CHAPTER 32

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BEECHCRAFT
DUKE 60 SERIES
MAINTENANCE MANUAL

CHAPTER 32 - LANDING GEAR

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"END"

GENERAL - DESCRIPTION AND OPERATION

The landing gear is operated by a split-field series-wound motor and an actuator located under the cabin floorboards aft of the main spar. One field is used to drive the motor in each direction. To prevent overtravel of the landing gear, a dynamic braking relay simultaneously breaks the power circuit to the motor and makes a complete circuit through the armature and the unused field winding. The motor then acts as a generator and the resulting electrical load on the armature stops the landing gear almost instantly.

The landing gear motor is controlled by the gear extension switch located on the left subpanel. The larger upper arms and the lower arm of the actuator, in conjunction with rod assemblies and linkage, control extension and retraction of the main and nose landing gear. Rod assemblies attached to the smaller upper actuator arms operate the inboard main landing gear doors.

Landing gear limit switches, located adjacent to the actuator, limit the gear travel during the extend and retract cycle. These switches, when actuated, terminate the landing gear travel.

To prevent accidental landing gear retraction on the ground, a safety switch on the left main landing gear breaks the control circuit whenever the strut is compressed.

CAUTION

Never rely on the safety switch to keep the gear down while taxiing, landing, or on the takeoff roll. Always check the position of the landing gear switch.

The Duke landing gear incorporates Beech air-oil type shock struts that are filled with both compressed air and hydraulic fluid. Their correct inflation should be assured before each flight.

SAFETY SYSTEM

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, two pressure switches mounted on the inboard side of the left main landing gear wheel well and two microswitches located adjacent to the existing throttle position warning switches.

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 85 ± 2 knots. The pressure switch in the gear-down circuit will close with decreasing pressure at 120 ± 2 knots. When the landing gear position switch is in the UP position and an airspeed of 85 ± 2 knots. 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 adjacent to the throttle position switch must also be in the open position. This microswitch is actuated by the throttle control when the throttles are advanced sufficiently for the manifold pressure gage to register approximately 17 ± 1 in. Hg. Conversely, if the throttles are retarded beyond the position corresponding to approximately 17 ± 1 in. Hg of manifold pressure, the microswitch will close. If at the same time the microswitch closes, the airspeed has dropped below 120 ± 2 knots, 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 when the following conditions are mutually fulfilled.

a. The airplane must have attained an airspeed of at least 85 ± 2 knots.

b. The throttle setting must have been advanced sufficiently to have produced a manifold pressure of approximately 17 ± 1 in. Hg.

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

a. The airspeed must have dropped below 120 ± 2 knots.

b. The throttle setting must have been retarded enough for manifold pressure to have dropped below approximately 17 ± 1 in. 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.

MANUAL LANDING GEAR EXTENSION SYSTEM

In the event of landing gear malfunction in flight, the gear may be manually extended, but not retracted, by a hand crank located below copilot's seat.

WARNING

If the gear has been extended manually for emergency reasons, the airplane must be put on jacks and inspected before the gear controls are returned to their normal position.

"END"

TROUBLESHOOTING
LANDING GEAR ELECTRICAL SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Landing gear motor fails to shut off when gear is retracted.	a.	Up limit switch out of adjustment.	a.	Readjust switch.
		b.	Defective switch.	b.	Replace switch.
2.	Landing gear fails to retract.	a.	Safety switch not closing.	a.	Readjust.
		b.	Up limit switch remaining open.	b.	Replace limit switch.
3.	Landing gear motor fails to shut off when gear is extended.	a.	Down limit switch does not open.	a.	Readjust limit switch.
		b.	Defective down limit switch.	b.	Replace limit switch.
4.	Landing gear actuator is hitting internal stops.	a.	Limit switch out of adjustment.	a.	Readjust limit switch.
		b.	Dynamic brake switch defective.	b.	Replace switch.
5.	Warning horn inoperative or malfunctioning.	a.	Open or grounded circuit.	a.	Check continuity.
		b.	Throttle switches inoperative.	b.	Check and adjust as necessary.
6.	Landing gear fails to extend.	a.	Tripped circuit breaker.	a.	Reset circuit breaker.
		b.	Down limit switches open.	b.	Check down limit switch. With the gear retracted the down limit switch should be closed.
		c.	Open circuit.	c.	Run a continuity check on the down limit switch.
7.	Landing gear will not retract or extend.	a.	Bad electrical connections.	a.	Run a continuity check from circuit breaker to switch. Inspect the dynamic brake relay.
		b.	Landing gear motor not grounded.	b.	Check motor ground.
		c.	Defective control circuit.	c.	Check items 1 through 3.

"END"

MAIN GEAR AND DOORS - MAINTENANCE PRACTICES

MAIN GEAR SHOCK ABSORBERS

To check the fluid level in the landing gear shock absorbers, deflate the strut by releasing the air through the valve and permit the strut to fully compress, then remove the filler valve.

WARNING

Do not remove the filler valve until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel and property damage.

If the fluid level is low, add hydraulic fluid MIL-H-5606 (13, Chart 207, 91-00-00) until the fluid overflows slightly. Slowly cycle (compress and extend) the strut to expel any trapped air. Add fluid, as necessary, and install the filler valve.

With the airplane resting on the ground and the fuel cells full, inflate the main strut until 3 inches of the piston is exposed. Rock the airplane gently to prevent possible binding of the piston in the barrel when inflating.

CAUTION

Do not inflate the struts while the airplane is on jacks, since sudden extension or over-inflation of the struts may bend the torque knee.

LUBRICATION

MAIN WHEEL BEARINGS AND GREASE FITTINGS

Lubricate the main wheel bearings and grease fittings as detailed in the Lubrication Chart, Chapter 12-20-00.

UPLOCK ROLLERS

AIRPLANE SERIALS P-3 THROUGH P-154, P-156 THROUGH P-162, P-167 THROUGH P-171 AND P-181 PRIOR TO COMPLIANCE WITH SERVICE INSTRUCTIONS No. 0482-211.

The uplock rollers on these serials should be lubricated after 50 hours with SAE 10W-30 oil, and removed from the airplane and packed with MIL-G-23827 grease (11, Chart 207, 91-00-00), every 100 hours or any time that, while cleaning the wheel well, the bearings are subjected to degreasing with solvent under pressure.

NOTE

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

The uplock roller bearing may be lubricated as follows:

a. Place the airplane on jacks.
b. Partially retract the landing gear.
c. Remove the bolt attaching the uplock roller and the "V" brace drag leg center hinge point.
d. Remove the uplock roller bearing from the bolt.
e. Hold a finger over one end of the uplock roller center bearing race and place a grease gun against the opposite side of the bearing. As grease is pumped into the inner bearing race, it will be forced through the hole in the inner race and into the bearing cavity. Completely fill the bearing with grease.
f. Reinstall roller bearings and attaching bolt.

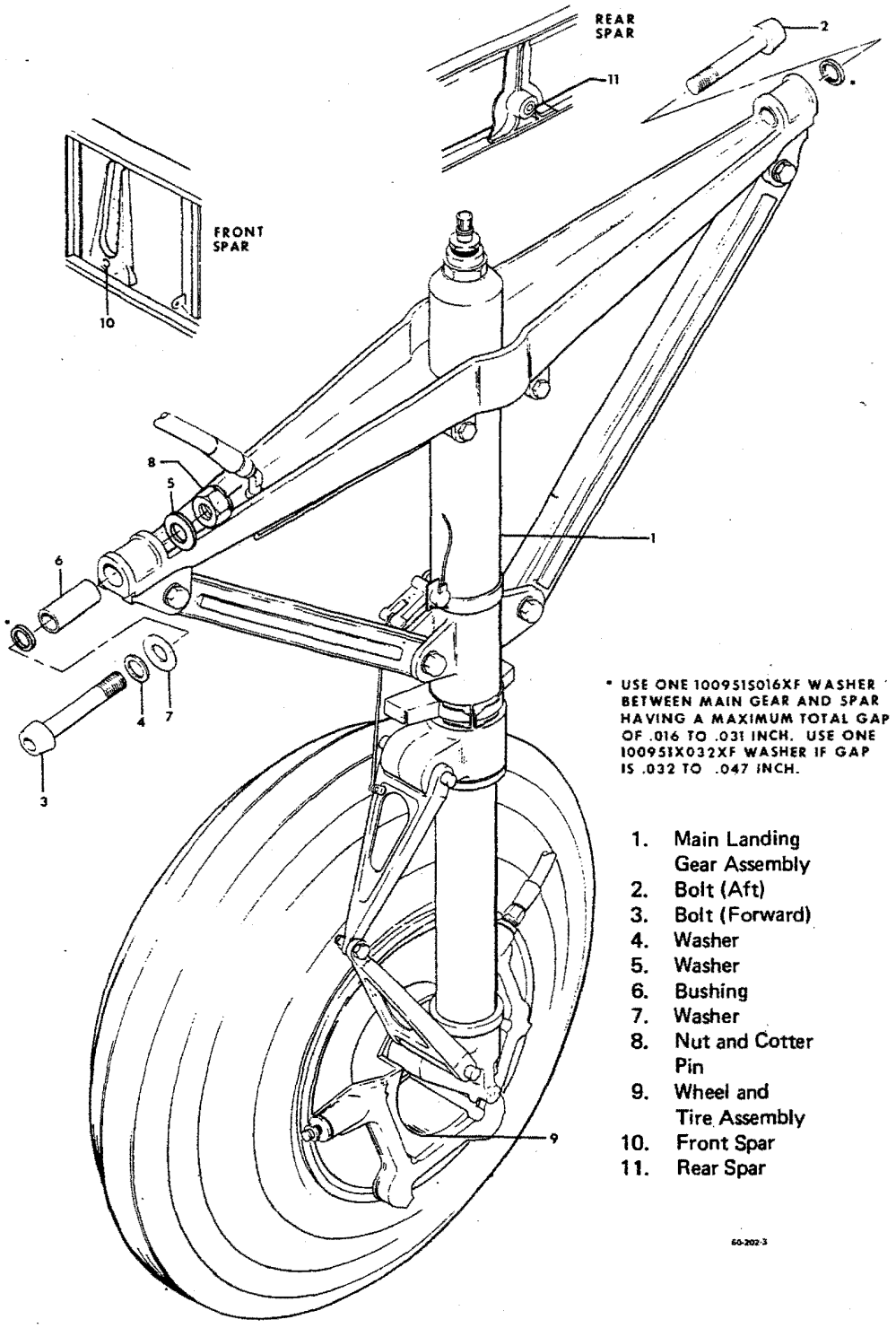
AIRPLANE SERIALS P-155, P-163 THROUGH P-166, P-172 AND AFTER, EXCEPT P-181, AND PRIOR AIRPLANE SERIALS IN COMPLIANCE WITH SERVICE INSTRUCTIONS No. 0482-211.

The uplock rollers on these serials are equipped with a grease fitting installed in the uplock roller bearing bolt and may be lubricated using a pressure grease gun. The uplock rollers should be lubricated using MIL-G-23827 grease (11, Chart 207, 91-00-00), each 100 hours, or any time that while cleaning the wheel well, the bearings are subjected to degreasing with solvent under pressure.

MAIN GEAR REMOVAL
(Figure 201)

When removing the landing gear, take care to preserve the original adjustments at the rod end fittings to facilitate reassembly.

a. With the airplane on a jack, retract the gear until the inboard landing gear door is in the fully open position.
b. Remove the outboard landing gear door from the landing gear strut.
c. Disconnect the inboard landing gear door actuating rod at the forward door hinge.
d. Unsnap the canvas cover and disconnect the uplock assembly from the strut.



* USE ONE 100951S016XF WASHER BETWEEN MAIN GEAR AND SPAR HAVING A MAXIMUM TOTAL GAP OF .016 TO .031 INCH. USE ONE 100951X032XF WASHER IF GAP IS .032 TO .047 INCH.

1. Main Landing Gear Assembly
2. Bolt (Aft)
3. Bolt (Forward)
4. Washer
5. Washer
6. Bushing
7. Washer
8. Nut and Cotter Pin
9. Wheel and Tire Assembly
10. Front Spar
11. Rear Spar

Main Gear Installation
Figure 201

e. Open the brake cylinder bleed ports and pump all fluid from the system.

f. Disconnect the hydraulic line where the flexible hose couples to the tubing on the landing gear.

g. Disconnect the safety switch wire. (Left gear only).

h. Remove the bolt attaching the lift leg to the strut.

i. Remove the access door in the lower surface of the wing leading edge for access to the forward hinge bolt retaining nut and remove the nut. The rear strut brace hinge bolt is accessible by lowering the flap.

j. Remove cotter pins and nuts (8), washer (5), bolts (2 and 3), washers (4 and 7), and bushings (6) from the front and rear spars (10 and 11).

k. Lower the main gear assembly away from the airplane, being careful not to bend the skin at the wheel well edge.

MAIN GEAR INSTALLATION
(Figure 201)

a. Carefully position the main gear assembly in place against the front and rear spars (10 and 11).

b. Align bolt holes and install bushing (6), bolts (2 and 3), washers (4, 5, and 7), and nuts (8). Torque to 250 to 400 inch-pounds. Install new cotter pins.

NOTE

Use one 100951S016XF washer between main gear and spar having a maximum total gap of .016 to .031 inch. Use one 100951X032XF washer if gap is .032 to .047-inch.

c. Install the access door in the lower wing leading edge.

d. Install the bolt attaching the lift leg to the strut.

e. Connect landing gear safety switch wire. (Left gear only).

f. Connect the brake hydraulic line.

g. Connect the uplock assembly to the strut and snap the canvas cover in place.

h. Connect the inboard landing gear door actuating rod to the forward door hinge.

i. Install the outboard landing gear door to the landing gear strut.

j. Bleed the brake system.

k. Operate the landing gear and check for proper rigging of the uplock and doors.

100-HOUR INSPECTION

ACTUATOR AND MOTOR - Check the actuator and motor for security, visible damage and condition. Check motor wiring for breaks and chafed or deteriorated insulation. Check all actuating rods for cracks, evidence of bending and security.

LANDING GEAR STRUT - Inspect the strut and attaching components for cracks, security, condition, and leakage at the air filler valve and piston area.

STRUT FLUID LEVEL - Inspect the strut for proper inflation. If leakage is detected, deflate the strut and check the fluid level.

"END"

NOSE GEAR AND DOORS - MAINTENANCE PRACTICES

NOSE GEAR SHOCK ABSORBER

To check the fluid level in the landing gear shock absorber, deflate the strut by releasing the air through the valve and permit the strut to fully compress, then remove the filler valve.

WARNING

Do not remove the filler valve until all air pressure has been released or it may be blown off with considerable force, causing injury to personnel and property damage.

If the fluid level is low, add MIL-H-5606 hydraulic fluid (13, Chart 207, 91-00-00) until the fluid overflows slightly. Slowly cycle (compress and extend) the strut to expel any trapped air. Add fluid, as necessary, and install the filler valve.

With the aircraft resting on the ground and the fuel cells full, inflate the nose strut until 4-1/16 to 4-5/16 inch of the piston is exposed. Rock the aircraft gently to prevent possible binding of the piston in the barrel when inflating.

CAUTION

Do not inflate the strut while the aircraft is on jacks, since sudden extension or over-inflation of the strut may bend the torque knees.

LUBRICATION

Lubricate the nose wheel bearings and grease fittings as detailed in the Lubrication Chart in Chapter 12-20-00.

NOSE GEAR REMOVAL (Figure 201)

When removing the nose gear, take care to retain the original adjustments at the rod end fittings to facilitate reassembly.

a. With the aircraft on a jack, partially retract the landing gear to relieve the load on the retract rod compression spring.

b. Disconnect the drag leg at its fitting on the nose gear brace assembly.

c. Disconnect the shimmy dampener at the nose gear.

d. Disconnect the steering mechanism at the nose gear.

e. Disconnect the landing light wiring.

f. Remove the nose baggage compartment flooring that covers the area on either side of the wheel well to gain access to the hinge bolts.

g. Remove cotter pins (5), nuts (4), washers (2), bolts (1) and bushings (3).

h. Lower the nose gear assembly from the nose wheel well.

NOSE GEAR INSTALLATION (Figure 201)

a. Carefully position the nose gear assembly against the nose wheel well structure.

b. Align bolt holes and install bushings (3), bolts (1), washers (2), nuts (4) and cotter pins (5).

NOTE

Use 100951X016YX and 100951X032YX washers, as required, to obtain total end play between the nose gear assembly and supports, of .000 to .016-inch.

c. Install the nose baggage compartment flooring.

d. Connect the landing light wire.

e. Connect the drag leg on the nose gear brace assembly.

f. Connect the steering mechanism to the nose gear.

g. Check the shimmy dampener adjustment, then connect the shimmy dampener to the nose gear.

h. Operate the landing gear and check for proper rigging and nose gear adjustment.

SHIMMY DAMPENER REMOVAL

a. Remove the nut, washers and bolt attaching the shimmy dampener to the nose landing gear.

b. Remove the nut, washer, bolt and spacer attaching the shimmy dampener to the nose wheel well structure.

SHIMMY DAMPENER INSTALLATION

a. Position the aft end of the shimmy dampener in the bracket on the nose wheel structure and install the spacer, bolt, washer and nut.

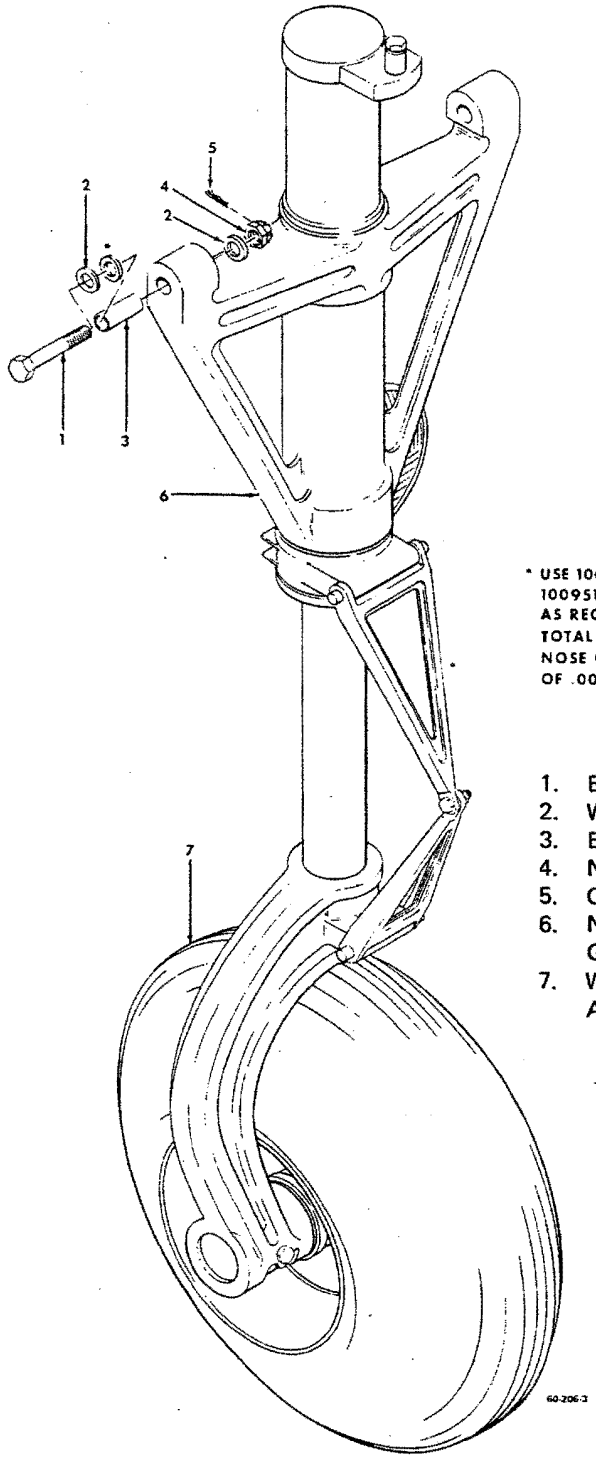
b. Adjust the shimmy dampener with the nose wheel in the extreme left position. The piston travel of the dampener should be adjusted to extend 1/16 to 1/4 inch beyond the attach point on the steering yoke.

c. Return the nose wheel to neutral and install the bolt, nut and washer.

100-HOUR INSPECTION

LANDING GEAR STRUT - Inspect the strut and attaching components for cracks, security, condition, and leakage at the air filler valve and piston area.

STRUT FLUID LEVEL - Inspect the strut for proper inflation. If leakage is detected, deflate the strut and check the fluid level.



* USE 100951X016YX AND 100951X032YX WASHERS, AS REQUIRED, TO OBTAIN TOTAL END PLAY BETWEEN NOSE GEAR AND SUPPORTS OF .000 TO .016 INCH.

1. Bolt
2. Washer
3. Bushing
4. Nut
5. Cotter pin
6. Nose Landing Gear Assembly
7. Wheel and Tire Assembly

Nose Gear Installation
Figure 201

"END"

cycling the gear listen for unusual noises at the motor and actuator. Cycle the gear a minimum of six times.

k. Install the access covers, carpet and the front seat.

l. Install the access door on the bottom of the fuselage.

LANDING GEAR DYNAMIC BRAKE RELAY REMOVAL

a. Remove the cabin right front seat.

b. Remove the access cover on top and directly behind the forward carry through structure.

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

d. Remove the two attaching screws and the relay.

LANDING GEAR DYNAMIC BRAKE RELAY INSTALLATION

a. Install the dynamic brake relay with the two attaching screws.

b. Connect the electrical wiring to the relay.

c. Install the access cover and the right front seat.

d. Cycle the landing gear and check for proper braking action. The gear should stop almost instantly.

CAUTION

When landing gear is approaching its extreme of travel, intermittently actuate the landing gear relay circuit breaker to prevent damage to the wing and fuselage structure and the actuating rods, linkage and the landing gear components.

LANDING GEAR RIGGING (Figure 201)

NOTE

Read the entire rigging procedure before attempting to rig the landing gear system. Physically locate each item as you read the procedure through.

CAUTION

Do not reverse the landing gear direction of travel without bringing the gear to a complete stop. If the direction of travel is reversed using the landing gear selector switch, damage to the sector gear may result. Use the landing gear relay circuit breaker to start or stop the landing gear during rigging.

Battery voltage is not sufficient to properly cycle the landing gear during rigging. A 28.25 (±0.25) volt auxiliary power unit capable of maintaining the initial setting within 0.25 volt during the extension and retraction cycles is recommended.

CAUTION

Excessive operation of the landing gear motor without proper cooling may cause damage to the motor. Allow five minutes cooling time after each extension and retraction cycle.

Whenever the landing gear mechanism is removed or disconnected, the landing gear should be checked to see that the system is properly rigged.

CAUTION

After making an adjustment to the gear, operate the landing gear intermittently as the system nears the limits of the retraction/extension cycle to prevent damage due to overtravel.

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 could cause the airplane to be unstable while on jacks.

a. With the airplane on jacks, allow adequate floor clearance for wheels during retraction or extension.

CAUTION

Care should be taken to ensure that the main gear retract rods are not lengthened far enough to damage the inboard landing gear doors.

b. If it is determined that the entire landing gear is out of rig, take the following precautions to prevent damage to the gear and airplane: Lengthen the main and nose gear retract rods sufficiently to eliminate the danger of the main gear V-brace damaging the wing skin when the gear is retracted. Place the uplock block in the lower position.

c. Disconnect the nose wheel door linkage. Secure the nose wheel door out of the way with tape. Disconnect the main wheel outboard door linkage at the strut.

d. Screw the stop bolts (on the main gear V-brace assembly) in until four or five threads are showing.

NOTE

The actuators (used on serials P-577 and after) may be installed on eariler airplanes. The new actuator is identified by part number 60-810030-5 or -7 and white epoxy paint on the upper actuator arm and on the upper and lower actuator housing.

e. Retract the landing gear to its 2/3 up position, then stop and inch the gear the remaining distance to the uplimit switch by intermittent operation of the landing gear relay circuit breaker. Check the emergency handcrank for 1/8 to 1/4 turn (or 5/8 to 3/4 turn on airplanes using 60-810030-5 or 60-810030-7 white actuator) free counterclockwise movement before the sector gear contacts the gearbox internal stop. If proper internal clearance is not obtained, adjust the landing gear uplimit switch. Locate the landing gear uplimit switch adjustment screw on the actuator arm and adjust the screw to stop the landing gear on its up cycle at the point where proper internal clearance is maintained.

CAUTION

The gearbox may be damaged if allowed to run full cycle into the internal stops. To preclude this possibility, the limit switches should initially be adjusted aft, for an early shutdown, if an out-of-adjustment condition is suspected.

NOTE

All adjustment and rigging of limit switches should be accomplished using an external power source adjusted to 28.25 (±0.25) volts. Due to overtravel, the landing gear will not stop at the same position that the limit switches are actuated.

On serials P-139 and after, there are two switch assemblies, one on each side of the actuator.

f. Extend the landing gear to its 2/3 down positic then stop and inch the gear the remaining distance to t downlimit switch by intermittent operation of the landi gear relay circuit breaker. Check the emergency handcra for 1/8 to 1/4 turn (or 5/8 to 3/4 turn on airplanes using 6 810030-5 or 60-810030-7 white actuators) free clockwi movement before the sector gear contacts the gearb internal stop. If proper internal clearance is not obtaine locate the landing gear downlimit switch adjustment scre on the upper arm of the landing gear actuator and adjust t screw to stop the landing gear on its down cycle at the po where proper internal clearance is achieved.

WARNING

Do not operate the handcrank with the power on.

g. Extend and retract the gear two or three times assure that the switches are correctly set. Check t handcrank each time to assure a free movement of 1/8 1/4 turn (or 5/8 to 3/4 turn on airplanes using 60-81003C or 60-810030-7 white actuators) before the sector ge contacts the internal stops.

h. Adjust both the right and left main retract rods maintain a minimum clearance of 0.12 inch between t knee joint of the V-brace and wing skin with the landing ge retracted. To determine V-brace and wing skin clearanc retract the landing gear and slide a 0.12-inch feeler gau between the landing gear knee joint V-brace lift leg and t top wing skin. The main gear should retract only far enou to clear the inboard door (see Step k) in addition maintaining the minimum 0.12-inch clearance. To decrea the clearance between knee and top wing skin, short retract rod.

i. To provide an attachment point for a spring sca when rigging the door tension, fabricate a hook which c be screwed into the hole provided in the inboard gear do

j. With the gear retracted, rig the inboard landi gear door linkage so that a force of 28 to 40 pounds required to deflect the forward outboard corner of the do 1/8 inch. With the gear down, 25 to 40 pounds should required to deflect the forward outboard corner 1/8 inch. T doors are adjusted by disconnecting the linkage rods at t clevis fitting and screwing the rods in or out to vary th length.

k. There shall be a clearance of 0.19 to 0.30 in between the main landing gear axle and the inside surfa of the inboard door, at its closest point, with the gear fu retracted.

NOTE

To measure the clearance between the main landing gear axle and the inside surface of the inboard door, place a 1/2-inch thickness or more of artists' clay or equivalent on the axle. Place one thickness of paper over the clay to prevent the clay from sticking to the door. Retract the landing gear and leave in fully retracted position long enough for the clay to remain in the flattened position, then extend the gear. Remove the paper and measure the depth of the clay. The depth should be between 0.19 to 0.30 inch.

CAUTION

Install the main landing gear door pushrod attaching bolt in the door linkage bracket with the head to rear. If installed wrong, the bolt may catch in the fuselage skin and root rib of the wing, causing damage to the landing gear retract mechanism or preventing the gear from retracting.

l. When the proper setting is obtained, leave the gears in the fully retracted position and screw the stopbolt down against the strut. To assure a firm setting, insert a 0.003-inch feeler gage under the bolt head and adjust the bolt until a firm, steady effort is required to pull the feeler gage out. With the feeler gage removed, screw the bolt 3/4 turn (counterclockwise, when viewing bolt head) from initial contact with no clearance. Tighten the locknut securely.

m. Fabricate a spring feeler gage from a piece of metal 0.002 inch thick by 1/2 inch wide by 1-1/2 inches long, a rubber band, and a hook made of a heavier piece of metal (see Figure 202). The rubber band must stretch tight enough to pull the 0.002-inch material from the torque knee contact surface when sufficient force is applied.

NOTE

On those airplanes prior to P-183, except P-163 through P-166, P-177, and P-181 which have not incorporated Kit No. 60-8006-1S, accomplish Step "n". Airplanes P-163 through P-166, P-177, P-181, and P-183 and after and earlier airplanes which have incorporated Kit No. 60-8006-1S, accomplish Step "o".

n. With the main landing gear fully extended, insert a 0.002-inch feeler gage, as shown in Figure 202 in the knee contact surface of the gear lift leg. Apply a force as shown in Detail "F" of Figure 201 until the knee joint deflects just enough to allow movement of the feeler gage. The knee should deflect when a force of 65 to 75 pounds is applied. To increase the tension, add washers (Part Number 100951S063XP) between the inboard end of retract rod spring and the end of retract rod. To decrease tension, remove washers.

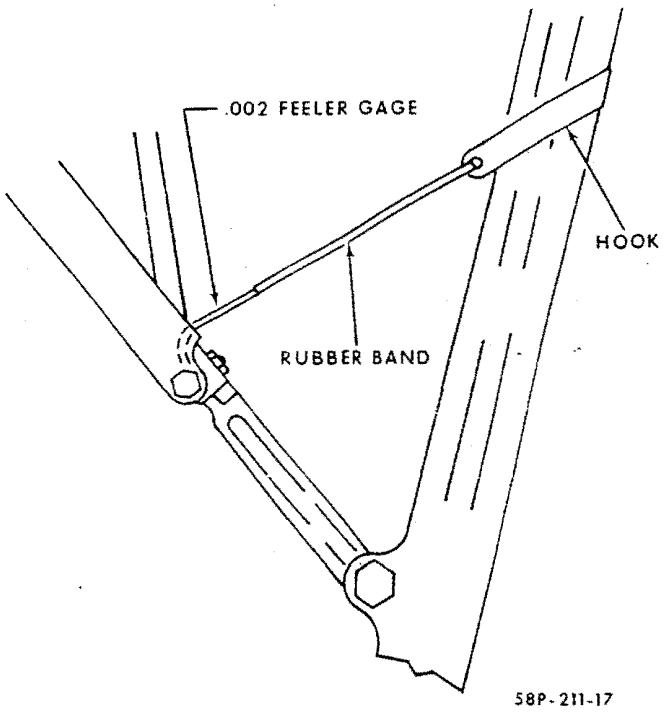
NOTE

If proper downlock tension cannot be established install a new spring. Check for a total minimum gap of 0.060 inch between the spring coils. The total spring gap is the sum of all gaps measured between the coils. Make certain the spring coils do not stack during gear operation.

o. With the main landing gear fully extended and the downlock disconnected, check the main gear retract rod end spring for minimum compression of 0.08 inch. Insert the spring feeler gage fabricated in Step "m", as shown in Figure 202, in the knee contact surface of the main gear lift leg. Apply a force, as shown in Detail "F" of Figure 201, using a push-pull scale. Apply the force until the torque knee contact surface of the lift leg releases the 0.002-inch spring feeler gage. The reading on the push-pull scale should be 55 to 65 pounds. To increase tension, add washer (Part Number 100951S063XP) as required, between the inboard end of retract rod spring and end of retract rod.

p. With the main landing gear fully extended and the downlock in the locked position, check the rollers for free movement of 0.01 to 0.02 inch between the rollers and downlock block. If this clearance is not obtained, loosen the block retaining bolts and adjust to proper clearance. Torque the bolts to 90 to 100 inch-pounds. With the main landing gear fully retracted and the uplock in the locked position, repeat this procedure to check and adjust the clearance between the uplock block and rollers as shown in Detail "E" of Figure 201.

q. With main landing gear fully extended, adjust the downlock cable to a tension of 52-1/2 (+10 −0) pounds using tensiometer in the wheel well. Tension is adjusted at the outboard end of the cable. If sufficient adjustment is not obtained at the cable eye, additional adjustment may be made at No. 3 wing rib by moving the cable housing inboard or outboard.



Main Gear Deflection
Figure 202

NOTE

Clean the clamp threads (bolt and nut).

Apply a light coat of thread locking compound (36, Chart 207, 91-00-00) on the cable clamp threads. Immediately after applying thread locking compound, install downlock cable and cable clamp on uplock cable. The cable clamp must maintain a clearance of 0.10 to 0.15 inch between the cable clamp and cable pulley. Torque cable clamp assembly to 80 to 90 inch-pounds. After five to seven minutes, retorque cable clamp assembly to 80 to 90 inch-pounds.

s. With the landing gear fully retracted, the uplock in the locked position and the uplock block adjusted as in step "p" there shall be a minimum of 0.11 inch overlap of the uplock stop angle with the lift leg of the brace assembly (Figure 203).

t. With the main landing gear fully retracted and the uplock in the locked position, apply a force of 58 to 68 pounds to the uplock assembly as shown in Figure 204. Using a feeler gage, check that the uplock stop angle deflects a maximum of 0.002 inch away from the landing gear lift leg.

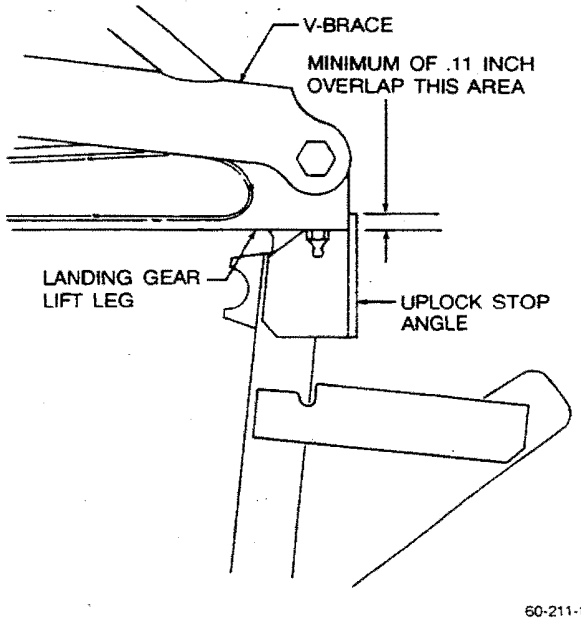
CAUTION

The uplock cable attach bolt must be installed with the bolt head aft. The bolt must be installed in this position to avoid interference between the bolt and the 49% stringer when the gear is fully retracted.

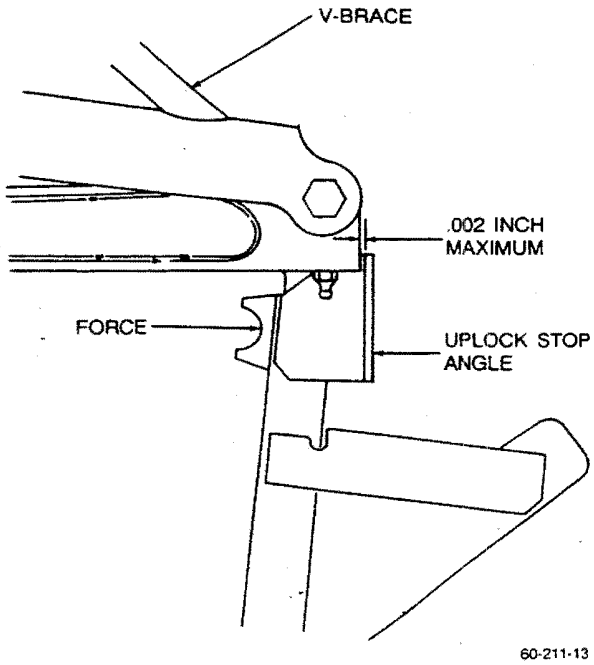
u. Extend the gear to approximately the 3/4 dow position and check for a minimum clearance of 0.50 inc between the tire and the inboard door at its closest poin while holding the door toward the tire.

v. Connect the outboard main gear door linkage an retract the gear slowly, checking to see that clearance i maintained between the door and gear. After checking t see that the door is not too tight, run the gear down an adjust the linkage as required. Continue this procedure unt a snug, firm fit is obtained when the door is completel closed.

w. Swivel the nose wheel to check the turning radiu of the strut for freedom of movement without binding c rough spots. Check the nose gear steering roller fc freedom of movement and the nose gear steering roller bo for security. Extend the gear to the full down position an



Uplock Stop Overlap
Figure 203



Uplock Deflection
Figure 204

make a preliminary adjustment on the down spring retaining nut located on the forward retract link to obtain a down spring length of 4.59 ± .030 inches (measure the forward spring retaining cap and the spring).

NOTE

Maintain a minimum spring length dimension of 4.56 inches (measure the forward retaining cap and the spring). Check that the spring does not stack or bottom out. Check to ascertain that the down spring is compressed a minimum of 1/8 inch when the gear is extended. Check that the bolts; or pins (serials P-153, P-155, P-163 through P-166, P-170 and after, and those serials P-4 through P-152, P-154, P-156 through P-162, P-167 through P-169 which have complied with Service Instructions No. 0460-212), through the slide tube are adjusted properly to allow the sleeve to slide on the tube.

CAUTION

If the nose gear down and lock light does not come on at landing gear extension at high air speeds, the length of the nose gear down spring should be readjusted to maintain a minimum compressed spring length of 4.59 ± .030 inches (measure the forward spring retaining cap and the spring). If unable to maintain proper down tension, the spring should be replaced.

x. Remove the access plate on the bottom side of the baggage compartment floor and disconnect the nose gear door linkage. Shorten the uplock linkage so the uplock will not interfere with nose gear stowage checks. Run the gear up slowly and check for clearance of the upper drag brace assembly to the baggage floor structure. Check the tire for proper clearance in the gear "up" position. The tire stows 1.0 inch above the closed gear door position. Adjust the front rod end on the forward retract rod as required to increase or decrease the tire clearance in the stowed position. Check for positive engagement of the uplock. Adjust the uplock for proper engagement. Extend the nose gear full down and check for compression of the forward retract rod plunger. Cycle the gear several times to ensure proper position. Check the down tension as follows:

1. Extend the gear to the full down position.
2. Move the lift leg joint just enough to insert a .002 inch feeler gage as shown in Figure 205 and return the gear to the full down position.

3. Apply a tension force downward at a 90° angle to the lift leg joint until the knee joint deflects just enough to allow movement of the feeler gage. The joint should deflect when a force of 60 ± 5 pounds is applied. If the down tension is not 60 ± 5 pounds, readjust the large spring retaining nut to obtain the correct down tension.

NOTE

Maintain a minimum spring length of 4.56 inches (measure the forward spring retaining cap and the spring).

y. Check that a clearance of .90 inch has been maintained between the baggage compartment floor and the nose gear in the retracted position.

NOTE

A one inch thickness of artist clay may be used to check this dimension (see the NOTE following step "k").

z. Connect the nose gear door linkage. On airplanes prior to P-281, adjust the nose gear door linkage rods to maintain a slight tension on the doors in the retracted position. On airplane serials P-281 and after, a force of 10 to 16 pounds should be required to deflect the forward, inboard corner of each door .125 inch.

NOTE

To provide an attachment point for a spring scale, fabricate a hook which can be screwed into the holes provided in the nose gear doors, as shown in Detail "I" of Figure 201. These holes are located at the inboard end of the forward hinges.

aa. Check that the nose gear tire clears the right door by a minimum of .50 inch at its closest point.

NOTE

If the tire does not clear the RH gear door by a minimum of .50 inch, the center retract rod may be shortened to increase the clearance. However, a minimum of .20 inch clearance must be maintained between the forward retract rod arm and the baggage floor when the nose landing gear is full "up". This dimension may be checked using clay.

Replace the access plate on the bottom side of the baggage compartment. With the nose gear system rigged, a final check should be made of the main gear down tension, the uplock spring tension, door tension, and the up stowage clearance.

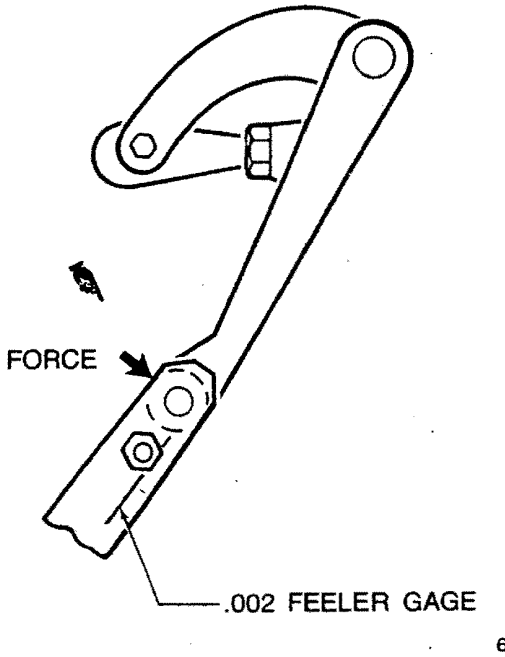
ab. Remove the wheel well access cover on the nose baggage compartment floor. With the landing gear retracted, adjust the uplock linkage until the uplock hook assembly has full engagement with the pin on the nose gear drag brace without deflecting the spring. After adjustment, extend the gear and safety the uplock link.

ac. With the gears down, check the adjustment of the safety switch. Refer to the Landing Gear Illustration, Figure 201, while adjusting the switch.

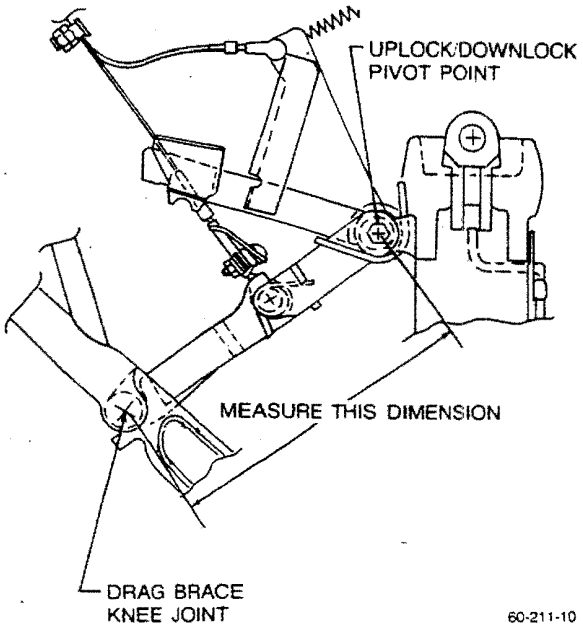
1. Remove the safety switch actuator rod (1) from the attaching bracket on the upper torque knee, then remove the retaining nut (2) and switch arm (3) from the switch shaft.
2. Jack the landing gear so the shock strut is compressed to .50 ± .12 inch from the extended position.
3. Connect the wire leads from a test light to pins inserted into the splices at wires number 1 and 3 (about 10 inches up from the safety switch).
4. Rotate the switch shaft clockwise until the test light comes on.
5. Remove the safety wire from the locking screw (4) on the switch arm (3) and back off the locking screw (4).
6. Install the switch arm (3) on the switch shaft in a position parallel to the upper torque knee and adjust the actuating rod end (1) to align with the attaching bracket on the torque knee. Install the actuating rod connecting bolt.
7. Position the shock strut to .87 ± .12 inch from the fully extended position and adjust the switch shaft counterclockwise at the adjusting screw (5) until the light goes out. When satisfactory adjustment is obtained, tighten the locking screw (4) and the retaining nut (2).
8. Recheck the landing gear travel to both dimensions described above before safety wiring the locking screw (4) to the switch arm.

ad. The landing gear position lights on the instrument panel are operated by uplock and downlock switches on each gear.

Main Gear: With the main landing gear fully extended, measure the distance between the uplock/downlock pivot



Nose Gear Deflection
Figure 205



Main Gear Downlock Switch Adjustment
Figure 206

points and the lift leg knee joint on the main landing gear as shown in Figure 206. Adjust the downlock switch (outboard side of gear) to actuate the in-transit light when the lift leg knee joint overcenter dimension is reduced by .15 ± .10 inch. With the landing gear fully retracted, adjust the uplock switches (inboard side of gear) to actuate the in-transit light when the actuator lacks five handcrank revolutions of being hard against the internal stop of the actuator. Adjust the switch as follows:

1. Handcrank the actuator until the sector gear contacts the internal stop.
2. Back the sector gear off the internal stop, by five revolutions of the handcrank.
3. Adjust the in-transit light switch to actuate in this position.

Nose Gear: With the nose gear fully extended adjust the downlock switch, located on the nose gear drag brace, so that the overtravel of the switch plunger is .050 to .125 inch after the actuation of the switch. Remove the wheel well access cover on the nose baggage compartment floor to gain access to the uplock switch. With the nose gear fully retracted, adjust the uplock switch (adjacent to the uplock hook) to actuate when the landing gear actuator lacks seven handcrank turns of being hard against the internal stop of the actuator. Adjust the switch as follows:

1. Handcrank the actuator until the sector gear is against the internal stop.
2. Back the sector gear off of the internal stop, by seven revolutions of the handcrank.
3. Adjust the uplock switch to actuate at this position.

ae. Recheck the limit switch adjustment and remove the airplane from the jack.

100-HOUR INSPECTION

RETRACT MECHANISM - Check the retraction system for proper operation of all components through at least two complete cycles. Check for unusual noises and evidence of binding.

DOORS AND LINKAGE - Check door operation, fit, rigging, and security.

POSITION INDICATORS - Check for security and adjustment of switches; wiring for breaks, condition of insulation and loose connections; indicators for proper indication.

WARNING HORN - Check for proper operation.

DOWNLOCKS - Check the main and nose gear deflection, the downlock switch for security and adjustment.

SAFETY SWITCH - Check for security and proper operation.

ACTUATOR - Check for unusual noises, binding, proper rigging.

LIMIT SWITCHES - Check for security and proper adjustment.

EMERGENCY EXTENSION - Check the system for freedom of operation and positive engagement of the downlocks.

"END"

WHEELS AND BRAKES - DESCRIPTION AND OPERATION

MAIN WHEEL ASSEMBLIES

The Duke is supplied with either Goodrich or Goodyear 6.50 x 8 wheel assemblies. (See TIRES for sizes, types and serial efeectivity.)

The wheel consists of an inner and outer magnesium wheel half held together with bolts, washers and nuts. The washers are used beneath the nuts and bolt heads to prevent galling and stress concentration.

A packing in the groove of the wheel halves provides a seal against air pressure. Bearing cups, cone bearings and seals are installed in the hub area. The Goodrich wheel assemblies are provided with balance weights; while both halves of the Goodyear wheel assembly are dynamically balanced. Identification and instruction plates are attached to both wheel halves.

Screws and safety wire retain sixteen torque keys in the slots of the flange area of the Goodrich inner wheel half; while fourteen keyway liners are riveted in place on the Goodyear inner wheel half. The torque keys/keyway liners retain the lugs of the brake disc which rotate with the wheel when the brake and wheel are mounted on the landing gear axle.

The wheel assemblies are secured to the axles with bushings, washers, nuts and cotter pins.

NOSE WHEEL ASSEMBLY

The Duke is supplied with either a Goodrich or Goodyear 6.00 x 6 wheel assembly mounting a 15.00 x 6.00 x 6, 4 ply, type VI, tube type tire. The wheel consists of an inner and outer wheel half. Goodrich wheels are manufactured of aluminum alloy; while Goodyear wheels are of magnesium. Both halves are held together with bolts, washers and nuts. Washers are used beneath the nuts and bolt heads to prevent galling and stress concentration.

Bearing cups, cone bearings and seals are installed in the hub area. Identification and instruction plates are installed on each Goodrich wheel half; while adhesive data and warning plates are installed on the outer Goodyear wheel half.

The wheel assembly is secured to the axle with a bushing, washer, nut and cotter pin.

TIRES

The main wheel tires supplied on the Duke, serials P-4 through P-189 and P-191, were 6.50 x 8, 8 ply tubeless, rim inflated tires. Later serials P-190, P-192 and after, and the earlier serials which have complied with Service Instructions No. 0536-203, are supplied with 19.50 x 6.75 x 8, 10 ply tube type tires.

The nose wheel tire supplied on the Duke is a 15.00 x 6.00 x 6, 4 ply, type VI, tube type tire.

BRAKE ASSEMBLY

Goodyear wheel and brake assemblies were supplied on serials P-4 through P-168. The later serials, P-169 and after, are supplied with Goodrich wheel and brake assemblies.

Both brake assemblies are designed for use with MIL-H-5606 hydraulic fluid (13, Chart 207, 91-00-00) to withstand 550 to 600 psi operational pressure with zero psi back pressure.

The Goodyear brake contains two rotating brake discs, which are keyed to rotate with the wheel, a stationary disc, pressure plate and back plate which are attached to the brake housing. Braking action occurs when hydraulic pressure is applied to the five small pistsons in the brake housing which force the disc stack together, creating friction between the rotating discs and the stationary parts. The pistons are sealed against leakage with packings. Indicator pins are used to determine brake wear. The brake assemblies are interchangeable between right and left by changing the location of the bleeder adapter.

The Goodrich brake contains one rotating brake disc, which is keyed to rotate with the wheel, two carrier linings, a torque plate and three piston insulators which are attached to the piston housing. Braking action occurs when hydraulic pressure is applied to the three small pistons in the piston housing which force the carrier linings together, creating friction between the rotating disc and stationary parts. The pistons are sealed against leakage with preformed packings. The brake assemblies are interchangeable between right and left by changing the location of the bleeder adapter.

HYDRAULIC BRAKE SYSTEM

Dual braking (pilot and copilot) is standard on serials P-4 through P-45. On serials P-46 and after, dual brakes are optional. The following description and operation discusses the dual braking system.

The dual hydraulic brakes are operated by either depressing the pilots or copilots rudder pedal. A shuttle valve adjacent to each set of pedals permits changing of braking action from one set of pedals to the other. The depression of either set of pedals compresses the piston rod of the attached master cylinder. The hydraulic pressure resulting from the movement of the pistons in the master cylinder is transmitted through flexible hoses and fixed aluminum tubing to the brake disc assemblies mounted on each main landing gear. This pressure forces the brake pistons to press against the linings and disc(s) of the brake assembly. Upon release of pressure against the pistons, the brake disc(s) will

have a tendency to drag against the stationary liners.

Dual parking brake valves are installed adjacent to the rudder pedals between the master cylinders of the pilot's rudder pedals and the wheel brake assemblies. After the pilot's pedals have been depressed to build up pressure in the brake lines, both valves can be closed simultaneously by pulling out the parking brake handle. This closes the valves and retains the pressure in the brake lines. The parking brake is released when the parking brake handle is pushed in and the pedals are depressed briefly to equalize the pressure on both sides of the valves, allowing them to open.

"END"

TROUBLESHOOTING
BRAKE SYSTEM

	TROUBLE		*PROBABLE CAUSE*		*REMARKS*
1.	Solid pedal and no brakes.	a.	Brake lining worn beyond allowable limit.	a.	Replace lining.
2.	Spongy brake.	a.	Air in system.	a.	Bleed brake system.
3.	Unable to hold pressure.	a.	Leak in brake system.	a.	Visually check entire system for evidence of leaks.
				b.	Check master cylinder seals, replace if scored
4.	Parking brake will not hold.	a.	Air in system.	a.	Bleed brake system.
		b.	Defective parking brake valve.	b.	Replace the valve.
5.	Brakes grab.	a.	Stones or foreign matter locking brake disc.	a.	Clean brake disc and lining.
		b.	Warped or bent disc.	b.	Replace disc.

"END"

WHEELS AND BRAKES - MAINTENANCE PRACTICES

MAIN WHEEL AND TIRE

The wheel and tire assembly is shipped from the factory completely assembled. The bearings are packed with the proper grease and may be installed as received.

NOTE

Extended storage of the lubricated bearings may require relubrication. If this is necessary, refer to the applicable Wheel and Brake Manual (P/N 98-32751 or 98-34998) for instructions.

Install the main wheel and tire assembly on the axle as follows:

a. Visually check the nut and axle for burrs and rough threads.

b. Apply Aeroshell 5 grease (38, Chart 207, 91-00-00) to the threads and all bearing surfaces.

c. Install the wheel and tire assembly with bushing, washer and nut.

NOTE

Make sure that the brake disc lugs engage the slots of the inner wheel half. Rotate the wheel while adjusting the axle nut to assure proper seating and check to see that there is no side motion.

d. While rotating the wheel, torque the axle nut to 250-300 inch-pounds to ensure that the bearings are properly seated, then back off the axle nut to zero torque.

e. While rotating the wheel, retighten the axle nut to 125-145 inch-pounds of torque in one continuous rotation before checking for alignment of the locking holes and installing the cotter pin.

f. If necessary, continue tightening the nut to the next available cotter pin position and install a new cotter pin.

MAIN WHEEL INSPECTION

On the fifth tire change after a new wheel has been installed, then on each third subsequent tire change up to a total of 20 tire changes and on each tire change thereafter, the wheel and tire should be removed from the airplane, disassembled, and inspected in accordance with the applicable vendor wheel and brake manual. Bolts should be magnafluxed for cracks or breaks, and the wheel halves should be dye-checked or fluorescent penetrant inspected.

The following inspections may be accomplished with the wheel on the airplane:

a. Inspect wheel half flanges for cracks and corrosion. Smooth minor abrasions, nicks and burrs with a fine file or emery cloth, removing as little metal as possible. Chemically treat and coat the surfaces as instructed in the applicable Wheel and Brake Manual.

b. Check for loose or missing bolts and nuts. Retighten or replace as necessary.

CAUTION

Wheels with loose or missing bolts should be removed from the airplane and fluorescent inspected for cracks.

c. Inspect for excessively worn or loose torque keys or keyway liners.

NOSE WHEEL AND TIRE

The wheel and tire assembly is shipped from the factory completely assembled. The bearings are packed with the proper grease and may be installed as received.

NOTE

Extended storage of the lubricated bearings may require relubrication. If this is necessary, refer to the applicable Wheel and Brake Manual (P/N 98-32751 or 98-34998) for instructions.

Install the nose wheel and tire assembly on the axle as follows:

a. Visually check the nut and axle for burrs and rough threads.

b. Apply Aeroshell 5 grease (38, Chart 207, 91-00-00) to the threads and bearing surfaces.

c. Install the wheel and tire assembly with bushing, washer and nut.

d. While rotating the wheel, tighten the axle nut to 250 to 300 inch-pounds torque to ensure that bearings are properly seated. Back off the nut to zero torque. While rotating the wheel, retighten the axle nut to 125 to 145 inch-pounds torque in one continuous rotation. Using a wrench, tighten the nut to the next cotter pin location and install a new cotter pin.

NOSE WHEEL INSPECTION

On the fifth tire change after a new wheel has been installed, then on each third subsequent tire change up to a total of 20 tire changes and on each tire change thereafter, the wheel and tire should be removed from the airplane, disassembled, and inspected in accordance with the applicable vendor Wheel and Brake Manual. Bolts should be magnafluxed for cracks or breaks, and the wheel halves should be dye-check or fluorescent penetrant inspected.

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b. Check for loose or missing bolts and nuts. Retighten or replace as necessary.

CAUTION

Wheels with loose or missing bolts should be removed from the airplane and fluorescent penetrant inspected for cracks.

c. Inspect for excessively worn or loose torque keys or keyway liners.

TIRE VALVE - TUBELESS TIRES

To replace a valve core, use the standard extraction tool to unscrew the valve core. If the stem or its attaching parts require replacement, dismount and disassemble the wheel and tire in accordance with the instructions in the applicable Wheel and Brake Manual. Replace parts as necessary.

HYDRAULIC BRAKE SYSTEM

Brake system servicing is limited primarily to maintaining the correct fluid level in the reservoir. (Refer to Chapter 12-20-00.) The other requirement related to servicing involves inspecting the wheel brake assemblies for wear.

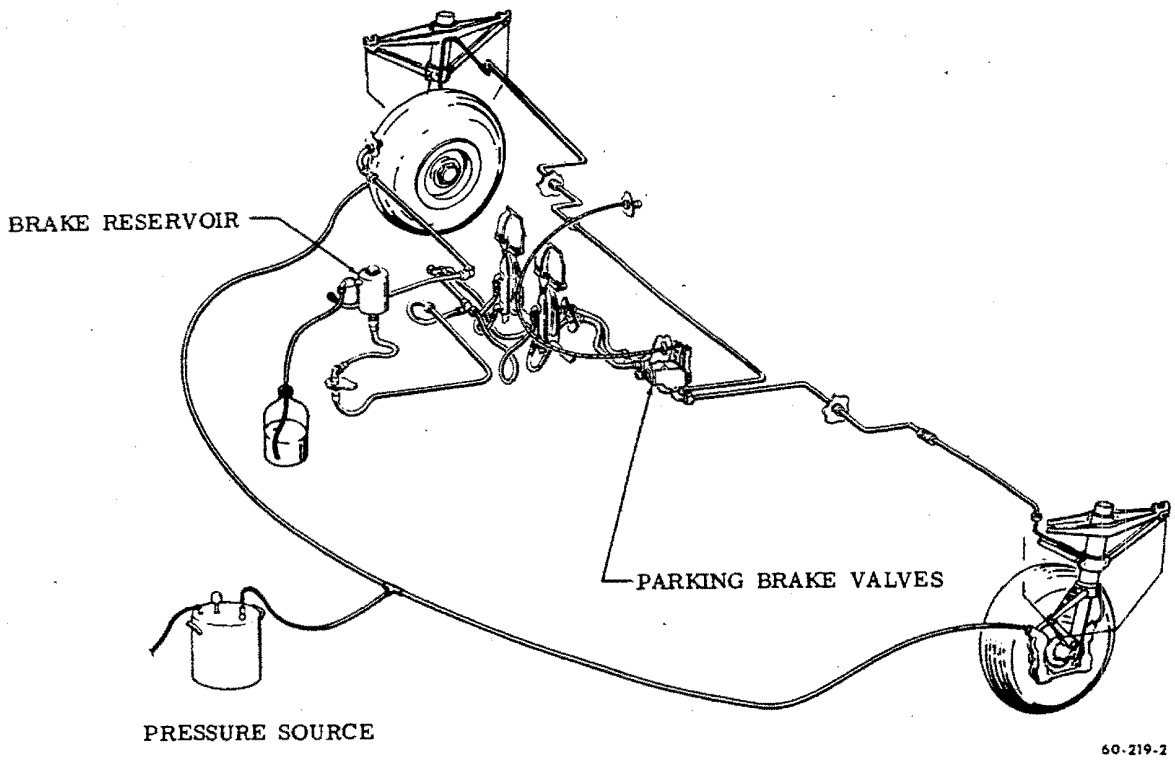
BRAKE SYSTEM BLEEDING

Brake system bleeding will be required whenever the system is opened at any point between the master cylinder and the wheel brake assembly, whenever the brakes become spongy in service, or wherever the parking brakes will no longer hold. In the latter instance, the system should be further checked for leakage.

Use only MIL-H-5606 hydraulic fluid (13, Chart 207, 91-00-00) in the brake system, and ensure that no dirt or foreign matter is allowed to get into the brake system. Dirt can get under seals and cause leaks or clog the compensating ports in the master cylinders and cause the brakes to lock.

Beech Aircraft recommends the use of pressure pot brake bleeding. If the pressure pot bleeding method is not avaliable, electric bleeding is recommended. Use the gravity method only if the other two methods are not available. If the gravity system is used, pressure bleed the brakes at the earliest possible time. Using any method, the parking brake lever and toe brake pedals must both be fully released to open the compensating ports in the brake master cylinders.

If the brakes feel soft or "spongy" after the bleeding operation, air may be trapped in the cylinders. Remove the brake and lay



Pressure Bleeding Brake System
Figure 201

it on its side. Add brake fluid as needed through the bleed port and tap the brake lightly with a rubber hammer to dislodge any air bubbles. When air bubbles no longer appear at the port, install the brake and repeat the bleeding procedure.

BRAKE SYSTEM PRESSURE BLEEDING

Pressure bleeding is the most efficient method of bleeding the brake system and is also the recommended method. This procedure involves attaching a pressure pot to the brake assembly bleeder ports and back bleeding the system to the fluid reservoir. Procedures for utilizing the preferred pressure pot, the electric bleeder and the gravity bleed method are outlined below.

Brake System Bleeding Using the Pressure Pot Method (Figure 201).

NOTE

The line hook-up for pressure pot bleeding is the same as shown in Figure 201 except the electric bleeder is replaced with a pressure pot.

a. Disconnect the pressure equalization line from the reservoir and attach an extension line approximately three feet in length.

b. Place the end of the extension line in a clean receptacle to collect the brake fluid overflow.

c. Cut the safety wire and remove the screws from the bleeder ports of each brake assembly. Install a bleeder hose adapter into each brake bleeder port.

Fabricate a bleeder hose assembly for each set of brakes; connect the bleeder hose assemblies between the bleeder hose adapters and the pressure lines of the pressure pot.

d. Apply a constant pressure of approximately 15 pounds to the pressure pot. Open the pressure pot control valve.

e. Bleed the system until the draining fluid is free of air bubbles.

f. Close the pressure pot valve. Remove the bleeder hose adapters and hose assemblies from each landing gear. Install the screws into the bleeder ports of each brake assembly and safety wire.

g. Remove the extension line from the pressure equalization port on the reservoir.

h. Connect the pressure equalization line to the reservoir.

i. Remove the cap from the hydraulic fluid reservoir and add MIL-H-5606 hydraulic fluid (13, Chart 207, 91-00-00) as required to obtain a full reading.

j. Check the operation of the brakes. There should be no soft or spongy feeling at the brake pedals and the pedal pressure should be equal on both brakes.

Brake System Bleeding Using the Electric Bleeder Method

a. Disconnect the pressure equalization line from the reservoir and attach the electric bleeder fluid return line to the reservoir.

b. Cut the safety wire and remove the screws from the bleeder ports of each brake assembly. Install a bleeder hose adapter into each brake bleeder port. Fabricate a bleeder hose assembly for each set of brakes; connect the bleeder hose assemblies between the bleeder hose adapters and the pressure lines of the pressure pot.

c. Activate the bleeder and set the relief valve to approximately 15 pounds; this may be ascertained by observing the pressure gage prior to opening the electric bleeder control valve.

d. Open the electric bleeder contro valve and observe the returning flui through the inline sight glass. Pumpin the pilot's and copilot's pedals durin the bleeding process may help to dislodg any air bubbles trapped in the maste cylinders.

e. When the returning fluid shows n further evidence of air bubbles, close th electric bleeder control valve.

f. Disconnect the fluid infusio lines from the bleeder hose assemblies an remove the bleeder hose assemblies an adapters from the brake assemblies Install the screws into the bleeder port of each brake assembly and safety wire.

g. Disconnect the fluid return lin from the brake fluid reservoir and recon nect the pressure equalization line.

h. Check the brake reservoir flui level and add MIL-H-5606 hydraulic flui (13, Chart 207, 91-00-00) as required t obtain a full reading.

i. Check the operation of the brakes When the brake pedals are depressed ther should be no spongy feeling and the peda pressure should be equal on both brakes.

Brake System Bleeding Using th Gravity Bleeding Method

This method of bleeding is done from th master cylinder down to the brake assem bly. The brake fluid reservoir must b kept full during the bleeding operation Since the pilot's and copilot's maste cylinders are plumbed in series, th entire system may be bled by operating th pilot's brake pedals in the followir manner:

a. Cut the safety wire and open th bleeder port screws of both brake assem blies on one landing gear.

b. Depress the pilot's correspondir brake pedal slowly and smoothly to elimi nate air trapped in the system.

c. Hold the brake pedal in the depressed position and close the bleeder port screws at the brake assemblies.

d. Release the brake pedal.

e. Repeat steps "a, b, c, and d" until no more air bubbles appear in the drained fluid.

f. Open the bleeder port screws of both brake assemblies on the other landing gear and repeat steps "a, b, c, and d", depressing the other brake pedal until no more air bubbles appear in the drained fluid.

g. Tighten the bleeder port screws at all four brake assemblies and safety wire.

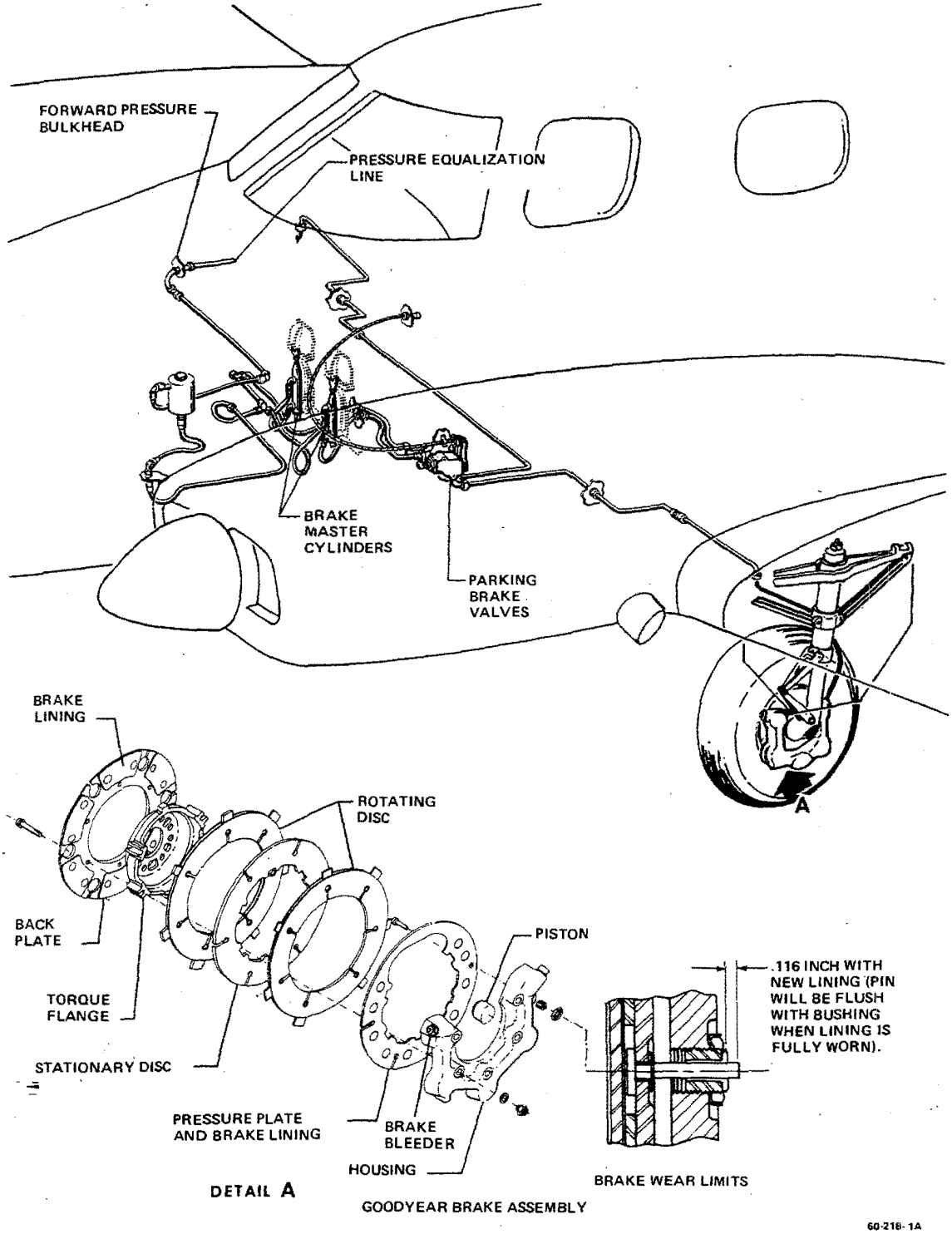
h. Check the brake reservoir fluid level and add MIL-H-5606 hydraulic fluid (13, Chart 207, 91-00-00) as required to obtain a full reading.

i. Check the brakes for proper operation. When the brake pedals are depressed there should be no spongy feeling and the pedal pressure should be equal for both brakes.

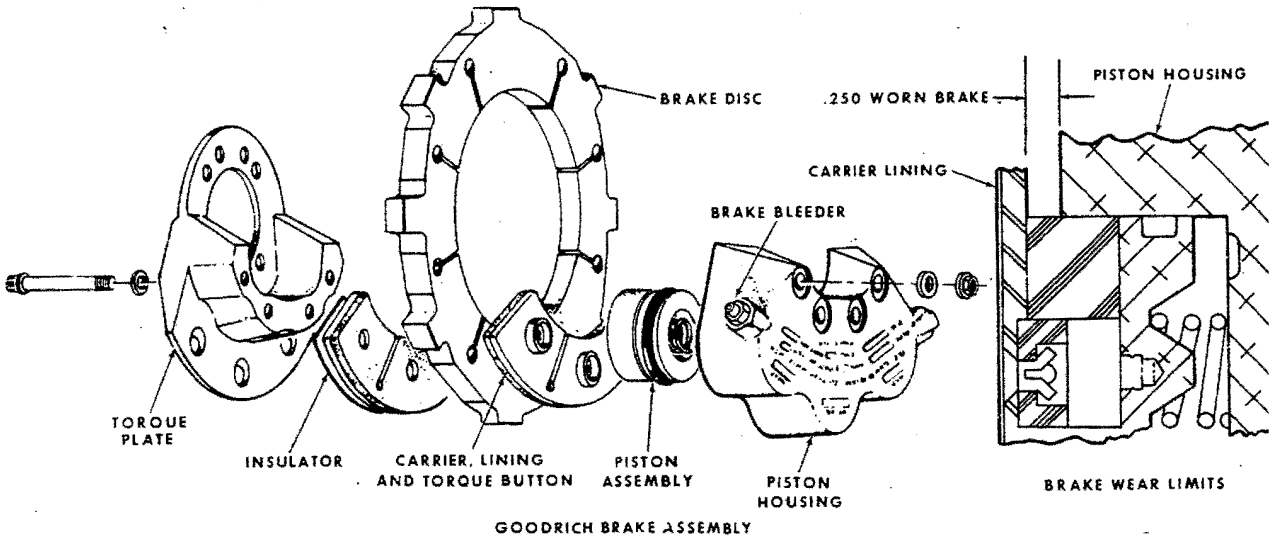
DUAL BRAKE SYSTEM BLEEDING

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 pedals to change the shuttle valve position. This causes hydraulic fluid to be routed through the copilot's system and this sytem 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.



Brake System (Sheet 1 of 2)
Figure 202



Brake System (Sheet 2 of 2)
Figure 202

BRAKE ASSEMBLY REMOVAL
(Figure 202)

a. Place the airplane on a jack.

b. Remove the cotter pin, wheel retaining nut, washer and bushing. Slide the wheel off the axle.

c. Disconnect the brake hydraulic line and cap the open line and port. Remove the bolts securing the brake housing to the landing gear torque flange. Slide the brake off the axle.

BRAKE ASSEMBLY INSTALLATION

a. Slide the brake assembly onto the axle and install the bolts attaching the brake housing to the landing gear torque flange. Tighten the bolts to 340 to 360 inch-pounds of torque.

b. Connect the brake hydraulic line.

c. Clean and repack the wheel bearings with Aeroshell 5 grease (38, Chart 207, 91-00-00) and slide the wheel on the axle. Install the bushing, washer and wheel retaining nut.

d. While rotating the wheel, tight the axle nut to 250-300 inch-pounds torq to ensure that bearings are proper seated.

e. Back off the axle nut to ze torque.

f. While rotating the whee retighten the axle nut to 125 to 1 inch-pounds torque in one continuo rotation.

g. Using a wrench, tighten the n to the next available cotter pin positi and install a new cotter pin.

h. Bleed the brake system.

BRAKE WEAR LIMITS (GOODYEAR)

A brake wear indicator pin is attach to the pressure plate on each brake. T pin moves with the pressure plate as t brakes are applied. When the brakes a applied and the indicator pin is flu with its bushing, the lining has reach its wear limit. The indicator pin wi measure 0.116 inch above the top of t

its wear limit. The indicator pin will measure 0.116 inch above the top of the bushing when new brake linings are installed and the brakes are applied.

BRAKE WEAR LIMITS (GOODRICH)

If a measurement of .250 inch or more is noted between the piston housing and carrier lining, the brake assembly requires a lining inspection. If the carrier and lining thickness is under .180 inch, the brake assembly should be overhauled in accordance with the Wheel and Brake Manual (P/N 98-34998).

BRAKE MASTER CYLINDER REMOVAL

a. Close the parking brake valve by placing the control in the ON position.

b. Unsnap the floor mat and remove the floorboard section below the brake pedals.

c. Disconnect the two brake hydraulic lines at each master cylinder and mark the lines to assure correct reinstallation.

d. Remove the master cylinder attaching bolts and nuts and remove the master cylinder.

e. If new master cylinders are to installed, note the positions of the master cylinder 45-degree elbow fittings.

BRAKE MASTER CYLINDER INSTALLATION

a. Install the master cylinder with attaching bolts and nuts.

b. Connect the two brake hydraulic lines at each master cylinder as noted during removal.

c. Install the floorboard and the foor mat.

d. Open the parking brake valve by placing the control in the OFF position.

e. Service the brake reservoir and bleed the brake system.

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 bulkhead 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.

PARKING BRAKE VALVE REMOVAL

a. Bleed the brake system of all hydraulic fluid.

b. Remove the floorboards forward of the pilot's and copilot's seats.

c. Disconnect the parking brake cable from the parking brake valve by loosening the set screw and pulling the cable free of the cable attach fitting.

d. Disconnect and cap the hydraulic lines from the parking brake valve.

e. Remove the attach bolts and remove the valve.

PARKING BRAKE VALVE INSTALLATION

a. Install the parking brake valve with the attaching bolts.

b. Connect the hydraulic lines to the valve.

c. Connect the parking brake cable to the valve by engaging the cable to the attach fitting ad tightening the set screw.

d. Install the floorboards forward of the pilot's and copilot's seats.

e. Service the hydraulic reservoir and bleed the brake system.

PARKING BRAKE ADJUSTMENT

a. Place the parking brake control in the off (valve open) position.

b. Remove the floorboards forward of the pilot's seats.

c. Loosen the set screw in the cable attach fitting and adjust the cable housing through the mounting block to obtain 1-1/2 inch travel between the cable housing and the cable attach fittings. The 1-1/2 inch clearance should be made with the parking brake valve lever in the open position.

d. Tighten the mounting block, insert the cable in the cable attach fitting, tighten and safety wire the set screw in the attach fitting.

e. Test the parking brake adjustment by pulling the parking brake handle out and operating the brake pedals.

f. If the brake pedals are not solid, place the parking brake control in the off position and recheck the rigging.

g. Inspect the parking brake valve for hydraulic fluid loss.

100-HOUR INSPECTION

WHEELS AND TIRES

a. Visually inspect wheels for cracks, nicks and general condition.

b. Check the wheels for loose or missing parts.

c. Inspect tires for breaks, blisters and excessive wear.

d. Check tires for proper inflation as instructed in Chapter 12-20-00.

NOTE

In service, the tire grows slightly due to shock loads during landing. Normally, this growth is balanced by tread wear so there is no increase in tire diameter.

NOTE

The use of recapped tires is not recommended by Beech Aircraft Corporation. The tires may pass the retraction test when first installed; however, recapped tires have a tendency to swell after use and may cause malfunction of the retract system or damage to the landing gear doors.

BRAKES

Check brake discs, linings and lines for wear, corrosion and security, brake housing, valves and lines for leakage.

"END"

STEERING - MAINTENANCE PRACTICES

Direct linkage to the rudder pedals allows the nose wheel to turn 15° each side of neutral position. Spring mechanisms in the linkage dampen excessive shock loads to the rudder pedals. When the landing gear is retracted, the nose wheel is automatically centered.

Friction of the nose wheel against the ground, while the airplane is static, inhibits the turning movement. Proper turning may be accomplished smoothly by allowing the airplane to roll and lightly depressing the appropriate rudder pedal.

ADJUSTMENT

a. With the airplane on jacks, turn the nose wheel as far to the left as the rudder pedal will permit. Check for a 15° travel from neutral position. If proper travel is not obtained, proceed as follows:

1. Disconnect the nose steering linkage at the nose steering bell crank.
2. Loosen the jam nut and thread the rod end in or out, as necessary, to obtain the proper travel.
3. Tighten the jam nut and connect the steering linkage to the bell crank.

b. Adjust the shimmy damper as follows:

1. Disconnect the shimmy damper at the steering yoke.
2. Turn the nose wheel as far to the left as the rudder will permit.
3. Adjust the shimmy damper piston to extend 1/16 to 1/4-inch beyond the attach point on the steering yoke.
4. Connect the shimmy damper to the steering yoke and tighten the jam nut on the piston rod.

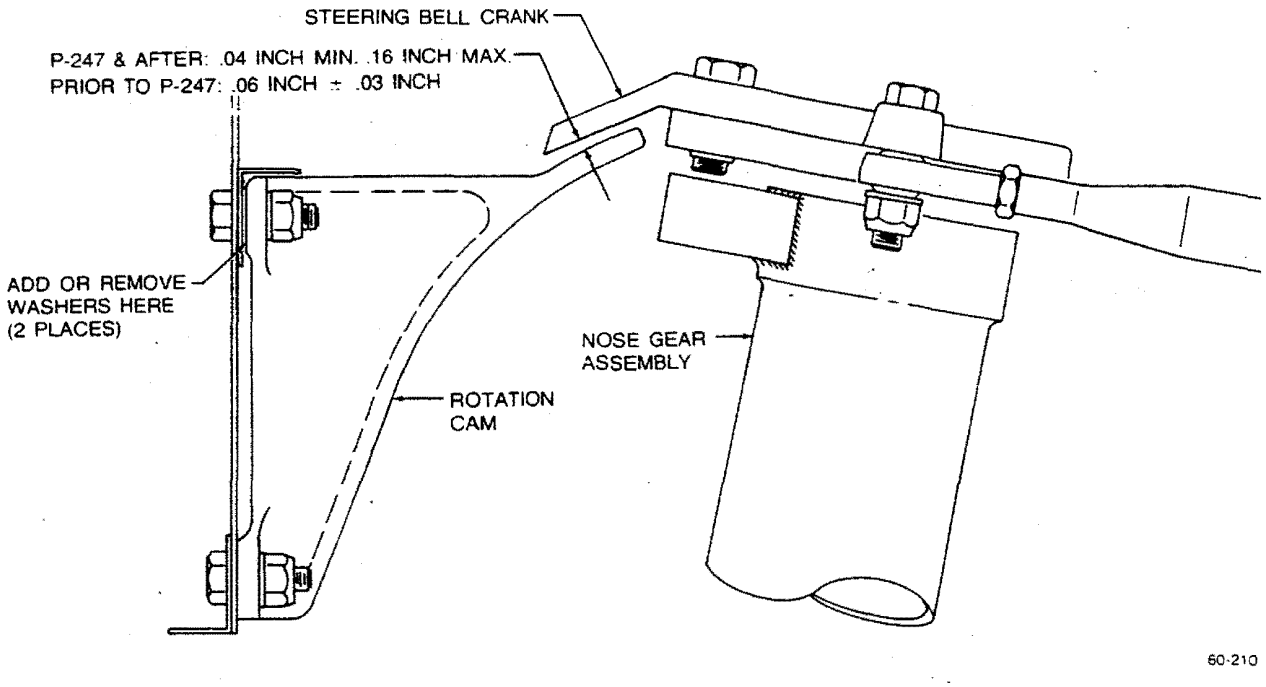
c. Adjust the steering bell crank clearance as follows:

1. Refer to Figure 201 and check the clearance between the bell crank and the rotation cam with the steering bell crank turned as far to the left and right (normal steering) as the rudder pedals will allow. Airplane serials prior to P-247 should have a clearance of .06 ± .03 inch. Airplane serials P-247 and after should have a clearance of .04 inch minimum and .16 inch maximum. Check the clearance with the bell crank in both the left and right positions.
2. If the clearance is other than the noted dimensions, AN960-416 or AN960-416L washers may be removed or added behind the rotation cam as required to maintain the correct clearance (refer to Figure 201). Up to a maximum of two AN960-416 and a maximum of four AN960-416L washers may be placed behind the rotation cam (2 places).

100-HOUR INSPECTION

STEERING LINKAGE - Check nose steering mechanism for condition, security and correct adjustment.

NOSE GEAR STEERING - Check the steering bell crank for cracks, condition, security and correct clearance.



Steering Bell Crank Clearance
Figure 201

"END"

POSITION AND WARNING - MAINTENANCE PRACTICES

SAFETY SYSTEM

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

a. Place the throttle in the closed or retarded position.

b. Place the battery master switch ON. The landing gear circuit breaker may be either in or out.

c. 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. The microswitch may then be adjusted as follows.

a. With the airplane in flight, mark the throttle control at the control console when the manifold pressure gage registers approximately 17 ± 1 in. Hg.

b. With the airplane on the ground, move the throttle until the mark on the control is aligned with the control console as accomplished in step "a".

c. 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 the switch in question fails to actuate at an airspeed within 2 knots 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.

a. Place the airplane on jacks.

b. With the master switch ON, the landing gear circuit breaker in, and the landing gear warning circuit-breaker out, advance the throttle to its maximum position.

c. Place the landing gear safety position switch in the ON position.

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

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

f. Crimp the end of the tubing and roll it up until the airspeed indicator registers 85 ± 2 knots. 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.

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

1. Secure the rolled up tubing so that it will hold the airspeed indicator reading at 85 ± 2 knots.

2. Connect a continuity tester across the contacts of the pressure switch, then turn the adjustment screw until the switch closes at 85 ± 2 knots on the airspeed indicator.

h. Turn the master switch ON and roll up the rubber tubing until the airspeed indicator registers 130 kts. (to allow the switch to reset), then secure the tubing so that the airspeed indicator will hold that reading.

i. Retard the throttle.

j. Slowly bleed off pressure, until the airspeed indicator registers 120 ± 2 knots. The landing gear will extend immediately if the pressure switch is properly adjusted.

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

1. Secure the rolled tubing so that it will hold the airspeed indicator reading at 120 ± 2 knots.

2. Connect a continuity tester across the contacts of the pressure switch, then turn the adjustment screw until the switch closes at the 120 ± 2 knots reading on the airspeed indicator.

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

LANDING GEAR LIMIT SWITCHES - ADJUSTMENT

a. When adjusting the landing gear limit switches, observe the following precautions.

1. Do not allow the actuator to run full cycle into the internal stops as this may damage the sector gear. Adjust the limit switches for an early shut-down if this is considered a possibility.

2. Do not reverse the landing gear direction of travel without bringing the gear to a complete stop. If the direction of travel is reversed using the landing gear selector switch, damage to the sector gear may result.

3. Use the landing gear relay circuit breaker to start or stop the landing gear during rigging.

4. Battery voltage is not sufficient to properly cycle the landing gear during rigging. 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.

5. Do not operate the landing motor without proper cooling as this may damage the motor. Allow 5 minutes cooling time after each extension and retraction cycle.

6. After making an adjustment to the limit switches, operate the landing gear intermittently as the system nears the limits of the extension/retraction cycle to prevent damage due to overtravel.

7. Do not jack the airplane if an unbalanced condition exists. The fuel should be evenly distributed in the wings.

b. Adjust the landing gear limit switches as follows:

1. Place the airplane on jacks. Allow adequate floor clearance for the wheels during the retraction or extension cycle.

NOTE

The actuators (used on serials P-577 and after) may be installed on earlier airplanes. The new actuator is identified by part number 60-810030-5 or -7 and white paint on the upper actuator arm, and on the upper and lower actuator housing.

2. Retract the landing gear to its 2/3 position, then stop and inch the gear the remaining distai to the uplimit switch by intermittent operation of the land gear relay circuit breaker. Check the emergency hand cr for 1/8 to 1/4 turn (or 5/8 to 3/4 turn on airplanes using 810030-5 or -7 white actuators) free counterclockw movement before the sector gear contacts the geart internal stop. If proper internal clearance is not obtain adjust the landing gear uplimit switch. Locate the land gear uplimit switch adjustment screw on the actuator a and adjust the screw to stop the landing gear on its up cy at the point where proper internal clearance is maintain

CAUTION

The gearbox may be damaged if allowed to run full cycle into the internal stops. To preclude this possibility, the limit switches should initially be adjusted aft, for an early shut-down, if an out-of-adjustment condition is suspected.

NOTE

All adjustment and rigging of limit switches should be accomplished using an external power source adjusted to 28.25 ± .25 volt. Due to overtravel, the landing gear will not stop at the same position that the limit switches are actuated.

NOTE

On series P-139 and after, there are two switch assemblies, one on each side of the actuator.

3. Extend the landing gear to its 2/3 dc position, then stop and inch the gear the remaining distai to the downlimit switch by intermittent operation of landing gear relay circuit breaker. Check the emerge hand crank for 1/8 to 1/4 turn counterclockwise (5/8 to turn with 60-810030-5 or -7 white actuators) before sector gear contacts the gearbox internal stop. If pro internal clearance is not obtained, locate the landing g downlimit switch adjustment screw on the upper arm of

landing gear actuator, and adjust the screw to stop the landing gear on its down cycle at the point where proper internal clearance is achieved.

WARNING

Do not operate the hand crank with the power on.

4. Extend and retract the gear two or three times to assure that the switches are correctly set. Check the hand crank each time to assure a free movement of 1/8 to 1/4 turn (5/8 to 3/4 turn on airplanes using 60-810030-5 or -7 white actuators) before the sector gear contacts the internal stop.

LANDING GEAR SAFETY SWITCH ADJUSTMENT

With the gear down, check the adjustment of the safety switch. Refer to the Landing Gear Illustration Figure 201 in 32-30-00, while adjusting the switch.

a. Remove the safety switch actuator rod (1) from the attaching bracket on the upper torque knee, then remove the retaining nut (2) and switch arm (3) from the switch shaft.

b. Jack the landing gear so the shock strut is compressed to .50 ± .12 inch from the extended position.

c. Connect the wire leads from a test light to pins inserted into the splices at wires number 1 and 3 (about 10 inches up from the safety switch).

d. Rotate the switch shaft clockwise until the test light comes on.

e. Remove the safety wire from the locking screw (4) on the switch arm (3) and back off the locking screw (4).

f. Install the switch arm (3) on the switch shaft in a position parallel to the upper torque knee and adjust the actuating rod end (1) to align with the attaching bracket on the torque knee. Install the actuating rod connecting bolt.

g. Position the shock strut to .87 ± .12 inch from the fully extended position and adjust the switch shaft counterclockwise at the adjusting screw (5) until the light goes out. When satisfactory adjustment is obtained, tighten the locking screw (4) and the retaining nut (2).

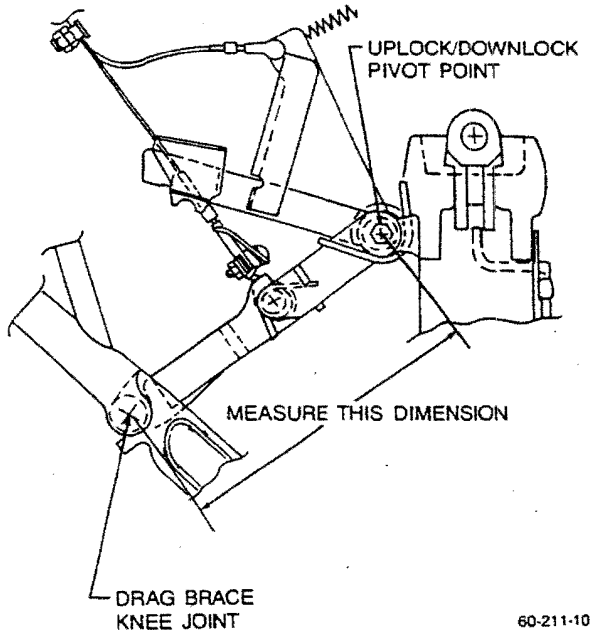
h. Recheck the landing gear travel to both dimensions described above before safety wiring the locking screw (4) to the switch arm.

LANDING GEAR POSITION LIGHTS ADJUSTMENT

The landing gear position lights on the instrument panel are operated by the uplock and downlock switches located on each landing gear.

a. Main Gear: With the main landing gear fully extended, measure the distance between the uplock/downlock pivot points and the lift leg knee joint on the main landing gear as shown in Figure 201. Adjust the downlock switch (outboard side of gear) to actuate the in-transit light when the lift leg knee joint overcenter dimension is reduced by .15 ± .10 inch. With the landing gear fully retracted adjust the uplock switches (inboard side of gear) to actuate the in-transit light when the actuator lacks five handcrank revolutions of being hard against the internal stop of the actuator. Adjust the switch as follows:

1. Handcrank the actuator until the sector gear contacts the internal stop.



Main Gear Downlock Switch Adjustment
Figure 201

2. Back the sector gear off the internal stop, by five revolutions of the handcrank.

3. Adjust the in-transit light switch to actuate in this position.

b. Nose Gear: With the nose gear fully extended adjust the downlock switch, located on the nose gear drag brace, so that the overtravel of the switch plunger is .050 to .125 inch after the actuation of the switch. Remove the wheel well access cover on the nose baggage compartment floor to gain access to the uplock switch. With the nose gear fully retracted, adjust the uplock switch (adjacent to the uplock hook) to actuate when the landing gear actuator lacks seven handcrank turns of being hard against the internal stop of the actuator. Adjust the switch as follows:

1. Handcrank the actuator until the sector gear is against the internal stop.

2. Back the sector gear off of the internal stop by seven revolutions of the handcrank.

3. Adjust the uplock switch to actuate at this position.

"END"