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## NONDESTRUCTIVE TEST MANUAL

### PART 6 - EDDY CURRENT

#### OUTBOARD CHORD OF THE LOWER SPAR ON RB211 STRUTS

##### 1. Purpose

- A. Use this procedure to do an inspection for surface cracks in the outboard chord of the lower spar on RB211 struts.
- B. The inspection location is at the lower spar at Nacelle Station (NSTA) 140. See Figure 1 and Figure 4 for the inspection locations.
- C. MPD Appendix B DTR Check Form Reference:
  - (1) ITEM 54-50-I03

##### 2. Equipment

- A. General
  - (1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 4.
  - (2) Refer to Part 1, 51-01-00 for data about the equipment manufacturers.
- B. Instrument
  - (1) Use an eddy current instrument that:
    - (a) Has an impedance plane display or a meter display
    - (b) Operates at a frequency range of 50 to 500 kHz
  - (2) The instrument that follows was used to help prepare this procedure.
    - (a) MIZ-21SR; Zetec, Inc.
- C. Probes
  - (1) Use a shielded pencil probe that can operate between 50 and 500 kHz.
  - (2) The probe that follows was used to help prepare this procedure.
    - (a) A right angle, flexible shaft probe with a 0.5 inch (13 mm) drop and a 7.0 inch (179 mm) length; the part number is MTF-9010-70FX and it is made by the NDT Engineering Corp.
- D. Reference Standard
  - (1) Make or buy reference standard NDT672 as shown in Figure 2.

NOTE: It is permitted to use reference standards 191 or NDT1062. Refer to Part 6, 51-00-21 for data about these reference standards.

##### 3. Preparation for Inspection

- A. Find the inspection areas on the airplane. See Figure 1 and Figure 4.
- B. Retract the leading edge slats of the wings to the closed position.
- C. Disconnect the braided lines at the inboard connection and clamp points. Move the braided lines as necessary to get access to the inspection area. See Figure 1.
- D. Remove the forward duct lateral link. See Figure 1.
- E. Remove dirt, grease, and sealant from the inspection areas that the probe will touch.
- F. Visually examine the inspection area for paint chips or unusual marks. Sand the paint if necessary with fine grit sandpaper.

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### 4. Instrument Calibration

A. Calibrate meter instruments as specified in Part 6, 51-00-12, par. 4.

NOTE: If reference standard NDT672 is used, see Figure 3 for the probe positions.

B. Calibrate impedance plane display instruments as specified in Part 6, 51-00-21, par. 4.

NOTE: If reference standard NDT672 is used, see Figure 3 for the probe positions.

### 5. Inspection Procedure

A. Identify the inspection areas on the airplane. See Figure 1 and Figure 4.

B. Put the probe on the outboard chord, adjacent to the most forward inspection fastener (see Figure 4). Make sure the probe is at a right angle to the chord.

C. Balance the instrument.

D. Slowly move the probe around the fastener collar. Make sure the probe is adjacent to the collar and at a right angle to the chord as you move the probe.

E. Monitor the instrument screen display as you move the probe.

F. Make a record of all fast upscale signals that are 50 percent (or more) of the notch signal from the reference standard.

G. Do Paragraph 5.B. thru Paragraph 5.F. again at the other 12 inspection fasteners on the outboard chord.

H. Move the probe around the outboard edge of the bracket attached to the outboard chord and monitor the instrument for crack signals. See Figure 4, Flagnote 1.

I. Do Paragraph 5.B. thru Paragraph 5.H. on the lower spar of the other strut.

### 6. Inspection Results

A. For meter display instruments, refer to Part 6, 51-00-12, par. 6., to help make an analysis of the inspection results.

B. For impedance plane display instruments, refer to Part 6, 51-00-21, par. 6., to help make an analysis of the inspection results.

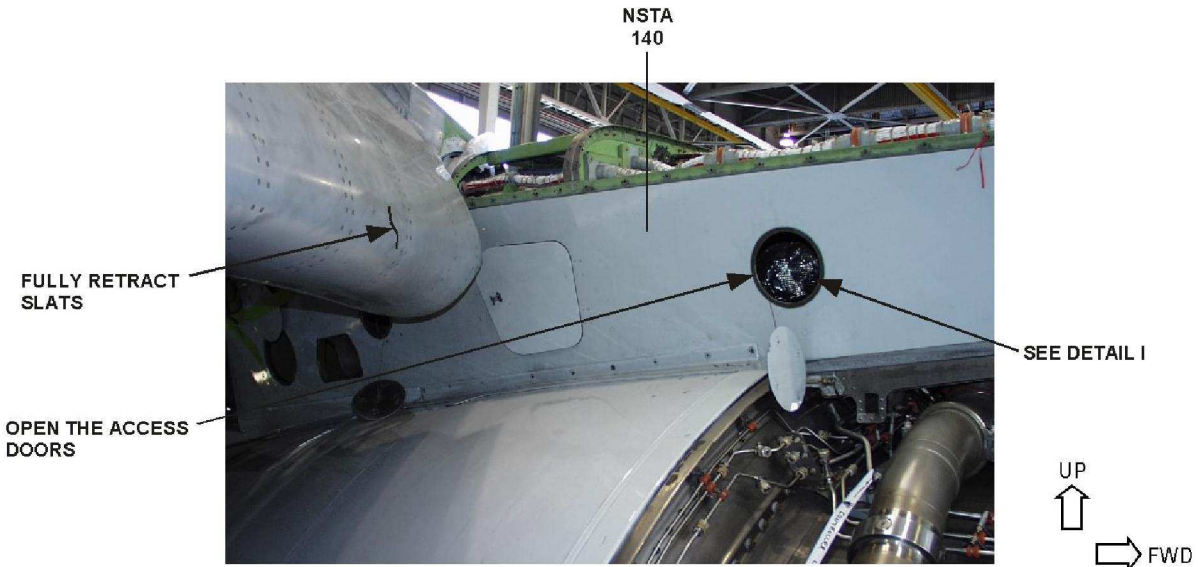
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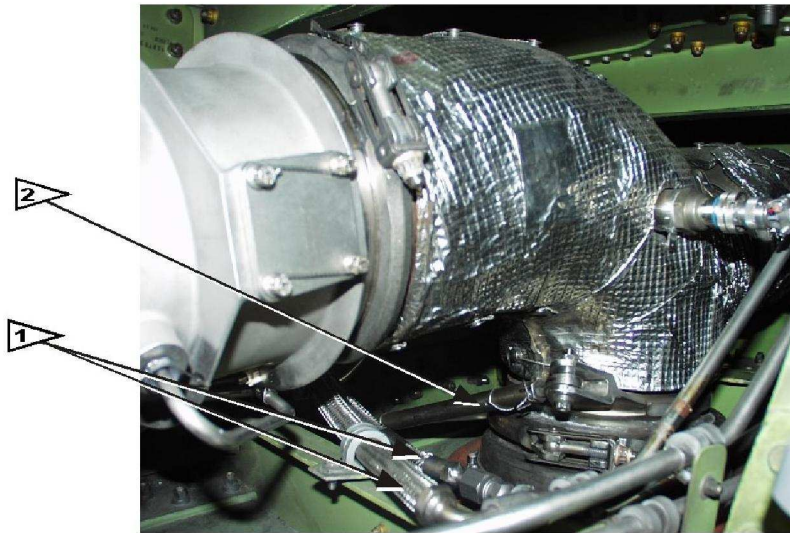
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LEFT STRUT (INBOARD SIDE) SHOWN  
USE THESE ACCESS HOLES TO EXAMINE  
THE OUTBOARD CHORD AT NSTA 140



LEFT STRUT (INBOARD SIDE) SHOWN  
REMOVE OR MOVE EQUIPMENT AS NECESSARY TO GET  
ACCESS TO THE OUTBOARD CHORD AT NSTA 140

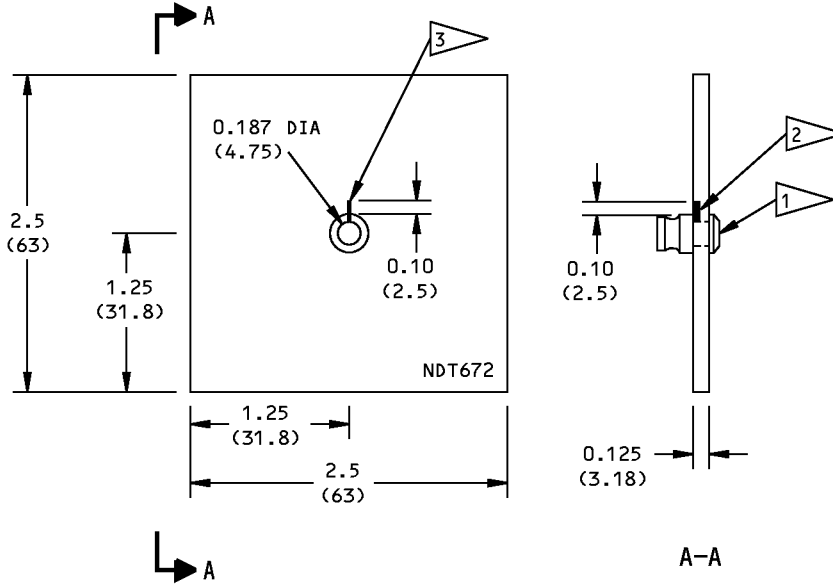
- NOTES**
- THE LEFT STRUT IS SHOWN, THE RIGHT STRUT IS ALMOST THE SAME  
DETAIL 1
- 1 DISCONNECT THE BRAIDED LINES AT THE INBOARD CONNECTIONS AND CLAMP POINTS AND MOVE THE LINES TO THE SIDE.
  - 2 REMOVE THE FORWARD DUCT LATERAL LINK.

**Outboard Lower Spar Chord of the Strut at NSTA 140  
Figure 1**

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NOTES

- ALL DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS ARE IN PARENTHESES).
- TOLERANCES (UNLESS SPECIFIED DIFFERENTLY):
 

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.05	X = ±1
- MATERIAL: 15-5PH CRES, 17-7PH CRES OR 4130 STEEL
- ETCH OR STAMP NDT672 WHERE SHOWN

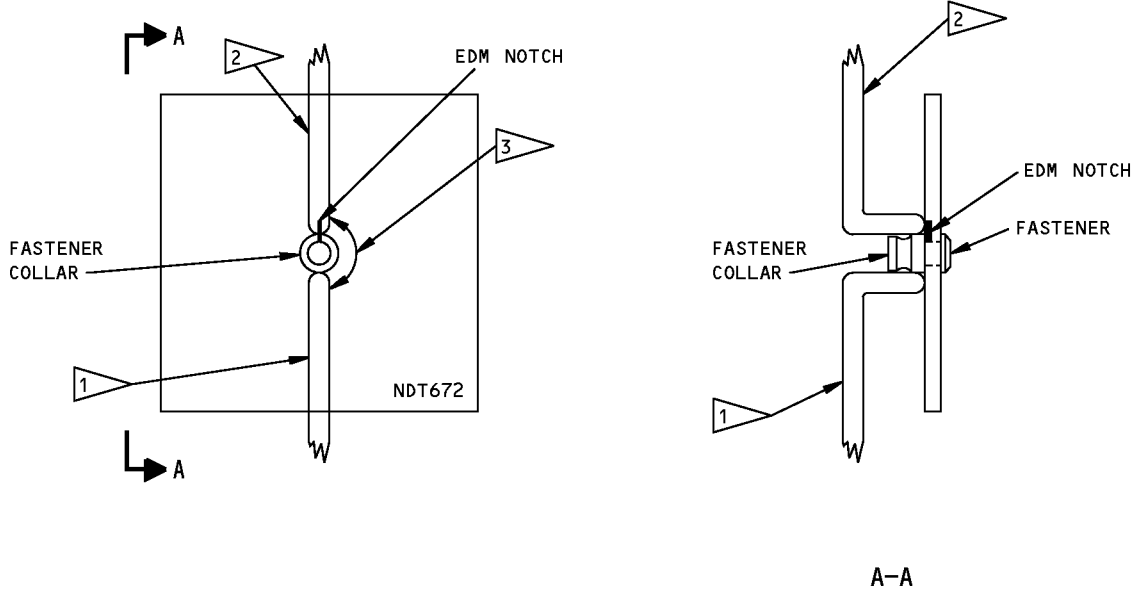
- 1 FASTENER - BACB30NX6K2; COLLARS - BACC30X6S
- 2 EDM NOTCH:  
THE MAXIMUM WIDTH OF THE EDM NOTCH IS 0.005 INCH (0.12 MM); THE DEPTH IS 0.015-0.020 INCH (0.38-0.50 MM)
- 3 THE EDM NOTCH MUST EXTEND 0.10 INCH (2.5 MM) FROM THE EDGE OF THE FASTENER COLLAR

Reference Standard NDT672  
Figure 2

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**NOTES**

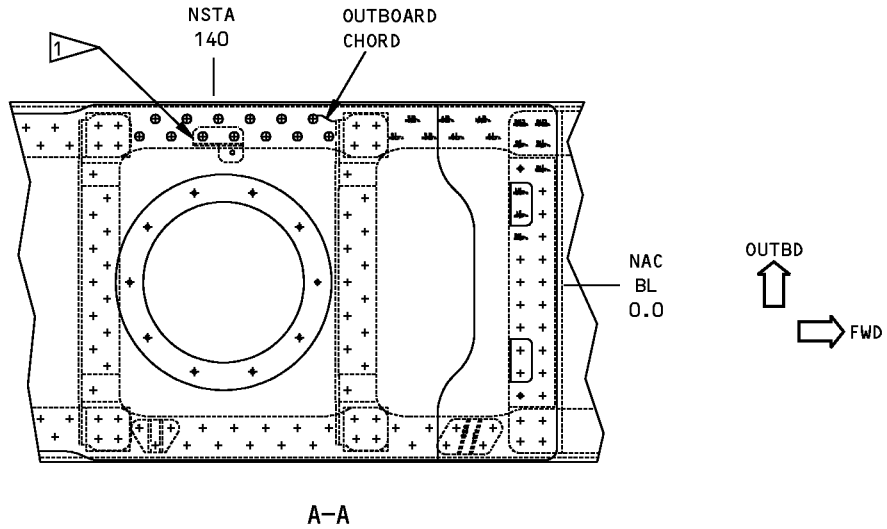
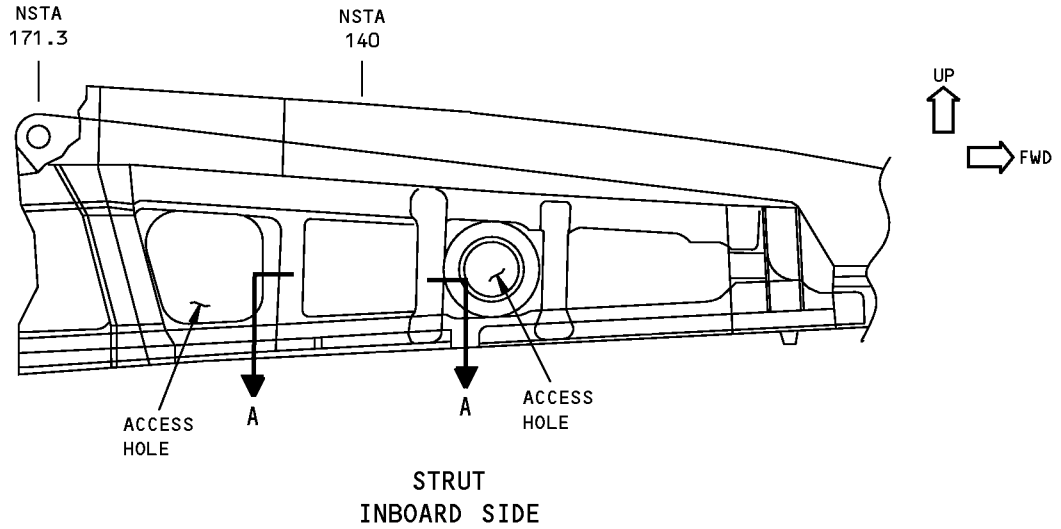
- 1 PROBE POSITION 1. PUT THE PROBE ADJACENT TO THE FASTENER COLLAR SO THAT IT IS AWAY FROM THE EDM NOTCH.
- 2 PROBE POSITION 2. PUT THE PROBE ADJACENT TO THE FASTENER COLLAR SO THAT IT IS ABOVE THE EDM NOTCH.
- 3 SLOWLY MOVE THE PROBE AROUND THE FASTENER COLLAR. USE THE FASTENER COLLAR AS A GUIDE.

**Instrument Calibration  
Figure 3**

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**NOTES**

- STRUT # 1 IS SHOWN; STRUT # 2 IS ALMOST THE SAME.
- PUT THE PROBES THROUGH THE ACCESS HOLES TO EXAMINE AROUND THE 13 FASTENER COLLARS ON THE OUTBOARD CHORD OF THE LOWER SPAR.
- DO A 360° SCAN AROUND THE FASTENER COLLAR.

1 MOVE THE PROBE AROUND THE OUTBOARD EDGE OF THE BRACKET THAT IS ATTACHED TO THE OUTBOARD CHORD OF THE LOWER SPAR.

**FASTENER SYMBOLS**

⊕ INSPECTION FASTENERS

**Inspection Area - Outboard Chord of the Lower Spar  
Figure 4**

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## PART 6 - EDDY CURRENT

### MIDSPAR CHORDS - CF6-80C2, CF6-80A, JT9D, PW4000 STRUTS

#### 1. Purpose

- A. Use this open hole eddy current procedure to examine the fastener holes in the midspar chord of the CF6-80A, CF6-80C2, JT9D and PW4000 struts for cracks. See Figure 1 and Figure 2 for the inspection locations.
- B. MPD DTR Check Form Reference:
  - (1) Item 54-50-I01
  - (2) Item 54-50-I04

#### 2. Equipment

- A. General
  - (1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 4.
  - (2) Refer to Part 1, 51-01-00, for data about the equipment manufacturers.
- B. Instrument
  - (1) Use an eddy current instrument that:
    - (a) Has an impedance plane display and a miniature rotary scanner.
    - (b) Operates at a frequency range of 200 kHz to 500 kHz.
    - (c) Can be calibrated on the reference standard as specified in Paragraph 4.
  - (2) The instruments and miniature rotary scanners that follow were used to help prepare this procedure.

NOTE: A small scanner is necessary to examine the fastener holes from inside the strut.

Instrument	Rotary Scanner	Recommended Scanner Speed
Elotest B1	MR3-MF	Fixed
Elotest M-2	MR3-MF	1200
Nortec 2000	9020066	1500
MIZ-21SR	ZS-4	1000
Phasec 2S	073-200-001	1500
Phasec 2200	073-200-0011	1500
US-454	JF-15, PN96130	1500

#### C. Probes

- (1) Use a probe that:
  - (a) Operates at a frequency range of 200 kHz to 500 kHz.
  - (b) Has a differential-bridge coil or a differential reflection coil.
  - (c) Operates with a minimum signal-to-noise ratio of 5:1 on the reference standard and a minimum signal-to-noise ratio of 3:1 on the part to be examined.

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- (d) Use a probe that can be used in a 0.187 inch (4.74 mm) diameter hole. For examples of different probe designs, see Part 6, 51-00-17, Fig. 1 and 2.

NOTE: If you use a probe that cannot be expanded, make sure the difference between the hole diameter and the probe outer diameter is not more than 0.010 inch (0.25 mm).

NOTE: Probes that can be expanded must be set so that there is a light interference fit when the probe is put into the hole.

NOTE: If the probe fit is too tight, the probe will not turn freely and will wear quickly.

- (2) The probe that follows was used to help prepare this procedure.
- (a) BYU-12/16; made by NDT Engineering
- (3) Reference Standards
- (a) Make or buy reference standard NDT1040. See Part 6, 51-00-17, for instructions about reference standard NDT1040.

**3. Preparation for Inspection**

- A. Find the inspection areas on the airplane. See Figure 1, Figure 2 and Figure 3.
- B. Remove the engines from the struts.
- C. Remove the struts from the airplane.
- D. Get access to the inspection area and remove the fasteners shown in Figure 1 and Figure 2, as applicable.
- E. Look in all the holes to be examined for surface conditions that can cause noise signals to occur during the inspection. Look for these conditions:
- (1) A rough edge (burr).
- (2) Metal smear and/or tool or fastener galling.
- (3) Grooves caused by a tool or fastener gouge.
- (4) An out-of-round hole.
- F. Do a cleanup ream, if necessary, to remove surface conditions that can cause a noise signal. Get local engineering approval for the cleanup ream before you do it.

**4. Instrument Calibration**

- A. Connect the probe to the scanner and the instrument.
- B. Set the instrument frequency to between 200 and 500 kHz.
- C. Calibrate the instrument as specified in Part 6, 51-00-17, par. 4, but use the reference standard and probe specified in this procedure.

NOTE: The Nortec 2000 lift-off must be set in the vertical position when lift-off is adjusted in the X/Y mode (impedance plane mode) as specified by the manufacturer's instructions. Only the vertical channel is displayed.

NOTE: The Elotest M-2 lift-off must be set in the vertical position when lift-off is adjusted in the X/Y mode (impedance plane mode).

NOTE: You can put plastic tape on the probe head or use approved light oil, silicon spray or grease to decrease probe wear.

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**NONDESTRUCTIVE TEST MANUAL****5. Inspection Procedure**

- A. Refer to Figure 1, Figure 2 and Figure 3 (as applicable) to identify the inspection area to be examined on your airplane.

NOTE: The inboard and outboard midspar chords are examined with this procedure on each engine strut.

- B. Calibrate the instrument as specified in Paragraph 4.

NOTE: Do not make adjustments to the instrument gain or filters.

- C. Put the probe in an inspection hole to be examined. Make sure the probe is rotating.

NOTE: Make sure you use plastic tape when you examine the holes if you calibrated the instrument with plastic tape (to decrease probe wear).

NOTE: If plastic tape is not used (to decrease probe wear), use an approved light oil, silicon spray or grease on the probe.

NOTE: Do a check of the probe position in the scanner. The probe can move out of the scanner when it turns.

- D. Continue to slowly push the probe into the hole to examine the full length of the hole.

- E. Make a mark at the location that causes a crack signal to occur. Make sure you know the depth of the probe in the hole.

- F. Do Paragraph 5.C. thru Paragraph 5.E. again on all the inspection fastener holes on the inboard and outboard sides of the strut. See Figure 1, Figure 2 or Figure 3.

- G. Do Paragraph 5.C. thru Paragraph 5.F. again on the other engine.

**6. Inspection Results**

- A. Signals that are 50% (or more) of the reference standard notch amplitude are indications of a crack. A crack signal will almost be the same as the signal you got during calibration from the reference standard notch. Make sure you know the location of the possible crack in the hole.

(1) Compare the signals that occur during the inspection to the signals you got during calibration from the EDM notch of the reference standard.

- B. Noise signals can cause crack signals to be missed. A noise signal will have a wider shape than a crack signal. If the signal-to-noise ratio between the notch signal in the reference standard and the inspection surface noise level is more than 3:1, look for the surface conditions specified in Paragraph 3.E.

NOTE: Get local engineering approval to do a cleanup ream.

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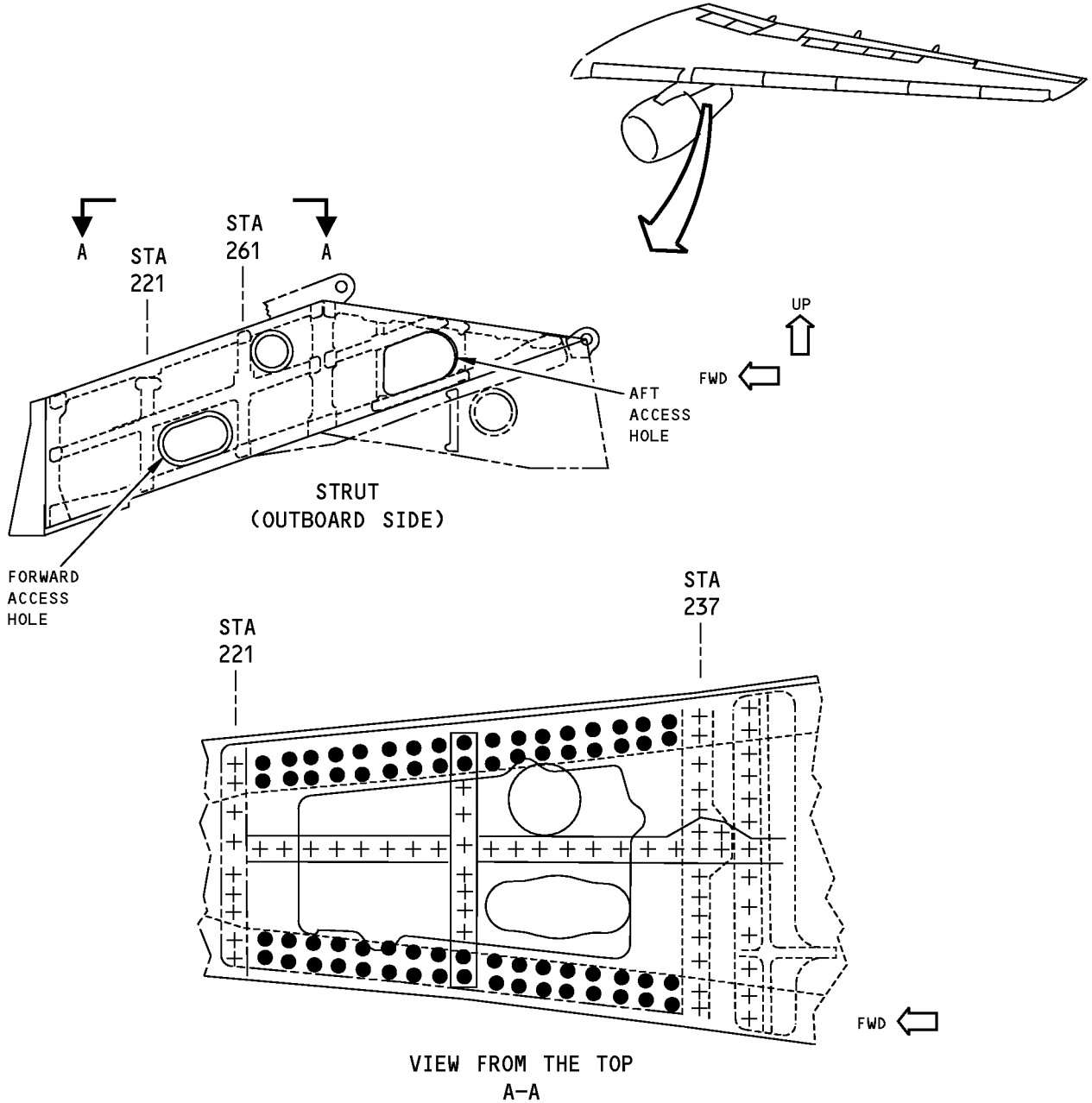
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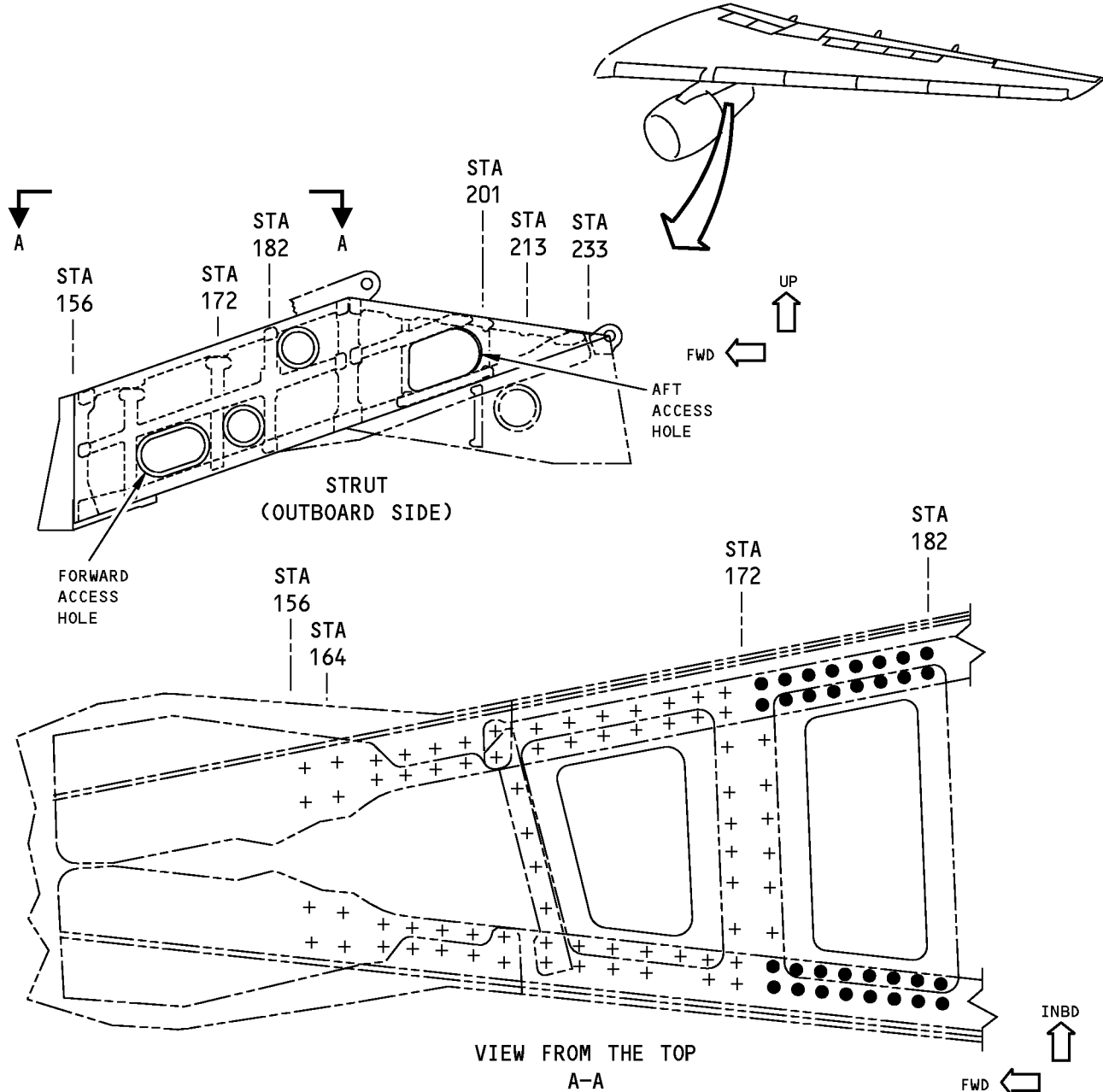
- STRUT NO. 1 IS SHOWN; STRUT NO. 2 IS ALMOST THE SAME.
- INSPECTION FASTENERS - EXAMINE A TOTAL OF 68 FASTENER HOLES IN THE INBOARD AND OUTBOARD SIDES OF THE MIDSPAR CHORD BETWEEN STA 221 AND STA 237.
- REMOVE THE FORWARD ACCESS DOORS ON THE INBOARD AND OUTBOARD SIDES OF THE STRUT TO GET ACCESS TO THE INSPECTION AREA.

**Inspection Areas - CF6-80A and CF6-80C2 Struts  
Figure 1**

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**NOTES:**

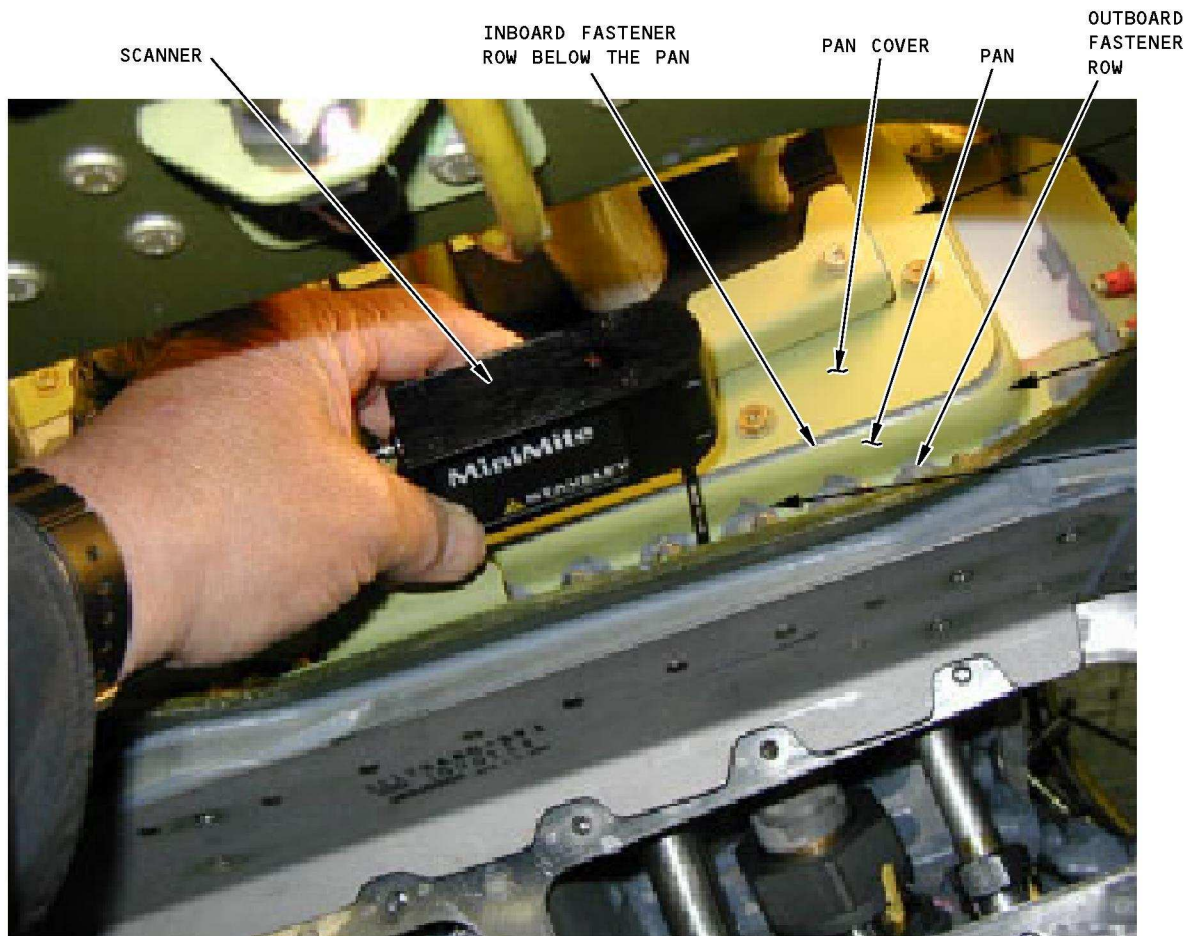
- STRUT NO. 1 IS SHOWN; STRUT NO. 2 IS ALMOST THE SAME.
- + JT9D STRUT - EXAMINE THE FASTENER HOLES IN THE MIDSPAR CHORD ON THE INBOARD AND OUTBOARD SIDES OF THE STRUT FROM STA 164 TO STA 172.
- PW4000 STRUT - EXAMINE THE FASTENER HOLES IN THE MIDSPAR CHORD ON THE INBOARD AND OUTBOARD SIDES OF THE STRUT FROM STA 172 TO STA 182.
- REMOVE THE FORWARD ACCESS DOORS ON THE INBOARD AND OUTBOARD SIDES OF THE STRUT TO GET ACCESS TO THE INSPECTION AREA.

**Inspection Areas - JT9D and PW4000 Struts  
Figure 2**

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**INSIDE VIEW OF THE STRUT THROUGH THE FORWARD ACCESS HOLE**

**NOTES:**

- THE OUTBOARD SIDE OF THE STRUT IS SHOWN; THE INBOARD SIDE OF STRUT 2 IS ALMOST THE SAME.
- REMOVE ALL INSPECTION FASTENERS IN THE MIDSPAR CHORD AS FOLLOWS:
  - FOR CF6-80A AND CF6-80C2 STRUTS: EXAMINE A TOTAL OF 68 FASTENER HOLES THAT ARE ON EACH SIDE OF THE STRUT.
  - FOR PW4000 STRUTS: EXAMINE A TOTAL OF 32 FASTENER HOLES THAT ARE ON EACH SIDE OF THE STRUT.
  - FOR JT9D STRUTS: EXAMINE A TOTAL OF 24 FASTENER HOLES THAT ARE ON EACH SIDE OF THE STRUT.
- THE PAN COVER AND PAN WILL HAVE TO BE REMOVED TO EXAMINE THE INBOARD FASTENER ROWS.

**Inspection Area Inside the Strut**  
**Figure 3**

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