



AIRCRAFT MAINTENANCE MANUAL

AILERON PRIMARY MECHANICAL CONTROL - ADJUSTMENT/TEST

EFFECTIVITY: ALL

1. General

- A. This section gives the procedure to measure the backlash of the aileron primary-mechanical control.
- B. The procedures in this section are given in the sequence below. The tasks identified with (♦) are part of the Scheduled Maintenance Requirements Document (SMRD).

TASK NUMBER	DESCRIPTION	EFFECTIVITY
27-11-00-700-801-A ♦	AILERON PRIMARY-MECHANICAL CONTROL BACKLASH - FUNCTIONAL CHECK	ALL



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TASK 27-11-00-700-801-A

EFFECTIVITY: ALL

2. AILERON PRIMARY-MECHANICAL CONTROL BACKLASH - FUNCTIONAL CHECK

A. General

- (1) This task gives the procedure to measure the aileron backlash.
- (2) [Figure 501](#) shows the rig pin locations.
- (3) [Figure 502](#) shows the indication of Roll Trim.
- (4) [Figure 503](#) shows the input rod location.
- (5) [Figure 504](#) shows the NRU location.
- (6) [Figure 505](#) and [Figure 506](#) show the input lever location.
- (7) [Figure 507](#) shows the GSE locations.
- (8) [Figure 508](#) shows the aileron backlash charts.

B. References

REFERENCE	DESIGNATION
AMM MPP 06-41-01/100	-
AMM MPP 06-44-00/100	- COMPONENT LOCATION
AMM TASK 20-40-01-860-801-A/200	ENERGIZATION OF THE AIRCRAFT WITH AN EXTERNAL POWER SOURCE
AMM TASK 27-11-07-000-801-A/400	AILERON NEUTRAL RECOVERY UNIT - REMOVAL
AMM TASK 27-11-07-400-801-A/400	AILERON NEUTRAL RECOVERY UNIT - INSTALLATION
AMM TASK 27-12-01-000-801-A/400	AILERON POWER-CONTROL ACTUATOR (PCA) - REMOVAL
AMM TASK 27-12-01-400-801-A/400	AILERON POWER-CONTROL ACTUATOR (PCA) - INSTALLATION
AMM TASK 29-10-00-860-801-A/200	HYDRAULIC SYSTEM - PRESSURIZATION WITH HTS
FIM TASK 27-12-00-810-804-A	-
IPC 27-12-00	AILERON HYDRAULIC ACTUATION

C. Zones and Accesses

ZONE	PANEL/DOOR	LOCATION
123	123BL	Area below the cockpit floor
551	551CB	Wing
651	651CB	Wing



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D. Tools and Equipment

ITEM	DESCRIPTION	PURPOSE	QTY
GSE 058	Rig Pin Kit	To lock the control wheel in the neutral position	
GSE 056	Dynamometer	To apply the loads	
GSE 060	Kit, Backlash Measurement	To measure the aileron backlash	
GSE 072	Magnetic Stand	To hold the dial indicator	
GSE 489	Dial Indicator	To measure the aileron deflections	
GSE 378	Control Surface Backlash Calculation Software (Alternative)	To calculate the aileron backlash	

E. Auxiliary Items

Not Applicable

F. Consumable Materials

Not Applicable

G. Expendable Parts

ITEM	IPC REFERENCE (VENDOR REFERENCE)	QTY
Cotter pin	IPC 27-12-00	02

H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	Cockpit and Wing
2	Do the task	Wing

I. Preparation

SUBTASK 841-002-A

CAUTION: EMBRAER RECOMMENDS THAT THE AIRCRAFT STAY IN THE HANGAR AND ON GROUND.

- (1) Make sure that the aircraft is safe for maintenance.
- (2) Do not do other tasks on the aircraft because it will cause error on the surface position measurement.
- (3) Remove cockpit underfloor-access hatch 123BL (AMM MPP 06-41-01/100).
- (4) Energize the aircraft with the External DC Power Supply ([AMM TASK 20-40-01-860-801-A/200](#)) and make sure that the roll trim is in the neutral position. Refer to the EICAS indication [Figure 502](#).
- (5) Install the rig pins on the aileron torque tube. Refer to [Figure 501](#).
- (6) Remove access doors 551CB and 651CB ([AMM MPP 06-44-00/100](#)).

- (7) Install the rig pin on the wing sector of the aileron. Refer to [Figure 501](#).

J. Functionally Check Aileron Primary Mechanical Control Backlash

SUBTASK 720-002-A

- (1) Get access to the left aileron wing sector to do this step and to measure the left aileron backlash, as follows:
 - (a) Disconnect the input rod from the PCA ([Figure 503](#)). Refer to [AMM TASK 27-12-01-000-801-A/400](#).
 - (b) Disconnect the NRU from the PCA ([Figure 504](#)). Refer to [AMM TASK 27-11-07-000-801-A/400](#).
 - (c) Put the PCA input lever at the extension command stop. For this, move the input lever fully rearward.
- (2) Manually move the aileron surface to the fully up position (trailing edge up), until the PCA stop is got.

WARNING: THE HYDRAULIC SYSTEM CONTAINS PHOSPHATE-ESTER HYDRAULIC FLUID. THE FLUID CAN CAUSE IRRITATION IN YOUR SKIN OR INJURY TO YOUR EYES. USE THE APPLICABLE RUBBER GOGGLES AND GLOVES. IF THE FLUID TOUCHES YOU, FLUSH YOUR SKIN WITH WATER AND GET MEDICAL HELP.

- (3) Pressurize the hydraulic system ([AMM TASK 29-10-00-860-801-A/200](#)).

NOTE: If the aileron moves down, let the aileron move freely. After this, look at the PCA input lever to make sure that it is in the extension command stop (input lever in rearward position).

- (4) Use the input lever to move the aileron surface up and down for 5 cycles. Make sure that the aileron surface is in the up position after the last cycle.
- (5) Use a tie-down strap to attach the input lever to a hole in the lower surface skin as shown in the [Figure 505](#) and [Figure 506](#).
- (6) With the left aileron surface in the fully up position (trailing edge up), on the overhead panel, turn on aileron system 1.
 - Make sure that the AILERON SHUTOFF SYS 1 pushbutton light is off and the AILERON SHUTOFF SYS 2 pushbutton light is on.
 - Make sure that the EICAS display shows the AIL SYS 2 INOP caution message.
- (7) Install a magnetic stand (GSE 072) to the flap/aileron torsion box. Refer to ([Figure 507](#)). Use double-faced adhesive tape.
- (8) Install dial indicator (GSE 489) on magnetic stand ([Figure 507](#)).
NOTE: The dial indicator stylus must be perpendicular to the aileron surface.
- (9) Adjust the dial indicator to zero.
 - The indication found when the aileron moves up is positive (+).

- The indication found when the aileron moves down is negative (-).

- (10) Install the dynamometer (GSE 056) in the attachment device (GSE 060) and gradually and continuously apply the load upwards for 5.0, 10.0, 15.0, 20.0, 25.0 and 30.0 kgf (11.0, 22.0, 33.0, 44.1, 55.1 and 66.1 lbf).
- (11) Write down in ([Table 501](#)) the values shown on the dial indicator for cycle 1
- (12) Remove the load applied by the dynamometer.
- (13) Hold the aileron trailing edge and push the surface up and down for 5 times.
- (14) Set the dial indicator to zero.
- (15) Install the dynamometer (GSE 056) in the attachment device (GSE 060) and gradually and continuously apply the load downwards for 5.0, 10.0, 15.0, 20.0, 25.0 and 30.0 kgf (11.0, 22.0, 33.0, 44.1, 55.1 and 66.1 lbf).
- (16) Write down in ([Table 501](#)) the values shown on the dial indicator for cycle 1
- (17) Remove the load applied by the dynamometer.
- (18) Hold the aileron trailing edge and push the surface 5 times up and down
- (19) Do steps (9) thru (18) again for cycle 2.

Table 501 - AILERON DISPLACEMENT X LOAD APPLIED

LOAD APPLIED kgf (lbf)	DISPLACEMENT MM (IN)			
	UPWARD ^[1]		DOWNWARD ^[1]	
	cycle 1	cycle 2	cycle 1	cycle 2
5.0 (11.0)	+	+	-	-
10.0 (22.0)	+	+	-	-
15.0 (33.0)	+	+	-	-
20.0 (44.1)	+	+	-	-
25.0 (55.1)	+	+	-	-
30.0 (66.1)	+	+	-	-

[1] With the aileron in the up position.

- (20) (Only if the GSE 378 is not available) For each cycle, find the backlash as follows:
 - (a) Make a graph of the “Load x Displacement” for the left aileron for each cycle. Refer to ([Figure 508](#)).
 1. Make sure that the data agree with the graph of ([Figure 508](#)).
 2. If the graph does not agree with the graph in [Figure 508](#), ignore this cycle and start a new cycle.
 - (b) The backlash of the left aileron surface is the average value of the backlash of the two cycles.

NOTE: You must make sure of the quality of the indications when you make the graphs. Ignore the points that are too far from the straight lines. If there is



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too much dispersion of points around the straight line, you must do the test again.

- (c) The maximum value permitted for the aileron backlash is:

Table 502 - MAXIMUM VALUE PERMITTED FOR THE AILERON BACKLASH

MAXIMUM VALUE PERMITTED FOR THE AILERON BACKLASH mm (in)	
0.88 mm	0.034 in

NOTE: If the value found is out of the limit, refer to FIM TASK 27-12-00-810-804-A.

- (21) (Only if GSE 378 is available) For each cycle, find the backlash as follows:
- Enter in the software the values of cycles 1 and 2 indicated in Table 501.
 - Make sure that the value of the Aileron Backlash is as given in Table 502.
- (22) Push the AILERON SHUTOFF SYS 1 pushbutton to turn off aileron system 1. Make sure that the pushbutton light comes on.
- Make sure that the EICAS display shows the AIL SYS 1-2 INOP caution message.
- (23) Push the AILERON SHUTOFF SYS 2 pushbutton to turn on aileron system 2. Make sure that the pushbutton light goes off.
- Make sure that the EICAS display shows the AIL SYS 1 INOP caution message.
- (24) Do steps (9) thru (23) for hydraulic system 2.
- (25) Release the pressure of the hydraulic system ([AMM TASK 29-10-00-860-801-A/200](#)).
- (26) If applicable, de-energize the aircraft ([AMM TASK 20-40-01-860-801-A/200](#)).
- (27) Remove the tie-down strap that attaches the input lever to a hole in the lower surface skin as shown in the [Figure 505](#) and [Figure 506](#).
- (28) Do this procedure to put the left aileron system back to the normal condition.
- Connect the input rod to the PCA ([Figure 503](#)). Refer to [AMM TASK 27-12-01-400-801-A/400](#).
- NOTE: If the input rod end has a grease fitting, make sure that this grease fitting points down and does not interfere with the PCA surface (Refer to [Figure 503](#), DET. C). If the grease fitting points up, an interference with the PCA surface can occur.
- Connect the NRU to the PCA ([Figure 504](#)). Refer to [AMM TASK 27-11-07-400-801-A/400](#).
- (29) Do steps (1) thru (28) for the right aileron.

K. Follow-on

SUBTASK 842-002-A

- (1) Remove all GSEs.



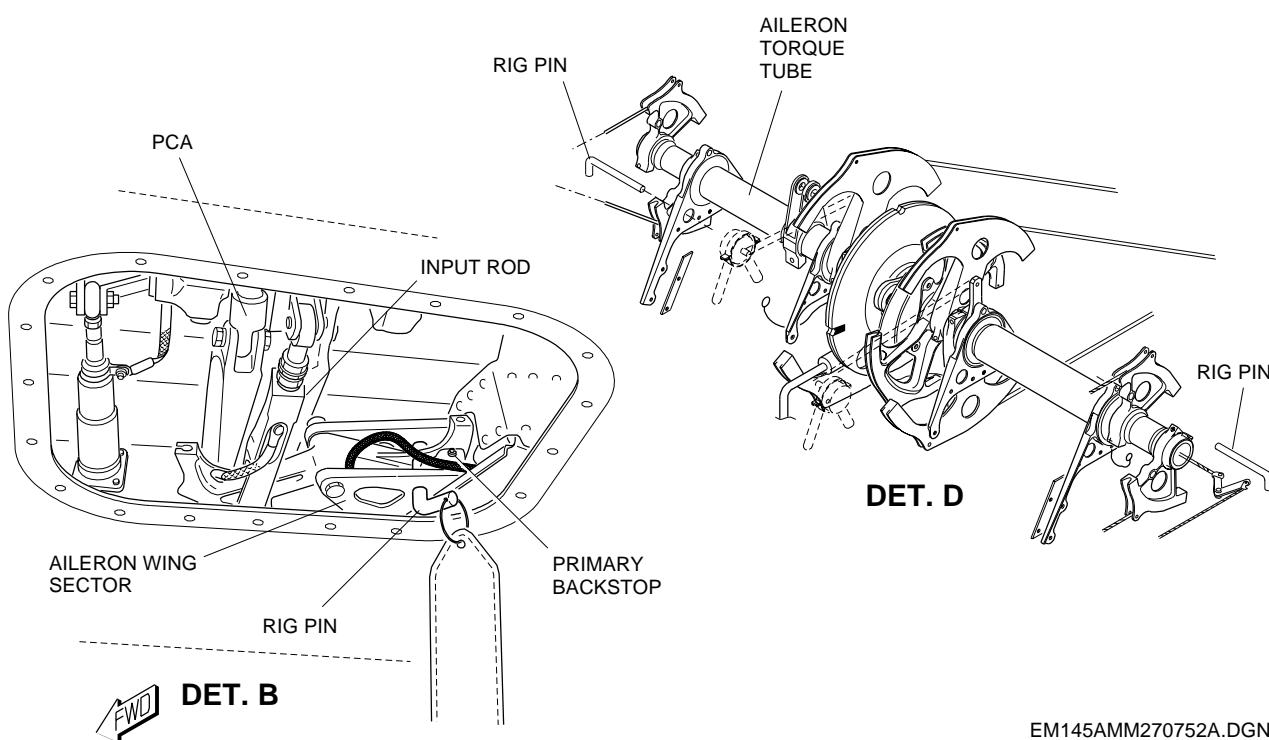
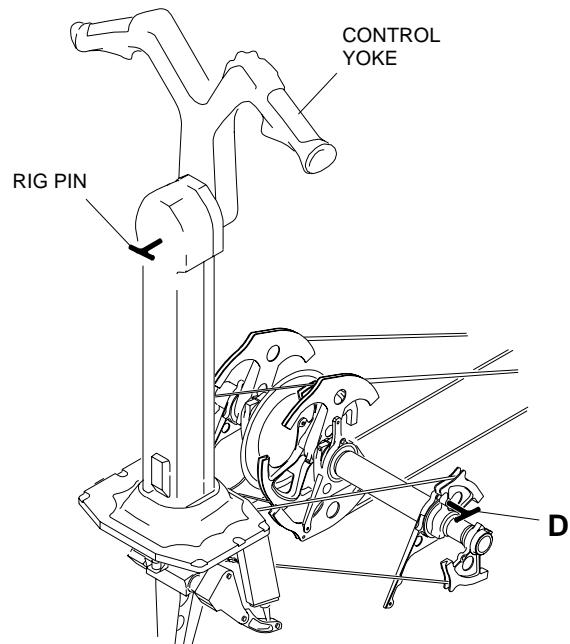
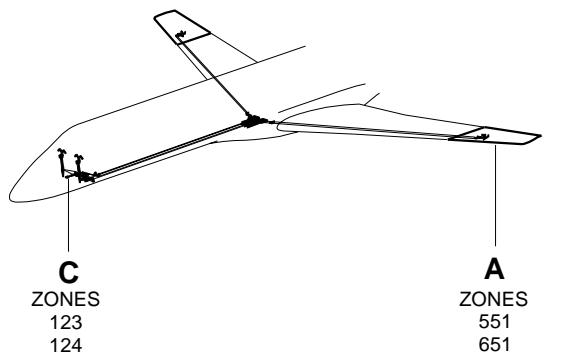
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- (2) Install access doors 551CB and 651CB ([AMM MPP 06-44-00/100](#)).
- (3) Install access doors 123BL (AMM MPP 06-41-01/100).

EFFECTIVITY: ALL

Rig pin - location

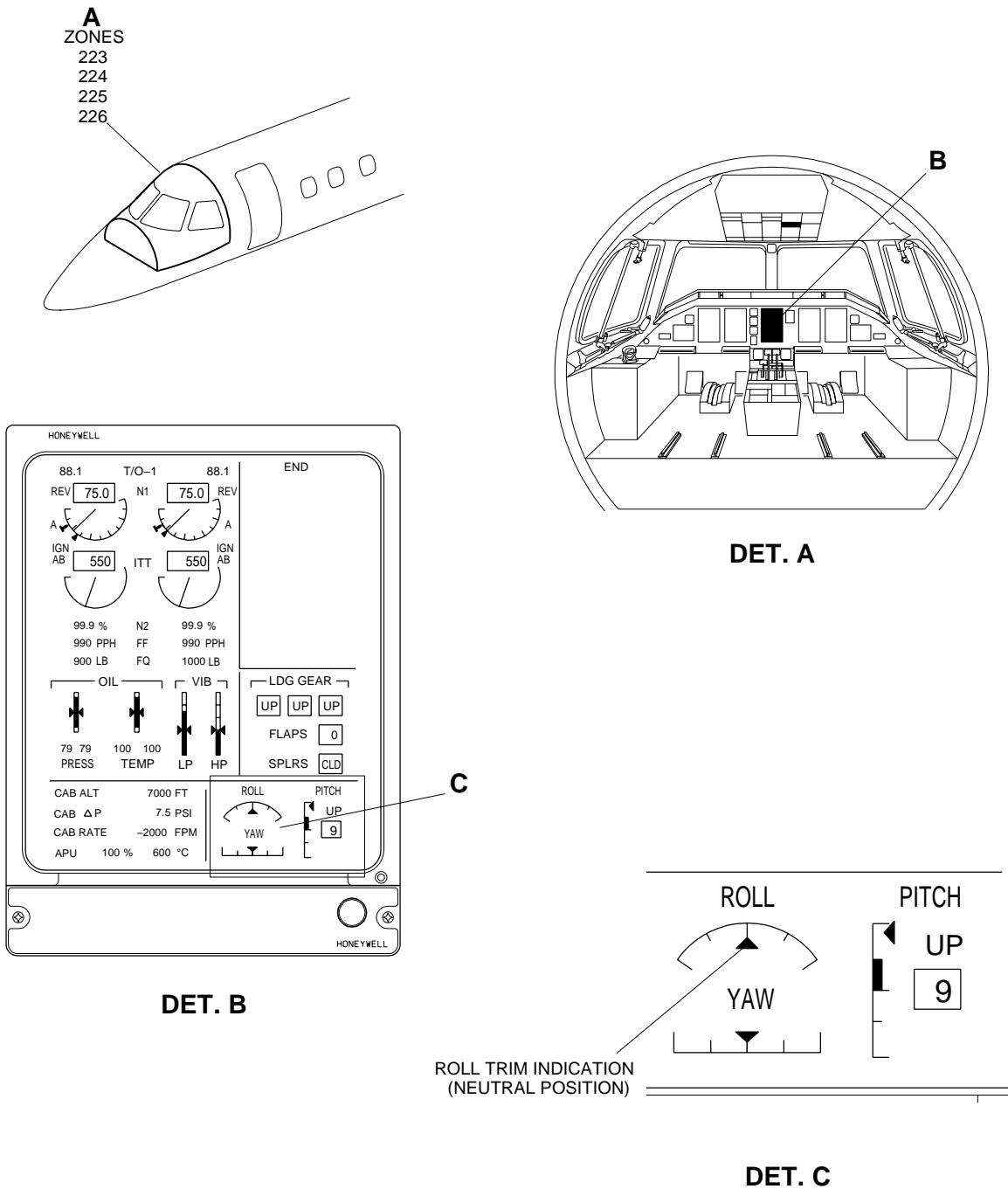
Figure 501



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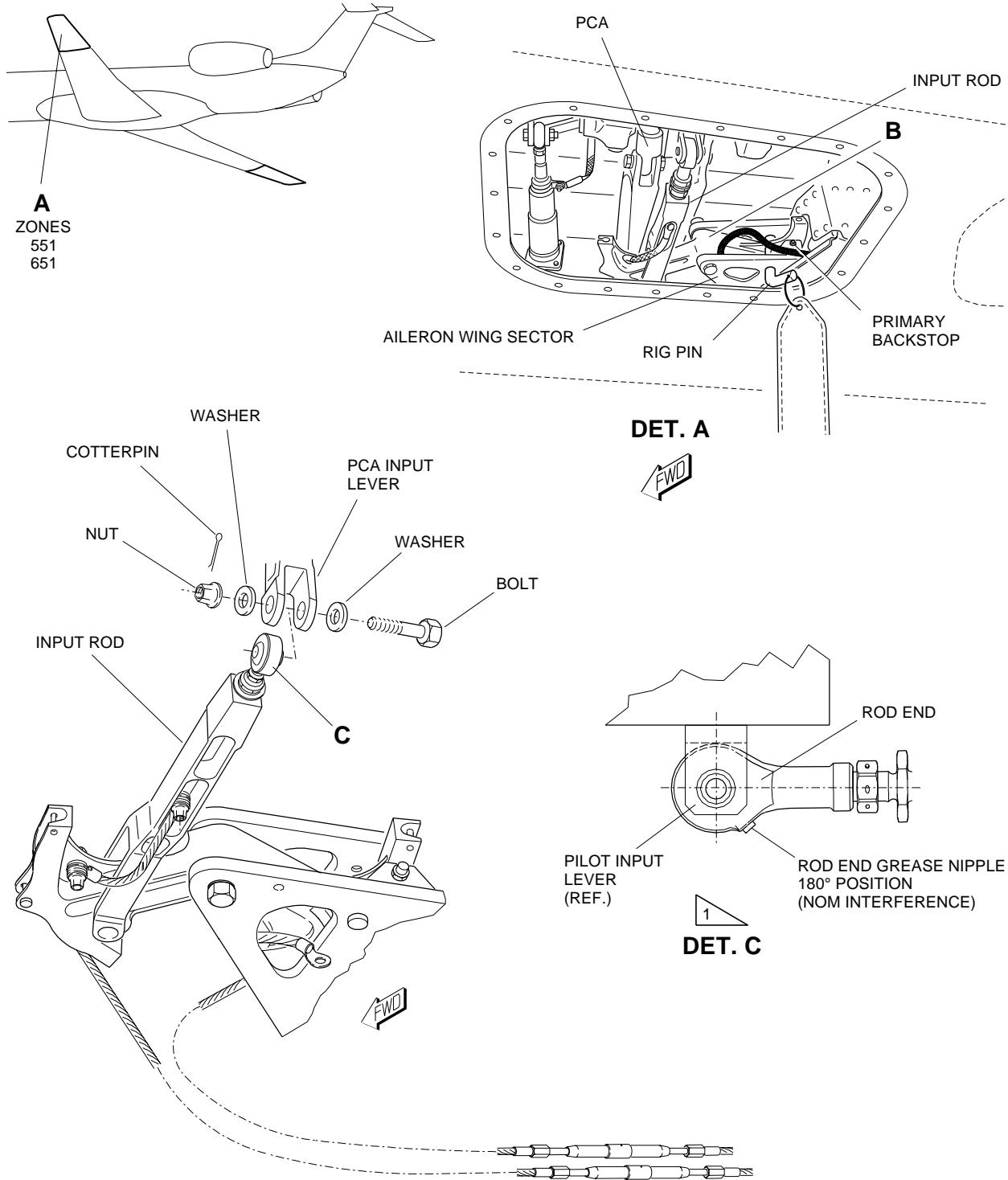
EFFECTIVITY: ALL

EICAS Indication - Roll Trim in Neutral Position
Figure 502



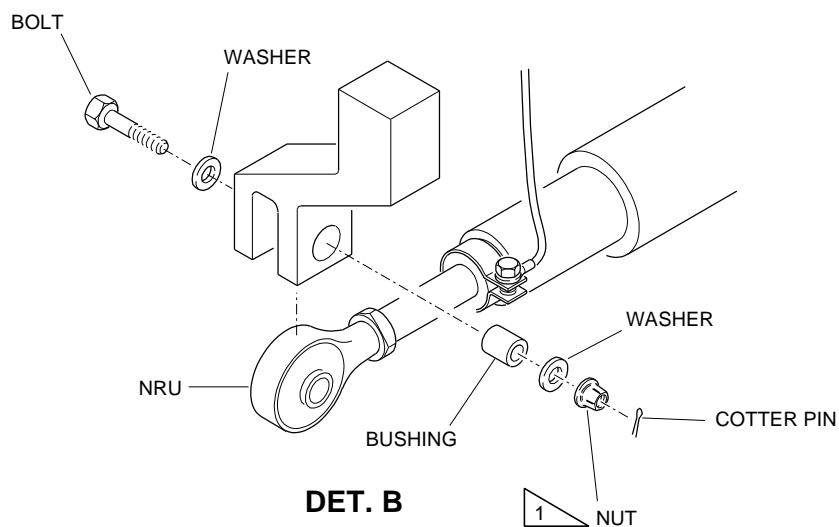
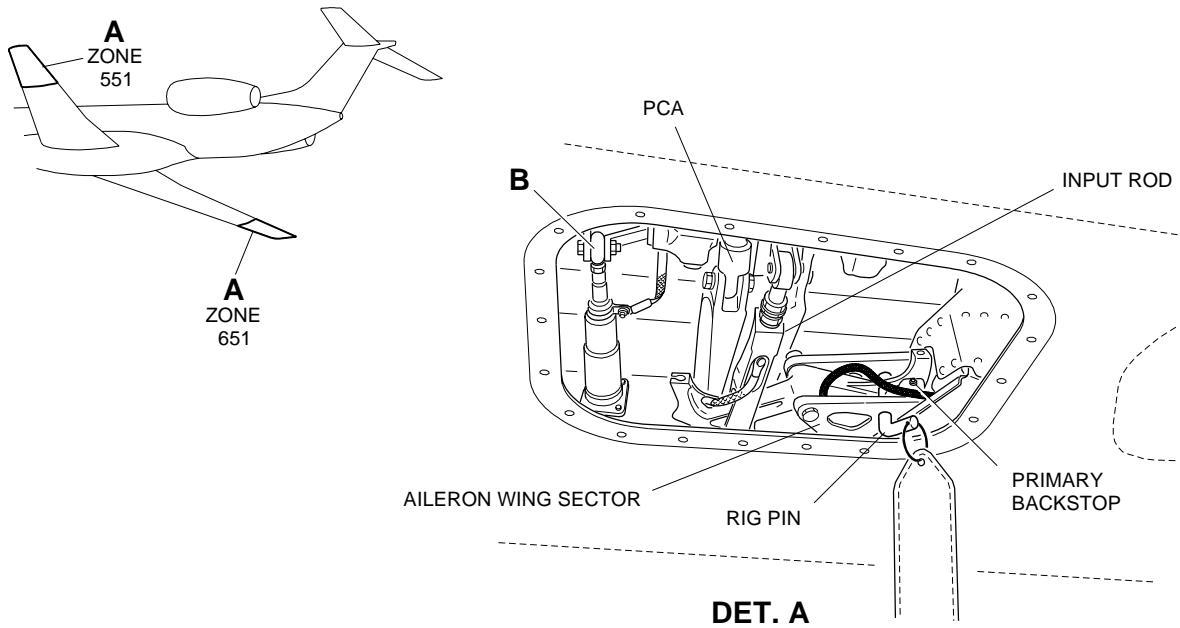
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EFFECTIVITY: ALL
Input Rod - Location
Figure 503



EM145AMM270301D.DGN

EFFECTIVITY: ALL
NRU - Location
Figure 504



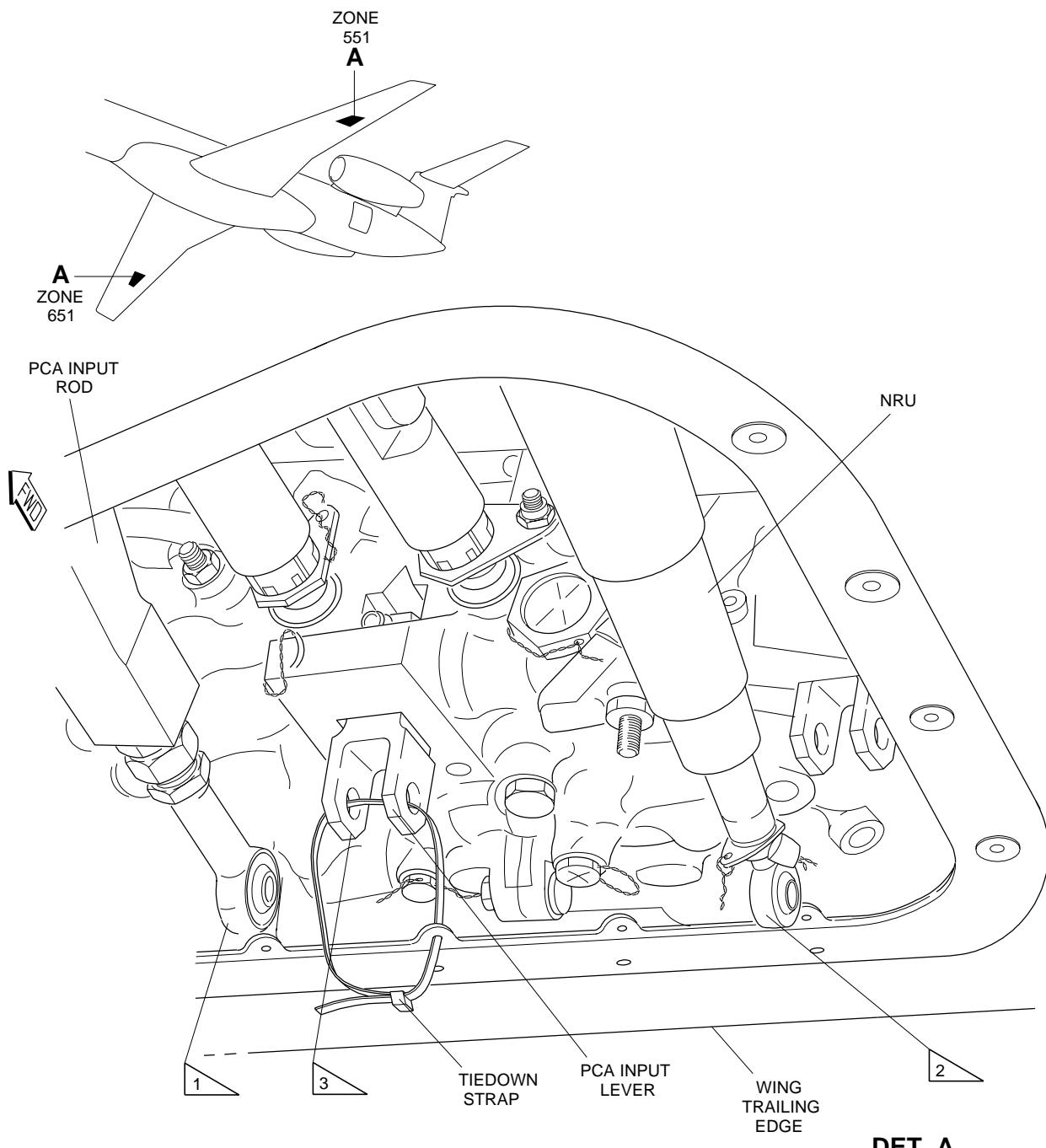
 **TORQUE: 1.4 – 1.7 N.m (12 – 15 lb.in)**

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EFFECTIVITY: FOR AIRCRAFT PRE-MOD S.B 145-27-0062

PCA Input Lever

Figure 505



1 MAKE SURE THAT THE PCA INPUT ROD IS DISCONNECTED FROM THE PCA.

2 MAKE SURE THAT THE NRU IS DISCONNECTED FROM THE PCA.

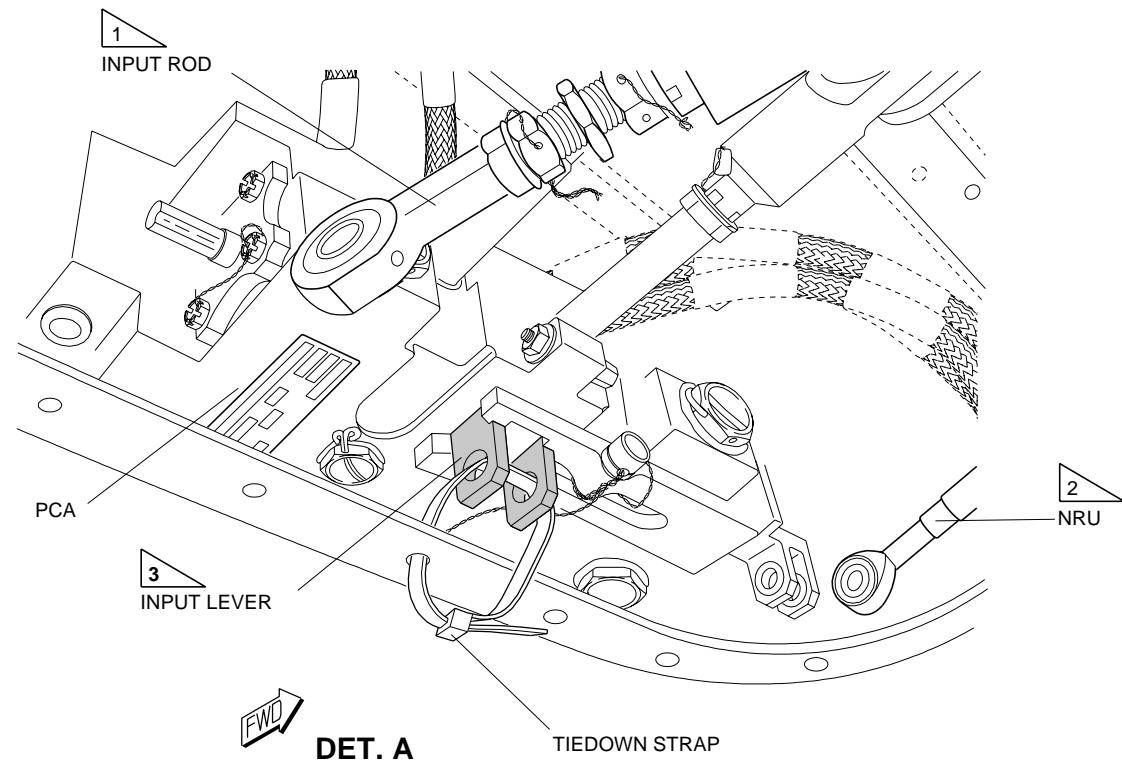
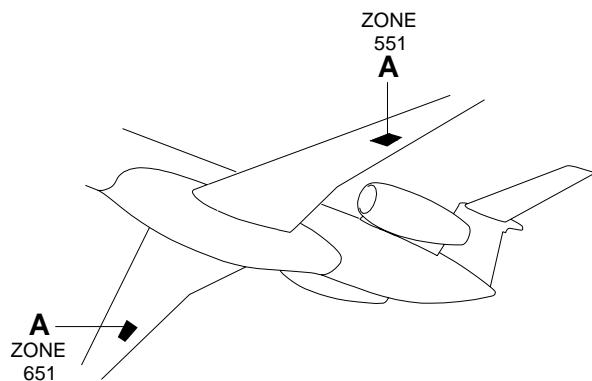
3 MAKE SURE THAT THE PCA INPUT LEVER IS AT THE EXTEND COMMAND STOP,
IN THE TOTALLY REARWARD POSITION.

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EFFECTIVITY: FOR AIRCRAFT POST-MOD S.B 145-27-0062

PCA Input Lever

Figure 506



 1 MAKE SURE THAT THE PCA INPUT ROD IS DISCONNECTED FROM THE PCA.

 2 MAKE SURE THAT THE NRU IS DISCONNECTED FROM THE PCA.

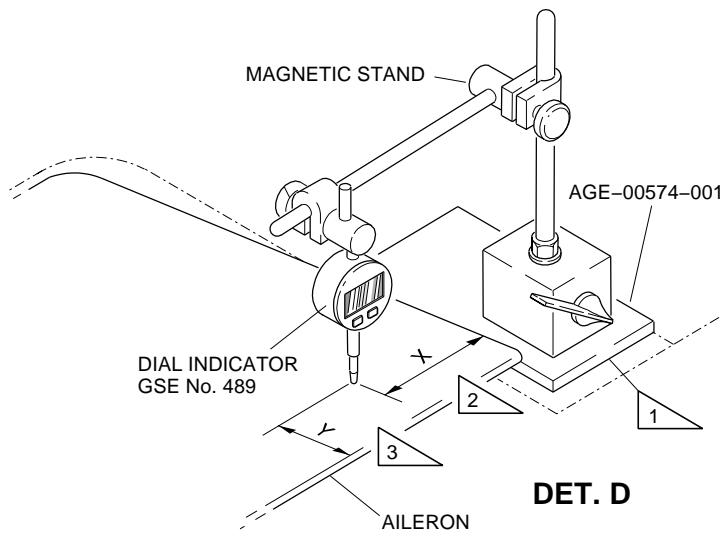
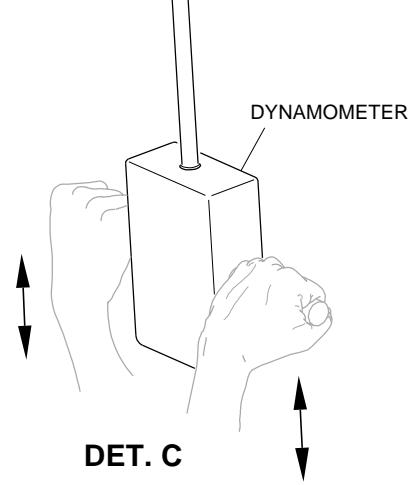
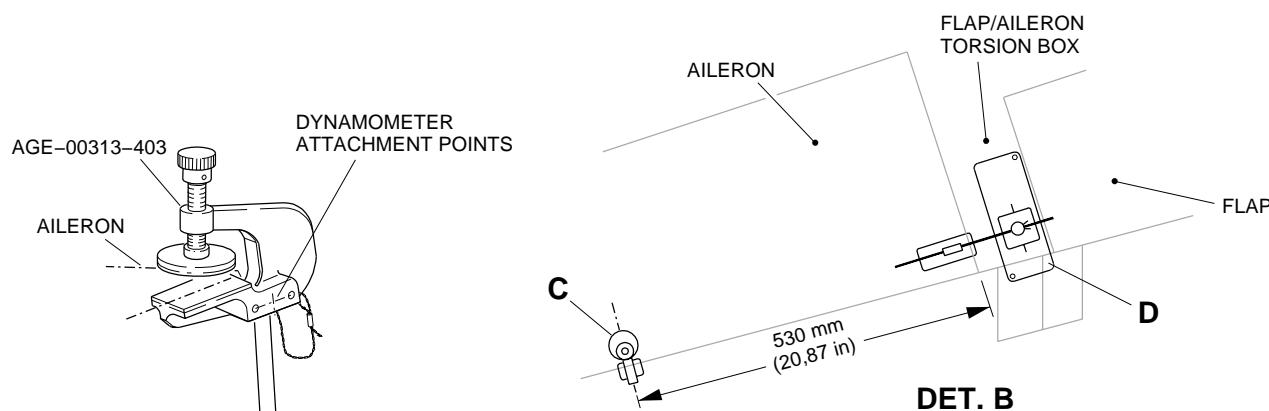
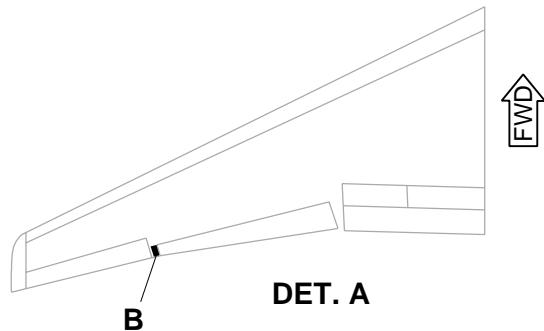
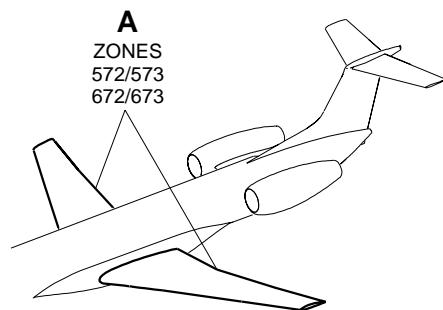
 3 MAKE SURE THAT THE PCA INPUT LEVER IS AT THE EXTEND COMMAND STOP IN THE TOTALLY REARWARD POSITION.

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EFFECTIVITY: ALL

Aileron Backlash - GSE Locations

Figure 507



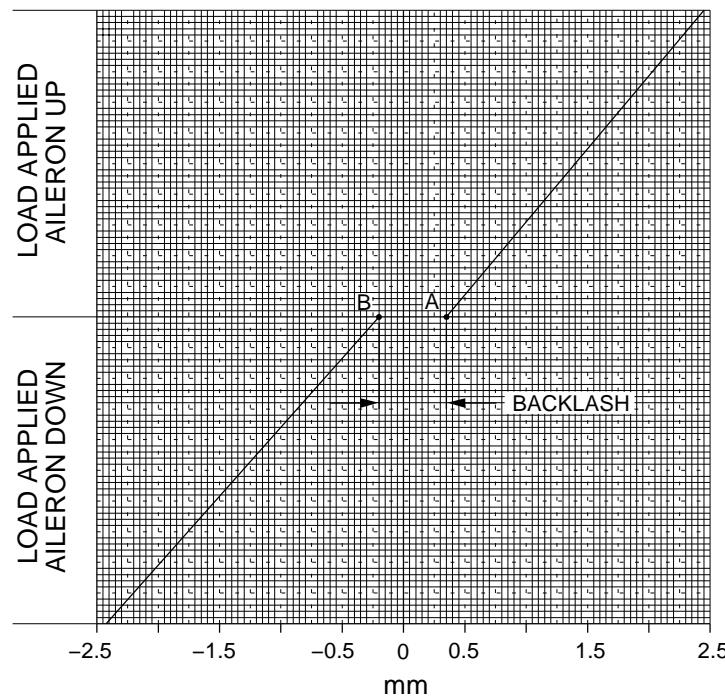
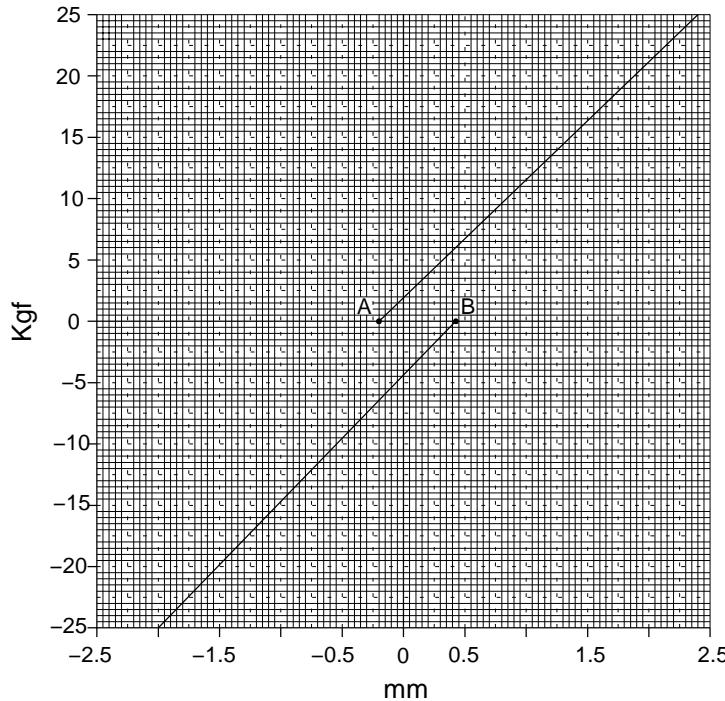
1 USE DOUBLE-FACE ADHESIVE TAPE TO INSTALL AGE-00574-001 TO THE AILERON/FLAP TORSION BOX.

2 X = 70.0 mm (2.76 in)

3 Y = 30.0 mm (1.18 in)

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EFFECTIVITY: ALL
 Aileron Backlash - Graph
 Figure 508 - Sheet 1


NOTES:

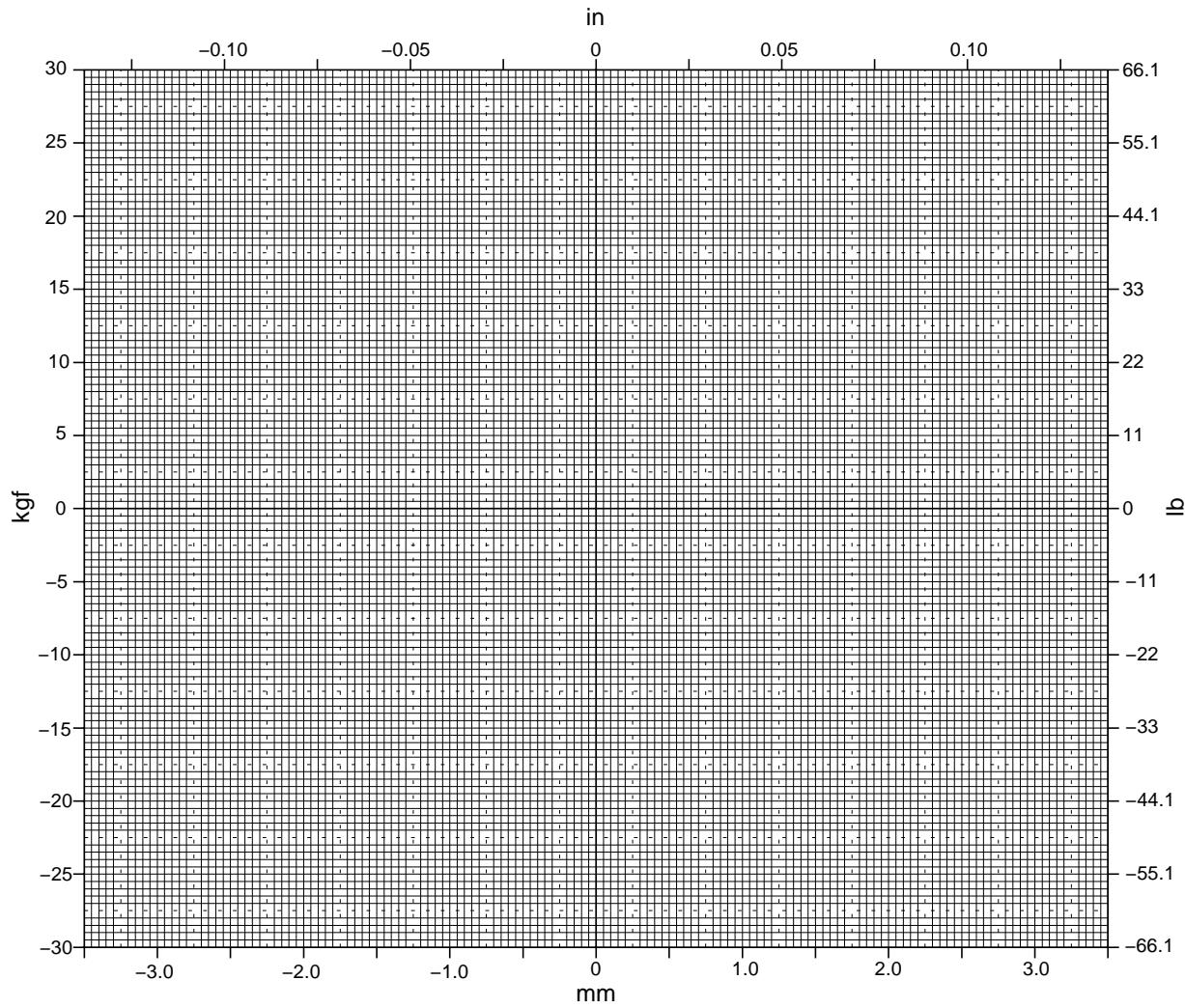
1 - WHEN YOU MAKE A GRAPH, IF "A" IS LESS THAN "B" (GRAPH I), YOU MUST IGNORE THE DATA AND MAKE A NEW CYCLE UNTIL YOU GET A GRAPH THAT IS EQUIVALENT TO GRAPH BUT, IF YOUR GRAPH IS SIMILAR TO THE GRAPH I AND "D" VALUE IS EQUIVALENT TO 20% OF MAXIMUM VALUE PERMITTED FOR THE BACKLASH, THIS GRAPH IS ACCEPTABLE, AND THE BACKLASH IS CONSIDERED EQUAL TO ZERO.

2 - THE GRAPH THAT SHOWS THE INCORRECT RESULTS ("A" IS LESS THAN "B") AND THE GRAPH THAT SHOWS THE CORRECT RESULTS ("A" IS MORE THAN "B") CAN BE WITH THE POINTS "A" AND "B" TO THE LEFT OR TO THE RIGHT OF "Y" AXIS.

GRAPHIC II - "A" IS MORE THAN "B" (CORRECT RESULTS)

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EFFECTIVITY: ALL
 Aileron Backlash - Graph
 Figure 508 - Sheet 2



AILERON:

PRESSURIZED BY HYDRAULIC SYSTEM

BACKLASH:mm (in)

MAXIMUM PERMISSIBLE
 AILERON BACKLASH: 0.88 mm (0.034 in)

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