



Piper Aircraft Corporation
Lock Haven, Pennsylvania, U.S.A.

"F.A.A. APPROVED"

SERVICE BULLETIN

No. 289

PIPER CONSIDERS
COMPLIANCE MANDATORY.

February 17, 1969

<u>Subject:</u>	Elevator Control System Friction
<u>Models Affected:</u>	PA-31 and PA-31-300 Navajo
<u>Serial Numbers Affected:</u>	31-2 to 31-326 incl., 31-328 to 31-332 incl., 31-334
<u>Compliance Time:</u>	Prior to but not later than the next 100 hours of operation
<u>Purpose:</u>	Provide instructions for checking and reducing, if necessary, the total friction in the elevator control system and the readjustment of the elevator bungee spring.
<u>Instructions:</u>	<p>Adjust the elevator bungee spring to 30 pounds \pm 1 per attached instructions.</p> <p>Using a spring scale of approximately fifty (50) pounds capacity determine that the total friction in the elevator control system does not exceed seven (7) pounds. If the frictional value exceeds seven (7) pounds, see attached sketch and instructions.</p>
<u>Material Required:</u>	Not applicable
<u>Availability of Parts:</u>	Not applicable
<u>Material Allowance:</u>	Not applicable
<u>Labor Allowance:</u>	<p>Refer to attached instructions (Sections I through V, incl.) for the following labor allowance scale:</p> <p>Section I: Two (2) Hours</p> <p>Section II: One (1) Hour</p> <p>Section III: Two (2) Hours</p> <p>Section IV: Two (2) Hours</p> <p>Section V: Five (5) Hours</p> <p>Comply with Warranty and Credit Claim Procedures</p>
<u>Labor Allowance Termination Date:</u>	August 31, 1969

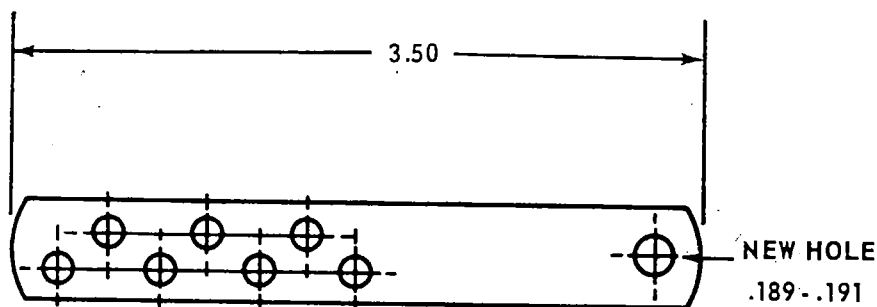
NOTE

Compliance Cards will be furnished to distributors in amounts relative to the number of affected aircraft in each distributors area. Following compliance with this bulletin, this compliance card must accompany a properly completed warranty and credit claim.

INSTRUCTIONS

SECTION I

1. Remove the bottom section of the fuselage tail fairing. The top section provides a reference point and should not be removed.
 - (a) Reference PA-31 Navajo Service Manual, Page 5-20, Figure 5-5, Sketch C. Attach a 1 lb. increment spring scale to the aft end of the elevator bungee spring, Item 16, and determine the spring tension as installed. The elevators must be positioned as shown in Sketch A when measuring the spring tension.
 - (b) If the spring tension is less than 30 lbs. ± 1 , determine if 30 lbs. ± 1 can be obtained by repositioning the spring in one of the adjusting holes in the link, Item 17, part number 42376-00.
 - (c) If the proper tension cannot be obtained, proceed with the following steps:
2. Remove the link from the aircraft and modify to conform with the sketch below:



- (a) When the modification of the link is complete, reinstall the link in its original location, attaching the aft end only to the elevator control tube.
- (b) With the elevators positioned as shown in Sketch A; attach a 1 lb. increment spring scale to the aft end of the elevator bungee spring, reference Item 1 (b), and exert a force on the scale until a reading of 30 lbs. is obtained. Mark the hole in the forward

part of the link that most nearly aligns with the rearmost point of the spring while a spring scale reading of 30 lbs. is maintained. Remove the scale from the spring and install the rear loop of the spring through the hole that has been marked. This will result in an elevator bungee spring tension of 30 lbs. ± 1 when the elevators are positioned as illustrated in Sketch A.

SECTION II

1. Using a 1 lb. increment spring scale, determine the actual friction in the elevator control system by the following procedure:

- (a) Attach the spring scale to the inboard trailing edge of the elevator as shown in Sketch A.
- (b) With the spring scale attached, position the elevator trailing edge down approximately 2 inches from the reference position.
- (c) Record the force (see Note 2) required to raise the elevator through the reference position until the trailing edge is approximately 2 inches above the reference position.
EXAMPLE: 22 lbs. to raise; read at reference position.
- (d) Record the restraining force lowering the elevator from the 2 inch up position through the reference position to the original 2 inch down position.
EXAMPLE: 16 lbs. to lower; read at reference position.
- (e) Repeat the above raising and lowering process until average forces are obtained.
- (f) The "total friction" is obtained by subtracting the 2 forces.

EXAMPLE: 22 lbs. - 16 lbs. = 6 lbs. "Total Friction."

NOTES

1. Do not exceed 60 pounds force for any measurement.
2. The elevator shall be rotated with a steady movement and the force reading taken when the elevator is passing through the

reference position. Do not stop rotating when taking the reading.

- (g) If the friction in the elevator control system does not exceed 7 lbs., Service Bulletin No. 289 is complied with and no further action is required.
- (h) If the system friction exceeds 7 lbs., continue with Section III of these instructions:

SECTION III

1. Reference Service Manual Page 5-20, Figure 5-5, Sketch "C", disconnect the elevator control arm, Item 18, from the elevator control tube, Item 15.
 - (a) Lubricate the elevator hinges as per the lubrication chart, reference Figure 2-13.
 - (b) Lubricate the tab hinges and the tab actuator fork end where it attaches to the tab horn. Determine that the bolt securing the tab actuator rod to the horn is free to rotate.
 - (c) The elevator and tab hinges should permit frictionless travel through their full operating range.
 - (d) Reconnect the elevator control tube to the elevator control arm. Determine that the control tube rod end does not bind in the fork end of the control arm through the full range of elevator travel.
 - (e) Relieve the elevator cable tension by loosening the turnbuckles located at fuselage station 110.5, reference Item 3, Figure 5-5.
 - (f) Disconnect the elevator control tube from the elevator bellcrank, Item 14. Disconnect the elevator cables from the bellcrank.
 - (g) Remove the bellcrank pivot bolt, Item 24, and slide the bellcrank out of its mounting bracket. Determine that the pivot bearing, part number 452 344, rotates freely. Replace the bearings if required.
 - (h) Lubricate the bellcrank pivot bearing, position the bellcrank in the mounting bracket, install the pivot bolt and tighten. Be certain the bellcrank is reinstalled precisely

as removed and check to assure free rotation exists after the installation is complete.

- (i) Lubricate the elevator control tube fork end and attaching bolt and reinstall to the elevator bellcrank.
- (j) Lubricate the elevator cable fork ends and the attaching bolts and reinstall to the elevator bellcrank, reference Item 21, Figure 5-5, Sketch "C".
- (k) Adjust the elevator cable tension as per Table V-1 and Section 5-27 of the Service Manual, omitting Paragraph "e" of Section 5-27. Refer to the AltiMatic III Service Manual, Section 3-45, for those aircraft incorporating AltiMatic III autopilot installations.

NOTE

Adjust the bridle cable clamps so that the bridle cable (Y) has

9 ± 1 lb. tension.

- (l) Reference Sketch "A" and Part II of these instructions, again determine the total friction in the elevator system. If the friction still exceeds 7 lbs. proceed with Section IV.

SECTION IV

1. To insure proper operation of the elevator control cable system, conduct a visual inspection of the entire system with particular emphasis on the following:
 - (a) Elevator control cables are properly routed and have adequate clearance from all airframe members, tubes, wiring and other components.
 - (b) Cable pulleys should be properly aligned, free to rotate and guard pins properly installed.
 - (c) Elevator autopilot cables; for proper installation refer to Piper AltiMatic III Service Manual.

- (d) Reference Sketch "A" and Section II of these instructions. Again determine the total friction in the elevator system. If the friction still exceeds 7 lbs., proceed as follows:

SECTION V

1. The control column installation, reference Figure 5-1, should be checked to insure unrestricted operation of the following:

NOTE

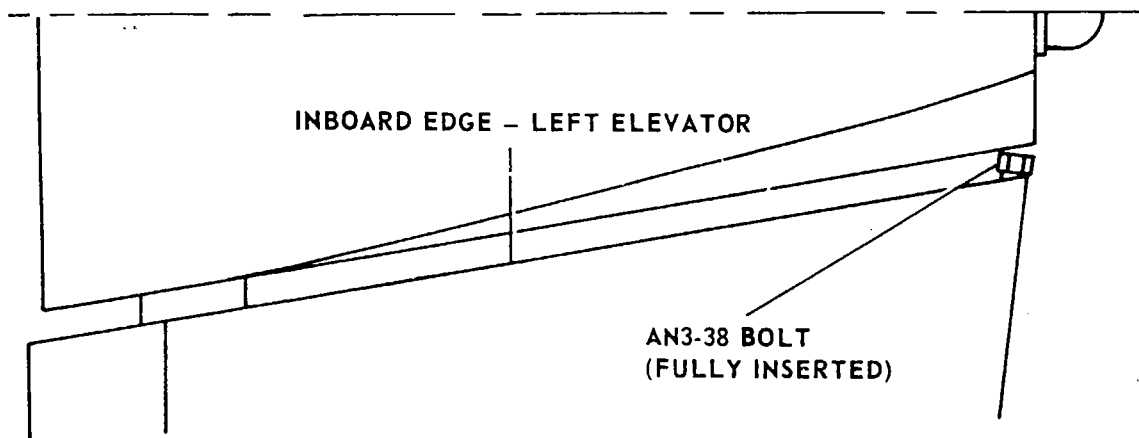
All numbered items in Section V refer to Figure 5-1 of the Service Manual.

- (a) Ascertain that wire harnesses, hoses, tubing and other components are not in contact with any portion of the control column assembly and related attaching points.
- (b) Disconnect the control arms, Items 11, 13, 16 and 18 from the link assemblies, reference Item 30 (4 each) and check that the torque tube, Item 14, rotates freely in the bearing blocks, Items 15 and 19.
- (c) Remove the control column wheel and tube assemblies as per Section 5-5 of the Service Manual, reference Items 43, 44 and 27 of Figure 5-1.
- (d) The inside of the control tubes must be thoroughly cleaned.
- (e) Determine that the nylon blocks, Item 75, Sketch B, on the square tube are free of abrasion or foreign particles and provide a smooth bearing surface on which the control tube will slide.
- (f) Reassemble the control wheel and tube assemblies onto the square tubes, as per Section 5-6 of the Service Manual.
- (g) Adjust rollers, Item 69, Sketch "B", through the use of the eccentric bushings in each roller to allow .003 of an inch between the square tube and the roller. Reference Section 5-6 (c) 2.

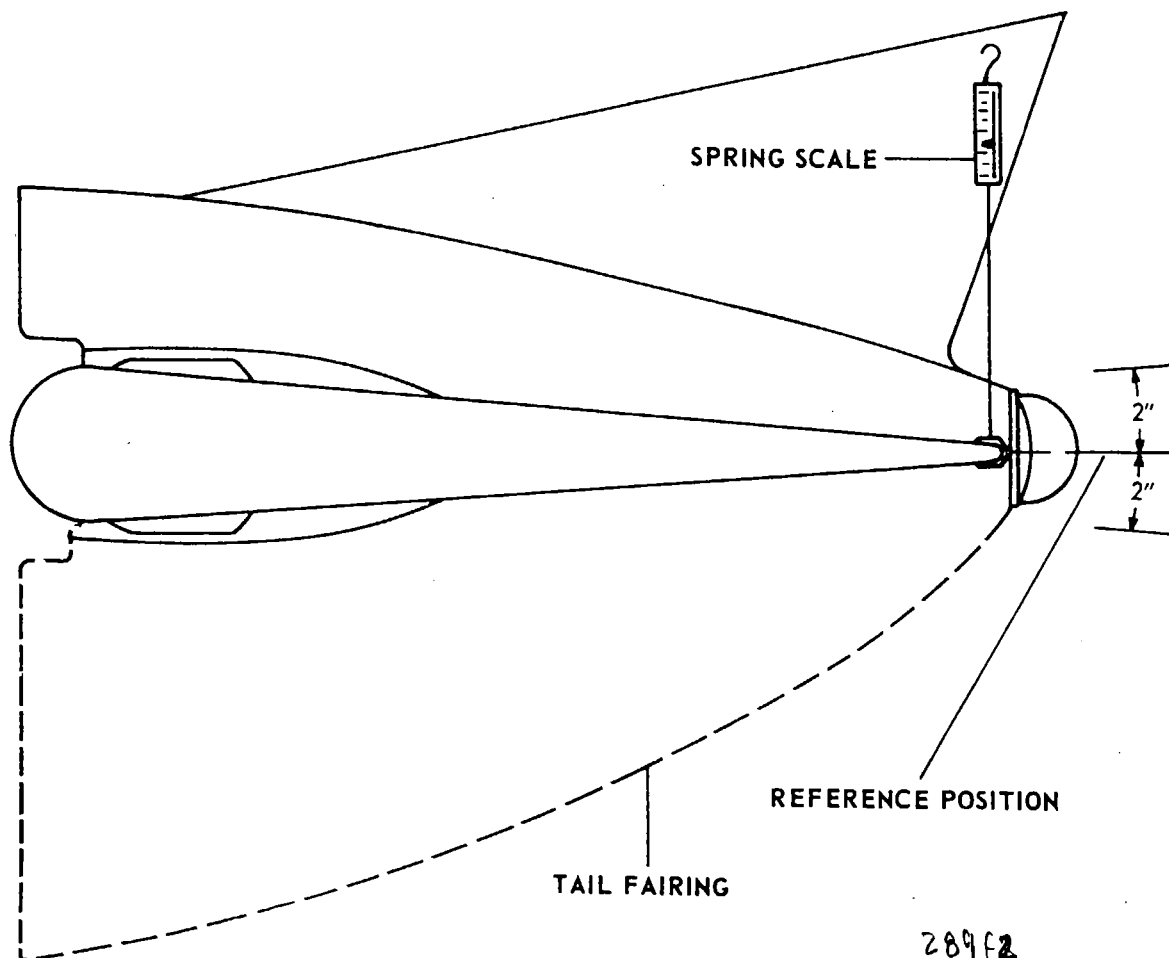
- (h) The links (Item 30), must rotate freely on lubricated shoulder bolts, Item 28 of Figure 5-1.
- (i) Reconnect the links to the control arms, lubricate the bolts, Item 32, prior to assembling.
- (j) Reference Sketch "A" and Section II of these instructions, again determine the total friction in the elevator system. The friction as measured with the spring scale should not exceed 7 lbs.
- (k) Reinstall the bottom section of the fuselage tail fairing.

NOTES

1. Ascertain that all safeties are replaced.
2. Recheck for interference forward of the instrument panel throughout control travels.
3. Make log book entry.
4. Return compliance card.



TOP VIEW



SIDE VIEW

SKETCH A

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