LANDING GEAR
WHEELS AND BRAKES
MAINTENANCE PRACTICES

1. LANDING GEAR - WHEELS AND BRAKES - MAINTENANCE PRACTICES

A. Nose Wheel Assembly

Warning: Read and understand the LANDING GEAR SYSTEM SAFETY PRECAUTIONS (Ref. 32-00-00, 201) before performing any work on the main landing gear.

(1) Nose Wheel Assembly - Removal

(a) Remove electrical power from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Jack the nose wheel (Ref. 07-10-00, 201, JACKING).

(c) Remove the nut and bushing which retains the nose wheel assembly on the axle.

(d) Remove the nose wheel assembly from the nose landing gear by sliding it off the axle.

(2) Nose Wheel Assembly - Installation

(a) Be sure electrical power has been removed from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Clean and repack wheel bearings (Ref. NOSE WHEEL - INSPECTION AND CLEANING).

(c) Replace any damaged grease seals and insure the grease seal retaining rings and snap rings are in place before installing the wheel.

(d) Check for burrs or rough threads on the axle and retaining nut. Apply grease (8, Table 1, 20-40-00) to the nose landing gear axle threads and bearing surface of the nut.

Note: A bushing is permanently installed on the inboard end of the nose landing gear axle. No other hardware is required between the wheel and the inboard end of the axle.

(e) Install the nose wheel, outer spacer, retaining nut, and cotter pin.

(f) Torque the axle nut as follows:

1 While rotating the wheel, tighten the axle retaining nut to 150 to 200 inch-pounds to insure that the bearings are properly seated.

2 Back off the axle retaining nut to zero torque.

3 While rotating the wheel, torque the axle retaining nut to 30 inch-pounds and check for alignment of the locking holes.

4 If not at a locking position, continue tightening the axle nut to the first locking position and install the cotter pin.

(g) Remove the nose wheel from the jack (Ref. 07-10-00, 201, JACKING).

(h) Restore electrical power to the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - CONNECT).

(3) Nose Wheel Assembly - Inspection and Cleaning

Warning: Cleaning solutions are toxic and volatile. Use in a well ventilated area. Avoid contact with skin or clothing. Do not inhale the vapors.

(a) Degrease all parts and dry thoroughly. A soft bristle brush may be used to remove hardened grease, dust and dirt.

Caution: Do not spin bearings with compressed air. This will cause damage.

(b) Visually inspect bearing cups and cones for nicks, scratches, water staining, galling, heat discoloration, roller wear, cage damage and cracks or distortion. Replace if damaged or worn.

(c) Inspect the wheel bearing grease for contamination and solidification at each periodic maintenance inspection.

(d) Inspect wheel halves for cracks, corrosion and other damage. Cracked or badly corroded castings should be replaced. Small nicks, scratches, or pits can be blended out using fine (400 grit) sandpaper.

(e) Inspect the snap rings and grease seals for deterioration and wear; replace if damaged or deformed. Saturate felt seal with

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SAE 10W30 oil (38, Table 1, 20-40-00). Remove excess oil by pressing slightly. Prior to assembly, coat the sides and outer diameter with grease (8, Table 1, 20-40-00).

(f) Inspect the wheel bolts for cracks, corrosion or other damage. Replace any cracked bolts.

B. Main Wheel and Brake Assembly

Warning: Read and understand the LANDING GEAR SYSTEM SAFETY PRECAUTIONS (Ref. 32-00-00, 201) before performing any work on the main landing gear.

Each main wheel assembly has its own brake assembly installed to it and both are remove as an assembly. After removal, the brake assembly can be removed from the wheel assembly for inspection and maintenance.

(1) Main Wheel And Brake Assembly (Goodyear) - Removal

Note: This section is applicable to airplane serials TC-1 thru TC-370, TC-372 thru TC-662, TC-664 thru TC-978, TC-980 thru TC-983, TC-985 thru TC-998, and TC-1002 with Goodyear wheel and brake assemblies.

(a) Remove electrical power from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Place the airplane on jacks (Ref. 07-10-00, 201, JACKING).

(c) Remove the cotter pin, wheel retaining nut, spacers, bearings, wheel and release disc clips. Support the brake disc to prevent it from dropping and striking the axle when the wheel is removed.

(d) Disconnect the brake hydraulic line, remove the six brake housing attaching bolts and remove the brake housing.

(2) Main Wheel And Brake Assembly (Goodyear) - Installation

Note: This section is applicable to airplane serials TC-1 thru TC-370, TC-372 thru TC-662, TC-664 thru TC-978, TC-980 thru TC-983, TC-985 thru TC-998, and TC-1002 with Goodyear wheel and brake assemblies.

(a) Be sure electrical power has been removed from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Place the brake housing on the axle and position the housing on the axle attaching hole from the perpendicular so that the brake cylinders slant down and aft from the strut center line.

(c) Install the brake housing attaching bolts and connect the brake hydraulic line to the brake assembly.

(d) Clean the wheel bearings with solvent (15, Table 1, 20-40-00) and repack with grease (9, Table 1, 20-40-00).

(e) Position the brake disc and install the wheel assembly, aligning the square notches in the disc teeth with corresponding notches in the wheel. Install the bearings, spacers, wheel retaining nut and brake disc clips.

(f) Install the wheel retaining nut.

(g) Tighten the wheel retaining nut, then back off until the wheel rotates.

(h) Install a new cotter pin.

(i) Bleed the brake system.

(j) Remove the airplane from the jacks (Ref. 07-10-00, 201, JACKING).

(k) Restore electrical power to the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - CONNECT).

(3) Main Wheel And Brake Assembly (Cleveland) - Removal

Note: This section is applicable to airplane serials TC-371, TC-663, TC-979, TC-984, TC-999 and After except TC-1002; TE-1 and After with Cleveland wheel and brake assemblies.

(a) Remove electrical power from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Place the airplane on jacks (Ref. 07-10-00, 201, JACKING).

(c) Remove the four bolts (six bolts on the heavy duty brakes) which attach the back brake plate and inner linings to the cylinders, then remove the back plate assembly.

(d) Disconnect the brake hydraulic line and remove the cylinder assembly by sliding the two guide pins out of the torque plate.

(e) Remove the cotter pin, wheel retaining nut, spacers and bearing. Slide the wheel off the axle.

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Note: The brake linings and cylinder assembly can be removed without removing the wheel, by utilizing Steps (c), (d) and (e).

(f) The brake disc assembly can be removed, if desired, by removing the six bolts which join the wheel halves. However, the tires should first be completely deflated.

(4) Main Wheel And Brake Assembly (Cleveland) - Installation

Note: This section is applicable to airplane serials TC-371, TC-663, TC-979, TC-984, TC-999 and After except TC-1002; TE-1 and After with Cleveland wheel and brake assemblies.

(a) Be sure electrical power has been removed from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Clean the wheel bearings with solvent (15, Table 1, 20-40-00) and repack with grease (9, Table 1, 20-40-00).

(c) Replace any damaged grease seals and be sure grease seal retaining rings are in place before installing the wheel.

Note: Lightly saturate the felt oil seal with oil (38, Table 1, 20-40-00). remove the excess oil by lightly compressing the felt oil seal sides. Coat the sides and the outer diameter of the felt oil seal with wheel bearing grease.

(d) Slide the wheel on the axle and install the bearings, spacers and wheel retaining nut.

Note: If the torque plate has been removed, it should be installed so that the guide pin holes are positioned aft and are centered above and below the horizontal center line of the axle.

The torque on the torque plate bolts should be 100 to 140 inch-pounds .

(e) Install the brake cylinder assembly by inserting the two guide pins into the torque plate.

(f) Install the back plate (inner lining) assembly and tighten the four attaching bolts (six on the heavy duty brake).

Note: On the cleveland heavy duty brakes, torque the six back plate attach bolts to 80 to 90 inch-pounds.

(g) Connect the brake hydraulic line.

(h) Install the wheel retaining nut.

(i) Torque the wheel retaining nut as follows:

1 While rotating the wheel, tighten the wheel retaining nut to 180 to 240 inch-pounds to seat the bearings.

2 Back off the wheel retaining nut to zero torque.

3 While rotating the wheel, torque the wheel retaining nut to 30 inch-pounds.

4 Check for alignment of the wheel retaining nut with the holes in the axle. If not at a locking position, continue tightening the nut to the next hole and install a new cotter pin through the wheel retaining nut and axle.

(j) Bleed the brake system.

(k) Remove the airplane from the jacks (Ref. 07-10-00, 201, JACKING).

(l) Restore electrical power to the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - CONNECT).

C. Brakes

Warning: Read and understand the LANDING GEAR SYSTEM SAFETY PRECAUTIONS (Ref. 32-00-00, 201) before performing any work on the main landing gear.

(1) Brake Lining Wear Limits (TC-1 thru TC-422 except TC-371)

The brake lining wear is indicated by the distance between the steel brake disc and the outside edge of the brake housing with the brakes applied (Ref. Figure 201). Replace the linings when this distance is 0.250 inches.

On airplane serials TC-1 thru TC-99 the measurement is to the face of the disc outside of the lining contact area.

On airplane serials TC-100 thru TC-422 except TC-371, the measurement is to the recessed surface at the outer edge of the disc. Replace the steel brake disc when the thickness is 0.225 inches, measured at the thinnest section. The brake disc and wheel side must also be replaced when the distance between the disc teeth and wheel teeth reaches 0.040 inches.

(2) Brake Lining Wear Limits (TC-423 thru TC-662, TC-664 thru TC-978, TC-980 thru TC-983, TC-985 thru TC-998, and TC-1002)

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On airplane serials TC-423 thru TC-662, TC-664 thru TC-978, TC-980 thru TC-983, TC-985 thru TC-998, and TC-1002, the measurement is to the face of the disc outside of the lining contact area., with the brakes applied, measure the distance between the brake disc and the flat surface of the brake housing (parallel to the disc) near the center of the disc face (Ref. Figure 201). Replace the linings when this distance is 0.187 inches.

Replace the brake disc when the thickness of the brake disc has worn to 0.310 inches, or when an irregular surface on the face of the disc has developed in excess of 1/16 inches. Replace the wheel half when any of the disc drive teeth have worn to a thickness of 0.070 inches. when measured 0.100 inches. from the top of the tooth.

(3) Brake Lining Wear Limits (TC-371, TC-663, TC-979, TC-984, TC-999 and After except TC-1002; TE-1 and After; TH-1 and After)

On airplane serials TC-371, TC-663, TC-979, TC-984, TC-999 and After except TC-1002; TE-1 and After; TH-1 and After, the brake linings should be replaced before the metal back plate is exposed through the abrasive surface (Ref. Figure 201). This can be checked visually without disassembling the brake. The minimum allowable thickness for the abrasive surface is 0.100 inches. The brake disc should be replaced when its thickness measures 0.330 inches.

(4) Brake Lining Wear Limits (TC-2092 and After; TE-1114 and After; TH-873 and After With Optional Heavy Duty Brakes)

On airplane serials TC-2092 and After; TE-1114 and After; TH-873 and After having the optional heavy duty brakes, above the minimum allowable thickness of the abrasive surface of the brake linings is 0.100 in. The brake disc should be replaced when its thickness measures 0.475 inches (Ref. Figure 201).

(5) Brake Lining (Cleveland) - Removal and Installation

On all airplanes that have the CLEVELAND brake assemblies installed (airplane serials TC-371, TC-663, TC-979, TC-984, TC-999 and After except TC-1002; TE-1 and After), the lining, after extended use, has a tendency to stick to the retaining plate. The locating pins for the lining section are peened into the retaining plate (Ref. Figures 202 or 203). It is not necessary to drill out these locating pins to remove the brake lining. To remove the lining apply a screwdriver or a similar prying tool between the retaining plate and the lining, the lining should then pop off. Replace the lining by fitting a new lining section over the locating pins in the retainer plate.

(6) Brake Master Cylinders - Removal and Installation

(a) Remove electrical power from the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - DISCONNECT).

(b) Close parking brake valve by pulling parking brake handle.

(c) Unsnap the floor mat and remove the floorboard section below the brake pedals.

(d) Disconnect the two brake hydraulic lines at each master cylinder and mark the lines to assure correct installation.

(e) Remove the master cylinder attaching bolts and nuts and remove the master cylinders.

(f) If new master cylinders are to be installed, note the positions of the master cylinder 45-degree elbow fittings.

(g) Install the master cylinders by reversing the removal procedure.

(h) Replenish and bleed the brake hydraulic system.

(i) Restore electrical power to the airplane (Ref. 24-36-00, 301, ELECTRICAL POWER - CONNECT).

(7) Brake Master Cylinder (Paramount) - Disassembly

(a) Remove the snap ring (3) and pull the piston assembly from the housing (18) (Ref. Figure 204).

(b) Remove the clevis (1), nut (2) and cotter pin (11) from rod (16); this will allow the removal of retaining washers (4), rod wiper (5), guide bushing (6) and packings (7 and 8) from the piston rod.

(c) Remove the piston (10) and packing (9) from piston rod and remove the spring washer (15).

(d) Remove the cotter pin (12) from valve stop (14) and remove the valve stop from the piston rod.

(e) The valve assembly (13) and spring (17) will fall free of the housing (18) with the piston assembly removed.

(f) Clean all parts with solvent (15, Table 1, 20-40-00).

(g) Check all parts for cracks, corrosion, distortion and wear.

(8) Brake Master Cylinder (Paramount) - Assembly

(a) Lubricate all parts with hydraulic fluid (13, Table 1, 20-40-00).

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Note: During assembly, install new washers, packings, and seals.

(b) Install the valve assembly (13) and spring (17) into the housing (18) (Ref. Figure 204).

(c) Install the valve stop (14) and cotter pin (12) to the piston rod (16).

(d) Install the spring washer (15), packing (9) and piston (10) to the piston rod (16).

(e) Install the packings (7 and 8), guide bushing (6), rod wiper (5), retaining washer (4), cotter pin (11), nut (2) and clevis (1) to the piston rod (16).

(f) Install the assembled piston assembly into the housing (18) and install the snap ring (3).

(9) Brake Master Cylinder (Gerdes) - Disassembly

(a) Remove the snap ring (4) from the clevis end of housing (17) and pull the assembled piston assembly from the housing (Ref. Figure 204).

(b) Remove the clevis (1), lock nut (2), cap end and bearing (6) from shaft (3).

(c) Remove packings (5 and 7) from cap end and bearing.

(d) Remove snap ring (8), thrust collar (9) and spacer(10) from shaft.

(e) Remove packing (11) from shaft.

(f) Remove snap ring (15) and spring (14) from shaft.

(g) Remove piston (13) from shaft.

(h) Remove packing (12) from piston.

(i) Remove spring (16) from housing.

(j) Clean all parts with solvent (15, Table 1, 20-40-00).

(k) Check all parts for cracks, corrosion, distortion and wear.

(10) Brake Master Cylinder (Gerdes) - Assembly

(a) Lubricate all parts with hydraulic fluid (13, Table 1, 20-40-00).

Note: During assembly, install new washers, packings, and seals.

(b) Install spring (16) into housing (17) (Ref. Figure 204).

(c) Install packing (12) on piston (13).

(d) Install piston (13) on shaft (3).

(e) Install packing (11) on shaft.

(f) Install spacer (10), thrust collar (9) and snap ring (8) on shaft.

(g) Install packings (5 and 7) to cap end and bearing (6).

(h) Install cap end and bearing, lock nut (2) and clevis (1) to shaft.

(i) Install assembled piston assembly into housing.

(j) Install snap ring (4) to housing.

(11) Parking Brake Valve - Overhaul

(a) Remove the valve seat (1) from the parking brake valve assembly (Ref. Figure 205).

(b) Remove the elbow (2) from the valve seat.

(c) Remove the spring (3), washer (4) and ball (5) from the valve seat.

(d) Remove the lock washer (9) from the pin through the brake valve handle, remove the spacers (7) on the arm and push the plunger (6) through housing and out through the valve seat bore.

(e) Remove the old packing from the inside of the brake valve housing.

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(f) Clean all parts in solvent (15, Table 1, 20-40-00) and air dry all parts.

(g) Place a new packing inside the brake valve housing.

(h) Check the valve seat for wear and distortion. If necessary replace the valve seat.

Check the parking brake valve for leaks by placing 1,500 psi in the valve through the elbow (2). Remove the pressure and place it in the nozzle (8). The valve should open with application of 2 psi or less. If this is not the case, the valve is not serviceable.

(12) Parking Brake - Adjustment

Put the parking brake control in the OFF position and check the parking brake valve to make sure it is in the OFF position. Loosen the lock nut and screw and take up slack in the actuator wire. Tighten the screw and lock nut down on the brake actuator wire. Pull the brake control to the ON position and pump the brakes to see if the pedals are solid. If the brake pedals are not solid, put the brakes in the OFF position and recheck the rigging.

(13) 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. To adjust the linkage for this position loosen the jam nut on the upper end of the master cylinder piston rod and turn the piston rod to attain the desired length. After both pistons are adjusted to the same length tighten the jam nuts
(Ref. Figure 201).

(14) Brake Fluid Reservoir - Filling

Fill to 1-1/2 inch of the top with hydraulic fluid (13, Table 1, 20-40-00). Maintain visible fluid level on the dip stick.

(15) Brake System - Bleeding

Use only hydraulic fluid (13, Table 1, 20-40-00) in the brake lines and insure that no dirt or foreign matter is allowed to get in the brake system (Ref. Figure 201). Dirt can get under seals and cause leaks or clog the compensating valve and cause the brakes to lock.

Use either gravity flow or pressure bleeding to bleed brakes. Using either method, the parking brake lever and toe brake pedals must both be fully released to open the compensating port in the brake master cylinders.

(16) Brake System - Gravity Bleeding

The reservoir must be kept full during bleeding. The brake pedals should be operated slowly and smoothly to eliminate trapped air in the master cylinders. When no more air bubbles appear in the fluid drained from the bleeder plug, close the bleeder valve.

(17) Brake System - Pressure Bleeding

Connect the hoses from a pressure pot to the bleeder fitting on the brake and bleed the system from the wheel cylinder up. Disconnect the fluid supply line at the reservoir, attach a hose to it and put the other end of the hose in a large, clean container. Using not more than 30 psi bleed the system until all air bubbles are gone from the draining fluid. Pumping the brakes is not necessary.

(18) Brake System (Dual) - Bleeding

In airplanes having the optional dual brake system, the copilot's brake system is bled by closing the valve on the pressure pot and pumping the copilot's brake pedal to change the shuttle valve position. This causes hydraulic fluid to be routed through the copilot's system and this system should be bled as was the pilot's system.

After the pilot's and copilot's brakes have been bled, close the bleeder valve and repeat for the other wheel.

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