

SECTION 5

LANDING GEAR

TABLE OF CONTENTS

	Page		Page
LANDING GEAR	5-2	HEAVY-DUTY NOSE GEAR	5-32
Trouble Shooting	5-2	NOSE WHEEL	5-32
MAIN GEAR	5-3	Replacement	5-32
Removal	5-3	Disassembly	5-32
Installation	5-4	Inspection and Repair	5-32
Step Bracket Replacement	5-4	Assembly	5-32
Brake Line Fairing Replacement	5-4	WHEEL BALANCING	5-32
MAIN WHEEL AND AXLE	5-4	NOSE WHEEL STEERING SYSTEM	5-38
Removal	5-4	Steering Tubes and Bungee	5-38
Installation	5-5	Adjustment	5-38
MAIN WHEELS (Goodyear)	5-5	TAIL GEAR	5-38
Removal	5-5	Replacement	5-38
Disassembly	5-5	TAILWHEEL	5-38
Inspection and Repair	5-5	Replacement	5-38
Assembly	5-5	Tire Replacement	5-38
Installation	5-5	Cleaning and Lubrication	5-39
MAIN WHEELS (Cleveland)	5-5	TAILWHEEL LOCKING SYSTEM	5-39
Removal	5-5	Trouble Shooting	5-39
Disassembly	5-10	Replacement	5-39
Inspection and Repair	5-10	Rigging	5-39
Assembly	5-10	TAILWHEEL FRICTION CHECK	5-45
Installation	5-14	SPEED FAIRINGS	5-45
CESSNA MAIN LANDING GEAR CASTERING		Replacement	5-45
AXLES	5-14	Repair	5-47
Removal	5-14	Precautions	5-47
Disassembly	5-14	Scraper Adjustment	5-47
Cleaning, Inspection, Repair,		BRAKE SYSTEMS	5-47
and Lubrication	5-14	Brake Master Cylinders	5-47
Assembly	5-14	Hydraulic Brake Lines	5-48
Installation	5-16	Wheel Brake Assemblies	5-48
Functional Check	5-16	Trouble Shooting	5-48
Checking Fluid Quantity	5-16	Replacement of Brake Lines	5-49
MAIN WHEEL ALIGNMENT	5-16	Replacement of Master Cylinders	5-49
CROSSWIND WHEELS	5-16	Repair of Master Cylinders	5-49
NOSE GEAR	5-22	Removal of Wheel Brakes	5-49
Shimmy Dampener	5-22	Disassembly of Wheel Brakes	5-49
Torque Links	5-22	Inspection and Repair of Wheel Brakes	5-49
Replacement	5-22	Assembly of Wheel Brakes	5-49
Disassembly (Model 150)	5-25	Installation of Wheel Brakes	5-49
Assembly (Model 150)	5-25	Checking Brake Linings	5-50
Disassembly (Models 172 and P172)	5-26	Brake Lining Replacement	5-50
Assembly (Models 172 and P172)	5-26	Brake Bleeding	5-50
Disassembly (Model 182)	5-31	PARKING BRAKE SYSTEMS	5-50
Assembly (Model 182)	5-31	Replacement	5-50

5-1. LANDING GEAR.

5-2. A tapered, spring-steel strut supports each main wheel, and a steerable nosewheel is mounted on an air-oil shock strut in all tricycle-gear equipped airplanes. Model 180 and 185 series airplanes are equipped with conventional gear utilizing spring-steel main gear struts and a tapered, tubular tailwheel strut. The tailwheel is steerable with the rudder pedals up to maximum pedal deflection, after which it becomes free-swiveling. Model 185 series airplanes are equipped with a tailwheel lock, which still permits steering of approximately 2.5° each side of neutral while the lock is engaged. The nosewheel is also steerable with the rudder pedals up to maximum pedal deflection, after which it becomes free-swiveling up

to a maximum travel of 30° right or left of center. Through use of the brakes, tricycle gear airplanes can be pivoted about the outer wing strut fitting.

Cleveland wheels and brakes are used on all Model 150 and 185 series airplanes, Model 172F and on, Model 180G and on, and Model 182H and on. All other models were equipped with Goodyear wheels and brakes. Cleveland and Goodyear nose wheels are interchangeable on all models. Tube-type tires are used on all models except the first ten Model 150C airplanes, which were equipped with tubeless tires.

Speed fairings of reinforced, resin-bonded glass-fiber are standard equipment on some models and optional equipment on others.

5-3. TROUBLE SHOOTING THE LANDING GEAR.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
AIRPLANE LEANS TO ONE SIDE.		
Incorrect tire inflation.	Check with tire gage.	Inflate to correct pressure.
Landing gear attaching parts not tight.	Hoist or jack airplane and check attaching parts.	Tighten loose parts and replace defective parts.
Landing gear spring excessively sprung.	Check visually.	Remove and replace.
Incorrect shimming at inboard end of spring.	If no defects are found, incorrect shimming is indicated.	Install shims as required. Refer to paragraph 5-6 for limitations.
Bent axles.	Check visually.	Replace axles.
WHEEL BOUNCE EVIDENT EVEN ON SMOOTH SURFACE.		
Out of balance condition.	Check wheel balance.	Correct in accordance with paragraph 5-44.
NOSE WHEEL SHIMMY.		
Nose strut loose in attaching clamps.	Raise nose, remove cowl and check strut attachment.	Tighten nose strut attaching clamp bolts.
Shimmy dampener lacks fluid.	Refer to paragraphs 2-21, 2-21A, or 2-21B.	Refer to paragraphs 2-21, 2-21A, or 2-21B.
Defective shimmy dampener.	Raise nose, turn nose wheel back and forth to check dampening.	Repair or replace defective shimmy dampener.
Loose or worn nose wheel steering linkage.	Check for evidence of play.	Tighten or replace defective linkage.

TIRES WEAR EXCESSIVELY.

Incorrect tire inflation.	Check with tire gage.	Inflate to correct pressure.
Wheels out of alignment.	Check toe-in and camber.	Align in accordance with paragraph 5-23.
Landing gear spring excessively sprung.	Check visually.	Remove and replace.
Incorrect shimming at inboard end of spring.	If no defects are found, incorrect shimming is indicated.	Install shims as required. Refer to paragraph 5-6 for limitations.
Bent axles.	Check visually.	Replace axles.
Dragging brakes.	Jack wheel and spin to check for friction.	See paragraph 5-72.
Wheel bearings too tight.	Jack wheel and check for bearing drag.	Adjust properly.
Loose torque links.	Check for excessive clearances.	Add washers or replace as necessary.
Loose or defective nose wheel bearings.	Raise nose, check wheel bearings.	Tighten wheel bearings properly; replace, if defective.
Nose wheel out of balance.	Check wheel balance.	Correct in accordance with paragraph 5-44.

HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.

Defective strut seals.	Check for evidence of fluid leakage.	Replace defective seals.
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NOSE STRUT WILL NOT HOLD AIR PRESSURE.

Defective air filler valve, or valve not tight.	Check for air leakage at valve.	Check gasket and tighten loose valve. Replace, if defective.
Defective strut seals.	Check for evidence of fluid leakage.	Replace defective seals.

5-4. MAIN GEAR.**5-5. REMOVAL.****NOTE**

Three different methods are used to attach the main landing gear spring to the fuselage outboard structure. Wide U-bolts are used on some models, shims and wedges on others, and steel channels on others. The spring is attached to the fuselage inboard structure with a bolt which passes through a hole in the end of the spring.

a. Remove floorboard access covers over spring, remove screws and slide external fairing and seal

down around spring, drain hydraulic brake fluid and hoist or jack airplane in accordance with Section 2.

b. On those models where the brake line is attached to a bulkhead fitting through the fuselage skin, disconnect the brake line at this fitting. On those models where the brake line connection is inside the fuselage beneath the floor, disconnect the brake line from the spring and the wheel brake cylinder. Remove the gear, leaving the brake line protruding from the fuselage.

c. On aircraft with U-bolts, remove the nuts and washers from the U-bolts and tap them free of the attaching structure. On aircraft with shims and wedges, remove the attaching bolts and pry the shims and wedges out of the fuselage. On aircraft with a channel, remove the attaching bolts, washers, and nuts and remove the channel.

- d. Remove the bolt, washer, and nut attaching the inboard end of the spring and pull the entire gear out of the fuselage. Note shims placed under the inboard end of the spring and mark them to be sure they are replaced correctly at reinstallation of the landing gear.

5-5A CORROSION CONTROL ON LANDING GEAR SPRINGS.

a. General

- (1) The main landing gear springs are made from high strength steel that is shot peened on the lower surface to increase the fatigue life of the part.
- (2) The shot peened layer is between 0.010 and 0.020 inch thick.
- (3) If the protective layer of paint is chipped, scratched, or worn away, the steel may corrode (rust).

NOTE: Corrosion pits that extend past the shot peen layer of the gear spring will cause a significant decrease in the fatigue life of the spring.

- (4) Operation from unimproved surfaces increases the possibility of damage.

b. Corrosion removal and repair.

WARNING: Do not use chemical rust removers or paint strippers on landing gear springs. High-strength steel parts are very susceptible to hydrogen embrittlement. Acidic solutions, such as rust removers and paint strippers, can cause hydrogen embrittlement. Hydrogen embrittlement is an undetectable, time-delayed process. Since the process is time delayed, failure can occur after the part is returned to service.

- (1) Examine for signs of corrosion (red rust) if damage to the paint finish of the landing gear spring is found.
- (2) Carefully remove any rust by light sanding.
 - (a) The sanding must blend the damage into the adjacent area in an approximate 20:1 ratio.

EXAMPLE: An 0.005-inch-deep pit. The pit must be blended to a 0.10-inch radius or 0.20-inch diameter.
 - (b) Make sure the last sanding marks are along an inboard-to-outboard direction, or along the long dimension of the spring.
- (3) After the sanding is complete, measure the depth of the removed material from the damaged area.

NOTE: The maximum combined depth of removed material to the top and bottom or leading and trailing edge is not to be more than 0.063 inch at any two opposite points on the gear spring. This measurement limitation includes areas that have previously been damaged and repaired.

- (a) Make sure the depth of the damage area on the bottom of the gear spring is not more than 0.012 inch deep.
 - 1 If the damage is deeper than 0.012 inch deep and less than 0.063 inch deep, replace or shot peen the gear spring. The gear spring must be removed and sent to an approved facility to be shot peened.
 - a The shot peen specification is to be Almen intensity of 0.012 to 0.016 with 330 steel shot.
 - (b) Make sure the depth of any damage on the leading edge, trailing edge, or top of the gear spring is not more than 0.063 inch deep.
 - 1 If the damage is deeper than 0.063 inch deep, replace the gear spring.
- (4) Touch-up paint as required.

NOTE: Additional information regarding corrosion control can be found in FAA documents AC-43-4, Chapter 6, or AC43.13-1B Chapter 6.

- c. Axle bolt hole corrosion.
 - (1) Operation of an airplane on skis increases the loads on the lower part of the gear spring because of the unsymmetrical and twisting loads.
 - (a) The increased loads have produced spring fractures that originate from pits in the axle attach holes.
 - 1 Catastrophic failures can occur from fatigue cracks as small as 0.003 to 0.010-inch long that originated at pits.

NOTE: Although operation on skis causes more loads, the criteria apply to all airplanes.

- (2) There is no maximum damage depth for pits that develop in the axle bolt holes. If pits or corrosion is found, ream to remove it, subject to the following limitations:
 - (a) Remove the minimum material necessary to repair the damage.
 - (b) Make sure the diameter of the axle attachment holes are no more than 0.383 inch for 3/8- inch bolts.
 - (c) Make sure the diameter of the axle attachment holes are no more than 0.321 inch for 5/16- inch bolts.
 - (d) If reaming to the maximum dimension does not remove all signs of corrosion, discard the landing gear spring.

5-6. INSTALLATION.

- a. Slide seal and external fairing plate over upper end of landing gear spring.
- b. Slide the spring into place and work shims in position under inboard end of spring. Install bolt, washer, and nut to secure inboard end of spring.

NOTE: Shims are installed under the inboard end of the spring as required to level the wings within a total tolerance of three inches. Maximum number of shims permissible is three for the Models 150, 180, and 185; two for the Models 172 and P172; one for the Model 182.

- c. Where U-bolts are used, install with washers and nuts. Where shims and wedges are used, tap them securely in place and install attaching bolts. Avoid excessive pounding of wedges to prevent deforming supporting structure, especially on the Model 150 prior to serial no. 15060127. After the noted serial, a bolt replaces a rivet in the forward end of each lower inboard angle. Where a channel is used, install with bolts, washers, and nuts. Make sure the identification arrow on the channel points outboard; it is possible to install it incorrectly.
- d. Lower aircraft to ground.
- e. Connect brake lines; bleed brakes.
- f. Install parts removed for access.

5-7. STEP BRACKET REPLACEMENT.

NOTE: The step bracket is secured to the landing gear spring strut with Conley-Weld, or a similar epoxy base adhesive.

- a. Mark the position of the bracket so that the replacement bracket will be installed in approximately the same position.
- b. Remove all traces of the original adhesive as well as any rust, paint, or scale with a wire brush and coarse sand paper.
- c. Leave surfaces slightly roughened or abraded, but deep scratches or nicks should be avoided.
- d. Clean the surfaces to be bonded thoroughly. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important for the surfaces to be clean and dry.
- e. Check the fit of the step bracket on the spring. A gap of not more than 1/32 inch is permissible.
- f. Mix the adhesive carefully according to manufacturer's directions.
- g. Spread a coat of adhesive on the surfaces to be bonded, and place step bracket in position on the spring. Tap the bracket upward to insure a tight fit.
- h. Form a small fillet of the adhesive at all edges of the bonded surfaces. Remove excess adhesive with lacquer thinner.
- i. Allow the adhesive to cure thoroughly according to manufacturer's recommendations before flexing the gear spring or applying loads to the step.
- j. Repaint gear spring and step bracket after curing is complete.

5-7A. BRAKE LINE FAIRING REPLACEMENT (182).

- a. Disconnect brake line at wheel and drain fluid, or plug line to avoid draining. Flex brake line away.
- b. Remove all traces of the original adhesive as well as any rust, paint, or scale with a wire brush and coarse sand paper. Sand inner surface of fairing strip, running sanding marks lengthwise.
- c. Leave surfaces slightly roughened or abraided, but deep scratches or nicks should be avoided.
- d. Clean the surfaces to be bonded thoroughly. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important for the surfaces to be clean and dry. Solvent should not be used on the vinyl fairing strip.
- e. Mix the adhesive (B.F. Goodrich A-1188-B) according to manufacturer's directions.
- f. Apply a thin, uniform coat of adhesive to each bonding surface. Allow adhesive to air dry until solvent odor is gone (approx. 3 to 4 minutes at room temperature). Make assembly within ten minutes after solvent evaporates.

WARNING: Keep catalyst away from heat, sparks, and open flame. Use with adequate ventilation and avoid prolonged breathing of vapor. Avoid contact with skin, eyes, and mouth.

- g. Position fairing strip between brake line and strut, and press firmly against strut. Press brake line into groove of fairing strip and wrap immediately with masking tape in five equally spaced places. Excess adhesive may be removed with solvent.
- h. Allow the adhesive to cure thoroughly according to manufacturer's directions before flexing the gear.
- i. After the recommended curing time, remove tape and connect brake line.
- j. Paint the area as required.
- k. Fill and bleed brake system.

5-8. MAIN WHEEL AND AXLE.

5-9. REMOVAL.

- a. Disconnect, drain, and plug the hydraulic brake line at the brake cylinder.
- b. Remove the wheel in accordance with paragraph 5-12 (or 5-18 for Cleveland wheels).
- c. Remove the nuts and bolts securing axle and brake components to the spring strut. Note the number and position of the wheel alignment shims. Mark these shims or tape them together carefully so they will be reinstalled in exactly the same position to ensure that wheel alignment is not disturbed. Remove axle and brake components.