PART 4 - ULTRASONIC

LEFT AND RIGHT UPPER SPAR CHORDS AT NSTA 242.7

1. Purpose

A. Use this procedure to examine the left and right upper spar chords of each nacelle strut for cracks. The upper spar chords are examined at fastener locations at NSTA 242.7 in areas where the upper spar chords are hidden by structure or fittings. See Figure 1 for the inspection areas.

B. An ultrasonic shear wave transducer is used to examine the upper spar chords for cracks that are 0.25 inch (6.4 mm) long at the fastener locations in the hidden areas. Eight fastener locations are examined on the left chord of each strut and four fasteners locations are examined on the right chord of each strut (for a total of 24 fastener locations for each airplane). See Figure 1 for the inspection areas.

C. The upper spar chords are 15-5PH CRES.

D. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 54-51-17F_1

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) All ultrasonic test instruments are permitted for use if they can operate between 4 and 6 MHz and can be calibrated on the reference standard as specified in Paragraph 4.

(2) The instruments that follow were used to help prepare this procedure.

(a) USN 60; GE Inspection Technology

(b) EPOCH 600; Olympus NDT

C. Transducers

(1) Use a 5 MHz transducer that can put a 45 degree shear wave in steel.

(2) The transducers that follow were used to help prepare this procedure.

(a) Nortec SPO-6151, 45°S; Olympus NDT

(b) SS-455S; Techna NDT

D. Reference Standards

(1) Use reference standard NDT3224 (available from Aerofab NDT) or an equivalent. See Figure 3 for data about this reference standard.

E. Couplant

(1) Use a couplant that is permitted for use with this structure.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Get access to the inspection area.

(1) Remove access panel 433CT.

C. Clean the inspection area.

4. Instrument Calibration

A. Set the instrument frequency at 5 MHz. A frequency adjustment is not necessary if you use a broadband instrument.

B. Apply a sufficient quantity of couplant at transducer position 1 (TP 1) and transducer position 2 (TP 2) on reference standard NDT3224 as shown in Figure 2, Details I and II.

C. Put the transducer at TP1 on the reference standard (approximately 0.5 inch (12.7 mm) from the hole) as shown in Figure 2 so that the transducer points at the hole.

D. Move the transducer a small distance to and from the hole and to the left and right until the hole signal is at a maximum height on the screen display. See Detail I in Figure 2.

E. Adjust the instrument delay to set the initial pulse at 0 percent of full screen width (FSW). Adjust the instrument range to set the signal from the hole at 60 percent of FSW. See Detail III in Figure 2.

F. Put the transducer at TP2. Slowly turn the transducer to the left and to the right and move it to and away from the notch to get the maximum signal from the notch. The notch signal will be to the right of the hole signal.

G. Adjust the gain to set the notch signal to 80 percent of full screen height (FSH). See Detail IV in Figure 2.

H. Record the gain setting.

I. Add 6 dB of gain.

5. Inspection Procedure

A. Identify the areas of the upper spar chords to be examined (see Figure 1).

(1) The upper spar chord on the right side of a strut is examined for cracks at four fasteners that go through the side of the upper spar chord at NSTA 242.7.The inspection area of this upper spar chord is hidden behind structure.

(2) The upper spar chord on the left side of a strut is examined for cracks at four fasteners that go through the side of the upper spar chord at NSTA 242.7 and also at four fasteners that go through a fitting that is attached to the top of the upper spar chord at NSTA 242.7.The inspection area of this upper spar chord is hidden behind structure and the fitting.

B. Apply a sufficient quantity of couplant on the inspection surface. See Figure 1.

C. Calibrate the instrument as specified in Paragraph 4.

D. Put the transducer on the inspection surface and point the transducer at the fastener location. Move the transducer to and away from the fastener to get a hole signal that is at its maximum height.

(1) If the hole signal does not occur on the screen display, increase the gain until the hole signal is 30 percent of FSH. Do not lower the gain if the hole signal is initially above 30 percent of FSH.

(2) It can be necessary to move the transducer nearer to the fasteners on the inspection surface. At each transducer location, keep the transducer as perpendicular as possible to the possible crack location. See Figure 1, Views C and D, for example transducer positions and example crack directions.

E. Slowly turn the transducer approximately 10 to 15 degrees to the left and right to make a scan for possible cracks. While you turn the transducer to the left and right, slowly move the transducer to and away from the hole. Move the transducer at least one full transducer length on the inspection surface when you make your scan. Examine each side of the fastener hole for cracks. During the scan:

(1) Carefully monitor the signal from the fastener hole. If there is a crack, the signal from the crack will occur to the right of the signal from the fastener hole and will increase in FSH as the fastener hole signal decreases in FSH. If a crack signal occurs, move the transducer as necessary to get the maximum crack signal.

(2) Make an analysis of all possible crack signals that are 40 percent or more of FSH as specified in Paragraph 6.

F. Make sure to examine all of the inspection areas specified in Paragraph 5.A. and shown in Figure 1.

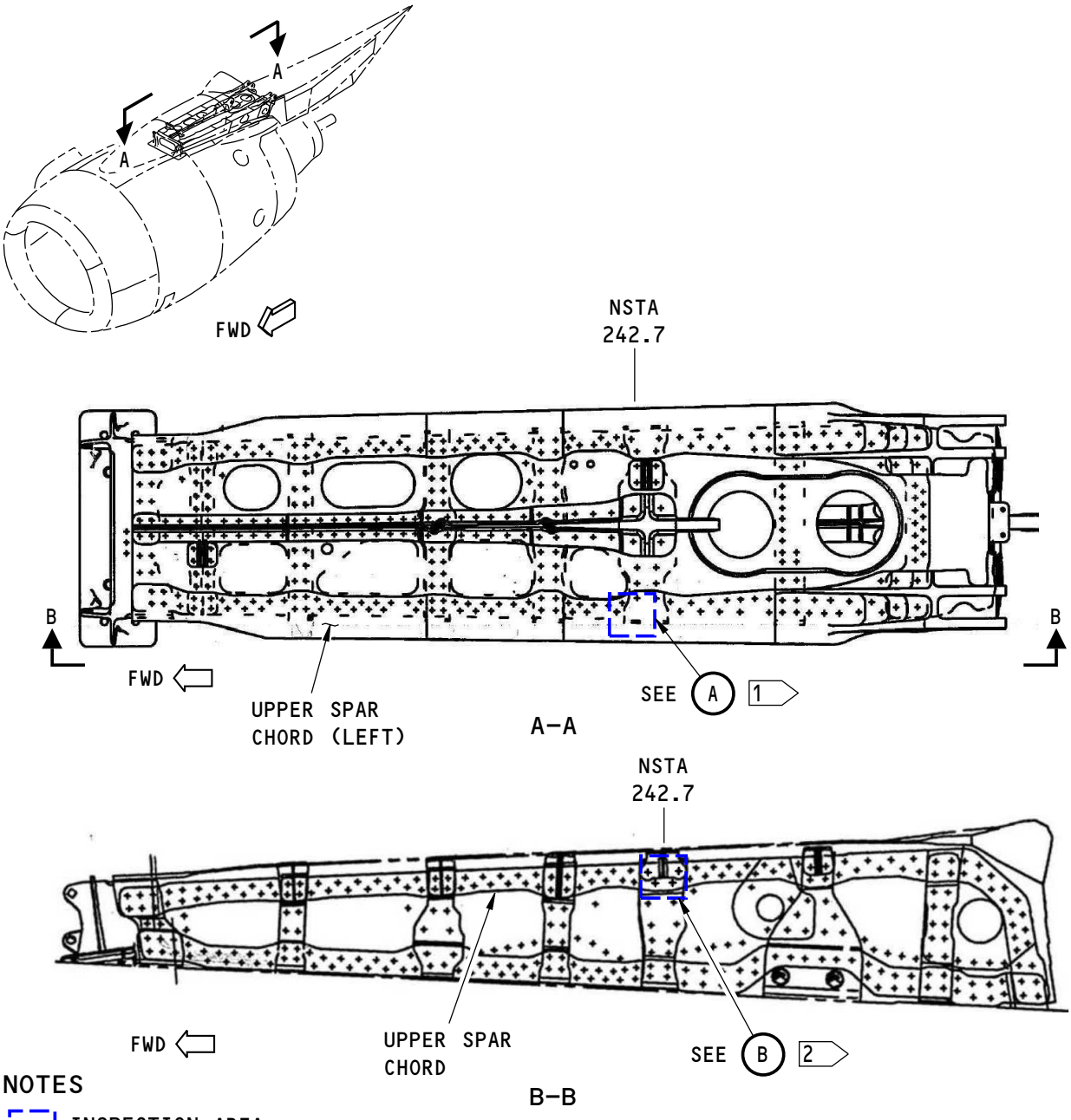
G. After all fastener holes have been examined, set the gain to the value recorded in Paragraph 4.H. Then use the reference standard to do a calibration check to make sure that the signal from the notch is 70 percent (or more) of FSH. If the signal from the notch is less than 70 percent of FSH, do the calibration and inspection again.

H. Do Paragraph 5.A. thru Paragraph 5.G. again to examine the upper spar chords of the strut on the other side of the airplane for cracks.

6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and are to the right of the hole signal are possible crack indications. Compare the signals that occur during the inspection with the signal from the notch on the reference standard.

B. To make sure of a crack indication, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17.



NOTES

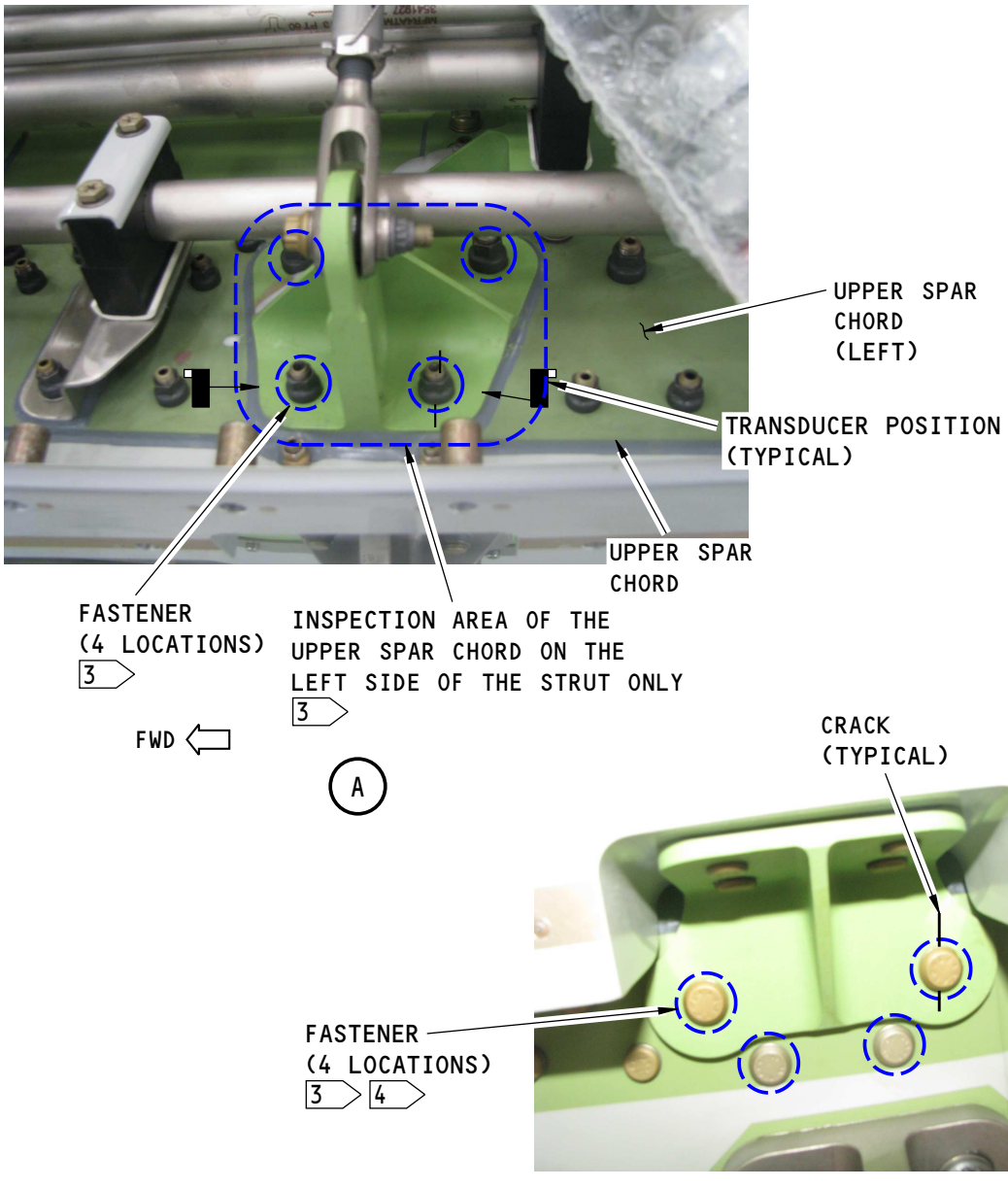
INSPECTION AREA

1 THIS INSPECTION AREA OF THE UPPER SPAR CHORD IS BEHIND A FITTING THAT IS ONLY ON THE LEFT SIDE OF THE STRUT

2 FOR THE OUTER VIEW OF THIS INSPECTION AREA. THIS INSPECTION AREA OF THE UPPER SPAR CHORD IS ON THE LEFT AND RIGHT SIDES OF THE STRUT

2375738 S0000543822_V2

Inspection Area
Figure 1 (Sheet 1 of 2)



VIEW OF THE OUTER SIDE OF THE LEFT STRUT AT NSTA 242.7 THE RIGHT SIDE IS OPPOSITE

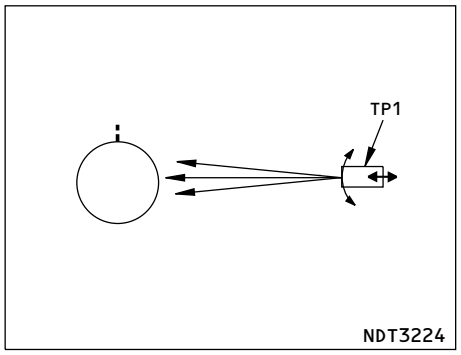
NOTES:

3 EXAMINE THE UPPER SPAR CHORD FOR CRACKS AT THE FOUR FASTENER LOCATIONS

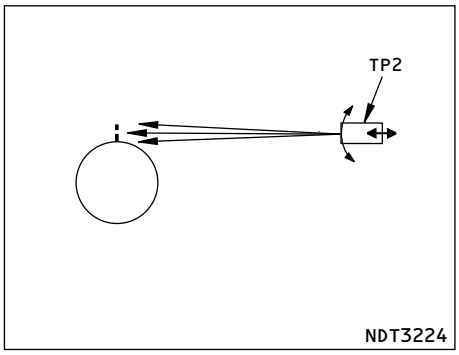
4 THESE FOUR FASTENER LOCATIONS ARE EXAMINED FROM THE INNER SIDE.

2375812 S0000543823_V2

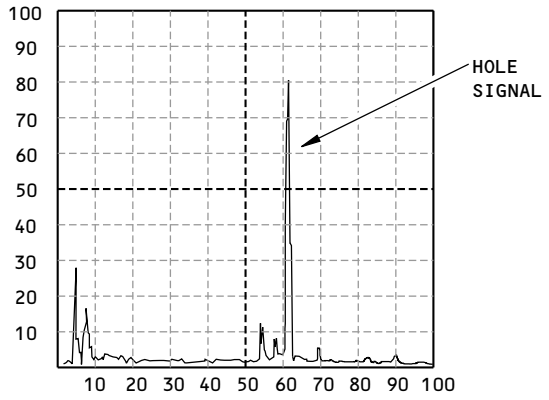
Inspection Area
Figure 1 (Sheet 2 of 2)



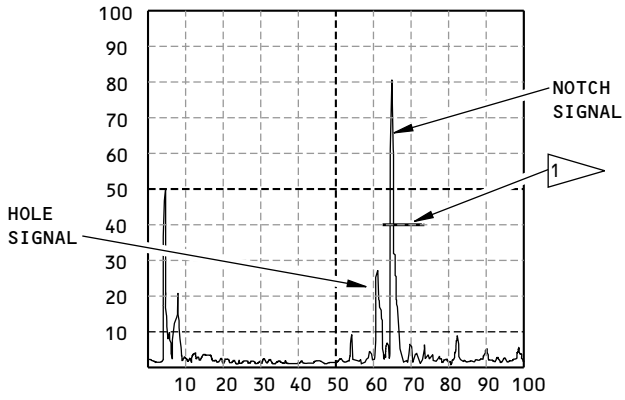
TRANSDUCER POSITION 1
DETAIL I



TRANSDUCER POSITION 2
DETAIL II



TRANSDUCER POSITION 1 SIGNAL
DETAIL III



TRANSDUCER POSITION 2 SIGNALS
DETAIL IV

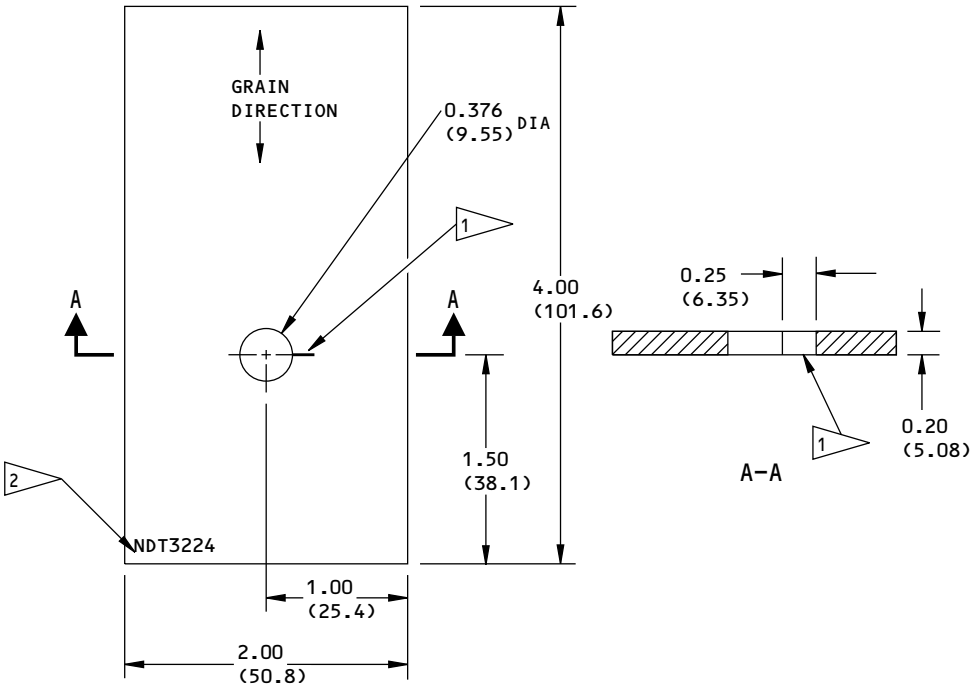
NOTES:

TP = TRANSDUCER POSITION

1 DURING THE INSPECTION, EXAMINE AREAS THAT CAUSE SIGNALS TO OCCUR THAT ARE 40 PERCENT (OR MORE) OF FULL SCREEN HEIGHT (FSH) AND NO MORE THAN 10 PERCENT OF FULL SCREEN WIDTH (FSW) TO THE RIGHT OF THE HOLE SIGNAL. THE SIGNAL FROM THE FASTENER HOLE WILL CHANGE IN FULL SCREEN WIDTH AS THE TRANSDUCER MOVES TO AND FROM THE FASTENER HOLE.

2375851 S0000543825_V1

Instrument Calibration
Figure 2



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: 15-5PH, 4330, OR 4340 STEEL
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1 EDM NOTCH:
0.250 (6.35) LONG X 0.010 (0.25)
MAXIMUM WIDTH; THROUGH THE THICKNESS

2 ETCH OR STAMP THE REFERENCE
STANDARD NUMBER, NDT3224, AT
APPROXIMATELY THIS LOCATION

2375848 S0000543826_V1

Reference Standard NDT3224
Figure 3

PART 4 - ULTRASONIC

LOWER SPAR CHORDS AT THE FIRE SEAL DEPRESSOR BRACKETS OF THE ENGINE SUPPORT STRUTS

1. Purpose

A. Use this procedure to examine the lower spar chords for cracks at the fire seal depressor brackets of the engine support struts. The left and right lower spar chords are examined at the NSTA 203.4 and NSTA 207.8 fastener locations. See Figure 1 for the inspection area.

B. An ultrasonic shear wave transducer is used to examine the lower spar chords for 0.25 inch (6.4 mm) long (or longer) cracks at the fastener locations. Two fastener locations are examined on the left lower spar chord of each strut and two fastener locations are examined on the right lower spar chord of each strut. See Figure 1 for the inspection areas.

C. The lower spar chords are 15-5PH CRES.

D. 737 Maintenance Planning Document (MPD) Damage Tolerance Record (DTR) Check Form Reference:

(1) Item: 54-51-10b

2. Equipment

A. General

(1) All ultrasonic test instruments are permitted for use if they 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) All ultrasonic test instruments are permitted for use if they can operate at a frequency between 4 and 6 MHz and can be calibrated on the reference standard as specified in Paragraph 4.

(2) The instruments that follow were used to help prepare this procedure.

(a) USN 60; GE Inspection Technology

(b) EPOCH 600; Olympus NDT

C. Transducers

(1) Use a 5 MHz transducer that can put a 60 degree shear wave in steel.

(2) The transducers that follow were used to help prepare this procedure.

(a) Nortec SPO-6151, 45°S; Olympus NDT

D. Reference Standards

(1) Use reference standard NDT3224 (available from Aerofab NDT) or an equivalent. See Figure 3 for data about reference standard NDT3224.

E. Couplant

(1) Use a couplant that is permitted for use with this structure.

3. Prepare for the Inspection

A. Identify the inspection areas shown Figure 1.

B. Clean the inspection area.

(1) Remove loose paint, dirt and sealant from the surface of the inspection area.

4. Instrument Calibration

A. Set the instrument frequency at 5 MHz. A frequency adjustment is not necessary if you use a broadband instrument.

B. Apply a sufficient quantity of couplant at transducer positions (TP) 1 and 2 on reference standard NDT3224 as shown in Figure 2, Details III and IV.

C. Put the transducer at TP1 on the reference standard (approximately 1/2 inch from the hole) as shown in Figure 2 so that the transducer points at the hole.

D. Move the transducer a small distance to and from the hole and to the left and right until the hole signal is at a maximum height on the screen display. See Detail III in Figure 2.

E. Adjust the instrument delay to set the initial pulse to 0 percent of full screen width (FSW). Adjust the instrument range to set the signal from the hole at 60 percent of FSW. See Detail I in Figure 2.

F. Put the transducer at TP2. Slowly turn the transducer to the left and to the right and move it toward and away from the notch to get the maximum signal from the notch. The notch signal will be to the right of the hole signal.

G. Adjust the gain to set the notch signal to 80 percent of full screen height (FSH). See Detail II in Figure 2.

H. Record the gain setting.

I. Add 6 dB of gain.

5. Inspection Procedure

A. Identify the inspection areas of the lower spar chords shown in Figure 1.

B. Apply a sufficient quantity of couplant on the inspection surfaces. See Figure 1.

C. Calibrate the instrument as specified in Paragraph 4.

D. Put the transducer on the inspection surface and point the transducer at the fastener location. Move the transducer away from the fastener and toward the fastener so that the hole signal is at a maximum height.

(1) If the hole signal does not occur on the screen display, increase the gain until the hole signal is 30 percent of full screen height. Do not lower the gain if the hole signal is initially above 30 percent of full screen height.

(2) It can be necessary to move the transducer nearer to the fasteners on the inspection surface. At each transducer location, keep the transducer as perpendicular to the possible crack location as you can.

E. Make a scan as you slowly turn the transducer approximately 10 to 15 degrees to the left and right to find possible cracks. While you turn the transducer to the left and right, slowly move the transducer toward and away from the hole. Move the transducer at least one full transducer length on the inspection surface when you make your scan. Examine for cracks on each side of the fastener hole. During the scan:

(1) Carefully monitor the signal from the fastener hole. If there is a crack, the signal from the crack will occur to the right of the signal from the fastener hole and will increase in FSH as the fastener hole signal decreases in FSH. If a crack occurs, then move the transducer as necessary to get the maximum crack signal.

(2) Go to Paragraph 6. for instructions to help make an analysis of all possible crack signals that are 40 percent or more of FSH.

F. Make sure to examine the left and right lower spar chords at the four inspection areas shown in Figure 1.

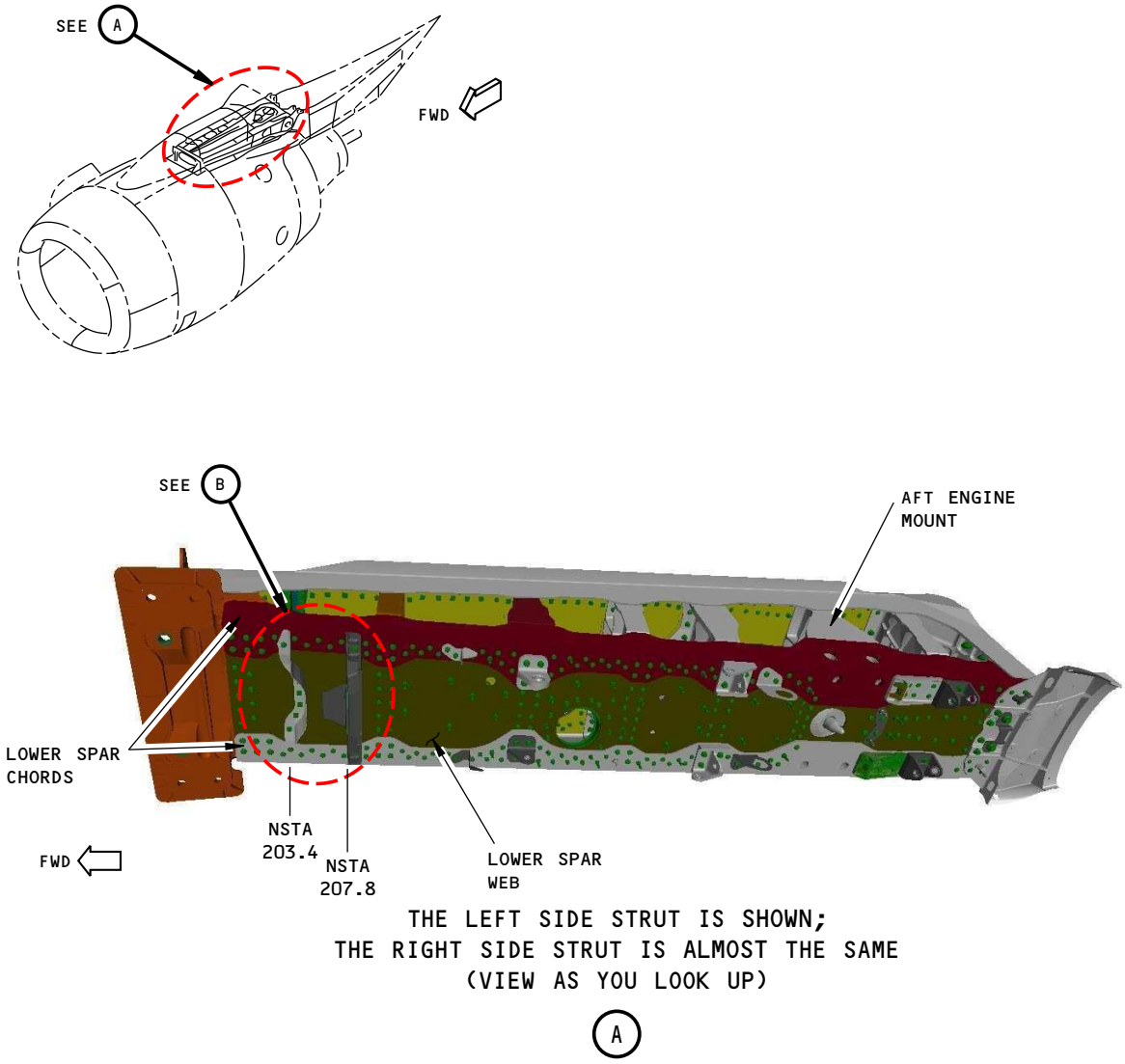
G. After all the fastener holes have been examined, set the gain to the value recorded in Paragraph 4.H. Then use the reference standard to do a calibration check to make sure that the signal from the notch is 70 percent of FSH or more. If the signal from the calibration notch is less than 70 percent of FSH, do the calibration and inspection again.

H. Do Paragraph 5.A. thru Paragraph 5.G. again on the other engine support strut.

6. Inspection Results

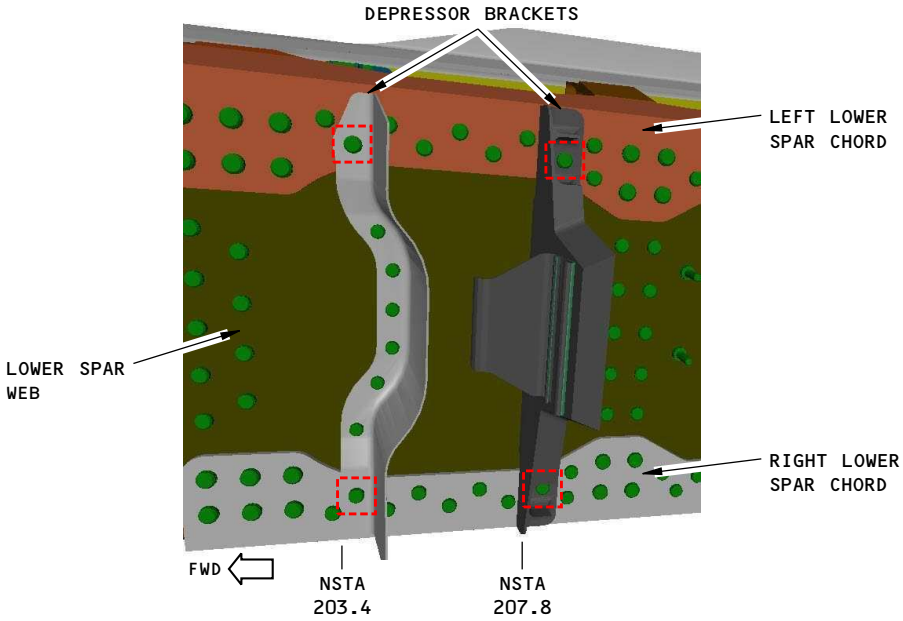
A. Ultrasonic signals that are 40 percent (or more) of FSH and are to the right of the hole signal are possible crack indications. Compare the signals that occur during the inspection with the signal from the notch on the reference standard.

B. To make sure of a crack indication, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 19.



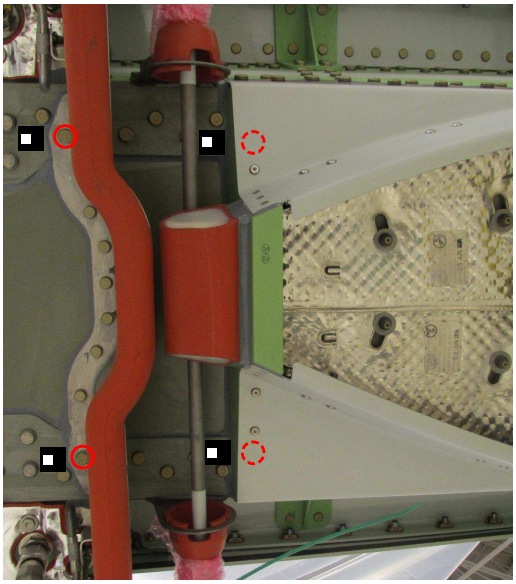
2427469 S0000561144_V1

Inspection Area
Figure 1 (Sheet 1 of 2)



(COMPUTER VIEW)
(VIEW AS YOU LOOK UP)

B



FWD

(PICTURE VIEW)
(VIEW AS YOU LOOK UP)

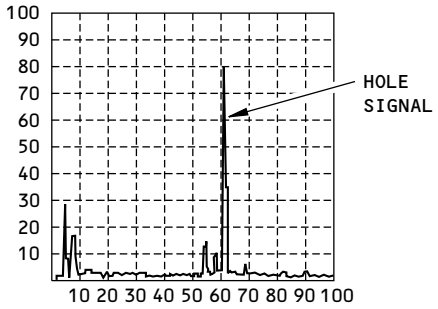
B

NOTES

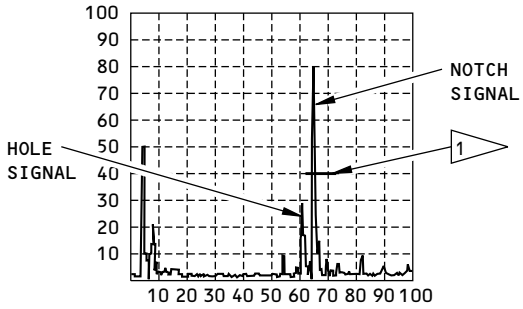
- INSPECTION AREAS (4 LOCATIONS)
- FASTENER LOCATIONS TO BE EXAMINED
- TRANSDUCERS

2427510 S0000561145_V1

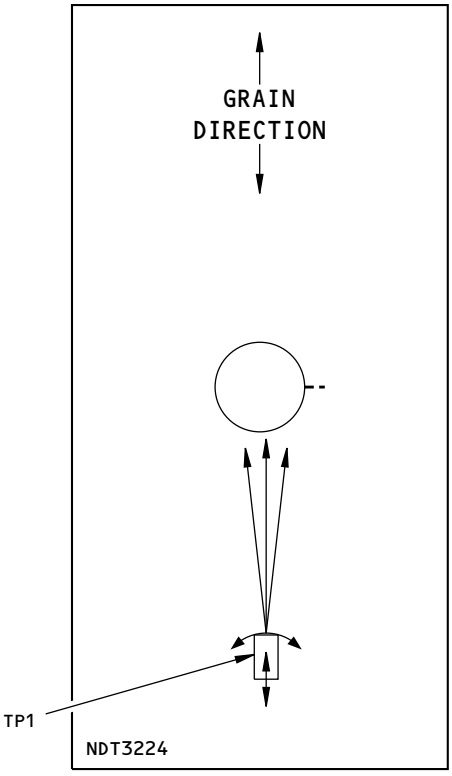
Inspection Area
Figure 1 (Sheet 2 of 2)



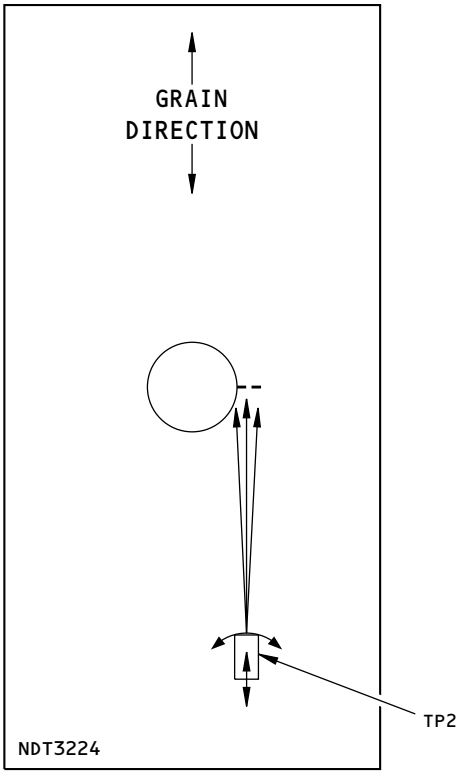
TRANSDUCER POSITION 1 SIGNAL
DETAIL I



TRANSDUCER POSITION 2 SIGNAL
DETAIL II



TRANSDUCER POSITION 1
DETAIL III



TRANSDUCER POSITION 2
DETAIL IV

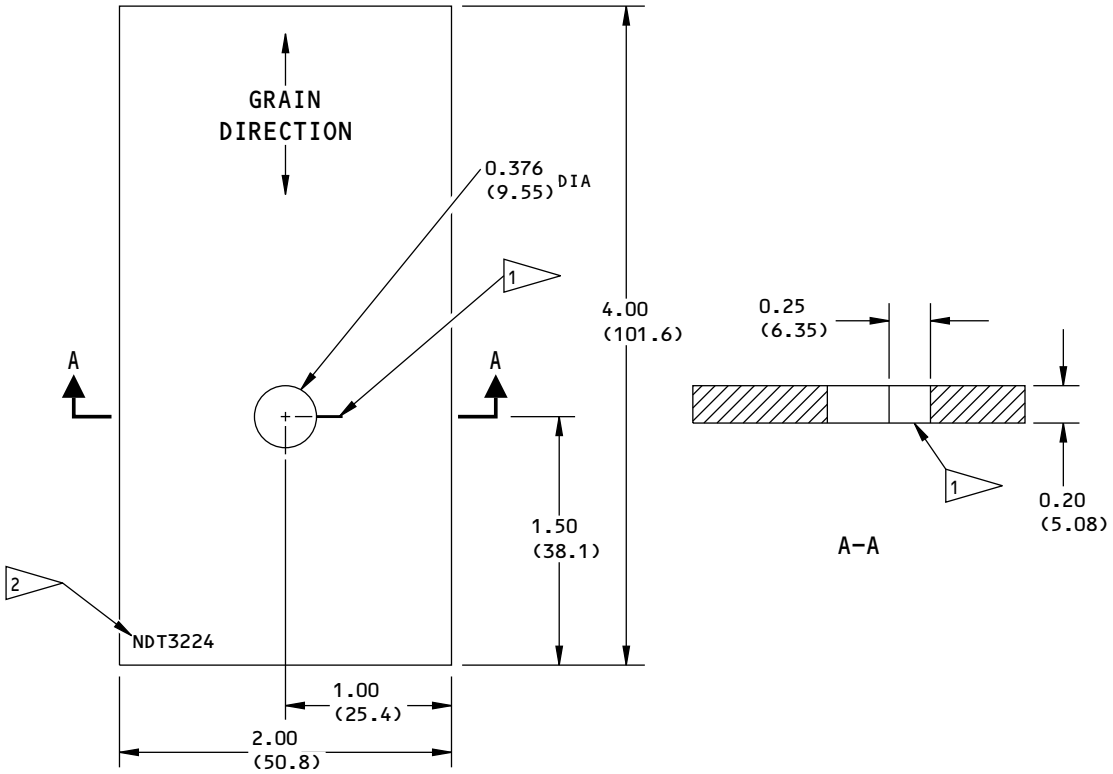
NOTES

TP = TRANSDUCER POSITION

1 EXAMINE AREAS THAT CAUSE SIGNALS TO OCCUR THAT ARE 40 PERCENT (OR MORE) OF FULL SCREEN HIGHT (FSH) AND WITHIN 10 PERCENT OF FULL SCREEN WIDTH (FSW) TO THE RIGHT OF THE HOLE SIGNAL. THE SIGNAL FROM THE FASTENER HOLE WILL CHANGE IN FULL SCREEN WIDTH AS THE TRANSDUCER MOVES TO AND FROM THE FASTENER HOLE.

2427644 S0000561146_V1

Instrument Calibration
Figure 2



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: STEEL 15-5PH, 4330, OR 4340
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1 EDM THRU NOTCH: 0.250 (6.35) LONG; 0.010 (0.25) MAXIMUM WIDTH

2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3224, AT APPROXIMATELY THIS LOCATION

2427671 S0000561147_V1

Reference Standard NDT3224
Figure 3

PART 4 - ULTRASONIC

UPPER LINK OF THE ENGINE STRUT

1. Purpose

A. Use this procedure to examine the aft lug hole of the 15-5PH CRES upper links for cracks and corrosion that can start at the inner surface of the hole (bore). The upper and lower surfaces of the hole are examined with this procedure. See Figure 1 for the location of the upper links and the inspection areas.

B. Two upper links are examined with this procedure; one upper link is at each engine strut.

C. Use this procedure to examine the 311A1710 upper link only.

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.

(3) Refer to Part 1, 51-04-00, for more instructions about how to find cracks by ultrasonic inspection.

B. Instrument

(1) Use an ultrasonic instrument that:

(a) Can do pulse echo inspection.

(b) Operates at a frequency of 5 MHz.

(2) The instruments that follow were used to help prepare this procedure.

(a) USM Go; GE

(b) Sonic 1200; Olympus

(c) Masterscan 340; Sonatest Inc.

C. Transducer

(1) Use a transducer that has these properties:

(a) Puts a 45° shear wave into steel.

(b) Has a maximum length of 1.0 inch (25 mm) and a maximum width of 0.38 inch (9.5 mm).

(c) Has a top-mounted connector.

(d) Can satisfactorily do the instrument calibration instructions given in Paragraph 4.

(e) Has a signal-to-noise ratio of 5 to 1 in the area of the notch signals and when the reference notch signal is set to 80% of full screen height (FSH).

(2) The transducers that follow were used to help prepare this procedure.

(a) SPO-6151; Nortec

(b) 545-ST-1; Techna NDT

D. Reference Standard

(1) Use reference standard NDT3242. See Figure 2 for data about reference standard NDT3242.

E. Couplant

(1) Use an ultrasonic couplant that will not cause corrosion or other damage to the airplane. The couplant that is used during calibration must also be used during the inspection of the upper link.

3. Prepare for the Inspection

A. To get access to the upper link, remove or open the applicable access panels. Refer to Section 4 in the D6-38278 Maintenance Planning Data Document for the access panel location data.

B. Clean the inspection surface to remove all loose dirt. If the surface is rough, lightly smooth the transducer contact surfaces by an approved procedure and wipe clean.

NOTE: Do not damage the finish on the upper link when the surface is prepared for the inspection.

4. Instrument Calibration

A. Connect the 45° transducer to the instrument.

B. Set the instrument frequency to 5 MHz or the nearest set frequency range to 5 MHz.

C. Put couplant and then the transducer on the reference standard at transducer position 1 (TP 1) as shown in Figure 3.

D. Move the transducer forward, rearward, and at an angle to get a maximum signal from notch A.

E. Adjust the instrument controls to set the initial pulse at 0% of full screen width (FSW) and the maximum signal from notch A at 80% of FSW.

F. Adjust the gain to set the maximum signal from notch A at 80% of full screen height (FSH).

G. Put couplant and then the transducer on the reference standard at TP 2 as shown in Figure 3. Move the transducer as necessary to get a maximum signal from notch B. If the maximum signal from notch B is less than 80% of FSH, then add gain to set it to 80% of FSH.

H. Put couplant and then the transducer at TP3 and get a maximum signal from notch C. The signal from notch C will come into view at approximately 72% of FSW. If the signal is less than 80% of FSH, then adjust the gain to set the signal from notch C to 80% of FSH.

I. Add 6 dB more gain.

5. Inspection Procedure

A. Calibrate the instrument to the instructions given in Paragraph 4.

B. Put a sufficient quantity of couplant on the upper transducer contact surface of one of the two upper links to be examined.

C. Put the transducer on the upper transducer contact surface of the upper link to examine the upper area of the lug bore where cracks can occur (see Figure 1). Make a scan of the inspection area as shown in Figure 1, Detail I. Overlap the transducer by approximately one-half the width of the transducer for each full-length scan of the inspection area (see Figure 1, flagnote 1). As you make a scan, use the scan procedure shown in Figure 1, flagnote 2 to make sure the inspection area is fully examined.

(1) Go to Paragraph 6. for instructions to help make an analysis of possible crack signals.

D. Do Paragraph 5.C. again but turn the transducer 180° and examine the same inspection area from the opposite direction.

E. Put the transducer at approximately the same angle that was used during the instrument calibration and make a full length scan along the length of the two edges of the upper inspection area (see Figure 1, Detail II).

(1) Go to Paragraph 6. for instructions to help make an analysis of possible crack signals.

F. Do Paragraph 5.E. again but turn the transducer 180° and examine the same inspection area from the opposite direction.

G. Do Paragraph 5.B. thru Paragraph 5.F. again but put the transducer on the lower inspection surface of the upper link to examine the lower area of the lug bore for cracks.

H. Do Paragraph 5.B. thru Paragraph 5.G. again to examine the other upper link for cracks.

6. Inspection Results

A. An ultrasonic signal that is 40 percent (or more) of FSH and between 65 and 85 percent of FSW is an indication of a crack. If this occurs, go to Paragraph 6.B. and continue to make an analysis of the possible crack signal.

B. Compare the crack signal to the signal that you get from the applicable notch in the reference standard to be sure it is a possible crack signal.

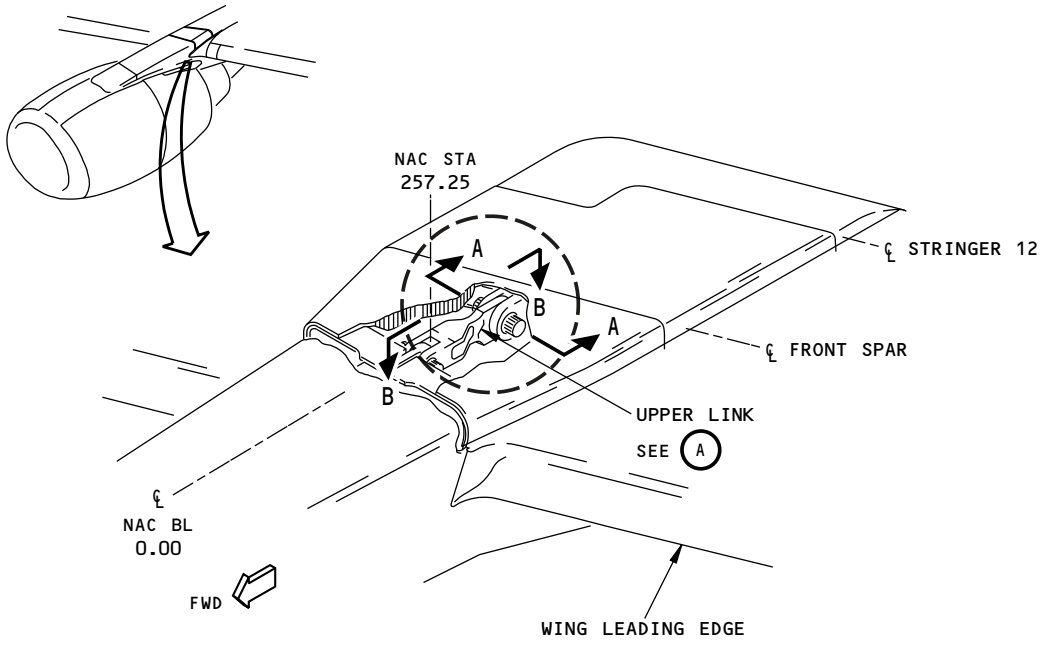
C. Do a check of the instrument calibration to make sure that the sensitivity has not changed. If the sensitivity has changed, calibrate the instrument again and then examine the area with the possible crack signal again. If the signal continues to be 40 percent (or more) of FSH, then go to Paragraph 6.D.

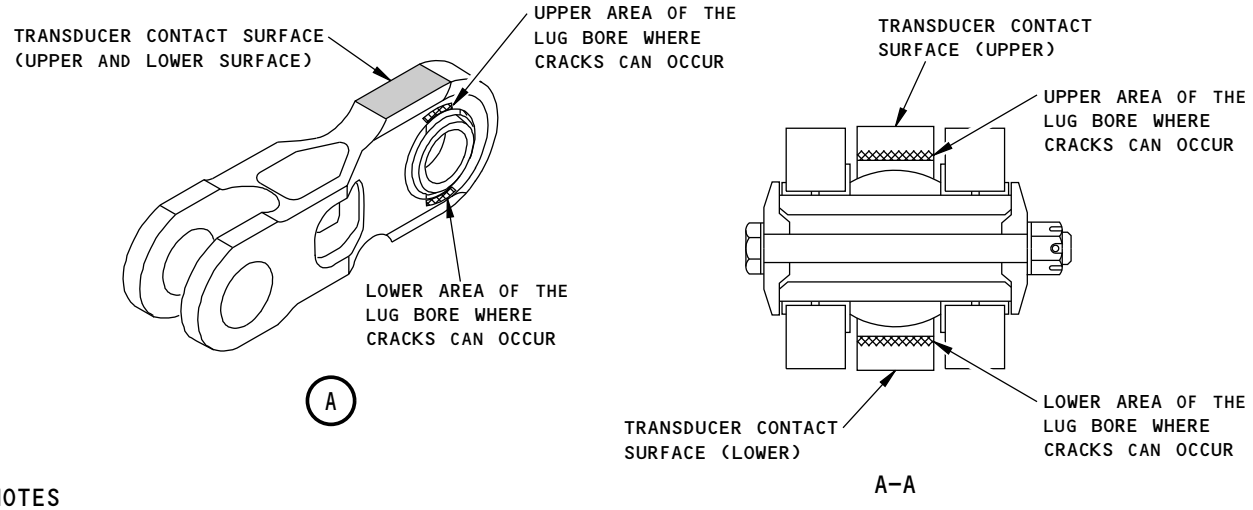
D. Remove all couplant from the transducer contact surface and then put a small quantity of couplant on the surface of the lug but only at the transducer location where the signal occurred. If the maximum signal continues to be 40 percent (or more) of FSH, go to Paragraph 6.E. and continue to make an analysis of the signal. If the signal goes away, no more analysis is necessary.

E. Try to dampen the signal. To do this, put a small quantity of couplant on a finger and rub the different surfaces of the lug. The possible crack signal will decrease in FSH when the finger touches the area of the lug that has caused the ultrasonic signal. If you cannot dampen the signal, then go to Paragraph 6.F. and continue to make an analysis of the signal. See the important note that follows.

NOTE: Because it is also possible to dampen a signal from a crack, more analysis is necessary if the location where you can dampen a signal is at the location where cracks can occur. See Figure 1 for the areas where cracks can occur. If you can dampen the signal at the area where cracks can occur, then go to Paragraph 6.F. and continue to make an analysis of the signal.

F. Do a surface eddy current inspection in the area that causes the crack type signal to occur. If necessary, remove the upper link to do this. If necessary, remove the bushings and do a surface eddy current inspection around the outer edges of the hole and in the hole (bore). Do this inspection as specified in Part 6, 51-00-00, Procedure 19, or do a penetrant inspection as specified in SOPM 20-20-02.



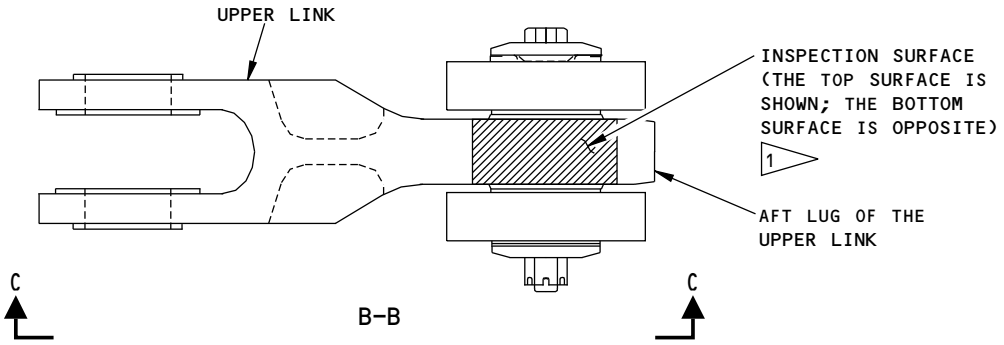


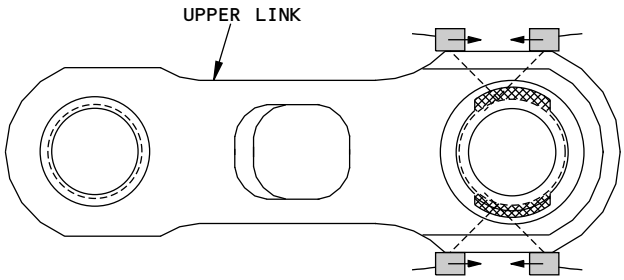
NOTES

- EXAMINE THE AFT LUG OF THE UPPER LINK FOR CRACKS
- THERE ARE TWO UPPER LINKS TO EXAMINE; ONE IS ON EACH ENGINE STRUT

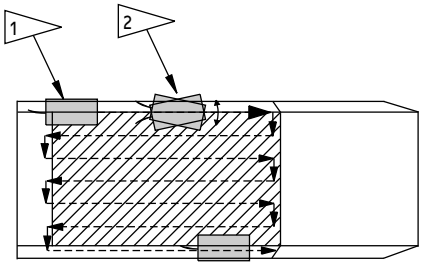
2433569 S0000564008_V1

Inspection Area - Aft Lug of the Upper Link
Figure 1 (Sheet 1 of 2)

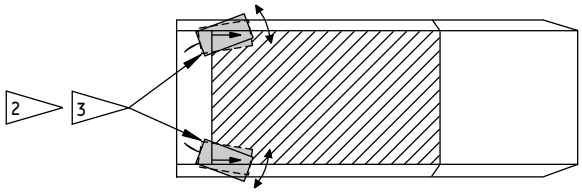




C–C



DETAIL I



DETAIL II

NOTES

INSPECTION SURFACES

LOCATIONS WHERE CRACKS CAN OCCUR

1. TO EXAMINE THE FULL WIDTH OF THE AFT BORE OF THE UPPER LINK AT THE UPPER AND LOWER INSPECTION AREAS, USE THE SCAN PATTERN SHOWN AND OVERLAP EACH SCAN BY APPROXIMATELY ONE–HALF OF THE TRANSDUCERS WIDTH. THEN TURN THE TRANSDUCER 180° AND EXAMINE THE SAME AREA AGAIN FROM THE OPPOSITE DIRECTION.

2. WHILE YOU MAKE A SCAN, MOVE THE TRANSDUCER FROM SIDE–TO–SIDE AS SHOWN (APPROXIMATELY 5 DEGREES EACH WAY)

3. TO EXAMINE THE TWO EDGES OF EACH INSPECTION AREA, SET THE TRANSDUCER AS SHOWN AND MAKE A SCAN ALONG THE EDGE OF THE PART. THEN TURN THE TRANSDUCER 180° AND EXAMINE THE SAME AREA AGAIN FROM THE OPPOSITE DIRECTION.

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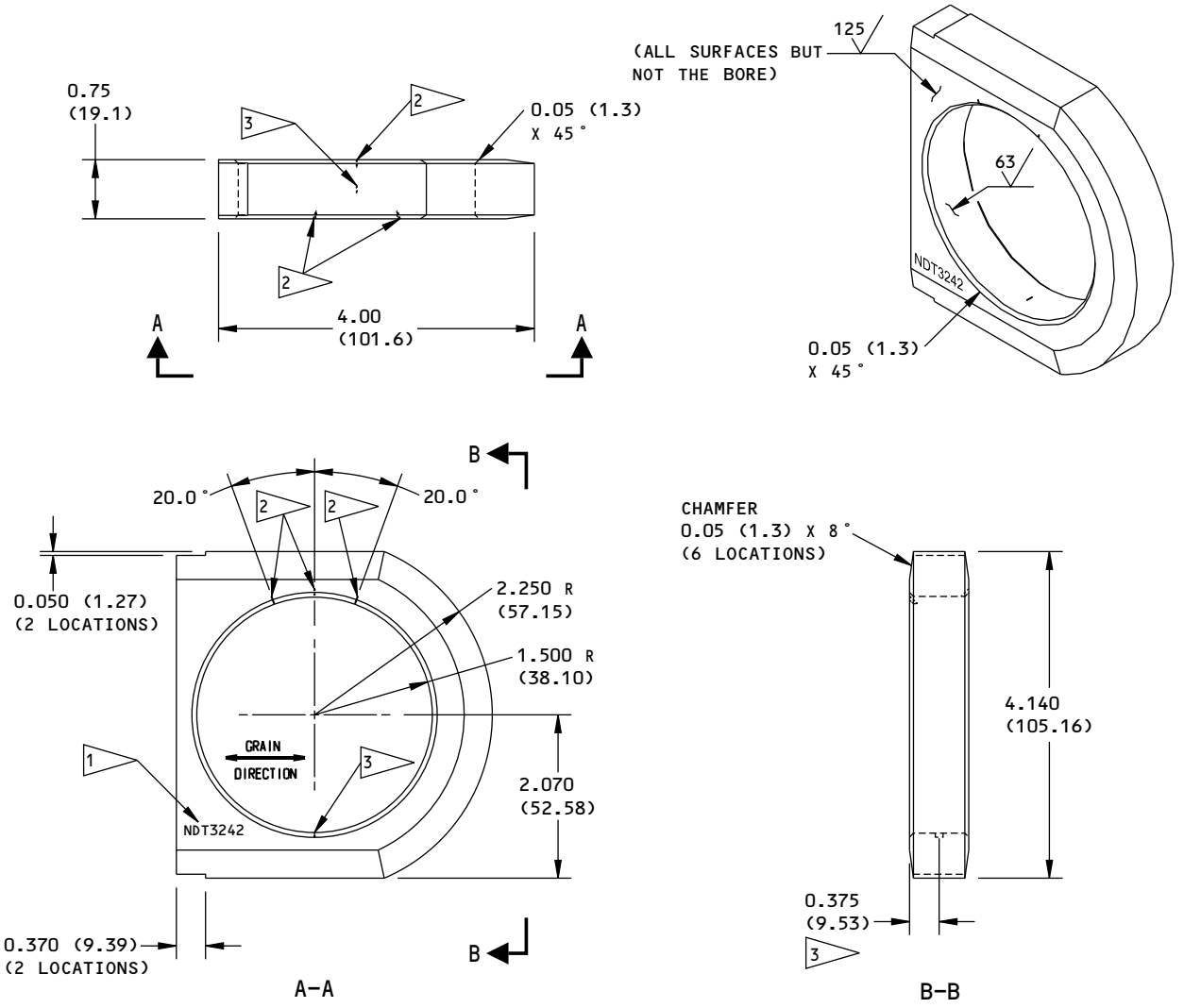
Inspection Area - Aft Lug of the Upper Link
Figure 1 (Sheet 2 of 2)



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

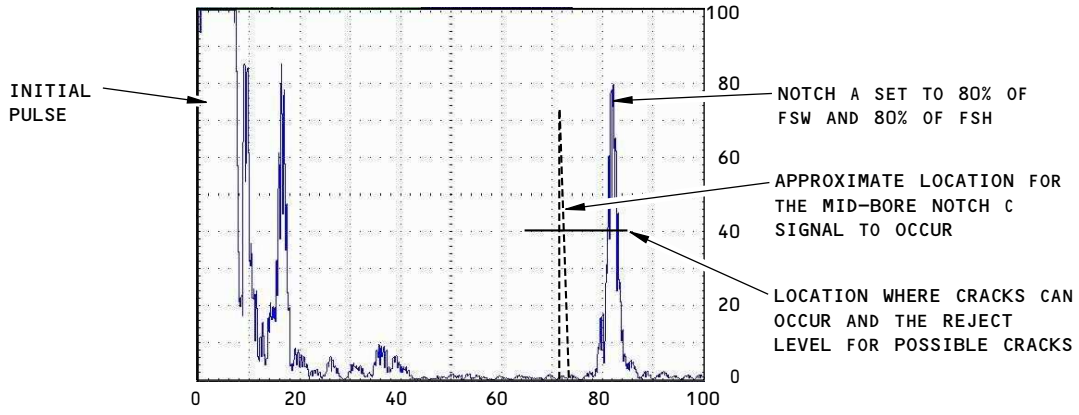
INCHES	MILLIMETERS	ANGULAR
X.XXX = ±0.005	X.XX = ±0.10	±1°
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

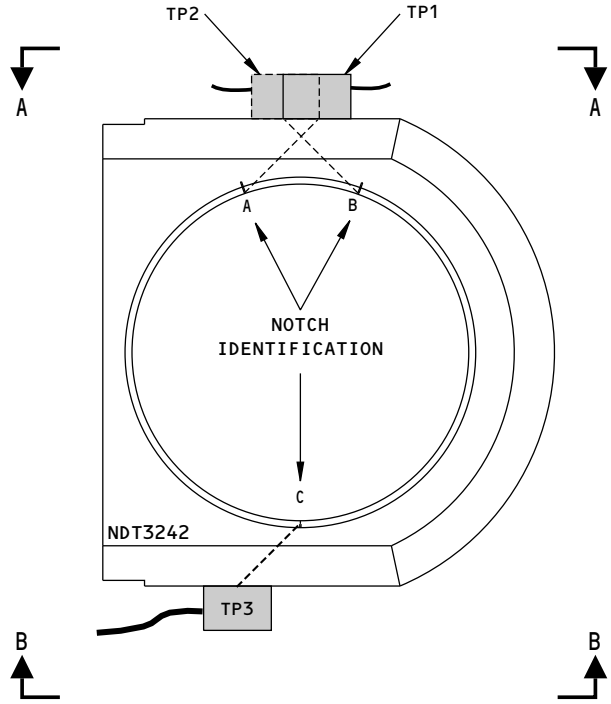
- MATERIAL: 15-5PH CRES
- SURFACE ROUGHNESS: 125 Ra FOR ALL SURFACES BUT THE BORE. 63 Ra IN THE BORE

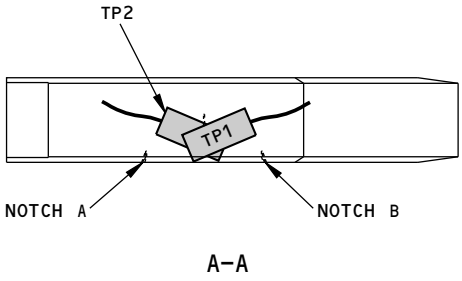
1. ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3242, AT APPROXIMATELY THIS LOCATION
2. EDM CORNER NOTCH: 0.100 (2.54) X 0.100 (2.54) X 0.010 (0.25) MAXIMUM WIDTH
3. EDM MID-BORE NOTCH: 0.100 (2.54) LONG X 0.050 (1.3) DEEP X 0.010 (0.25) MAXIMUM WIDTH

2433811 S0000564010_V1

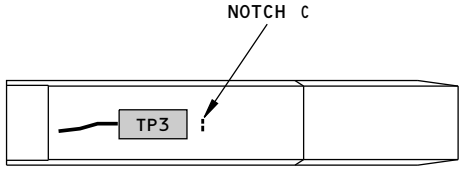
Reverence Standard NDT3242
Figure 2







A–A



B–B

NOTES

- MAKE A SCAN OF NOTCHES A AND B TO FIND THE NOTCH THAT GIVES THE SMALLEST FSH SIGNAL. USE THAT NOTCH TO SET THE INSTRUMENT SENSITIVITY TO 80% OF FSW AND FSH. DO A CHECK OF THE SENSITIVITY OF NOTCH C TO MAKE SURE IT IS MORE THAN 80% OF FSH.

2433850 S0000564011_V1

Instrument Calibration
Figure 3

PART 4 - ULTRASONIC

CROWN BEAM FITTING OF THE STRUT-T0-WING ATTACH FITTINGS

1. Purpose

A. Use this procedure to examine the lug hole at the aft end of the 15-5PH CRES crown beam fitting for cracks and corrosion that can start at the inner surface of the hole (bore). The upper and lower surfaces of the hole are examined with this procedure. See Figure 1 for the inspection areas.

B. Two crown beam fittings are examined with this procedure; there is one crown beam fitting at each engine strut.

C. Use this procedure to examine the 311A1111 crown beam fitting only.

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.

(3) Refer to Part 1, 51-04-00, for more instructions about how to find cracks by ultrasonic inspection.

(4) Use an ultrasonic instrument that:

(a) Can do pulse echo inspection.

(b) Operates at a frequency of 5 MHz.

(5) The instruments that follow were used to help prepare this procedure.

(a) USM Go; GE

(b) Sonic 1200; Olympus

(c) Masterscan 340; Sonatest Inc.

B. Transducer

(1) Use a transducer that has these properties:

(a) Puts a 45° shear wave into steel.

(b) Has a maximum length of 1.0 inch (25 mm) and a maximum width of 0.38 inch (9.5 mm).

(c) Has a top-mounted connector.

(d) Can satisfactorily do the instrument calibration instructions given in Paragraph 4.

(e) Has a signal-to-noise ratio of 5 to 1 in the area of the notch signals and when the reference notch signal is set to 80% of full screen height (FSH).

(2) The transducers that follow were used to help prepare this procedure.

(a) SPO-6151; Nortec

(b) AFM-545ST; Aerofab-NDT

C. Reference Standard

(1) Use reference standard NDT3243. See Figure 2 for data about reference standard NDT3243.

D. Couplant

(1) Use an ultrasonic couplant that will not cause corrosion or other damage to the airplane. The couplant that is used during calibration must also be used during the inspection of the crown beam fittings.

3. Prepare for the Inspection

A. Remove the access panels necessary to get access to the crown beam fitting on the two engine struts. Refer to Section 4 in the D6-38278 Maintenance Planning Data Document for the access panel location data.

B. Clean the inspection surface to remove all loose dirt. If the surface is rough, lightly smooth the transducer contact surfaces by an approved procedure and wipe clean.

NOTE: Do not damage the finish on the crown beam fitting when the surface is prepared for the inspection.

4. Instrument Calibration

A. Connect the 45° (in steel) transducer to the instrument.

B. Set the instrument frequency to 5 MHz or the nearest set frequency range to 5 MHz.

C. Put couplant and then the transducer on the reference standard at transducer position 1 (TP1) as shown in Figure 3.

D. Move the transducer as necessary to get a maximum signal from the hole (bore).

E. Adjust the instrument controls to set the initial pulse at 0% of full screen width (FSW) and the maximum signal from the hole at 90% of FSW. See Figure 3, Detail I.

F. Put couplant and then the transducer on the reference standard at TP2 as shown in Figure 3. Move the transducer as necessary to get a maximum signal from notch A. This signal will come into view at approximately 72% of FSW as shown in Figure 3, Detail II.

G. Adjust the gain to set the maximum signal from notch A at 80% of full screen height (FSH).

H. Put couplant and then the transducer on the reference standard at TP3 as shown in Figure 3. Move the transducer as necessary to get a maximum signal from notch B. This signal will come into view at approximately 72% of FSW. If the maximum signal from notch B is less than 80% of FSH, then add gain to set it to 80% of FSH.

I. Put couplant and then the transducer at TP4 and get a maximum signal from notch C. The signal from notch C will come into view at approximately 66% of FSW and will be more than 80% of FSH.

J. Make a record of the gain used that you can refer to during the analysis of a possible crack signal.

K. Add 6 dB of gain.

5. Inspection Procedure

A. Calibrate the instrument to the instructions given in Paragraph 4.

B. Put a sufficient quantity of couplant on the upper transducer contact surface that is shown in Figure 1 for the crown beam fitting.

C. Put the transducer on the upper transducer contact surface at one of the two edges of the lug for the crown beam fitting and move the transducer as necessary to get a signal from the hole. See Figure 1, flagnote 2.

NOTE: If necessary, use the reference standard to see where the transducer must be set on the crown beam fitting to get a signal from the hole.

D. Make a scan along the edge of the lug until the transducer is at the end of the transducer contact surface. While you make the scan, continuously turn the transducer from side to side (approximately ± 3 degrees) as shown in Figure 1, flagnote 3. As you make a scan, look for possible crack signals to occur between 60 and 90% of FSW that are 40% (or more) of FSH. Go to Paragraph 6. for instructions to help make an analysis of possible crack signals.

NOTE: It is permitted to do a quick scan along the two edges of the crown beam fitting to find a crack that goes to the edge of the lug. If you find a crack that causes the crown beam fitting to be rejected, then no more inspection would be necessary.

E. Move the transducer back to the location where the hole signal occurs and also move the transducer laterally by one-half the width of the transducer to make an overlap of the last scan. Make a new scan in the aft direction until the transducer is at the end of the transducer contact surface. As you make a scan, look for possible crack signals to occur between 60 and 90% of FSW that are 40% (or more) of FSH. Go to Paragraph 6. for instructions to help make an analysis of possible crack signals.

F. Do Paragraph 5.E. again and again until the full width of the lug is examined as shown in Figure 1, Section View B-B.

G. Do Paragraph 5.B. thru Paragraph 5.F. again, but use the lower transducer contact surface (and not the upper transducer contact surface) to examine the lower area of the lug hole for the crown beam fitting.

H. Do Paragraph 5.B. thru Paragraph 5.G. to examine the crown beam fitting for cracks at the other engine strut.

6. Inspection Results

A. An ultrasonic signal that is 40 percent (or more) of FSH and between 60 and 90% of FSW is an indication of a crack. If this occurs, go to Paragraph 6.B. and continue to make an analysis of the possible crack signal.

B. Compare the crack signal to the signal that you get from the applicable notch in the reference standard to be sure it is a possible crack signal.

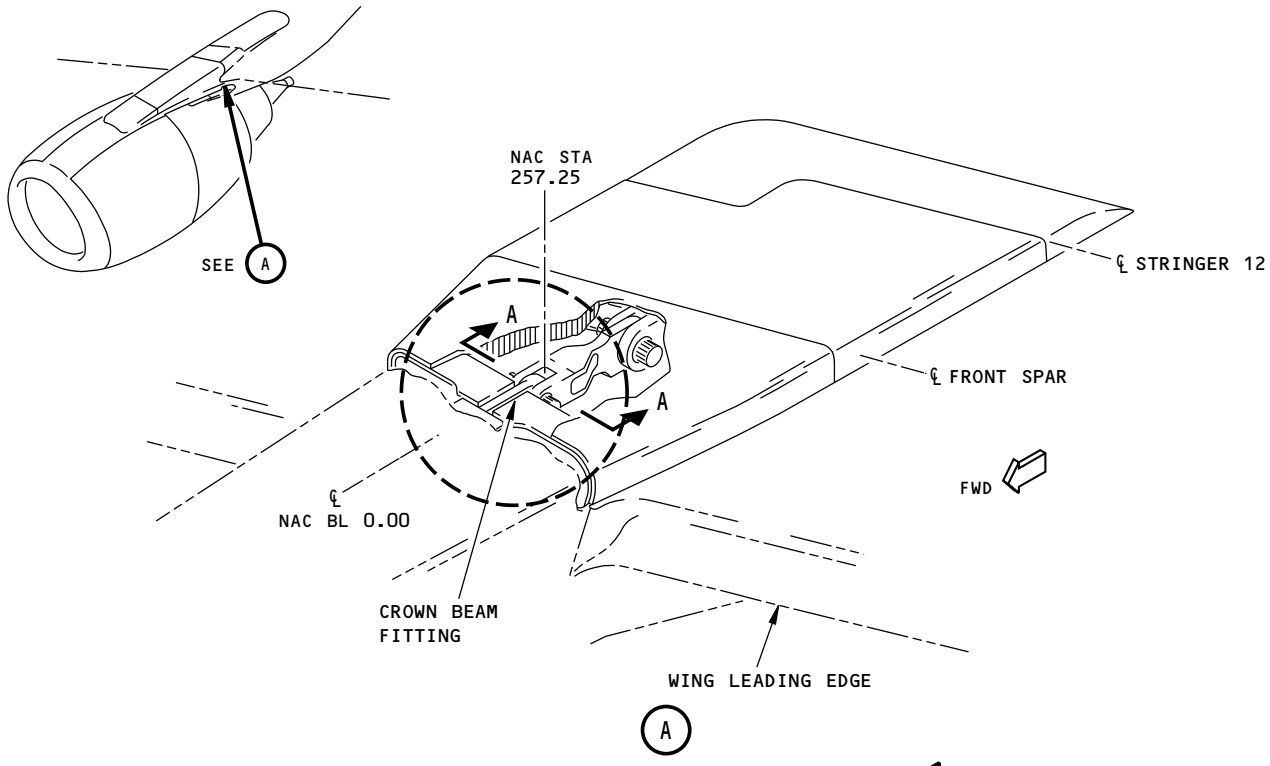
C. Do a check of the instrument calibration to make sure that the sensitivity has not changed. If the sensitivity has changed, calibrate the instrument again and then examine the area with the possible crack signal again. If the signal continues to be 40 percent (or more) of FSH, then go to Paragraph 6.D.

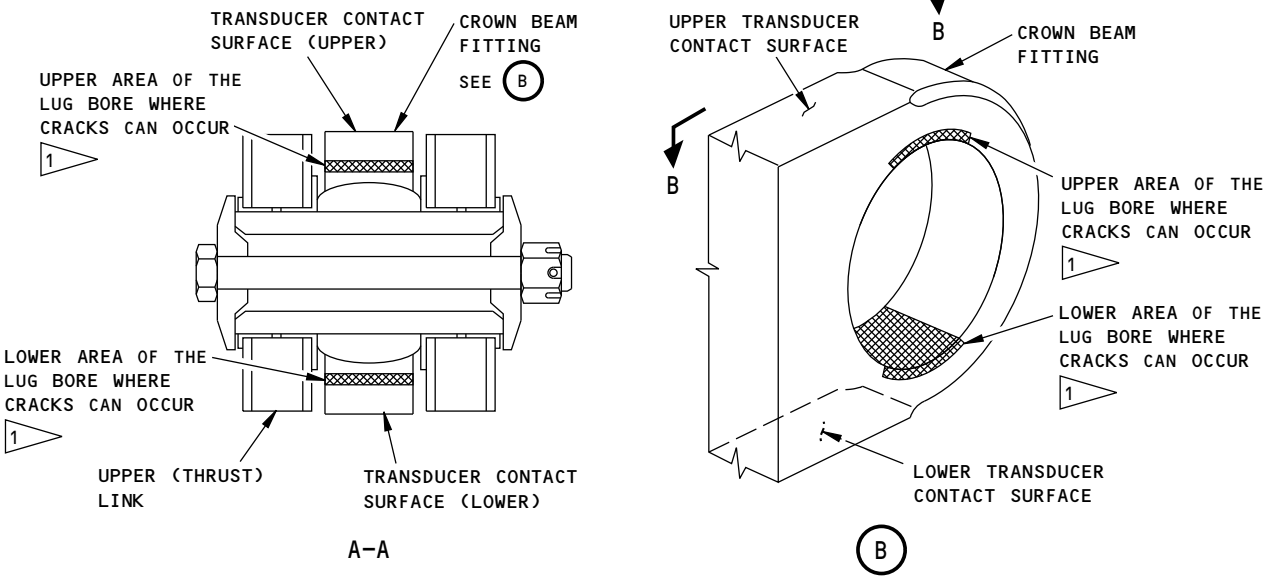
D. Remove all couplant from the transducer contact surface and then put a small quantity of couplant on the surface of the lug but only at the transducer location where the signal occurred. If the maximum signal continues to be 40 percent (or more) of FSH, go to Paragraph 6.E. and continue to make an analysis of the signal. If the signal goes away, no more analysis is necessary.

E. Try to dampen the signal. Put a small quantity of couplant on a finger and rub different surfaces of the lug. The possible crack signal will move up and down when the finger touches the area of the lug that has caused the ultrasonic signal. If you cannot dampen the signal, then go to Paragraph 6.F. and continue to make an analysis of the signal. See the important note that follows.

NOTE: Because it is also possible to dampen a signal from a crack, more analysis is necessary if the location where you can dampen a signal is at the location where cracks can occur. See Figure 1 for the areas where cracks can occur. If you can dampen the signal at area where cracks can occur, then go to Paragraph 6.F. and continue to make an analysis of the signal.

F. Do a surface eddy current inspection in the area that causes the crack type signal to occur. If necessary, remove the crown beam fitting to get more access. If necessary, remove the bushings and do a surface eddy current inspection around the outer edges of the hole and in the hole (bore). Do this inspection as specified in Part 6, 51-00-00, Procedure 19, or do a penetrant inspection as specified in SOPM 20-20-02.





NOTES

- EXAMINE THE LUG ON THE AFT END OF THE CROWN BEAM FITTING FOR CRACKS
- THERE ARE TWO CROWN BEAM FITTINGS TO EXAMINE; ONE IS ON EACH ENGINE STRUT

1 THE BUSHINGS ARE NOT SHOWN TO GIVE A CLEAR VIEW OF WHERE CRACKS CAN OCCUR

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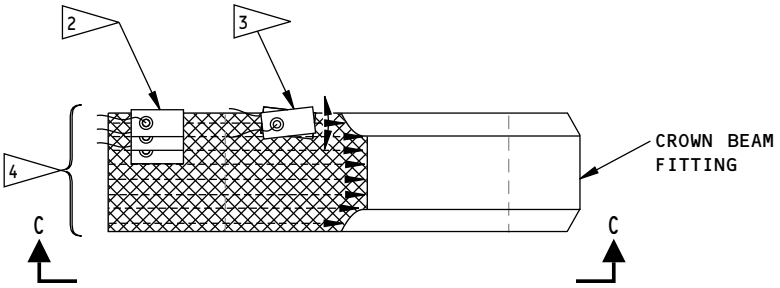
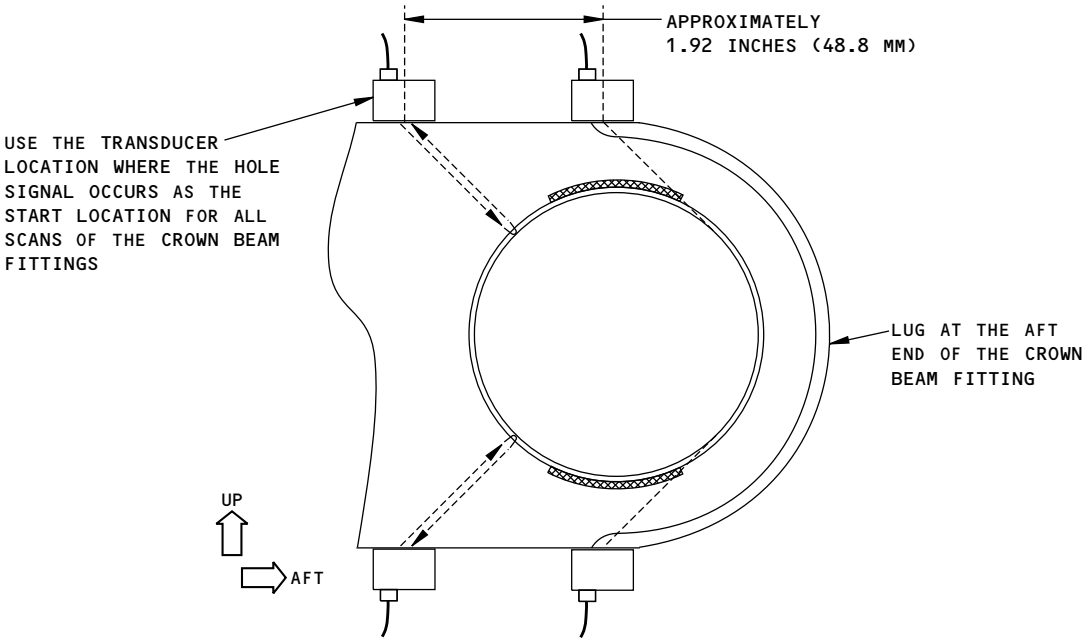
Inspection Area
Figure 1 (Sheet 1 of 2)



B–B



C–C

NOTES

TRANSDUCER CONTACT SURFACE

LOCATIONS WHERE CRACKS CAN OCCUR

- EXAMINE THE FULL WIDTH OF THE LUG AT THE AFT END OF THE CROWN BEAM FITTINGS FROM THE UPPER AND LOWER TRANSDUCER CONTACT SURFACES
- THERE ARE TWO LUGS TO BE EXAMINED ON EACH AIRPLANE. ONE CROWN BEAM FITTING IS ON EACH ENGINE STRUT.

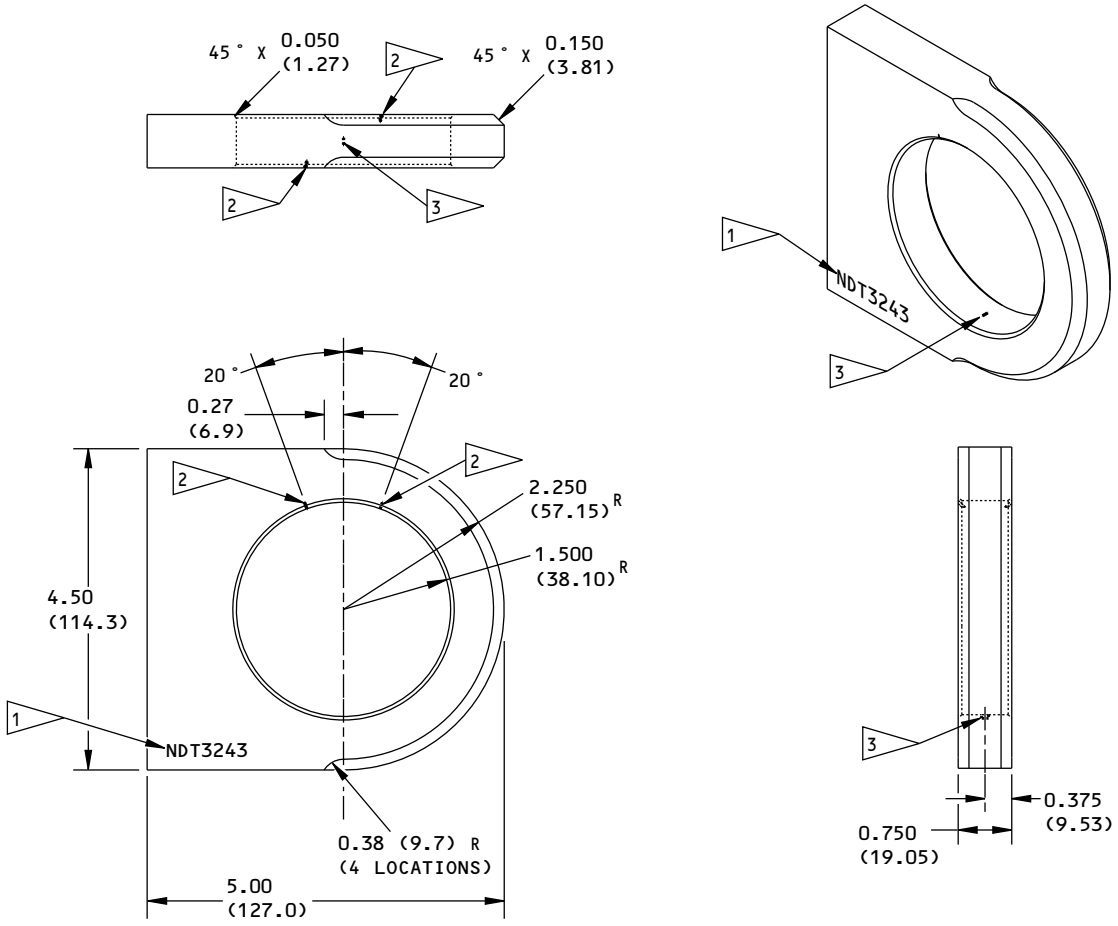
2 APPROXIMATE TRANSDUCER LOCATION WHERE THE SIGNAL FROM THE HOLE (BORE) WILL OCCUR

3 WHILE YOU MAKE EACH SCAN, CONTINUOUSLY MOVE THE TRANSDUCER AS SHOWN (APPROXIMATELY 3 DEGREES IN EACH DIRECTION)

4 TO START EACH SCAN, MOVE THE TRANSDUCER AS NECESSARY TO GET A SIGNAL FROM THE HOLE. THEN MAKE A SCAN TO THE END OF THE TRANSDUCER CONTACT SURFACE. USE THE SCAN PATTERN THAT IS SHOWN AND OVERLAP EACH SCAN BY APPROXIMATELY ONE–HALF THE WIDTH OF THE TRANSDUCER

2434938 S0000564092_V1

Inspection Area
Figure 1 (Sheet 2 of 2)



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS	ANGULAR
X.XXX = ±0.005	X.XX = ±0.10	±1 °
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

- MATERIAL: 15-5PH CRES
- SURFACE ROUGHNESS: 125 Ra OR BETTER

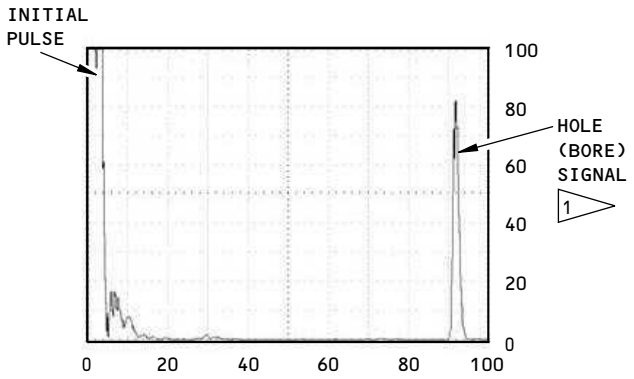
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3243, AT APPROXIMATELY THIS LOCATION

2 EDM CORNER NOTCH:
0.100 (2.54) X 0.100 (2.54) X 0.010 (0.25) WIDE

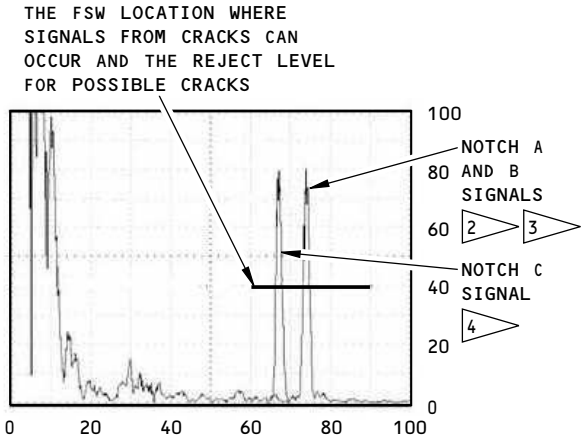
3 EDM MID-BORE NOTCH:
0.100 (2.54) LONG X 0.050 (1.27) DEEP X 0.010 (0.25) WIDE

2434967 S0000564093_V1

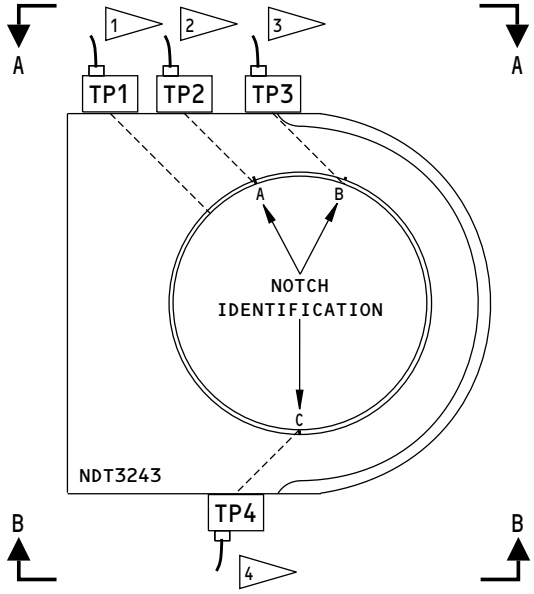
Reference Standard NDT3243
Figure 2

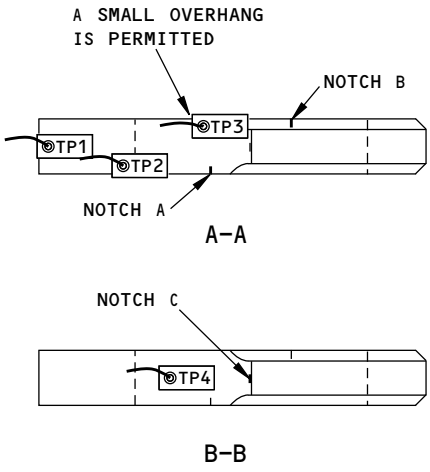


THE SIGNAL FROM THE HOLE (BORE) SET AT 90% OF FSW AND 80% (OR MORE) OF FSH
DETAIL I



SCREEN DISPLAY OF THE SIGNALS FROM NOTCH A AND C. THE NOTCH B SIGNAL OCCURS AT APPROXIMATELY THE SAME FSW LOCATION AS THE NOTCH A SIGNAL
DETAIL II





NOTES

1. USE TP1 TO GET A MAXIMUM SIGNAL FROM THE HOLE (BORE). SET THE INITIAL PULSE AT 0% OF FSW AND THE HOLE SIGNAL AT 90% OF FSW. ADJUST THE GAIN TO SET THE HOLE SIGNAL AT 80% (OR MORE) OF FSH
2. USE TP2 TO GET A MAXIMUM SIGNAL FROM NOTCH A. THIS SIGNAL WILL OCCUR AT APPROXIMATELY 72% OF FSW. SET THIS SIGNAL TO 80% OF FSH
3. USE TP3 TO GET A MAXIMUM SIGNAL FROM NOTCH B. THIS SIGNAL WILL OCCUR AT APPROXIMATELY 72% OF FSW. IF NECESSARY, ADD GAIN TO SET THIS SIGNAL TO 80% OF FSH.
4. USE TP4 TO GET A MAXIMUM SIGNAL FROM NOTCH C. THIS SIGNAL WILL OCCUR AT APPROXIMATELY 66% OF FSW. THIS SIGNAL WILL BE MORE THAN 80% OF FSH.

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Instrument Calibration
Figure 3

PART 4 - ULTRASONIC

SIDE SKIN OF THE ENGINE STRUT AT THRUST REVERSER HINGE FITTINGS 2 AND 3 (NSTA 222.6 AND NSTA 242.7)

1. Purpose

A. Use this procedure to help find cracks in the titanium side skin of the nacelle struts at the fastener locations for thrust reverser (TR) hinge fittings 2 and 3. The inspection area is at NSTA 222.6 and NSTA 242.7 on the left and right sides of the strut. See Figure 1 for the inspection areas.

B. A shear wave transducer is used to look for cracks that are 0.25 inch (6.4 mm) long that go through the side skin of the strut at the fastener locations for TR hinge fittings 2 and 3. There are two number 2 TR hinge fittings and two number 3 TR hinge fittings on each strut, with four fasteners in each fitting for a total of sixteen fastener locations to examine in each strut. Thus, there are a total of thirty-two fastener locations to examine on each airplane. See Figure 1 for the inspection areas.

C. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 54-51-16B

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) All ultrasonic test instruments are permitted for use if they can operate between 4 and 6 MHz and can be calibrated on the reference standard as specified in Paragraph 4.

(2) The instruments that follow were used to help prepare this procedure.

(a) USM Go; GE Inspection Technology

(b) EPOCH 600; Olympus

C. Transducers

(1) Use a 5 MHz transducer that can put a 45 degree shear wave into titanium.

(2) The transducers that follow were used to help prepare this procedure.

(a) Nortec SPO-6151, 45 degree in aluminum; Olympus NDT

(b) SS-455A, 45 degree in aluminum; Techna NDT

NOTE: A transducer that puts a 45 degree shear wave into aluminum will put approximately a 45.3 degree shear wave into titanium. You can use a transducer that is made to put a 45 shear wave into titanium or one that is made to put a 45 degree shear wave into aluminum for this procedure.

D. Reference Standards

(1) Use reference standard NDT3235. See Figure 2 for data about reference standard NDT3235.

E. Couplant

(1) Use a couplant that will not damage the airplane structure. The couplant used during the instrument calibration must also be used during the inspection of the strut side skin.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Remove the fire seal from the lower edges on the right and left sides of the engine strut. Replace the fire seals when the inspection has been completed.

C. Clean the inspection surface of loose paint, dirt and sealant.

4. Instrument Calibration

A. Set the instrument frequency at 5 MHz. A frequency adjustment is not necessary if you use a broadband instrument.

B. Apply a sufficient quantity of couplant at transducer position 1 (TP1) on reference standard NDT3235. See Figure 3, Detail I.

C. Put the transducer at TP1 on the reference standard (approximately 0.6 inch (15 mm) from the hole) as shown in Figure 3, Detail I and point the transducer at the hole.

D. Move the transducer a small distance to and away from the fastener hole and also turn it to the left and right until the hole signal is at a maximum full screen height (FSH).

E. Adjust the instrument controls to set the initial pulse at 0 percent of full screen width (FSW) and the maximum signal from the hole is at 60 percent of FSW as shown in Figure 3, Detail II.

F. Slowly turn the transducer to TP2 and get a maximum signal from the notch in the reference standard. The notch signal will occur to the right of the hole signal and will increase in FSH as the signal from the hole decreases in FSH.

G. Adjust the gain to set the notch signal to 80 percent of FSH as shown in Figure 3, Detail III.

H. Put the transducer back at TP1 and again move the transducer as necessary to get a maximum signal from the hole.

I. Slowly move the transducer laterally from TP1 to TP3 as shown in Figure 3, Detail IV. Do not move the transducer to or away from the hole in the reference standard, only laterally. If the signal from the notch is less than 80% of FSH, then add gain to set the notch signal to 80% of FSH.

J. Make a record of the gain that is used.

K. Add 6 dB of gain.

5. Inspection Procedure

A. Examine the side skin of the engine strut for cracks at the four fastener locations at TR hinge fitting 2 as follows:

(1) Apply a sufficient quantity of couplant on the inspection surfaces shown in Figure 1.

(2) Put the transducer adjacent to a fastener location as shown in Figure 1 and get a signal from the hole.

(a) If the hole signal is very small or does not show on the screen display, increase the gain until the hole signal is 30% (or more) of FSH. Do not lower the gain if the hole signal is initially above 30 percent of FSH.

(3) Do lateral scans of the two upper fastener locations shown in Figure 1, Detail I, as follows:

(a) Make a scan in the up direction to examine the upper area of each fastener location.

(b) Make a scan in the down direction to examine the lower area of each fastener location.

(4) Do off-angle scans of the two lower fastener locations shown in Figure 1, Detail I, as follows:

(a) At each transducer location, set the transducer as perpendicular as possible to the direction of crack growth.

(b) Make a scan of the upper area of each fastener hole. If a crack signal occurs, move the transducer as necessary to get a maximum signal from the crack.

(c) Make a scan of the lower area of each fastener hole. If a crack signal occurs, move the transducer as necessary to get a maximum signal from the crack.

(5) Make an analysis of all possible crack signals that are 40 percent (or more) of FSH as specified in Paragraph 6.

B. Do Paragraph 5.A. again to examine the four fastener locations at TR hinge fitting 2 on the opposite side of the engine strut.

C. Examine the side skin of the engine strut for cracks at the four fastener locations at TR hinge fitting 3 as follows:

(1) Apply a sufficient quantity of couplant on the inspection surfaces shown in Figure 1.

(2) Put the transducer adjacent to a fastener location as shown in Figure 1 and get a signal from the hole

(a) If the hole signal is very small or does not show on the screen display, increase the gain until the hole signal is 30% (or more) of FSH. Do not lower the gain if the hole signal is initially above 30 percent of FSH.

(3) Do lateral scans of each fastener location shown in Figure 1, Detail II, as follows:

(a) Make a scan in the up direction to examine the upper area of each fastener location.

(b) Make a scan in the down direction to examine the lower area of each fastener location.

(4) Make an analysis of all possible crack signals that are 40 percent (or more) of FSH as specified in Paragraph 6.

D. Do Paragraph 5.C. again to examine the four fastener locations at TR hinge fitting 3 on the opposite side of the engine strut.

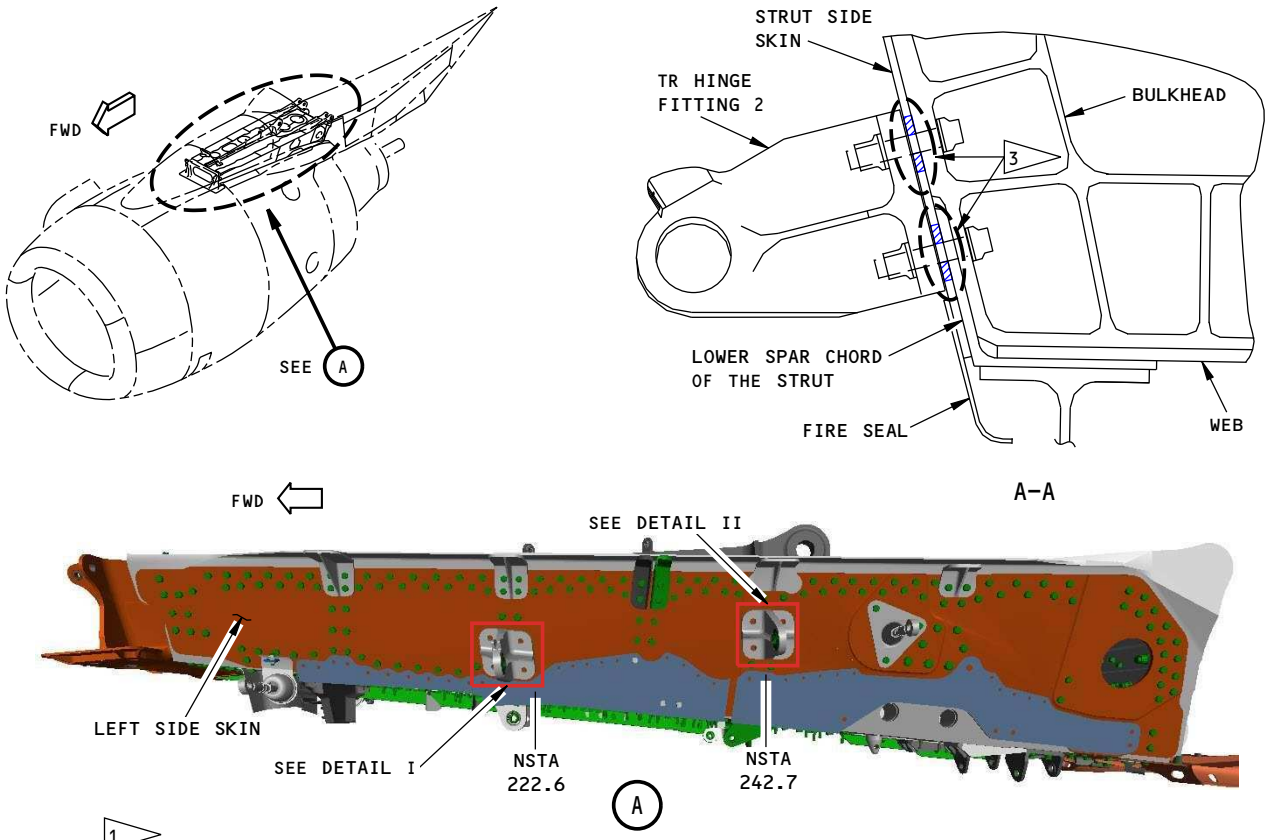
E. Do Paragraph 5.A. thru Paragraph 5.D. again to examine the side skin of the engine strut for cracks at TR hinge fittings 2 and 3 on the other side of the airplane.

F. After all fastener holes have been examined, set the gain to the value recorded in Paragraph 4.J. Do a calibration check to make sure that the signal from the notch in the reference standard is 70 percent (or more) of FSH. If the signal from the notch is less than 70 percent of FSH, do the calibration and inspection again. A calibration check after a period of time (usually every 30 minutes) is recommended. See the instruction manual for your instrument to see if or how often a calibration check is necessary.

6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and occur immediately to the right of the fastener hole signal (as the notch signal occurred during instrument calibration) are possible crack indications. Compare the signals that occur during the inspection with the signal from the notch in the reference standard.

B. To make sure that a crack indication is from a crack, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17.



THRUST REVERSER (TR) HINGE 2
DETAIL I

THRUST REVERSER (TR) HINGE 3
DETAIL II

NOTES:

- THE LEFT STRUT IS SHOWN; THE RIGHT STRUT IS OPPOSITE

○ FASTENER LOCATIONS TO EXAMINE THE SIDE SKIN OF THE STRUTS FOR CRACKS

▨ LOCATION WHERE CRACKS CAN OCCUR

1 MAKE LATERAL SCANS AT THE FASTENER LOCATIONS WHERE THERE IS SUFFICIENT ACCESS TO DO THIS

2 THE FIRE SEAL MUST BE REMOVED TO DO THIS INSPECTION

3 LOCATIONS WHERE CRACKS CAN OCCUR (TYPICAL)

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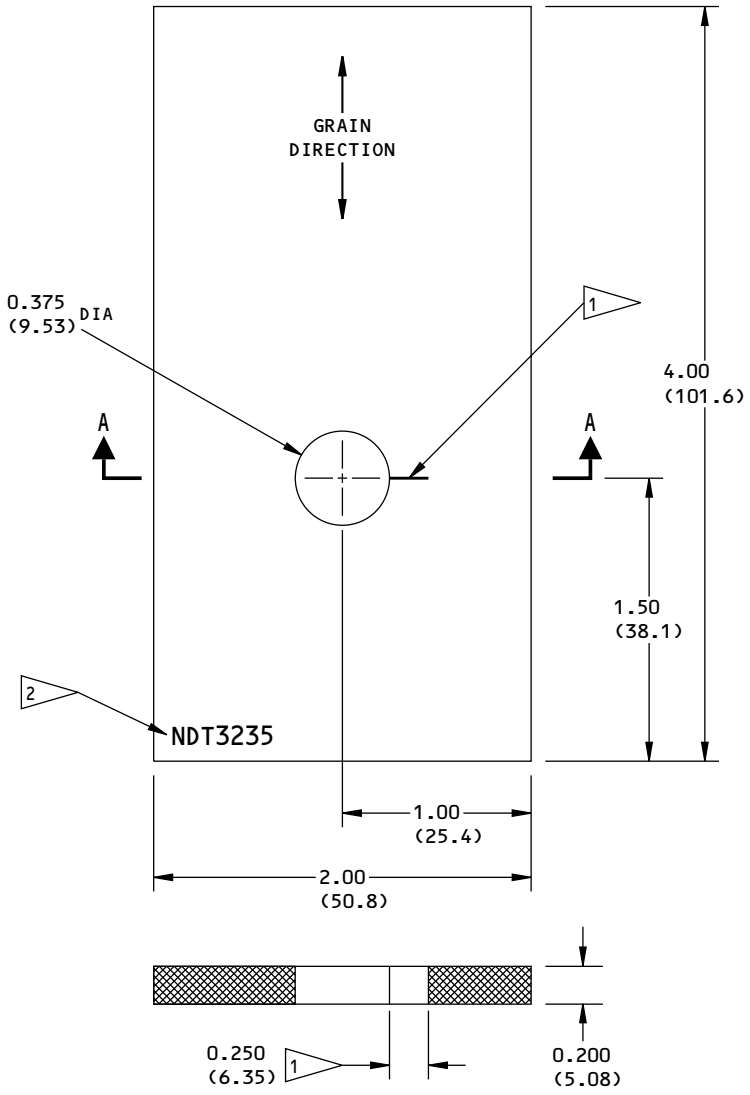
Inspection Areas
Figure 1



A–A

NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: 6AL–4V TITANIUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1 EDM THROUGH NOTCH: 0.25 (6.35) LONG X 0.010 (0.25) WIDE

2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3235, AT APPROXIMATELY THIS LOCATION

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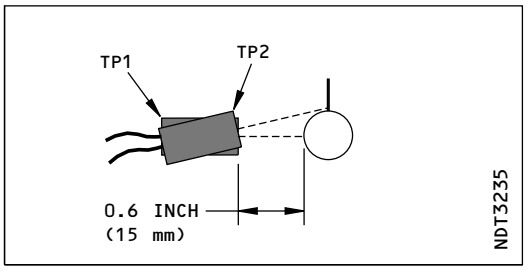
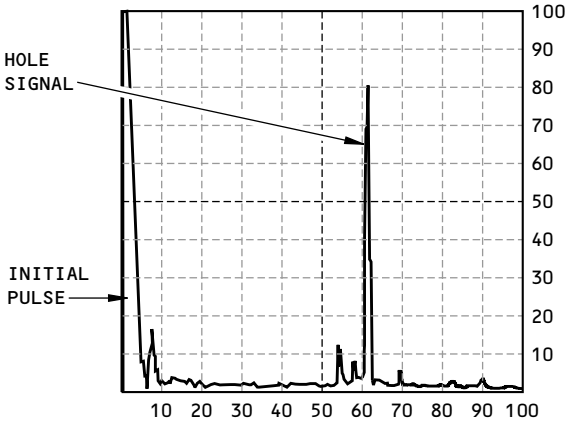
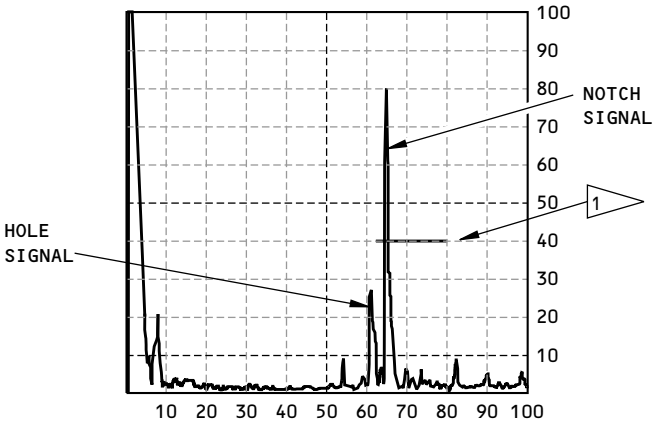
Reference Standard NDT3235
Figure 2



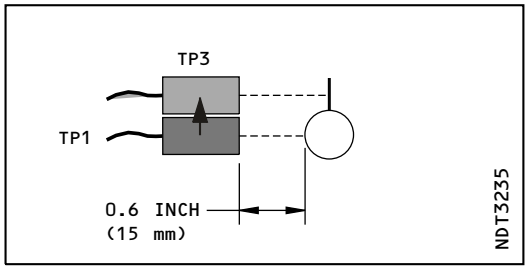
CALIBRATION TRANSDUCER POSITIONS
DETAIL I



SIGNAL FROM THE HOLE AT TP1
DETAIL II



SIGNAL FROM THE NOTCH AT TP2
DETAIL III



LATERAL SCAN SENSITIVITY CHECK
DETAIL IV

NOTES:

TP = TRANSDUCER POSITIONER

- THE FSW LOCATION OF THE HOLE SIGNAL WILL CHANGE AS THE TRANSDUCER IS MOVED NEARER TO AND FARTHER FROM THE HOLE

1 DURING THE INSPECTIONS, MAKE AN ANALYSIS OF ALL CRACK SIGNALS THAT ARE 40% (OR MORE) OF FSH THAT OCCUR TO THE RIGHT OF THE HOLE SIGNAL. THIS WOULD BE ALMOST THE SAME AS THE CRACK SIGNAL THAT OCCURRED FROM THE NOTCH IN THE REFERENCE STANDARD

2435698 S0000564025_V1

Instrument Calibration
Figure 3

PART 4 - ULTRASONIC

LOWER SPAR CHORDS OF THE ENGINE STRUT TORQUE BOX AT THE PRECOOLER FITTING AND BRACKET LOCATIONS

1. Purpose

A. Use this procedure to help find cracks in the lower spar chords of the engine strut torque box. The left and right lower spar chords are examined at the precooler fitting and bracket locations. See Figure 1 for the inspection areas. The inspection locations are as follows

(1) Precooler fittings at NSTA 222.6 (left and right lower spar chords)

(2) Precooler fittings at NSTA 242.7 (left and right lower spar chords)

(3) Bracket at NSTA 216 (left lower spar chord)

(4) Bracket at NSTA 218 (right lower spar chord)

B. An ultrasonic shear wave transducer is used to examine the lower spar chords for cracks at the fastener locations. There is one area where there is no access for the transducer. At this location, a surface eddy current inspection is used to complete the inspection. See Figure 1.

C. The lower spar chords are 15-5PH CRES.

D. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 54-51-10C

(2) Item: 54-51-10D

2. Equipment

A. General

(1) All ultrasonic test instruments are permitted for use if they can be calibrated on the reference standards as specified in Paragraph 4.

(2) Refer to Part 1, 51-01-00 for data about the equipment manufacturers.

B. Instrument

(1) All ultrasonic instruments are permitted for use if they can operate at a frequency between 4 and 6 MHz and can be calibrated on the reference standards as specified in Paragraph 4.

(2) The instruments that follow were used to help prepare this procedure.

(a) USN 60; GE Inspection Technology

(b) EPOCH 600; Olympus NDT

C. Transducer – Use a 5 MHz transducer that can put a 45 degree shear wave into steel and has a maximum length of 0.38 inch (9.6 mm) and a maximum width of 0.25 inch (6.3 mm). A top mounted connector is recommended. The transducer that follows was used to help prepare this procedure.

(1) AFS-0536, 5 MHz; Aerofab NDT

D. Reference Standards – Use reference standards NDT3253 and NDT3254. See Figure 2 and Figure 3 for data about these reference standards.

E. Couplant

(1) Use an ultrasonic couplant that will not cause corrosion or other damage to occur on the airplane.

3. Prepare for the Inspection

A. Remove the insulation blankets from the inspection areas on the lower spar chords of the strut torque box.

B. Loosen or remove other structure as necessary to get access to the inspection areas.

C. Fully clean the inspection surfaces. If there is loose paint or paint chips, use an approved procedure that will not damage the airplane to make the area smooth.

4. Instrument Calibration

A. Calibrate the equipment on reference standard NDT3253 as follows:

(1) Set the instrument frequency in the 4 to 6 MHz range.

(2) Put couplant on the reference standard at the transducer position 1 (TP1) and transducer position 2 (TP2) locations shown in Figure 4.

(3) Put the transducer at TP1 and move it as necessary to get a maximum signal from the hole. Make sure the front of the transducer is at the scribe line as shown in Figure 4.

(4) Adjust the delay and range to put the initial pulse at 0 percent of full screen width (FSW) and the maximum signal from the hole at 50 percent of FSW. See Figure 4.

(5) Slowly turn the transducer in the direction of the notch (TP2) to see that a signal from the notch occurs to the right of the hole signal. Adjust the transducer at this location to get a maximum signal from the notch.

(6) Adjust the gain to put the notch signal at 80 percent of full screen height (FSH). It is possible for two notch signals to occur on the screen display. If this occurs, adjust the higher signal to put it at 80 percent of FSH.

(7) Add 6 dB of gain.

(8) Turn the transducer to point it at the hole (TP1) to see the hole signal again and then turn it back to point it at the notch (TP2) to see the notch signal again. Do this two (or more) times to monitor how the hole signal decreases as the notch signal increases. The crack signal will occur to the right of the hole signal and this is also how a crack signal will occur during the inspection on the airplane.

B. Calibrate the equipment on reference standard NDT3254 as follows:

(1) Do Paragraph 4.A. (1) thru Paragraph 4.A.(8) but use reference standard NDT3254.

5. Inspection Procedure

A. Examine the lower spar chords for cracks at the fastener holes of the precooler fittings at NSTA 222.6 and NSTA 242.7.

(1) Calibrate the equipment on reference standard NDT3253 as specified in Paragraph 4.A.

(2) Identify the inspection areas on the lower spar chords of the strut torque box at NSTA 222.6 and 242.7. See Figure 1.

(3) Apply a sufficient quantity of couplant to the inspection surfaces on the lower spar chords at the forward and aft sides of the precooler fittings at NSTA 222.6 and 242.7. The scan areas are the areas where the transducers are shown in Figure 1.

(4) Put the transducer on the inspection surface such that the front of the transducer is against the precooler fitting as shown in Figure 1. Point the transducer at the hole to get the hole signal to be at its maximum height. If the hole signal does not occur on the screen display, increase the gain to get the hole signal to 30 percent of full screen height (FSH). Do not lower the gain if the hole signal is above 30 percent of FSH.

(5) Slowly turn the transducer approximately 10 to 15 degrees to the left and right and move it as you did during calibration to make a scan for cracks. As you do the scans, move the transducer away from the hole (by approximately the length of the transducer) as you turn the transducer to the left and right. During the scan:

(a) Carefully monitor the signal from the fastener hole. If there is a crack, the signal from the crack will occur to the right of the fastener hole signal and will increase in FSH as the fastener hole signal decreases in FSH. If a crack signal occurs, move the transducer as necessary to get the maximum crack signal.

(b) Go to Paragraph 6. for instructions to help make an analysis of all possible crack signals that are 40 percent (or more) of FSH.

(6) Make sure to examine the left and right lower spar chords at the precooler fittings at NSTA 222.6 and NSTA 242.7. Figure 1 shows all of the holes to be examined at NSTA 222.6 and NSTA 242.7.

(7) Do Paragraph 5.A. (2) thru Paragraph 5.A. (6) again to examine the lower spar chords for cracks at the other strut torque box.

B. Examine the lower spar chords for cracks at the fastener holes of the brackets at NSTA 216 (left side) and NSTA 218 (right side).

(1) Calibrate the equipment on reference standard NDT3254 as specified in Paragraph 4.B.

(2) Identify the inspection areas at the brackets on the lower spar chords of the strut torque box at NSTA 216 (left side) and NSTA 218 (right side). See Figure 1.

(3) Apply a sufficient quantity of couplant to the inspection surfaces of the lower spar chords at the forward and aft sides of the brackets at NSTA 216 (left side) and NSTA 218 (right side). The scan areas are the areas where the transducers are shown in Figure 1.

(4) Put the transducer on the inspection surface such that the front of the transducer is against the bracket as shown in Figure 1. Point the transducer at the hole to get the hole signal to be at its maximum height. If the hole signal does not show on the screen display, increase the gain to get the hole signal to 30 percent of FSH. Do not lower the gain if the hole signal is above 30 percent of FSH.

(5) Do Paragraph 5.A. (5).

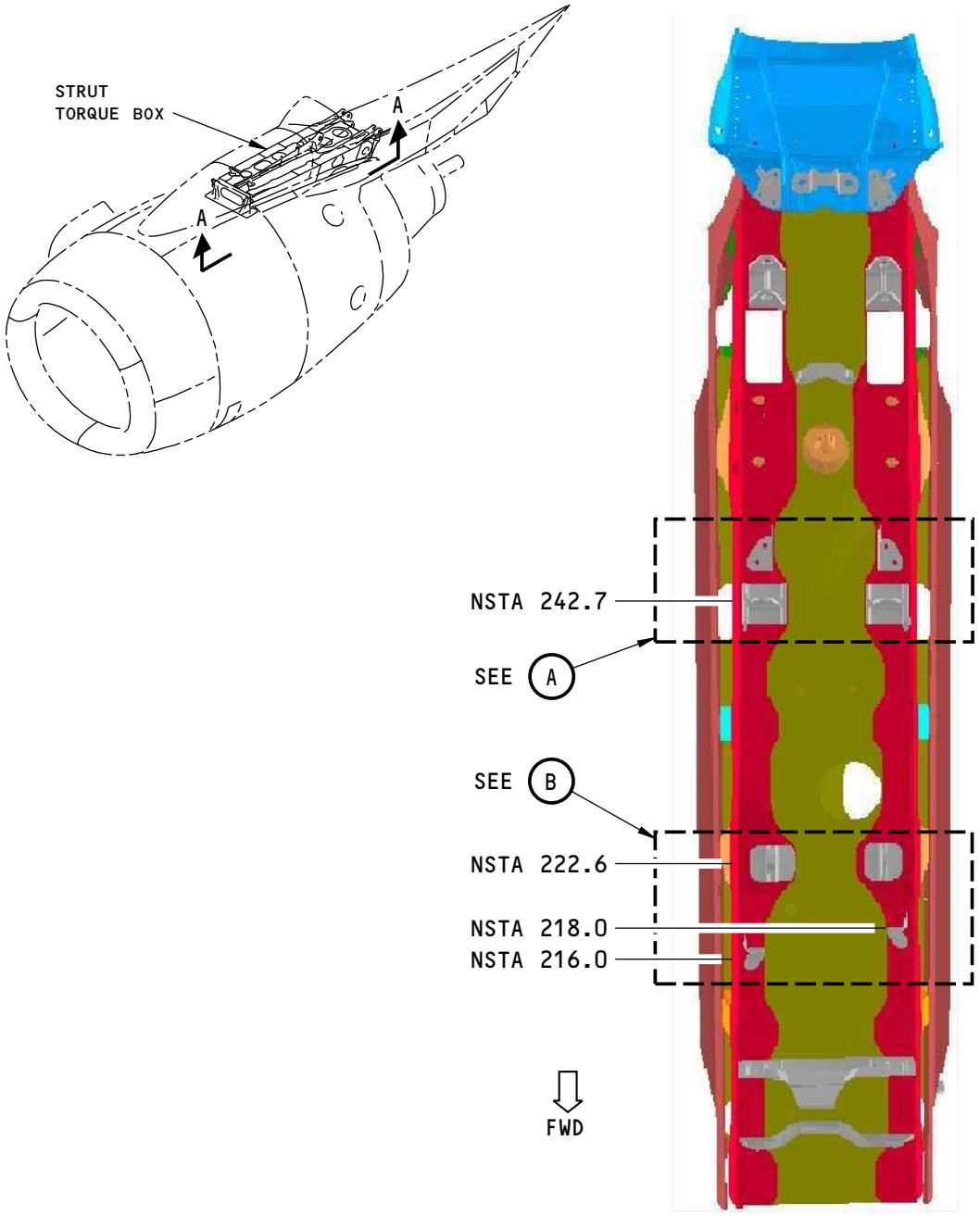
(6) Make sure to examine the left and right lower spar chords at the brackets at NSTA 216 (left side) and 218 (right side). Figure 1 shows the holes to be examined at NSTA 216 and 218.

(7) Do Paragraph 5.B. (2) thru Paragraph 5.B. (6) again to examine the lower spar chords for cracks at the other strut torque box.

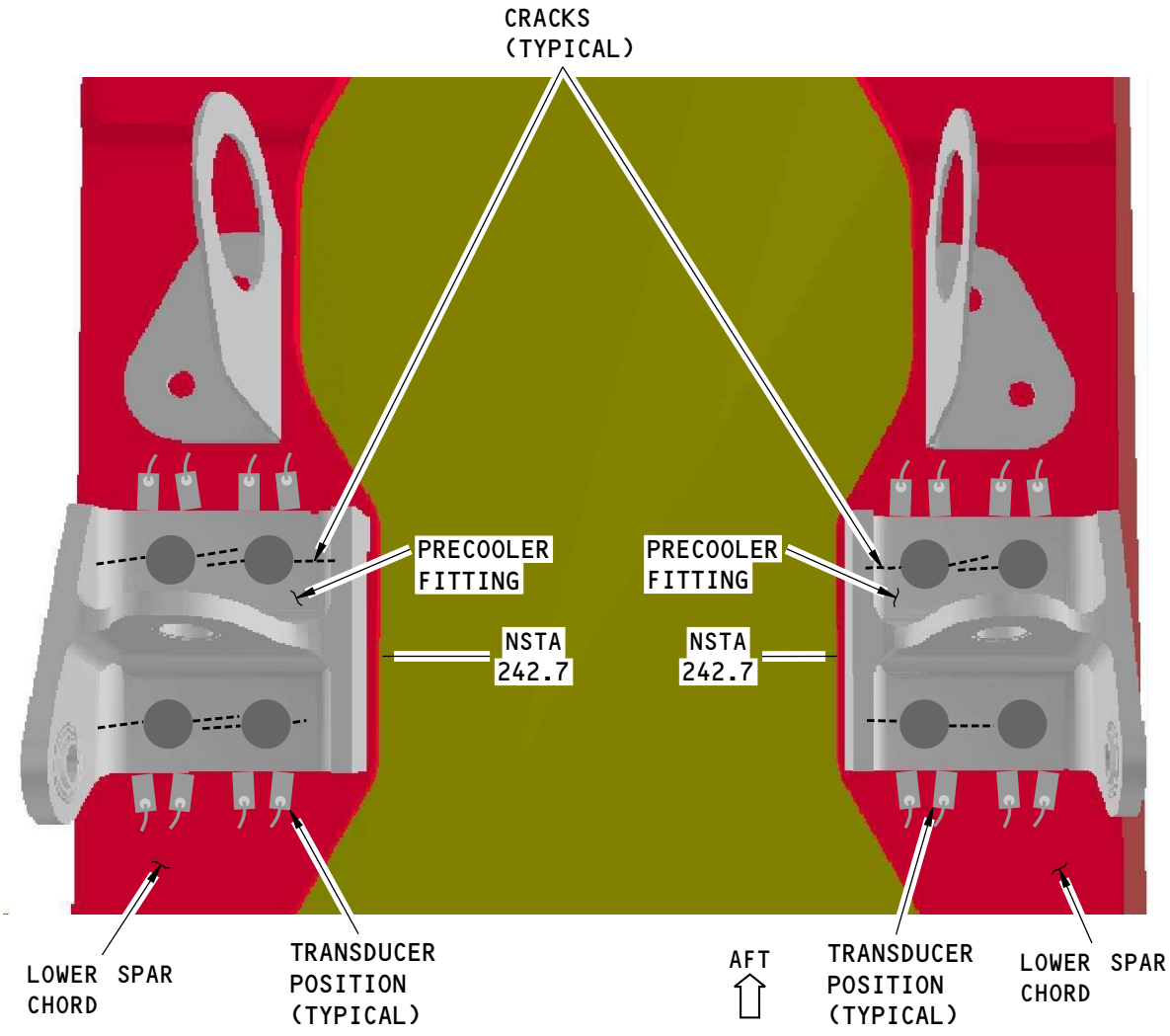
6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and are to the right of the hole signal are possible crack indications. Compare the signals that occur during the inspection with the signal that you got from the notch in the reference standard.

B. To make sure that a crack indication is caused by a crack, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 19.



Inspection Areas
Figure 1 (Sheet 1 of 3)



THIS IS A VIEW OF THE LOWER SPAR CHORDS OF THE STRUT TORQUE BOX AS YOU LOOK UP

A

NOTES:

- DO THE CALIBRATION ON REFERENCE STANDARD NDT3253 WITH A 45 DEGREE SHEAR WAVE TRANSDUCER AS SPECIFIED IN PARAGRAPH 4.
- DO THE TRANSDUCER SCANS AT ALL OF THE TRANSDUCER LOCATIONS SHOWN ABOVE ON THE AFT AND FORWARD SIDES OF THE PRECOOLER FITTINGS.

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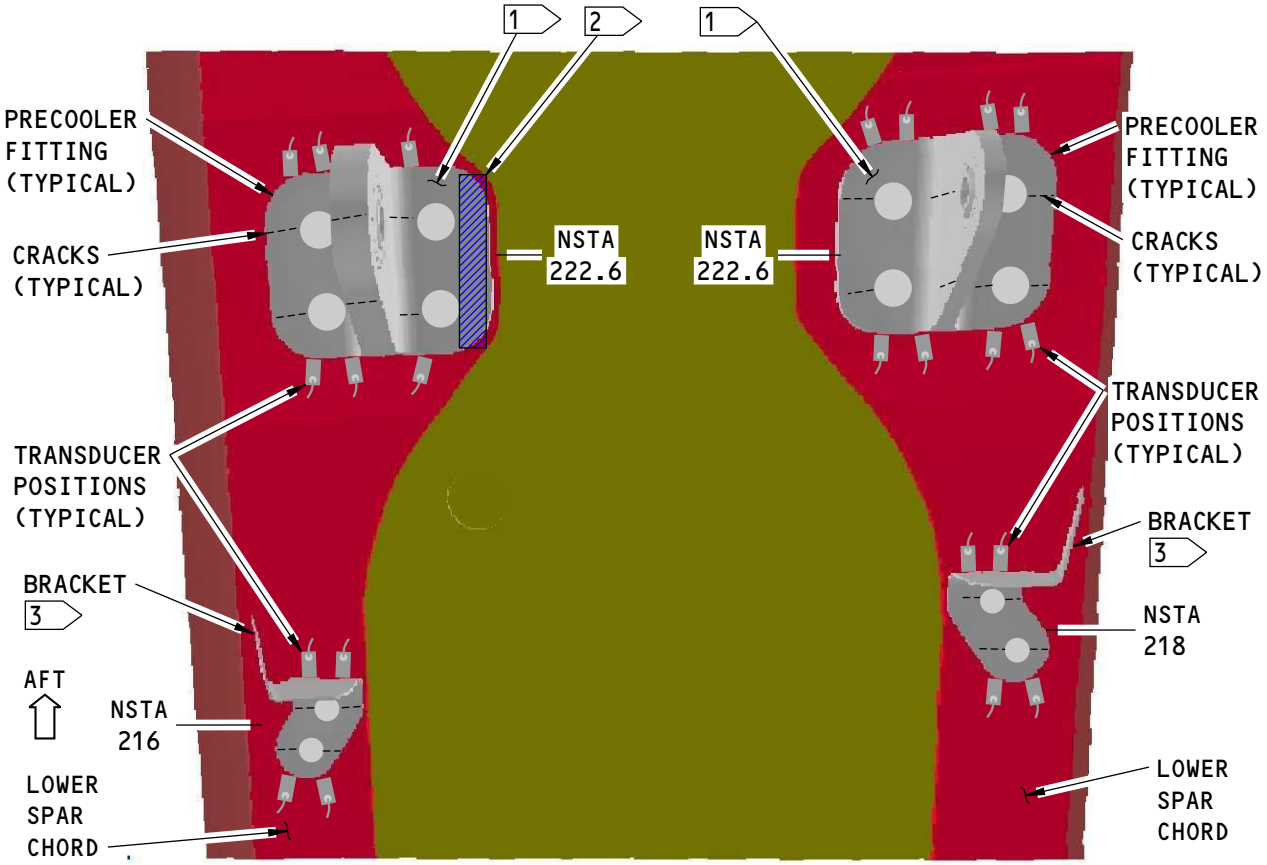
Inspection Areas
Figure 1 (Sheet 2 of 3)



THIS IS A VIEW OF THE LOWER SPAR CHORDS OF THE STRUT TORQUE BOX AS YOU LOOK UP

B

NOTES:

1 DO THE CALIBRATION ON REFERENCE STANDARD NDT3253 WITH A 45 DEGREE SHEAR WAVE TRANSDUCER AS SPECIFIED IN PARAGRAPH 4. DO THE TRANSDUCER SCANS AT ALL OF THE TRANSDUCER LOCATIONS SHOWN ABOVE ON THE FORWARD AND AFT SIDES OF THE PRECOOLER FITTINGS.

2 THIS AREA CANNOT BE EXAMINED WITH A TRANSDUCER. DO A SURFACE EDDY CURRENT SCAN WITH A PENCIL PROBE ON THE LOWER SPAR CHORD. REFER TO PART 6, 51-00-00, PROCEDURE 24, FOR CALIBRATION AND INSPECTION INSTRUCTIONS OF STEEL PARTS. PUT THE PROBE ON THE LOWER SPAR CHORD ALONG THE EDGE OF THE PRECOOLER FITTING AND DO A PROBE SCAN IN A FORWARD AND AFT DIRECTION.

3 DO THE CALIBRATION ON REFERENCE STANDARD NDT3254 WITH A 45 DEGREE SHEAR WAVE TRANSDUCER AS SPECIFIED IN PARAGRAPH 4. DO THE TRANSDUCER SCANS AT ALL OF THE TRANSDUCER LOCATIONS SHOWN ABOVE ON THE FORWARD AND AFT SIDES OF THE BRACKETS.

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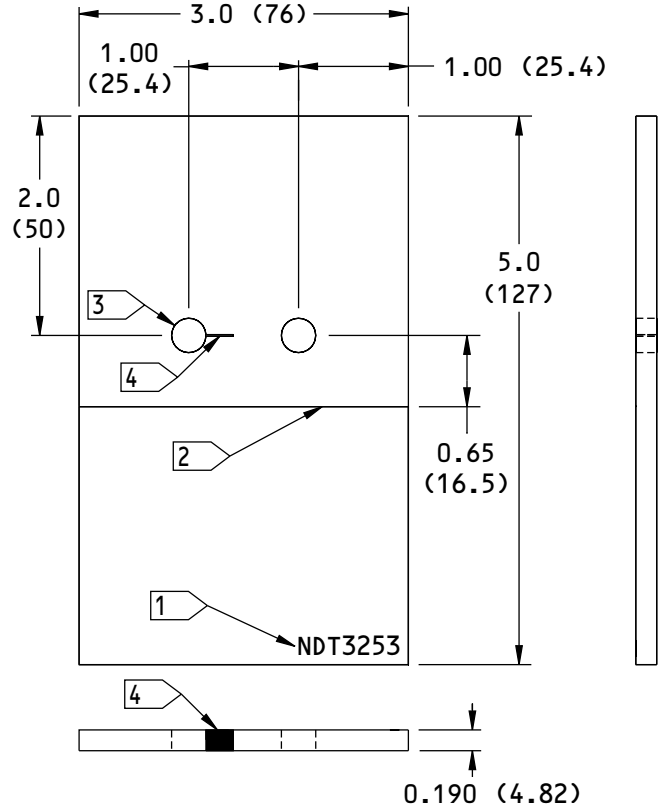
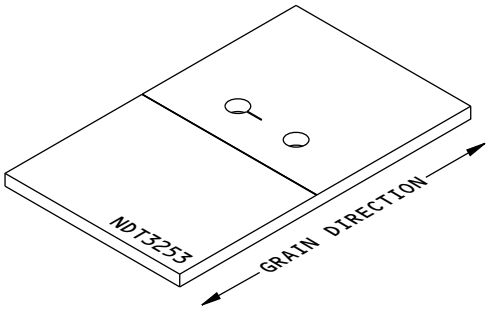
Inspection Areas
Figure 1 (Sheet 3 of 3)





NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL: 15-5PH CRES OR 4340 STEEL

HEAT TREAT DATA:

- IF 15-5PH CRES IS USED, HEAT TREAT TO 180-200 KSI AS SPECIFIED IN BAC5619
- IF 4340 STEEL IS USED, NORMALIZE THE PART AS SPECIFIED IN BAC5617 OR MIL-H-6875

1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3253, AT APPROXIMATELY THE LOCATION SHOWN.

2 ETCH OR LASER BURN A SCRIBE LINE (TOP SURFACE):
MAXIMUM WIDTH: 0.007 (0.18)
MAXIMUM DEPTH: 0.005 (0.13)

3 HOLE DIAMETERS (TWO LOCATIONS):
0.312 (7.94)

4 EDM NOTCH:
MAXIMUM WIDTH: 0.015 (0.38)
DEPTH: THROUGH THE THICKNESS
LENGTH: 0.250 (6.35)

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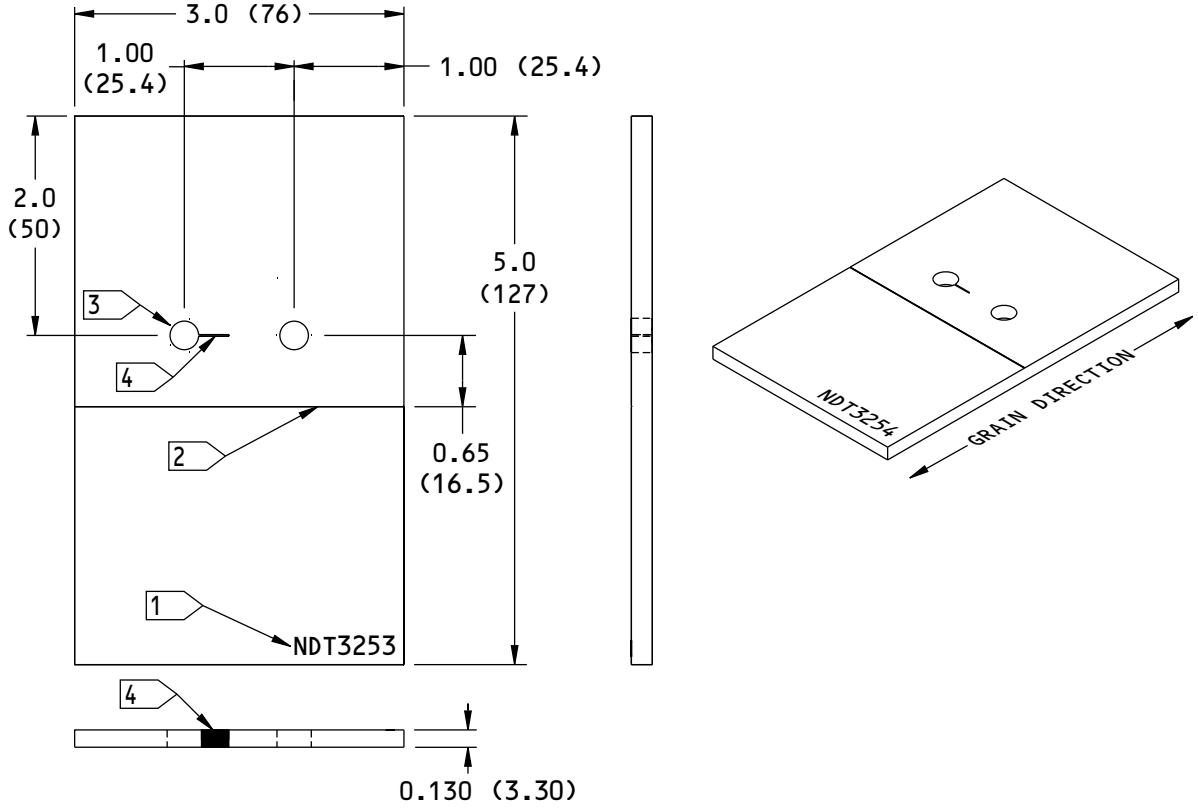
Reference Standard NDT3253
Figure 2



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- SURFACE ROUGHNESS = 125 Ra OR BETTER
- MATERIAL: 15-5PH CRES OR 4340 STEEL

HEAT TREAT DATA:

- IF 15-5PH CRES IS USED, HEAT TREAT TO 180-200 KSI AS SPECIFIED IN BAC5619
- IF 4340 STEEL IS USED, NORMALIZE THE PART AS SPECIFIED IN BAC5617 OR MIL-H-6875

1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3254, AT APPROXIMATELY THE LOCATION SHOWN.

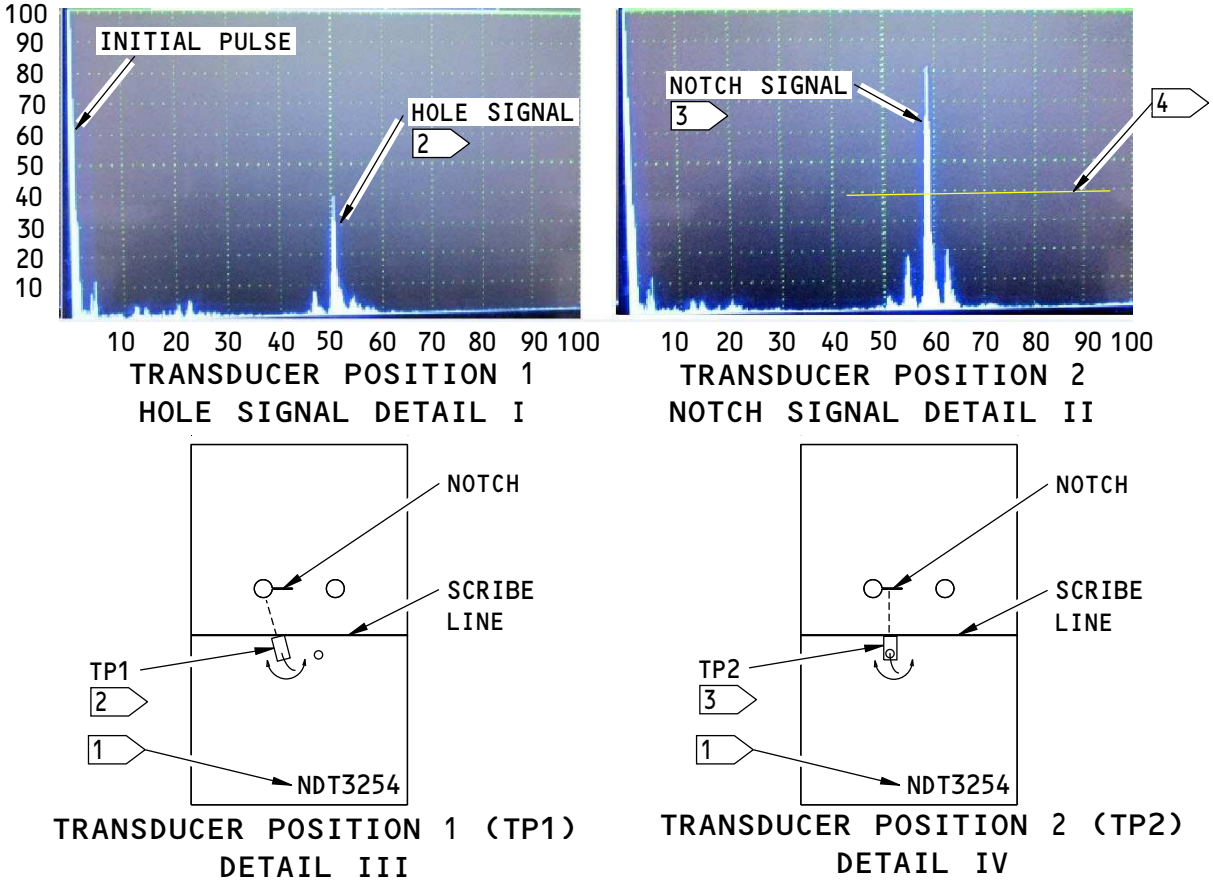
2 ETCH OR LASER BURN A SCRIBE LINE (TOP SURFACE):
MAXIMUM WIDTH: 0.007 (0.18)
MAXIMUM DEPTH: 0.005 (0.13)

3 HOLE DIAMETERS (TWO LOCATIONS):
0.250 (6.35)

4 EDM NOTCH:
MAXIMUM WIDTH: 0.015 (0.38)
DEPTH: THROUGH THE THICKNESS
LENGTH: 0.250 (6.35)

2477819 S0000580566_V1

Reference Standard NDT3254
Figure 3



1 THE CALIBRATION SHOWN ABOVE USES REFERENCE STANDARD NDT3254 WITH THE 45 DEGREE TRANSDUCER TO EXAMINE THE LOWER SPAR CHORDS AT NSTA 216.0 (LEFT) AND NSTA 218.0 (RIGHT). USE REFERENCE STANDARD NDT3253 FOR THE CALIBRATION TO EXAMINE THE LEFT AND RIGHT LOWER SPAR CHORDS AT NSTA 222.6 AND NSTA 242.7, WITH THE 45 DEGREE TRANSDUCER. THE CALIBRATION SIGNALS FOR THE TWO REFERENCE STANDARDS ARE EQUIVALENT.

2 TRANSDUCER POSITION 1 (TP1): PUT THE TRANSDUCER ALONG THE SCRIBE LINE AS SHOWN IN DETAIL III AND TURN IT TO POINT AT THE HOLE TO GET THE HOLE SIGNAL ON THE DISPLAY. ADJUST THE POSITION OF THE HOLE SIGNAL AS SHOWN IN DETAIL I.

3 TRANSDUCER POSITION 2 (TP2): TURN THE TRANSDUCER TO POINT AT THE NOTCH AS SHOWN IN DETAIL IV AND MONITOR THE DISPLAY TO SEE HOW THE HOLE SIGNAL DECREASES AS THE NOTCH SIGNAL OCCURS TO THE RIGHT OF THE HOLE SIGNAL. ADJUST THE TRANSDUCER AT TP2 TO GET A MAXIMUM SIGNAL FROM THE NOTCH. ADJUST THE GAIN TO PUT THE NOTCH SIGNAL AT 80 PERCENT OF FSH. IF YOU GET TWO NOTCH SIGNALS, ADJUST THE HIGHEST NOTCH SIGNAL TO BE AT 80 PERCENT OF FSH, THEN ADD 6 dB OF GAIN.

4 SIGNALS THAT ARE 40 PERCENT (OR MORE) OF FSH AND APPROXIMATELY 20 PERCENT OF FSW TO THE RIGHT OF THE HOLE SIGNAL ARE POSSIBLE CRACK INDICATIONS.

2477827 S0000580567_V1

Instrument Calibration
Figure 4

PART 4 - ULTRASONIC

LOWER CHORDS OF THE NACELLE STRUT

1. Purpose

A. Use this procedure to examine the lower chords of the nacelle struts for cracks at NSTA 244.9. See Figure 1 for the inspection area.

B. The lower chord is 15-5PH steel.

C. 737 Maintenance Planning Data (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 54-51-10

2. Equipment

A. General

(1) Use 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. Instruments

(1) Use a pulse echo ultrasonic instrument. The instruments that follow were used to help prepare the procedure.

(a) Epoch 600; Olympus NDT

(b) USM Go; GE Inspection Technologies

(c) D70; Sonatest

C. Transducers

(1) Use a 5 MHz transducer that can put a 60 degree shear wave in aluminum. The transducer must have a maximum width of 0.25 inch (6.35 mm) and a maximum length of 0.6 inch (15 mm) with a top mounted connector. The transducer that follows was used to help prepare this procedure.

(a) AFS-560AT; AeroFab NDT

D. Reference Standards

(1) Use reference standard NDT3262 to help calibrate the instrument. See Figure 2 for data about reference standard NDT3262.

E. Couplant

(1) Use a couplant that is permitted for use with the airplane structure.

3. Prepare for the Inspection

A. Identify and get access to the inspection areas shown in Figure 1.

B. Clean the inspection surface.

(1) Remove paint only if it is loose.

(2) Remove sealant as necessary.

4. Instrument Calibration

A. Calibrate the instrument to examine the lower chord of the nacelle strut.

(1) Connect the transducer to the instrument and set the instrument to the Pulse-Echo mode.

(2) Set Delay to zero and Reject to zero.

(3) Put couplant on reference standard NDT3262 at transducer position 1 (TP1). See Figure 3, Detail I.

(4) Put the transducer at TP1 on the reference standard as shown in Figure 3, Detail I. Move the transducer until the fastener hole signal is at its maximum height on the screen display. Make sure the transducer does not move across the scribe line.

(5) Adjust the range and delay controls to put the initial pulse at zero percent of full screen width (FSW) and the fastener hole signal at approximately 40 percent of FSW as shown in Figure 3, Detail II.

(6) Monitor the screen display and move the transducer to TP2. As you move the transducer, the signal from the fastener hole will decrease and a signal from the notch will occur immediately to the right of the fastener hole signal as shown in Figure 3, Detail II.

(7) Move the transducer to get the maximum signal from the notch and adjust the gain to set the signal at 80 percent of full screen height (FSH). Make sure the transducer does not move across the scribe line. See Figure 3, Detail I.

NOTE: Two fastener locations identified by flagnote 3 in Figure 1 can be examined from the alternative inspection surface shown in View B. If you make a decision to use the alternative inspection surface, do Paragraph 4. again, but use TP3 and TP4 as alternatives to TP1 and TP2.

5. Inspection Procedure

A. Examine the lower chords of the nacelle strut for cracks at NSTA 244.9. See Figure 1 for the inspection areas.

(1) Identify the inspection area shown in Figure 1.

(2) Calibrate the instrument as specified in Paragraph 4.

(3) Apply a thin layer of couplant to the inspection surface. Put the transducer on the inspection surface and move the transducer as necessary to get a signal from the fastener hole. See Figure 1.

NOTE: If the hole signal does not occur on the screen display, increase the gain until the hole signal is between 10 and 20 percent of FSH. Do not lower the gain if the signal is initially more than 20 percent of FSH.

(4) Slowly turn the transducer approximately 10 to 15 degrees to the left and right as you move it to and away from the fastener hole to find possible cracks. During the scan, move the transducer a minimum of one full transducer length on the inspection surface, if possible. Examine the lower chord from the inboard and outboard sides of each fastener, if possible.

(5) Do Paragraph 5.A.(3) and Paragraph 5.A.(4) again to examine the lower chords of the nacelle strut on the opposite side of the airplane for cracks.

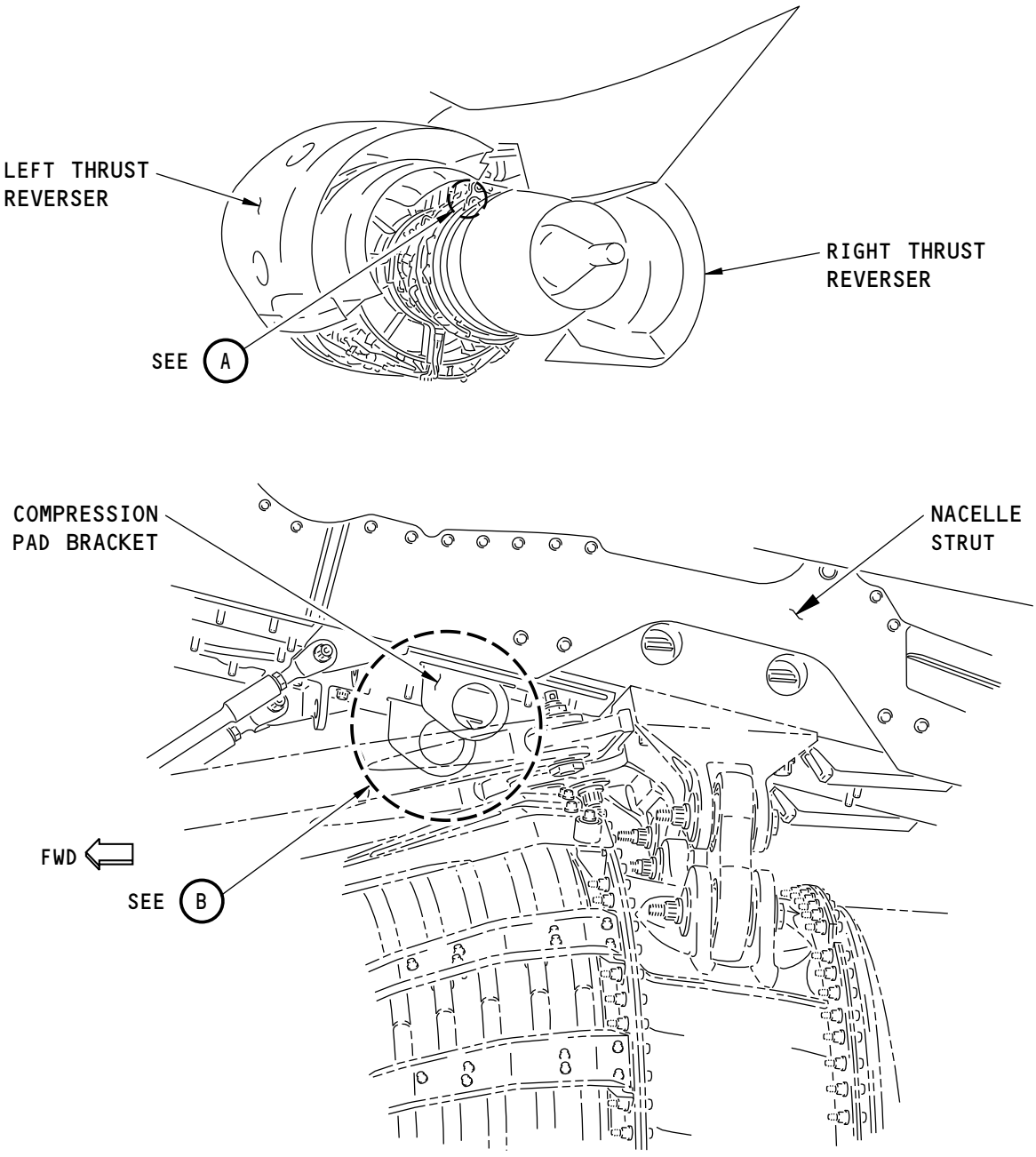
6. Inspection Results

A. A signal that is 40 percent (or more) of FSH is a sign of a crack and the location that causes this signal to occur must be rejected. More analysis is necessary at locations that cause crack type signals to occur.

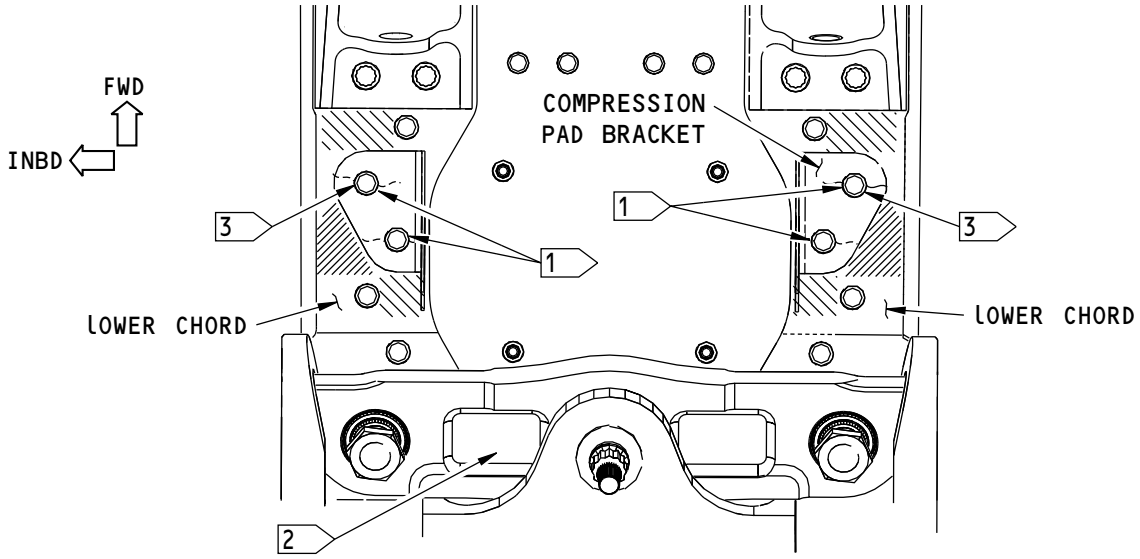
(1) Compare a possible crack signal that occurs during the inspection with the signals you got from the notch in the reference standard during calibration.

(2) Compare the possible crack signals with the signals that you get from an equivalent structure on the same or a different airplane.

B. Remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 19, to make sure there is a crack.



Inspection Area
Figure 1 (Sheet 1 of 2)



VIEW AS YOU LOOK UP AT THE NACELLE STRUT
THE NACELLE STRUT ON THE LEFT SIDE OF THE AIRPLANE IS SHOWN;
THE NACELLE STRUT ON THE RIGHT SIDE OF THE AIRPLANE IS THE SAME

B

NOTES:

INSPECTION SURFACE. PUT THE TRANSDUCER IN THIS AREA.

ALTERNATIVE INSPECTION SURFACE.

1 FASTENER LOCATIONS TO BE EXAMINED FOR CRACKS

2 SOME ASSEMBLIES ARE NOT SHOWN TO GET A CLEAR VIEW OF THE INSPECTION AREA.

3 IT IS PERMITTED TO EXAMINE THIS FASTENER LOCATION FROM THE ALTERNATIVE INSPECTION SURFACE. IF YOU MAKE A DECISION TO EXAMINE THIS FASTENER LOCATION FROM THE ALTERNATIVE INSPECTION SURFACE, CALIBRATE THE EQUIPMENT AS SPECIFIED IN PARAGRAPH 4 AND FIGURE 3 BUT USE TRANSDUCER POSITIONS TP3 AND TP4, NOT TP1 AND TP2.

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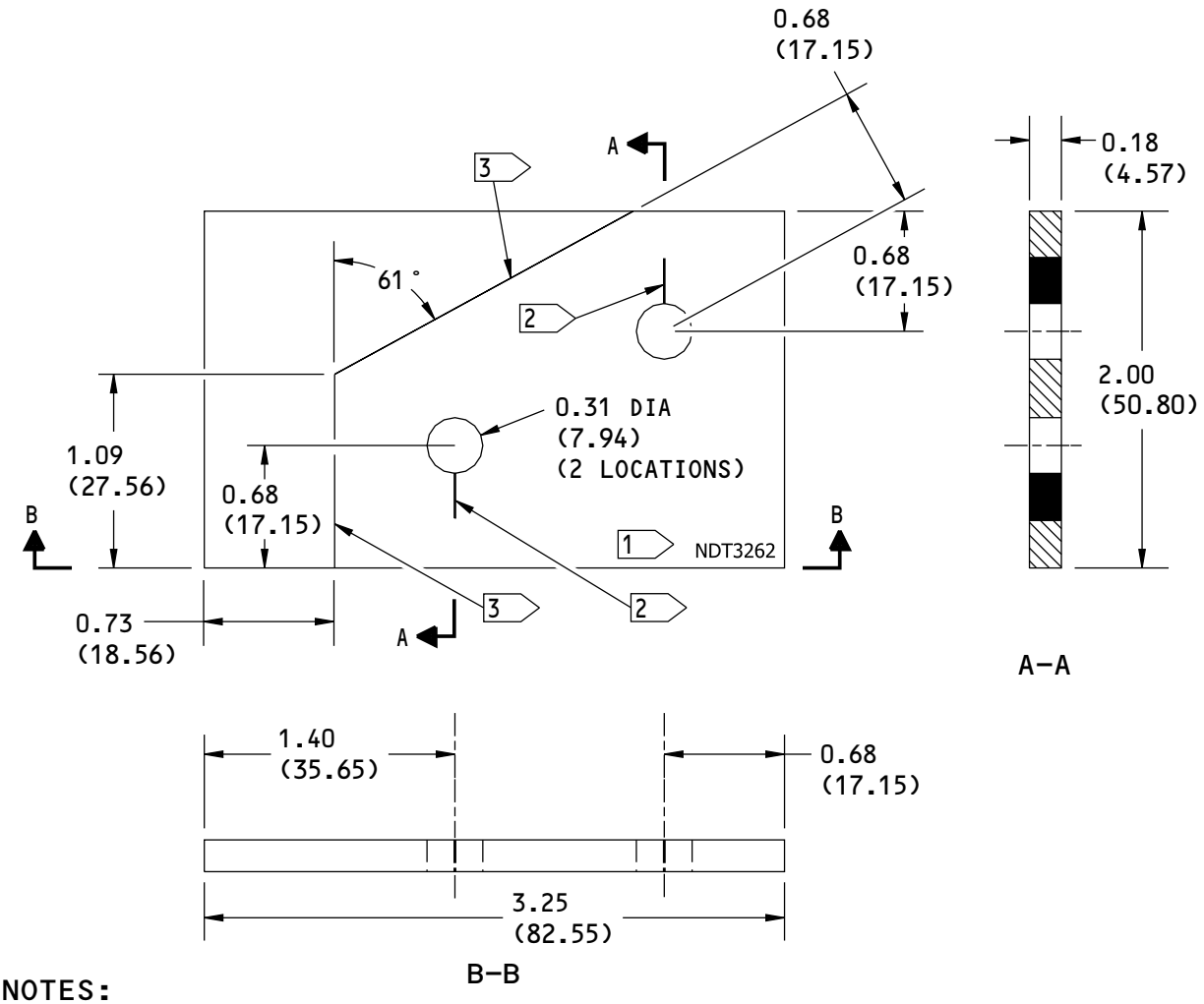
Inspection Area
Figure 1 (Sheet 2 of 2)



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: 15-5PH STEEL OR EQUIVALENT
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS	ANGULAR
X.XXX = ±0.005	X.XX = ±0.10	±1 DEGREE
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3262, AT APPROXIMATELY THIS LOCATION

2 EDM NOTCH (2 LOCATIONS):
LENGTH: 0.25 (6.35)
DEPTH: THROUGH THE THICKNESS
WIDTH: 0.007 (0.18)

3 SCRIBE LINE

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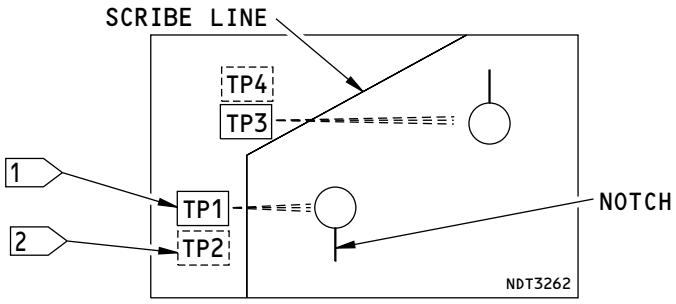
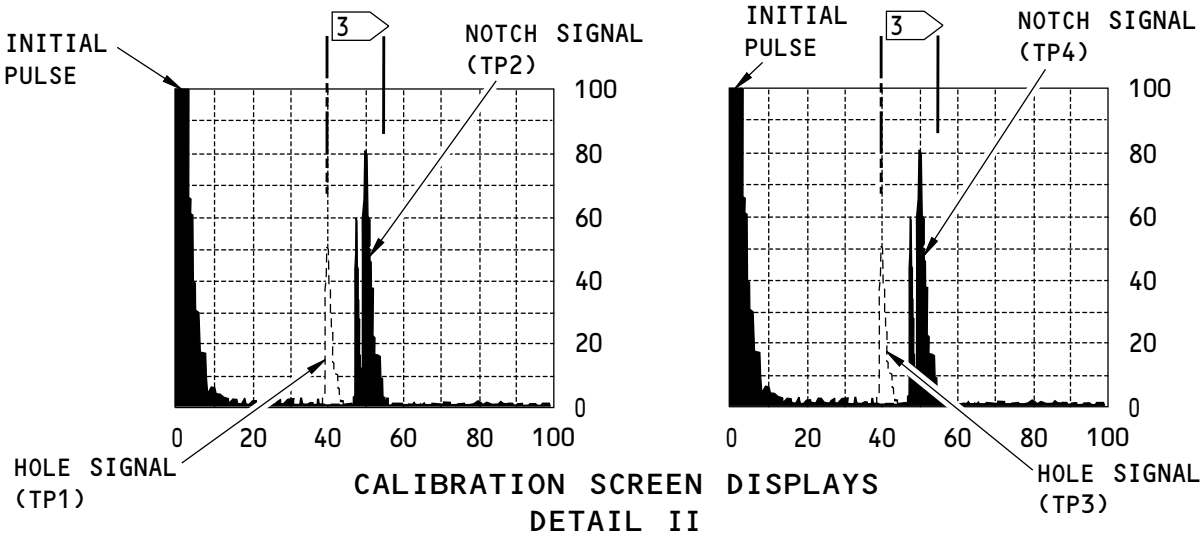
Reference Standard NDT3262
Figure 2



CALIBRATION TRANSDUCER POSITIONS
DETAIL I



CALIBRATION SCREEN DISPLAYS
DETAIL II

1 PUT THE TRANSDUCER AT TP1 AND MOVE IT A SMALL DISTANCE TO AND AWAY FROM THE FASTENER AS YOU TURN IT A SMALL QUANTITY TO THE LEFT AND RIGHT UNTIL THE HOLE SIGNAL IS AT A MAXIMUM ON THE SCREEN DISPLAY. MAKE SURE THE TRANSDUCER DOES NOT MOVE ACROSS THE SCRIBE LINE ON THE REFERENCE STANDARD.

2 MONITOR THE SCREEN DISPLAY AND MOVE THE TRANSDUCER TO TP2 AND GET THE MAXIMUM SIGNAL FROM THE NOTCH. THE FASTENER HOLE SIGNAL AT TP1 WILL DECREASE AND GO OUT OF VIEW WHILE YOU MOVE THE TRANSDUCER TO TP2 AND THE NOTCH SIGNAL COMES INTO VIEW. MAKE SURE THE TRANSDUCER DOES NOT MOVE ACROSS THE SCRIBE LINE ON THE REFERENCE STANDARD.

3 ULTRASONIC SIGNALS THAT ARE 40% (OR MORE) OF FSH AND ARE TO THE RIGHT OF THE HOLE SIGNAL WITHIN 20% OF FSW ARE POSSIBLE CRACK INDICATIONS. AREAS THAT CAUSE POSSIBLE CRACK INDICATIONS TO OCCUR MUST BE EXAMINED MORE FULLY. THE CENTERLINE OF THE HOLE SIGNAL WILL OCCUR AT DIFFERENT LOCATIONS ON THE SCREEN DISPLAY WHEN THE TRANSDUCER IS AT DIFFERENT DISTANCES FROM THE FASTENER HOLE.

2503987 S0000588729_V1

Calibration on Reference Standard NDT3262
Figure 3

PART 4 - ULTRASONIC

VERTICAL LEG OF THE LOWER CHORDS OF THE NACELLE STRUT

1. Purpose

A. Use this procedure to examine the vertical leg of the lower chords of the nacelle struts for cracks. See Figure 1 for the inspection area.

B. The lower chord is 15-5PH steel.

C. 737 Maintenance Planning Data (MPD) Damage Tolerance Rating (DTR) Check Form Reference:

(1) Item: 54-51-10

2. Equipment

A. General

(1) Use 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. Instruments

(1) Use a pulse echo ultrasonic instrument. The instruments that follow were used to help prepare this procedure.

(a) Epoch 600; Olympus NDT

(b) USMGo; GE Inspection Technologies

(c) D70; Sonatest

C. Transducers

(1) Use a 5 MHz transducer that can put a 45 degree shear wave in steel. The transducer must have a maximum width of 0.25 inch (6.35 mm) and a minimum length of 0.25 inch (6.35 mm) with a top mounted connector. The transducer that follows was used to help prepare this procedure.

(a) AFS-545AT; AeroFab NDT

D. Reference Standards

(1) Use reference standard NDT3258-B to help calibrate the instrument. See Figure 2 for data about reference standard NDT3258-B.

E. Couplant

(1) Use a couplant that is permitted for use with the airplane structure.

3. Prepare for the Inspection

A. Identify and get access to the inspection areas shown in Figure 1.

B. Clean the inspection surface.

(1) Remove paint only if it is loose.

(2) Remove sealant from the inspection surface, if necessary.

4. Instrument Calibration

A. Calibrate the instrument to examine the vertical leg of the lower chord of the nacelle strut.

(1) Connect the transducer and set the instrument to the Pulse-Echo mode.

(2) Set Delay to zero and Reject to zero.

(3) Put couplant on the reference standard at transducer position 1 (TP1). See Figure 3, Detail I.

(4) Put the transducer at TP1 on the reference standard as shown in Figure 3, Detail I. Move the transducer until the fastener hole signal is at its maximum height on the screen display. Make sure the transducer does not move across the scribe line.

(5) Adjust the range and delay controls to put the initial pulse at zero percent of full screen width (FSW) and the fastener hole signal at approximately 50 percent of FSW as shown in Figure 3, Detail II.

(6) Monitor the screen display and move the transducer to TP2. As you move the transducer, the signal from the fastener hole will decrease and a signal from the notch will occur immediately to the right of the fastener hole signal as shown in Figure 3, Detail II.

(7) Move the transducer to get the maximum signal from the notch and adjust the gain to set the signal at 80 percent of full screen height (FSH). Make sure the transducer does not move across the scribe line. See Figure 3, Detail I.

5. Inspection Procedure

A. Examine the vertical leg of the lower chords of the nacelle strut for cracks in the area from NSTA 209.0 to 212.3 and from NSTA 231.8 to 234.4. See Figure 1 for the inspection areas.

NOTE: NSTA 211 is the centerline of frame 1 of the nacelle strut. NSTA 233 is the centerline of frame 3 of the nacelle strut. See Figure 1.

(1) Identify the inspection areas shown in Figure 1.

(2) Calibrate the instrument as specified in Paragraph 4.

(3) Apply a thin layer of couplant to the inspection surface. Put the transducer on the inspection surface and move the transducer as necessary to get a signal from the fastener hole. See Figure 1.

NOTE: If the hole signal does not occur on the screen display, increase the gain until the hole signal is between 10 and 20 percent of FSH. Do not lower the gain if the signal is initially more than 20 percent of FSH.

(4) Move the transducer away from and back to the hole as you slowly turn it approximately 10 to 15 degrees to the left and right to make a scan for possible cracks. During the scan, move the transducer a minimum of one full transducer length on the inspection surface, if possible. Examine the lower chord from the forward and aft sides of each fastener, if possible.

(5) Do Paragraph 5.A.(3) and Paragraph 5.A.(4) again to examine the lower chords of the nacelle strut on the opposite side of the airplane for cracks.

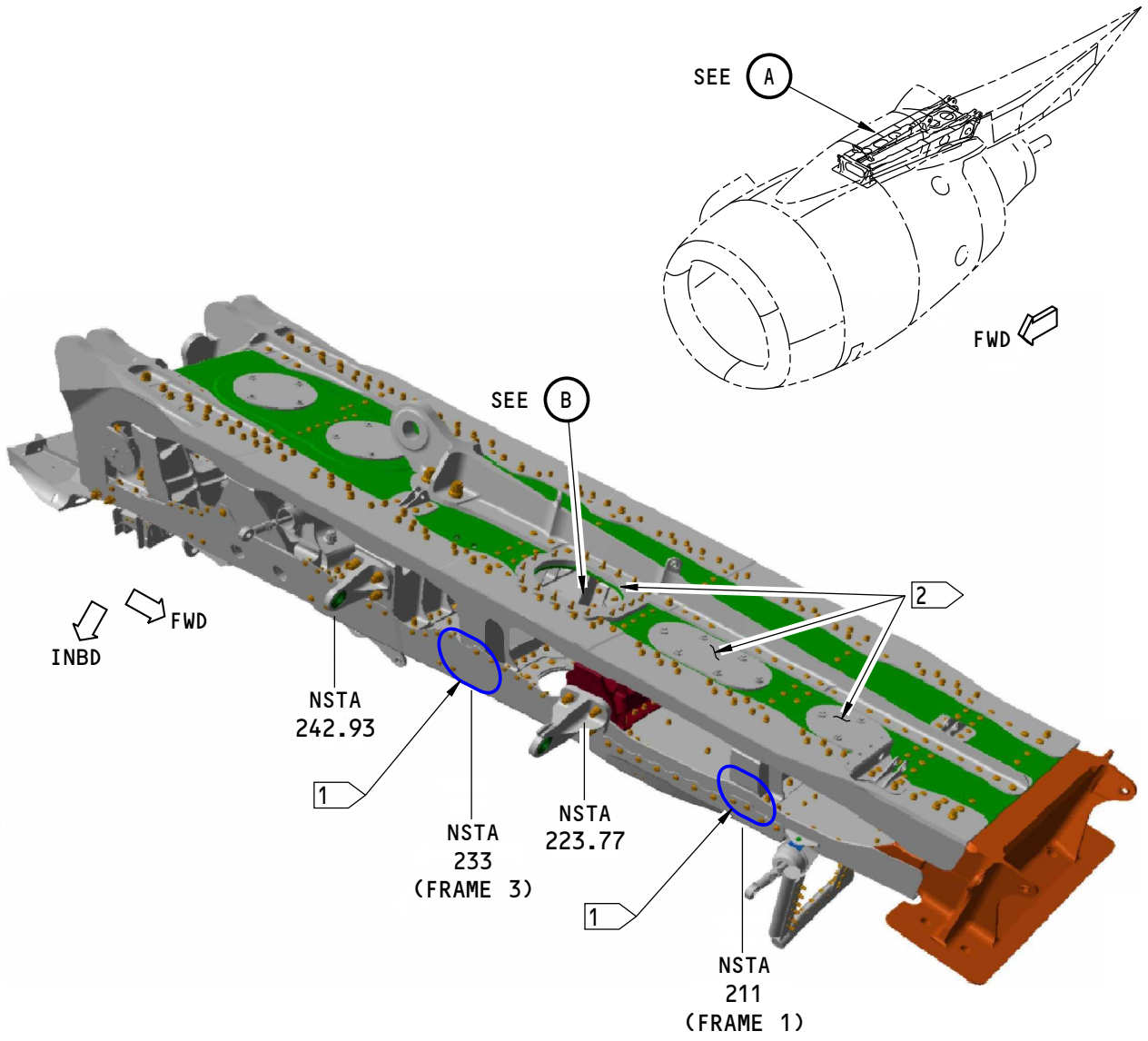
6. Inspection Results

A. A signal that is 40 percent (or more) of FSH is a sign of a crack and the location that causes this signal to occur must be rejected. More analysis is necessary at locations that cause crack type signals to occur.

(1) Compare a possible crack signal that occurs during the inspection with the signals you got from the notch in the reference standard during calibration.

(2) Compare the possible crack signals with the signals that you get from an equivalent structure on the same or a different airplane.

B. Remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 19, to make sure there is a crack.



THE LEFT NACELLE STRUT IS SHOWN;
THE RIGHT NACELLE STRUT IS THE SAME

A

NOTES:

1 INSPECTION AREA. THERE ARE 4 FASTENER LOCATIONS IN EACH INSPECTION AREA. THERE IS A TOTAL OF 16 FASTENER LOCATIONS TO BE EXAMINED ON EACH NACELLE STRUT.

2 REMOVE THE ACCESS PANELS AND THE DUCT TO GET ACCESS INSIDE THE NACELLE STRUT.

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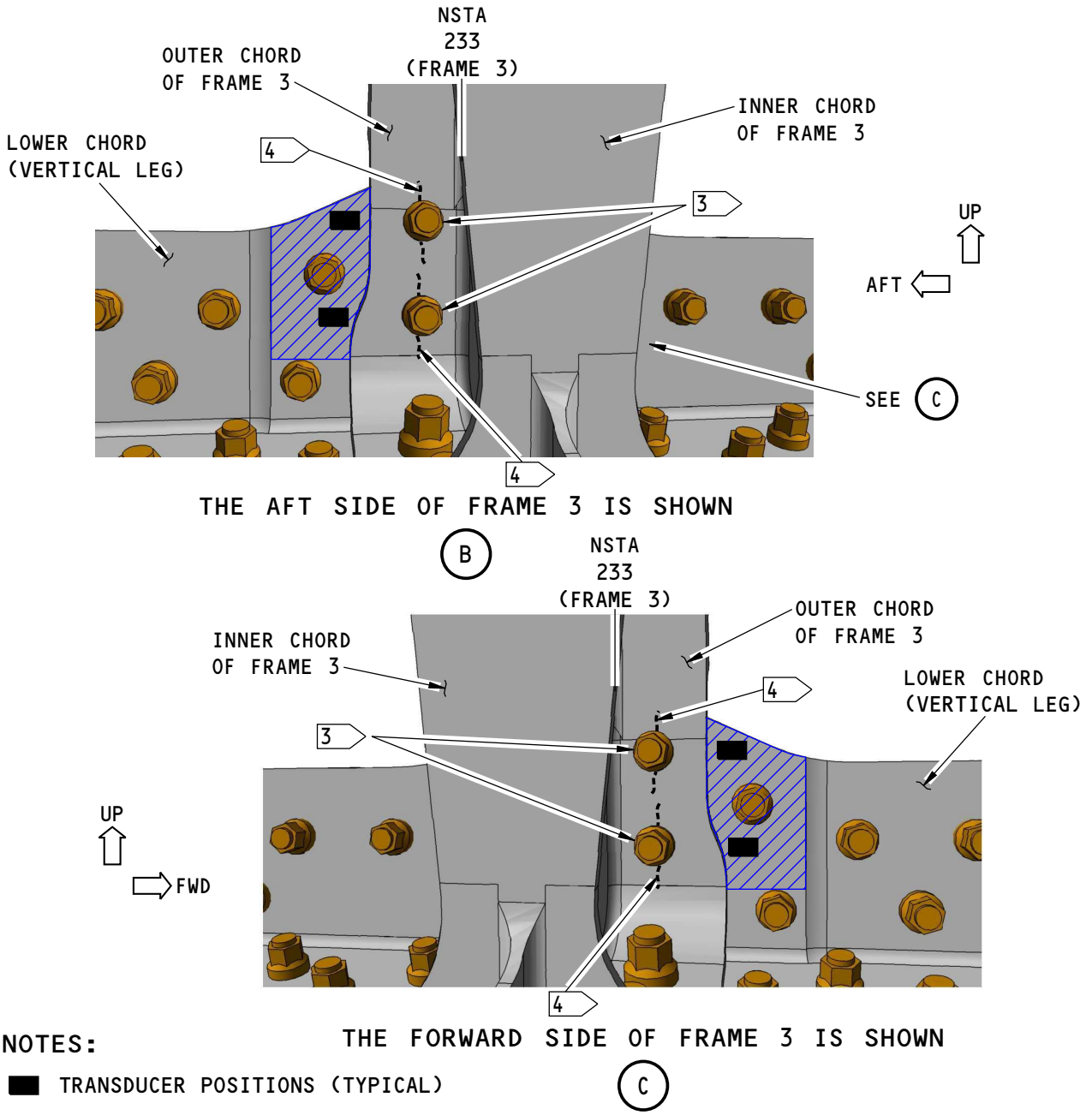
Inspection Area
Figure 1 (Sheet 1 of 2)



NOTES:

- TRANSDUCER POSITIONS (TYPICAL)
- INSPECTION SURFACE
  - THE FORWARD AND AFT SIDES OF FRAME 3 ARE SHOWN; FRAME 1 IS ALMOST THE SAME

3 FASTENER LOCATIONS TO BE EXAMINED. THERE ARE TWO FASTENER LOCATIONS ON THE FORWARD AND AFT SIDES OF FRAME 1 AND FRAME 3.

4 CRACK DIRECTION (TYPICAL)

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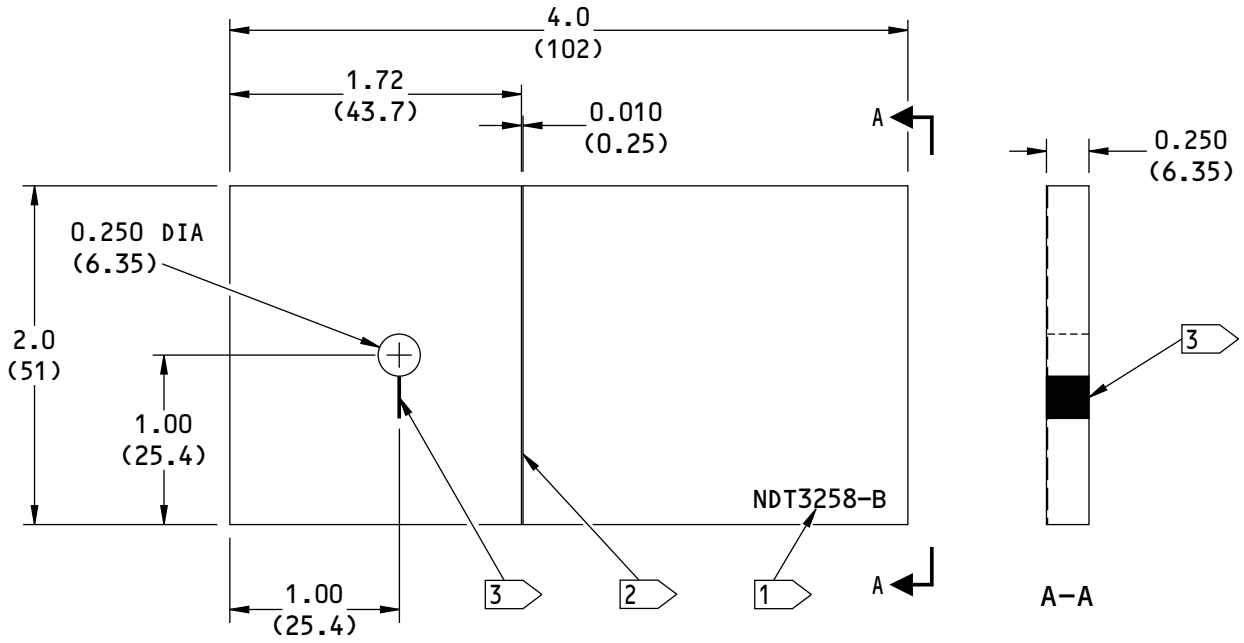
Inspection Area
Figure 1 (Sheet 2 of 2)



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: 15-5PH STEEL
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.10
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

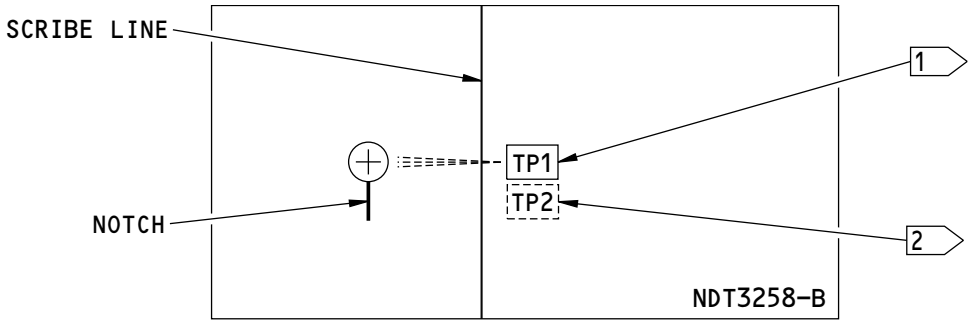
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3258-B, AT APPROXIMATELY THIS LOCATION.

2 ETCH OR LASER CUT A SCRIBE LINE ON THE REFERENCE STANDARD AT THIS LOCATION.

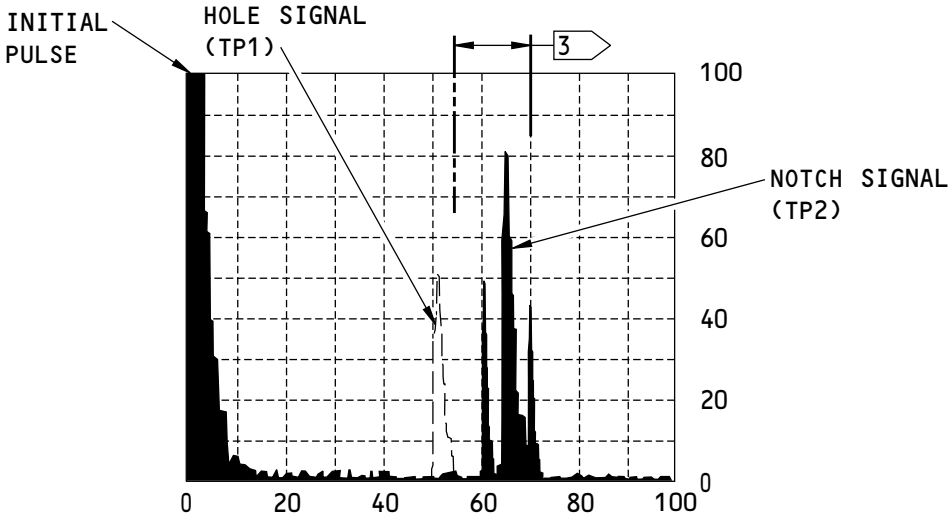
3 EDM NOTCH:
WIDTH: 0.010 (0.25) MAXIMUM
DEPTH: THROUGH THE THICKNESS
LENGTH: 0.250 (6.35)

2501388 S0000587960_V1

Reference Standard NDT3258-B
Figure 2



CALIBRATION TRANSDUCER POSITIONS
DETAIL I



CALIBRATION SCREEN DISPLAY
DETAIL II

1 PUT THE TRANSDUCER AT TP1 AND MOVE IT A SMALL DISTANCE TO AND AWAY FROM THE FASTENER AS YOU TURN IT A SMALL QUANTITY TO THE LEFT AND RIGHT UNTIL THE FASTENER HOLE SIGNAL IS AT A MAXIMUM ON THE SCREEN DISPLAY. MAKE SURE THE TRANSDUCER DOES NOT MOVE ACROSS THE SCRIBE LINE ON THE REFERENCE STANDARD.

2 MONITOR THE SCREEN DISPLAY AND MOVE THE TRANSDUCER TO TP2 AND GET THE MAXIMUM SIGNAL FROM THE NOTCH. THE FASTENER HOLE SIGNAL AT TP1 WILL DECREASE AND GO OUT OF VIEW WHILE YOU MOVE THE TRANSDUCER TO TP2 AND THE NOTCH SIGNAL COMES INTO VIEW. MAKE SURE THE TRANSDUCER DOES NOT MOVE ACROSS THE SCRIBE LINE ON THE REFERENCE STANDARD.

3 ULTRASONIC SIGNALS THAT ARE 40 PERCENT (OR MORE) OF FSH AND ARE TO THE RIGHT OF THE FASTENER HOLE SIGNAL WITHIN 20 PERCENT OF FSW ARE POSSIBLE CRACK INDICATIONS. AREAS THAT CAUSE POSSIBLE CRACK INDICATIONS TO OCCUR MUST BE EXAMINED MORE FULLY. THE CENTERLINE OF THE FASTENER HOLE SIGNAL WILL OCCUR AT DIFFERENT LOCATIONS ON THE SCREEN DISPLAY WHEN THE TRANSDUCER IS AT DIFFERENT DISTANCES FROM THE FASTENER HOLE.

2505714 S0000587961_V1

Calibration on Reference Standard NDT3258-B
Figure 3