on the mounting pad.

c. Install the attaching nuts and washers bringing to a snug condition. Torque the nuts to 150 to 180 inch-pounds in diagonally opposite pairs.

d. Connect the electrical wiring to the alternator.

**CAUTION**

Never turn the battery switch “ON” until all wiring harness connections have been made and properly tightened or serious damage to the wiring harness and alternator may result from accidental grounding.

e. Start the engine and check for oil seepage and proper operation.

**PREPARATION FOR NEW ALTERNATOR INSTALLATION**
*(28 volt system) (CE-748, CE-772 and after) (CJ-149 and after)*

The new alternator will be received without the drive gear and coupling. The drive gear and coupling from the old alternator will need to be installed on the new alternator. The drive and coupling may be changed by following the procedures as follows.

a. Remove the shipping spacer and washer (if installed) from the 100 ampere alternator.

b. Install the woodruff key (if not already installed), coupling assembly and thrust washer. Ensure the bearing surface (copper color) of the thrust washer is installed toward the alternator.

c. Install the nut and tighten to a torque of 400 inch-pounds. If the slots of the castellated nut do not align with the cotter pin hole in the shaft, the nut should be tightened further, but not to exceed 500 inch-pounds. Do not back off the nut to align holes.

d. Install an MS24665-302 cotter pin carefully to ensure clearance when the alternator is installed in the engine.

**NOTE**

The cotter pin must be installed and then trimmed. The portion bent toward the alternator housing must NOT touch the thrust washer when bent over the nut. The portion bent away from the alternator housing must NOT reach beyond the threads on the end of the shaft.

Once the preceding steps are completed, refer to **ALTERNATOR INSTALLATION (28 volt system and after)** for installation of the alternator on the engine.

**VOLTAGE REGULATOR ADJUSTMENTS (28 volt system)**
*(CE-748, CE-772 and after) (CJ-149 and after)*

The output of the alternator is regulated by a fully transistorized voltage regulator located on the right side of the firewall. The voltage regulator is adjusted to 28.50 ± .25 vdc and will automatically adjust the alternator output to the required electrical load, including battery recharging. The voltage regulator is connected to the airplane bus through a 10 ampere switch/circuit breaker.

**NOTE**

The voltage regulator is set and sealed at the factory. Breaking the seal prior to the warranty limitations voids the warranty. Once the warranty limitations have been reached it should become necessary to adjust the voltage regulator, adjustments may be made in the following manner.

**CAUTION**

Observe engine operating limitations.

a. Bring the voltage regulator and alternator up to operating temperature by operating the engine at 1800 rpm with approximately 50% load for a minimum of 15 minutes.

b. Connect a precision voltmeter to the circuit breaker bus.

c. Operate the engine at cruise rpm (2500 rpm) with the alternator “ON”, and the electrical load reduced to a minimum.

d. Check the bus voltage. The voltage reading should be 28.50 ± .25 vdc. If the voltage reading is not as noted, adjustments should be made as follows:

  e. Remove the plastic plug labeled “REG” from
cover of the regulator and adjust the regulator by turning the potentiometer clockwise to increase the voltage and counterclockwise to decrease the voltage. Make any adjustments in small increments and allow 2 or 3 minutes operation time for the system to stabilize between adjustments.

NOTE

Final voltage check can best be made during flight or immediately after flight.

f. For final check and adjustment, the engine should be operated at cruise rpm (2500 rpm) with the alternator "ON" and carrying approximately 50% load.

OVERVOLTAGE RELAY

The electrical system on airplanes CE-290 and after, and CJ-26 and after is protected by an overvoltage relay that disconnects the alternator from the electrical bus whenever an overvoltage condition occurs during flight. The pilot is warned of this condition by the illumination of the ALTMOUT light located on the instrument panel. The voltage regulator establishes a holding circuit from the battery bus that keeps the overvoltage relay energized. To reset the relay and attempt to return the alternator to service requires isolating the relay from the power source. If an overvoltage condition occurs in flight the following procedure may be used:

1. Momentarily move the BATTERY switch (some models may be placarded BAT-ALT switch) to the OFF position. This allows the overvoltage relay to de-energize and the alternator voltage again will return to the bus.
2. If the overvoltage condition does not recur, continue to use the alternator.
3. Should the overvoltage condition persist and the voltage relay again disconnects the alternator, turn the ALTERNATOR switch to the OFF position and minimize electrical current consumption.

OVERVOLTAGE RELAY ADJUSTMENTS (28 volt system) (CE-748, CE-772 and after) (CJ-149 and after)

CAUTION

This adjustment should only be performed in the airplane in cases of most extreme necessity, because an error in following the procedures could result in damage to the airplane electrical equipment.

If it is necessary to adjust the overvoltage relay and it is not feasible to make the adjustments on the bench, it may be made on the airplane. To make this adjustment the alternator is used as a power source, and the voltage regulator must be put out of adjustment and the entire system subjected to abnormal voltages. Prior to making the adjustment, turn off all unnecessary electrical and avionics equipment and open all circuit breakers not necessary for the test.

a. Connect a precision voltmeter to the circuit breaker bus.

CAUTION

Observe engine operating limitations.

b. Operate the engine at cruise rpm (2500 rpm).
c. Monitor the voltmeter to determine the voltage at which the overvoltage relay trips and remove the alternator from the line. Slowly adjust the voltage regulator to increase the bus voltage. The overvoltage relay must trip at 32.0 ± 1 volts.
d. If the overvoltage relay trips below the 31.0 volts requirements or fails to trip when the bus reaches 33.0 volts as measured on a precision voltmeter, the overvoltage relay must be adjusted. Remove the plastic plug marked O. V., and turn the adjustable potentiometer clockwise to increase voltage and counterclockwise to decrease the trip voltage.

NOTE

To allow the overvoltage relay to reset all power must be momentarily removed from the unit.

e. Recheck the adjustment.
f. Readjust the voltage regulator to 28.5 ± .25 volts. This adjustment should be checked with the engine running at cruise rpm (2500 rpm) and the alternator on and stabilized as noted in VOLTAGE REGULATOR ADJUSTMENTS.
g. Replace the plastic plugs over the adjustable potentiometers.

STARTER

STARTER REMOVAL (IO-520 engine) (CE-1 and after) (CJ-1 and after)

a. Access to the starter may be gained through the right hand cowl door.
b. Disconnect the electrical wiring from the starter.
c. Remove the two hex nuts and washers from the mounting studs, and remove the starter.

STARTER INSTALLATION (IO-520 engine) (CE-1 and after) (CJ-1 and after)

a. Install a new "O" ring on the flange of the starter.
b. Position the starter on the mounting pad.
c. Install the attaching nuts and torque the nuts to 200-220 inch-pounds.
d. Connect the electrical wiring to the starter.
e. Start the engine to check for oil seepage at the mounting flange and check for proper operation.
STARTER OVERHAUL

Refer to applicable Vendor Publications for complete tests and maintenance procedures.

STARTER LUBRICATION (IO-520 engine)

DELCO-REMY (CE-1 thru CE-771, except CE-748) (CJ-1 thru CJ-148)

When the motor is disassembled for any reason, lubricate as follows:

a. Oil wicks, if present, should be resaturated.
b. Bushings and the armature shaft should be coated with a small amount of Delco-Remy Lubricant No. 1960954.
c. The drive assembly should be wiped clean.

CAUTION

Do not clean in any degreasing tank or with grease dissolving solvents; this will dissolve the lubricant in the clutch mechanism.

d. The roll type overrunning clutch requires no lubrication.
e. Avoid excessive lubrication.

PRESTOLITE (CE-1 and after) (CJ-1 and after)

Soak new absorbent bronze bearings in SAE 20 oil before installation. Saturate the felt oiling pad in the commutator end head with SAE 20 oil. Allow excess oil to drain out before installing end head on motor. Put a light film of Lubriplate #777 on the drive end of the armature shaft before and after installing the drive end head.

CAUTION

Do not clean the starter in any degreasing tank or grease dissolving solvents. Avoid excessive lubrication.

STARTER BRUSH REPLACEMENT (IO-520 engine)

DELCO-REMY (CE-1 thru CE-771, except CE-748) (CJ-1 thru CJ-148)

If the brushes are excessively worn when compared to a new brush, they should be replaced. Make sure the brush holders are clean and that the brushes are not binding in the holders. The full brush surface should ride on the commutator to give proper performance. Check by hand to ensure that the brush springs are giving firm contact between the brush and the commutator. If the springs are discolored or distorted, they should be replaced.

PRESTOLITE (CE-1 and after) (CJ-1 and after)

Brushes must be replaced when they have worn down to a length of 1/4" or less. Refer to Prestolite service bulletin ASM-1 for brush replacement procedure. There should be a spring tension of 32 to 40 ounces with new brushes. Measure with a spring scale hooked under the spring at the brush. Pull on a line opposite the line of force exerted by the spring and take the reading just as the spring leaves the brush.
ELECTRICAL UTILIZATION LOAD CHART (28-Volt System)

Airplane serials CE-748, CE-772 and after; CJ-149 and after

The following specifies the electrical load for each piece of equipment, either standard or optional, available on the airplane. Based on this information, the total electrical load for the airplane may be determined. Intermittent items should not be figured into the total figure since the short duration of their usage will not significantly alter the standard load.

The electrical load has been divided into 4 categories as follows:

a. Continuous load (standard equipment)
b. Continuous load (optional equipment)
c. Intermittent load (standard equipment)
d. Intermittent load (optional equipment)

Under no condition shall the total continuous electrical load be more than 80% of the total alternator capacity. Total continuous load consists of loads listed as continuous and the avionics receiving loads. Transmit loads are intermittent loads.

NOTE

The loads listed as continuous loads are for equipment which will be operated for periods of 15 minutes or longer. However, the intermittent loads and the avionics transmitting loads should be considered for determining possible overloading during shorter periods of time, i.e., takeoff and landing.

CONTINUOUS LOAD (28-Volt System Standard Equipment)

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<th>AMPS EACH</th>
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</table>

(1) Intermittent Operation
(2) Unit operates in gear down position only
### INTERMITTENT LOADS (28-Volt System Standard Equipment)

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>NUMBER AIRPLANE</th>
<th>AMPS EACH</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarette Lighter</td>
<td>2</td>
<td>6.00</td>
<td>12.00</td>
</tr>
<tr>
<td>Flap Motor</td>
<td>1</td>
<td>11.00</td>
<td>11.00</td>
</tr>
<tr>
<td>Flasher, Gear Warning</td>
<td>1</td>
<td>.04</td>
<td>.04</td>
</tr>
<tr>
<td>Horn, Gear Warning</td>
<td>1</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Horn, Stall Warning</td>
<td>1</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Landing Gear Motor</td>
<td>1</td>
<td>40.00</td>
<td>40.00 (3)</td>
</tr>
<tr>
<td>Pump, Auxiliary Fuel</td>
<td>1</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Pump, Auxiliary Fuel</td>
<td>1</td>
<td>3.00</td>
<td>3.00 (4)</td>
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<tr>
<td>Relay, Dynamic Brake</td>
<td>1</td>
<td>1.25</td>
<td>1.25</td>
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<tr>
<td>Relay, Starter</td>
<td>1</td>
<td>3.30</td>
<td>3.30</td>
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<tr>
<td>Starter, Engine</td>
<td>1</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Relay, Landing Gear Latch</td>
<td>1</td>
<td>.08</td>
<td>.08</td>
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### LIGHTING

<table>
<thead>
<tr>
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<th>NUMBER AIRPLANE</th>
<th>AMPS EACH</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Alternator Out</td>
<td>1</td>
<td>.04</td>
<td>.04</td>
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<tr>
<td>Courtesy Light</td>
<td>2</td>
<td>.17</td>
<td>.34</td>
</tr>
<tr>
<td>Door Ajar</td>
<td>1</td>
<td>.04</td>
<td>.04</td>
</tr>
<tr>
<td>Landing Gear Indicator</td>
<td>4</td>
<td>.04</td>
<td>.16</td>
</tr>
<tr>
<td>Landing Light</td>
<td>1</td>
<td>8.93</td>
<td>8.93</td>
</tr>
<tr>
<td>Condenser Door Open</td>
<td>1</td>
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<td>.04</td>
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### INTERMITTENT LOADS (28 Volt System Optional Equipment)

<table>
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<tr>
<th>EQUIPMENT</th>
<th>NUMBER AIRPLANE</th>
<th>AMPS EACH</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Actuator, Elevator Trim</td>
<td>1</td>
<td>.85</td>
<td>.85</td>
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<tr>
<td>Resistor, Trim Shunt</td>
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<td>.38</td>
<td>.38</td>
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</table>

### LIGHTING

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>NUMBER AIRPLANE</th>
<th>AMPS EACH</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxi Light</td>
<td>1</td>
<td>8.93</td>
<td>8.93</td>
</tr>
</tbody>
</table>

(3) Peak current after initial start-up load
(4) Used only when dual auxiliary fuel pumps are required
STANDBY GENERATOR SYSTEM

A standby generator system is provided to power essential equipment in the event of loss of electrical power on the main system.

The standby generator system is an independent electrical system incorporated into the main system in such a manner to furnish power only to essential engine instruments, turn coordinator and navigation and communication system. A diode in the circuit from the battery to the standby generator system prevents the generator from furnishing any power to the battery, but allows the battery (if serviceable) to supply power to the essential equipment in the event of inadequate output or failure of the standby generator.

NOTE

The circuits from the battery to the standby generator system and the battery to the stall warning system are always alive, even though the battery switch may be in the OFF position.

The standby generator system should only be used when there is a loss of electrical power on the main electrical system. As soon as a loss of electrical power is evident, turn the alternator/generator and battery switches OFF. (This is to prevent possible damage to the main system if a short exists therein, and to save battery power for lowering the flaps and gear if the problem is determined to be only a faulty alternator/generator). After turning the switch(es) OFF, turn the standby generator switch ON.

14 VOLT SYSTEM

The standby generator (optional on CD-1290 and after, CJ-31 through CJ-148, CE-347 through CE-747) requires an engine rpm of at least 1700 to function adequately. With the engine running at 1700 rpm, place the standby generator switch momentarily to the TEST position. The GEN TEST and BAT TEST lights will illuminate, indicating that the battery and generator are both supplying power.

The standby generator is located on the accessory drive pad of the engine. The ON-OFF-TEST switch and the GEN TEST and BAT TEST lights are located above the NAV COMM XFER switch on the instrument panel. The terminal board, zener diode and number one transistor (which controls the conductance of the number two transistor) is located on a bracket attached to the rear of the ON-OFF-TEST switch. The number two transistor is located in the engine compartment on the lower left side.

On serials prior to CE-613 and CJ-105 the overvoltage relay and rheostat are on the lower aft side of the firewall in the vicinity of the landing gear warning horn and flasher. At serial CE-613 and after, CJ-105 and after the standby generator overvoltage relay was moved to the structure forward of the control column, close to the center line of the airplane. On serials prior to CE-674 the overvoltage relay will actuate at 15.7 ± .1 volts. On serial CE-674 and after the overvoltage relay will actuate at 16.0 ± .3 volts and remove the standby generator from service should the standby voltage regulator fail. The overvoltage relay will reset when the input voltage is removed. When the overvoltage relay is actuated it bypasses the ON-OFF switch to lock the relay in the actuated position until the engine is shutdown, at which time the regulator will reset. Generator and battery fuses are on the upper forward side of the firewall and the bus and circuit breakers are on the forward side of the cabin. The two power relays are located on the upper right aft side of the firewall. Maintenance of the system is limited to isolating a defective component and replacing it in accordance with accepted electrical maintenance practices. Refer to the troubleshooting guide for probable trouble and corrective action.

28 VOLT SYSTEM

On airplane serial CE-834 and after, and CJ-149 and after a 28 volt standby generator is offered as optional equipment. It is mounted aft of the right magneto on the engine accessory case. Cooling air for the generator is picked up from the engine baffle on the left side of the engine.

The switch and voltmeter are located on the right side of the instrument panel. The switch is placarded OFF ON GEN/TEST. The voltage regulator/overvoltage relay is mounted aft of the firewall and controls the generator output to a standby bus bar.

The standby generator is self exciting and requires no external electrical power for it to function, although it does require at least 1950 engine rpm to function adequately. This standby system will supply sufficient power to operate essential instruments such as turn coordinator, fuel quantity, oil and cylinder temperature, Comm-1 and Comm-2, transponder, audio amplifier, panel voltmeter, glareshield light, and standby panel light. The generator will produce a continuous 6.5 amps at 28 volts or for intermittent (1 minute on 2 minutes off) operation 11 amps at 24 volts with a minimum engine speed of 1950 rpm.

The standby generator system is controlled and protected by its own voltage regulator/overvoltage relay. The regulator will control the voltage at 28.30 ± .30 volts. The overvoltage relay will remove the standby generator from the circuit should the voltage reach 32.0 ± 0.1 volts. Although the overvoltage relay is set to trip and remove the generator from the circuit at 32.0 ± 0.1 volts it is not sensitive to small voltage spikes of short duration. Should a transient voltage spike cause the overvoltage relay to trip removing the generator from the system, it may be reset in flight by moving the switch momentarily to the GEN/RESET position.
FLAP SYSTEM

NOTE
In event of emergency flap extension at speeds above the normal extension speeds inspect flaps for damage or distortion before next flight.

FLAP POSITION INDICATOR AND ADJUSTMENT

On Model C33 airplanes serials CD-1044 and after and on Model C33A airplanes serials CE-60, CE-77 and after a flap position indicator is installed in place of the flap position indicator lights. An adjustable flap position indicator transmitter is installed on the flap actuator in the left wing just forward of the rear spar to transmit flap travel gage readings.

a. Adjust the flap travel limit switches, controlled by left flap, to provide the correct up and down travel of the flaps. (Refer to FLAP LIMIT SWITCH ADJUSTMENT.)

b. Run the flaps full down and check the flap position indicator for 100% flaps. If down flaps are not indicated, loosen the transmitter attachment bolts and adjust transmitter fore and aft or rotate slightly until the reading is correct, then tighten the transmitter attaching bolts.

c. Run the flaps up and check the indicator for up flaps reading.

FLAP LIMIT SWITCH ADJUSTMENT

NOTE
Battery voltage is not sufficient to properly cycle the flaps during rigging. On serials CE-748, CE-772 and after and CJ-149 and after, a 28.25 ± .25 volt auxiliary power unit capable of maintaining the initial setting within .25 volt during the extension and retraction cycles is recommended. On earlier serials use an auxiliary power supply capable of maintaining 14.25 ± .25 volts during the extension and retraction cycles.

NOTE
If the airplane is not equipped with an external power receptacle, a jumper cable can be used to connect the external power supply to the battery. Care should be taken to match polarities.

CAUTION
Excessive operation of the flap motor without proper cooling may cause damage to the motor. Allow a short period of time for cooling after each extension and retraction cycle.

The flap limit switches are mounted on a bracket and installed on the outboard side of the inboard flap track in the left wing panel. The limit switches control the travel of the flaps by breaking the circuit to the flap motor at the extreme limits of travel. They are accessible by lowering the flaps.

TWO-POSITION FLAPS

To adjust the flap to up position, loosen the screws of the switch assembly so that the assembly can pivot on the forward elongated hole. Adjust the switch as necessary to stop the flaps in up position. Actuate the flap switch to the down position and measure the degrees of travel. (Proper degree of travel is 30° ± 0° - 2°.) Adjustment of the down position of the flaps is made on the downlimit switch.

THREE-POSITION FLAPS
(CJ-150 and after, CE-816 and after)

On the three-position flaps, the flap travel is adjusted by moving the limit switches. The left flap is rigged first and then the right flap is synchronized with it. Rig as follows:

NOTE
Rig the flaps under a simulated flight load to reduce overtravel to a minimum after the limit switches have been adjusted.

a. Adjust the uplimit switch so the flap will stop at the up position.

b. Adjust the 14° limit (inboard) switch in its mounting slot until the flaps stop at 14° to 14.5° when the flaps are actuated from the up to the approach position (15° range). Adjust the 16° limit (outboard) switch in its mounting slot until the flaps stop at 15.5° to 16° when the flaps are actuated from the down to the approach position.

c. Adjust the downlimit switch in its mounting slot until it actuates at 28° to 30° of flap travel.

d. Remove the bolt attaching the right actuator to the right flap.

e. Turn the jackscrew on the right actuator in or out to align the right flap with the left.
f. Install bolt connecting the actuator to the flap.

NOTE

After the flap is completely rigged, adjust the rubber bumper (flaps down) installed on the flap and aileron dividing rib. Turn the adjusting screw in or out, as required, to take out play or stop vibration when the flap is in the up position. A distinct change in the sound of the flap motor near the completion of the flap up travel may indicate an excessive outward adjustment of the bumper.

CAUTION

If the flaps are removed for any reason, place the main power switch in the OFF position.

g. Operate the flaps through full travel to ensure that the flaps contact the limit switches before they contact the rubber bumper.
FLAP SETTING
CD-1 THROUGH CE-1304
CE-1 THROUGH CE-815
CJ-1 THROUGH CJ-149
FULL DOWN 30° + 0° - 2°

CJ-150 AND AFTER
CE-816 AND AFTER
APPROACH 15°
FULL DOWN 30° + 0° - 2°

Figure 3-9A. Flap System
## TROUBLE SHOOTING
### 60 AMPERE ALTERNATOR

<table>
<thead>
<tr>
<th>Troubleshooting Issue</th>
<th>Probable Cause(s)</th>
</tr>
</thead>
</table>
| **BATTERY DISCHARGED** | 1. Loose drive belt.  
2. Charging circuit resistance.  
3. Voltage limiter malfunction or low setting.  
4. Accessory load too high for alternator rating.  
5. Corroded or loose battery cable connector clamps.  
6. Metal chips in field relay core gap. |
| **BATTERY OVERCHARGED** | 1. Voltage limiter set too high for aircraft operating conditions.  
2. Voltage limiter coil open, 14.0 or 0.04 ohm resistor open, broken coil lead wire or solder connection in regulator.  
3. Voltage limiter upper contacts stuck closed.  
4. Ground wire loose or broken between regulator and alternator.  
5. Shorted cell in battery causing other cells to use water excessively. |
| **VOLTAGE LIMITER CONTACTS BURNED** | 1. Shorted or grounded field coil or circuit.  
2. Brushed pig-tail wires touching each other at times. |
| **NOISY ALTERNATOR** | 1. Defective bearing.  
2. Shorted rectifier (magnetic noise).  
3. Loose, worn, or frayed drive belts.  
5. Loose rear housing or improperly installed stator.  
6. Loose pulley not seated against bearing.  
7. Loose mounting bolts. |
| **AMMETER POINTER OR LIGHTS FLICKER** | 1. Dirty or oxidized regulator contacts.  
2. Loose connections in charging system or damaged wiring harness.  
3. Worn bushes. Check brushes every 2000 hours and replace if necessary. |
| **BURNED CONNECTOR WIRE IN REGULATOR** | 1. Field terminal on alternator accidentally grounded.  
2. Rotor coil shorted to ground or has a "flying short" to ground.  
3. Brush retracting wire not removed from alternator. |

---

3-20
STROBE LIGHT

BULLOCK UNIT

The system consists of a solid state power supply unit, a circuit breaker switch on the instrument panel, a shielded power cable and a single, ventral-mounted xenon gas light. System operation is based on the capacitance discharge principle. A DC converter steps up the aircraft battery voltage to approximately 400 volts to charge the capacitor. The trigger circuit consists of a unijunction oscillator and a silicon controlled rectifier which applies a pulse of negative voltage to the trigger transformer in the lamp. The trigger transformer produces an ionization voltage of approximately 4000 volts to ignite the xenon gas in the lamp. As the lamp ignites, the energy stored in the capacitor is discharged through the lamp to produce a peak light intensity of over a million candle power. When the capacitor voltage drops below 50 volts, the lamp will go out and the capacitor begins recharging for the next cycle. System operational cycle will repeat, until the strobe light is turned off, at a flash rate of 45 flashes per minute.

TROUBLE ANALYSIS

Whenever trouble occurs, check all primary power lines, external circuit elements, fuses and wiring for a malfunction before troubleshooting the strobe light system. System electrical failure may be traced to any of three general areas: power unit, lamp assembly or wiring. A quick method of isolating the trouble source is to remove the lamp and test the lamp. Inspect the lamp to see if it is broken or loose in its socket. If the lamp is intact, use a volt meter to check for approximately 350 volts at the top of the lamp with the system turned on. The rate that the voltage peaks should be between 40 and 55 times per minute. If no voltage is present, the fault is probably located in the power unit.

TROUBLESHOOTING POWER UNIT

Disassemble the power unit by removing the screws securing the end plates to the power unit. Remove the end plate which has the power plug and slide the bottom heat sink forward until it can be separated. The large capacitor may be attached to the rear end plate by thermal epoxy for efficient heat transfer and should be taken to avoid breaking this bond. The upper heat sink (with transistors mounted on it) can be slid forward, exposing the component board and capacitor bracket. Remove the nuts securing the board to the metal bracket and the component board will be completely accessible.

CONVERTER TROUBLESHOOTING

a. If the fuse keeps blowing, check transistor 2N3055 for a possible short. It will be necessary to remove the emitter wire, and unsolder the base wire before an ohmmeter check can be made. Many times only one transistor will fail. Failure of Capacitor C1 will also cause the fuse to blow.

b. If the converter won't start when voltage is first applied, a small current "kick" is noted and then no current is drawn; look for a poor solder joint in the starting circuit, R1 1.3K and R1 82 ohms. The converter may be started by applying about 2 volts to the junction of R1 and R2.

c. Low or no output voltage, but converter operates otherwise. Using an ohmmeter, look for a shorted diode in the bridge circuit. In extreme cases, the transformer could have a shorted winding. As a check, disconnect a lead from the transformer secondary, if the current remains the same, the transformer should be replaced.

d. Low output voltage can be the result of a faulty capacitor C2. Check by removing the positive lead from the capacitor.

e. Low voltage coupled with very slow voltage buildup can be traced to a faulty transistor 2N3055. An ohmmeter check will indicate which transistor has failed. Select replacement transistors having a collector to emitter resistance of 100 ohms minimum.

TRIGGER CIRCUIT TROUBLESHOOTING

a. Using a high impedance voltmeter, check for 180 volts DC at the junction of R6, R9 and C5. If there is no voltage, check C5 and SCR T1145A2.

b. If there is voltage at the junction, it should periodically drop to around 30 volts as the SCR triggers. If the SCR does not trigger, measure the voltage across R7 (100 ohms). This voltage will be below .5 volts. If the voltage is indicated, place an oscilloscope across R7 and look for a positive going pulse of around 4 volts at the repetition rate of 40 to 55 times per minute. If the pulse is recorded on the scope, then the SCR is not triggering and should be replaced.

c. When no voltage is observed across R7, check for battery voltage at R5 and R6. If voltage is present, then the trouble is in the unijunction.

d. If normal voltage is observed across R7, check the capacitor C4 for shorts and leakage.

e. If unijunction Q3 is to be replaced, it may be necessary to readjust the flash rate. This can be done by changing R5 or by changing the value of C4. In many cases, the value is recorded on the component board, and it is only necessary to order the exact value from the manufacturer (see the Vendor Publication List).

NOTE

In some instances, power supply units which have been stored or not operated on the aircraft for a considerable period of time, may not operate instantly when the system is turned on. Before determining that the power unit is inoperative, leave the system on for a period of at least 30 minutes. If the power unit does not operate in this span of time, refer to TROUBLESHOOTING POWER UNIT.

Issued: November, 1970
Figure 3-10. Bullock Power Supply Schematic (Internal)
GRIMES STROBE LIGHT SYSTEM

The system consists of a solid state power supply unit, a circuit breaker switch on the instrument panel, and 3 xenon gas lights mounted in the tail and each wing tip. The function of the Grimes Strobe Light system is essentially the same as the strobe light system described earlier in this section. Use that system description for a more detailed explanation of the method by which the Grimes system operates. The Grimes System does not incorporate a timing circuit, since all the lights flash at the same time at a rate of 60 flashes per minute.

POWER SUPPLY REMOVAL AND INSTALLATION

To gain access to the power supply unit, remove the floorboard on the RH side of the baggage compartment. The entire unit may be removed by disconnecting the electrical wiring to the power supply and removing the screws anchoring the module to the support structure. To reinstall the power supply unit, reverse the foregoing procedures.

CAUTION

Observe the precautions noted in the following procedure when removing and installing the power supply.

STROBE LIGHT WIRING

An incorrect hook-up of the wires at either the power input or between the strobe light assemblies and the power supply unit will cause a reversal of polarity that results in serious component damage and failure. Care must be taken to ensure that the red wire is connected to positive power and the black wire to ground. Make sure that the connectors are properly assembled and that red, white, and black wires (white/red, white/black, and white/yellow wires on the 28-volt system) are connected to pins "A", "B", and "C" of the connector respectively. The shields for the wing and tail light cables should be grounded to the airplane structure at the power supply.

WARNING

Although a bleed-off resistor is incorporated in the power supply circuit, high voltage is involved in the circuit between the power supply and light assemblies. For this reason, turn the control switch for the strobe lights OFF and wait for at least 10 minutes to elapse before disconnecting the cables at the power supply or light assemblies and before handling or disassembling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

REMOVAL AND INSTALLATION OF TAIL STROBE LIGHT

a. Remove the tail cone and light cover to gain access to the strobe light assembly.

CAUTION

To avoid damage to the strobe light system or possible physical injury from electrical shock, observe the precautions outlined under STROBE LIGHT WIRING before removing or installing the strobe light assembly.

b. Remove the two retaining screws that secure the light assembly in place and disconnect the light from the airplane electrical system.

c. Remove the 2 screws on the side of the light assembly to free the retainer and lens.

d. Rotate the lamp until free if it is to be replaced.

e. If the flash tube is to be replaced, remove the 4 screws on the backside of the light subassembly and pull it apart from the light assembly.

f. Remove the 2 screws on the bottom of the subassembly and remove the flash tube.

g. Reverse the preceding steps to reinstall the strobe light assembly.

REMOVAL AND INSTALLATION OF WING STROBE LIGHTS (Model G33)

CAUTION

To avoid damage to the strobe light system or possible physical injury from electrical shock, observe the precautions outlined under STROBE LIGHT WIRING in this section before removing or installing the strobe light assembly.

a. Remove the 3 screws securing the strobe light in place.

b. Lift out the light assembly and disconnect the electrical wiring.

c. Remove the light assembly. Remove the lens and replace the flash tube or lamp as required.

d. Reverse the preceding steps to reinstall the light assembly.
REMOVAL AND INSTALLATION OF WING STROBE LIGHTS (MODEL F33A)

CAUTION

To avoid damage to the strobe light system or possible physical injury from electrical shock, observe the precautions outlined under STROBE LIGHT WIRING in this section before removing or installing the strobe light assembly.

a. Remove the transparent shield over the wing tip lights.
b. Remove the two screws securing the lens and light to the mounting bracket.
c. Remove the lens, and lift the strobe light out to disconnect the electrical wiring.
d. Reverse the preceding steps to reinstall the light assembly.

STROBE LIGHT LAMP REPLACEMENT GUIDE

<table>
<thead>
<tr>
<th>STROBE LIGHT</th>
<th>BULB NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>G33, F33A Tail Strobe Light Lamp (Grimes)</td>
<td>633</td>
</tr>
<tr>
<td>G33, F33A Tail Strobe Light Flash Tube (Grimes)</td>
<td>31-2440-1</td>
</tr>
<tr>
<td>F33A, F33C Tail Strobe Light Flash Tube (Grimes) (28 volt)</td>
<td>30-0815-1</td>
</tr>
<tr>
<td>F33A Wing Strobe Light Flash Tube (Grimes)</td>
<td>31-1840-1</td>
</tr>
<tr>
<td>G33 Wing Strobe Light Lamp (Grimes)</td>
<td>A7512-12</td>
</tr>
<tr>
<td>G33 Wing Strobe Light Flash Tube (Grimes)</td>
<td>31-2059-1</td>
</tr>
<tr>
<td>F33A, F33C Wing Strobe Light Flash Tube (Grimes) (28 volt)</td>
<td>30-1467-1</td>
</tr>
</tbody>
</table>
## STANDBY GENERATOR TROUBLESHOOTING GUIDE

### NOTE

The number two transistor and other components mounted to the rear of the ON-OFF-TEST switch will be referred to as the voltage regulator.

### ENGINE NOT RUNNING

1. Battery switch OFF, ON-OFF-TEST switch to TEST - BAT TEST light will not illuminate.
   - a. Open circuit between battery and BAT TEST light.
   - b. Fuses between battery and ON-OFF-TEST switch blown.
   - c. Faulty diode between battery and ON-OFF-TEST switch.
   - d. Defective BAT TEST lamp.
   - e. Defective ON-OFF-TEST switch.
     - a. Locate and repair open circuit.
     - b. Check for and correct cause of blown fuse. Replace fuse.
     - c. Replace diode.
     - d. Replace lamp.
     - e. Replace switch.

2. With STBY switch to ON and PWR XFER switch to NAV COM 1 - COMM 1, NAV 1, Audio Amplifier, Turn Coordinator and Engine Instruments are inoperative.
   - a. Defective power relay.
     - a. Replace relay.

3. With STBY switch to ON and PWR XFER switch to NAV COMM 2, NAV 2 and COMM 2 are inoperative.
   - a. PWR XFER switch defective or wired incorrectly.
     - a. Replace switch or rewire as necessary.

### ENGINE RUNNING

4. With STBY switch to TEST, engine at 1200 RPM GEN TEST light will not illuminate.
   - a. Loose connections.
   - b. Defective GEN TEST lamp.
   - c. Blown standby generator fuse.
   - d. Defective overvoltage relay.
     - a. Secure connections.
     - b. Replace lamp.
     - c. Check for and correct cause of blown fuse. Replace fuse.
     - d. Replace relay.
<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>PROBABLE CAUSE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGINE RUNNING</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. With STBY switch to TEST, engine at 1200 RPM GEN TEST light will not illuminate. (Cont’d)</td>
<td>e. Defective voltage regulator.</td>
<td>e. Replace faulty component of voltage regulator.</td>
</tr>
<tr>
<td></td>
<td>f. Defective standby generator.</td>
<td>f. Replace standby generator.</td>
</tr>
<tr>
<td></td>
<td>g. Defective ON-OFF-TEST switch.</td>
<td>g. Replace switch.</td>
</tr>
<tr>
<td>5. With the STBY switch to TEST, engine at 1200 RPM, GEN TEST light illuminates dimly, but will not get brighter as engine RPM is increased.</td>
<td>a. Faulty overvoltage relay.</td>
<td>a. Replace relay.</td>
</tr>
<tr>
<td></td>
<td>b. Rheostat out of adjustment.</td>
<td>b. Bench set rheostat or replace.</td>
</tr>
<tr>
<td></td>
<td>c. Faulty generator.</td>
<td>c. Replace generator.</td>
</tr>
<tr>
<td></td>
<td>d. Faulty voltage regulator.</td>
<td>d. Replace faulty component of regulator.</td>
</tr>
<tr>
<td>6. With the STBY switch to TEST, engine at 1200 RPM, GEN TEST light will illuminate dimly, but goes out as engine RPM increases</td>
<td>a. Faulty overvoltage relay.</td>
<td>a. Replace relay.</td>
</tr>
<tr>
<td></td>
<td>c. Defective voltage regulator.</td>
<td>c. Replace faulty component of regulator.</td>
</tr>
<tr>
<td></td>
<td>d. Defective generator.</td>
<td>d. Replace generator.</td>
</tr>
</tbody>
</table>
BEECHCRAFT NEW-MATIC AUTOPILOT
(Figure 3-10)

The BEECHCRAFT New-matic autopilots operate on an electro-pneumatic concept. Electronic circuitry is used for navigational beam detection, magnetic heading direction and turns. Pneumatic servos are used for the flight control actuators. The systems are completely non-tumbling. Yaw, roll and turn detection is made by a tilted gyro (EVT turn coordinator electrical vacuum torquing combination) mounted in the instrument panel. A dampened miniature aircraft serves as the instrument indicating arm. Any deviation from straight flight causes the rate gyro to move a pressure (or vacuum) valve which puts force into the aileron or rudder to return the aircraft to straight flight. Turns or beam following is made by rotating a valve sleeve by a torquing movement proportional to the voltage imposed upon it. This unit also supplies an output voltage proportional to the turning rate that is used for dip compensation and nose up signal during turns. The pitch control system does not use a gyro for reference, but uses the airspeed, rate of airspeed change and inertial signals to control the elevator through the pitch servos. An attitude hold sensing unit works in conjunction with the pitch control to sustain a given altitude.

Figure 3-10. BEECHCRAFT New-Matic B-5 Autopilot System
The pitch control in an aircraft is designed to respond to a given altitude. As the aircraft's altitude changes, the control system reacts by moving the ailerons and elevators. The diagram illustrates the connection between various components such as the static pressure and airspeed systems, which feed data to the main control unit. The control system uses these inputs to adjust the ailerons and elevators to maintain the aircraft's stability.

From the static pressure and airspeed sensors, analog signals are fed into the control system. These signals are then processed by the computer to determine the aircraft's attitude and altitude. The control system then sends signals to the aileron and elevator servos to adjust their position accordingly. This ensures that the aircraft remains stable and retains the desired altitude.

The diagram shows how these systems work together to maintain aircraft stability. The static pressure and airspeed sensors provide the necessary data, which is then processed by the computer. The output of the computer is then used to control the servos, ensuring that the aircraft's attitude is maintained at the desired level.
Figure 3-12. BEECHCRAFT New-Matic B-5 and B-7 Heading Lock/Navigation Coupler System Adjustment Points
## AUTOPilot TROUBLESHOOTING GUIDE

### NOTE

This procedure applies to the BEECHCRAFT New-matic autopilots. Manuals noted in the Supplementary Publications list and the appropriate test sets as listed in those manuals will aid further in troubleshooting procedures.

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<tr>
<td><strong>ROLL AXIS</strong></td>
<td></td>
<td></td>
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<tr>
<td>1. Insufficient or excessive pressure indicated on aircraft system gage.</td>
<td>a. Leak in aircraft pressure system. b. Regulator valve improperly adjusted. c. Adjustable orifice or regulator improperly adjusted. d. Faulty pressure pump. e. Ambient air filter clogged. f. Clogged system filter.</td>
<td>a. Check all lines and fittings for breaks, looseness, kinks, etc. b. Adjust as outlined in Section 3. c. Adjust as outlined in Section 3. d. Replace pump. e. Clean or replace. f. Check as outlined in Section 3 and replace if necessary.</td>
</tr>
<tr>
<td>2. Aircraft hunts or recovers slowly from turn in one direction.</td>
<td>a. Regulator valve improperly adjusted. b. Loose aircraft primary cables or excessive friction in aileron and/or rudder cables, pulleys, bell cranks or loose servo cables. c. Leak in servo or servo lines. d. Obstruction in servo lines. e. Faulty turn coordinator gyro.</td>
<td>a. Adjust as outlined in Section 3. b. Check security of attachment, binding, etc. and adjust as outlined in Section 3. c. Check for leaks. d. Check for foreign matter. e. Replace turn coordinator.</td>
</tr>
<tr>
<td>3. Autopilot sluggish.</td>
<td>a. Low system pressure setting.</td>
<td>a. Check system filters and adjust as outlined in Section 3.</td>
</tr>
<tr>
<td>4. Aircraft turns continuously on basic stabilization. (Controller &quot;OFF&quot;)</td>
<td>a. Aircraft out of trim or improperly rigged. b. Loose primary cables or excessive friction in cables and system. Loose servo cable. c. Defective turn coordinator gyro. d. Leak in servo or servo line.</td>
<td>a. Trim aircraft or check controls for proper rig as outlined in Section 3. b. Check security of attachment, binding, etc. and adjust as outlined in Section 3. c. Replace turn coordinator gyro. d. Check for servo or line leaks.</td>
</tr>
<tr>
<td>5. Aircraft rate of turn too fast or too slow.</td>
<td>a. Improper regulator adjustment. b. Turn coordinator faulty.</td>
<td>a. Adjust regulator as outlined in Section 3. b. Replace turn coordinator.</td>
</tr>
<tr>
<td>6. Continuous control wheel oscillation in smooth air.</td>
<td>a. Turn coordinator faulty.</td>
<td>a. Replace turn coordinator.</td>
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<tr>
<td>6. Continuous control wheel oscillation in smooth air.</td>
<td>b. Improper gyro speed or excessive pressure in system.</td>
<td>b. Adjust system pressure as outlined in Section 3.</td>
</tr>
<tr>
<td>(Contd)</td>
<td>a. Faulty turn coordinator.</td>
<td>a. Replace turn coordinator.</td>
</tr>
<tr>
<td>7. No turns or turns in one direction only, in response to</td>
<td>b. Faulty controller/amplifier.</td>
<td>b. Replace controller/amplifier.</td>
</tr>
<tr>
<td>turn control or on all models of navigation coupler operation.</td>
<td></td>
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<tr>
<td>8. Aircraft rolls in one direction only either left or right.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Aircraft turns in the wrong direction in &quot;CAP&quot; and &quot;TRK&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>modes.</td>
<td></td>
<td></td>
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<tr>
<td>10. No aircraft response from navigation coupler in any mode,</td>
<td></td>
<td></td>
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<tr>
<td>ground check shows electrical.</td>
<td></td>
<td></td>
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<tr>
<td>11. Aircraft fails to turn to and hold magnetic headings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Magnetic headings consistently high or low.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Cardinal headings inaccurate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Cardinal headings accurate but intermediate headings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inaccurate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Insufficient or no control in &quot;CAP&quot; and &quot;TRK&quot; modes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Localizer approach is either sluggish or too sensitive.</td>
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| 17. No electrical output left or right on controller/amplifier test jacks. | a. No A+ input or improperly grounded. 
| | b. Defective controller/amplifier or power supply. | a. Check A+ and ground. 
| | a. Defective controller/amplifier. | b. Replace controller/amplifier or power supply. 
| 18. Output only one way on controller/amplifier test jacks. | a. Defective controller/amplifier or power supply. | a. Replace controller/amplifier. 
| 19. No output on HDG mode on controller/amplifier test jacks. | | a. Replace controller/amplifier; or harness, or heading sensor. 
| 20. Heading output on two reciprocal headings, but not on the other two. | a. Defective sensor; or harness; or faulty controller/amplifier. | a. Replace heading sensor, or check harness. Replace controller/amplifier. 
| 21. "0" output when in CAP, TRK, or APP mode, with nav signal. | a. Defective nav switching console; or no nav information; or defective controller/amplifier. | a. Check nav input leads. Replace controller/amplifier. 
| 22. Output voltage in CAP mode decays to "0" voltage. | a. Wrong nav input signals. 
| | c. Dirty input signal (AC volts). | b. Repair or replace console. 
| 24. Nav indicator needle deflects left or right when controller/amplifier or radio is turned on. | a. One of the components is shorted to ground. | a. Reverse pins. (See Figure 3-11) 
| 25. Low or high intercept angle. | a. Incorrect setting on controller/amplifier. | a. Check for shorts. 
| | b. Low or high voltage output on nav indicators. | a. Adjust intercept angle. 
| | | b. Check nav indicators to manufacturer's specs. 
| PITCH AXIS | | |
| 1. Pitch channel will not center up electrically. | a. Defective pitch/altitude sensor or amplifier. | a. Check on Test Set TS-108 or replace one at a time. 
| 2. Altitude channel will not center up electrically. | a. Defective pitch/altitude sensor or amplifier. | a. Check on Test Set TS-108 or replace one at a time. 
| 3. Altitude hold solenoid valve will not actuate. | a. Pressure switch on servo control valve out of circuit. | a. Check for faulty switch and replace if necessary. 
| | b. Defective solenoid valve. | b. Replace solenoid valve. 
| | c. Defective altitude switch on controller/amplifier. | c. Check continuity (see Figure 3-11). 
| 4. Servo control valve will not center. | a. Improper pressure adjustment. | a. Adjust as outlined in Section 3. 
| | b. Sticky valve. | b. Replace valve. 
| 5. Output voltage is inadequate. | a. Pitch/altitude amplifier sensor or harness shorted or improperly wired. | a. See Figure 3-11, run continuity check and check for shorts. 

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<td>6. Pressure switch will not make contact when pressure is on.</td>
<td>a. Defective pressure switch or not set at proper pressure.</td>
<td>a. Replace pressure switch.</td>
</tr>
<tr>
<td>7. Output voltage one way only on pitch and altitude channels.</td>
<td>a. Servo control valve shorted to ground.</td>
<td>a. Replace valve.</td>
</tr>
<tr>
<td>8. System will not maintain trimmed configuration even through centered electrically.</td>
<td>a. Servo control valve not pneumatically centered.</td>
<td>a. Disconnect electrical power. Center valve pneumatically by use of differential gage to ± 0.4 in. Hg.</td>
</tr>
<tr>
<td></td>
<td>b. Leak in servos or improperly rigged.</td>
<td>b. Check for leaks and rig.</td>
</tr>
<tr>
<td></td>
<td>c. Leak in pitch/altitude sensor.</td>
<td>c. Replace sensor.</td>
</tr>
<tr>
<td>9. System will not respond to airspeed changes.</td>
<td>a. Primary pressure not set properly.</td>
<td>a. Adjust as outlined in Section 3.</td>
</tr>
<tr>
<td></td>
<td>b. Pitot pressure inadequate.</td>
<td>b. Check pitot plumbing.</td>
</tr>
<tr>
<td></td>
<td>c. Decay rate improperly adjusted.</td>
<td>c. Adjust as required.</td>
</tr>
<tr>
<td>10. System will not respond to up-command adjustment.</td>
<td>a. Defective pitch/altitude amplifier.</td>
<td>a. Replace pitch/altitude amplifier.</td>
</tr>
<tr>
<td></td>
<td>b. No EVT potentiometer output.</td>
<td>b. Replace turn coordinator.</td>
</tr>
<tr>
<td>11. System will not respond to altitude gain adjustment.</td>
<td>a. Pitch/altitude amplifier limiter improperly set.</td>
<td>a. Adjust as required.</td>
</tr>
<tr>
<td>12. Aircraft has long term oscillation about pitch axis with altitude hold OFF.</td>
<td>a. Decay rate improperly adjusted.</td>
<td>a. Adjust as required.</td>
</tr>
<tr>
<td></td>
<td>b. Pitch altitude gain improperly adjusted.</td>
<td>b. Adjust as required.</td>
</tr>
<tr>
<td></td>
<td>c. Friction in elevator or servo system.</td>
<td>c. Check for friction and correct.</td>
</tr>
<tr>
<td>13. Aircraft has short term oscillation about pitch axis.</td>
<td>a. Decay rate too tight.</td>
<td>a. Adjust as required.</td>
</tr>
<tr>
<td></td>
<td>b. Pitch gain too high.</td>
<td>b. Adjust as required.</td>
</tr>
<tr>
<td></td>
<td>c. Primary pressure too high.</td>
<td>c. Readjust as outlined in Section 3.</td>
</tr>
<tr>
<td></td>
<td>b. Decay rate improperly adjusted.</td>
<td>b. Adjust as required.</td>
</tr>
<tr>
<td>15. Aircraft does not return to altitude when displaced.</td>
<td>a. Altitude hold solenoid inoperative.</td>
<td>a. Replace solenoid.</td>
</tr>
<tr>
<td></td>
<td>b. Leak in altitude system.</td>
<td>b. Check for leaks.</td>
</tr>
<tr>
<td></td>
<td>c. Altitude limiter improperly adjusted.</td>
<td>c. Adjust as required.</td>
</tr>
<tr>
<td>16. Aircraft descends or ascends continually when system engaged.</td>
<td>a. Servo control valve not phased correctly.</td>
<td>a. Apply positive 6.0 volts (max) to blue lead and verify nose up response.</td>
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SECTION 4

MAJOR DISASSEMBLY
SECTION 4

Major Disassembly
## SECTION 4
### RECORD OF TEMPORARY REVISIONS

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**NOTE:** Insert this Record of Temporary Revisions after the Section 4 divider tab.
SEATS

REMOVAL AND INSTALLATION OF FRONT SEAT

a. Remove seat rear stops.

b. With seat adjustment handle pulled up, move seat to the rear; disengage the seat channels from the tracks.

c. Remove the seat.

d. Reinstall the front seat by reversing the above removal procedure.

REMOVAL AND INSTALLATION OF THIRD AND FOURTH PLACE SEAT (CD-1 thru CD-813)

a. Unsnap the rear spar cover beneath the rear seat back.

b. Disconnect and remove the seat belts.

c. Unsnap and remove all seat cushions.

d. Remove the cotter pins from the top rear seat tube and pull the tube out through the baggage door opening.

e. Remove the cotter pins from the lower tube.

f. Slide the tube to the left until it will clear the bracket on the right side, then lift the right end up until it can be removed out through the cabin door opening.

g. Remove the tube and the sling.

h. Reinstall the rear seat by reversing the above removal procedure.

THIRD AND FOURTH SEAT REMOVAL (CD-814 and after, CE-1 and after, CJ-1 and after)

a. Remove the seat track stops.

b. Engage the fore-and-aft adjustment lever and slide the seat off the tracks.

THIRD AND FOURTH SEAT INSTALLATION (CD-814 and after, CE-1 and after, CJ-1 and after)

a. Align the seat with the three seat tracks and slide the seat into position.

NOTE

The fore-and-aft adjustment lever will need to be engaged before the seat will slide into position.

b. Install the seat track stops.

REMOVAL AND INSTALLATION OF FIFTH AND SIXTH SEATS (CE-316 and after)

NOTE

At serial CE-674 and after the sixth seat is not installed.

a. Remove the two bolts at the lower aft portion of the seat bottom that secure the seat bottom and seat belt to the seat attach brackets.

b. Remove the seat back by removing the extrusion at the forward top side of the hatshelf. Reinstall the extrusion on the hatshelf.

c. Installation may be accomplished by reversing the above procedure.

FIFTH AND SIXTH SEAT STOWAGE (CE-316 and after)

NOTE

At serial CE-674 and after, the sixth seat is not installed.

a. Pull forward on the lower portion of the seat back until the seat back is in a horizontal position. By lifting up on the forward side of the seat bottom, rotate the seat bottom to a vertical position and position the seat bottom legs parallel with the seat bottom.

b. Lower the seat back into a vertical position and snap the retaining strap into position.

SEAT BACK ADJUSTMENT (CD-388 and after, CE-1 and after, CJ-1 and after)

A lever located on the inboard side of each seat operates the seat back adjustment. The seat back may be adjusted up or down by rotating this lever to actuate either Cam lock, or Roton lock, actuators, which will allow seat back movement. If Roton locks are the type of back lock, the back adjustment lever may be adjusted in either direction to move the seat back in either direction. If cam locks are the type of seat back lock used, the adjustment lever must be moved aft to move the seat back down. With cam locks the seat back may be raised without engaging the adjustment lever. The pilot's seat uses cam adjusters only.

WINGS

The all metal wing group consists of the front and rear spars, leading edge, wing tips, flaps, ailerons, and fuel tanks. The wing tips, flaps, and ailerons are readily removable. The forward wing attaching point is located at FS 83.00 while the rear wing attaching point is located at FS 118.00 on all Model 33 series airplanes. An optional remote compass is located in the left wing tip on all serials.

WING TIP REMOVAL

a. Remove the screws attaching the wing tip to the wing.
b. Disconnect the electrical leads to the navigation light.
c. Disconnect the remote compass at the left wing tip (if installed).

**WING TIP INSTALLATION**

a. Connect the remote compass at the left wing tip (if installed).
b. Connect the electrical leads to the navigation light.
c. Place the wing tip in position and secure it to the wing with screws.

**REMOVING THE WING**

a. Remove the front seats.
b. Remove the carpet and cover from the rear spar carrythrough structure.
c. Drain fuel cells.
d. Remove the wing mounting bolt access plates from the top and bottom of the wing.
e. Place the airplane on jacks and raise until the wheels are clear. A three point jack should be used because of the unbalanced condition of the airplane after the wing is removed.
f. Open the brake cylinder bleed ports and pump all fluid from the system. Disconnect and cap hydraulic lines at the wing root.
g. Operate the landing gear circuit breaker until the inboard landing gear doors are fully open.
h. Disconnect the inboard door actuator rod from the control horn.
i. Disconnect the landing gear uplock cable at the inboard connection in the wheel well.
j. Disconnect the landing gear actuator rod from the V-brace in the wheel well.
k. Disconnect and cap and fuel lines. The lines can be disconnected between the wing root rib and fuselage.
l. Disconnect and cap the pitot line at the left wing root in the wheel well.
m. Disconnect and label electrical wiring in the wheel wells.

n. Disconnect and label aileron cables at the turnbuckles under the third and fourth seats.
o. Disconnect the flap drive shaft from the motor.
p. Cradle wing.
q. Place a wing stand under the wing not being removed and place a stand under the tail.
r. Outline the position of the wing on the fuselage as a guide to reinstallation.

**CAUTION**

There should be no bolt binding during removal. Should binding occur, adjust the wing position until the bolt disengages freely. Do not screw or drive a bolt in or out of the fittings.

---

**WARNING**

The bushing installed in the upper forward wing spar (CD-1286 thru CD-1304 and CE-377 thru CE-400 except CE-394 and CE-395) and in the lower forward wing spar (CE-377 and after and CD-1286 and after) should not be removed and must be in place prior to the installation of the wing attach bolts.

s. Remove the mounting bolts, washers and nuts from the wing attach fittings.

**NOTE**

Discard the soft aluminum washers used between the upper wing attach fittings. Install new washers when installing the wing.

t. Disconnect the cold air ducts at the wing leading edge.
u. Remove the wing by pulling it straight away from the fuselage.

**INSTALLING THE WING**

a. Using a nonmetallic brush and naptha or methyl ethyl ketone (1 or 2, Chart 2), clean all wing attach fittings and hardware (bolts, washers and nuts). Inspect the wing attach fittings, bolts, washers and nuts as instructed under **WING BOLT, NUT, AND FITTING INSPECTION**.

**WARNING**

Wing bolts and nuts that have reached their life limit (10 years after the initial inspection) must not be reused.

b. Coat the fitting bolt bores and bearing faces, bolts, washers, and nuts with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

**WARNING**

The bushing installed in the upper forward wing fitting (CD-1286 thru CD-1304 and CE-377 thru CE-400 except CE-394 and CE-395) and in the lower forward wing fitting (CE-377 and after, CD-1286 and after) must be in place prior to installation of the wing bolts.

c. Move the wing into position, align the wing fittings with the carry through fittings, install new soft
Figure 4-1. Upper Forward Wing Bolt Installation
Figure 4-1A. Upper Aft Wing Bolt Installation
Figure 4-1B. Lower Forward Wing Bolt Installation

WET BOLT TORQUE: 2480 TO 2600 INCH-POUNDS. COAT THE COMPLETE BOLT, NUT, WASHER, WING FITTING BOLT BORES, AND EXPOSED THREADS WITH MIL-C-16173 GRADE 2 CORROSION PREVENTIVE COMPOUND.

*ONE OR TWO MS 20002-12 WASHERS MAY BE USED UNDER THE NUT TO PROVIDE BOLT GRIP ADJUSTMENT.
Figure 4-1C. Lower Aft Wing Bolt Installation
aluminum washers between the upper fittings, and insert the bolts.

**CAUTION**

Each bolt must be inserted by hand without binding. If a bolt cannot be easily inserted, reposition the wing until the bolt moves freely through the fittings. Do not screw or drive a bolt into the fittings. Bolts and nuts must be oriented as shown in the applicable illustration for each location (Figure 4-1, 4-1A, 4-1B, or 4-1C).

d. Start the nuts on the upper forward and aft bolts. Rotate the wing trailing edge until alignment with the outline on the fuselage is realized. After rotation is established, verify that the lower forward bolt is not binding in the bolt bore. If bolt binding is encountered, adjust the wing position until the bolt moves freely.

e. Tighten the upper forward and aft nuts.

**CAUTION**

When torquing the wing nuts assure that the wrenches do not bottom out on the wing fittings. Such an occurrence could cause false torque readings and damage to the fittings. After torquing the upper forward wing attach nut, remove the holding force from the wing cradle and torque the remaining three nuts.

e. Torque the nuts in the following order: upper forward, upper aft, lower forward, and lower aft. When a torque wrench adapter is used, the length of the adapter must be added to the length of the torque wrench and the proper wet torque value computed as detailed in Figure 4-1D.

**CAUTION**

Prior to torquing the lower aft nut, a slight gap may be evident between the fittings. This gap should not exceed a width of .060 inch. No gap should exist after the nut is torqued. Torque the wing attach bolts at the nut end; do not rotate the bolt in the bolt bore.

f. Coat the bolt threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound.

g. Connect the flap drive shaft to the flap motor.
h. Connect the aileron cables at the turnbuckles.
i. Connect the electrical wiring in the wheel well.
j. Connect the pitot line in the wheel well (LH only).
k. Connect the fuel lines.
l. Connect the hydraulic brake lines and bleed the brakes.
m. Connect the inboard door actuator rod.

computing torque

When a torque wrench and adapter is used, compensation must be made for the extra leverage gained. New indicator readings must be calculated before the wrench is used. To figure the desired lower readings which will actually give the torques specified, use the following formula:

\[ D = \frac{33 \times 5,000}{33 + 11} = \frac{165,000}{44} = 3,750 \text{ inch-pounds} \]

**Example:**

- \( D = \text{Desired reading} \)
- \( L = \text{Length of torque wrench} \)
- \( A = \text{Adapter length} \)
- \( T = \text{Torque} \)

- \( D = ? \)
- \( L = 33 \text{ inches} \)
- \( A = 11 \text{ inches} \)
- \( T = 5,000 \text{ inch-pounds} \)
An acceptable method of checking the torque, if a torque wrench is not available, is to attach a spring scale to a conventional flex or "T" handle inserted in an adapter. Force should be applied in a direction perpendicular to an imaginary line extending from the center of the bolt through the spring scale attaching point.

To calculate the force in pounds (scale reading) required to obtain the specific torque, divide the torque in inch-pounds by the distance in inches between the center of the bolt and the scale attaching point. For example, if the specified torque is 5,000 inch-pounds and the distance is 25 inches, a pull of 200 pounds must be applied. Unless torque values are specified as wet (lubricated), bolts to be torqued must be clean and free of all lubricants; otherwise loss of normal friction allowed for establishing the torque values may result in overtorquing of the bolt.

When a torque wrench adapter is used, the length of the adapter must be added to the length of the flex or "T" handle wrench and a value calculated for that particular combination. The following is a typical example in finding a desired value.

| Effective length of flex or "T" handle wrench | 12 inches |
| Length of adapter | 3 inches |
| Total length | 15 inches |
| Desired torque on bolt | 2,000 inch-pounds |

\[
\frac{2,000 \text{ inch-pounds}}{15 \text{ inches}} = 133.3 \text{ pounds (scale reading)}
\]

**Computing Torque with Spring Scale**

*Figure 4-1E*

**REMOVAL OF LEADING EDGE AND MAIN SPAR**

The wing must be removed from the airplane before the leading edge or main spar can be removed.

To remove the main spar disconnect the landing gear.

**NOTE**

Support the landing gear to avoid damaging the aft spar gear connection or remove the gear at both connections.

a. Support the wing on a suitable cradle.

b. Remove the wing tip, fuel cell, and other equipment as required by the work being done.

c. Remove the screws around the spar caps at the root and root tip ribs.

d. Pull the steel hinge pins. (Vise Grip pliers may be used to clamp on the pin and, using the pliers as both fulcrum and lever, to pull.) Remove the pins from the wing. Do not attempt to spin the pins out with a drill motor; the heating and expansion of the pin will cause it to seize in the hinge and break.

**INSTALLATION OF LEADING EDGE AND MAIN SPAR**

a. Before assembling the spar to the wing sections it is advisable to drive a hinge pin through the hinge sections to remove any burrs or foreign matter.

b. Use a new hinge pin coated liberally with MIL-M-7866B molybdenum disulfide powder.

c. Position the spar on the leading edge and align the hinge section.

**CAUTION**

Do not attempt to spin the hinge pin in with a drill motor.

d. Using an E-2 rivet gun (or a gun of equivalent size), drive the hinge pin in until the point is completely through the hinge but not against the wing attachment fitting. The pin must be supported during the driving operation with telescoping tubes of Repair Kit 35-588. A 5/64 x 10 inch steel rod and a flush rivet set with a 3/32 inch hole are suitable for driving the pin. Start the pointed end of the pin in the hinge and support the pin with the longest
tubes, the larger against the hinge, then commence driving the pin. Replace the telescoping tubes as necessary until the pin is completely driven. The hinge pins should extend 4.9 inches beyond the end of the spar. If necessary, trim them to obtain this length. Bend the end of the hinge pins 90 degrees and secure.

**NOTE**

It is imperative that the larger tube be held firmly against the hinge throughout the driving procedure in order to prevent the pin from kinking in the intervening space.

e. Install the main wing section in the same manner as the leading edge.

**NOTE**

If necessary, place a phenolic block against the spar and vibrate the spar with another rivet gun.

f. Replace the screws in the spar and root tip ribs.

g. Install all components which had been removed.

**ADJUSTING THE WINGS**

After a wing has been reinstalled or repaired, flight tests may show the wing to be chronically heavy or light. This condition may be corrected by rotating the wing to lower the trailing edge of a heavy wing or raising the trailing edge of a light wing by or a combination of adjusting both wings. The aluminum washers between the upper wing fittings must be replaced each time the position of the wing is changed. If both wings have been removed, install the right wing with the trailing edge at the highest point of the adjustment travel and the left wing 1/16 inch down from the highest point of travel. The total adjustment on each wing is approximately 1/8 inch. The following steps should be implemented when adjusting the wings:

a. Using a grease pencil outline the position of the wing on the fuselage.

b. Place the airplane on a three point jack and raise until the wheels are clear. Place a suitable cradle under the wing being adjusted and a wing stand under the unaffected wing. A tail stand will also be required to assure stability.

c. Loosen the nuts on the lower wing attach bolts and remove the nuts and bolts from the upper wing attach fittings. Coat the bearing faces and bolt bores of the fittings, the complete bolt, washers, and nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2). Install new soft aluminum washers between the upper wing attach fittings and replace the bolts and nuts. Raise or lower the trailing edge as required and retorque the wing attach nuts in the following order: upper forward, upper aft, lower forward, and lower aft. There should be no gap between the fittings after the last nut is torqued. Torque each nut to the wet torque value specified in the appropriate illustration (Figure 4-1, 4-1A, 4-1B, and 4-1C). Coat the threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

**NOTE**

After torquing the upper forward wing attach nut, remove the holding force from the wing cradle prior to torquing the remaining three nuts.

d. Remove the wing and tail stands, remove the airplane from the jack, and test the airplane.

e. At the first scheduled inspection after the wing has been adjusted, check the wing bolts for proper torque. Check the drain ports in the upper wing attach fittings to assure that they are unobstructed.

**WING BOLT, NUT, AND FITTING INSPECTION**

**NOTE**

Read the entire section before removing any wing bolts for inspection.

**WARNING**

An initial and recurring wing bolt and nut inspection and replacement schedule must be instituted on all Model 33 Series airplanes, five years old or older (see Chart 1). Wing bolts and nuts that are removed in compliance with the schedule shown in Chart 1 or because of condition, must be rendered unserviceable.

**CAUTION**

There should be no wing bolt binding during removal or installation of the bolts. Do not screw or drive a bolt into or out of the fittings. If wing bolt binding is encountered, place the airplane on a three point jack and raise until the wheels are clear. Place a wing stand under each wing and a tail stand under the aft fuselage. Defuel the wing, loosen the remaining three nuts and rotate the wing until the bolt moves freely through the fittings. Replace the soft aluminum washers between the upper wing attach fittings and retorque the nuts as instructed under INSTALLING THE WING. If bolt binding is not encountered and the wing has not shifted, replacement of the soft aluminum washers between the upper fittings is not required.
The first wing bolt inspection for airplanes five years old or older must be performed at the first scheduled inspection following the issue date of revision C14.

At each replacement interval, all wing attach hardware (bolts, washers, and nuts) must be replaced.

NOTE

Beech Aircraft Corporation supplies wing attach hardware that has been given an additional magnetic particle inspection since manufacture. These components may be identified by the green dye on the head of the bolt and on some portion of the nut.

a. Before removing any wing bolt, draw an outline of the wing position on the fuselage with a grease pencil. If wing bolt binding is encountered and the wing must be shifted, the outline will be helpful in returning the wing to its original position.

WARNING

Use only the components specified in the applicable illustrations. DO NOT INSTALL THE BLACK P/N H-20 NUTS. These nuts have been dry film lubricated with molybdenum disulfide. When MIL-C-16173 Grade II corrosion preventive compound is added to these nuts, the additional lubrication may cause improper preload in the bolt when torqued.

b. Starting at the lower wing attach point on each side, remove, inspect and retorque one bolt and nut set at a time until the complete set of eight bolts and nuts have been inspected.

c. Using a nonmetallic brush thoroughly clean the bolt, washer, and nut with naptha or methyl ethyl ketone (1 or 2, Chart 2).

CAUTION

Assure that the 95-110025-1 (shown in Figure 4-1) and the 95-110025-7 (shown in Figure 4-1A and 4-1C) washers have a full complete radius with no sharp edges that could damage the fittings.

d. If the bolts and nuts do not exceed the life limit shown in Chart 1, visually inspect each bolt and nut with a 10-power or stronger magnifying glass; inspect for corrosion, cracks, and mechanical damage. The cadmium plating may display areas that appear rubbed, discolored, or polished. These areas usually are the result of prevailing installation procedures and are of no significance. A bolt should not be rejected because of cadmium plating deterioration; however, any component that is cracked, corroded, or has mechanical damage must be replaced.

e. Using the magnetic particle inspection process described in this chapter, check each bolt for circumferential crack indications and each nut for longitudinal crack indications. If the bolts and nuts prove to be free of all damage (corrosion, cracks, and mechanical damage), they may be reused after demagnetization and cleaning.
f. Clean the spar fitting bolt bores with naptha or methyl ethyl ketone (1 or 2, Chart 2). Do not strip the epoxy paint from this area. Inspect the surface condition of each fitting; focus special attention on the washer seat and bolt bore area. If scoring, corrosion pitting or washer impressions are discovered in this area, contact the Commercial Service Department of Beech Aircraft Corporation. If the fitting is satisfactory, coat the bolt bore and bearing faces of the fitting with Alodine 1200, 1200S or 1201 (3, Chart 2). Allow the coating to remain on the surface for approximately five minutes. When the time has elapsed, wash the coated areas with water and blow dry (do not wipe dry). Paint the treated areas with zinc chromate primer (4, Chart 1) and allow to dry.

g. Coat the bearing faces and bolt bores of the fittings, the complete bolt, washers, and nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 1).

h. Install the bolt, washers and nut into the fittings.

CAUTION

Do not allow the wing bolt wrenches to bottom out on the wing attach fittings. This could result in damage to the fittings and erroneous torque readings.

i. Torque the nut to the wet torque value shown in the appropriate illustration (Figure 4-1, 4-1A, 4-1B, or 4-1C). When a torque wrench adapter is used, the length of the adapter must be added to the length of the torque wrench and the proper torque value computed as detailed in Figure 4-1D and 4-1E.

j. Coat the exposed threads that protrude through the nut with MIL-C-16173 Grade II corrosion preventive compound (5, Chart 2).

k. Check that the decal shown in Figure 4-1F is affixed to the appropriate locations on the airplane.

l. Check the drain ports in the upper wing attach fittings to ensure that they are open and free to drain.

m. At the first scheduled inspection after the wing bolts have been inspected or replaced, check for correct torque readings.

---

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SPECIFICATION</th>
<th>PRODUCT</th>
<th>VENDOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Naptha</td>
<td>TT-N-95</td>
<td>Alodine</td>
<td>Amchem Products Inc., Spring Garden St.</td>
</tr>
<tr>
<td>3. Coating</td>
<td>MIL-P-8565</td>
<td>Briscote</td>
<td>Bray Oil Co., 1925 Marianna St., Los Angeles, Calif. 90032</td>
</tr>
<tr>
<td>4. Primer, Zinc Chromate</td>
<td>MIL-C-16173</td>
<td>Petrotech</td>
<td>Penreco P.O. Box 671, Butler, Pa 16001</td>
</tr>
</tbody>
</table>

---

CHART 2

CONSUMABLE MATERIALS
<table>
<thead>
<tr>
<th>POSITION</th>
<th>BOLT PART NO.</th>
<th>WRENCH PART NO.</th>
<th>NUT PART NO.</th>
<th>NUT TORQUE ADAPTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWER NAS152-46/M/ FORWRD</td>
<td>(CD-1 thru CD-765)</td>
<td>TS1222-3</td>
<td>12B126</td>
<td>TS1171-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(CD-1 thru CD-1304, CE-1 thru CE-927, CJ-1 thru CJ-155)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MS20012-28/M/ or 131790-3 (CD-766 thru CD-1285, CE-1 thru CE-376, CJ-1 thru CJ-30)</td>
<td>TS1222-5 or 9/16 inch Allen Wrench</td>
<td>EB126</td>
<td>TK1817-922-2 (CE-928 and after, CJ-156 and after)</td>
</tr>
<tr>
<td></td>
<td>NAS152-37/M/ or 131790-1 (CD-1305 and after, CE-394, CE-395, CE-401 and after, CJ-31 and after)</td>
<td>TS1222-3 (5/8 inch hex)</td>
<td>2N8126</td>
<td>TK1817-922-2 (CE-928 and after, CJ-156 &amp; after)</td>
</tr>
<tr>
<td>UPPER AFT NAS150-33/M/</td>
<td>TS1222-5 or 9/16 inch Allen Wrench</td>
<td>12B108</td>
<td>TS1171-1</td>
<td>50-590013</td>
</tr>
<tr>
<td>LOWER AFT NAS150-35/M/</td>
<td>TS1222-5 or 9/16 inch Allen Wrench</td>
<td>12B108</td>
<td>TS1171-1</td>
<td>50-590013</td>
</tr>
</tbody>
</table>
Bolts: Inspection of a bolt is accomplished by longitudinal magnetization in a multturn low-fill factor coil (i.e., the inner diameter of the coil greatly exceeds the bolt diameter). For proper magnetization the bolt is positioned close to the coil inside wall with the bolt length perpendicular to the winding direction. The magnetic particle suspension is flowed on the bolt and the appropriate current is applied to achieve adequate field strength. Using the described procedure, laboratory testing has indicated that the ampere turns values listed in Chart 4 provide optimum detection of discontinuities perpendicular to the bolt axis.

MAGNETIC-PARTICLE INSPECTION

Inspection of a bolt is accomplished by longitudinal magnetization in a multturn low-fill factor coil (i.e., the inner diameter of the coil greatly exceeds the bolt diameter). For proper magnetization the bolt is positioned close to the coil inside wall with the bolt length perpendicular to the winding direction. The magnetic particle suspension is flowed on the bolt and the appropriate current is applied to achieve adequate field strength. Using the described procedure, laboratory testing has indicated that the ampere turns values listed in Chart 4 provide optimum detection of discontinuities perpendicular to the bolt axis.

CHART 4
MAGNETIC-PARTICLE INSPECTION
(STEEL BOLTS)

<table>
<thead>
<tr>
<th>BOLT DIAMETER</th>
<th>TOTAL BOLT LENGTH INCLUDING HEAD TO NEAREST 1/4 INCH</th>
<th>AMPERE TURNS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 INCH</td>
<td>2 1/2 INCH</td>
<td>7900</td>
</tr>
<tr>
<td>5/8 INCH</td>
<td>3 1/4 INCH</td>
<td>6600</td>
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<td>3 1/4 INCH</td>
<td>7900</td>
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</tr>
<tr>
<td>7/8 INCH</td>
<td>3 1/2 INCH</td>
<td>7900</td>
</tr>
<tr>
<td>7/8 INCH</td>
<td>3 1/4 INCH</td>
<td>7400</td>
</tr>
<tr>
<td>7/8 INCH</td>
<td>4 INCH</td>
<td>6900</td>
</tr>
<tr>
<td>1 INCH</td>
<td>5 INCH</td>
<td>5500</td>
</tr>
</tbody>
</table>

*Amperage requirement is the ampere turns value divided by the number of turns on the coil. For example: A 1-inch diameter x 5-inch long bolt tested on a 5-turn coil would require 6200 ÷ 5, or 1260 amps.

Nuts: Inspection of a nut is accomplished by circular magnetization on a central conductor (usually a copper rod) the approximate size of the nut inside diameter. For proper magnetization, the central conductor bar is inserted through the nut and the bar is positioned between the heads of the wet horizontal equipment. The magnetic particle suspension is flowed on the nut and the appropriate current is applied through the central conductor to achieve adequate field strength. Using the described procedure, laboratory testing has indicated that the amperage values listed in Chart 5 provide optimum detection of discontinuities parallel to the nut axis.

CHART 5
MAGNETIC-PARTICLE INSPECTION
(STEEL NUTS)

<table>
<thead>
<tr>
<th>NUT SIZE</th>
<th>CENTRAL CONDUCTOR SIZE</th>
<th>AMPERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 INCH</td>
<td>1/2 INCH</td>
<td>500 AMPS</td>
</tr>
<tr>
<td>3/4 INCH</td>
<td>3/4 INCH</td>
<td>700 AMPS</td>
</tr>
<tr>
<td>1 INCH</td>
<td>7/8 INCH</td>
<td>800 AMPS</td>
</tr>
</tbody>
</table>
This illustration represents a typical section of the spar cap areas to be inspected for indicators of possible corrosion. The indicators are all shown in one area and are exaggerated for clarity. Any one or any combination of the indicators are cause for further investigation.

Visual Spar Cap Inspection
Figure 4-1G

After magnetic particle inspection, the parts must be carefully demagnetized and cleaned of the ferromagnetic particles. Examine parts for any possible evidence of electric arc burn that may have occurred during the inspection.

OUTBOARD WING MAIN SPAR CAP INSPECTION

The outboard wing main spar cap must be inspected annually for corrosion.

WARNING

All areas of the spar cap from the wing attach fitting to the outboard end of the spar cap must be inspected.

Beechcraft Kit No. 35-4008-1S provides the parts and information necessary to install a new 000-11001-1 LH spar and a new 000-11001-2 RH spar on the 35-33 thru G33 series Bonanzas. The kit does not contain the spars which must be ordered separately. Parts for installing new spars on the E33 and F33 series Bonanzas may be ordered from the appropriate parts catalog.

NOTE

Special emphasis should be placed on airplanes that have been operated or stored for extended periods (5 years or longer) where geographical locations or atmospheric conditions are highly conducive to corrosion.

Inspection of the upper and lower spar cap should be accomplished in the following manner:

a. Examine the forward and aft sides of the spar cap where it meets the skin. If a whitish, salt-like, nonmetallic substance is noted in these areas, a thorough inspection should be performed to determine if corrosion has occurred. Wax or paint trapped between the edge of the skin and the exposed section of the spar cap should not be misinterpreted as corrosion.

b. Wash all exposed areas of the upper and lower spar cap.

c. Visually inspect all exposed areas of the upper and lower spar caps for irregularities, such as paint blisters, raised or uneven areas, and cracks. The exposed areas of the spar cap are extruded flat and irregularities could be an indication of corrosion. Investigate all irregularities to determine if any damage has occurred.
NOTE

Uneven or raised areas on the spar caps may be detected by sliding the fingers over the surface, by moving a straight edge over the surface or by sighting down the length of the spar cap surface.

If unusual conditions are encountered that cannot be resolved locally, contact Beech Aircraft Corporation for evaluation and determination of corrective action that may be required.

STABILIZERS

REMOVAL AND INSTALLATION OF HORIZONTAL STABILIZER

a. Remove the tail cone, the access plate over the elevator tab actuator sprocket and the access doors on the left side of the fuselage.
b. Place the elevator tab in neutral position and mark the chain and the sprocket to aid in reinstallation. Disconnect the elevator tab cables from the tab actuator.
c. Disconnect the elevator push rods.
d. Remove the bolts attaching the elevators to the bracket that is mounted over the stabilizer rear spar.
e. Remove the remaining attaching bolts in the rear spar, the attaching bolts in the front spar and remove the bracket. Remove the stabilizer.

CAUTION

The nuts for the rear spar attaching bolts must be placed on the forward side of the spar to avoid contact with the elevator center hinge assembly. Bolt pressure on the center hinge assembly imposes stresses which can induce structural failure of the hinge.

f. Reinstall the stabilizer by reversing the above removal procedure.

REMOVAL AND INSTALLATION OF VERTICAL STABILIZER

a. Remove the tail cone and the access doors on the left side of the fuselage.
b. Disconnect antenna mast wiring.
c. Remove the bolts attaching the rudder to the rudder bell crank.
d. Remove the bolts in the front and rear spars at the fuselage fittings.
e. Pull the stabilizer straight up from the fuselage.
f. Reinstall the stabilizer by reversing the above removal procedure.

WHEELS

(Refer to Service Instructions No. 0212-200. Landing Gear. Modification of Goodyear Wheels for Use With Tube Type Tires or Rim Inflated Tubeless Tires.)

NOTE

Do not exceed 500 wheel miles between repacking intervals.

DISASSEMBLY OF MAIN AND NOSE WHEEL

(Prior to CD-640 except CD-625, CD-632, CD-637, and CD-638.)

a. Remove back plate from brake assembly on main wheel. Remove guard assembly from nose landing wheel.
b. Remove outer dust shield and hub cap on main wheel.
c. Remove cotter pin and unscrew axle nut.
d. Remove spacer and wheel from axle.

CAUTION

Make sure tire is fully deflated before disassembling wheel.

e. Deflate tire and break bead away from wheel flange.

NOTE

Avoid damaging wheel when breaking beads. A scratched, gouged, or damaged wheel may cause an air leak.

f. Remove locknuts and washers from through bolts.
g. Separate wheel halves, removing the rubber O-ring and tire.

h. On main wheel remove inner dust shield, grease seal felt, grease seal ring, bearing cone and brake disc. On nose wheel remove snap rings from both wheel halves, releasing the grease seal rings, grease seal felts, and bearing cones.

NOTE

The bearing cups are a press fit in the wheel halves and should not be removed unless replacement is necessary. To remove, heat the wheel half in boiling water for 15 minutes and press the bearing cup out on an arbor press. Press in the new cup while the wheel is still hot.

DISASSEMBLY OF MAIN AND NOSE WHEEL

(CD-625, CD-632, CD-637, CD-638, CD-640 and after and CE-1 and after.)

a. Remove the guard assembly from the nose landing wheel.

b. Remove the outer dust shield and hub cap from the main wheel.

c. After removing the retaining cotter pin, unscrew the axle nut.

d. Remove the spacer and wheel from the axle.

CAUTION

Make sure the tire is fully deflated before disassembling the wheel.

e. After the tire has been deflated and the wheel removed, break the bead of the tire away from the flange of the wheel.

NOTE

Take all necessary precautions to avoid damaging the wheel while breaking the beads of the tire free from the wheel flange, since a scratched, gouged, or damaged wheel may cause an air leak.

f. Remove the locknuts and washers from the bolts securing the two wheel halves together.

g. Separate the wheel halves and the ring disc, removing the rubber O-ring (if installed) and the tire. The nose wheel is disassembled in the same manner except that it does not contain a ring disc.

NOTE

The bearing cups are shrunk fit into the wheel halves and should not be removed when the wheel is disassembled unless replacement of the cups is necessary. Before removal and installation of the cup is attempted, the wheel half must be heated for a period of 30 minutes either in an oven at temperatures not to exceed 149°C (300°F) or in boiling water.

REASSEMBLY OF MAIN AND NOSE WHEEL
(Prior to CD-640 except CD-625, CD-632, CD-637, and CD-638.)

a. Main Wheel: position the through-bolts into the brake disc and set into the inner wheel half, using the bolts to guide the disc. Make sure the disc is bottomed in the wheel half. Nose Wheel: position the through-bolts and their washers into the bolt holes of one wheel half.

b. Set disc and/or wheel flat on the table exposing the three bolt ends and the O-ring groove. Place the tire around the wheel half. Inspect the O-ring groove on both wheel halves to assure a clean and smooth surface. Dirt or chips under the O-ring will cause an air leak. Wipe the O-ring with clean bearing grease. Aero Shell 5 (Shell Oil Co., Houston, Texas) and center in the O-ring groove. Place the other wheel half over it, using the bolt ends as a guide. Apply a light downward force to the outer wheel half; if the wheel halves do not bottom solidly together the O-ring is not positioned properly. Assemble the washers and nuts on the bolts and torque all nuts to 90 inch-pounds.

NOTE

Uneven or improper torque may cause bolt failure and ultimate wheel failure.

NOTE

Saturate felt seals in 10 W 30 oil and press out excess oil. Coat the sides and circumference of the felt seals with the same grease used on the wheel bearings.

c. Pack bearing cones with clean bearing grease. Install bearing cone, grease seal ring, grease seal felt, and snap ring on nose wheel or inner dust shield on disc side of main wheel.

d. Place wheel on axle. Main Wheel: insert remaining bearing cone on axle and into wheel. Assemble spacer, axle nut and cotter pin. Install hub cap and dust shield. Nose Wheel: assemble axle nut and cotter pin.

e. On main wheels, put back plates on brakes.

f. Rotate wheels to check installation.
REASSEMBLY OF MAIN AND NOSE WHEEL
(CD-625, CD-632, CD-637, CD-638, CD-640 thru
CD-1257, CE-1 thru CE-300, CJ-1 thru CJ-30)

a. Using a lint-free cloth dampened with denatured alcohol, wipe the wheel flange bead seat and wheel mating surfaces to remove any foreign matter.

b. After lubricating the O-ring seal with Aero Shell 5 (Shell Oil Co., Houston Texas) bearing grease or its equivalent, install it in the brake-side wheel half.

NOTE
All reference to the O-ring is for tubeless tires only.

c. Position the ring disc subassembly on the brake-side wheel half, and insert the retaining bolts through the wheel half.

d. After wiping the tire beads clean with a cloth, carefully position the tire on the brake half of the wheel.

e. Using the retaining bolts as a guide while taking care to avoid rotating or damaging the O-ring seal in the brake-side wheel half, cautiously join the wheel halves together.

f. Lock the wheel assembly together with the three retaining washers and self-locking nuts.

g. Tighten the self-locking nuts of the main wheel evenly (in rotation) until a torque of 140 inch-pounds is reached. The nuts on the retaining bolts of the nose wheel must be tightened to a torque of 83 inch-pounds.

CAUTION
The uneven application of torque to the nuts may cause bolt failure or air leaks.

h. After sparingly but thoroughly lubricating the bearing cones and cups with Aero Shell 5 grease (Shell Oil Company, Houston, Texas), carefully install the bearings in the cups.

i. Place the main wheel in position on the axle and adjust the bearing.

CAUTION
When installing the wheel, carefully guide the ring disc into position between the brake linings to avoid possible damage to the linings. This means that the brake piston must be forced far enough back into the recess of the brake housing for the piston lining to clear the ring disc during this operation.

j. Assemble the spacer, axle nut, and cotter pin in place on the axle.

NOTE
Rotate the wheel while adjusting the axle nut to insure the proper seating. Maintain free movement of the wheel with no side motion.

k. Place the nose wheel in position on the axle; install the axle nut then rotate the wheel while torquing the nut to 150 to 200 inch-pounds.

l. Back off the axle nut to "O" inch-pounds.

m. While rotating the wheel, torque the nut to 30 inch-pounds and install the cotter pin. If the nut is not at a locking position tighten to the next position.

MAIN WHEEL ASSEMBLY REMOVAL
(CE-301 and after, CD-1258 thru CD-1304, CJ-31 and after, and earlier airplanes with Kit No. 35-8004 installed)

a. Place the airplane on a jack.

b. Remove the four bolts which secure the back brake plate and inner linings.

c. Remove the cotter pin, wheel retaining nut, washer, and bushing (spacer).

d. Remove the wheel from the axle; the inner bushing (spacer) may remain on the axle.

MAIN WHEEL ASSEMBLY INSTALLATION
(CE-301 and after, CD-1258 thru CD-1304, CJ-31 and after, and earlier airplanes with Kit No. 35-8004 installed)

a. Clean and repack the wheel bearings. Replace any damaged or worn parts.

1. Clean the wheel bearings and seals with PD680 solvent.

NOTE
Be sure the components are dry.

2. Pack the wheel bearings with Aero Shell No. 5 grease; Shell Oil Company, One Shell Plaza, P.O. Box 2463 Houston, Texas or alternate grease MIL-G-81322. (These greases are not compatible; do not mix them.)

3. Soak the felt seals in 10W30 oil. Press excess oil from the seals and coat the sides and circumference with the same grease used on the wheel bearings.

b. Install the bearing, washer, felt seals, washer, and snap-ring on one side of the wheel and repeat the procedure on the other side of the wheel.

c. Install the spacer on the axle (if it was removed).
d. Install the wheel on the axle.
e. Install the bushing (spacer) and optional washer.
f. Install the axle nut and torque to 15 to 20 foot-pounds while rotating the wheel. (This will seat the wheel bearings.)
g. Back the axle nut off to "O" torque and retighten finger tight to remove end play in the bearings. Using a wrench tighten nut to the next cotter pin position and install the cotter pin.
h. Install the four bolts which secure the back brake plate and inner linings.
i. Remove the airplane from the jack.

NOTE

Heating the wheel halves in boiling water for 15 minutes will aid in pressing the outer bearing race (cup) from the wheel. While the wheel is still hot, press a new race (cup) into the wheel.

NOTE

Be certain the wheels are clean and dry before proceeding further.

d. Press or tap the old bearing race (cup) from the wheel halves, and press a new race (cup) into place.

NOTE

The bearing race (cup) should be chilled in dry ice for fifteen minutes prior to installation.

e. Assemble the wheel halves together. Torque wheel nuts as indicated on the wheel name plate.
f. Clean the bearings and other components in PD680 solvent.
g. Replace any worn or damaged parts.
h. Pack the bearings with Aero Shell No. 5 grease (Shell Oil Company, One Shell Plaza, P.O. Box 2463 Houston, Texas), or alternate grease MIL-G-81322. (Do not mix these greases; they are not compatible.)
i. Place a light film of grease on the bearing outer race (cone).

NOTE

Soak the felt seals in 10W30 oil. Press out the excess oil and coat the sides and circumference with wheel bearing grease.

j. Working on the right side of the wheel, install the bearing, washer, felt seal, washer and snap ring.
k. Repeat step "j" on the left side of the wheel.

NOTE

Skip steps "c" through "e" unless the bearings outer race needs replacement.

c. Remove the wheel bolts, this will allow the wheel to be separated into two halves.
e. Back off the nut to "0" torque.
   f. While rotating the wheel torque the axle nut to 30 inch-pounds.
   g. Install the cotter pin. If the locking positions do not align, tighten nut to the next locking position.

BRAKES

DISASSEMBLY OF CLEVELAND BRAKES
(Prior to CD-640 except CD-625, CD-632, CD-637, and CD-638.)

NOTE

Brake disc minimum thickness is .227. When the lining has worn to a thickness of 3/32 inch it should be replaced. Further use will result in the rivets scoring the brake disc.

NOTE

It is not necessary to remove wheel to disassemble the brake.

a. Remove the back plate by removing two bolts.
   b. Slide the brake cylinder back out of torque plate and slide the pressure plate off the anchor plate.
   c. Disconnect hydraulic brake line from brake fitting and drain brake fluid from brake cylinder. Cap the lines. (The brake cylinder may be reinstalled on the torque plate to hold it while disconnecting the brake lines.)

NOTE

Avoid getting brake fluid or other oil on the brake linings.

NOTE

A scored brake cylinder should be replaced. A scored cylinder will leak or cause rapid O-ring wear.

d. Blow out piston with air hose through port in tube fitting.
   e. Remove bleeder cap and bleeder screw from bleeder seat.

NOTE

To avoid aluminum thread wear with resulting leaks, the tube fitting and the bleeder seat are not normally removed unless replacement is necessary.

f. Remove O-ring from piston.

NOTE

It is not necessary to remove back plate or pressure plate linings unless relining is necessary.

NOTE

If the anchor bolts are nicked or gouged they should be sanded smooth to prevent binding with the pressure plate and torque plate.

NOTE

Anchor bolts generally are not replaced at each overhaul. If their removal is desired, they may be pressed out after removing the nuts and washers.

DISASSEMBLY OF BEECH BRAKES
(CD-625, CD-632, CD-637, CD-638, CD-640 through CD-1105, CE-1 through CE-172)

NOTE

When the bottom of the brake housing is within 1/32 inch of the landing gear torque flange, lining replacement is indicated.

The maximum wear limit on the anvil lining is 5/32 inch measured from the rubbing surface to the back of the lining center.

The maximum wear limit on the piston lining subassembly is 15/16 inch measured from the rubbing surface to the bottom of the metal support at the center.

a. Remove the wheel from the airplane as directed in the instructions previously outlined in this section.
   b. Disconnect and cap the hydraulic brake line from the brake fitting and drain the brake fluid from the brake cylinder, while taking the precautions necessary to avoid getting brake fluid or other oil on the brake linings.
   c. Remove the bolts securing the brake and torque arm spacer to the torque flange of the landing gear.
   d. Remove the hinge bolt, washer, and spacer
securing the torque arm to the brake assembly.

e. Remove the nuts and washers from the two bolts securing the back plate subassembly, lining guide, and spacer to the brake housing, and separate the back plate and spacer from the housing while removing the piston lining and carrier.

f. Remove the attaching screw to separate the piston lining from the carrier.

g. Release the anvil lining from the anvil by removing the retaining screw.

h. Remove the flat head screw, washer, and nut that anchor the lining guide to the brake housing.
i. Remove the piston from the housing and the O-ring seal from the piston.

NOTE

It is recommended that the O-ring seal be replaced at each overhaul; however, if the seal is to be reinstalled upon reassembly of the wheel, its position with relation to its seat should be carefully indicated on a clean sheet of paper. The seal should then be carefully removed and placed on the paper as indicated by the markings so that it can be reinstalled as nearly as possible in its original position.

j. Remove the bleed screw and washer from the brake housing.

REASSEMBLY OF CLEVELAND BRAKES
(Prior to CD-640 except CD-625, CD-632, CD-637 and CD-638.)

NOTE

Brake disc minimum thickness is .227. When the lining has worn to a thickness of 3/32 inch it should be replaced. Further use will result in the rivets scoring the brake disc.

a. Install bleed screw in bleeder seat.
b. Wet O-ring in brake fluid and install on piston.

c. Wet piston with brake fluid and press into cylinder.
d. Connect brake lines to tube fittings and bleed brakes.
e. Assemble bleeder cap.

NOTE

If the anchor bolts are nicked or gouged they should be sanded smooth to prevent binding with the pressure plate and torque plate.

f. Assemble pressure plate and slide cylinder onto torque plate.
g. Assemble back plate.

REASSEMBLY OF BEECH BRAKES
(CD-625, CD-632, CD-637, CD-638, CD-640 through CD-1105, CE-1 through CE-172.)

NOTE

When the bottom of the brake housing is within 1/32 inch of the landing gear torque flange, lining replacement is indicated.

The maximum wear limit on the anvil lining is 5/32 inch measured from the rubbing surface to the back of the lining center.

The maximum wear limit on the piston lining subassembly is 15/16 inch measured from the rubbing surface to the bottom of the metal support at the center.

a. Apply a thin coat of MIL-H-5606 hydraulic fluid to the cylinder wall of the housing and to the contacting surfaces of the piston.
b. Lubricate the piston O-ring seal with MIL-H-5606 hydraulic fluid prior to installing it on the piston.
c. When installing the piston in the brake housing, position it so that the wider surface adjacent to the O-ring groove will be toward the lining.
d. Align the lining guide with the brake housing and secure it in place with the retaining screw, washer, and nut.
e. Anchor the anvil lining to the anvil with the retaining screw.
f. Anchor the piston lining to the carrier with the attaching screw.
g. With the spacer properly aligned with the brake housing and the piston lining and carrier held in position on the spacer and guide, insert the two attaching bolts through the brake housing, guide, spacer, and back plate.
h. With a washer in place under each bolt head and nut, apply a torque of 160-190 inch-pounds to the nuts, locking in place the bolts that secure the brake housing and back plate together.
i. Insert the bleed screw through the washer and into the housing.
j. After lubricating the hinge bolt sleeve with MIL-G-81322 grease (or its equivalent), secure the torque arm to the brake housing with the sleeve, washer, and hinge bolt. Torque the hinge bolt to 30 inch-pounds dry torque and secure with safety wire.
k. After aligning the torque arm spacer and torque arm of the brake assembly on the backside of the landing gear torque flange, secure the brake assembly in place with the four attaching bolts, washers, and nuts.

l. Connect the hydraulic line to the elbow on the brake housing, and bleed the brake. The back fill method of pressure filling from the brake bleeder screw is recommended.

m. Install the wheel on the landing gear axle as described in the instructions previously outlined in this section.

CAUTION

When installing the wheel, carefully guide the ring disc into position between the brake linings to avoid possible damage to the linings. This means that the brake piston must be forced far enough back into the recess of the brake housing for the piston lining to clear the ring disc during this operation.

n. Apply the brake several times to seat the parts.
o. Release the brake and check to be sure that the wheel rotates freely.

DISASSEMBLY AND REASSEMBLY OF BEECH BRAKES
(CD-1106 through CD-1271, CE-173 through CE-300, CJ-1 through CJ-30)

For disassembly and reassembly of brakes on the above airplanes, refer to BEECHCRAFT Supplementary Publications Manual 98-33281B or subsequent.

DISASSEMBLY AND REASSEMBLY OF CLEVELAND BRAKES
(CD-1272 and after, CE-301 and after, CJ-31 and after)

For disassembly and reassembly of brakes on the above airplanes, refer to BEECHCRAFT Supplementary Publications Manual 98-35012 or subsequent.

BRAKE MASTER CYLINDER LINKAGE ADJUSTMENT

The proper linkage arrangement will adjust the brake pedals to a straight upright position. This is considered the best adjustment since it will prevent the pedals from hitting the firewall in their extreme forward position. Linkage adjustment is obtained by removing the clevis from the rudder pedal and turning the clevis on or off the piston rod as required. After both pistons are adjusted to the same length, tighten the jam nuts.

BRAKE MASTER CYLINDER REMOVAL AND INSTALLATION

a. Close the parking brake valve by pulling the parking brake control.
b. Unsnap the floor mat and remove the floor board section below the brake pedals.
c. Disconnect the two brake hydraulic lines at each master cylinder and mark each line to ensure correct installation.
d. Remove the master cylinder attaching bolts and nuts and remove the master cylinder.
e. If a new master cylinder is to be installed, note the position of the 45-degree elbow fittings.
f. Reinstall the master cylinder by reversing the removal procedure.
g. Replenish with hydraulic fluid (MIL-H-6506) and bleed the brakes.

BRAKE MASTER CYLINDER OVERHAUL

PARAMOUNT

DISASSEMBLY

a. Remove the snap ring (3) and pull the assembled piston from the housing (18).
b. Remove the clevis (1), nut (2) and cotter pin (11) from rod (16); this will allow the removal of retaining washer (4), rod wiper (5), guide bushing (6) and O-rings (7 & 8) from the piston rod.
c. Remove the piston (10) and O-ring (9) from the piston rod and remove the spring washer (15).
d. Remove cotter pin (12) from the valve stop (14) and remove the valve stop from the piston rod.
e. The valve assembly and spring will fall free of the housing with the piston assembly removed.
f. Clean all parts with solvent (PD680).
g. Check all parts for cracks, corrosion, distortion and wear.

ASSEMBLY

a. Lubricate all parts with hydraulic fluid (MIL-H-5606).

NOTE

Use new O-rings when assembling the master cylinder.

b. Install the valve assembly (13) and spring (17) into the housing.
c. Install the valve stop (14) and cotter pin (12) to the piston rod (16).
d. Install spring washer (15), O-ring (9) and piston (10) to the piston rod.
Figure 4-2. Brake Master Cylinders
e. Install O-rings (7 & 8), guide bushing (6), rod wiper (5), retaining washer (4), cotter pin (11), nut (2) and clevis (1) on the piston rod.

f. Install the assembled piston assembly into the housing and install the snap ring (3).

GERDES

DISASSEMBLY

a. Remove the snap ring (22) from the clevis end of housing (35) and pull the assembled piston assembly from the housing.

b. Remove the clevis (19), lock nut (20) and cap, end and bearing (24) from the shaft (21).

c. Remove O-rings (23 & 25) from the cap, end and bearing.

d. Remove snap ring (26), thrust collar (27) and spacer (28) from shaft.

e. Remove O-ring (29) from the shaft.

f. Remove snap ring (33) and spring (32) from the shaft.

g. Remove piston (31) from the shaft.
h. Remove “O” ring (30) from the piston.
i. Remove spring (34) from the housing.
j. Clean all parts with solvent (PD 680).
k. Check all parts for cracks, corrosion, distortion and wear.

ASSEMBLY

a. Lubricate all parts with hydraulic fluid (MIL-H-5606).

b. Install spring (34) into the housing (35).
c. Install “O” ring (30) on the piston (31).
d. Install piston on shaft (21).
e. Install spring (32) and snap ring (33) on shaft.
f. Install “O” ring (29) on shaft at clevis end.
g. Install spacer (28), thrust collar (27) and snap ring (26) on shaft.
h. Install “O” ring (25) to cap end and bearing (24).
i. Install cap end and bearing (24), lock nut (20) and clevis (19) to shaft.
j. Install assembled piston assembly into housing.
k. Install snap ring (22) to housing.

PROPELLER GOVERNOR

REMOVAL AND INSTALLATION OF PROPELLER GOVERNOR ASSEMBLY

The governor is mounted on the engine pad with four studs and self-locking nuts. Remove the governor as follows:

a. Disconnect the control rod at the governor control lever.

b. Remove the four mounting nuts and pull the governor from the studs.

NOTE

A tool may be made locally to facilitate the removal of the governor. A 6 or 8 inch wrench with a ½ inch box and open end may be used. At approximately ¾ inches from the open end, heat and bend the wrench 90°. The wall of the box end may have to be ground down to fit.

c. Cover the governor base and engine pad to protect them.
d. Install the governor by reversing the above procedure.

NOTE

Torque the mounting bolts per Teledyne Continental Motors Torque Chart 530322.

WINDOWS

WINDOW SURFACE REFINISHING

Acrylic windows may be refinished if they have minor scratches. Windows with crazing as a result of chemical damage can not be repaired.

WINDSHIELD REMOVAL (ONE OR TWO PIECE)

a. Remove the glareshield and outside air temperature gage (if installed in this area).

b. Remove the attaching screws from the defroster duct and move the duct to clear the lower row of rivets on the windshield.

c. Remove the screws and spacer from the glareshield angles.

d. Remove the trim strips from around the inside of the windshield.

e. To facilitate reinstallation, mark the location of the trim strip clips.
FLAP DRIVE CABLE CONNECTION

Connect the LH and RH flap drive cables to the flap drive motor as follows, using the illustration for component locations:

a. Install the outboard nut and washer as far as it will go on the threaded portion of the flap cable.

b. Insert the retainer through the mount support and onto the motor shaft as far as it will go. Align the retainer keyway with the key slot in the flap motor drive shaft and tighten one set screw temporarily.

c. While inserting the flap cable through the mount support, install the inboard washer and nut. Install the cable through the retainer and into the motor drive shaft until the keyway is just past the key slot in the retainer.

d. Loosen the set screw that was tightened in Step b. Ensure that the retainer is still installed on the motor shaft as far as it will go and rotate the retainer 90°.

e. Keep inboard pressure on the retainer and tighten both retainer set screws.

f. Secure the flap drive cable to the mounting support by tightening the nuts. Tighten the inboard nut to ensure that there is sufficient clearance between the outboard edge of the retainer and the cable housing to allow the retainer to rotate without coming into contact with the cable housing. If the threaded part of the cable housing is not long enough to install the two nuts and washers, using a die, add 5/8-24 UNEF threads until .88 inch thread length is reached. Tighten the outboard nut against the mounting support.
f. Drill out the rivets from around the windshield.
g. Remove the windshield.

NOTE

Because the window is sealed, considerable effort may be required to break the windshield loose from the canopy section.

WINDSHIELD INSTALLATION (ONE OR TWO PIECE)

a. Remove any sealer around the canopy with toluol. Touch-up scratches or bare metal with zinc chromate primer.
b. Trim the tooling tabs from the windshield, place the windshield in position and mark the areas where material must be removed from the windshield to obtain a proper fit.
c. Remove the windshield and trim off excess material as determined in step “b”.
d. Place the windshield in position and cleco in place using the pilot holes provided.
e. Back drill the windshield frame using the existing holes in the canopy section as a guide.
f. Remove the windshield, burr all holes and apply Presstite #576 sealer to the windshield frame where it makes contact with the canopy section.
g. Place the windshield in position and cleco in place.
h. Using AN470AD4 rivets, secure the windshield to the canopy section.

NOTE

When riveting the windshield in place, install the trim strip clips in the same locations as marked in step “e” of the “Windshield Removal” procedure.

i. Secure the glareshield angles in place with attaching screws, nuts and spacers.
j. Position the defroster duct and secure in place.
k. Install the trim strips.
l. Install the glareshield and outside air temperature gauge (if removed).
m. Clean the paint as necessary.

FLAP MOTOR

FLAP MOTOR REMOVAL

(CD-1 and after, CE-1 thru CE-682 and CJ-1 thru CJ-128)

a. Remove the front seat assemblies as indicated in REMOVAL AND INSTALLATION OF FRONT SEAT.
   b. Remove the spar cover.
   c. Detach the clamp supporting the electrical wiring from the right hand flap shaft housing.
   d. Disconnect the flap shafts from the flap motor.
   e. Disconnect the flap motor electrical wiring at the quick disconnect.
   f. Remove the flap motor attaching bolts and remove the flap motor.

NOTE

When a 35-380109 motor is used to replace the motor originally installed on serials CD-1 thru CD-1199 and CE-1 thru CE-248, the larger size of the new motor makes it necessary to enlarge the flap motor access hole (located under the front seat) by .75 inch on the aft edge to provide clearance. (See illustration.) The existing cover plate over the access hole may be retained to cover the enlarged hole.

a. Place the flap motor in position and secure with the flap motor attaching bolts. Ensure that the ground wire is attached to one of the bolts.
   b. Connect the flap motor electrical wiring at the quick disconnect.
   c. Connect the flap shafts to the flap motor.
   d. Attach the clamp that supports the electrical wiring to the right hand flap shaft housing.
   e. Install the access cover.
   f. Install the front seat assemblies as indicated in REMOVAL AND INSTALLATION OF FRONT SEAT.

FLAP MOTOR REMOVAL

(CE-683 and after and CJ-129 and after)

a. Remove the front seat assemblies, as indicated in REMOVAL AND INSTALLATION OF FRONT SEAT.
   b. Remove the spar cover.
   c. Detach the clamp supporting the electrical wiring from the right hand flap shaft housing.
   d. Disconnect the flap shafts from the flap motor.
   e. Disconnect the flap motor electrical wiring at the quick disconnect.
   f. Remove the flap motor attaching bolts and remove the flap motor.
Figure 4-2A. Flap Motor Access Hole Modification
(When Making Initial Installation of 35-380109 Flap Motor,
CD-1 Thru CD-1199 and CE-1 Thru CE-246)

FLAP MOTOR INSTALLATION
(CE-683 and after and CJ-129 and after)

CAUTION
The flap motor used on airplane serials CE-683
and after and CJ-129 and after, is NOT
interchangeable with the flap motor used on
prior serials. In the event of flap motor failure or if
it is determined that major overhaul is required for
the flap motor to operate properly, the flap motor
should be replaced. No attempt should be made
to overhaul the motor in the field.

a. Place the flap motor in position and secure with the
flap motor attaching bolts.
b. Connect the flap motor electrical wiring at the
quick disconnect.
c. Connect the flap shafts to the flap motor.
d. Attach the clamp that supports the electrical wiring
to the right hand flap shaft housing.
e. Install the access cover.
f. Install the front seat assemblies as indicated in
INSTALLATION OF FLAP TRACK ROLLERS
Install the flap track rollers (four rollers per flap and two
rollers per track) in the flap track brackets with the flanges
facing each other. Use only the wide flanged rollers in the aft
location.

FLAP TRACK WEAR LIMITS
The allowable track wear on the bearing surfaces is .032
inch, resulting in a maximum flap track slot dimension of
.785 inch. The allowable wear into the track side surface is
.050 inch. Track wear within the preceding limitations may be
dressed smooth with light emery cloth to prevent roller
binding. MIL-M-7866B (Molykote 2) mixed with naphtha may
be brushed on the flap tracks during servicing of the airplane.

ELEVATOR TRIM TAB

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY
(CE-1 thru CE-616, CE-743 and after, CJ-1 thru
CJ-110, CJ-142 thru CJ-148, except airplanes which
incorporate kit 33-4002-1 or kit 33-4002-3)
(Figure 4-3)

a. Remove the snap ring (1) from the actuator
housing and pull the nut assembly (2) out of the housing.
b. Remove the actuator screw (4) from the nut assembly.

CAUTION
Do not damage rod end when drilling out rivets.
At serial CE-743 and after, and CJ-142 and after, item 5 is a shoulder pin with a nut and washer. At the same serial effectiveness, item 11 is made of aluminum; earlier housings were manufactured of magnesium.

Figure 4-3. Elevator Tab Actuator (CE-1 Thru CE-616, CJ-1 Thru CJ-110; CE-743 and after, CJ-142 and after)

1. Snap Ring
2. Nut Assembly
3. Bearing
4. Actuator Screw
5. Rivet or Shoulder Pin
6. Actuator Rod End
7. Bearing
8. Bushing
9. Check Nut
10. Adjusting Bushing
11. Housing
12. Rivet
13. O-Ring

NOTE

The trim tab actuator to be installed on the left hand horizontal stabilizer must have threads on its actuator screw (4) that rotate clockwise when screwed into the nut assembly (2). The trim tab actuator to be installed on the right hand horizontal stabilizer must have threads on the actuator screw (4) that rotate counterclockwise when screwed into the nut assembly (2).

NOTE

Lubricate all parts with MIL-G-23827 grease prior to assembly.

c. Drill out rivets (5) and (12); on CE-743 and after or CJ-142 and after, remove the nut, washer and shoulder pin, before drilling out rivet (12). Remove actuator rod end (6) from the screw. The bearing (7) and the bushing (8) can now be removed from the screw.

d. Remove check nut (9) and screw out the end adjusting bushing (10) with appropriate spanner wrench.

e. Remove the bearing (3) from housing (11).

Clean all parts in PD680 solvent and inspect for cracks, corrosion, and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate all parts with MIL-G-23827 grease prior to assembly.

ELEVATOR TRIM TAB ACTUATOR ASSEMBLY
(CE-1 thru CE-616, CE-743 and after, CJ-1 thru CJ-110, CJ-142 thru CJ-148, except airplanes which incorporate kit 33-4002-1 or kit 33-4002-3) (Figure 4-3)

a. Install bearing (3) into housing (11).

b. Install adjusting bushing (10) and check nut (9). (Do not tighten.)

c. Install bushing (8), bearing (7) and snap ring (1) on actuator screw (4).

d. Install actuator rod end (6) on actuator screw (4) and secure with rivets (5) and (12), or (on serials CE-743 and after, and CJ-142 and after) secure with nut, washer, and shoulder pin (5), and rivet (12).

e. Install screw (4) into nut (2).

WARNING

The trim tab actuator to be installed on the left hand horizontal stabilizer must have threads on its actuator screw (4) that rotate clockwise when screwed into the nut assembly (2). The trim tab actuator to be installed on the right hand horizontal stabilizer must have threads on the actuator screw (4) that rotate counterclockwise when screwed into the nut assembly (2).

f. Install nut assembly (2) into housing (11); secure with snap ring (1).

g. Install a new O-ring (13) in the adjusting bushing (10).

h. Screw adjusting bushing (10) into housing (11) until the end play has been removed from the nut assembly, and tighten the check nut (9). An end play of 0.003 inch is permissible. A maximum of 15 inch-pounds may be required to overcome internal friction.

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY
(CE-617 thru CE-742, CJ-111 thru CJ-141, except airplanes which incorporate kit 33-4002-1 or kit 33-4002-3) (Figure 4-4)

a. Remove the retainer ring (2) from the housing (5) and pull the nut assembly (6) out of the housing.

b. Remove the actuator screw (4) from the nut assembly (6).

c. Drill out rivet (12).
Figure 4-4. Elevator Tab Actuator (CE-617 Thru CE-742, CJ-111 Thru CJ-141)

d. Remove nut (10), washer (11) and shoulder pin (9). Remove the actuator rod end (1). The collar (3) can now be removed.

e. Remove check nut (8) and screw out bushing (7) with the appropriate spanner wrench.

Clean all parts with PD680 solvent and replace parts that are cracked, corroded and distorted. Lubricate all parts with lubricating grease MIL-G-23827 prior to assembly.

ELEVATOR TRIM TAB ACTUATOR ASSEMBLY
(CE-617 thru CE-742, CJ-111 thru CJ-141, except airplanes which incorporate kit 33-4002-1 or kit 33-4002-3)
(Figure 4-4)

a. Place collar (3) and retainer ring (2) on actuator screw (4).

b. Install actuator rod end (1) on actuator screw (4) being careful to align the holes.

c. Install shoulder pin (9) washer (11) and nut (10).

d. Install rivet (12), P/N MS20613-3C10.

e. Install actuator screw (4) into nut (6).

NOTE
Lubricate all parts with lubricating grease MIL-G-23827 prior to assembly.

f. Install nut assembly (6) into housing (5), and secure with retainer ring (2).

g. Install bushing (7) and secure with nut (8).

WARNING

The trim tab actuator to be installed on the left hand horizontal stabilizer must have threads on its actuator screw (4) that rotate clockwise when screwed into the nut assembly (6). The trim tab actuator to be installed on the right hand horizontal stabilizer must have threads on the actuator screw (4) that rotate counterclockwise when screwed into the nut assembly (6).
Figure 4-4A Elevator Tab Actuator

NOTE

When assembling the actuator, screw the threaded bushing (7) into the assembly (5) until end play of the nut assembly (6) has been removed then lock in place by tightening the check nut (8). The nut assembly (6) must be free to rotate and provide smooth operation through its full travel with a maximum end play of 0.0015 inch.

ELEVATOR TRIM TAB ACTUATOR DISASSEMBLY
Model E33C, F33C (CJ-1 through CJ-148 which incorporate kit 33-4002-1 or kit 33-4002-3)
(Figure 4-4A)

a. Remove the snap ring (4) from the actuator housing and pull the nut assembly (7) out of the housing.
b. Remove the actuator screw (6) from the nut assembly.
c. Remove nut (1), washer (2) and shoulder pin (3). The bushing (5) can now be removed from the screw.
d. Remove check nut (12) and screw out the end adjusting bushing (11) with appropriate spanner wrench.
e. Remove O-ring (10).
f. Remove the bearing (9) from housing (8).

Clean all parts in PD680 solvent and inspect for cracks, corrosion, and distortion. Replace bushings and any parts showing evidence of deterioration. Lubricate all parts with MIL-G-23827 grease prior to assembly.

a. Install bearing (9) into housing (8).
b. Install O-ring (10) into adjusting bushing (11).
c. Install adjusting bushing (11) and check nut (12). (Do not tighten.)
d. Install bushing (5) and snap ring (4) on actuator screw (6).
e. Install shoulder pin (3), washer (2) and nut (1) on actuator screw (6).

NOTE

Lubricate all parts except O-ring with MIL-G-23827 grease prior to assembly. Lubricate the O-ring with MIL-S-8660.

f. Install screw (6) into nut (7).

WARNING

The trim tab actuator to be installed on the left hand horizontal stabilizer must have threads on its actuator screw (6) that rotate clockwise when screwed into the nut assembly (7). The trim tab actuator to be installed on the right hand horizontal stabilizer must have threads on the actuator screw (6) that rotate counterclockwise when screwed into the nut assembly (7).

g. Install nut assembly (7) into housing (8), secure with snap ring (4).
**P/N of Federal Products Corp., Providence, R.I.**

**Figure 4-5. Fabricating Check Fixture for Tab Deflection**
h. Screw adjusting bushing (11) into housing (8) until the end play has been removed from the nut assembly, and tighten the check nut (12). An end play of 0.003 inch is permissible.

**ELECTRIC ELEVATOR TRIM TAB SYSTEM**

For the electric trim tab system see **ELECTRIC TRIM TAB SYSTEM** in Section 3.

**CHECKING ELEVATOR TAB FREE PLAY**

(Figure 4-5)

Visually inspect the elevator tabs for any damage, security of hinge attach points, and for tightness of the actuating systems. Inconsistencies should be remedied prior to checking the free play of the tabs. This check should be performed at least once a year to ensure that the trim tab free play falls within the prescribed limits.

A check fixture (P/N 45-135030-9/810 or the equivalent as shown in Figure 4-5), a dial indicator, and a spring scale for applying accurate loading to the tabs, are required for making the inspection for free play of the tabs.

a. Securely lock the control surfaces to prevent movement of the elevators. Set the elevator tabs in the neutral position.

b. Affix the dial indicator check fixture so that the dial indicator point is positioned; on the outboard edge of the tab, 3.30 inches aft of the hinge line as measured along the top of the tab.

c. Apply a small piece of masking tape (for paint protection) 4.50 inches aft of the tab hinge line and along the centerline of the tab actuator. This will be the point of pressure against the tab by the push-pull scale.

d. Apply another piece of masking tape in the corresponding position on the bottom surface of the tab for the same purpose.

e. Zero the dial indicator at no load initially. Do not reset during the checking procedure.

f. With the push-pull scale at the point of the masking tape, apply a full 3-pound downward load. Record the dial reading as “A”.

g. Release half the load until a 1.5-pound downward load is obtained. Record the dial reading as “B”.

h. Apply a full 3-pound upward load at the masking tape on the bottom surface. Record the dial reading as “C”.

i. Release half the load until a 1.5-pound upward load is obtained. Record the dial reading as “D”.

j. Enter the recorded values on a copy of Chart 6 and proceed as follows:

1. Multiply "B" by 2 and record as "2B".
2. Subtract "A" from "2B" and record as "X".
3. Multiply "D" by 2 and record as "2D".
4. Subtract "C" from "2D" and record as "Y".

**CHART 6**

**ELEVATOR TAB FREE PLAY LIMITS**

<table>
<thead>
<tr>
<th>1.5 POUND READING</th>
<th>3-POUND READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>2B</td>
</tr>
</tbody>
</table>

\[
2B - A = X
\]

\[
2D - C = Y
\]

\[
X + Y = E
\]

(E = 0.05 inch maximum)

**NOTE**

The results of "X" and "Y" can be negative numbers.

5. Add "X" and "Y" and record as "E".

k. Repeat steps b through j on the opposite elevator tab.

l. If deflection of the tab is within the allowable limits, the tab and its linkage are in good condition.

m. If the free play is excessive, disconnect the trim tab actuator rod and visually inspect the bolts and bushing for indications of excessive wear. Replace excessively worn parts.
SECTION 5

MAJOR MAINTENANCE AND OVERHAUL
SECTION 5

Major Maintenance and Overhaul
MAIN AND NOSE WHEEL OVERHAUL

(Refer to Service Instructions No. 0212-200, Landing Gear, Modification of Goodyear Wheels for Use With Tube Type Tires or Rim Inflated Tubeless Tires.)

a. Clean all metal parts in naphtha or equivalent and dry.

b. Clean all felt in naphtha or equivalent and dry thoroughly.

c. “O” rings are generally replaced at each overhaul. If their reuse is necessary, they should be wiped clean with a clean oiled rag and inspected for damage.

d. Inspect wheel halves for cracks. Cracked wheels should be replaced. Nicks, gouges, and slightly corroded areas should be sanded out. Where the protective coating has been removed, the area should be cleaned thoroughly and repainted with zinc chromate primer and aluminum lacquer.

e. On the main wheels, the brake discs should be replaced if scoring is present. Small nicks and scratches should be sanded smooth.

f. Bearing caps and cones should be inspected carefully for damage and discoloration. Bearing cones should be repacked with clean bearing grease before installation in the wheel.

g. If the Goodyear wheel assembly is installed on the aircraft, inspect the ring disc for signs of distortion and for security of attachment by its component parts. Inspect the thickness from the outside diameter to the inside diameter between the lining surfaces. When this thickness measures .432 inch or less, replace the ring disc.

d. Inspect the brake linings for wear. When the lining of a Cleveland brake has worn to a thickness of 3/32 of an inch, it should be replaced since further use would result in the rivets scoring the disc. On Goodyear brakes the maximum wear limit permissible on the piston lining is 15/16 of an inch, when measured from the rubbing surface to the bottom of the metal support at center. The lining of Goodyear brakes must also be replaced whenever the bottom of the brake housing is within 1/32 of an inch of the landing gear torque flange.

e. Inspect brake cylinder bore for scoring. A scored brake cylinder will leak and cause rapid “O” ring wear.

f. If anchor bolts are nicked or gouged they should be sanded smooth to prevent binding with the pressure plate and torque plate.

g. Inspect the brake housing for evidence of wear or damage. Any small nicks or corrosion should be polished out with fine sandpaper and repainted with two coats of zinc chromate primer followed by two coats of aluminum lacquer.

h. Inspect the cylinder walls and the contacting surfaces of the piston for damage. Small scratches and nicks can be removed by polishing the damaged area with fine sandpaper (400 grit).

RELINING CLEVELAND BRAKES (Prior to CD-640 except CD-625, CD-632, CD-637, and CD-638.)

a. Place back plate on table with lining down flat.

b. Punch out rolled rivet.

c. Remove linings from pressure plate using same procedure used on back plate.

d. Place anvil of rivet setting kit, Part No. R561, in vise.

e. Position lining on back plate and place rivet in center hole.

f. Make sure rivet is in linings and place rivet head against anvil.

g. Place rivet setting punch against rivet and hold back plate down firmly against anvil.

h. Set rivets by hammering punch until lining is firmly against back plate.

i. Realign lining on back plate and set remaining rivets.

j. Set rivets on pressure plate using same procedure as used on back plate.
When installing the wheel, carefully guide the ring disc of the main wheel into position between the brake linings to avoid damaging the linings. The piston lining must be in the complete released position during this operation.

m. Apply the brake several times to seat the parts, then with the brake released, check the wheel for free rotation.

RELINING BEECH BRAKES (CD-1106 through CD-1271, CE-173 through CE-300 and CJ-301 and after)

For relining brakes on the above aircraft refer to BEECHCRAFT Supplementary Publications Manual, P/N 98-33281B or subsequent.

RELINING CLEVELAND BRAKES (CD-1272 and after, CE-301 and after, CJ-31 and after)

For relining brakes on the above aircraft refer to BEECHCRAFT Supplementary Publications Manual, P/N 98-35012 or subsequent.
SECTION 6

ELECTRICAL WIRING DIAGRAMS
SECTION 6

Electrical Wiring Diagrams
The purpose of these diagrams is to show the electrical components, wiring, and connections of the aircraft in a manner that makes the operation of each circuit easily understandable. The circuits are arranged to help understand their operation and do not indicate the actual physical locations of the components. Each wire is identified by the number it bears in the aircraft. The individual components of each circuit are indexed and identified in the list of components with each circuit or diagram.

With the exception of the Models B33, C33, and E33, the circuits are shown individually. A General Wiring Diagram has been introduced for the Models B33, C33, and E33. This diagram provides the technician with single fold-out on which most of the electrical circuits are shown. The page adjacent to the General Diagram contains a keyed index of the individual circuit components. For optional circuits, or circuits with later serial effectivities, refer to the Index of Wiring Diagrams for the applicable Model, and the BEECHCRAFT Bonanza Wiring Diagram Manual, P/N 35-590102-7.

The wiring diagrams for those airplane serials CD-1 through CD-1304, CE-1 through CE-612 and CJ-1 through CJ-104 are contained within Section 6 of this Shop Manual.

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Issued: December, 1969
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Models B33, C33, and E33

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Issued: December, 1969
LANDING GEAR CONTROL
Models 33 and A33

Issued: December, 1959
IGNITION SWITCH
Models 33 and A33

1. Ignition Switch
2. Right Magneto
3. Left Magneto

1. BUS BAR
2. CIRCUIT BREAKER - 35A (Std)
   50A (Optional)
3. VOLTAGE REGULATOR - 35A (Std)
   50A (Optional)
4. GENERATOR SWITCH
5. GENERATOR - 35A - (Std)
   50A - (Optional)

BATTERY AND STARTER
Models 33 and A33

1. BUS BAR
2. STARTER SWITCH
3. RELAY
4. BATTERY
5. MASTER SWITCH
6. STARTER
7. AMMETER

Issued: December, 1969
1. Bus Bar
2. Circuit Breaker
3. Rotating Beacon Switch
4. Upper Beacon Light
5. Lower Beacon Light

NOTE: Do not reverse the power and ground terminals as shown on the lower beacon circuit when a Whelan dual beacon is installed.

OPTIONAL DUAL ROTATING BEACON

1. Bus Bar
2. Circuit Breaker
3. Switch
4. Booster Pump

(WELDON) BOOST PUMP
Models 33 and A33

1. Bus Bar
2. Circuit Breaker
3. Indicator

TURN AND BANK INDICATOR
Models 33 and A33

Issued: December, 1969
FLAP CONTROL AND POSITION INDICATOR
Model 33
NOTE
See Model A33 Navigation Light Circuit for Flap Indicator Circuit and Landing Gear Indicator Circuit

STALL WARNING INDICATOR
Models 33 and A33

Issued: December, 1969
1. Manual Circuit Breakers Bus Bar
2. Fuel Quantity Indicator Circuit Breaker
3. Main Fuel Cell Quantity Indicator
4. Main Fuel Cell Quantity Indicator
   Selector Switch (Left-Right)
5. Right Wing Break Connector
6. Left Wing Break Connector
7. Main Fuel Cell Transmitter Unit (Left)
8. Main Fuel Cell Transmitter Unit (Right)
9. Auxiliary Fuel Cell Quantity Indicator
10. Auxiliary Fuel Cell Quantity Indicator
    Selector Switch (Left-Right)
11. Auxiliary Fuel Cell Transmitter Unit (Left)
12. Auxiliary Fuel Cell Transmitter Unit (Right)

**FUEL QUANTITY INDICATOR**
Models 33 and A33

1. Bus Bar
2. Oil Temperature Indicator Circuit Breaker
3. Oil Temperature Indicator
4. Engine Oil Temperature Resistance Bulb

**OIL TEMPERATURE INDICATOR**
Models 33 and A33

Issued: December 1969
1. Bus Bar
2. Circuit Breaker
3. Cylinder Head Temperature Indicator
4. Cylinder Head Transmitter

CYLINDER HEAD TEMPERATURE INDICATOR CIRCUIT (OPTIONAL)
Models 33 and A33

1. Bus Bar
2. Circuit Breaker
3. Switch
4. Disconnect Splice
5. Heated Pitot

NOTE: All items of this circuit are optional except wire H2.

HEATED PITOT CIRCUIT (OPTIONAL)
Models 33 and A33

1. Bus Bar
2. Cigarette Lighter

CIGARETTE LIGHTER
Models 33 and A33

1. Bus Bar
2. Circuit Breaker
3. Landing Light Switch
4. Nose Landing Light

NOSE LANDING LIGHT
Models 33 and A33

Issued: December, 1969
1. Bus Bar
2. Circuit Breaker
3. Disconnect Splice
4. Rheostat
5. Tab Position Indicator Light
6. Resistor
7. Instrument Flood Lights
8. Landing Gear Visual
9. Compass Light
10. Cabin Lights
11. Switch

MISCELLANEOUS LIGHTING
Model 33
1. Bus Bar
2. Flap Position Indicator Circuit Breaker
3. Navigation Light Switch
4. Disconnect Splice
5. RH Navigation Light (Green)
6. Rear Fuselage Navigation Light (Clear)
7. LH Navigation Light (Red)

NAVIGATION LIGHT
Model 33

1. Bus Bar
2. Circuit Breaker
3. Navigation Light Switch
4. Disconnect Splice
5. RH Navigation Light (Green)
6. Rear Fuselage Navigation Light (Clear)
7. LH Navigation Light (Red)
8. Resistor
9. Flap Up Indicator (Green)
10. Flap Down Indicator (Red)
11. LG Up Indicator (Red)
12. LG Down Indicator (Green)

NAVIGATION LIGHT
Model A33
GENERAL WIRING DIAGRAM (INDEX)
Models B33, C33, and E33

Issued: December, 1969
SEE INDEX OF WIRING DIAGRAMS FOR LATER EFFECTIVITIES AND OPTIONAL CIRCUITS

GENERAL WIRING DIAGRAM
Models B33, C33, and E33

Issued: December, 1969
1. Terminal Board and Bus
2. External Power Relay
3. Diode
4. External Power Receptacle

EXTERNAL POWER (OPTIONAL)
Model C33 and E33 (CD-1057 thru CD-1304)

1. Bus
2. Circuit Breaker
3. Flap Control Switch
4. Up Limit Switch
5. Down Limit Switch
6. Flap Motor
7. Flap Position Transmitter
8. Flap Position Indicator

FLAP CONTROL AND POSITION INDICATOR
Model C33 and E33 (CD-1044 thru CD-1304)
1. Pitch Trim and Ignition Boost Circuit Breaker
2. Control Column Coil Cord
3. Control Switch
4. Trim Actuator Assembly
5. Shunting Resistor
6. Speed Adjust

ELEVATOR TRIM (OPTIONAL)
Model E33 (CD-1119 thru CD-1304)
1. Strobe Light Circuit Breaker
2. Power Supply
3. Strobe Light

**STROBE LIGHT - HOSKINS (OPTIONAL)**
Model E33 (CD-1199 thru CD-1204)

1. Strobe Light Circuit Breaker
2. Power Supply
3. Strobe Light

**STROBE LIGHT - BULLOCK (OPTIONAL)**
Model E33 (CD-1227 thru CD-1304)
NOTE: VENDOR FURNISHED WIRES ARE NOT CODED.

1. Instrument Light Rheostat
2. Fuel Panel Placard Light
3. Outside Air Temperature Light
4. Landing Gear Visual Indicator Light
5. Trim Tab Indicator Light
6. Switch
7. Compass Light
8. Engine Instrument Cluster Lights
9. Glareshield Instrument Lights

INSTRUMENT LIGHTS
Model E33 (CD-1119 thru CD-1202)

Issued: December, 1969
1. Oil Temp Radio Inst and Cabin Lights Circuit Breaker
2. Dim Control Rheostat
3. Compass and OAT Light Switch
4. OAT Light
5. Fuel Selct Light
6. Engine Instrument Lights
7. Trim Tab Light
8. Landing Gear Visual Indicator Light
9. Glareshield Connector
10. Glareshield Lights
11. Compass Light

INSTRUMENT LIGHTS
Model E33 (CD-1203 thru CD-1304)
1. Oil Temperature, Instrument, and Cabin Lights Circuit Breaker
2. Radio and Instrument Lights Dim Control
3. Instrument Flood Lights Dim Control
4. Instrument Lights
5. Panel Edge Lights
6. Fuel Panel Light
7. Compass Light
8. Compass Light Resistor
9. Trim Tab Indicator Light
10. LG Visual Indicator Light
11. Instrument Flood Lights
12. Engine Instrument Cluster Lights
13. Dim Resistor

INSTRUMENT LIGHTS (OPTIONAL)
Model 853 (CD-388 thru CD-390)

NOTE: UNCODED WIRES ARE FURNISHED WITH LIGHTS
NOTE: UNCoded WIRES ARE
FURNISHED WITH LIGHTS

INSTRUMENT LIGHTS (OPTIONAL)
Model D33, C33, and E33 (CD-691 and after)

1. Oil Temperature, Instrument, and
   Cabin Lights Circuit Breaker
2. Radio and Instrument Lights
   Dim Control
3. Instrument Flood Lights Dim Control
4. Instrument Lights
5. Panel Edge lights
6. Fuel Panel Light
7. Compass Light
8. Compass Light Resistor
9. Trim Tab Indicator Light
10. LG Visual Indicator Light
11. Instrument Flood Lights
12. Engine Instrument Cluster Lights

Issued: December, 1969
1. Avionics Bus
2. Constant Copilot Solenoid Valve
3. Constant Copilot Switch
4. Constant Copilot Wheel Switch
5. Constant Copilot Autopilot Circuit Breaker

CONSTANT COPILOT (OPTIONAL)
Model E33 (CD-1119 thru CD-1304)
NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON THE GROUND AND THROTTLE OFF

1. Landing Gear Circuit Breaker
2. Throttle and Landing Gear Warn Circuit Breaker
3. Landing Gear Control Switch
4. Landing Gear Down Limit Switch
5. Landing Gear Up Brake Switch
6. Landing Gear Down Brake Switch
7. Landing Gear Safety Switch
8. Landing Gear Up Limit Switch
9. Landing Gear Motor
10. 90 MPH Pressure Switch
11. Landing Gear Safety System Switch
12. Landing Gear Safety Relay
13. Throttle Control Switch
14. 120 MPH Pressure Switch
15. Diode
16. Bus
17. Landing Gear Down Indicator
18. Landing Gear Up Indicator
19. Landing Gear and Flap Indicator
Lights Circuit Breaker

A LATCHING SOLENOID
A WIRES FURNISHED BY VENDOR

LANDING GEAR WITH SAFETY SYSTEM (OPTIONAL)
Model: C33 and E33
(CD826, CD855, CD856, CD895 and after)
BATTERY AND STARTER
Models C33A, E33A, and E33C
EXTERNAL POWER (OPTIONAL)
Models C33A and E33A
(CE-102 thru CE-612)

RADIO PROTECTION
Models C33A, E33A, and E33C
1. Bus Bar
2. Circuit Breaker
3. Oil Temperature Indicator
4. Oil Temperature Transmitter

OIL TEMPERATURE INDICATOR
Models C33A, E33A, and E33C

1. Bus Bar
2. Circuit Breaker
3. Auxiliary Fuel Pump Switch
4. Auxiliary Fuel Pump

AUXILIARY FUEL PUMP
Models C33A, E33A, and E33C

1. Bus Bar
2. Circuit Breaker
3. Cylinder Head Temp. Indicator

CYLINDER HEAD TEMPERATURE INDICATOR
Models C33A, E33A, and E33C
1. Bus Bar
2. Circuit Breaker
3. Indicator

TURN AND BANK INDICATOR
Models C33A, E33A, and E33C

40 GALLON (OPTIONAL)

25 GALLON (STANDARD)

1. Bus Bar
2. Circuit Breaker
3. Fuel Level Indicator R.H.
4. Fuel Level Indicator, L.H.
5. Fuel Level Transmitter, L.H., Inboard
6. Fuel Level Transmitter, L.H., Outboard
7. Fuel Level Transmitter, R.H., Outboard
8. Fuel Level Transmitter, R.H., Inboard
9. Fuel Level Indicator, R.H.
10. Fuel Level Indicator, L.H.
11. Fuel Level Transmitter, L.H.
12. Fuel Level Transmitter, R.H.

FUEL QUANTITY INDICATOR
Models C33A, E33A, and E33C
1. Circuit Breaker
2. Auxiliary Fuel Quantity Indicator
3. Indicator Select Switch
4. Tip Tank Fuel Quantity Transmitter

GROUND TRANSMITTER WIRE TO AIRCRAFT STRUCTURE WHENEVER TIP TANKS ARE REMOVED TO PREVENT INDICATOR DAMAGE.

WING TIP FUEL QUANTITY (OPTIONAL)
Models C33A and E33A

1. Aircraft Bus
2. Fuse
3. Switch
4. Solenoid Valve (N.C.)

WING TIP FUEL SOLENOID (OPTIONAL)
Models C33A, E33A, and E33C

Issued: December, 1969
1. Bus Bar
2. Circuit Breaker
3. Cigarette Lighter

CIGARETTE LIGHTERS
Models C33A, E33A, and E33C

1. Bus Bar
2. Circuit Breaker
3. Upper Beacon Light
4. Lower Beacon Light

ROTATING BEACON (OPTIONAL)
Models C33A, E33A, and E33C

1. Bus Bar
2. Circuit Breaker
3. Landing Light

LANDING LIGHT
Models C33A, E33A, and E33C

Issued: December, 1969
1. Instrument Light Rheostat
2. Fuel Panel Placard Light
3. Cabin Lights
4. Landing Gear Visual Indicator Light
5. Trim Tab Indicator Light
6. Compass Light Resistor
7. Compass Light
8. Engine Instrument Cluster Lights
9. Glareshield Instrument Lights
10. Interior Lights Circuit Breaker

NOTE: VENDOR FURNISHED WIRES ARE NOT CODED
NOTE: VENDOR FURNISHED WIRES ARE NOT CODED.

1. Instrument Light Rheostat
2. Fuel Panel Placard Light
3. Outside Air Temperature Light
4. Landing Gear Visual Indicator Light
5. Trim Tab Indicator Light
6. Switch
7. Compass Light
8. Engine Instrument Cluster Lights
9. Glareshield Instrument Lights

INTERIOR LIGHTS
Models E33A (CE180 thru CE250)
E33C (CJ1 thru CJ13)

Issued: December, 1969
1. Oil Temp, Radio Inst, and Cabin Lights Circuit Breaker
2. Dim Control Rheostat
3. Compass and OAT Light Switch
4. OAT Light
5. Fuel Select Light
6. Engine Instrument Lights
7. Trim Tab Light
8. Landing Gear Visual Indicator Light
9. Glareshield Connector
10. Glareshield Lights
11. Compass Light

INTERIOR LIGHTS
Model E33A (CD-251 thru CD-1304)
Model E33C (CJ-14 thru CJ-104)
NOTE: UNCODED WIRES ARE FURNISHED WITH LIGHTS

1. Oil Temperature, Instrument, and Cabin Lights Circuit Breaker
2. Radio and Instrument Lights Dim Control
3. Instrument Flood Lights Dim Control
4. Instrument Lights
5. Panel Edge lights
1. Bus Bar
2. Flap Circuit Breaker
3. Position Indicator Light Circuit Breaker
4. Flap Up Indicator Light (Green)
5. Flap Down Indicator Light (Amber)
6. Flap Motor
7. Flap Control Switch
8. Flap Up Limit Switch
9. Flap Down Limit Switch

FLAP CONTROL AND POSITION INDICATOR
Model C33A (CE1 thru CE70, except CE60)

Issued: December, 1969
PITOT HEAT (OPTIONAL)
Models C33A, E33A, and E33C

NAVIGATION LIGHTS
Models C33A, E33A, and E33C

STALL WARNING INDICATOR
Models C33A, E33A, and E33C

Issued: December, 1969
FLAP CONTROL AND POSITION INDICATOR
Model C33A (CE-60 and CE-71 thru CE-612)
Model E33A, E33C

1. Bus Bar
2. Flap Circuit Breaker
3. Flap Control Switch
4. Flap Up Limit Switch
5. Flap Down Limit Switch
6. Flap Motor
7. Flap Position Transmitter
8. Flap Position Indicator
   "PC" Board
9. Flap Position Indicator
1. Bus Bar  
2. L.G. Power Circuit Breaker  
3. L.G. Warning Circuit Breaker  
4. L.G. & Flap Ind. Circuit Breaker  
5. L.G. Down Ind. Light (Green)  
6. L.G. Up Ind. Light (Red)  
7. L.G. Motor  
8. L.G. Down Limit Switch  
9. L.G. Up Limit Switch  
10. L.G. Down Brake Limit Switch  
11. L.G. Up Brake Limit Switch  
12. Flasher  
13. L.G. Warning Horn  
14. Throttle Warning Limit Sw  
15. L.G. Safety Limit Switch  
16. Landing Gear Switch  
17. L.G. Warning Limit Switch

LANDING GEAR CONTROL AND POSITION INDICATOR
Models C33A, E33A, and E33C

Issued: December, 1969
NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON THE GROUND AND THROTTLE OFF

1. Landing Gear Circuit Breaker
2. Throttle and Landing Gear Warn Circuit Breaker
3. Landing Gear Control Switch
4. Landing Gear Down Limit Switch
5. Landing Gear Up Brake Switch
6. Landing Gear Down Brake Switch
7. Landing Gear Safety Switch
8. Landing Gear Up Limit Switch
9. Landing Gear Motor
10. 90 MPH Pressure Switch
11. Landing Gear Safety System Switch
12. Landing Gear Safety Relay
13. Throttle Control Switch
14. 120 MPH Pressure Switch
15. Diode
16. Bus
17. Landing Gear Down Indicator
18. Landing Gear Up Indicator
19. Landing Gear and Flap Indicator
   Lights Circuit Breaker

\[\text{\textcopyright LATCHING SOLENOID}\]
\[\text{\textcopyright WIRES FURNISHED BY VENDOR}\]

LANDING GEAR WITH SAFETY SYSTEM (OPTIONAL)
Models C33A, E33A, and E33C

Issued: December, 1969
1. Strobe Light Circuit Breaker
2. Power Supply
3. Strobe Light

STROBE LIGHT, HOSKINS (OPTIONAL)
Models C33A, E33A, and E33C

STROBE LIGHT, BULLOCK (OPTIONAL)
Models C33A, E33A, and E33C

Issued: December, 1969
ALTERNATOR (70A)
Model C33A (CE-1 thru CE-87)

1. Bus Bar
2. 80A Circuit Breaker
3. 10A Circuit Breaker
4. Alternator (70A)
5. Indicator & #330 Lamp
6. Overvoltage Relay
7. Alternator Switch
8. Voltage Regulator
9. Suppressor
10. Battery Relay
11. Connector
12. Plug and Cable Assembly
13. Battery Switch
14. Perm. Splice

Issued: December, 1969
1. Bus Bar
2. Alternator Circuit Breaker
3. Overvoltage Relay Circuit Breaker
4. Alternator
5. Voltage Regulator and Overvoltage Relay
6. Connector
7. Overvoltage Indicator
8. Battery Switch
9. Suppressor
10. Alternator Switch
11. Connector

ALTERNATOR (70A)
Model C33A (CE-88 thru CE-159)

Issued: December, 1969
1. Bus Bar
2. Alternator Circuit Breaker
3. Overvoltage Relay Circuit Breaker
4. Alternator
5. Voltage Regulator and Overvoltage Relay
6. Connector
7. Overvoltage Indicator
8. Battery Switch
9. Suppressor
10. Alternator Switch
11. Connector
12. Fuse

ALTERNATOR (70A)
Model C33A (CE-160 thru CE-179)

Issued: December, 1969
1. Bus Bar
2. Alternator Circuit Breaker
3. Overvoltage Relay Circuit Breaker
4. Alternator
5. Voltage Regulator and Overvoltage Relay
6. Connector
7. Alternator - Out Indicator
8. Battery Switch
9. Suppressor
10. Alternator Switch
11. Connector
12. Alternator Out Relay
13. Fuse
14. Resistor

*INSTALLED ON CE-199 AND AFTER AND ON CJ-1 AND AFTER AND ON PRIOR AIRCRAFT SERIALS MODIFIED IN ACCORDANCE WITH S.I. 0111-350

ALTERNATOR (70A)
MODEL E33A (CE-180 thru CE-248)
MODEL E33C (CJ-1 thru CJ-13)

Issued: September, 1971
1. Bus Bar
2. Alternator Circuit Breaker
3. Overvoltage Relay Circuit Breaker
4. Alternator
5. Voltage Regulator and Overvoltage Relay
6. Connector
7. Alternator - Out Indicator
8. Battery Switch
9. Suppressor
10. Alternator Switch
11. Not Used
12. Alternator Out Relay
13. Fuse
14. Filter Capacitor
15. Resistor

ALTERNATOR (70A)
Model E33A (CE-249 thru CE-265)
Model E33C (CJ-14 thru CJ-22)

Issued: September, 1971
1. Bus Bar
2. Alternator Circuit Breaker
3. Overvoltage Relay Circuit Breaker
4. Alternator
5. Voltage Regulator and Overvoltage Relay
6. Connector
7. Alternator - Out Indicator
8. Battery Switch
9. Suppressor
10. Alternator Switch
11. Not Used
12. Alternator-Out Sensor
13. Fuse
14. Filter Capacitor

ALTERNATOR (70A)
Model E33A (CE-266 thru CE-612)
Model E33C (CJ-23 thru CJ-104)
1. Pitch Trim and Ignition Boost Circuit Breaker
2. Control Column Coil Cord
3. Control Switch
4. Trim Actuator Assembly
5. Shunting Resistor (CE 245 and after, CJ 10 and after)
6. Speed Adjust Resistor (CE 180, CE 182, CE 239 and after)

ELEVATOR TRIM (OPTIONAL)
Models C33A, E33A, and E33C

Issued: December, 1969
1. Bus Bar
2. Circuit Breaker Switch
3. Ammeter
4. Timer
5. Brush Block
6. Slip Ring
7. Deice Boot

PROPELLER DEICE (OPTIONAL TWO-BLADED)
Models C33A, E33A, and E33C

1. Bus Bar
2. Circuit Breaker Switch
3. Ammeter
4. Timer
5. Brush Block
6. Slip Ring
7. Deice Boot

PROPELLER DEICE (OPTIONAL THREE-BLADED)
Models C33A, E33A, and E33C

Issued: December, 1969
1. Bus Bar
2. Circuit Breaker
3. Auxiliary Fuel Control Panel
4. Auxiliary Fuel Pump-High Pressure
5. Auxiliary Fuel Pump-Low Pressure
6. Quick Disconnect

FUEL BOOST PUMPS (HIGH AND LOW PRESSURE)
Model E33C

Issued: December, 1969
1. Pitch Trim and Ignition Boost Circuit Breaker
2. Fuel Boost Light
3. Fuel Pressure Switch
1. Avionics Bus
2. Constant Copilot Solenoid Valve
3. Constant Copilot Switch
4. Constant Copilot Wheel Switch
5. Constant Copilot Autopilot Circuit Breaker

CONSTANT COPILOT (OPTIONAL)
Model E33A (CE-236 thru CE-612)
Model E33C
POWER DISTRIBUTION
Model F33 (CD-1235 thru CD-1254)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-26 thru CJ-30)
POWER DISTRIBUTION (Vertical Instruments)
Model F33A(CE-350 thru CE-373)

Issued: December, 1972

1. DC Bus
2. Power Terminal Board
POWER DISTRIBUTION (Vertical Instruments)
Model F33A (CE-374 thru CE-408)

1. DC Bus
2. Power Terminal Board
POWER DISTRIBUTION (with standby generator).
Model F33A (CE-409 thru CE-612)
Model F33C (CJ-31 thru CJ-104)
TO AVIONICS CIRCUIT BREAKERS

AVIONICS MASTER
START RELAY
AUXILIARY FUEL PUMP
TRIM
AUTO PILOT
LIGHTER
FLAP MOTOR
FLAP POSITION
ALTERNATOR FIELD
TO BATTERY MASTER RELAY
P5B4
LANDING GEAR SWITH
P11B4
P11C4
LANDING LIGHT
NAV LIGHTS
BEACON LIGHTS
HEAT

1. DC Bus
2. Power Terminal Board

POWER DISTRIBUTION (without standby generator)
Model F33A (CE-409 thru CE-612)
Model F33C (CJ-31 thru CJ-104)
TO AVIONICS CIRCUIT BREAKERS

FLOOD LIGHTS

CABIN AND MAP LIGHTS

RADIO AND INSTR LIGHTS

LIGHTER

FLAP MOTOR

FLAP POSITION

TO ALTERNATOR FIELD

P11B6

LANDING GEAR MASTER RELAY

P5B4

P11C8

TO ALTERNATOR

TO AVIONICS CIRCUIT BREAKERS

FUEL QUANTITY

TURN COORDINATOR

LANDING GEAR POSITION

STARTER RELAY

AUXILIARY FUEL PUMP

THROTTLE AND LANDING GEAR WARNING

LANDING GEAR SAFETY

LANDING LIGHT

TAXI LIGHT

NAV LIGHTS

ROT LIGHTS

BEACON LIGHTS

STROBE LIGHTS

PITOT HEAT

1. DC Bus

2. Power Terminal Board

POWER DISTRIBUTION

Model G-33 (CD-1255 thru CD-1289)
POWER DISTRIBUTION
Model G33 (CD-1290 thru CD-1304)
BATTERY AND EXTERNAL POWER
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-612)
Model F33C (CJ-26 thru CJ-30)
TO POWER DISTRIBUTION — P5B4

1. Diode
2. Battery Master Relay
3. Battery Master Switch
4. Fuse
5. Shunt
6. Ammeter
7. Battery
8. External Power Relay
9. External Power Receptacle
10. Diode

BATTERY AND EXTERNAL POWER
Model F33A (CE-350 thru CE-408)

6-50H
BATTERY AND EXTERNAL POWER
F33A (CE-409 thru CE-1304)
F33C (CJ-31 thru CJ-1304)
1. Engine Start Relay Circuit Breaker
2. Ignition Switch
3. RH Magneto
4. LH Magneto
5. Starter
6. Starter Relay

STATER AND IGNITION
Model F33 (CD-1235 thru CD-1254)
Model F33A (CE-290 thru CE-315 and CE-324)
Model F33C (CJ-26 thru CJ-30)
Aircraft prior to incorporation of S. I. 0410-354, Revision I

Issued: December, 1972
1. Engine Start Relay Circuit Breaker
2. Ignition Switch
3. RH Magneto
4. LH Magneto
5. Starter
6. Starter Relay

AVIONICS PROTECTION NOT INSTALLED ON MODEL
G33 SERIALS CD-1256 AND AFTER OR ON MODEL
F33A SERIALS CE-350 AND AFTER
F33C SERIALS CJ-31 AND AFTER

STARTER AND IGNITION
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-316 thru CE-612)
Model F33C (CJ-31 thru CJ-104)
and prior airplanes in compliance with S.I. 0410-344 Rev. 1
1. Circuit Breaker
2. Cigarette Lighter

CIGARETTE LIGHTERS
Models F33, G33, F33A and F33C

Issued: August, 1971
1. Stall Warn Circuit Breaker
2. Stall Detector Switch
3. Stall Warning Horn

STALL WARNING
Models F33, G33, F33A and F33C

1. Pitot Heat Circuit Breaker
2. Pitot Heater

PITOT HEAT (OPTIONAL)
Models F33, G33, F33A and F33C

Issued: August, 1971
1. Turn Coordinator Circuit Breaker
2. Turn Coordinator Indicator

TURN COORDINATOR
Models F33, G33, F33A and F33C

1. Landing Light Circuit Breaker
2. Landing Light
3. Taxi Light Circuit Breaker
4. Taxi Light

LANDING AND TAXI LIGHTS
Models F33, G33, F33A and F33C

Issued: August, 1971
1. Navigation Lights Circuit Breaker
2. RH Navigation Light
3. Tail Navigation Light
4. LH Navigation Light

NAVIAGTION LIGHTS
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-435)
Model F33C (CJ-26 thru CJ-30)
1. Navigation Lights Circuit Breaker
2. RH Navigation Light
3. Tail Navigation Light
4. LH Navigation Light

**NAVIGATION LIGHTS**
Model F33A (CE-436 thru CE-612)
Model F33C (CJ-31 thru CJ-104)
**GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.**

1. Fuel Quantity Circuit Breaker
2. Printed Circuit Board
3. Fuel Quantity Indicator
4. Inboard Fuel Cell Transmitter
5. Outboard Fuel Cell Transmitter

**FUEL QUANTITY**
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-26 thru CJ-30)
**GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT:** E31A20N (OIL TEMPERATURE), E39A20N (CYLINDER HEAD TEMPERATURE), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.

**Circuit Breaker**
**Fuel Quantity Indicator**
**Inboard Fuel Quantity Transmitter**
**Outboard Fuel Quantity Transmitter**

FUEL QUANTITY (Vertical Instruments)
Model F33A (CE-350 thru CE-408)

* GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.

1. Fuel Quantity Circuit Breaker
2. Printed Circuit Board
3. Fuel Quantity Indicator
4. Inboard Fuel Cell Transmitter
5. Outboard Fuel Cell Transmitter

FUEL QUANTITY (OPTIONAL)
Model F33A (CE-409 thru CE-479)
Model F33C (CJ-31 thru CJ-51)
PRINTED CIRCUIT BOARD IS MOUNTED ON GLARESHEILD SUPPORT (UPPER FORWARD PORTION OF FIXED INSTRUMENT PANEL)

- GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.

1. Fuel Quantity Circuit Breaker
2. Printed Circuit Board
3. Fuel Quantity Indicator
4. Inboard Fuel Cell Transmitter
5. Outboard Fuel Cell Transmitter

FUEL QUANTITY (OPTIONAL)
Model F33A (CE-480 thru CE-612)
Model F33C (CJ-52 thru CJ-104)

- GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.

1. Fuel Quantity Circuit Breaker
2. Printed Circuit Board
3. Fuel Quantity Indicator
4. LH Fuel Cell Transmitter
5. RH Fuel Cell Transmitter

FUEL QUANTITY (STANDARD)
Model F33A (CE-409 thru CE-479)
Model F33C (CJ-31 thru CJ-51)
*PRINTED CIRCUIT BOARD IS MOUNTED ON GLARESHIELD SUPPORT (UPPER FORWARD PORTION OF FIXED INSTRUMENT PANEL)*

"*GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.*

1. Fuel Quantity Circuit Breaker
2. Printed Circuit Board
3. Fuel Quantity Indicator
4. LH Fuel Cell Transmitter
5. RH Fuel Cell Transmitter

**FUEL QUANTITY (STANDARD)**
Model F33A (CE-480 thru CE-612)
Model F33C (CJ-52 thru CJ-104)
1. Auxiliary Fuel Pump Circuit Breaker  
2. Auxiliary Fuel Pump Switch  
3. Auxiliary Fuel Pump Motor

**FUEL BOOST PUMP**  
*Models F33 and F33A (CE-290 thru CE-349)*

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1. Auxiliary Fuel Pump Circuit Breaker  
2. Auxiliary Fuel Pump Switch  
3. Auxiliary Fuel Pump Motor

**FUEL BOOST PUMP**  
*Model G33*  
*Model F33A (CE-350 thru CE-612)*

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6-58  
C7
1. Fuel Quantity, Cylinder Head Temperature, and Auxiliary Fuel Pump Circuit Breaker
2. Auxiliary Fuel Control Panel
3. Auxiliary Fuel Pump - High Pressure
4. Auxiliary Fuel Pump - Low Pressure

**FUEL BOOST PUMP**
Model F33C

Issued: August, 1971
1. Flap Motor Circuit Breaker
2. Flap Control Switch
3. Flap Down Limit Switch
4. Flap Up Limit Switch
5. Flap Motor

**WIRE FURNISHED BY VENDOR**

**FLAP MOTOR**
Models F33, G33, F33A and F33C

Issued: August, 1971
1. Flap Position Indicator Circuit Breaker
2. Printed Circuit Board
3. Flap Position Indicator
4. Flap Position Transmitter

FLAP POSITION INDICATOR
Models F33, G33, F33A and F33C

Issued: August, 1971
NOTE: CIRCUIT IS SHOWN WITH AIRCRAFT ON THE GROUND

1. Landing Gear Circuit Breaker
2. Landing Gear Control Switch
3. Landing Gear Up Brake Switch
4. Landing Gear Down Brake Switch
5. Landing Gear Up Limit Switch
6. Landing Gear Down Limit Switch
7. Landing Gear Safety Switch
8. Landing Gear Motor

WARNING

△ WIRE FURNISHED BY VENDOR

LANDING GEAR WITHOUT SAFETY SYSTEM
Model F33 (CD-1235 thru CD-1254)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-26 thru CJ-30)
NOTE: CIRCUIT IS SHOWN WITH AIRCRAFT ON THE GROUND

1. Landing Gear Circuit Breaker
2. Landing Gear Control Switch
3. Landing Gear Up Brake Switch
4. Landing Gear Down Brake Switch
5. Landing Gear Up Limit Switch
6. Landing Gear Down Limit Switch
7. Landing Gear Safety Switch
8. Landing Gear Motor

△ WIRE FURNISHED BY VENDOR

LANDING GEAR WITHOUT SAFETY SYSTEM
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-350 thru CE-637, CE-542, CE-544 and CE-547)
LANDING GEAR WITHOUT SAFETY SYSTEM
Model F33A (CE-538 thru CE-541, CE-543, CE-545, CE-546 and CE-548 thru CE-612)

6-62B
NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON GROUND AND THROTTLE OFF

1. Landing Gear Circuit Breaker
2. Not Used
3. Landing Gear Up Brake Switch
4. Landing Gear Down Brake Switch
5. Landing Gear Up Limit Switch
6. Landing Gear Down Limit Switch
7. Landing Gear Motor
8. Landing Gear Safety Switch Circuit Breaker
9. 90 MPH Pressure Switch
10. Diode
11. Landing Gear Safety Relay
12. Landing Gear Safety Switch
13. Landing Gear Safety System Switch
14. 150 MPH Pressure Switch
15. Throttle Control Switch
16. Landing Gear Control Switch
17. Fuse

- LATCHING SOLENOID
- WIRE FURNISHED BY VENDOR

LANDING GEAR WITH SAFETY SYSTEM

LANDING GEAR WITH SAFETY SYSTEM (OPTIONAL)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-350 thru CE-357, CE-542 and CE-547)
LANDING GEAR WITH SAFETY SYSTEM (OPTIONAL)
Model F33 (CE-538 thru CE-541, CE-543, CE-546, CE-548 thru CE-608)
LANDING GEAR WITH SAFETY SYSTEM (OPTIONAL)
Model F33 (CE-609 thru CE-612)
Model F33C (CJ-100 thru CJ-104)
1. Landing Gear And Throttle Warn Circuit Breaker
2. Navigation Lights Circuit Breaker
3. Landing Gear Position Circuit Breaker
4. Warn Lights Test Switch
5. Warn Lights Dim Relay
6. Landing Gear Position Lights
7. Gear In Transit Light
8. Terminal Board
9. Terminal Board
10. Diode
11. Dim Resistors
12. RH Gear "Up" Lock Switch
13. RH Gear "Down" Lock Switch
14. Nose Gear "Up" Lock Switch
15. Nose Gear "Down" Lock Switch
16. LH Gear "Up" Lock Switch
17. LH Gear "Down" Lock Switch

* SWITCH TYPE CIRCUIT BREAKER

LANDING GEAR POSITION INDICATOR
Model F33 (CD-1235 thru CD-1252)
Model F33A (CE-290 thru CE-308)
Model F33C (CJ-26 thru CJ-30)
LANDING GEAR POSITION INDICATOR
Model F33 (CD-1253 thru CD-1255)
Model F33A (CE-309 thru CE-349)
NOTE: CIRCUIT SHOWN WITH AIRCRAFT ON GROUND AND THROTTLE CLOSED

To Landing Gear Position Indicator

1. Landing Gear and Throttle Warning Circuit Breaker
2. Throttle Control Switch
3. Flasher
4. Landing Gear Safety Switch
5. Landing Gear Warning Horn
6. Landing Gear Control Switch

LANDING GEAR AND THROTTLE WARNING
Model F33(CD-1235 thru CD-1254)
Model G33(CD-1255 thru CD-1289)
Model F33A(CE-290 thru CE-547 except CE-545 and CE-546)
NOTE: CIRCUIT SHOWN WITH AIRPLANE ON GROUND AND THROTTLE CLOSED

LANDING GEAR AND THROTTLE WARNING
Model F33A (CE-545 thru CE-612 except CE-547)
1. Generator Circuit Breaker
2. Voltage Regulator
3. Generator Switch
4. Generator

TO POWER DISTRIBUTION

P11A6

1 (35A) P14A18

P10A4

P15A4

B F G

GENERATOR (35A)
Model F33

Issued: August, 1971
1. Alternator Field Circuit Breaker
2. Alternator Switch
3. Voltage Regulator
4. Alternator
5. Capacitor
6. Alternator Circuit Breaker

ALTERNATOR (Optional)
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1279 except CD-1276)

Issued: December, 1972
1. Alternator Field Circuit Breaker
2. Alternator Switch
3. Voltage Regulator
4. Alternator
5. Capacitor
6. Alternator Circuit Breaker

ALTERNATOR
Model G33 (CD-1276, CD-1280 thru CD-1304)
ALTERNATOR
Model F33A (CE-290 thru CE-481)
1. Bus
2. Alternator Field Circuit Breaker
3. Navigation Lights Circuit Breaker
4. Door and Alternator Out Circuit Breaker
5. Alternator Circuit Breaker
6. Alternator
7. Alternator Master Switch
8. Fuse
9. Overvoltage Relay
10. Low Voltage Sensor
11. Alternator Out Light
12. Warning Light Dim Relay
13. Diode
14. Warning Lights Switch
15. Resistor
16. Capacitor

ALTERNATOR
Model F33C (CJ-26 thru CJ-51)
1. Bus
2. Alternator Field Circuit Breaker
3. Navigation Lights Circuit Breaker
4. Alternator Out Circuit Breaker
5. Alternator Circuit Breaker
6. Alternator
7. Alternator Master Switch
8. Fuse
9. Overvoltage Relay
10. Low Voltage Sensor
11. Alternator Out Light
12. Warning Light dim Relay
13. Diode
14. Warning Lights Switch
15. Resistor
16. Capacitor

**ALTERNATOR**
- Model F33A (CE-482 thru CE-612)
- Model F33C (CJ-52 thru CJ-104)
FUEL SELECTOR LIGHT
Model F33A (CE-290 thru CE-464)
Model F33C (CJ-26 thru CJ-51)
PROPELLER DEICE (THREE BLADED)
Models F33, G33, F33A and F33C

1. Prop Deice Circuit Breaker
2. Ammeter
3. Connector
4. Timer
5. Slip Ring Assembly
6. Deice Boot
7. Brush Block
8. Bus

PROPELLER DEICE (TWO BLADED)
Models F33, G33, F33A and F33C

Issued: August, 1971
**GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N, AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.**

1. Cylinder Head and Oil Temperature Circuit Breaker
2. Cylinder Head, Oil Temperature, and Oil Pressure Indicator
3. Cylinder Head Temperature Transmitter Bulb

CYLINDER HEAD TEMPERATURE INDICATOR
Models F33, G33, F33A (CE-290 thru CE-349) and F33C

Issued: September, 1971
**GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT:** E31A20N (OIL TEMPERATURE), E39A20N (CYLINDER HEAD TEMPERATURE), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.

1. Circuit Breaker
2. Cylinder Head Temperature Indicator
3. Cylinder Head Temperature Transmitter

CYLINDER HEAD TEMPERATURE INDICATOR (Vertical Instruments)
Model F33A (CE-350 thru CE-408)

Issued: December, 1972
1. Cylinder Head and Oil Temperature Circuit Breaker
2. Cylinder head, Oil Temperature, and Oil Pressure Indicator
3. Oil Temperature Transmitter Bulb

**GROUND THE FOLLOWING INSTRUMENT WIRES
AT A SINGLE POINT: E31A20N (CYLINDER HEAD),
E42A20N AND E44A20N (FUEL QUANTITY). DO
NOT GROUND ANY OTHER WIRES AT THIS POINT.**

OIL TEMPERATURE INDICATOR
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-26 thru CJ-51)
**GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (OIL TEMPERATURE), E39A20N (CYLINDER HEAD TEMPERATURE), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.**

OIL TEMPERATURE AND OIL PRESSURE INDICATOR (Vertical Instruments)
Model F33A (CE-350 thru CE-408)

Issued: December, 1972
1. CYLINDER HEAD AND OIL TEMP CIRCUIT BREAKER

2. ENGINE INST CLUSTER
   - INST POWER
   - INST GROUND
   - CYL HEAD TEMP
   - OIL TEMP

3. OIL TEMP TRANSMITTER BULB
   - E31A20N
   - E41A20
   - E32A20
   - E33A20N

4. CYL HEAD TEMP TRANSMITTER BULB
   - E40A20N

**GROUND THE FOLLOWING INSTRUMENT WIRES AT A SINGLE POINT: E31A20N (CYLINDER HEAD), E42A20N AND E44A20N (FUEL QUANTITY). DO NOT GROUND ANY OTHER WIRES AT THIS POINT.**
1. Circuit Breaker
2. Manifold Pressure Indicator
3. Manifold Pressure Transducer

MANIFOLD PRESSURE INDICATOR (Vertical Instruments)
Model F33A (CE-350 thru CE-408)

Issued: December, 1972
FUEL FLOW INDICATOR (Vertical Instruments)
Model F33A (CE-350 thru CE-408)

Issued: December, 1972
TACHOMETER (Vertical Instruments)
Model F33A (CE-350 thru CE-385)

 Issued: December, 1972
TACHOMETER (Vertical Instruments)
Model F33A (CE-386 thru CE-408)

1. Circuit Breaker
2. Tachometer Indicator
3. Tachometer Pickup Probe
4. Resistor

Issued: December, 1972
1. Indicator
2. Thermocouple Harness
3. Thermocouple Probe

REPLACEMENT PARTS MUST BE IDENTICAL OR ENTIRE UNIT MUST BE REPLACED

EXHAUST GAS TEMPERATURE
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-349, CE-409 thru CE-612)
Model F33C (CJ-26 thru CJ-104)

EXHAUST GAS TEMPERATURE INDICATOR (Vertical Instruments)
Model F33A (CE-350 thru CE-408)
1. Rotating Beacon Circuit Breaker
2. Upper Rotating Beacon
3. Lower Rotating Beacon

ROTATING BEACON
Models F33, G33, F33A and F33C

Issued: September, 1971
CABIN AND MAP LIGHTS
Model F33 (CD-1235 thru CD-1254)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-1 thru CJ-30)

1. Cabin and Map Lights Circuit Breaker
2. Compass and OAT Light Switch
3. OAT Light
4. Glareshield Connector
5. Compass Light
6. Cabin Light Switch
7. Cabin Light
8. Reading Light Switch
9. Reading Light
10. Map Light Switch
11. Map Light
CABIN AND MAP LIGHTS
Model F33 (CD-1255 thru CD-1304)
Model F33A (CE-350 thru CE-469)
Model F33C (CJ-31 thru CJ-51)
1. Flood Lights Circuit Breaker
2. Dim Control Rheostat
3. Dim Control Transistor
4. Trim Tab Light
5. Landing Gear Visual Light
6. Fuel Select Light
7. Clock Light (Optional)
8. Glareshield Connector
9. Glareshield Flood Lights

INSTRUMENT FLOOD LIGHTS
Model F33 (CD-1235 thru CD-1254)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-26 thru CJ-30)
1. Flood Lights Circuit Breaker
2. Dim Control Rheostat
3. Dim Control Transistor
4. Trim Tab Light
5. Landing Gear Visual Light
6. Not Used
7. Not Used
8. Glareshield Connector
9. Glareshield Flood Lights

INSTRUMENT FLOOD LIGHTS
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-350 thru CE-469)
1. Flood Lights Circuit Breaker
2. Dim Control Rheostat
3. Dim Control Transistor
4. Trim Tab Light
5. Landing Gear Visual Light
6. Not Used
7. Not Used
8. Glareshield Connector
9. Glareshield Flood Lights

INSTRUMENT FLOOD LIGHTS
Model F33A (CE-470 thru CE-612)
Model F33C (CJ-52 thru CJ-104)
1. Radio and Instrument Lights Circuit Breaker
2. Dim Control Rheostat
3. Dim Control Transistor
4. Omni Lights
5. Wedge Lights
6. Bus No. 3
7. Bus No. 4

OMNI LIGHTS CONNECTED TO FLIGHT INSTRUMENT DIMMING WHEN OPTIONAL FLIGHT INSTRUMENT LIGHTS INSTALLED

ENGINE INSTRUMENT WEDGE LIGHTS
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-349)
Model F33C (CJ-26 thru CJ-51)
ENGINE INSTRUMENT POST LIGHTS
Models F33, G33, F33A (CE-290 thru CE-349) and F33C

Issued: September, 1971
When Optional Flight Instrument Dimming is Installed, connect L80A20 to that dimming transistor.

Model F33A (CE-350 thru CE-408)

ENGINE INSTRUMENT LIGHTS (Vertical Instruments)

1. Circuit Breaker
2. Rheostat-Radio and Engine Instrument Dimming
3. Transistor-Radio and Engine Instrument Dimming
4. Resistor-Engine Instrument Dimming
5. Omni Indicator Lights

Issued: December, 1972
1. Radio and Instrument Lights Circuit Breaker
2. Dim Control Rheostat
3. Dim Control Transistor
4. Omni Lights
5. Wedge Lights
6. Bus No. 3
7. Bus No. 4

⚠️ Omni Lights connected to flight instrument dimming when optional flight instrument lights installed.
RADIO AND INSTRUMENT LIGHTS CIRCUIT BREAKER

TO OPTIONAL ENGINE INSTRUMENT POST LIGHTS

OMNI LIGHTS CONNECTED TO FLIGHT INSTRUMENT DIMMING WHEN OPTIONAL FLIGHT INSTRUMENT LIGHTS INSTALLED

ENGINE INSTRUMENT LIGHTS
Model F33A (CE-470 thru CE-612)
Model F33C (CJ-52 thru CJ-104)

6-74D C7
FLIGHT INSTRUMENT WEDGE LIGHTS (OPTIONAL)
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-469)
Model F33C (CJ-26 thru CJ-52)
1. Wedge Light
2. Bus No. 1
3. Bus No. 2
4. Flap Position
5. Trim Tab Light
6. Landing Gear Visual Light
7. Clock
8. Dimming Transistor
9. Rheostat
10. Radio and Instrument Lights Circuit Breaker
11. Omni Indicator Lamps
12. Control Wheel Clock Post Light
13. Cable
14. Air Pressure
15. Vertical Speed
16. Directional Gyro
17. Turn Coordinator
18. Altimeter
19. Air Speed
20. Gyro Horizon
21. Clock
22. ADF
23. Compass

FLIGHT INSTRUMENT WEDGE LIGHTS (OPTIONAL)
Model F33A (CE-470 thru CE-612)
Model F33C (CJ-53 thru CJ-104)
OPTIONAL INTERNALLY LIT INSTRUMENTS
Model F33A (CE-409 thru CE-474)
OPTIONAL INTERNALLY LIT INSTRUMENTS
Model F33A (CE-475 thru CE-612)
FLIGHT INSTRUMENT POST LIGHTS
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-350 thru CE-474)
Model F33C (CJ-1 thru CJ-52)
FLIGHT INSTRUMENT POST LIGHTS
Model F33A (CE-475 thru CE-612)
Model F33C (CJ-53 thru CJ-104)
1. Flood Lights Circuit Breaker
2. Electroluminous Panel Lights Dim Transistor
3. Dim Control Rheostat
4. Inverter
5. Electroluminous Panel

ELECTROLUMINOUS PANEL LIGHTS
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-469)
Model F33C (CJ-26 thru CJ-51)
1. Flood Lights Circuit Breaker
2. Electroluminous Panel Lights Dim Transistor
3. Dim Control Rheostat
4. Inverter
5. Electroluminous Panel
ELEVATOR TRIM (OPTIONAL)
Model F33 (CD-1235 thru CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-290 thru CE-469)
Model F33C (CJ-26 thru CJ-51)

1. Pitch Trim and Ignition
   Boost Circuit Breaker
2. Control Column Coil Cord
3. Control Switch
4. Trim Actuator Assembly
5. Shunting Resistor
6. Speed Adjust Resistor
7. Pitch Trim Switch
1. Pitch Trim and Ignition Boost Circuit Breaker
2. Control Column Coil Cord
3. Control Switch
4. Trim Actuator Assembly
5. Shunting Resistor (F33A)
6. Speed Adjust Resistor (F33A)
7. Pitch Trim Switch

ELEVATOR TRIM
Model F33A (CE-470 thru CE-612)
Model F33C (CJ-52 thru CJ-104)
1. Avionics Bus
2. Constant Copilot Solenoid Valve
3. Constant Copilot Switch
4. Constant Copilot Wheel Switch
5. Constant Copilot Autopilot Circuit Breaker

CONSTANT COPILOT (OPTIONAL)
Models F33, G33, F33A and F33C

Issued: August, 1971
STROBE LIGHT GRIMES (OPTIONAL)
Models G33 and F33A
1. Strobe Light Circuit Breaker
2. Power Supply
3. Strobe Light

STROBE LIGHT HOSKINS (OPTIONAL)
Models F33, G33, F33A and F33C

1. Strobe Light Circuit Breaker
2. Power Supply
3. Strobe Light

STROBE LIGHT BULLOCK (OPTIONAL)
Models F33, G33, F33A and F33C

Issued: August, 1971
FUEL BOOST LIGHT
Model F33C

1. Diode
2. Resistor
3. Fuel Boost Indicator
4. Fuel Boost Pressure Switch

Issued: August, 1971
1. Battery Bus
2. Courtesy Light Fuse
3. Courtesy Light Switch
4. Courtesy Light

COURTESY LIGHT (OPTIONAL)
Model F33 (CD-1235 and CD-1254)
Model G33 (CD-1255 thru CD-1304)
Model F33A (CE-350 thru CE-464)
Model F33C (CJ-26 thru CJ-51)

1. Battery Bus
2. Courtesy Light Fuse
3. Courtesy Light Switch
4. Courtesy Light

COURTESY LIGHT (OPTIONAL)
Model F33A (CE-465 thru CE-612)
F33C (CJ-52 thru CJ-104)
AIR CONDITIONER
Model F33A (CE-602 thru CE-612)
SECTION 7

REPLACEMENT SCHEDULE
SECTION 7

Replacement Schedule
OVERHAUL AND REPLACEMENT SCHEDULE

The first overhaul or replacement should be performed not later than the required period. The condition of the item at the end of the first period can be used as a criteria for determining subsequent periods applicable to the individual airplane or fleet operation providing the operator has an approved monitoring system.

The time periods for inspections noted in this manual are based on average usage and average environmental conditions.

SPECIAL CONDITIONS CAUTIONARY NOTICE

Airplanes operated for Air Taxi or other than normal operation and airplanes operated in humid tropics or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas periodic inspections should be performed until the operator can set his own inspection periods based on experience.

NOTE

The required periods do not constitute a guarantee the item will reach the period without malfunction as the aforementioned factors cannot be controlled by the manufacturer.

NOTE

On condition items are to be overhauled or replaced when inspection or performance of these items reveal a potentially unsafe or unservicable condition.
ITEM

Landing Gear

Main Gear
Nose Gear
Actuator assembly (all except P/N 35-810075-13)
Actuator assembly (P/N 35-810075-13)
Retract motor
Retract motor brushes
Shimmy damper
Wheels and tires
Brake assembly
Master cylinder
Shuttle valve assembly
Parking brake valve
All hose

Power Plant

*Engine
Engine controls
Engine vibration isolator mounts
Exhaust system
Starter

Alternator
Oil Cooler

OVERHAUL OR REPLACE

Every 2000 hours
Every 2000 hours
Every 4000 hours except as a trainer, 2000 hours
Every 2000 hours
Every 500 hours or on condition
Every 1000 hours
On condition
On condition
On condition
On condition
On condition

Every 1500 hours
On condition
At engine change
On condition
Overhaul at engine overhaul, or replace on condition
On condition or at engine overhaul
On condition (replace when contaminated)
ITEM

Power Plant (Cont'd)

Propeller
  McCauley
  Hartzell
  Flotorp

Propeller controls
Propeller Governor
Pressure pump
Pressure pump intake filter
All hose

Vacuum pump

Flaps And Flight Controls

Flight Controls
  Elevator tab actuator
  Flap motor and drives
  Flap motor brushes
  Flap gearbox
  Flap actuators
  Flap flexible shaft

Fuel System

Fuel cells

OVERHAUL OR REPLACE

At engine overhaul, but not to exceed 1200 hours or 3 years, whichever occurs first

2000 hours or 5 years

At engine overhaul, but not to exceed 1000 hours

On condition

At engine overhaul

Every 1500 hours

Every 500 hours

Hoses carrying flammable liquids at engine overhaul or every 5 years. All other hoses on condition

Every 1200 hours

On condition

On condition

Every 2000 hours

On condition

Every 2000 hours

Every 2000 hours

On condition (If fuel reservoir is installed, inspect foam insert material for deterioration. Replace foam insert material every 10 years)
ITEM

Fuel System (Cont'd)

Wing fuel quantity transmitters
Fuel cell drain valve
Fuel system check valves
Fuel selector valve
Fuel boost pump
All hose

OVERHAUL OR REPLACE

On condition
On condition
On condition
Inspect every 600 hours
Overhaul every 1200 hours
Every 1200 hours
Hoses carrying flammable liquid at engine overhaul or every 5 years. All other hoses on condition

Instruments

Turn coordinator
Altimeter

Directional gyro
Gyro horizon
Gyro pressure gage
Engine gage units
Airspeed indicator
Rate-Of-Climb
Fuel flow/manifold pressure indicator
Tachometer
Clock
Flap position indicator
Free air temperature indicator
All hose
Pressure system intake filter
Pressure system inline filter
Air pressure regulator valve

On condition
Every 24 months per FAA directive (Inspect and calibrate)
On condition
On condition
On condition
On condition
On condition
On condition
On condition
On condition
On condition
On condition
On condition
Every 500 hours
Every 300 hours
On condition
ITEM

Electrical System

Battery master relay
All other relays
Voltage regulator
Starter relay
Battery (Emergency locator transmitter)

Standby generator (14 or 28 volt)
Standby generator brushes (28 volt)

Miscellaneous

Hand fire extinguisher
Cabin heating and ventilating ducts
Heater muff
Oxygen regulator
Oxygen cylinder (Light weight) ICC 3HT 1850

Oxygen cylinder (Heavy weight) ICC 3AA 1800
Vacuum regulator

Air conditioner filter
Air conditioner compressor
Seat belts or shoulder harness

OVERHAUL OR REPLACE

On condition
On condition
On condition
On condition
Replace at 50% of useful life (as stated on the battery) or any time the transmitter is used more than one cumulative hour
Every 1500 hours
Every 500 hours
Inspect every 12 months recharge as necessary.
On condition, inspect every 12 months
On condition
On condition
Hydrostatically test every 3 years or replace every 24 years or 4380 fillings (ICC Regulation)
Hydrostatically test every 5 years (ICC Regulation)
Replace when all vacuum driven instruments operate erratically
On condition
On condition
Every 12 months or on condition
**Wing bolts**

Replace 10 years after the initial inspection or on condition. See Section 4

*Refer to Teledyne Continental Motors Service Bulletin M74-20 Rev I dated November 7, 1974 or later issue.*
SECTION 8

Periodic Inspections
E33C, F33C SPIN INSPECTION (ACROBATIC CATEGORY)

This inspection is required on all E33C, and F33C (CJ-1 and after) airplanes, which are being acrobatically spun (even if the spin time is only a small part of total time). This inspection is NOT required if an airplane is performing acrobatic maneuvers other than spins (no spins at all). The regular 100-Hour Inspection (P/N 98-32227G or subsequent), Intermediate 100-Hour Inspection (P/N 98-38999 or subsequent), or Continuing Care Inspection Guide (P/N 98-36711D or subsequent) MUST also be complied with.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>PART</th>
<th>INSPECTION</th>
<th>CORRECTIVE ACTION</th>
<th>MECH INSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 50 Hours</td>
<td>Rudder pedal bell crank support assembly</td>
<td>Check for cracks.</td>
<td>If cracks are found contact Beech Aircraft Corporation Commercial Services Department.</td>
<td></td>
</tr>
<tr>
<td>2. 50 Hours</td>
<td>Elevator to Elevator torque fitting casting joint</td>
<td>Check screw holes (4 per elevator) for proper hole diameter.</td>
<td>If hole diameter is more than .194 inch ream hole to .206 ± .002 inch diameter and install NAS 2903-4 or NAS 6203-4X oversize bolt. If hole diameter exceeds .210 inch for oversize bolts contact Beech Aircraft Corporation Commercial Services Department for rework instructions. Torque bolt or screw to 30 to 40 inch lbs.</td>
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</tr>
<tr>
<td>3. 50 Hours</td>
<td>Horizontal and vertical stabilizer attachment bolt holes (stabilizer spars and bulkheads)</td>
<td>Horizontal stabilizer forward spar: Check diameter of 4 outboard bolt holes on each side (2 upper and 2 lower). Horizontal stabilizer rear spar: Check diameter of 2 outboard bolt holes on each side (1 upper and 1 lower). If any of these holes are oversize, check all other horizontal stabilizer bolt holes and vertical stabilizer bolt holes for correct diameter. Check torque on all nuts.</td>
<td>If bolt holes are more than .253 inch in diameter or elongated, ream the bushings to .270 ± .002 inch diameter and install NAS 2904-14 oversize bolts. If hole diameter exceeds .272 for oversize bolts contact Beech Aircraft Corporation Commercial Services Department for rework instructions. Torque the nuts to 85 to 100 inch lbs.</td>
<td></td>
</tr>
<tr>
<td>4. 50 Hours</td>
<td>Inboard elevator hinge bolts Elevator pushrods to elevator torque fitting bolt.</td>
<td>Check for straightness and wear.</td>
<td>Replace if bent or worn.</td>
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<tr>
<td>FREQUENCY</td>
<td>PART</td>
<td>INSPECTION</td>
<td>CORRECTIVE ACTION</td>
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<tr>
<td>5. 50</td>
<td>Upper and middle rudder hinges</td>
<td>Inspect for cracks, corrosion and excessive wear.</td>
<td>Replace if any of noted conditions exist.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower rudder hinge</td>
<td>Inspect for cracks, corrosion and excessive wear.</td>
<td>Replace if any of noted conditions exist.</td>
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<tr>
<td>6. 50</td>
<td>Elevator hinge joint</td>
<td>Check bearing for looseness and bearing bracket for cracks, corrosion and excessive wear.</td>
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<td></td>
<td></td>
<td>Check bushing diameters.</td>
<td>Replace if noted conditions exist.</td>
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<td></td>
<td></td>
<td>Check elevator hinge brackets hole diameter.</td>
<td>If I.D. is over .188 inch or O.D. is under .310 inch, replace bushings.</td>
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<td></td>
<td></td>
<td>Check elevator hinge bracket for cracks, corrosion and excessive wear.</td>
<td>If greater than .200 replace bracket.</td>
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<td></td>
<td>Check bolts for wear.</td>
<td>Replace if noted conditions exist.</td>
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<td></td>
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<td>Check reassembled joint for looseness.</td>
<td>Install new parts as required.</td>
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<tr>
<td>7. 50</td>
<td>Elevator pushrods</td>
<td>Check for straightness, and cracks.</td>
<td>Replace pushrod if bent or cracked.</td>
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<td></td>
<td></td>
<td>Check rod end bearing for excessive freeplay.</td>
<td>Replace rod end bearing if excessive freeplay is noted.</td>
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<td></td>
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<td>Check rod end mounting hole diameter.</td>
<td>If more than .378 inch in diameter, replace rod end.</td>
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<tr>
<td>8. 50</td>
<td>Trim Tab</td>
<td>Check for cracks.</td>
<td>Replace if noted conditions exist.</td>
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<td></td>
<td></td>
<td>Check freeplay as indicated in Chapter 27-30-00.</td>
<td>Replace tab bushing and/or tab pushrod ends and/or trim tab actuator shaft and/or trim tab hinge if excessive freeplay is noted.</td>
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<tr>
<td>9. 50</td>
<td>Elevator</td>
<td>Check for cracks, especially between outboard hinge and elevator balance horn.</td>
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<td></td>
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<td>If cracks are found contact Beech Aircraft Corporation Commercial Service Department for repair.</td>
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<tr>
<td>10. 50</td>
<td>Trim tab pushrod assemblies</td>
<td>Check straightness</td>
<td>Replace if bent.</td>
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<tr>
<td>11. 50</td>
<td>Trim tab actuator</td>
<td>Check output shaft for straightness.</td>
<td>Replace if bent.</td>
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<td></td>
<td></td>
<td>Check actuator installation for looseness.</td>
<td>Check attach bolts for proper torque.</td>
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</tr>
<tr>
<td>12. 50</td>
<td>Elevator bellcrank</td>
<td>Check pushrod mounting hole for proper diameter.</td>
<td>If more than .379 inch, press out existing bushing and press in one BS105740-X-0968 bushing and drill .377 ± .002 inch diameter hole thru bushing.</td>
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<tr>
<td>FREQUENCY</td>
<td>PART</td>
<td>INSPECTION</td>
<td>CORRECTIVE ACTION</td>
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<tr>
<td>13. 50 Hours</td>
<td>Bolt (elevator pushrods to elevator bell crank)</td>
<td>Check for straightness and wear.</td>
<td>Replace if bent or worn smaller than .370.</td>
<td></td>
</tr>
<tr>
<td>14. 50 Hours</td>
<td>Inboard elevator hinge casting</td>
<td>Check for cracks. Check hinge bearing for looseness.</td>
<td>Replace if noted conditions exist.</td>
<td></td>
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</tbody>
</table>
100-HOUR INSPECTION GUIDE

CAUTION

Any time an airplane is repainted, inspect all placards to assure that they are not covered with paint, are easily readable, and are securely attached.

The owner or operator is primarily responsible for maintaining the airplane in an airworthy condition, including compliance with all applicable Airworthiness Directives as specified in Part 39 of the Federal Aviation Regulations. It is the responsibility of the owner or operator to ensure that the airplane is inspected in accordance with the requirements of Parts 43 and 91 of the Federal Aviation Regulations. Beech Aircraft Corporation has prepared this inspection guide to assist the owner or operator in meeting the foregoing responsibilities. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgment of a certified airframe and powerplant mechanic in the performance of his duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

NOTE

Additional inspection forms are available under Part Number 98-32227D or subsequent revision.

The time periods for the inspections noted in this schedule are based on normal usage under average environmental conditions. Airplanes operated in extremely humid tropics, or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, lubrication, and/or lack of maintenance. Under these adverse conditions, perform periodic inspections in compliance with this guide at more frequent intervals until the operator can set his own inspection periods based on the contingencies of field experience. An annual inspection MUST be accomplished within each 12-month period for compliance with the Federal Aviation Regulations. To the extent that the airplane is operated in excess of 100 hours per year, Beech Aircraft Corporation strongly recommends that the airplane be inspect at 100-hour intervals rather than annually. The 100-hour interval between performance of the procedures specified herein should NEVER be exceeded by more than 10 hours, and then only if the additional time is required to reach a place where the inspection can be satisfactorily accomplished. However, if an inspection is done at 110 hours, the next inspection is due 90 hours later with no extension allowed. The first overhaul or replacement MUST be performed no later than the required period.

While this guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various sections of this manual (especially Sections 2, 3, 4 and 7) and the pertinent vendor publications. It is also recommended that reference be made to the applicable Maintenance Handbooks, Service Instructions, Service Letters, Service Bulletins, Installations Instructions, and Vendor's Specifications for torque values, clearances, settings, tolerances, and other requirements. It should further be verified that all interior and exterior placards are legible and in place during the inspection. In the final analysis, it is the responsibility of the owner or operator to ensure that the airframe and powerplant mechanic inspecting the airplane has access to the previously noted documents as well as to this inspection guide.

NOTE

In addition to the inspections prescribed by this schedule, the altimeter system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in FAR Parts 91.170 and 91.177 under Title 14 of the Code of Federal Regulations.

CAUTION

After the first twenty-five hours of engine operating time, a new, remanufactured or newly overhauled engine should be given the 100-hour inspection including draining and renewing lubricating oil.

NOTE

Model E33C and F33C airplanes being spun MUST also have the ACROBATIC INSPECTION at 50 hours.
A. OPERATIONAL INSPECTION

<table>
<thead>
<tr>
<th></th>
<th>MECH.</th>
<th>INSPI.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. STARTER - Check for proper operation, unusual noises and dragging. Check starter energized light (if installed) and/or loadmeter to ensure starter disengagement when the starter switch is released</td>
<td></td>
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<tr>
<td>2. FUEL PRESSURE - Check for proper fuel pressure limits and fluctuations</td>
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<tr>
<td>3. CYLINDER HEAD TEMPERATURE - Check for proper operation, temperature and fluctuations</td>
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<tr>
<td>4. ALTERNATOR/GENERATOR - Check for proper output and unusual noises</td>
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<tr>
<td>5. STANDBY GENERATOR - Check for proper operation in test mode</td>
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<tr>
<td>6. PROPELLER OPERATION - Cycle propeller and check for proper rpm drop and smoothness of operation</td>
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<tr>
<td>7. PROPELLER DEICER - Check for proper operation and amperage draw on ammeter</td>
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<td></td>
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<tr>
<td>8. OIL PRESSURE AND TEMPERATURE - Check for proper pressure, temperature limits and unusual fluctuations</td>
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<tr>
<td>9. MAGNETOS - Check the performance of the magneto by performing the MAGNETO DROP-OFF CHECK specified in Sect. 3 of P/N 35-590096B Shop Manual</td>
<td></td>
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</tr>
<tr>
<td>10. POWER CHECK - Check per engine manufacturer's manuals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. AMMETER - Check for proper indication and unusual fluctuations</td>
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<tr>
<td>12. HEATING AND VENTILATING SYSTEM - Check for proper operation, heat and airflow output. Check controls for freedom of operation</td>
<td></td>
<td></td>
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<tr>
<td>13. FIREWALL SHUTOFF VALVE - Check for proper operation and freedom of movement</td>
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<tr>
<td>14. IDLE RPM AND MIXTURE SETTINGS - Check for both proper rpm and mixture settings. Check controls for freedom of operation</td>
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<tr>
<td>15. IDLE CUT-OFF - Check for proper operation and freedom of movement</td>
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<tr>
<td>16. IGNITION SWITCH - Rotate the ignition switch through the OFF position to the extreme limit of switch travel; if the engine stops firing, the switch is normal. If the engine continues to run with the switch held in the past OFF position, it is an indication that one magneto is still &quot;hot&quot; or ungrounded. When the switch is released from the past OFF position, it should automatically return to normal OFF and the engine should stop running. However, any ignition switch exhibiting this abnormal condition should be replaced</td>
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<tr>
<td>17. ALL ENGINE CONTROLS - With the engine running, check for proper operational limits, engine response and rigging. Check friction locks for proper operation</td>
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<tr>
<td>18. FUEL QUANTITY GAGES - Check for proper operation and unusual fluctuations</td>
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</tbody>
</table>
**A. OPERATIONAL INSPECTION (Cont’d.)**

<table>
<thead>
<tr>
<th></th>
<th>MECH.</th>
<th>INSPI.</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.</td>
<td>AUXILIARY FUEL PUMP - Check pump for proper operation, unusual noise and fluctuations</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>FUEL TANK SELECTOR - Check for proper operation and feel for positive detent and proper placarding</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>ALL LIGHTS - Check for condition, attachment, cracked or broken lenses. Check switches, knobs and circuit breakers for looseness and operation</td>
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</tr>
<tr>
<td>22.</td>
<td>STALL WARNING SYSTEM - Check for proper operation</td>
<td></td>
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<tr>
<td>23.</td>
<td>RADIO OPERATION - Check for proper operation, security of switches and knobs</td>
<td></td>
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<tr>
<td>24.</td>
<td>FLAPS - Check for noisy operation, full travel and proper indication</td>
<td></td>
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<tr>
<td>25.</td>
<td>PITOT HEAT - Check amperage draw on ammeter and for proper heating of the unit</td>
<td></td>
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<tr>
<td>26.</td>
<td>FLIGHT INSTRUMENTS - Check for condition and proper operation</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>BRAKES - Check for condition and wear, ease of operation and proper release of the parking brake. Check for unusual brake chatter</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>EMERGENCY LOCATOR TRANSMITTER - Check for proper operation and assure that the ELT is armed when the airplane is returned to service</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>AIR CONDITIONER - Operate the air conditioner and verify that the retractable condenser moves to the ground extended position when turned on and returns to the retracted position when turned off. Check for proper operation and unusual noise</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>OXYGEN SYSTEM - Functionally check the oxygen system for proper operation. Check the oxygen bottle shutoff valve for proper operation</td>
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<tr>
<td>31.</td>
<td>SWITCHES, CIRCUIT BREAKERS - Check for proper operation</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>FLIGHT CONTROLS, TRIM CONTROLS AND TRIM INDICATOR - Check freedom of movement and proper operation through full travel with and without flaps extended. Check electric trim controls for operation</td>
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</tbody>
</table>

**B. POWER PLANT**

<table>
<thead>
<tr>
<th></th>
<th>MECH.</th>
<th>INSPI.</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>NACELLE SKIN - Check for deformation and obvious damage or cracks. Check for loose or missing rivets</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>NACELLE STRUCTURE - Check for cracks and deformation. Check for loose or missing rivets and concealed damage</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>COWLING - Check for condition, security and adjustment of latches. Open the upper cowling and clean. Inspect for cracks</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>COWL FLAPS - Check for travel, deformation and security. Inspect for cracks</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>SPARK PLUGS - Clean, test and regap spark plugs. Tighten spark plugs to proper torque and check ignition harness condition and for proper attachment</td>
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<tr>
<td><strong>B. POWER PLANT (Cont'd.)</strong></td>
<td><strong>MECH.</strong></td>
<td><strong>INSPI.</strong></td>
</tr>
<tr>
<td>6. COMPRESSION</td>
<td>Perform differential compression test</td>
<td></td>
</tr>
<tr>
<td>7. BATTERY</td>
<td>Inspect for clean, tight connections and add distilled water to maintain a level of ½ inch above the top of the separators. Inspect the vents and overflow tube for obstructions. Check for security and proper attachment. Check for corrosion. Make certain the battery is clean. Water or dirt on battery surfaces can cause the battery to discharge</td>
<td></td>
</tr>
<tr>
<td>8. PLUMBING</td>
<td>Inspect plumbing and associated accessories for condition (such as cracks and fraying) and attachment. Check plumbing clearance and secure against possible chafing</td>
<td></td>
</tr>
<tr>
<td>9. BRAKE FLUID RESERVOIR</td>
<td>Check reservoir for security, attachment, open vent, proper fluid level and for leaks</td>
<td></td>
</tr>
<tr>
<td>10. ENGINE OIL TANK OR SUMP</td>
<td>Check for cracks, leaks, proper fluid level, deformation and security</td>
<td></td>
</tr>
<tr>
<td>11. CRANKCASE</td>
<td>Check security of crankcase half bolts</td>
<td></td>
</tr>
<tr>
<td>12. OIL SUMP DRAINS AND SCREENS</td>
<td>Clean screens, check for holes in the screens and for obstructions. Check for proper torque after installation</td>
<td></td>
</tr>
<tr>
<td>13. OIL COOLER</td>
<td>Check oil cooler, lines and fittings for condition, security, chafing and leaks</td>
<td></td>
</tr>
<tr>
<td>14. PROPELLER AND MOUNTING BOLTS</td>
<td>Check for condition and security. Check the tip of the blades for evidence of lightning strikes. If there is evidence of lightning strikes, consult the propeller manufacturer, the engine manufacturer and Beech Aircraft Corporation. Inspect the blades for cracks, dents, nicks, scratches, erosion, corrosion, security and movement in the hub</td>
<td></td>
</tr>
<tr>
<td>15. PROPELLER SPINNER</td>
<td>Check for deformation, security and cracks</td>
<td></td>
</tr>
<tr>
<td>16. PROPELLER HUB</td>
<td>Check for cracks, excessively leaking seals and condition. Check propeller dome pressure</td>
<td></td>
</tr>
<tr>
<td>17. ALTERNATOR/GENERATOR</td>
<td>Check for condition and attachment. Check wiring for proper attachment and possible chafing. Check for unusual noise</td>
<td></td>
</tr>
<tr>
<td>18. ALTERNATOR</td>
<td>Inspect as indicated in BEECHCRAFT Service Instruction 0546-359 Rev II or subsequent</td>
<td></td>
</tr>
<tr>
<td>19. STARTER</td>
<td>Check for condition, attachment and chafed or loose wires</td>
<td></td>
</tr>
<tr>
<td>20. GENERATOR BELT</td>
<td>Check for proper tension and worn or frayed condition. Check tension adjustment bolt for tightness</td>
<td></td>
</tr>
<tr>
<td>21. STANDBY GENERATOR</td>
<td>Check for condition, attachment, security of wires and for chafing</td>
<td></td>
</tr>
<tr>
<td>22. MAGNETOS</td>
<td>Check contact points for proper clearance. Points with deep pits or excessively burned areas must be discarded. Inspect the cam follower felt pad for proper lubrication and clean the compartment with a clean, dry cloth. Check ignition harness for proper connection, security and fraying. Check timing</td>
<td></td>
</tr>
</tbody>
</table>
23. CYLINDERS AND BAFFLES - Check cylinders and exhaust manifold for obvious leaks, security and cracks; check baffles for cracks and security. Check cylinders for broken cooling fins and loose or missing base nuts.

24. EXHAUST SYSTEM - Check for deformation, security, cracks, leaks, loose or missing nuts and clamps. Check for thin wall condition which may occur due to normal internal erosion on stacks which have long service time.

25. FIREWALL - Check for wrinkles, damage or cracks. Check all electrical and control access holes for proper sealing.

26. HOSE AND DUCTS - Check all fuel, oil and air hose or duct for leakage, cracks, deterioration and damage. Check fittings for security.

27. ENGINE ACCESSORIES - Check for condition, security and leaks. Check wiring, hoses and tubes for chafing, security and leaks.

28. ENGINE MOUNTS - Check for cracks, corrosion and security. Inspect rubber cushions, mount bolts and nuts and grounding straps for condition and security.

29. CABIN HEATER SYSTEM - Check for cracks, distortion, corrosion, leaks and obstructions per Section 3 of P/N 35-590086B Shop Manual.

30. PROPELLER GOVERNOR - Check for leaks and control arm for security.

31. ENGINE CONTROLS - Check controls and associated equipment for condition, attachment, alignment and rigging. Every 300 hours remove the cable connection bolts and check for wear.

32. IGNITION HARNESS - Inspect for fraying and attachment.

33. ELECTRICAL WIRING AND EQUIPMENT - Inspect electrical wiring and associated equipment and accessories for fraying and attachment.

34. ALL DRAINS AND PLUGS - Check for condition, security and obstructions. Check for leaks and correct tightness.

35. PRESSURE PUMP INTAKE FILTER - Inspect filter for condition, cleanliness and security. Check filter container for cracks.

36. AIR CONDITIONER COMPRESSOR - Check for security and attachment. Check refrigerant and oil levels. Check belt for tension and worn or frayed condition. (See Sect. 2 and 3).

37. INDUCTION AIR FILTER - Check for condition, cleanliness and security.

38. INDUCTION SYSTEM AND ALTERNATE AIR - Check the hot and cold flexible air ducts for delamination of the inner lining. Check the alternate air valve for blockage, security, cracks, operation and wear.

39. CARBURETOR HEAT SYSTEM - Check for blockage, security, operation and wear.

40. CARBURETOR - Clean the screen and check for damage. Drain the inlet chamber and rear sections. Install screen and check for leaks. Check the primer solenoid for operation and to ensure secure mounting.
<table>
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<tr>
<th></th>
<th>POWER PLANT (Cont'd.)</th>
<th>MECH.</th>
<th>INSPI.</th>
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<tbody>
<tr>
<td>41.</td>
<td>FUEL INJECTION CONTROL VALVE - Clean the screen and check for damage. Install screen and check for leaks</td>
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</tr>
<tr>
<td>42.</td>
<td>FUEL INJECTION SYSTEM - Inspect all fuel injection components, lines and fittings for evidence of fuel leaks, fraying and cracking</td>
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<tr>
<td>43.</td>
<td>OIL SEPARATOR (Vacuum System) - Clean the screen as directed in Section 3 of P/N 35-5600968 Shop Manual (or subsequent) Check for condition, mounting and proper operation. Install the screen and check for security. Inspect for cracks</td>
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<tr>
<td>44.</td>
<td>VACUUM SYSTEM AIR FILTER (Located behind instrument panel) Check for security of attachment, replace as required</td>
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<tr>
<td>45.</td>
<td>VACUUM RELIEF VALVE - Clean and inspect filter, check for security of attachment</td>
<td></td>
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<tr>
<td>46.</td>
<td>ELECTRIC PROPELLER DEICER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Check for service damage to the deicer heaters, brush rods, springs and brushes. Check for attachment and security</td>
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<tr>
<td>B.</td>
<td>Check the lead strap and all other clamps, connectors and wiring for electrical soundness, security and attachment</td>
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<tr>
<td>C.</td>
<td>Check the slip rings for roughness, cracks, burned or discolored areas and for deposits of oil, grease or dirt. Check for security and attachment</td>
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<tr>
<td>D.</td>
<td>Check deicer boots for wrinkles, loose or torn areas</td>
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<tr>
<th></th>
<th>CABIN AND BAGGAGE COMPARTMENT</th>
<th>MECH.</th>
<th>INSPI.</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>SKIN - Inspect skins for deformation, cracks and loose or missing rivets. If damage is found, check adjacent structure</td>
<td></td>
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<tr>
<td>2.</td>
<td>STRUCTURE - Check for cracks and deformation. Check for loose or missing rivets and concealed damage</td>
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<tr>
<td>3.</td>
<td>CABLES AND PULLEYS - Inspect for condition, attachment, alignment, clearance, proper operation, binding and tension. Check turnbuckles for cracks and cables for fraying</td>
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<tr>
<td>4.</td>
<td>LANDING GEAR GEARBOX AND ACTUATING LINKAGE - Check for leakage, wear, condition and attachment. Check for unusual noise. Check oil level by engaging and turning the emergency handcrank 1/2 turn to determine that oil is being picked up on the worm gear. The oil level should be maintained no more than necessary to cover 1/2 of the diameter of the worm gear</td>
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<tr>
<td>5.</td>
<td>FLAP MOTOR AND SHAFTS - Check for condition, security and wear at all points. Check cable housing for security and check jam nuts for tightness</td>
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<tr>
<td>6.</td>
<td>AUXILIARY FUEL PUMP AND FUEL LINES - Check for condition, security and leaks. Check lines for signs of chafing or cracks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>BRAKE MASTER CYLINDER AND PARKING BRAKE VALVE - Check for condition, security and leaks. Check lines for signs of chafing or cracks</td>
<td></td>
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</tr>
</tbody>
</table>
8. RUDDER PEDALS - Check for freedom of movement. Check cables, push pull rods, bellcranks, pulleys, turnbuckets, fairleads, for proper routing, condition and security. Check rudder pedal fore and aft positions for wear. Check locks and pins to ensure positive lock.


10. ENGINE CONTROLS - Check for ease of operation through full travel. Check friction locks for proper operation.

11. ELECTRICAL WIRING AND EQUIPMENT - Check for condition, security and signs of chafing.

12. PLUMBING - Check all plumbing and connections for security, leakage and general condition.

13. WINDOWS AND DOORS - Inspect windows for scratches, crazing and general condition. Inspect doors for security of attachment. Check latching mechanism for proper engagement and ease of operation.

14. INSTRUMENTS AND INSTRUMENT PANEL - Inspect instrument panel, subpanels, placards and instruments for condition and attachment. Check all knobs for security. Inspect shock mounts, ground straps for cracks and security.

15. SEATS, SEAT BELTS AND SHOULDER HARNESSSES - Inspect cabin seats, seat belts and shoulder harnesses for proper operation, condition and security of attachment. Inspect floorboards for condition and seat attachment. Check for operation of the seat stops.

16. OXYGEN SYSTEM - Check condition of the oxygen system and check the oxygen masks for cleanliness and stowage.

17. VENTILATING SYSTEM - Check all fresh air and heat outlet vents for proper movement and operation.

18. FUEL SELECTOR VALVE - Inspect for leakage, security, freedom of movement, proper detent feel and condition. Clean strainers and inspect for condition. Check for proper placarding.

19. FILTERS - Inspect pressure system inline filter for condition, cleanliness and security. Replace pressure system inline filter and all other individual instrument air filters and/or time change master filter on vacuum system airplanes in accordance with Section 8 of P/N 35-590098B Shop Manual.

20. EMERGENCY EXIT HATCH - Check emergency release handle and latch assembly for proper operation. Check that the hatch moves out freely. Check the complete latch assembly for condition and all moving parts for proper operation. With the hatch installed, check for proper latching and seal. Repair the emergency exit with .020 inch dia. copper wire after opening.

21. STATIC SYSTEM - Check and drain water from the static lines.
1. **SKIN** - Check for deformation and obvious damage. Check for cracks, loose or missing rivets. If damage is found, check adjacent structure. Check for indications of hard landing or excessive flight loading.

2. **STRUCTURE** - Check for cracks, deformation and concealed damage. Check for loose or missing rivets.

3. **ACCESS DOORS AND PANELS** - Inspect for cracks, proper fit and attachment.

4. **CABLES AND PULLEYS** - Inspect for condition, attachment, alignment, proper operation and tension. Check for fraying of cables and cracks in turnbuckles.

5. **AILERONS** - Check for condition and security. Check for cracks, loose or missing rivets and freedom of movement. Check hinge bearings and brackets for condition, push-pull rods for security and rod ends for corrosion.

6. **FUEL TANKS, CAPS AND VENTS** - Inspect fuel tank vent lines and filler caps as directed in Section 3.

7. **PLUMBING** - Check for leakage, chafing, condition and security.

8. **ELECTRICAL WIRING AND EQUIPMENT** - Inspect for chafing, damage, security and attachment.

9. **FLAP LIMIT SWITCHES** - Check for condition and security, freedom of operation.

10. **FLAPS AND ACTUATORS** - Check for condition, security, binding or chafing of actuator cables. Check flap skin and structure for cracks, loose or missing rivets. Check roller bearings and tracks for condition, push-pull rods for security and rod ends for corrosion. Check stop area for condition and damage.

11. **FLAP POSITION TRANSMITTER** - Check for security and operation.

12. **WING SPAR** - Check for corrosion and condition (See Service Instructions No. 0514-035, Rev. II or subsequent).

13. **WING BOLTS** - Check wing bolts for proper torque at the first 100-hour inspection and at the first 100-hour inspection after each reinstallation of the wing attach bolts.

**CAUTION**

Confirm torque requirements per Section 4.

14. **RADAR ANTENNA COVER** - Check the fiberglass for security, attachment and cracks.

15. **FUEL VENTS, AIR INLETS, PITOT TUBE AND STALL WARNING VANE** - Check for condition and obstructions.
### E. NOSE GEAR

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>WHEEL AND TIRE - Check wheel for cracks and tire for wear, damage, condition and proper inflation</td>
</tr>
<tr>
<td>2.</td>
<td>LANDING GEAR STRUT - Inspect the shock strut and components for cracks, attachment, proper inflation and evidence of leakage</td>
</tr>
<tr>
<td>3.</td>
<td>ACTUATING LINKAGE - Check for wear at attach points. Check for cracks and security</td>
</tr>
<tr>
<td>4.</td>
<td>GEAR DOORS AND LINKAGE - Check doors for damage and cracks to the structure and skins. Check linkage for wear and cracks at the attach points. Check for condition and security</td>
</tr>
<tr>
<td>5.</td>
<td>NOSE GEAR STEERING LINKAGE - Inspect linkages for tightness, condition and security. Linkage boots for condition</td>
</tr>
<tr>
<td>6.</td>
<td>SHIMMY DAMPER - Check for condition and attachment. Check attach points for cracks. Check fluid level per the Shop Manual</td>
</tr>
<tr>
<td>7.</td>
<td>STRUT FLUID LEVEL - Check and maintain the proper hydraulic fluid level in the strut as outlined in Section 2</td>
</tr>
<tr>
<td>8.</td>
<td>STRUT AND A-FRAME HINGE BOLTS - Inspect for cracks and security of attachment</td>
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<tr>
<td>9.</td>
<td>STATIC CABLE (if installed) - Inspect for condition and proper clearances and attachment</td>
</tr>
<tr>
<td>10.</td>
<td>VISUAL INDICATOR - Check for condition</td>
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### F. MAIN GEAR AND BRAKES

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>BRAKE, LINES, LINING AND DISCS - Check for condition, wear and security. Check lines for chafing and signs of leakage or cracks. Check discs for wear or warping. Check brake discs for cracks</td>
</tr>
<tr>
<td>2.</td>
<td>WHEELS AND TIRES - Check wheels for cracks and tires for wear, damage, condition and proper inflation</td>
</tr>
<tr>
<td>3.</td>
<td>ACTUATOR GEARBOX, MOTOR AND SWITCHES - Check for leakage, condition and security</td>
</tr>
<tr>
<td>4.</td>
<td>LANDING GEAR STRUTS - Inspect the shock struts and components for cracks, attachment, proper inflation and evidence of leakage</td>
</tr>
<tr>
<td>5.</td>
<td>ACTUATING LINKAGE - Check for wear and cracks at attach points. Check for condition and security</td>
</tr>
<tr>
<td>6.</td>
<td>GEAR DOORS AND LINKAGE - Check doors for damage and cracks to the structure and skins. Check linkage for wear and cracks at the attach points. Check for condition and security. Determine that all clevis retaining pins are in place and secured with cotter pins</td>
</tr>
<tr>
<td>7.</td>
<td>STRUT FLUID LEVEL - Check and maintain the proper hydraulic fluid level in the struts as outlined in Section 2</td>
</tr>
<tr>
<td>8.</td>
<td>STRUT AND A-FRAME HINGE BOLTS - Inspect for cracks and security of attachment</td>
</tr>
</tbody>
</table>
G. MAIN GEAR OPERATION

NOTE

Since battery voltage is not sufficient to properly cycle the landing gear for this inspection, use only an external power source capable of delivering and maintaining either 14.25 ± .25 or 28.25 ± .25VDC, according to the airplane’s electrical system throughout the extension and retraction cycles when performing the landing gear retraction inspection.

For more specific information which may be necessary to accomplish the following items, refer to Section 5 of P/N 35-590096B Shop Manual and this Shop Manual.

1. DOORS - Check door operation, fit and fair. Check for unusual noise.

2. POSITION LIGHTS - Check for security, adjustment, wiring for breaks, condition of insulation, loose connections and proper indication.

3. WARNING HORN - Check for proper operation.

4. UPLOCK CABLE TENSION - Check uplock cable mechanism for condition and security. Check uplock cable for proper tension and for possible fraying.

5. EMERGENCY EXTENSION - Check system for freedom of operation and positive engagement of the downlocks. Check for unusual noise.

6. DOWNLOCK TENSION - Check for proper deflection force on the main gear knee joints.

7. UPLOCK ROLLERS - Check condition and clearance of uplock rollers and lubricate as indicated in the appropriate Shop Manual. Check for binding.

8. LIMIT SWITCH RIGGING - Check for security and proper adjustment of the limit switches. Refer to the P/N 35-590096B Shop Manual for correct landing gear gearbox internal clearance.

9. SAFETY SWITCH - Check for security, proper rig and operation.

10. GENERAL OPERATION - Place the airplane on jacks and cycle the landing gear while checking to ascertain that the position light switches operate in conjunction with the position of the landing gear. Check the condition and operation of complete landing gear system.

11. DYNAMIC BRAKING ACTION - Verify proper operation of dynamic braking action.

12. ASSIST STEP - Inspect retractable step for cable and safety link condition, proper adjustment and operation. Check fixed steps for security.
### H. NOSE GEAR OPERATION

**NOTE**

Since battery voltage is not sufficient to properly cycle the landing gear for this inspection, use only an external power source capable of delivering and maintaining either 14.25 ± .25 or 28.25 ± .25 VDC, according to the airplane's electrical system throughout the extension and retraction cycles when performing the landing gear retraction inspection.

For more specific information which may be necessary to accomplish the following items, refer to Section 5 of P/N 35-590096B Shop Manual.

1. **DOORS** - Check door operation, fit, and fair. Check for unusual noise.

2. **NOSE GEAR UP TENSION** - Check the up tension on the nose gear as indicated in the appropriate Shop Manual.

3. **DOWNLOCK TENSION** - Check the downlock tension on the nose gear as indicated in the appropriate Shop Manual.

4. **GENERAL OPERATION** - Place the airplane on jacks and cycle the landing gear while checking to ascertain that the position light switches operate in conjunction with the landing gear position. Check the condition and operation of the complete landing gear system.

5. **VISUAL INDICATOR** - Inspect for proper adjustment and operation.

6. **NOSE GEAR STEERING** - Check for condition and security.

### I. REAR FUSELAGE AND EMPENNAGE

1. **SKIN** - Check for deformation, cracks and obvious damage. Check for loose or missing rivets. If damage is found, check adjacent structure.

2. **INTERNAL FUSELAGE STRUCTURE** - Check for cracks and deformation. Check for loose and missing rivets. Check bulkheads, doorposts, stringers and doublers for corrosion, cracks and buckles.

3. **STRUCTURE** - Inspect the two most aft bulkheads for cracks, distortion, loose rivets or other obvious damage.

4. **CABLES AND PULLEYS** - Inspect for condition, attachment, alignment, clearance, proper operation and proper tension. Check for fraying of cables.

5. **CONTROL SURFACES** - Check for deformation, cracks and security. Check for loose or missing rivets. Check for freedom of movement. Check for security of rudder and elevator torque fitting, hinges and bond cables.

6. **TRIM TABS AND ACTUATORS** - Check for security and wear. Check allowable free play per Section 4. Check hinges and trim tab actuator for security and wear. Check trim tabs for cracks and control rods for attachment. Lubricate trim tab hinges per Section 2 of P/N 35-590096B Shop Manual.
### I. REAR FUSELAGE AND EMPENNAGE

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<th>MECH.</th>
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<tbody>
<tr>
<td>7.</td>
<td>STATIC PORTS - Check for obstruction and clean as necessary</td>
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<tr>
<td>8.</td>
<td>PLUMBING - Check for leakage, cracks, chafing, condition and security</td>
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<tr>
<td>9.</td>
<td>ELECTRICAL WIRING AND EQUIPMENT - Inspect for chafing, damage, security and attachment</td>
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<tr>
<td>10.</td>
<td>STATIC LINES - Check condition of static lines and drain</td>
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<tr>
<td>11.</td>
<td>ASSIST STEP BUNGEE - Inspect for condition and attachment</td>
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<tr>
<td>12.</td>
<td>ANTENNAS - Check for condition and security</td>
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### J. GENERAL

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<tbody>
<tr>
<td>1.</td>
<td>Airplane cleaned and serviced</td>
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<tr>
<td>2.</td>
<td>Airplane lubricated in accordance with the appropriate Shop Manual lubrication chart</td>
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<tr>
<td>3.</td>
<td>Inspect all placards to assure that they are easily readable and securely attached</td>
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For a complete or annual inspection of the airplane, all items on the airplane that are noted on this guide should be inspected.

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**ELECTRIC PROPELLER DEICER 50 HOUR INSPECTION**

The various components of the propeller deicer system should be inspected every 50 hours for the appearance of abnormal conditions. The following inspections may provide a means for detecting and correcting such abnormal conditions before they render the deicer system inoperative.

a. Set the brakes and operate the engine at near take-off power. Turn the deicer systems switch ON and observe the ammeter for at least 2 minutes. If the ammeter needle does not rest within the shaded band (except for a flicker at 30 second intervals when the step switch of the timer cycles) refer to the troubleshooting chart for the probable sources of trouble.

b. With the engine shut off, turn the deicer switch ON and feel the deicer boots on the propeller for the proper sequence of heater operation. The presence of local hot spots indicates service damage to the deicer heaters, which should be repaired before more serious damage develops.

c. Remove the spinner dome and open all access doors pertaining to the wiring and components of the deicer system. Turn the deicer switch ON and station an assistant in the cockpit to observe the system ammeter. Flex all accessible wiring, particularly the lead straps, leads from the slip ring assembly, and the firewall electrical connectors and their wiring. Any movement of the ammeter, other than the cycling flicker that occurs at 30 second intervals, indicates a short or open circuit that must be located and corrected.

d. To extend the life of the lead strap between the hub clamp and clip, reposition the bend in the strap at a point at least 1/2 inch from the existing location of the bend.

e. Check for damaged brush rods or springs and for worn or damaged brushes.

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### ELECTRIC PROPELLER DEICER 100 HOUR INSPECTION

a. Check for radio noise or radio compass interference by operating the engine at near take-off power.

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**CAUTION**

While following the instructions of step b., move the propeller back and forth to prevent arcing between the brushes and slip ring.
with the radio gear turned on. If, under these conditions, noise or interference occurs when the deicer switch is ON and disappears when the switch is OFF, refer to the troubleshooting chart for the probable source of trouble.

b. Check all clamps, clips, mountings, electrical connections and connectors for tightness and electrical soundness. Check also for loose, broken or missing safety wire.

c. Closely check the deicer boots for wrinkled, loose or torn areas, particularly around the outboard end and at the point where the strap passes under the hub clamp. Look for abrasion or cuts along the leading edge of the flat or thrust face. If the heater wires are exposed in damaged areas or if the rubber is found to be tacky, swollen or deteriorated (as from contact with oil or solvent fluids), replace the damaged deicer boot.

d. Check that the hub clamps are tight. Inspect for cracks or other damage. Check to see that the cushioning material is not missing or damaged in the area under the hub clamp or on the edge of the spinner dome. Manually operate the propeller from “high pitch” to “low pitch” while checking that the deicer lead straps do not come under tension.

e. Check the slip rings for gouges, roughened surfaces, cracks, burned or discolored areas, and for deposits of oil, grease, or dirt. Clean greasy or contaminated slip rings with CRC-2-26 solvent (a product of Corrosion Reaction Consultants, Inc., of Philadelphia, Pennsylvania). After such a cleaning, allow a run-in time of 5 hours of engine operation before turning on the deicer system.

f. If uneven wear or wobble is detected, check the alignment of the slip rings to the prop shaft with a dial indicator. While turning the prop to check the slip ring alignment, push in on the prop to eliminate play in the propeller thrust bearing. If the runout over 360 degrees of rotation is over 0.005 inch or if over any 4-inch arc it exceeds 0.003 inch, refer to the paragraph on Slip Ring Alignment.

g. Examine the brush mounting bracket and housing for cracks, deformation, or other indications of damage. Make sure that connections are tight and that the leads are not chafed or binding.

h. Check to see that each brush rides fully on its slip ring over 360 degrees of rotation. If the brush is not properly aligned, add shims under the brush block or elongate the holes in the mounting bracket to raise or lower the brush block to the proper position. If the brushes ride BOTH high and low with respect to the slip rings in 360 degrees of rotation, the slip ring assembly is eccentrically mounted and the spinner bulkhead must be replaced.

i. Check for proper spacing between the brush block and slip rings as indicated in Deicer Brush Replacement. If this distance is not within the specified limits, loosen the mounting screws and reposition them in the elongated holes until the block is properly positioned. If necessary, add shims between the thrust bearing plate and mounting bracket until the brush block is properly located.

j. Estimate the contact angle of the brush block in relation to the slip rings. If this angle is not approximately 2 degrees, as indicated in Deicer Brush Replacement, loosen the mounting screws and reposition the brush block until the proper angle exists between the brush block and slip rings. The spacing established in step i must also be maintained after the proper contact angle is established.

k. With the deicer system operating and a man in the cockpit observing the ammeter, visually inspect and physically flex the wiring from the brush blocks to each component of the deicer system and to the aircraft power supply. Jumps of the ammeter needle (other than the momentary flicker that occurs when the timer switches at 30-second intervals) indicate loose or broken wiring in the area under examination at the moment. In such instances, continue to flex the wiring in the area that first indicated trouble while checking the continuity through the individual wires of the affected harness until the source of trouble is located. Use the wiring diagram to trace the circuitry of the deicer system.

**WARNING**

Before moving the propeller, make certain that the ignition switch is off and that the engine has cooled completely. There is always some danger of a cylinder firing when a propeller is moved.

**CAUTION**

While following the instructions of step k, move the propeller back and forth to prevent arcing between the brushes and slip ring.

**LANDING GEAR DOORS INSPECTION AFTER LOWERING AT HIGH SPEED**

a. Visually check the landing gear doors and linkage for cracks and/or distortion; pay particular attention to the inboard doors.

**CAUTION**

Prior to jacking the airplane, ensure that an unbalanced condition does not exist. Fuel should be distributed evenly in both wings to prevent an unbalanced condition which would cause the airplane to be unstable on the jack.

b. Place the airplane on a jack.

c. Retract the landing gear and check that the doors close properly and have a snug fit.

d. Lower the landing gear and remove the airplane from the jack.
FLAP INSPECTION AFTER EXTENSION AT HIGH SPEED

a. Check flap rollers and bolts for visible damage and distortion.

b. Check flap flex drive ends at the motor and actuator for cracks and distortion. and flex drive shaft for distortion.

c. Check the points of actuator attachment to both the wing and the flap for cracks and distortion.

d. Check the skin for cracks and distortion.