PART 4 - ULTRASONIC

HORIZONTAL STABILIZER - UPPER CHORD OF THE REAR SPAR AT STAB STA 68.14

1. Purpose

A. Use this procedure to find cracks in the upper chord of the rear spar where the closure rib and the hinge support rib, at STAB STA 68.14, are attached to the upper chord. See Figure 1.

B. This inspection procedure contains two procedures that examine the upper chord at the two fastener locations that attach the closure rib and the hinge support rib fittings to the upper chord. The two procedures are as follows:

(1) To do the inspection with the horizontal stabilizer installed on the airplane, see Figure 2.

(2) To do the inspection with the horizontal stabilizer removed, see Figure 3. Use this procedure to make sure of ultrasonic indications that have been found if the inspection was done with the horizontal stabilizer installed.

C. The cracks are on the upper and lower sides of the fastener hole.

D. This procedure uses a 5 MHz transducer that puts a 60 degree shear wave in aluminum to examine the upper chord with the horizontal stabilizer installed on the airplane. Use a 5 MHz transducer that puts a 45 degree shear wave in aluminum to examine the upper chord with the horizontal stabilizer removed from the airplane.

E. 737 Supplemental Structural Inspection Document (D6-37089 for -100/200/200C Airplanes; D6-82669 for -300/400/500 Airplanes) Reference:

(1) Item: W-17A

2. Equipment

NOTE: Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

A. All ultrasonic equipment that can do the calibration instructions of this procedure can be used.

(1) Instrument - Use an ultrasonic instrument that can operate from 4 to 6 MHz. Broadband instruments can be used if they can do the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

(a) Nortec 1200S; Staveley Instruments, Inc.

(b) USN 50, 52L, 60; Krautkramer Branson

(c) EPOCH 4; Panametrics, Inc.

(2) Transducers

(a) Use a 5 MHz transducer that puts a 45-degree shear wave in aluminum and has a top mounted connector. The case dimensions must not be more than 0.50 inch (13 mm) in length by 0.50 inch (13 mm) in height. Use a cable that has a right angle connector. The transducers that follow were used to help prepare this procedure.

1) SUM 545AT; NDT Engineering Corp.

2) XAB-6093; Xactex Corp.

3) SA-455T; Techna NDT

(b) Use a 5 MHz transducer that can put a 60-degree shear wave in aluminum.

1) Use a transducer with case dimensions that are not more than 0.50 inch (13 mm) in length and 0.40 inch (10 mm) in height and has an end mounted connector to do the inspection from the lower surface of the upper spar lug. Use a cable that has a right angle connector.

a) The transducers that follow were used to help prepare this procedure to do the inspection from the lower surface.

<1> XAB-6094; Xactex Corp.

<2> SA-605S; Techna NDT

2) Use a transducer that has a larger element (than the element of the transducers used in Paragraph 2.A.(2)(a) and Paragraph 2.A.(2)(b) to do the inspection from the upper surface of the upper chord if a high level of gain is necessary which causes the timebase noise level to be 10% or more.

a) The transducers that follow were used to help prepare this procedure to do the inspection from the upper surface.

<1> AP-HP-1/4-5.0; Xactex Corp.

<2> SUM 560AS; NDT Engineering Corp.

(3) Reference Standard - Make or buy reference standard NDT3081 (see Figure 4). Reference standards 343A and 343B can be used as an alternative to NDT3081.

(4) Couplant - All ultrasonic couplants that will not damage the airplane structure can be used. A light commercial grease works good.

3. Prepare for the Inspection

A. Identify all the transducer inspection surfaces in Figure 2 and Figure 3.

B. Remove the gap covers 9123L, 9223R, 9125L and 9225R if the inspection is to be done with the horizontal stabilizer installed on the airplane.

C. Clean all the inspection surfaces.

(1) If necessary, remove sealant from all the surfaces that the transducer will be put on.

(2) If the surface is rough, make it smooth by approved procedures. It is not necessary to remove paint unless it is loose.

4. Instrument Calibration

A. Calibrate the instrument to examine the upper chord with the horizontal stabilizer installed on the airplane (see Figure 2 for the inspection areas) as follows:

NOTE: Two calibrations are necessary, one to examine the upper fastener hole and one to examine the lower fastener hole.

(1) Calibrate the instrument to examine the lower fastener hole as follows:

(a) Connect the 60 degree transducer to the instrument.

(b) Set the instrument frequency from 4 to 6 MHz if a broadband instrument is not used.

(c) Apply a sufficient amount of couplant on the inspection surface of reference standard NDT3081 at transducer positions 1 thru 4. See Detail I in Figure 5.

(d) Put the transducer at position 1 on the reference standard as shown in Detail I in Figure 5. Make sure the sound beam is pointed at the lower hole and the sound exit point is set to the dimension identified. If the transducer does not have the sound exit point marked, use the center of the transducer.

(e) Adjust the instrument gain, delay and range controls as necessary to get a signal from the hole to occur on the screen display.

(f) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the hole.

(g) Adjust the instrument delay and range controls to get the signal from the hole set to 80% of full screen width (FSW) with the initial pulse set to 0%. See Detail II in Figure 5 for the screen display.

(h) Move the transducer to the edge of the reference standard at position 2 with the sound beam pointed at notch “A”. See Detail I in Figure 5.

(i) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the notch. See Detail III in Figure 5 for the FSW location of the notch (75% of FSW).

(j) Adjust the instrument gain to get the notch signal to be between 50 and 80% of full screen height (FSH). See Detail III in Figure 5.

NOTE: Do not use reject.

(k) Monitor the distance that the transducer is moved from Position 1 to Position 2 (maximum signal from the notch). This will help identify the distance the transducer has moved from the fastener hole to a crack of the approximate same length during the inspection.

(l) Make a complete scan of the hole away from the notch (position 1) and then at the hole with the notch (position 2). Monitor the signal(s) pattern at each location.

(2) Calibrate the instrument to examine the upper fastener hole as follows:

(a) Do Paragraph 4.A.(1)(d) thru Paragraph 4.A.(1)(l) again, but use transducer positions 3 and 4 (notch “B”) on the reference standard.

B. Calibrate the instrument to examine the upper chord with the horizontal stabilizer removed from the airplane (see Figure 3 for the inspection areas) as follows:

NOTE: One calibration is necessary to examine the two fastener locations (upper and lower fastener holes).

(1) Connect the 45 degree transducer to the instrument.

(2) Set the instrument frequency from 4 to 6 MHz if a broadband instrument is not used.

(3) Apply a sufficient amount of couplant on the inspection surface of reference standard NDT3081 at transducer positions 5 and 6. See Detail I in Figure 6.

(4) Put the transducer at position 5 on the reference standard as shown in Detail I in Figure 6. Make sure the sound beam is pointed at the hole and the sound exit point is set to the dimension identified. If the transducer does not have the sound exit point marked, use the center of the transducer.

(5) Adjust the instrument gain, delay and range controls as necessary to get a signal from the hole to occur on the screen display.

(6) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the hole.

(7) Adjust the instrument delay and range controls to get the signal from the hole set to 80% of full screen width (FSW) with the initial pulse set to 0%. See Detail II in Figure 6 for the screen display.

(8) Move the transducer to position 6 with the sound beam pointed at the notch. See Detail I in Figure 6.

(a) If necessary, adjust the instrument gain to keep the signal on the screen display.

(b) Move and turn the transducer from side to side, as much as necessary, to get a maximum signal from the notch.

(c) Monitor the distance that the transducer is moved from position 5 (maximum hole signal) to position 6 (maximum notch signal). This will help identify the distance the transducer has moved from the fastener hole to a crack of the approximate same length during the inspection.

NOTE: The notch signal will occur and increase in height a short distance to the right of the hole signal as the transducer is moved away from the hole.

(9) Adjust the instrument gain to get the notch signal to be between 50 and 80% of full screen height (FSH). See Detail III in Figure 6 for the screen display.

NOTE: Do not use reject.

5. Inspection Procedure

A. Examine the upper chord with the horizontal stabilizer installed on the airplane as follows (see Figure 2):

(1) Identify all the transducer inspection surfaces shown in Figure 2 on the upper chord (upper surface of the chord and lower surface of the upper spar lug).

(2) Calibrate the instrument as specified in Paragraph 4.A.(1) to examine the lower fastener hole for cracks. To examine the upper fastener hole for cracks, calibrate the instrument as specified in Paragraph 4.A.(2).

(3) Put a sufficient amount of couplant on the inspection surfaces.

(4) Examine the fastener holes as follows:

(a) Put the transducer on the inspection surface with the sound pointed in the direction of the hole to be examined. Set the sound exit point or the center of the transducer to the dimension identified in Detail II in Figure 2.

(b) Make a scan in the inspection areas as follows:

NOTE: See Figure 2, flagnote 1, for the typical crack direction and location.

1) Move the transducer a small distance in the inboard and outboard direction along the edge of the chord to get the maximum signal from the hole. Adjust the instrument gain to get the signal from the hole to be the same as that set during calibration.

NOTE: It can be necessary to remove paint from the upper surface of the chord if a high level of gain is necessary and the timebase noise level gets to 10% of FSH or more.

2) With the transducer on the upper surface of the chord, the hole signals from the upper and lower fastener holes will be at the same (or approximately the same) FSW location as that set during calibration.

3) With the transducer on the lower surface of the upper spar lug, the signal from the lower fastener hole will occur at approximately 65 to 70% of FSW, which is to the left of the signal that was set during calibration.

4) As you move the transducer in the inboard and outboard direction, monitor the screen display for a crack signal to be adjacent to the hole signal. The signal from a crack will be at maximum height to the right of the good hole signal. Compare the signal from a possible crack to the reference standard notch signal.

5) The signal from a fastener hole without a crack will show as a single peak and increase to a maximum and decrease quickly as the transducer is moved toward and away from the hole.

6) Carefully monitor the distance the transducer is moved and the position of the transducer at all times to help identify the signals that occur.

NOTE: Compare the travel distance with the distance the transducer was moved from the fastener hole maximum signal to the notch maximum signal during calibration.

B. Examine the upper chord with the horizontal stabilizer removed from the airplane (see Figure 3) as follows:

(1) Identify all the transducer inspection surfaces shown in Figure 3 on the upper chord (forward and aft surfaces of the upper spar lug).

(2) Put a sufficient amount of couplant on the inspection surfaces.

(3) Calibrate the instrument as specified in Paragraph 4.B.

(4) Examine the fastener holes as follows:

(a) Put the transducer on the inspection surface with the transducer pointed in the direction of the hole to be examined. See Detail II in Figure 3.

(b) Make a scan in the inspection areas as follows:

NOTE: See Figure 3, flagnote 1, for the typical crack direction and location.

1) If necessary, move the transducer a small distance in the inboard and outboard direction to get the maximum signal from the hole at approximately 80% of FSW.

2) Move and/or turn the transducer along the surface of the chord above and below the fastener hole. Also move the transducer a small distance in the inboard and outboard direction as you make the scan.

3) As you move the transducer above and below the hole, monitor the screen display for crack type signals to occur at the same FSW as the hole signal or to the right of the hole signal.

4) The signal from a fastener hole will decrease quickly as the transducer is moved toward and away from the hole.

5) Carefully monitor the distance the transducer is moved and the position of the transducer at all times to help identify the signals that occur.

NOTE: Compare the travel distance with the distance the transducer was moved from the fastener hole maximum signal to the notch maximum signal during calibration.

6. Inspection Results

A. For the inspection of the upper chord with the horizontal stabilizer installed on the airplane:

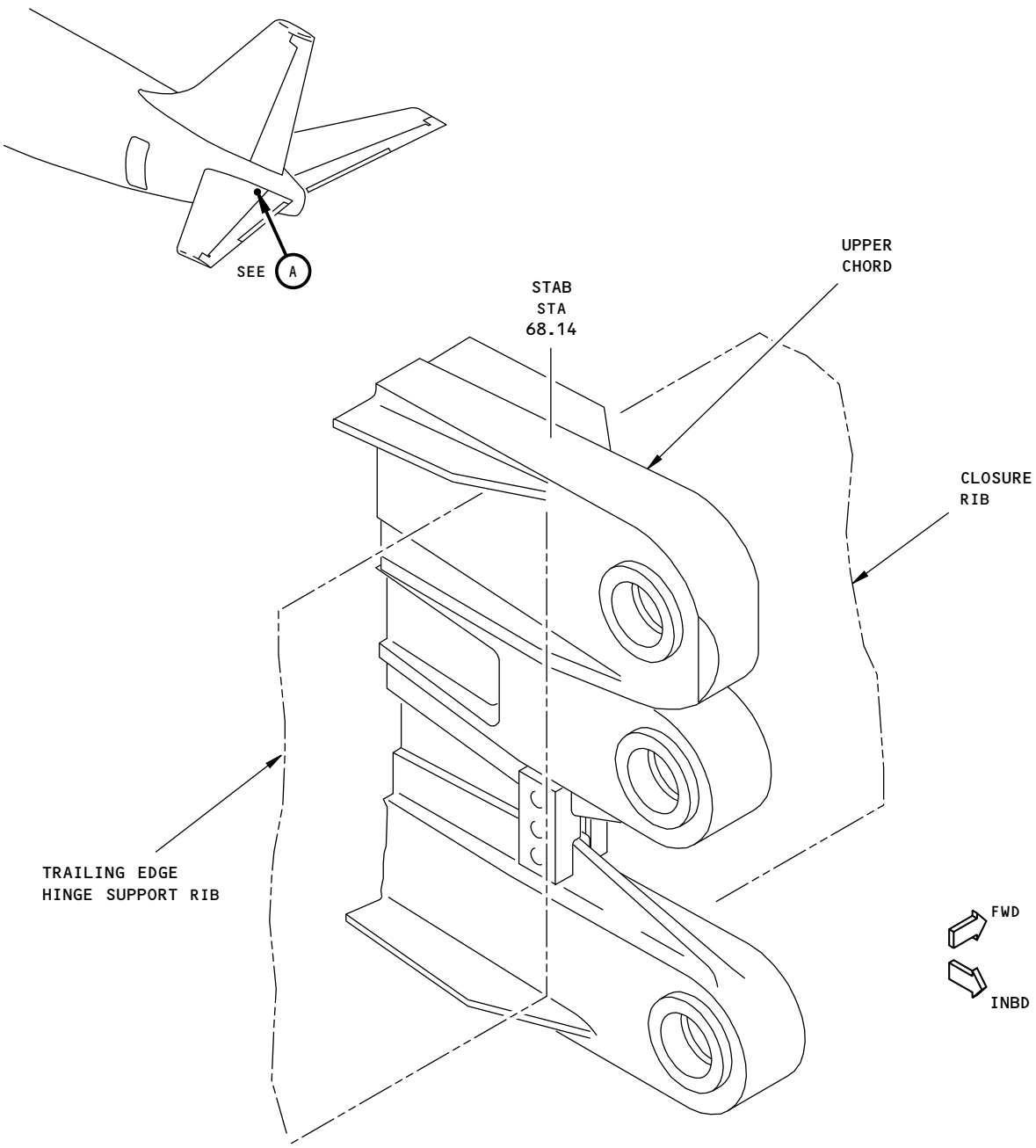
(1) Ultrasonic signals that occur to the right of the hole signals as you scan towards the hole and are 50% of FSH (or more) of the signal height set in Paragraph 4.A.(1)(j), are possible crack indications. Compare the signal pattern and the distance of transducer movement to the transducer signal characteristics on the reference standard.

(2) If crack-type signals occur, remove the stabilizer and do the inspection of the fastener holes as specified in Figure 3, “Inspection with the Stabilizer Removed”.

B. For the inspection of the upper chord with the horizontal stabilizer removed from the airplane:

(1) Ultrasonic signals that are 50% (or more) of the signal height set in Paragraph 4.B.(9) and occur in the upper and lower areas of the fastener holes are possible crack indications.

(2) If crack-type signals occur, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 16.



HORIZONTAL STABILIZER REAR SPAR LUG FITTINGS
(THE LEFT SIDE IS SHOWN, THE RIGHT SIDE IS OPPOSITE)
(VIEW TURNED 90 DEGREES COUNTERCLOCKWISE (CCW))

A

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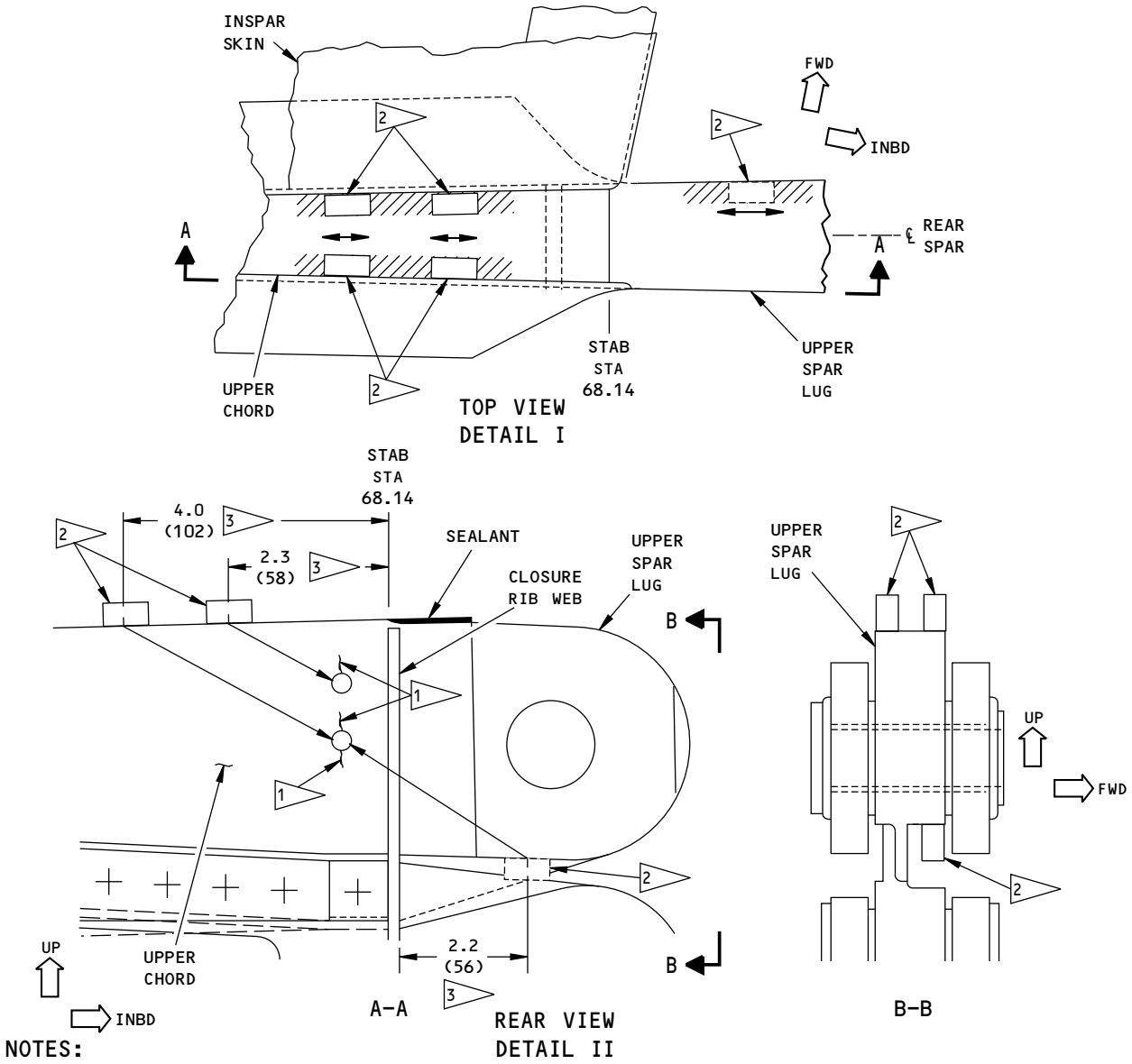
Horizontal Stabilizer - Rear Spar Upper Chord at Stab STA 68.14
Figure 1



NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- THE DETAILS SHOWN ABOVE ARE THE CONFIGURATION FOR THE -300/400/500 AIRPLANES. THE -100/200/200C AIRPLANES HAVE A DIFFERENT CONFIGURATION, BUT IT DOES NOT EFFECT THE INSPECTION.

TRANSDUCER INSPECTION SURFACE, SEE DETAIL I.

1 TYPICAL CRACK DIRECTION AND LOCATION THAT CAN OCCUR AT THE UPPER AND LOWER AREAS OF THE FASTENER HOLES OF THE CLOSURE RIB ATTACHMENT IN THE UPPER CHORD.

2 TYPICAL TRANSDUCER POSITIONS ON THE UPPER CHORD. THE INITIAL TRANSDUCER POSITION IS SET TO POINT THE SOUND BEAM AT THE FASTENER HOLE AS SHOWN. MAKE A SLOW SCAN AWAY FROM THE HOLE (IN THE OUTBOARD DIRECTION) AND THEN IN THE INBOARD DIRECTION UNTIL THE HOLE SIGNAL GOES AWAY WHEN SCANNED IN EACH DIRECTION.

3 INITIAL POSITION FOR THE SOUND EXIT POINT OF THE TRANSDUCER.

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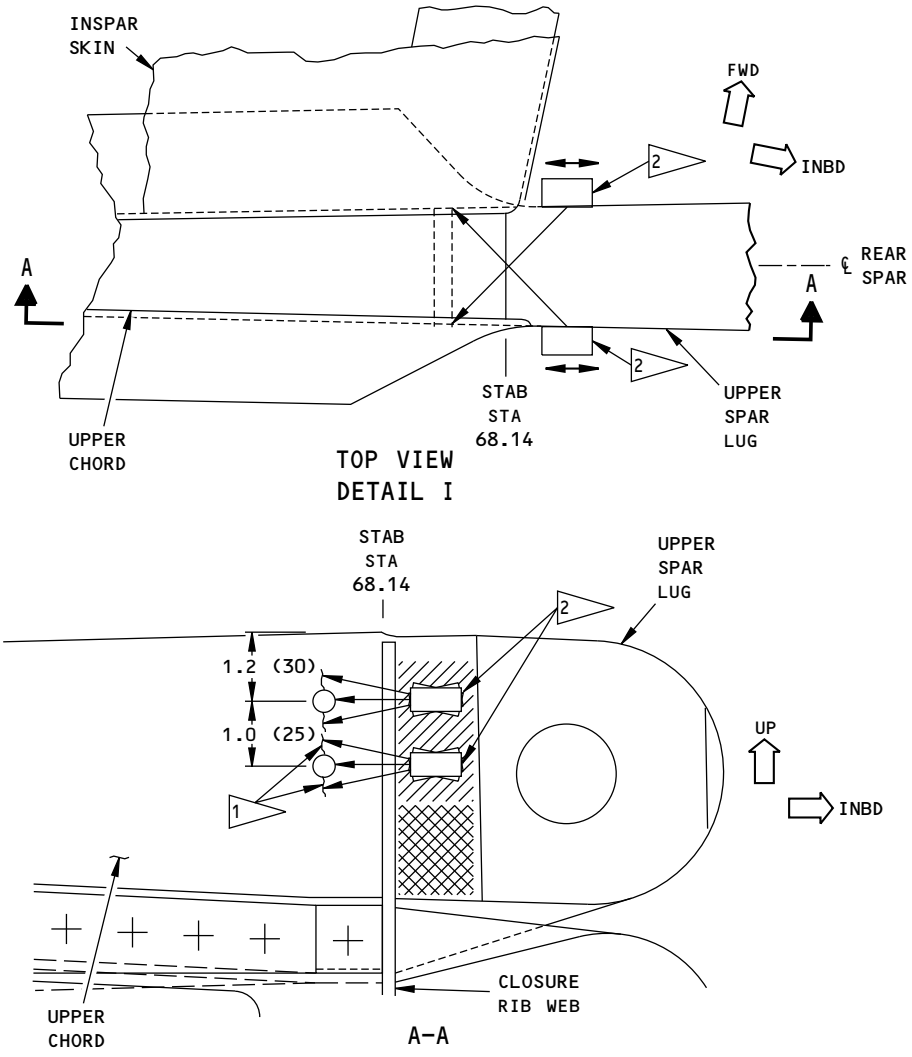
Horizontal Stabilizer - Rear Spar - Upper Chord Inspection with the Stabilizer Installed
Figure 2



NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- THE DETAILS SHOWN ABOVE ARE THE CONFIGURATION FOR THE -300/400/500 AIRPLANES. THE -100/200/200C AIRPLANES HAVE A DIFFERENT CONFIGURATION, BUT IT DOES NOT EFFECT THE INSPECTION.

//// TRANSDUCER INSPECTION SURFACE FOR ALL THE -100 THRU -500 AIRPLANES. THE INSPECTION AREA FOR THE -100/200/200C AIRPLANES EXTENDS TO THE BOTTOM OF THE UPPER LUG AS SHOWN

TRANSDUCER INSPECTION SURFACE TO EXAMINE TO THE BOTTOM OF THE UPPER LUG FOR THE -100/200/200C AIRPLANES ONLY.

1 TYPICAL CRACK DIRECTION AND LOCATION THAT CAN OCCUR ON THE UPPER AND LOWER AREAS OF THE FASTENER HOLES IN THE UPPER CHORD.

2 TYPICAL TRANSDUCER POSITIONS. THE INITIAL TRANSDUCER POSITION IS SET TO POINT THE SOUND BEAM IN THE DIRECTION OF THE FASTENER HOLE AS SHOWN. MAKE A SLOW SCAN ABOVE AND BELOW THE HOLE, MOVE THE TRANSDUCER IN THE INBOARD OR OUTBOARD DIRECTION AS MUCH AS POSSIBLE. TURN THE TRANSDUCER APPROXIMATELY 10 TO 15 DEGREES IN THE FORWARD AND AFT DIRECTIONS TO EXAMINE FOR OFF-ANGLE CRACKS AS YOU DO THE SCAN.

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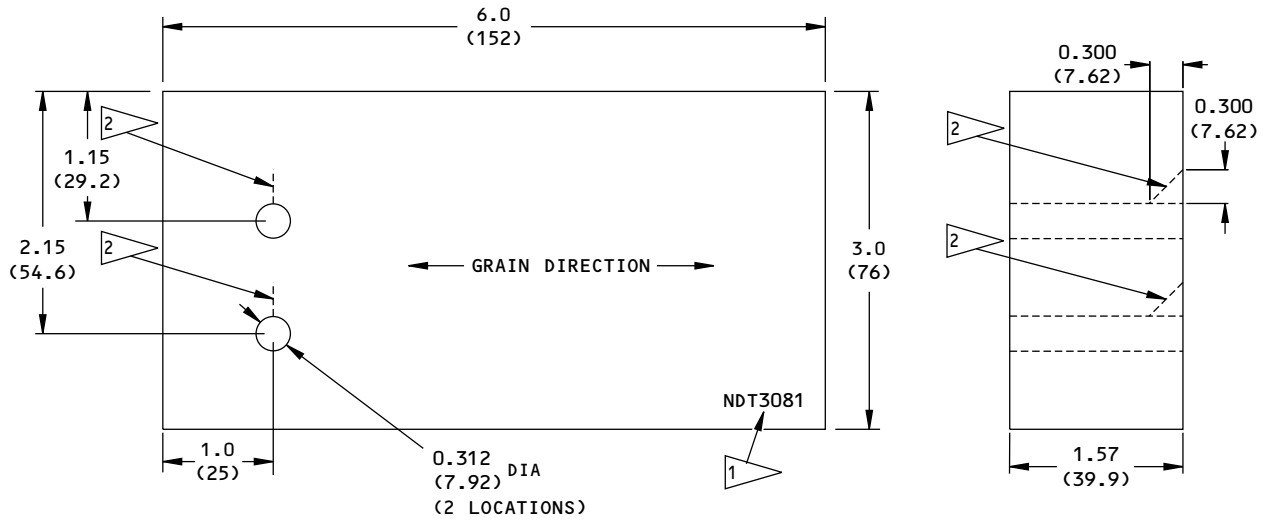
Horizontal Stabilizer - Rear Spar - Upper Chord Inspection with the Stabilizer Removed
Figure 3



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.1
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

- MATERIAL: AIRPLANE QUALITY ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER.

1 ETCH, ENGRAVE OR STEEL STAMP THE REFERENCE STANDARD NUMBER, NDT3081, AT APPROXIMATELY THIS LOCATION.

2 EDM CORNER NOTCH LOCATION AND TOLERANCE: THE NOTCH MUST BE WITHIN ± 0.005 (± 0.10) OF THE CENTERLINE OF THE HOLE AS SHOWN.

CORNER NOTCH DIMENSIONS AND TOLERANCE:
WIDTH: 0.010 (0.3) ±0.002 (0.05)
LENGTH: 0.300 (7.71)
DEPTH: 0.300 (7.71)

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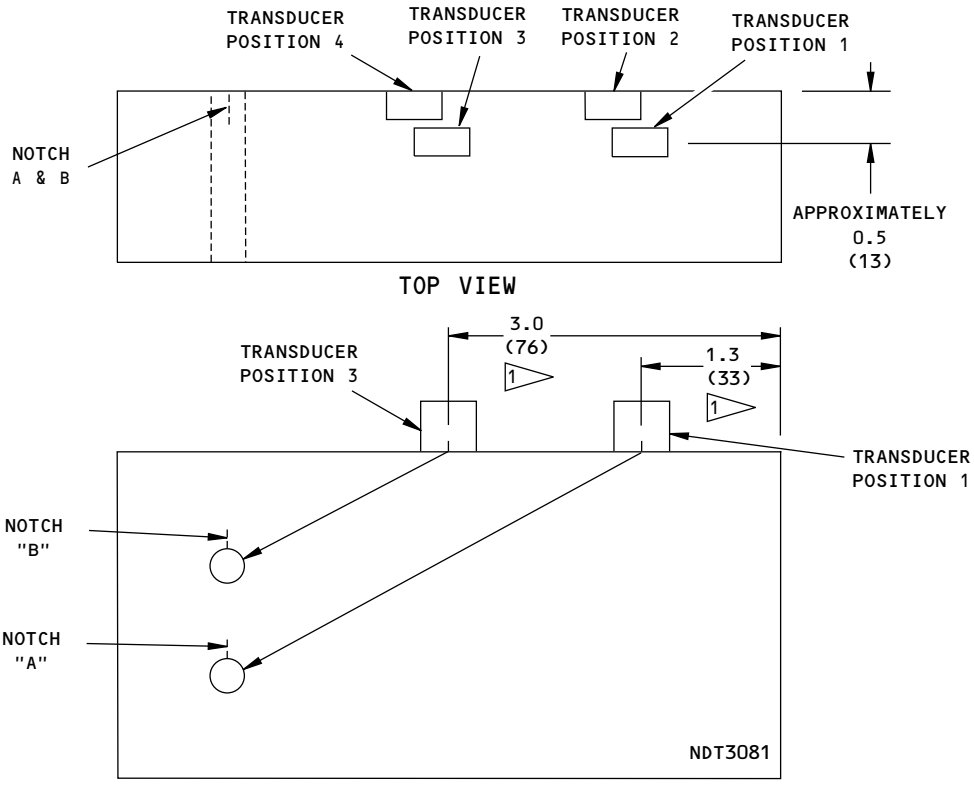
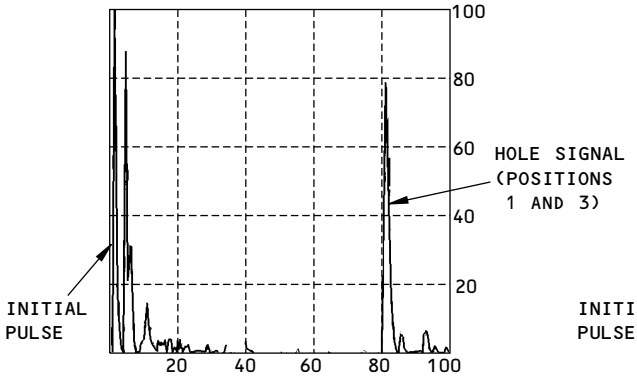
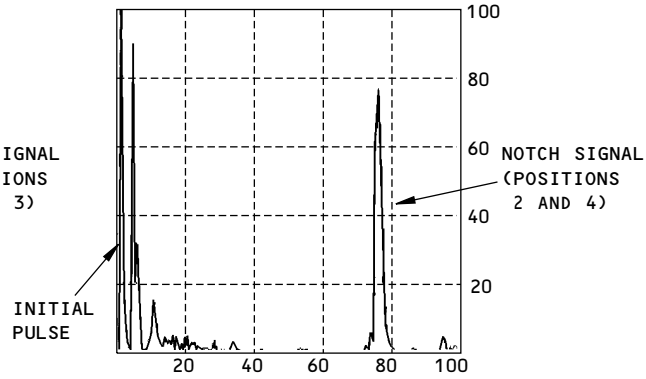
Reference Standard NDT3081
Figure 4



CALIBRATION TRANSDUCER POSITIONS
ON THE REFERENCE STANDARD
DETAIL I



TRANSDUCER POSITIONS 1 AND 3
SIGNAL DISPLAY
DETAIL II



TRANSDUCER POSITIONS 2 AND 4
SIGNAL DISPLAY
DETAIL III

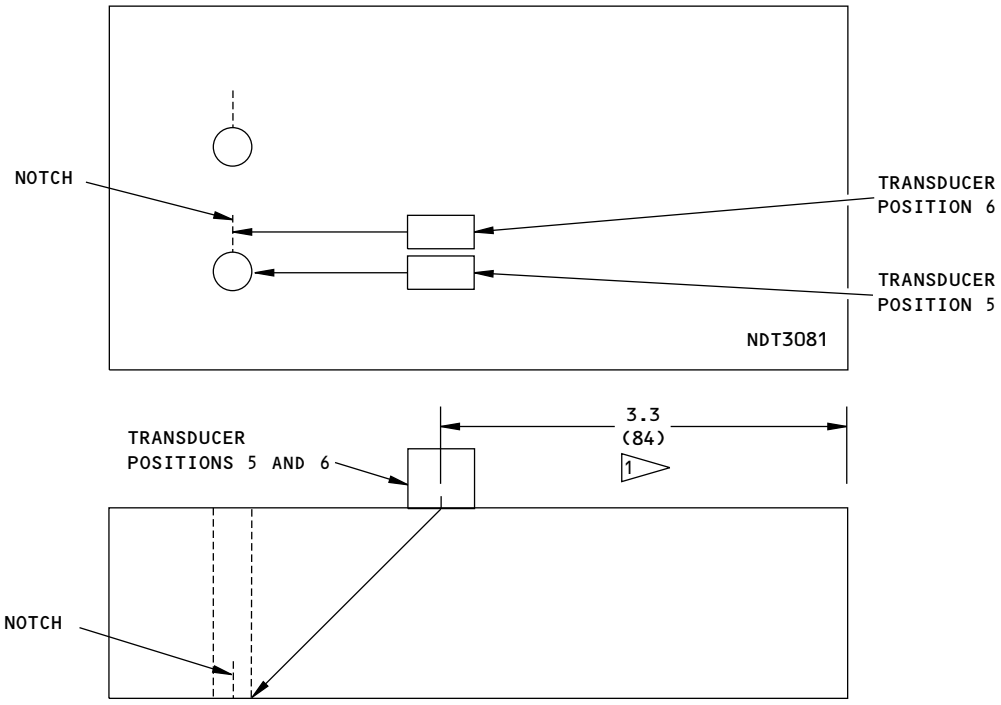
NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- THE DETAIL II THRU III SCREEN DISPLAYS ARE EXAMPLES. THE SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

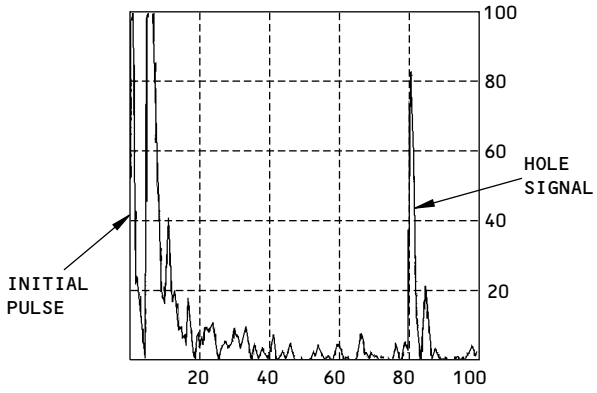
1 INITIAL LOCATION TO POSITION THE SOUND EXIT POINT OF THE TRANSDUCER.

2158449 S0000471367_V1

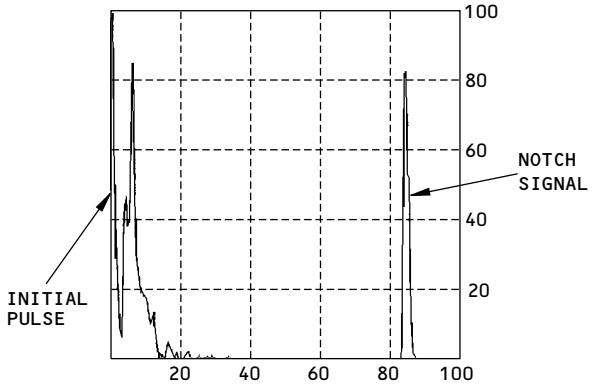
Instrument Calibration to Examine the Stabilizer Installed on the Airplane
Figure 5



CALIBRATION TRANSDUCER POSITIONS
ON THE REFERENCE STANDARD
DETAIL I



TRANSDUCER POSITION 5
SIGNAL DISPLAY
DETAIL II



TRANSDUCER POSITION 6
SIGNAL DISPLAY
DETAIL III

NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- THE DETAIL II AND III SCREEN DISPLAYS ARE EXAMPLES. THE SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

1 INITIAL LOCATION TO POSITION THE SOUND EXIT POINT OF THE TRANSDUCER.

2158451 S0000471369_V1

Instrument Calibration to Examine the Stabilizer Off of the Airplane
Figure 6

PART 4 - ULTRASONIC

ELEVATOR REAR SPAR CHORD BOND

1. Purpose

A. Use this procedure to find a disbond between the laminations of the aluminum rear spar of the elevator. This procedure examines the web from the aft side of the rear spar in the tab bay area as shown in Figure 1.

B. This inspection procedure uses a high or low frequency ultrasonic bondtester to examine for a disbond that is 1 square inch (25 mm) or larger. If a low frequency bondtester is used, the probe diameter must not be more than 1.25 inches (32 mm). It is not necessary to use a liquid couplant with a low frequency bondtester but it is with a high frequency bondtester.

C. Service Bulletin Reference: 737-55A1078

2. Equipment

NOTE: Refer to Part 1, 51-01-00, for data about the equipment.

A. Bondtest Instrument

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

(a) S-2B Sondicator (low frequency); Automation Industries

(b) S-5 Sondicator (low frequency); Zetec, Inc.

(c) S-9 (low frequency); Zetec, Inc.

(d) S-9R, MIZ-21R and MIZ-21SR and (high and low frequency); Zetec, Inc.

(e) Bondcheck V95 (low frequency); Rohmann Inc.

(f) Bondmaster (high and low frequency, MIA mode); Staveley Instruments

B. Probes

(1) The probes (pitch-catch and MIA) that follow were used with the specified low frequency bondtesters to help prepare this procedure.

(a) 1106-2-B (1.25 inch (32 mm)) diameter for the S-2B and S-5 Sondicator; Zetec, Inc.

(b) SP3 (1.25 inch (32 mm)) diameter for the S-2B and S-5 Sondicator; Zetec, Inc.

(c) SP3L/DTE ½” (1.25 inch (32 mm)) diameter, for the S-9 Sondicator, S-9R, MIZ-21R and MIZ-21SR; Zetec, Inc.

(d) SP Probe for the Bondcheck V95; Rohmann Inc.

(e) S-MP-3 or S-MP-5 (MIA probe) for the Bondmaster; Staveley Instruments

(2) The probes (resonance) that follow were used with the specified high frequency bondtesters to help prepare this procedure.

(a) S-PR-5 or S-PR-6 for the Bondmaster; Staveley Instruments

(b) S-9R 260kHz; Zetec, Inc.

C. Reference standard

(1) Make reference standard 375 as shown in Figure 2.

3. Prepare for the Inspection

A. Remove the elevator tab left and right to get access to the inspection surfaces. Refer to Figure 1.

B. Visually inspect the skin surface and remove all unwanted material which is present.

4. Instrument Calibration

A. S-2B and S-5 Sondicators

(1) Calibration Method

(a) Connect the probe to the Sondicator. Position the POWER switch toggle in the upward position. The BTRY indicator on the S-2B shows a fully charged battery when the needle fully moves to the right (white area).

(b) Position the probe on the calibration standard over a bonded area, see Figure 3, Position 1.

(c) Set the AMPLITUDE counting dial to read 250 for the S2-B and 300 for the S-5 and the PHASE counting dial to zero.

(d) Turn the PHASE control clockwise and look at the phase meter peak in deflection and return to the left.

(e) Continue to turn the PHASE control clockwise until a phase meter reading of 6 is gotten.

(f) Adjust the AMPLITUDE control to get an amplitude meter reading of 7. Because these controls interact to a degree, continue to adjust them one after the other until the meters read the given values.

(g) Scan the probe across the bonded part of the standard and check that the meter readings stay reasonably constant at the original settings.

(h) If an important change is noted, set up the instrument as before while continuously moving the search unit.

(i) To check the response from a disbond condition, scan probe from Position 1 to Position 2. Note the meter needle change. The amplitude meter reading should increase and the phase meter reading should decrease.

(2) Alternate Calibration Method

(a) Place the probe on the reference standard over a bonded area, see Figure 3, Position 1.

(b) Set both the amplitude and the phase dial controls to the zero position. Set phase, phase/AMPTD switch to phase/AMPTD on the S-2B and phase on the S-5.

(c) Turn the amplitude-counting-dial control clockwise until the dial reads 2 for the S2-B and 3 for the S-5.

(d) Turn the phase dial control clockwise and observe the "phase meter" needle peak (full scale) and then return to zero. Continue to turn the phase control clockwise until the "phase meter" needle again reaches full scale and returns to zero a second time.

NOTE: Due to the interactive amplitude/phase control, the "amplitude meter" needle should read approximately 100 percent full scale after completion of Paragraph 4.A.(2)(d).

(e) Scan the probe over the disbonded area of the reference standard, see Figure 3, Position 2. The "phase meter" needle should move from zero to full scale or near full scale.

NOTE: Monitor only the "phase meter" response to find the unbonded condition.

(f) Place the probe over a bonded area of the reference standard. To examine for excess noise, slowly move the probe a short distance (back and forth). If the "phase meter" needle varies more than half scale, turn the phase control clockwise until the "phase meter" needle moves left to the zero position and does not vary more than 1. Check for a full scale "phase meter" change per Paragraph 4.A.(2)(e).

B. To calibrate the low frequency bondtesters listed in Paragraph 2.A.(1)(c) thru Paragraph 2.A.(1)(f) and other low frequency bondtesters, refer to the instruments' instruction manual. Refer to Part 4, 51-40-00, Procedure 1, for the calibration instructions when a high frequency instrument is used. Use reference standard 375 and Figure 3 for the calibration and probe positions.

5. Inspection Procedure

A. Calibrate the instrument as specified in Paragraph 4.A. or Paragraph 4.B.

B. Make a scan of the inspection areas identified in Figure 1 as follows:

(1) When a low frequency instrument is used with a pitch catch (Sondicator) probe, make sure the transmitter and receiver tips are vertical to each other as shown in Figure 4.

(2) When a high frequency instrument is used with a resonance probe, make two scans with a maximum of 0.5 inches (13 mm) between scans as shown in Figure 4.

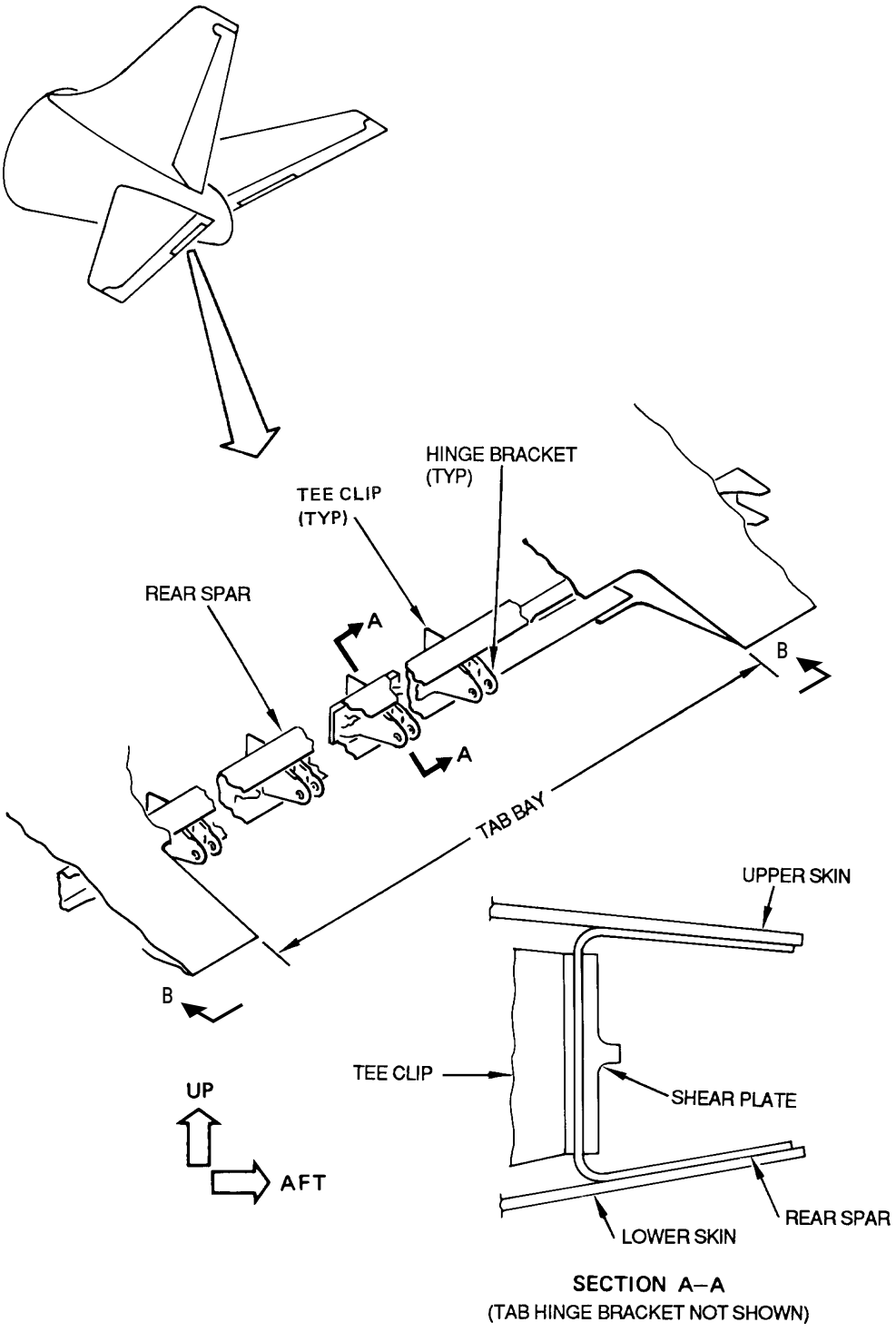
C. Note all instrument signals which are equal to or greater than the reference standard disbond response.

6. Inspection Results

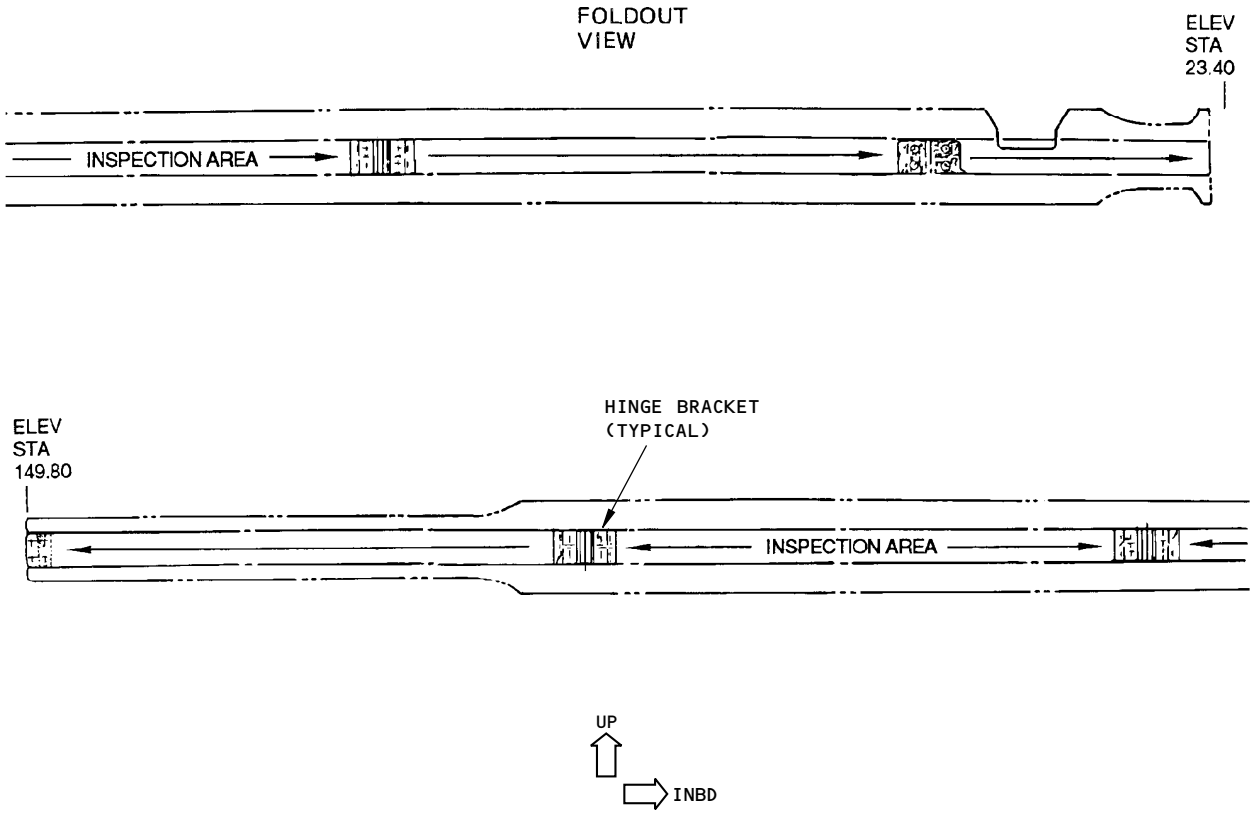
A. The smallest detectable disbond that can be found with the Sondicator probe is the dimension between the probe elements.

B. If another type of bond tester is used, refer to manufacturer's specifications for effective disbond detection characteristics for the probe.

C. All instrument signals which are equal to or greater than the signal gotten from the reference standard are considered disbonds. Refer to the Service Bulletin for corrective action.



Elevator Rear Spar Inspection Location
Figure 1 (Sheet 1 of 2)

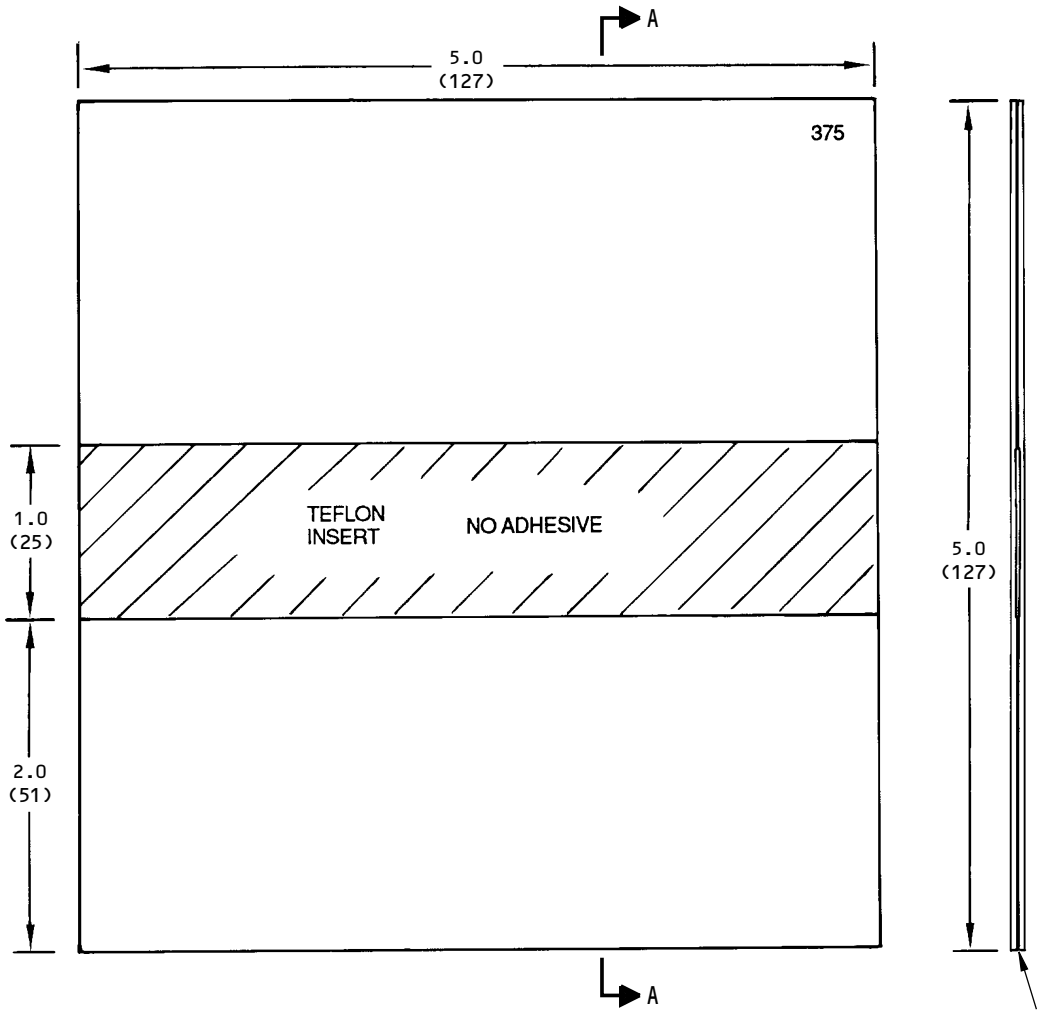


REAR SPAR CHORD - INSPECTION AREA

B-B

2183582 S0000483178_V1

Elevator Rear Spar Inspection Location
Figure 1 (Sheet 2 of 2)

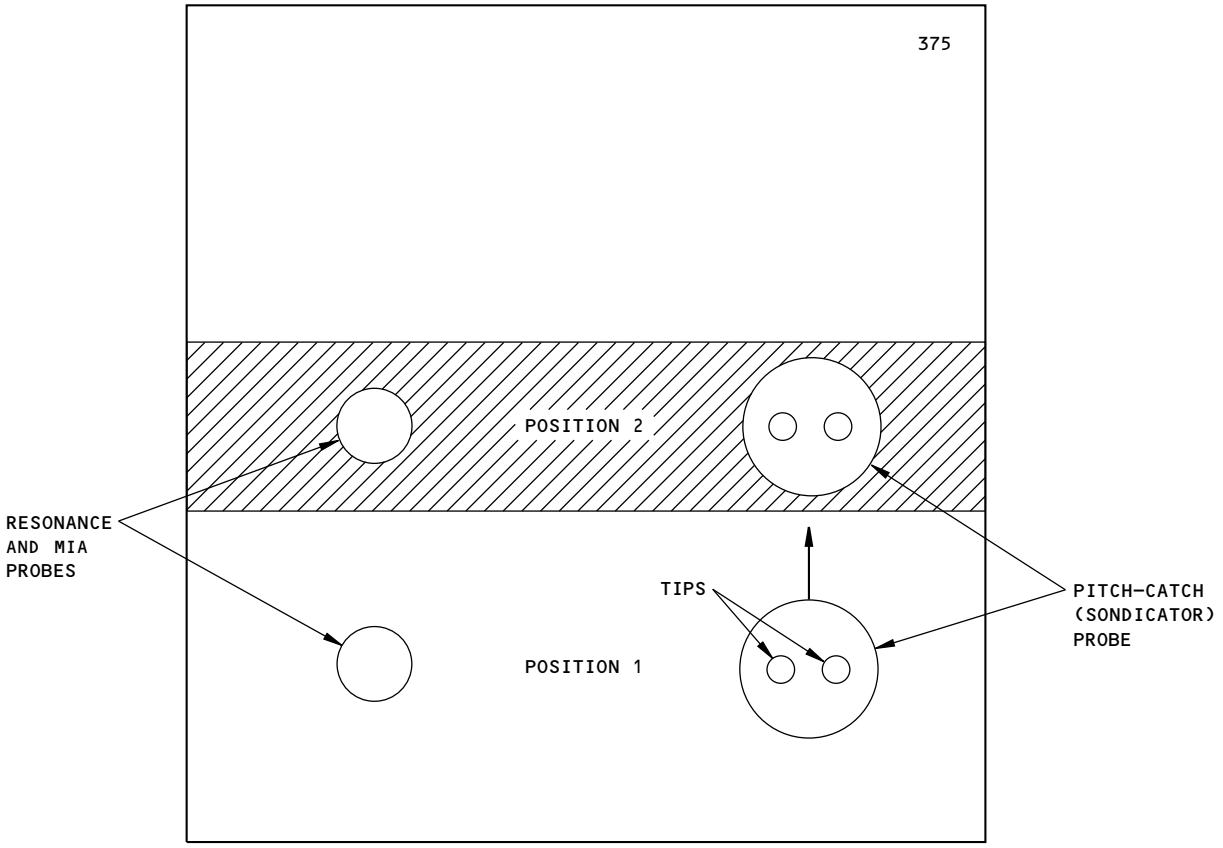


NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- ADHESIVE: ALL EPOXY ADHESIVES CAN BE USED
- MATERIAL: THE TOP AND BOTTOM SHEETS ARE ALUMINUM ALLOY SHEET (0.012 (0.31) THICK)
- TOLERANCES: X.X ±0.05 (1.3)
  X.XX ±0.02 (0.5)
  X.XXX ±0.005 (0.10)
- ETCH OR STEEL STAMP WITH 375.

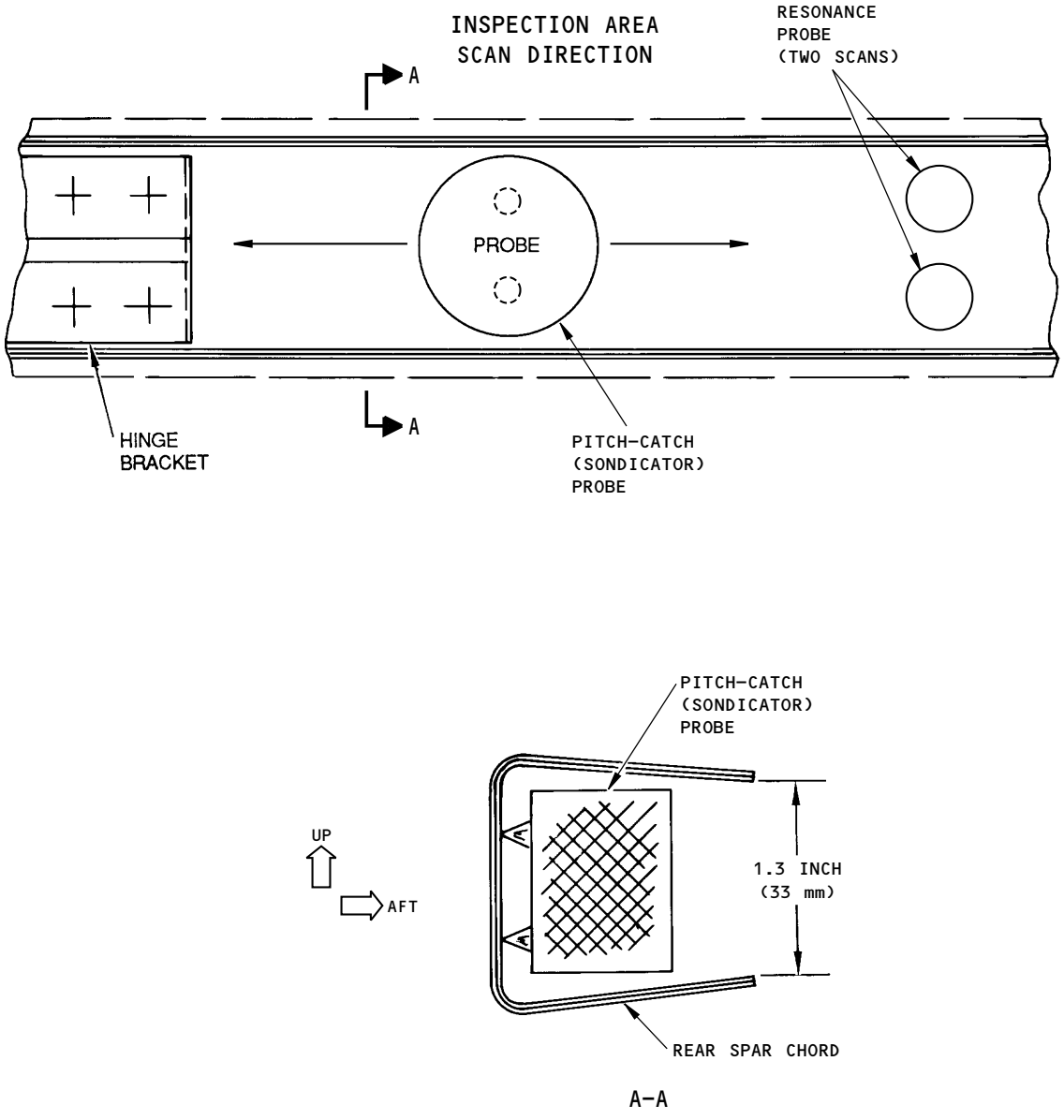
2158455 S0000471374_V1

Reference Standard 375
Figure 2



2158457 S0000471375_V1

Calibration Probe Positions
Figure 3



2158458 S0000471376_V1

Rear Spar Chord Inspection Scan Direction
Figure 4

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER - UPPER CHORD OF THE REAR SPAR FROM STAB STA 68.14 TO 193.9

1. Purpose

A. Use this procedure to find cracks in the upper chord of the rear spar from STAB STA 68.14 to STAB STA 193.9. See Figure 1.

B. This procedure examines the upper chord for cracks on the upper side of the fastener locations where the failsafe chord is attached to the upper chord. See Figure 2 for the inspection areas.

C. The upper chord has a configuration that tapers in the inboard to outboard direction. The depth of the fastener locations from the top surface (transducer inspection surface) of the chord changes along the length of the chord. Figure 2 shows the configuration of the upper chord and the fastener locations to be examined.

D. This procedure uses three different 5 MHz transducers that put shear waves (45, 60 and 70 degree) in aluminum, to examine all of the fastener locations in the upper chord, with the horizontal stabilizer installed on the airplane. Figure 2 identifies the applicable transducer to use for the fastener locations to be examined.

E. 737 Supplemental Structural Inspection Document (D6-82669) Reference:

(1) Item: W-17C

2. Equipment

NOTE: Refer to Part 1, 51-01-00, for data about the equipment manufacturers.

A. All ultrasonic equipment that can do the calibration instructions of this procedure can be used.

(1) Instrument - Use an ultrasonic instrument that can operate from 4 to 6 MHz. Broadband instruments can be used if they can do the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

(a) Nortec 1200S; Staveley Instruments, Inc.

(b) USN 50, 52L, 60; Krautkramer Branson

(c) EPOCH 4; Panametrics, Inc.

(2) Transducers

(a) Use a 5 MHz transducer with a 0.375 inch (9.53 mm) element that can put a 45 degree shear wave in aluminum. The transducers that follow were used to help prepare this procedure.

1) SU 545AS; NDT Engineering Corp.

2) MSW-QC Style, Gamma, part number (P/N) 234-590 with a 45 degree standard wedge, P/N W-221 45°

(b) Use a 5 MHz transducer with a 0.187 inch (4.75 mm) or 0.250 inch (6.35 mm) element that can put a 60-degree shear wave in aluminum. Use a transducer with a case width not more than 0.32 inch (8.13 mm). The transducers that follow were used to help prepare this procedure.

1) AP-HP-3/16-5.00-60; Xactex Corp.

2) MA-605S-32; Techna NDT

(c) Use a 5 MHz transducer with a 0.187 inch (4.75 mm) element that can put a 70 degree shear wave in aluminum. Use a transducer with a case width not more than 0.250 inch (6.35 mm). The transducers that follow were used to help prepare this procedure.

1) XAB 6028; Xactex Corp.

2) SA-705S; Techna NDT

(3) Reference Standard - Make or buy reference standard NDT3083. See Figure 3.

(4) Couplant - All ultrasonic couplants that will not damage the airplane structure can be used. A light commercial grease works good.

3. Prepare for the Inspection

A. Identify the inspection areas and the transducer inspection surfaces in Figure 2.

B. Make marks at the STAB STA locations on the forward side of the upper chord to help identify the transducer locations during the inspections.

C. Clean all the inspection surfaces.

(1) If necessary, remove sealant from all of the inspection surfaces that the transducer will be put on.

(2) If the surface is rough, make it smooth by approved procedures. It is not necessary to remove paint unless it is loose or the paint thickness causes too much sound loss.

4. Instrument Calibration

A. Three instrument calibrations are necessary to examine all of the fastener locations identified in Figure 2.

(1) Calibrate the instrument to examine the fastener locations between STAB STA 193.9 and 184.7 with the 70 degree transducer as follows:

(a) Connect the 70 degree transducer to the instrument.

(b) Set the instrument frequency from 4 to 6 MHz if a broadband instrument is not used.

(c) Apply a sufficient quantity of couplant on the inspection surface of reference standard NDT3083 at transducer positions 1 and 2. See Detail I in Figure 4.

(d) Put the transducer at position 1 on the reference standard as shown in Detail I in Figure 4. Make sure the sound beam is pointed at the hole and the sound exit point is set to the initial location identified. If the transducer does not have the sound exit point marked, use the center of the transducer.

(e) Adjust the instrument gain, delay and range controls, as necessary, to get a signal from the hole to occur on the screen display.

(f) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the hole.

(g) Adjust the instrument delay and range controls to get the signal from the hole set to 70% of full screen width (FSW) with the initial pulse set to 0%. See Detail II in Figure 4 for the screen display.

(h) Move the transducer on the reference standard to position 2. As you move the transducer to the hole with the notch, monitor the hole and notch signals as follows:

1) The hole signal will increase in height and be a maximum at 70% of FSW.

2) The notch signal will occur to the right, and adjacent to, the hole signal.

3) The hole signal will decrease in height and the notch signal will increase in height at a maximum of approximately 65% of FSW. See Detail III in Figure 4.

(i) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the notch.

(j) Adjust the instrument gain to get the notch signal to be between 50 and 80% of full screen height (FSH). See Detail III in Figure 4.

NOTE: Do not use reject.

(k) Make a complete scan of the hole without the notch (position 1) and then at the hole with the notch (position 2). Monitor the signal pattern at each location. The signal from the hole without the notch will be a narrow, single peak. The signal from the hole with the notch will be wider at the timebase and can have many peaks.

(l) Monitor the transducer travel distance at Positions 1 and 2 from the complete scans done in Paragraph 4.A.(1)(k). This will help identify the distance the transducer moves from the fastener hole to a crack of the approximate same length.

(2) Calibrate the instrument to examine the fastener locations between STAB STA 184.7 and 104.5 with the 60 degree transducer as follows:

(a) Connect the 60 degree transducer to the instrument.

(b) Set the instrument frequency from 4 to 6 MHz if a broadband instrument is not used.

(c) Apply a sufficient quantity of couplant on the inspection surface of reference standard NDT3083 at transducer positions 3 and 4. See Detail I in Figure 4.

(d) Put the transducer at position 3 on the reference standard as shown in Detail I in Figure 4. Make sure the sound beam is pointed at the hole and the sound exit point is set at the initial location identified. If the transducer does not have the sound exit point marked, use the center of the transducer.

(e) Adjust the instrument gain, delay and range controls as necessary to get a signal from the hole to occur on the screen display.

(f) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the hole.

(g) Adjust the instrument delay and range controls to get the signal from the hole set to 80% of full screen width (FSW) with the initial pulse set to 0%. See Detail IV in Figure 4 for the screen display.

(h) Move the transducer on the reference standard to position 4. As you move the transducer to the hole with the notch, monitor the hole and notch signals as follows:

1) The hole signal will increase in height and be a maximum at 80% of FSW.

2) The notch signal will occur to the right, and adjacent to, the hole signal.

3) The hole signal will decrease in height and the notch signal will increase in height at a maximum of approximately 75% of FSW. See Detail V in Figure 4.

(i) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the notch.

(j) Adjust the instrument gain to get the notch signal to be between 50 and 80% of full screen height (FSH). See Detail V in Figure 4.

NOTE: Do not use reject.

(k) Make a complete scan of the hole without the notch (position 3) and then at the hole with the notch (position 4). Monitor the signal pattern at each location. The signal from the hole without the notch will be a narrow, single peak. The signal from the hole with the notch will be wider at the timebase and can have many peaks.

(l) Monitor the transducer travel distance at Positions 3 and 4 from the complete scan done in Paragraph 4.A.(2)(k). This will help identify the distance the transducer moves from the fastener hole to a crack of the approximate same length.

(3) Calibrate the instrument to examine the fastener locations between STAB STA 101.9 and 68.14 with the 45 degree transducer as follows:

(a) Connect the 45 degree transducer to the instrument.

(b) Set the instrument frequency from 4 to 6 MHz if a broadband instrument is not used.

(c) Apply a sufficient quantity of couplant on the inspection surface of reference standard NDT3083 at transducer positions 5 and 6. See Detail I in Figure 4.

(d) Put the transducer at position 5 on the reference standard as shown in Detail I in Figure 4. Make sure the sound beam is pointed at the hole and the sound exit point is set at the initial location identified. If the transducer does not have the sound exit point marked, use the center of the transducer.

(e) Adjust the instrument gain and delay controls, as necessary, to get a signal from the hole to occur on the screen display.

(f) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the hole.

(g) Set the instrument range to 5.0 inches (127 mm) and set the instrument velocity to 1.23 inches (31.2 mm) per second.

(h) Adjust the instrument delay to set the signal from the hole at 90% of full screen width (FSW). The initial pulse will not be on the screen display. See Detail VI in Figure 4 for the screen display.

(i) Move the transducer on the reference standard to position 6. As you move the transducer to the hole with the notch, monitor the hole and notch signals as follows:

1) The hole signal will increase in height and be a maximum at 90% of FSW.

2) The notch signal will occur to the right, and adjacent to the hole signal.

3) The hole signal will decrease in height and the notch signal will increase in height at a maximum of approximately 88% of FSW. See Detail VII in Figure 4.

(j) Move the transducer a small distance forward and backward along the surface, as necessary, to get a maximum signal from the notch.

(k) Adjust the instrument gain to get the notch signal to be between 50 and 80% of full screen height (FSH). See Detail VII in Figure 4.

NOTE: Do not use reject.

(l) Make a complete scan of the hole without the notch (position 5) and then at the hole with the notch (position 6). Monitor the signal pattern at each location. The signal from the hole without the notch will be a narrow, single peak. The signal from the hole with the notch will be wider at the timebase and will have many peaks.

NOTE: Because of the 45 degree angle of the sound beam, the hole and notch signals can be difficult to isolate.

(m) Monitor the transducer travel distances at Positions 5 and 6 from the complete scan done in Paragraph 4.A.(3)(l). This will help identify the distance the transducer moves from the fastener hole to a crack of the approximate same length.

5. Inspection Procedure

A. Examine the fastener locations in the upper chord between STAB STA 68.14 and 193.9.

(1) Identify all the fastener locations shown in Figure 2. The fastener locations are divided into three inspection areas as follows:

(a) STAB STA 193.9 to 184.7 is examined with the 70 degree transducer.

(b) STAB STA 184.7 to 104.5 is examined with the 60 degree transducer.

(c) STAB STA 101.9 to 68.14 is examined with the 45 degree transducer.

(2) Examine the fastener locations between STAB STA 193.9 and 184.7 with the 70 degree transducer as follows:

(a) Calibrate the instrument as specified in Paragraph 4.A.(1).

(b) Put a sufficient quantity of couplant on the inspection surface. See Figure 2, flagnote 1 for the transducer travel distance.

(c) Put the transducer on the inspection surface with the transducer pointed in the outboard direction at the start of the inspection area at STAB STA 184.7.

(d) Set the sound exit point or center of the transducer to the dimension identified in Figure 2.

NOTE: The dimension identified to set the transducer can be different if the transducer used is not 70 degrees.

(e) Move the transducer a small distance along the surface in the inboard and outboard direction to get the maximum signal from the hole. Adjust the instrument gain to get the signal from the hole to be set as it was during calibration. The fastener hole signal will be at the same or approximate FSW location as that set during calibration. See Detail II in Figure 4.

NOTE: It can be necessary to remove paint from the upper surface of the chord if a high level of gain is necessary and the timebase noise level is 10% of FSH or more.

(f) Move the transducer inboard to the adjacent fastener location to make sure the inspection areas overlap.

(g) Make a slow scan in the inboard direction of all the fastener locations identified in Figure 2 as follows:

1) Adjust the instrument gain as necessary to keep the signal height of the fastener locations between 50 and 80% of FSH.

2) Monitor the screen display as follows:

a) A signal from a fastener hole without a crack will show as a single peak, increase to a maximum height and decrease quickly as the transducer is moved towards and away from the hole.

b) A signal from a crack on the upper side of the fastener hole will increase in amplitude on the right side of the hole signal as the signal from the fastener hole decreases, as the transducer is moved away from the hole.

c) Compare the signal from a possible crack to the signal you got from the reference standard notch.

d) Carefully monitor the distance the transducer is moved and the position of the transducer at all times to help identify signals that occur.

(3) Examine the fastener locations between STAB STA 184.7 and 104.5 with the 60 degree transducer as follows:

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

(b) Put a sufficient quantity of couplant on the inspection surface. See Figure 2, flagnote 2 for the transducer travel distance.

(c) Put the transducer on the inspection surface with the transducer pointed in the inboard direction at the start of the inspection area at STAB STA 184.7.

(d) Set the sound exit point or center of the transducer to the dimension identified in Figure 2.

NOTE: The dimension identified to set the transducer can be different if the transducer used is not 60 degrees.

(e) Move the transducer a small distance along the surface in the inboard and outboard direction to get the maximum signal from the hole. Adjust the instrument gain to get the signal from the hole to be set as it was during calibration. The fastener hole signal will be at the same or approximate FSW location as shown by flagnote 2 in Detail IV in Figure 4.

NOTE: It can be necessary to remove paint from the upper surface of the chord if a high level of gain is necessary and the timebase noise level is 10% of FSH or more.

(f) Move the transducer outboard to the adjacent fastener location to make sure the inspection areas overlap.

(g) Make a slow scan in the inboard direction of all the fastener locations identified in Figure 2 as follows:

1) Refer to the screen display in Detail IV in Figure 4 that shows the FSW locations of the first fastener location identified as flagnote 2 and the last fastener location in the inspection area identified as flagnote 3.

2) Adjust the instrument gain as necessary to keep the signal height of the fastener locations between 50 and 80% of FSH.

3) Monitor the screen display as follows:

a) A signal from a fastener hole without a crack will show as a single peak, increase to a maximum height and decrease quickly as the transducer is moved towards and away from the hole.

b) A signal from a crack on the upper side of the fastener hole will increase in amplitude on the right side of the hole signal as the signal from the fastener hole decreases, as the transducer is moved away from the hole.

c) Compare the signal from a possible crack to the signal you got from the reference standard notch.

d) Carefully monitor the distance the transducer is moved and the position of the transducer at all times to help identify signals that occur.

(4) Examine the fastener locations between STAB STA 101.9 and 68.14 with the 45 degree transducer as follows:

(a) Calibrate the instrument as specified in Paragraph 4.A.(3).

(b) Put a sufficient quantity of couplant on the inspection surface. See Figure 2, flagnote 3 for the transducer travel distance.

(c) Put the transducer on the inspection surface with the transducer pointed in the inboard direction at the start of the inspection area at STAB STA 101.9.

(d) Set the sound exit point or center of the transducer to the dimension identified in Figure 2.

NOTE: The dimension identified to set the transducer can be different if the transducer used is not 45 degrees.

(e) Move the transducer a small distance along the surface in the inboard and outboard direction to get the maximum signal from the hole. Adjust the instrument gain to get the signal from the hole to be set as it was during calibration. The fastener hole signal will be at the same or approximate FSW location as shown by flagnote 4 in Detail VI in Figure 4.

NOTE: It can be necessary to remove paint from the upper surface of the chord if a high level of gain is necessary and the timebase noise level is 10% of FSH or more.

(f) Move the transducer outboard to the adjacent fastener location to make sure the inspection areas overlap.

(g) Make a slow scan in the inboard direction of all the fastener locations identified in Figure 2 as follows:

1) Refer to the screen display in Detail VI in Figure 4 that shows the FSW locations of the first fastener location identified as flagnote 4 and the last fastener location in the inspection area identified as flagnote 5.

2) Adjust the instrument gain as necessary to keep the signal height of the fastener locations between 50 and 80% of FSH.

3) Monitor the screen display as follows:

a) A signal from a fastener hole without a crack will show as a single peak, increase to a maximum height and decrease quickly as the transducer is moved towards and away from the hole.

b) A signal from a crack on the upper side of the fastener hole will increase in amplitude on the right side of the hole signal as the signal from the fastener hole decreases, as the transducer is moved away from the hole.

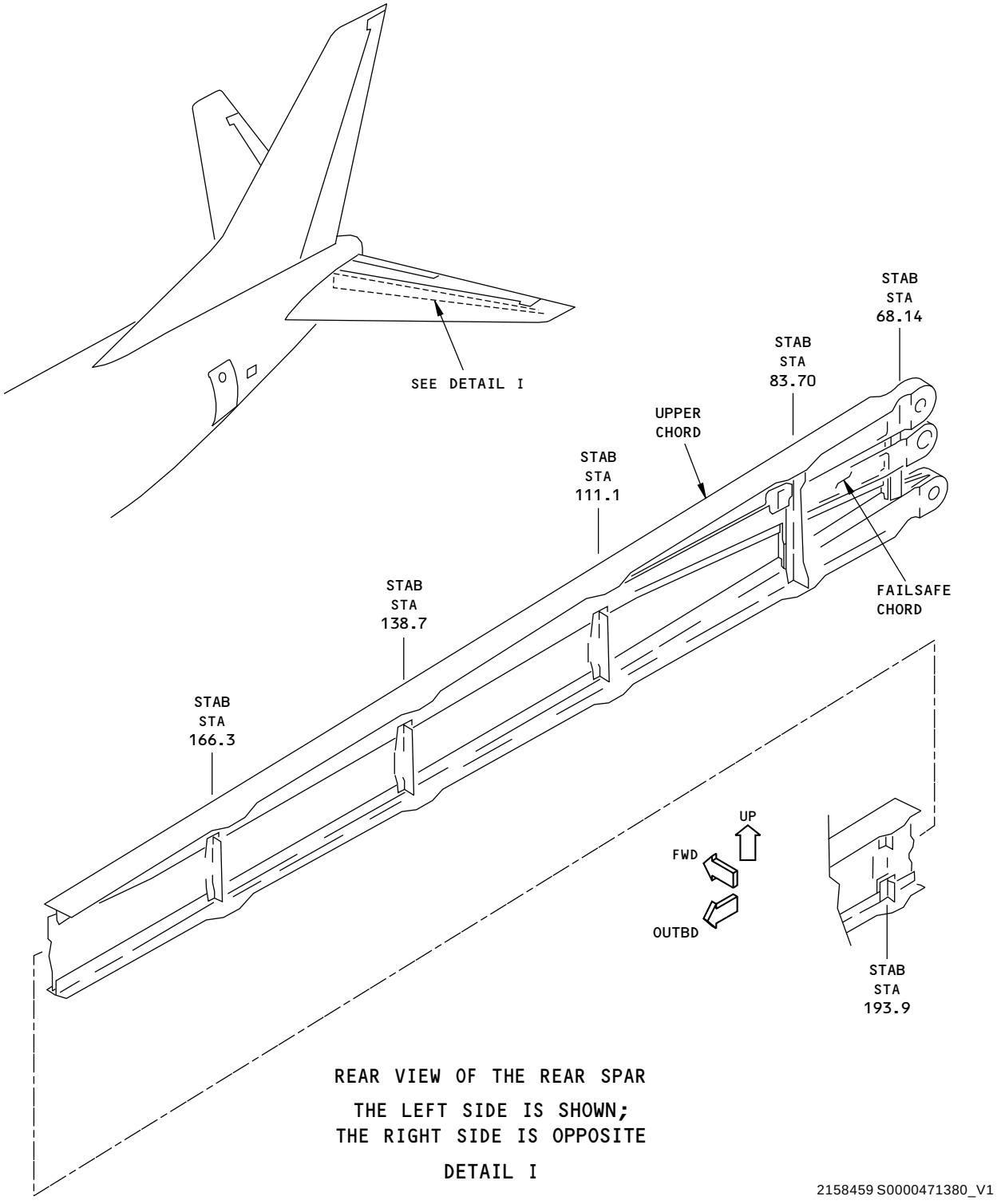
c) Compare the signal from a possible crack to the signal you got from the reference standard notch.

d) Carefully monitor the distance the transducer is moved and the position of the transducer at all times to help identify signals that occur.

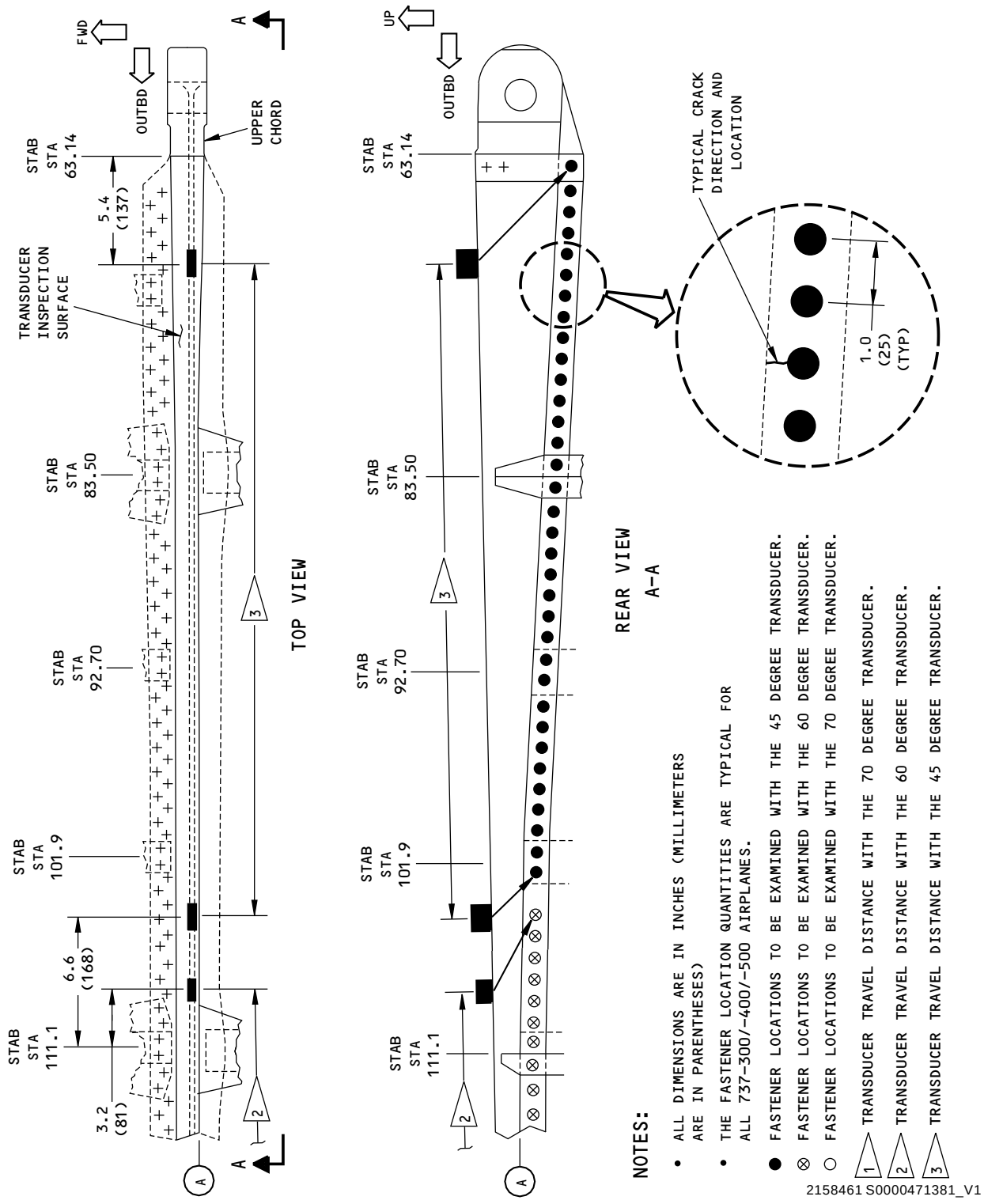
6. Inspection Results

A. An ultrasonic signal that occurs to the right of the hole signal as you do a scan away from the fastener hole is a possible crack signal. Compare the signal pattern and the distance of the transducer movement to those that occurred during calibration on the reference standard.

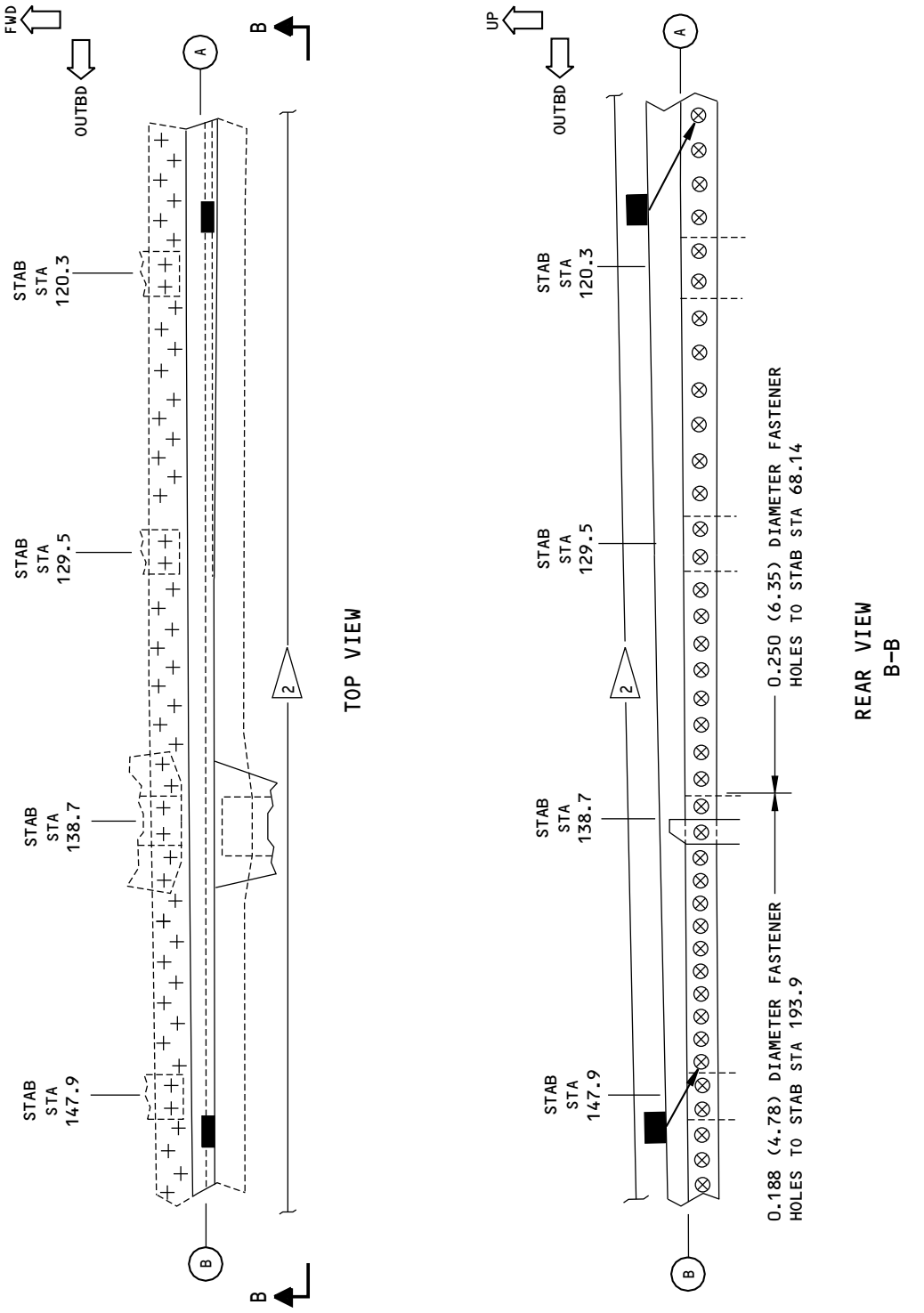
B. Do a scan of the fastener location from the opposite direction, if possible, at fastener locations where possible crack signals occur.



Horizontal Stabilizer - Rear Spar Upper Chord
Figure 1



Inspection Areas
Figure 2 (Sheet 1 of 3)



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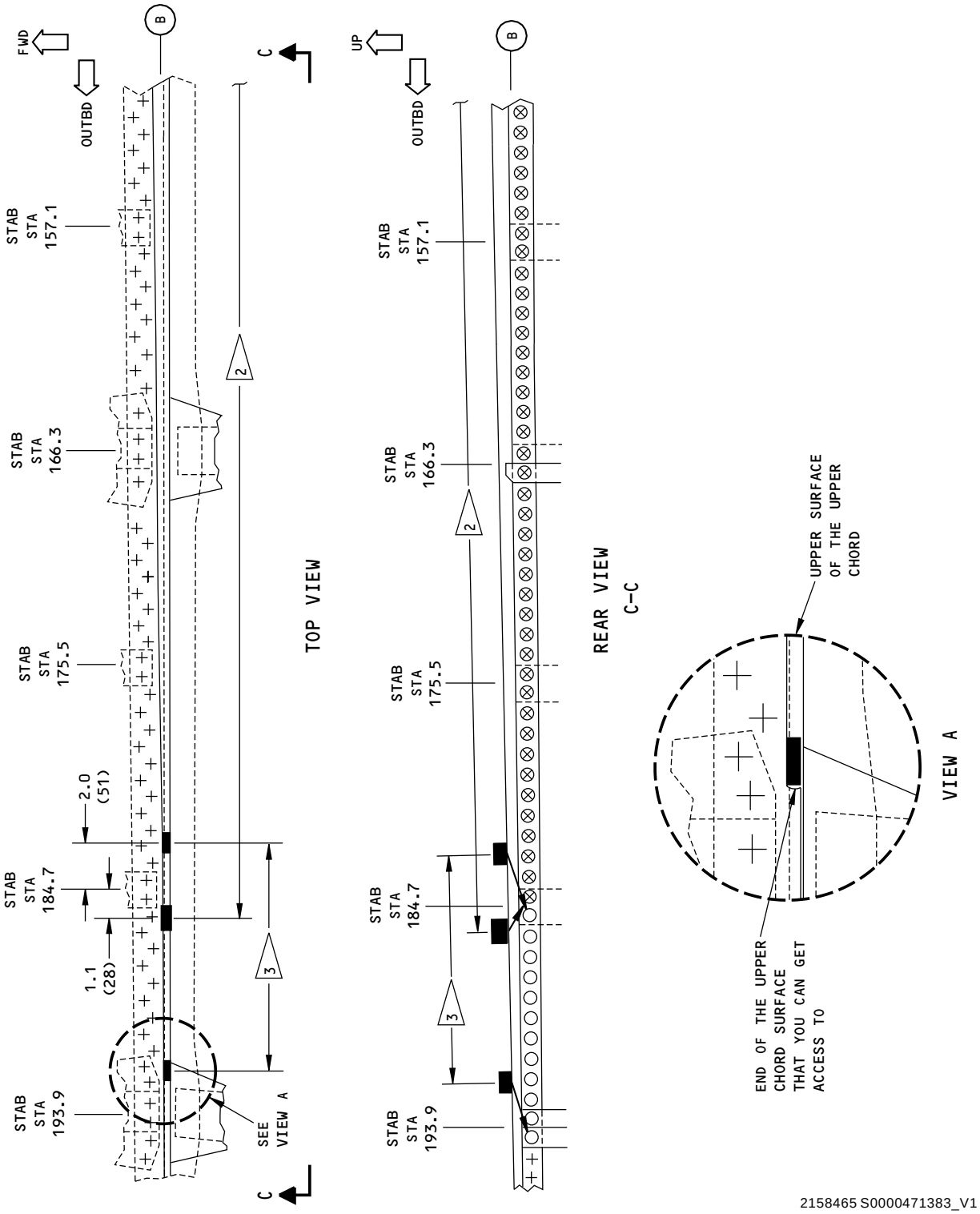
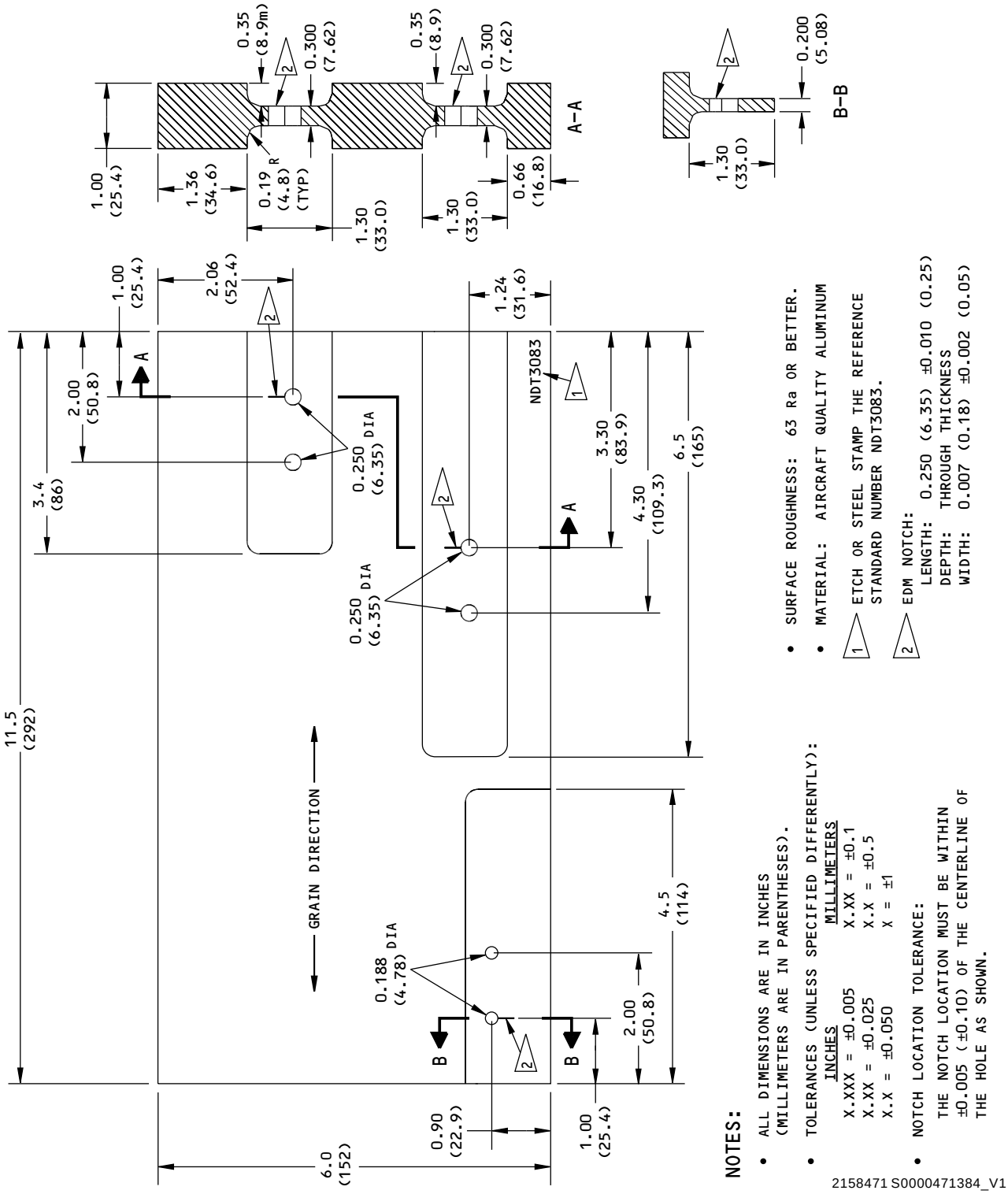
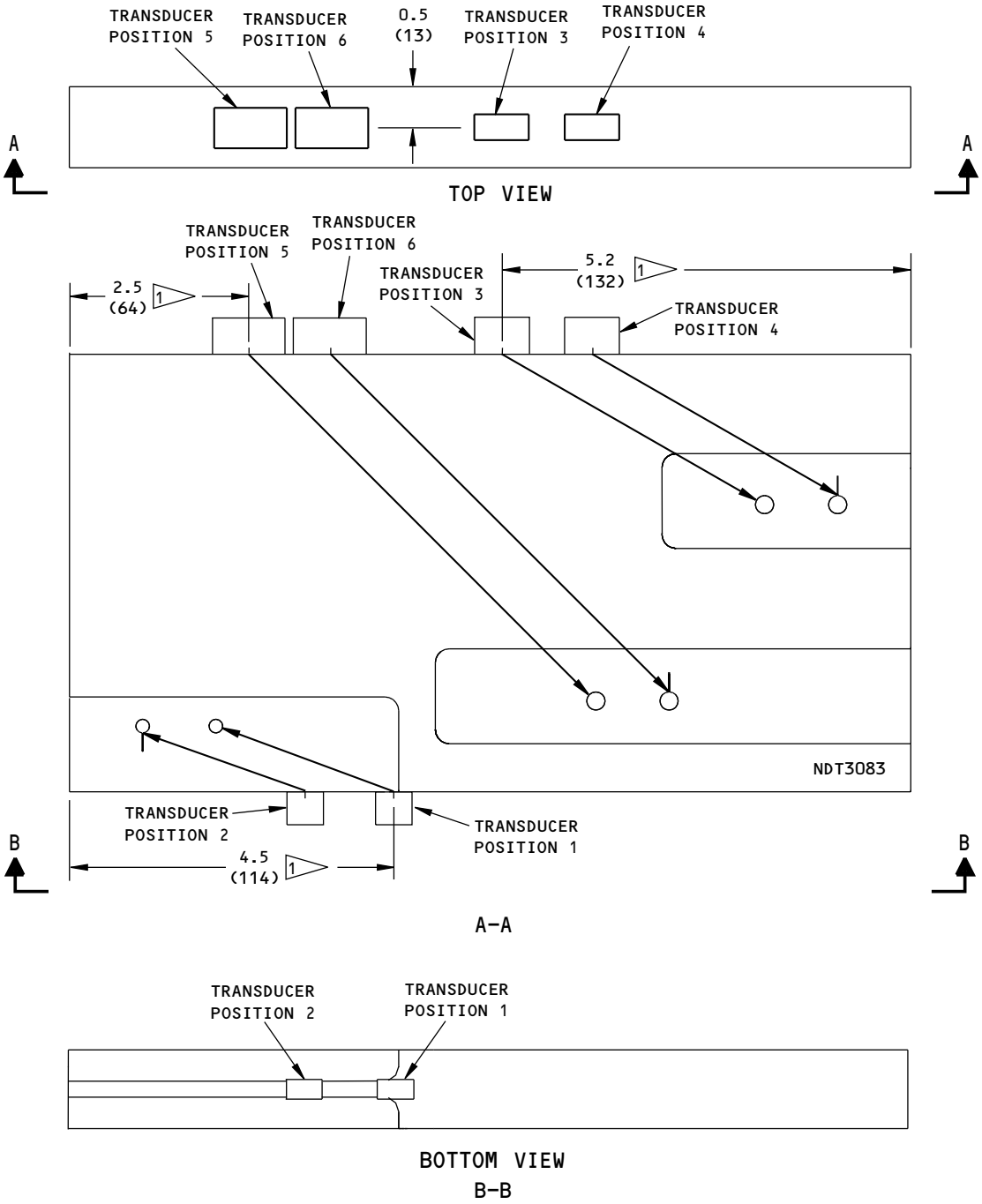
Inspection Areas
Figure 2 (Sheet 2 of 3)



Inspection Areas
Figure 2 (Sheet 3 of 3)



Reference Standard NDT3083
Figure 3



TRANSDUCER POSITIONS ON THE REFERENCE STANDARD
DETAIL I

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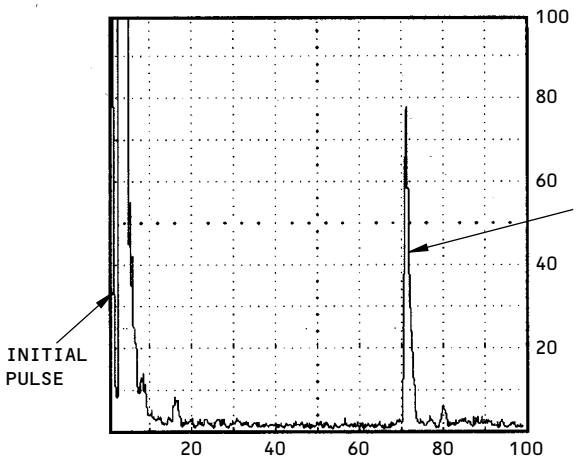
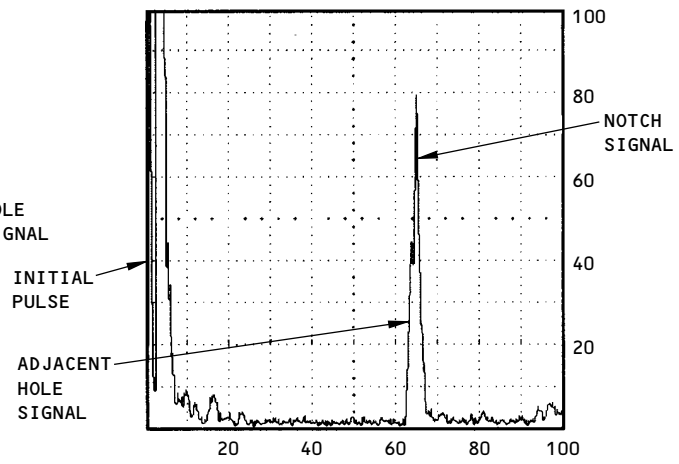
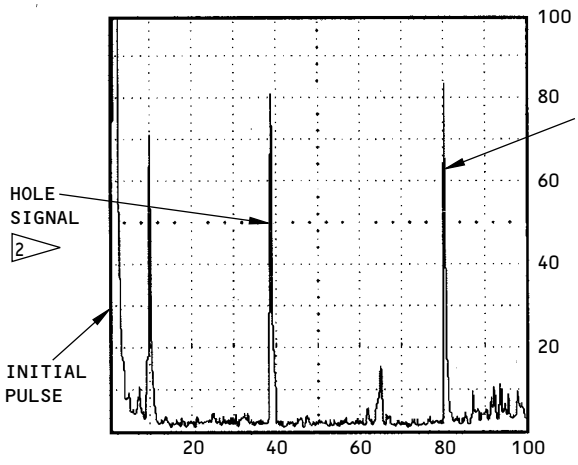
Instrument Calibration
Figure 4 (Sheet 1 of 3)



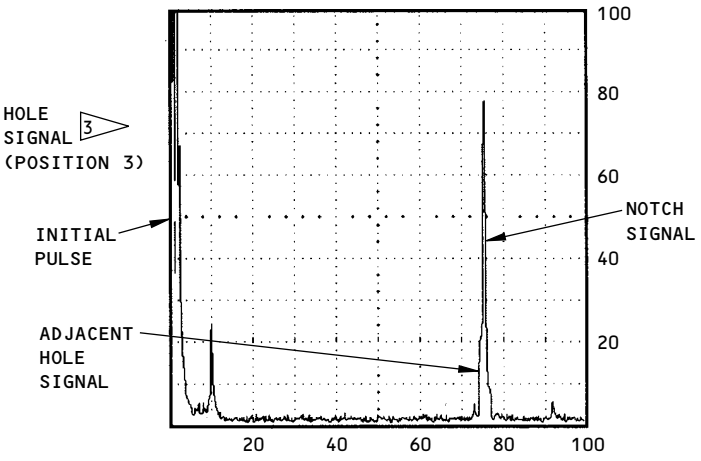
TRANSDUCER POSITION 1
WITH THE 70 DEGREE TRANSDUCER
DETAIL II



TRANSDUCER POSITION 2
WITH THE 70 DEGREE TRANSDUCER
DETAIL III



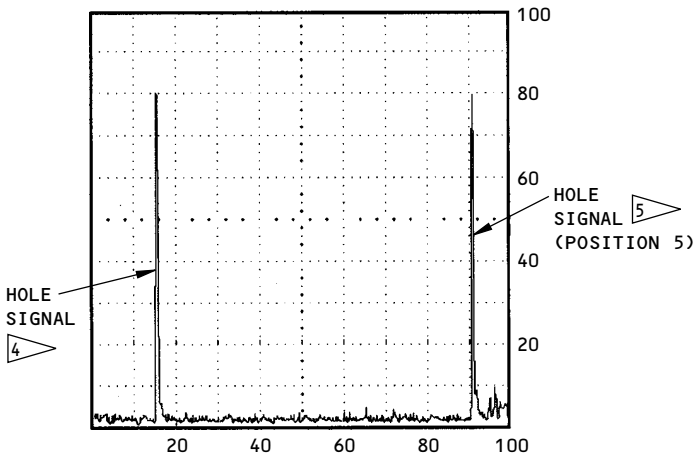
TRANSDUCER POSITION 3
WITH THE 60 DEGREE TRANSDUCER
DETAIL IV



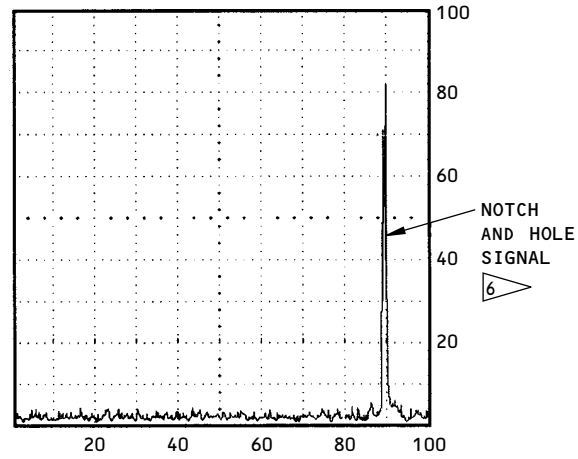
TRANSDUCER POSITION 4
WITH THE 60 DEGREE TRANSDUCER
DETAIL V

2158473 S0000471386_V1

Instrument Calibration
Figure 4 (Sheet 2 of 3)



TRANSDUCER POSITION 5
WITH THE 45 DEGREE TRANSDUCER
DETAIL VI



TRANSDUCER POSITION 6
WITH THE 45 DEGREE TRANSDUCER
DETAIL VII

NOTES:

- DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- THE DETAIL II THRU VII SCREEN DISPLAYS ARE EXAMPLES. THE SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

1 INITIAL LOCATION TO POSITION THE SOUND EXIT POINT OF THE TRANSDUCER.

2 SIGNAL ADDED TO SHOW THE SCREEN WIDTH LOCATION OF THE FIRST FASTENER HOLE OF THE START OF THE INSPECTION AREA AT STAB STA 184.4.

3 SCREEN WIDTH LOCATION OF THE LAST FASTENER LOCATION OF THE INSPECTION AREA AT STAB STA 104.5.

4 SIGNAL ADDED TO SHOW THE SCREEN WIDTH LOCATION OF THE FIRST FASTENER HOLE OF THE START OF THE INSPECTION AREA AT STAB STA 102.5.

5 SCREEN WIDTH LOCATION OF THE LAST FASTENER LOCATION OF THE INSPECTION AREA AT STAB STA 68.64.

6 THE SIGNAL FROM THE NOTCH AND THE HOLE ARE DIFFICULT TO ISOLATE. THE SIGNAL FROM THE NOTCH WILL BE A MAXIMUM AT APPROXIMATELY 88% OF FSW. TOGETHER, THE HOLE AND NOTCH SIGNALS CAUSE A WIDER SIGNAL TO OCCUR.

2158474 S0000471387_V1

Instrument Calibration
Figure 4 (Sheet 3 of 3)

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER CENTER SECTION - JACKSCREW FITTING LUGS

1. Purpose

A. Use this procedure to examine the jack screw fitting lugs of the horizontal stabilizer center section for cracks. This procedure uses longitudinal ultrasonic sound waves to examine the lugs for cracks that can start at the lug holes. See Figure 1 for the inspection areas.

B. A transducer that transmits longitudinal, ultrasonic, sound waves is put on the radius of the lug to examine the lug hole for mid-bore cracks that are 0.10 inches (3.8 mm) long. A total of two lug holes are examined on each airplane. The jackscrew fitting lug is made of aluminum. See Figure 1 for the inspection areas, example probe positions, and example crack directions.

C. 737 Supplemental Structural Inspection Document (D6-82669) Reference:

(1) Item: E-29B

D. 737 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-03-1

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 instrument. The instrument that follows was used to help prepare this procedure.

(a) Phasor XS; GE Inspection Technologies

C. Transducers

(1) Use a 10 MHz transducer that can put a 13 degree refracted longitudinal wave into the jackscrew fitting lug. The transducer that follows was used to help prepare this procedure.

(a) TEK 5133; Techna NDT

D. Reference Standards

(1) Use reference standard NDT3104. See Figure 2 for details.

E. Couplant

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

3. Prepare for the Inspection

A. Go through stabilizer access door opening 311BL to identify and get access to the inspection area shown in Figure 1.

B. Remove sealant, loose paint, dirt and fully clean the inspection area that the transducer will touch on the jackscrew fitting lugs. It can be necessary to smooth or remove the finish so the transducer can put sufficient sound in the jackscrew fitting lugs (see Figure 1).

4. Instrument Calibration

A. Set the instrument frequency to 10 MHz. A frequency adjustment is not necessary if you use a broadband instrument. Make sure the reject is set to off.

B. Apply a sufficient quantity of couplant to the transducer position on reference standard NDT3104 shown in Detail I in Figure 3.

C. Put the transducer on the reference standard as shown in Detail I in Figure 3 so that the sound points at the notch.

D. Move the transducer a small distance up and down the radius and to the left and right until the notch signal is at a maximum height on the screen display. Make sure the transducer does not extend across the edge of the reference standard. See Detail I in Figure 3.

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 notch at 60 percent of FSW. See Detail II in Figure 3.

F. Adjust the gain to set the notch signal to 80 percent of full screen height (FSH). See Detail II in Figure 3.

G. Record the gain setting.

H. Add 6 dB of gain.

5. Inspection Procedure

A. Identify the inspection areas of the jackscrew fitting. See 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 of one of the jackscrew fitting lugs and make a scan of the inspection area as follows:

(1) Move the transducer from transducer position 1 to transducer position 2 (see Figure 1, Sections A-A and B-B) and monitor the screen display for crack signals.

(a) To make sure the jackscrew fitting lug hole is fully examined, let the transducer overlap the edge of the lug a small quantity on the first and last scans.

(b) As you make a scan, monitor the screen display for noise signals. You can be sure that sound goes into the clevis lug if you see noise signals while you do the scan.

(2) Move the transducer in increments that are a maximum of one-half of the transducer's width and continue to do Paragraph 5.D.(1), until the full width of the lug has been examined.

(3) Turn the transducer 180 degrees and do Paragraph 5.D.(1) and Paragraph 5.D.(2) again but move the transducer from transducer position 2 to transducer position 1 (see Figure 1, Sections A-A and B-B).

E. Refer to Paragraph 6. to make an analysis of all possible crack signals that are 40 percent or more of FSH.

F. Make sure to examine the lugs on the left and right sides of the jackscrew fitting as shown in Figure 1.

G. After the jackscrew lug holes are examined, set the gain to the value recorded in Paragraph 4.G. 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.

6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and are between 50 and 70 percent of FSW are possible crack indications and must be examined more fully.

B. To examine the jackscrew lug more fully, do the steps that follow:

(1) Remove all the couplant and grease from all the surfaces of the jackscrew lugs. Put couplant only on the surface of the jackscrew lug that the transducer will touch and do the inspection again.

(2) Monitor the instrument screen as you move the transducer across the area where the crack indication occurs. See if the crack indication moves at the same rate as the transducer, or if it rises and falls quickly. A crack signal will rise and fall quickly; an indication from the shape of a part will usually rise and fall slowly.

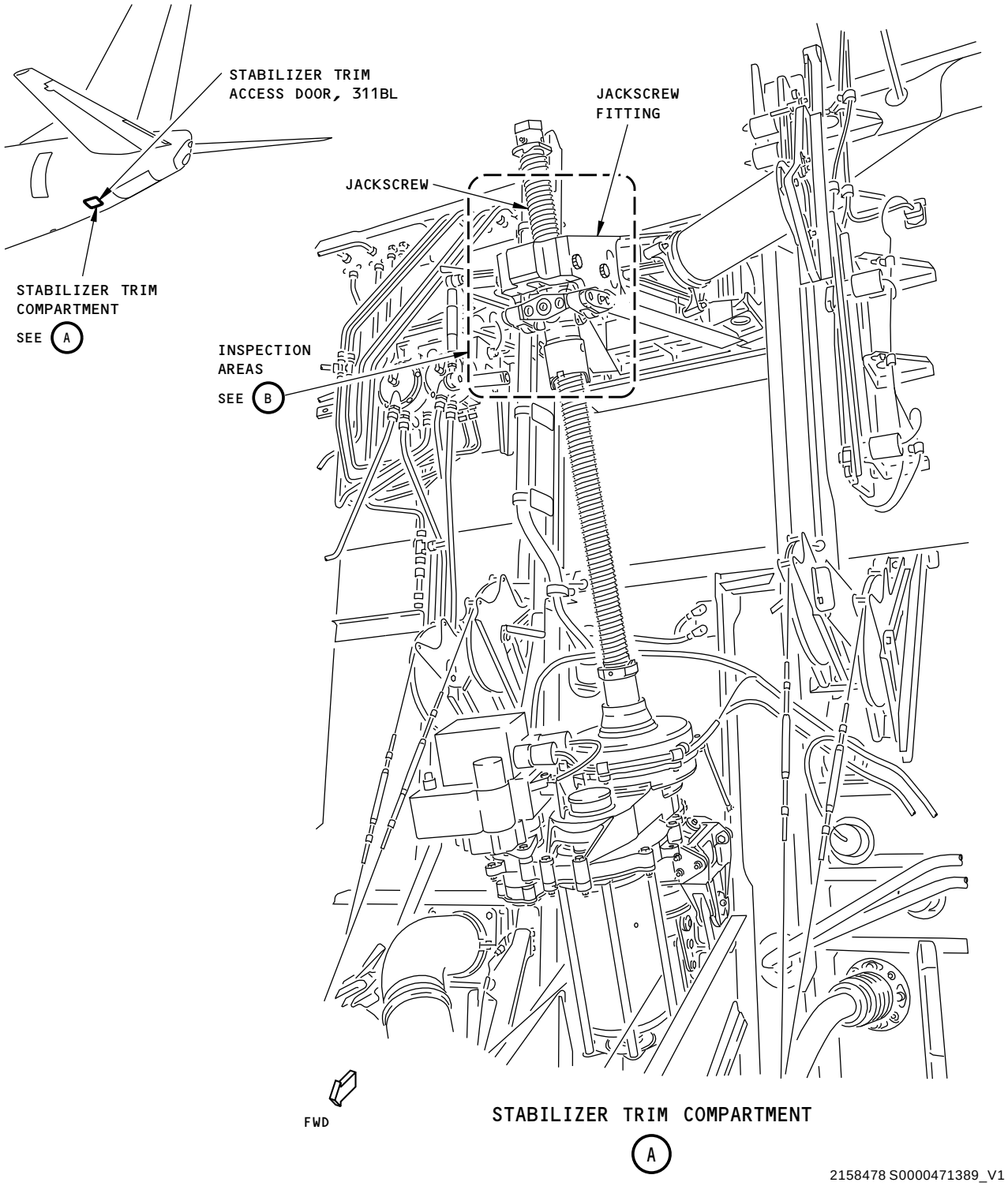
(3) If the crack indication stays above the reject level, remove the paint from the surface that the transducer touches. Set the gain to the value recorded in Paragraph 4.G. and do the inspection again. If the signal stays at 40 percent (or more) of FSH, go to Paragraph 6.C.

NOTE: Remove paint carefully to prevent damage to the surface of the lug. See the Airplane Maintenance Manual (AMM) for more instructions if necessary.

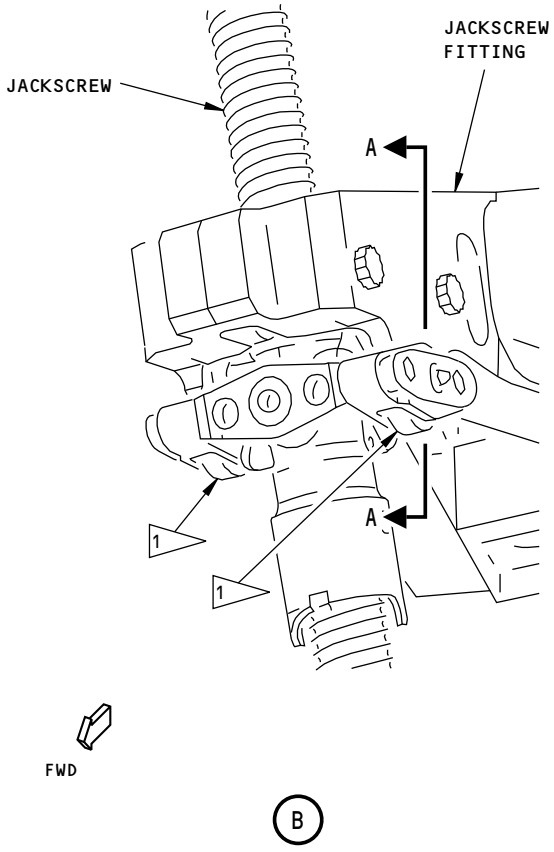
C. To make sure of a crack indication, remove the bushing from the hole and do one of the procedures that follow:

(1) Do a surface eddy current inspection on the inner diameter of the jackscrew lug hole as specified in Part 6, 51-00-00, Procedure 23.

(2) Or, do an open hole eddy current inspection on the jackscrew lug hole as specified in Part 6, 51-00-00, Procedure 16.



Inspection Areas
Figure 1 (Sheet 1 of 4)



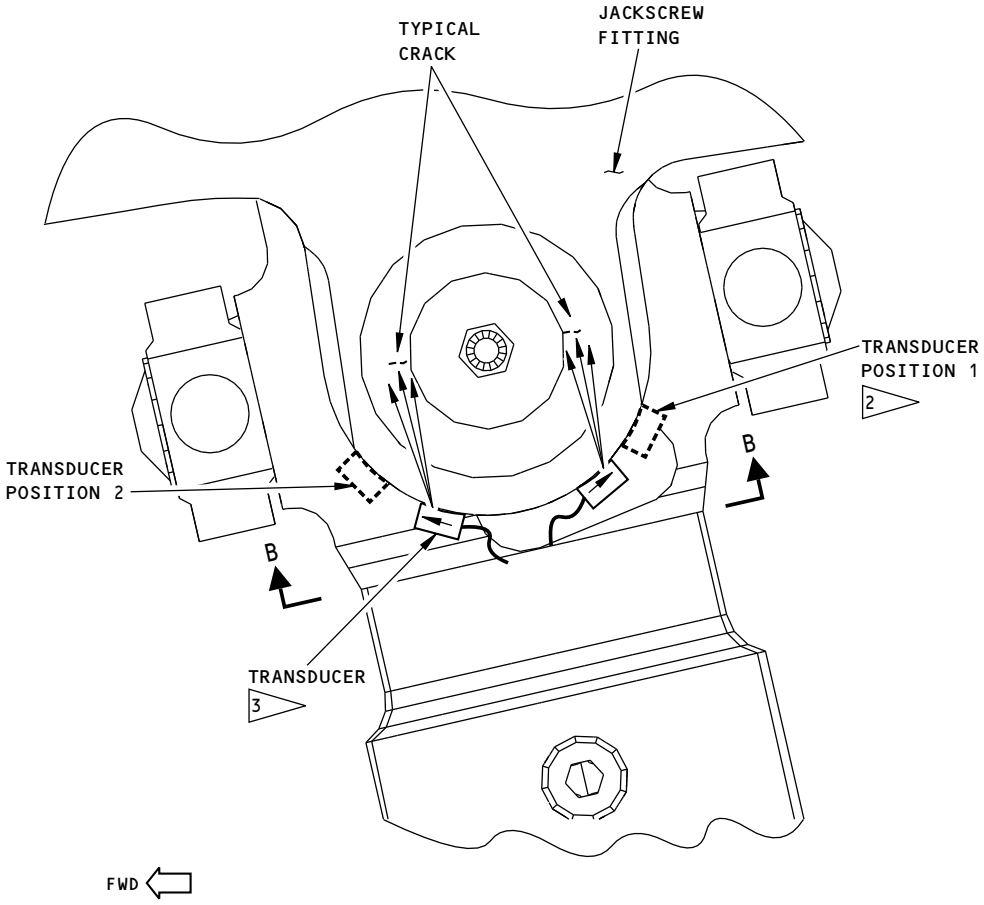
NOTES:

- EXAMINE THE LUGS ON THE LEFT AND RIGHT SIDES OF THE JACKSCREW

1 LUGS TO BE EXAMINED

2158479 S0000471390_V1

Inspection Areas
Figure 1 (Sheet 2 of 4)



(GIMBAL FITTING AND YOKE NOT SHOWN FOR CLARITY)
A-A

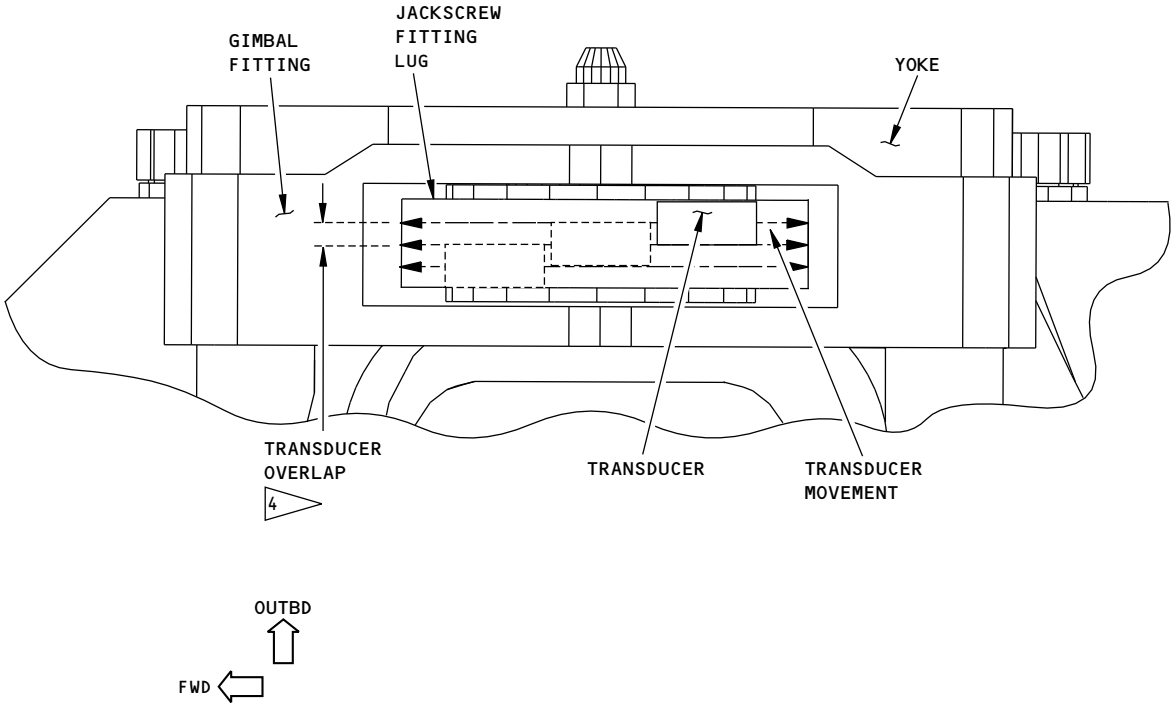
NOTES:

2 MOVE THE TRANSDUCER FROM TRANSDUCER POSITION 1 TO TRANSDUCER POSITION 2 TO EXAMINE THE FORWARD SIDE OF THE LUG. THEN TURN THE TRANSDUCER 180 DEGREES AND MOVE THE TRANSDUCER FROM TRANSDUCER POSITION 2 TO TRANSDUCER POSITION 1 TO EXAMINE THE AFT SIDE OF THE LUG.

3 MAKE SURE THE TRANSDUCER DIRECTION IS CORRECT FOR THE SIDE OF THE LUG TO BE EXAMINED.

2158481 S0000471391_V1

Inspection Areas
Figure 1 (Sheet 3 of 4)



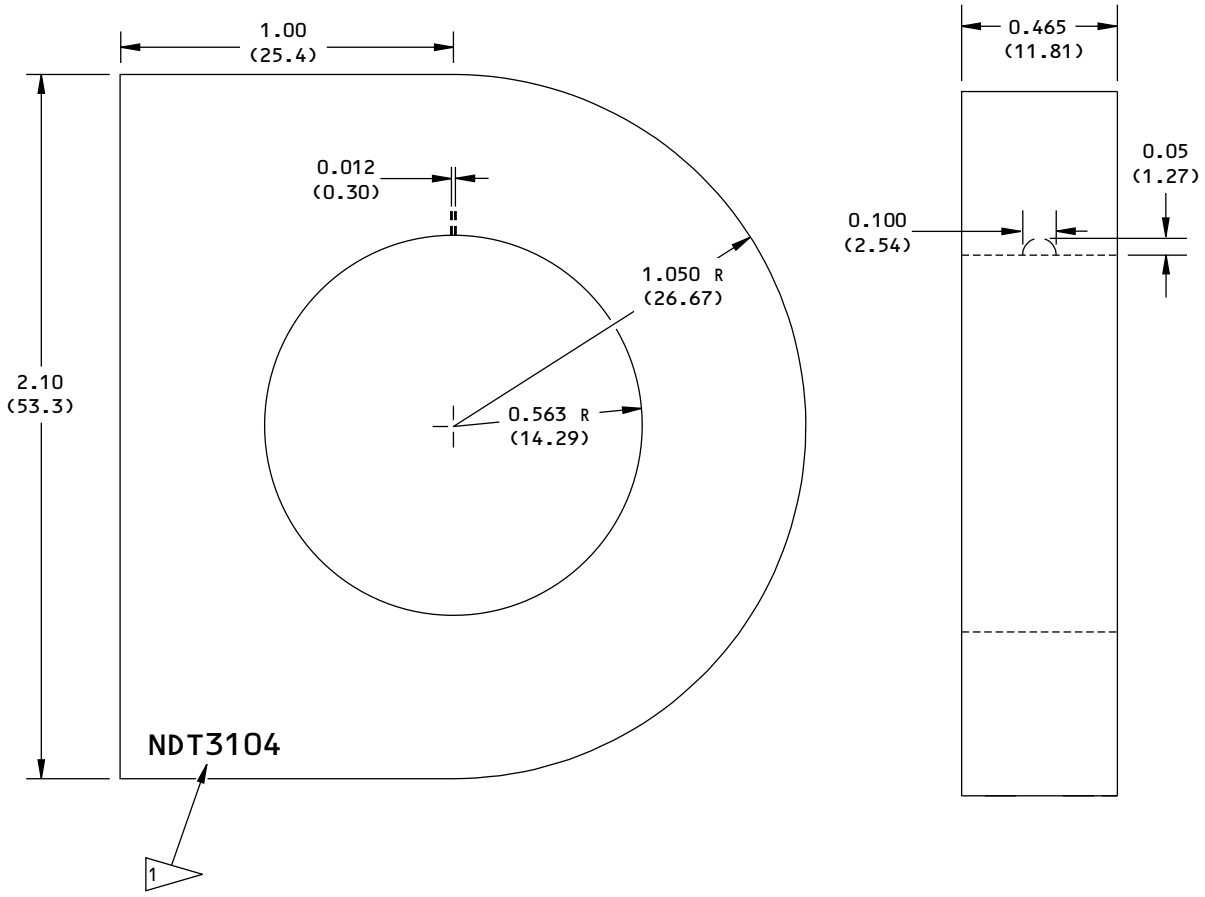
(THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE)
B-B

NOTES:

4 OVERLAP THE TRANSDUCER A MAXIMUM OF ONE HALF THE TRANSDUCER WIDTH.

2158483 S0000471392_V1

Inspection Areas
Figure 1 (Sheet 4 of 4)



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: 7050 ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

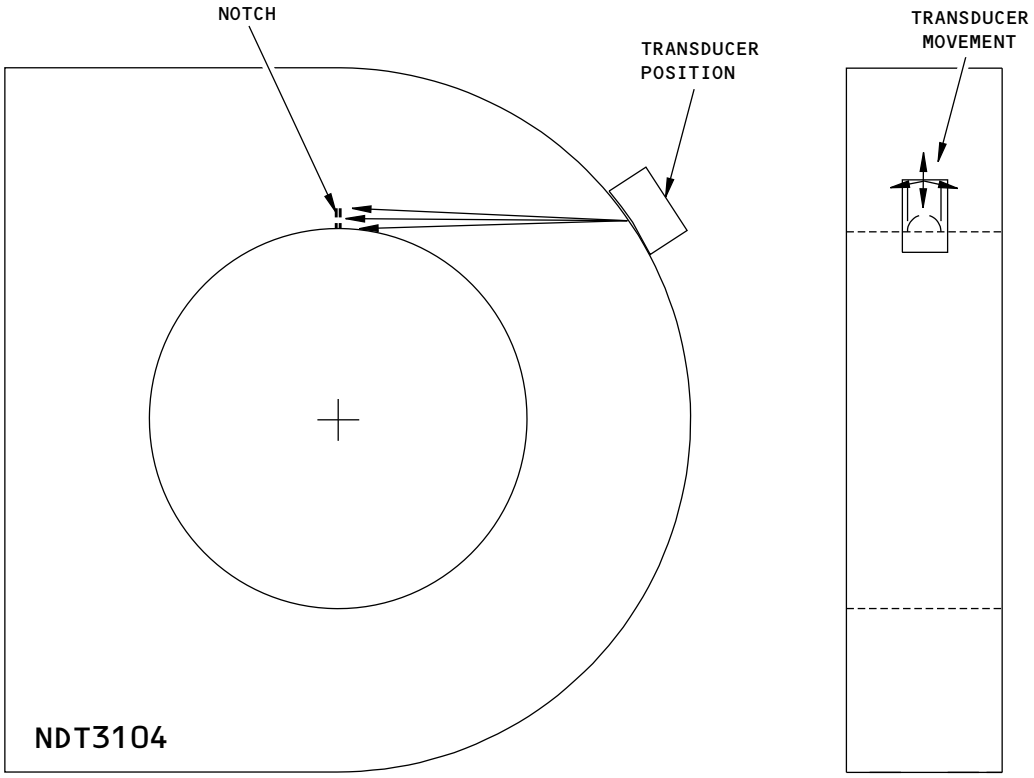
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.010
X.XX = ±0.025	X.X = ±0.05
X.X = ±0.050	X = ±1

- EDM NOTCH: 0.100 DIA (2.54) THUMBNAIL NOTCH; 0.012 (0.30) MAXIMUM WIDTH

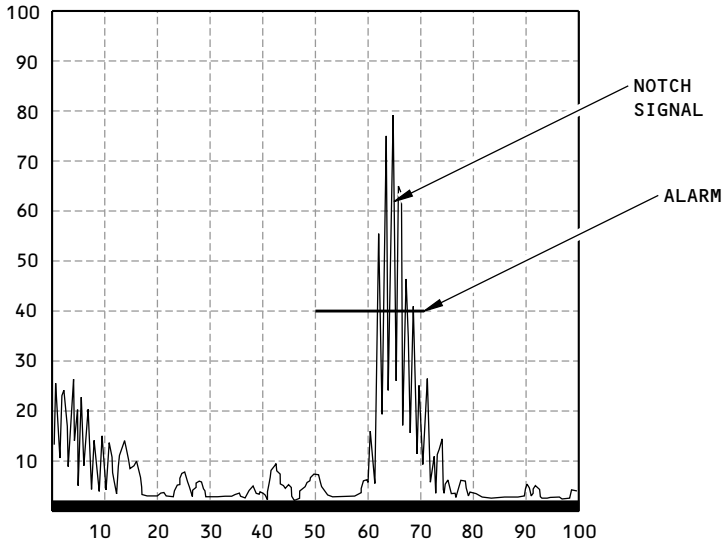
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER AT APPROXIMATELY THIS LOCATION.

2158487 S0000471393_V1

Reference Standard NDT3104
Figure 2



CALIBRATION TRANSDUCER POSITION
DETAIL I



TRANSDUCER POSITION SIGNAL
DETAIL II

2158488 S0000471394_V1

Calibration Details
Figure 3

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER CENTER SECTION - LOWER CLEVIS LUGS OF THE REAR SPAR

1. Purpose

A. Use this procedure to examine the lower clevis lugs of the rear spar of the horizontal stabilizer center section. This procedure uses longitudinal, ultrasonic, sound waves to examine the lugs for cracks that can start at the lug holes. See Figure 1 for the inspection areas.

B. A transducer that transmits longitudinal, ultrasonic, sound waves is put on the radius of a clevis lug to examine the lug hole for cracks that are 0.20 inches (7.2 mm) long. A total of four lug holes are examined on each airplane. The lower clevis lugs are made of aluminum. See Figure 1 for the inspection areas, example probe positions, and example crack directions.

C. 737 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-12-1

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 instrument. The instrument that follows was used to help prepare this procedure.

(a) Phasor XS; GE Inspection Technologies

C. Transducers

(1) Use a 10 MHz transducer that can put a 9.4 degree incident wave into the lower clevis lugs. The transducer that follows was used to help prepare this procedure.

(a) TEK 5135; Techna NDT

D. Reference Standards

(1) Use reference standard NDT3111 as specified Figure 2.

E. Couplant

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

3. Prepare for the Inspection

A. Go through stabilizer access door opening 311BL to identify and get access to the inspection areas shown in Figure 1.

B. Remove sealant, loose paint and dirt and fully clean the areas that the transducer will touch on the radii of the lower clevis lugs. It can be necessary to smooth or remove the finish so the transducer can put sufficient sound in the clevis lugs (see Figure 1).

4. Instrument Calibration

A. Set the instrument frequency to 10 MHz. A frequency adjustment is not necessary if you use a broadband instrument. Make sure the reject is set to off.

B. Apply a sufficient quantity of couplant to the transducer positions on reference standard NDT3111 shown in Figure 3.

C. Put the transducer at transducer position 1 on the reference standard as shown in Figure 3 so that the sound points at the notch.

D. Move the transducer a small distance up and down the radius and to the left and right until the notch signal is at a maximum height on the screen display. Make sure the transducer does not extend across the edge of the reference standard. See Detail I in Figure 3.

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 notch at 60 percent of FSW. See Detail II in Figure 3.

F. Adjust the gain to set the notch signal to 80 percent of full screen height (FSH). See Detail II in Figure 3.

G. Turn the transducer 180 degrees and put it at transducer position 2 on the reference standard as shown in Detail I in Figure 3. Make sure the sound from the transducer will be transmitted at the notch.

H. Move the transducer a small distance up and down the radius and to the left and right until the notch signal is at a maximum height on the screen display. Make sure the transducer does not extend across the edge of the reference standard. See Detail I in Figure 3.

NOTE: The notch signal will occur on the screen display from 50 to 70 percent of FSW.

I. If the maximum signal from the reference notch is less than the maximum signal from transducer position 1, adjust the gain to put the signal at 80 percent of FSH. See Detail II in Figure 3.

NOTE: Do not adjust the gain if the maximum signal from transducer position 2 is 80 percent (or more) of FSH.

J. Record the gain setting.

K. Add 6 dB of gain.

5. Inspection Procedure

A. Identify the inspection areas of the lower clevis lugs on the rear spar of the horizontal stabilizer center section. See 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 of one of the lower clevis lugs and make a scan of the inspection area as follows:

(1) Move the transducer from transducer position 1 to transducer position 2 (see Figure 1, View B and Section C-C) and monitor the screen display for crack signals.

(a) To make sure the lower clevis lug hole is fully examined, let the transducer overlap the edge of the lug a small quantity on the first and last scans.

(b) As you make a scan, monitor the screen display for noise signals. You can be sure that sound goes into the clevis lug if you see noise signals while you do the scan.

(2) Move the transducer in increments that are a maximum of one-half the transducer's width and continue to do Paragraph 5.D.(1) until the full width of the lug has been examined.

(3) Turn the transducer 180 degrees and do Paragraph 5.D.(1) and Paragraph 5.D.(2) again, but move the transducer from transducer position 2 to transducer position 1 (see Figure 1, View B and Section C-C).

E. Refer to Paragraph 6. to make an analysis of all possible crack signals that are 40 percent or more of FSH.

F. Examine the inboard and outboard lower clevis lug inspection areas as shown in Figure 1.

G. Examine the lower clevis lugs on the other side of the airplane.

H. After the lower clevis lug holes are examined, set the gain to the value recorded in Paragraph 4.J. Then use the reference standard to do a calibration check to make sure that the signals from the reference standard notches are 70 percent of FSH or more. If the signal from the reference standard notch is less than 70 percent of FSH, do the calibration and inspection again.

6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and are between 50 and 70 percent of FSW are possible crack indications and must be examined more fully.

B. To examine the lower clevis lugs more fully, do the steps that follow:

(1) Remove all the couplant and grease from all the surfaces of the lower clevis lug. Put couplant only on the surface that the transducer will touch and do the inspection again.

(2) Monitor the instrument screen as you move the transducer across the area where the crack indication occurs. See if the crack indication moves at the same rate as the transducer, or if it rises and falls quickly. A crack signal will rise and fall quickly; an indication from the shape of a part will usually rise and fall slowly.

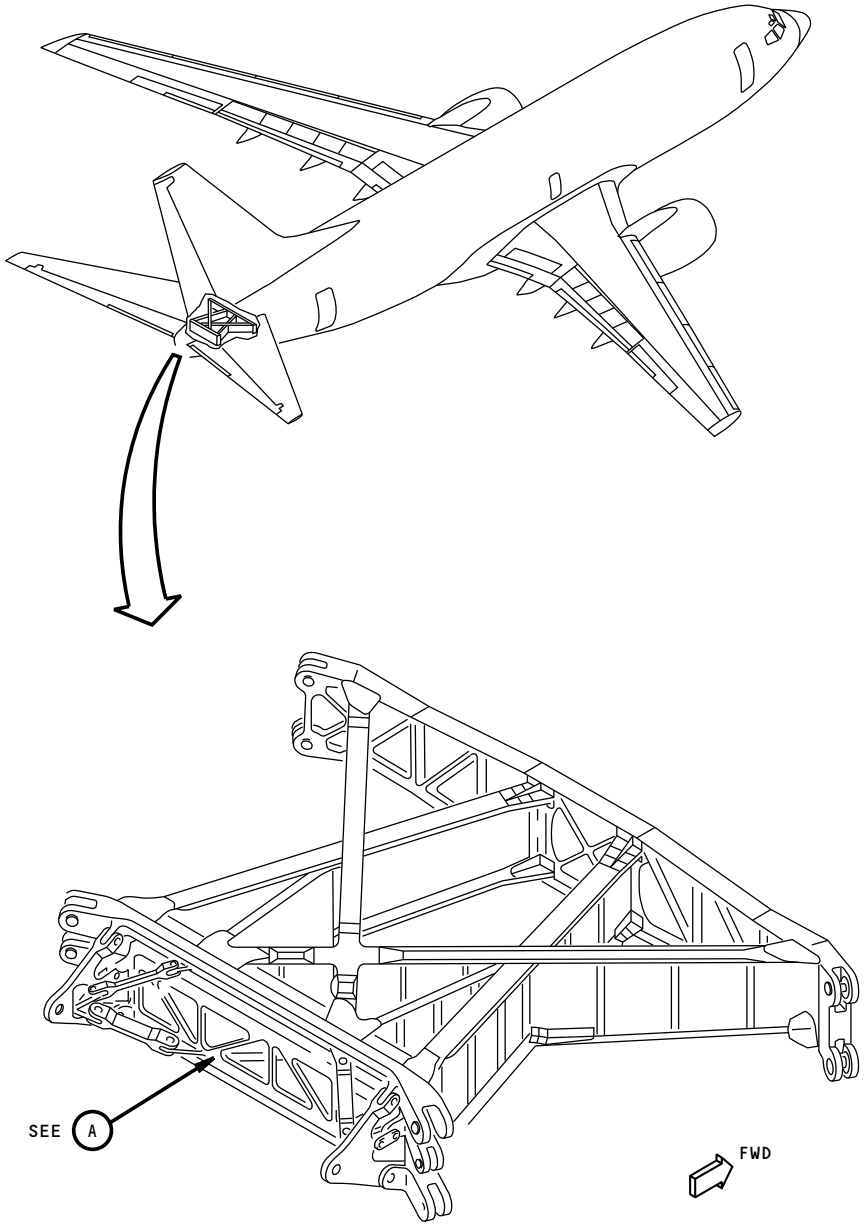
(3) If the crack indication stays above the reject level, remove the paint from the surface that the transducer touches. Set the gain to the value recorded in Paragraph 4.J. and do the inspection again. If the signal stays at 40 percent (or more) of FSH, go to Paragraph 6.C.

NOTE: Remove paint carefully to prevent damage to the surface of the part. See the Airplane Maintenance Manual (AMM) for more instructions if necessary.

C. To make sure of a crack indication, remove the bushing from the hole and do one of the procedures that follow:

(1) Do a surface eddy current inspection on the inner diameter of the clevis lug as specified in Part 6, 51-00-00, Procedure 23.

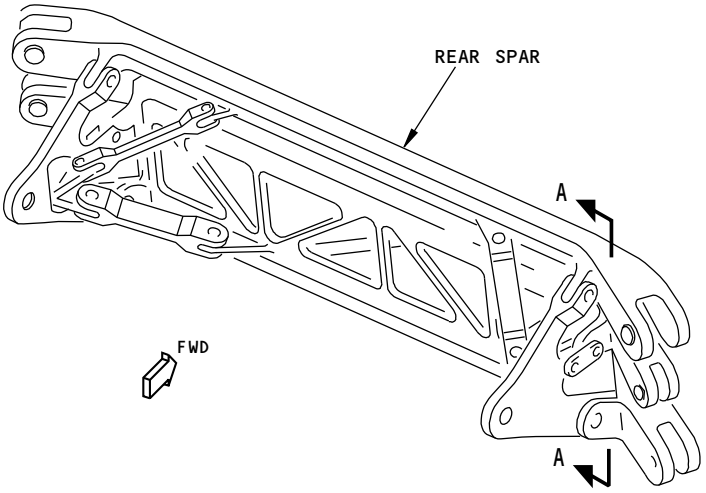
(2) Or, do an open hole eddy current inspection on the inner diameter of the clevis lug as specified in Part 6, 51-00-00, Procedure 16.



HORIZONTAL STABILIZER CENTER SECTION

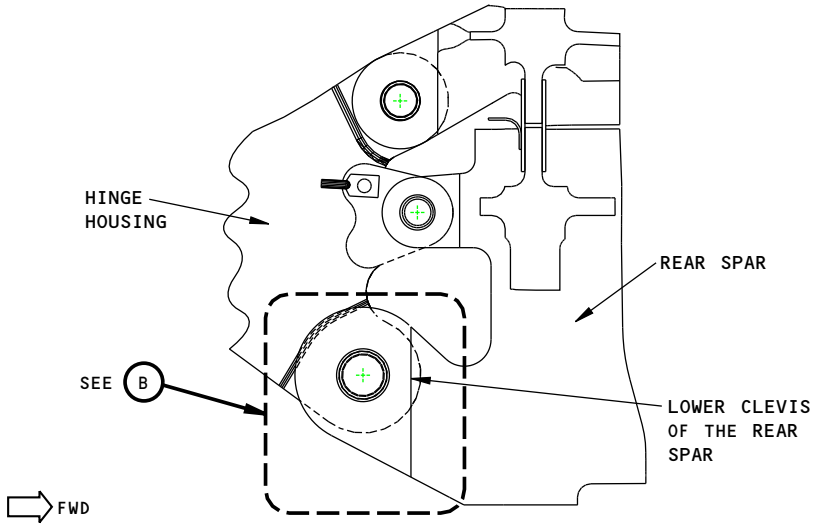
2158490 S0000471405_V1

Inspection Area
Figure 1 (Sheet 1 of 4)



REAR SPAR OF THE HORIZONTAL
STABILIZER CENTER SECTION

A



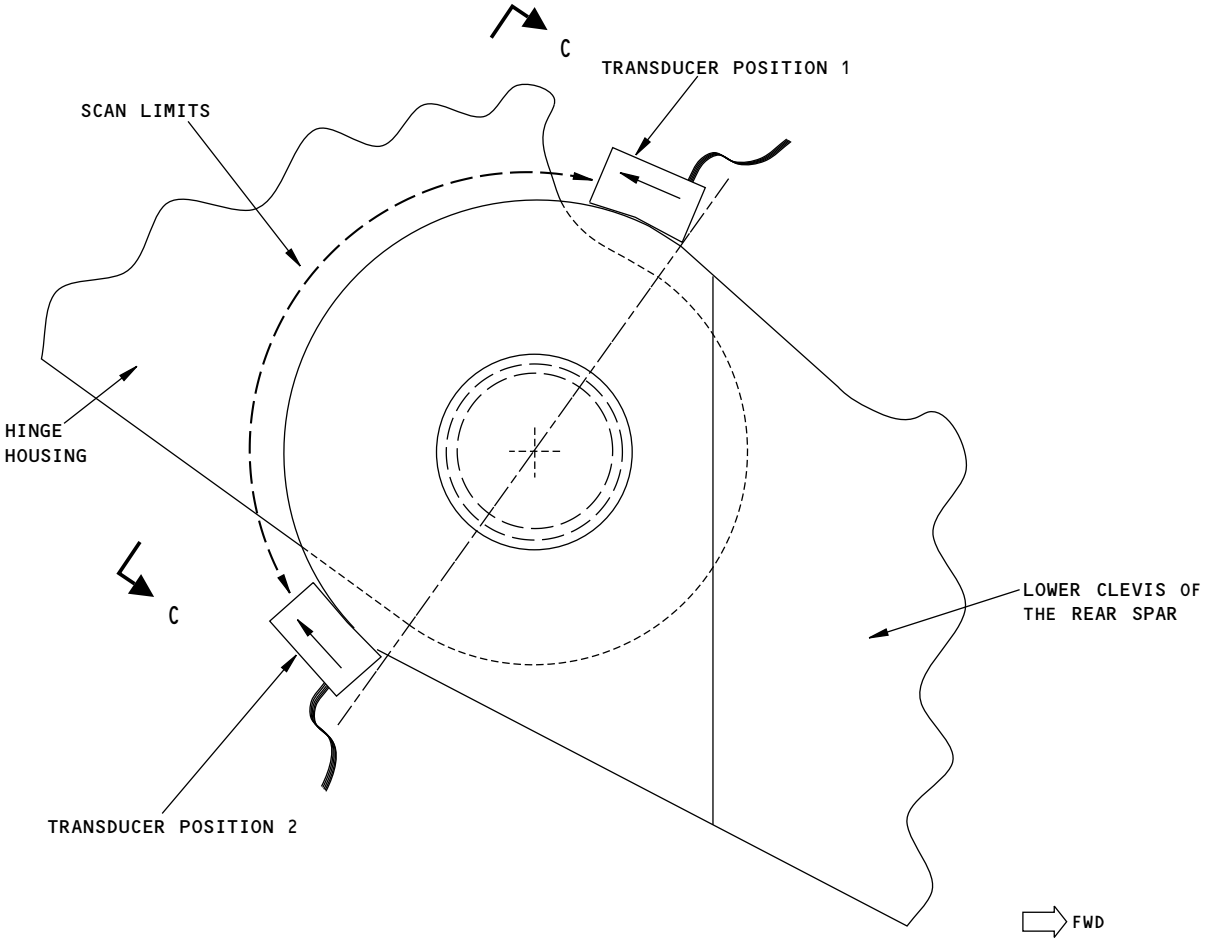
A–A

NOTES:

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

2158492 S0000471406_V1

Inspection Area
Figure 1 (Sheet 2 of 4)



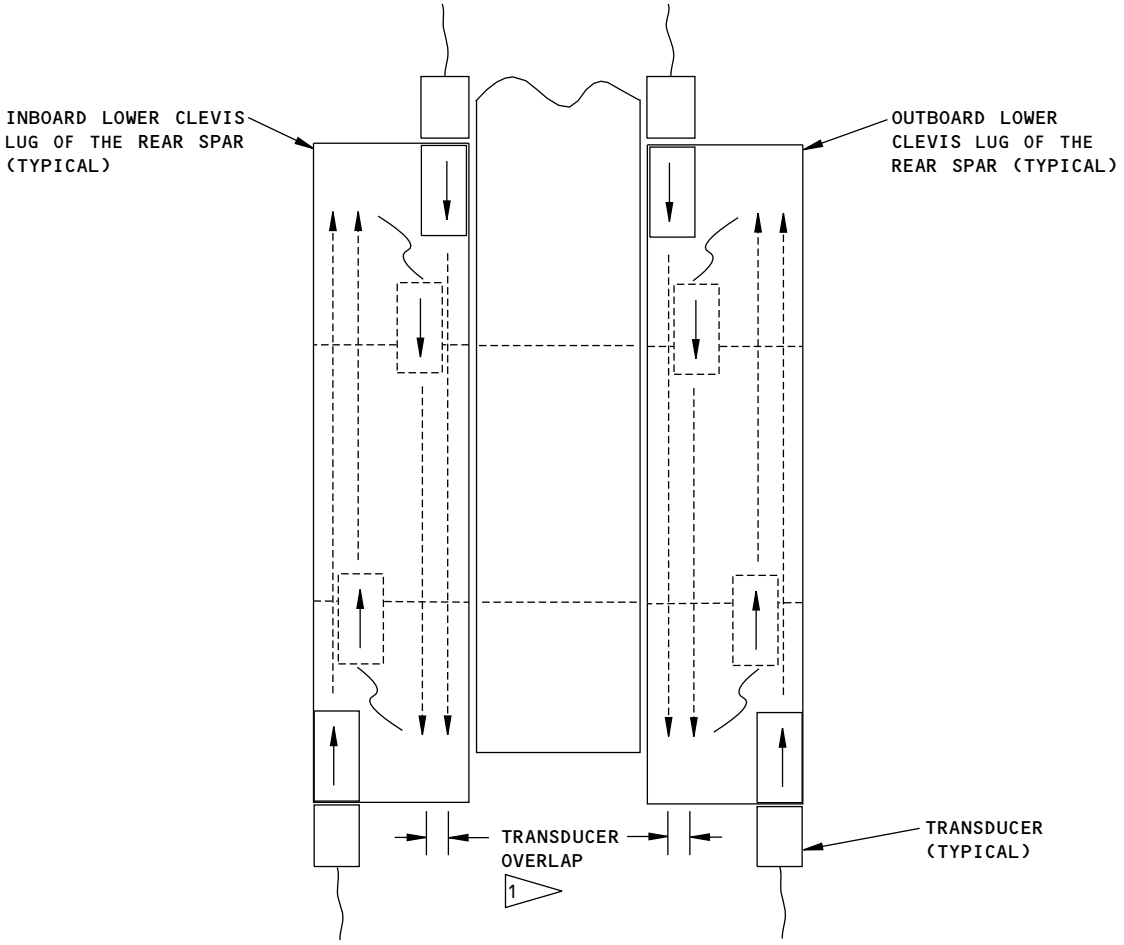
HINGE HOUSING TO LOWER CLEVIS
OF THE REAR SPAR ATTACHMENT
B

NOTES:

- THE OUTBOARD CLEVIS LUG IS SHOWN; THE INBOARD CLEVIS LUG IS ALMOST THE SAME

2158495 S0000471407_V1

Inspection Area
Figure 1 (Sheet 3 of 4)



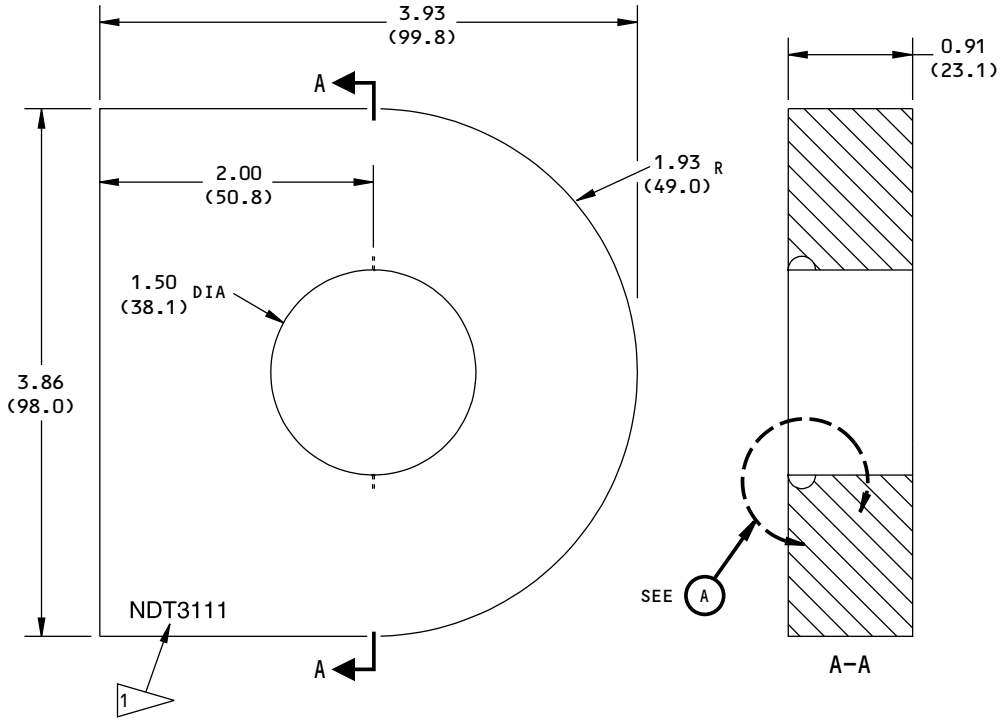
NOTES:

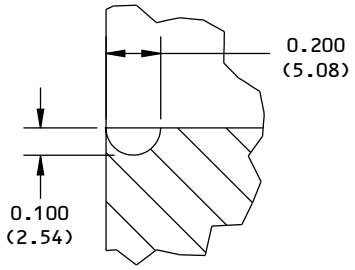
- IT IS NECESSARY TO EXAMINE THE OUTBOARD AND INBOARD CLEVIS LUGS ON THE RIGHT AND LEFT SIDES OF THE REAR SPAR.

1 OVERLAP THE TRANSDUCER A MAXIMUM OF ONE HALF THE TRANSDUCER WIDTH. MAKE A SCAN IN ONE DIRECTION UNTIL THE FULL WIDTH OF THE LUG HAS BEEN EXAMINED. TURN THE TRANSDUCER 180 DEGREES AND MAKE A SCAN IN THE OPPOSITE DIRECTION UNTIL THE FULL WIDTH OF THE LUG HAS BEEN EXAMINED.

2158497 S0000471408_V1

Inspection Area
Figure 1 (Sheet 4 of 4)





(TYPICAL NOTCH)
A

NOTES:

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

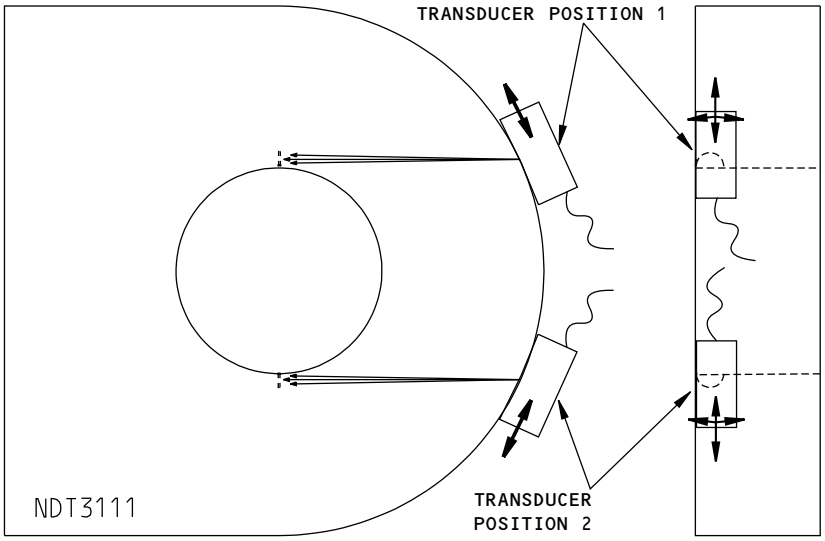
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.010
X.XX = ±0.025	X.X = ±0.05
X.X = ±0.050	X = ±1

- MATERIAL: 7075 AIRCRAFT ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- EDM NOTCHES:
  0.200 X 0.100 (5.08 X 2.54) THUMBNAIL NOTCHES (2 LOCATIONS);
  0.012 (0.30) MAXIMUM WIDTH

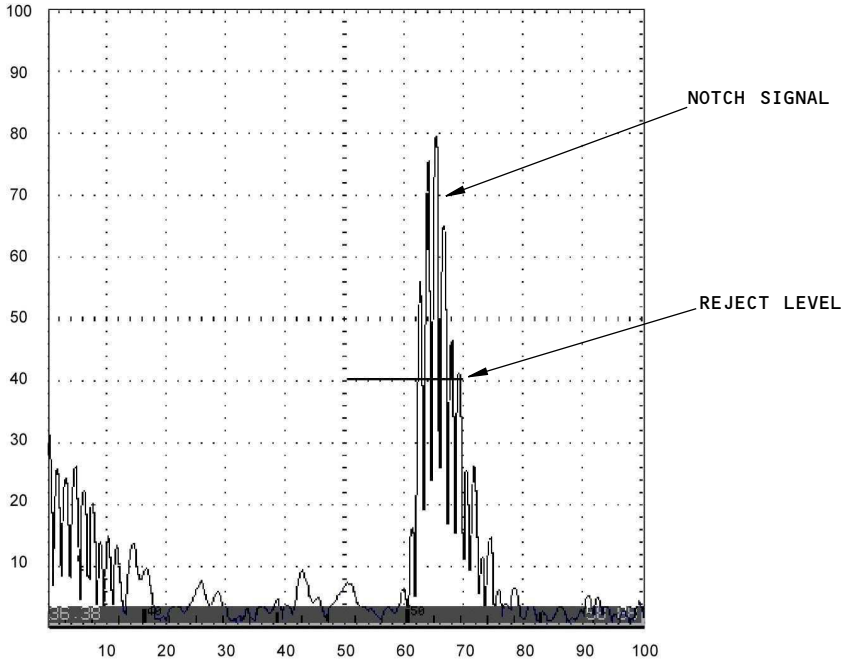
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER AT APPROXIMATELY THIS LOCATION

2158501 S0000471409_V1

Reference Standard NDT3111
Figure 2



CALIBRATION TRANSDUCER POSITIONS
DETAIL I



TRANSDUCER POSITION 1 AND 2 SIGNALS
DETAIL II

2158502 S0000471410_V1

Calibration Details
Figure 3

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER CENTER SECTION - UPPER CHORD OF THE REAR SPAR AT LBL 1.3 AND RBL 1.3

1. Purpose

A. Use this procedure to examine the upper chord of the rear spar of the horizontal stabilizer center section for cracks. The titanium upper chord is examined at two fastener hole locations where the shear tie fittings are attached to the upper chord; one location is at LBL 1.3 and the other is at RBL 1.3. See Figure 1 for the inspection areas.

B. 737 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-01-1

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) The pulse-echo, ultrasonic instruments that follow were used to help prepare this procedure.

(a) USN 60; GE Inspection Technologies

(b) USN 52L; GE Inspection Technologies

(c) Sonic 1200; Olympus NDT

C. Transducer

(1) Use a transducer that:

(a) Operates at 5 MHz.

(b) Causes a 60 degree shear wave in titanium.

(c) Has a top mounted connector.

(d) Has a maximum length of 0.375 inch (9.53 mm).

(e) Has a maximum width of 0.25 inch (6.3 mm).

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

(a) XA-605T; Techna NDT

D. Reference Standard

(1) Use reference standard NDT3099. Refer to Figure 2 for data about the reference standard.

E. Couplant

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

3. Prepare for the Inspection

A. Identify the inspection area. See Figure 1.

B. Remove sealant or loose paint. Clean the area that the transducer will touch.

4. Instrument Calibration

A. Connect the transducer to the instrument.

B. Put couplant on the reference standard in the general area of transducer position 1 (TP1). See Figure 3.

C. Set the initial pulse at 0% of full screen width (see Detail C in Figure 3).

D. Put the transducer on the reference standard at Position 1 (see Detail A in Figure 3).

E. Adjust the transducer to get a signal from the hole.

F. Adjust the hole signal so that it is at 50% of full screen width (see Detail C in Figure 3).

G. Turn the transducer to transducer position 2 (see Detail B in Figure 3) and monitor the signal that occurs from the EDM notch. If necessary, move the transducer toward and away from the notch approximately 0.5 inch (13 mm) or less to get a maximum signal from the notch.

NOTE: Do not move the transducer across the scribe lines.

H. Adjust the gain so the notch signal is at 80 percent of full screen height

I. Turn the transducer to the hole and monitor how the height of the notch signal decreases and the hole signal increases.

5. Inspection Procedure

A. Examine the upper chord for cracks behind the shear tie fittings at LBL 1.3 and RBL 1.3 as follows:

(1) Find the inspection area. See Figure 1.

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

(3) Put couplant on the upper surface of the upper chord at the approximate transducer locations shown by flag note 3 in Figure 1.

(4) Put the transducer on the upper chord at one of the outboard transducer locations shown by flag note 3 in Figure 1.

(5) Point the transducer so sound is transmitted to the fastener hole in the inspection area as shown in Detail A in Figure 1.

(6) Move the transducer to get a signal from the hole (move the transducer to and away from the hole if possible). If you cannot get a signal from the fastener hole, increase the gain until you get a signal that is 30% of full screen height.

(7) Turn the transducer away from the hole as shown in Detail B in Figure 1 and monitor the screen display for crack signals. Move the transducer toward and away from the hole a maximum of 0.5 inch (13 mm) to examine for corner cracks that can occur at the top of the hole.

(8) Do Paragraph 5.A.(5) thru Paragraph 5.A.(7) on the opposite side of the fastener hole.

(9) Do Paragraph 5.A.(5) thru Paragraph 5.A.(7) on the lower inboard side of the fastener hole to check for off-angle cracks. Note that this inboard check is not possible on the upper side of the fastener holes because of the shape of the upper chord.

(10) Do Paragraph 5.A.(5) thru Paragraph 5.A.(9) at the remaining fastener shown in Detail A in Figure 1.

6. Inspection Results

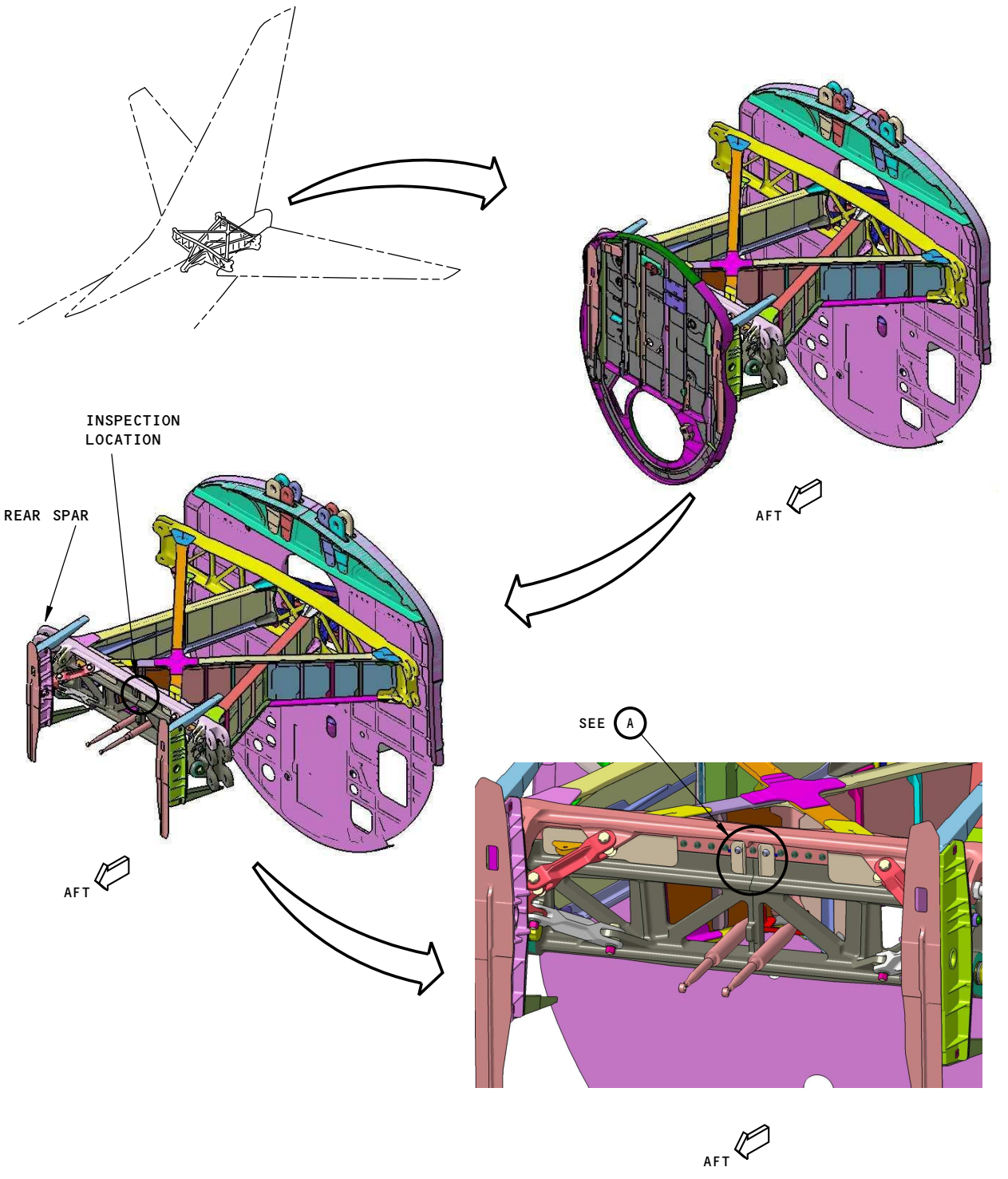
A. Signals that are 40 percent (or more) of full screen height and are immediately to the right of the hole signal can be crack indications.

B. If you get a crack indication, remove the couplant from the surface of the shear tie fitting in front of the transducer and do the scan again. Too much couplant on the surface can cause an incorrect crack indication to occur.

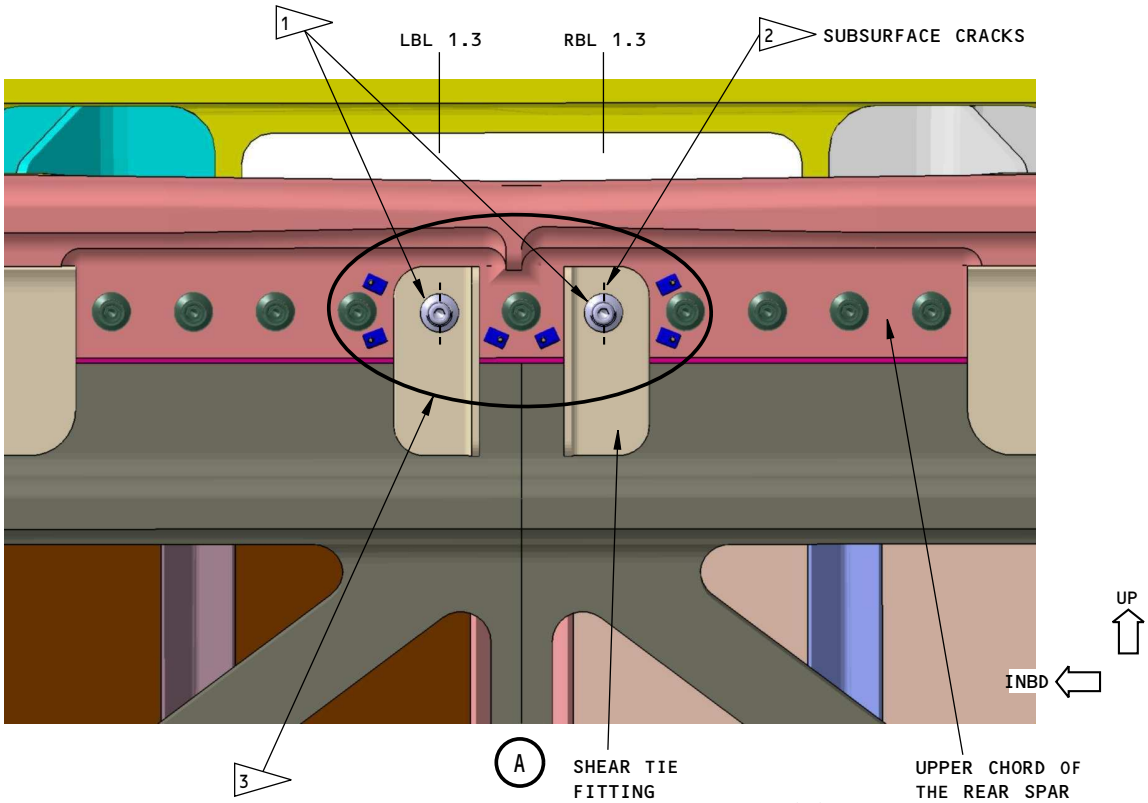
C. Compare the signal from the crack indication with the signal you get from the EDM notch in the reference standard. Put the transducer on the reference standard at the same distance from the fastener hole that it was on the airplane.

D. A signal that is almost the same as the one you got from the EDM notch in the reference standard is a crack indication.

E. Remove the fastener to do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17, to make sure there is a crack.



Inspection Area
Figure 1 (Sheet 1 of 3)



TYPICAL TRANSDUCER POSITION ON THE AFT SURFACE OF THE UPPER CHORD

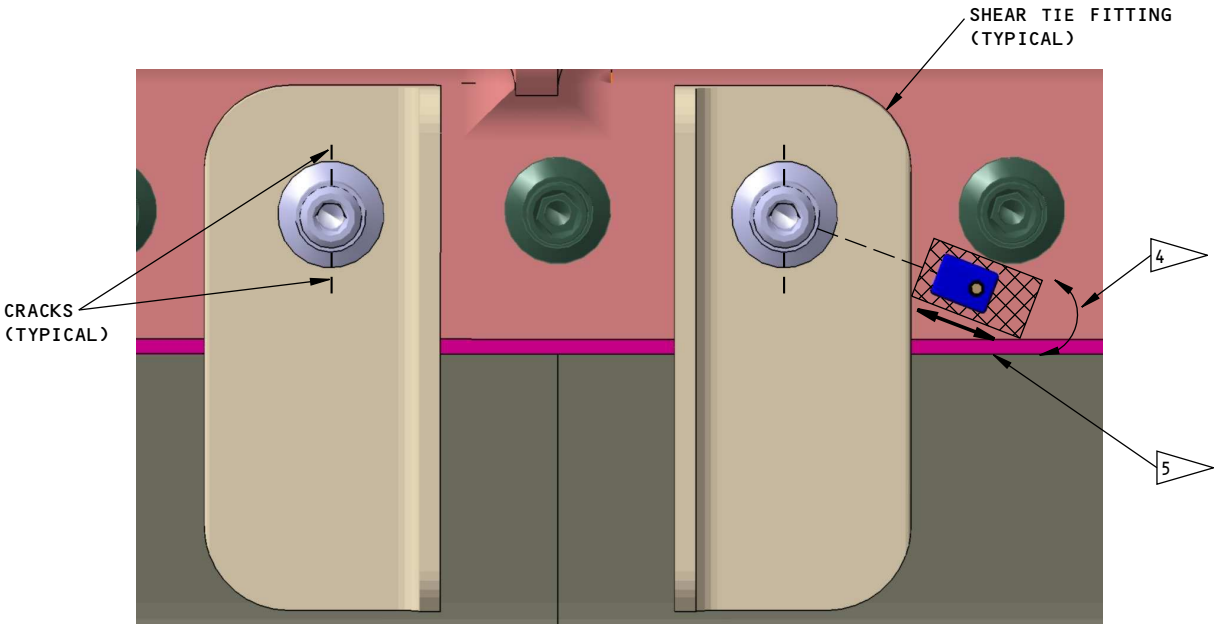
NOTES:

- EXAMINE THE UPPER CHORD OF THE REAR SPAR FOR CRACKS AT THE 2 FASTENER LOCATIONS THAT GO THROUGH THE 2 SHEAR TIE FITTINGS AT BL 1.3.

1. DTR CHECK FORM ITEM 55-10-01-1 INSPECTION AREA. THERE ARE 2 FASTENER LOCATIONS TO EXAMINE.
2. A CORNER CRACK CAN START ON THE AFT SURFACE OF THE UPPER CHORD BEHIND THE SHEAR TIE FITTING. CRACKS RUN IN THE UP AND DOWN DIRECTION FROM THE FASTENER HOLE.
3. APPROXIMATE TRANSDUCER LOCATIONS TO EXAMINE THE TWO INSPECTION HOLES (6 TRANSDUCER LOCATIONS)

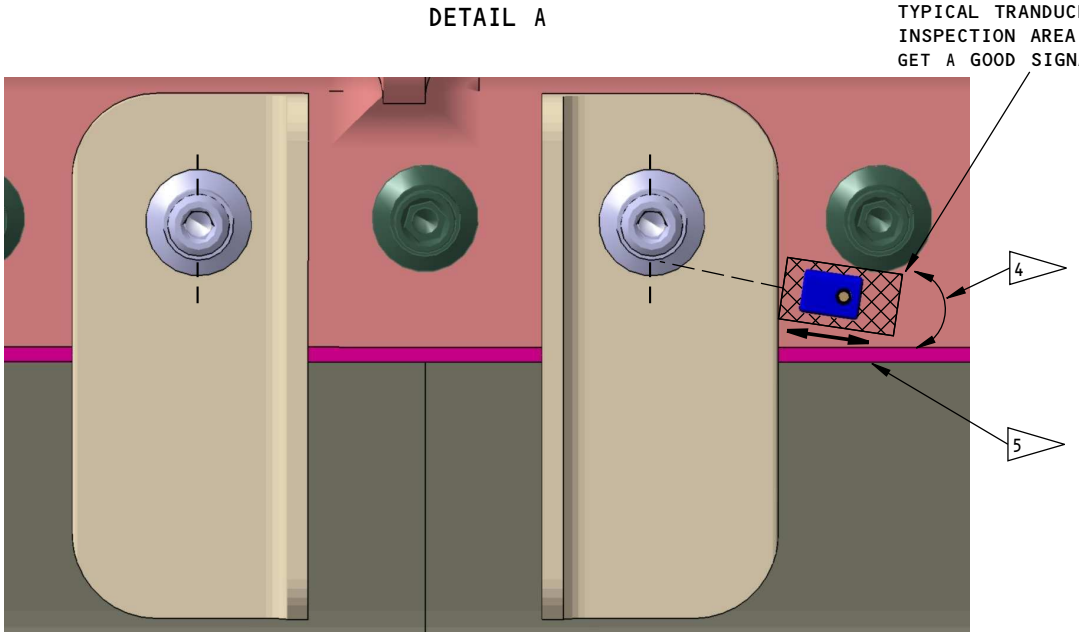
2158505 S0000471413_V1

Inspection Area
Figure 1 (Sheet 2 of 3)



TYPICAL TRANSDUCER POSITION TO GET THE HOLE SIGNAL

DETAIL A



TYPICAL TRANSDUCER POSITION TO GET THE NOTCH SIGNAL

DETAIL B

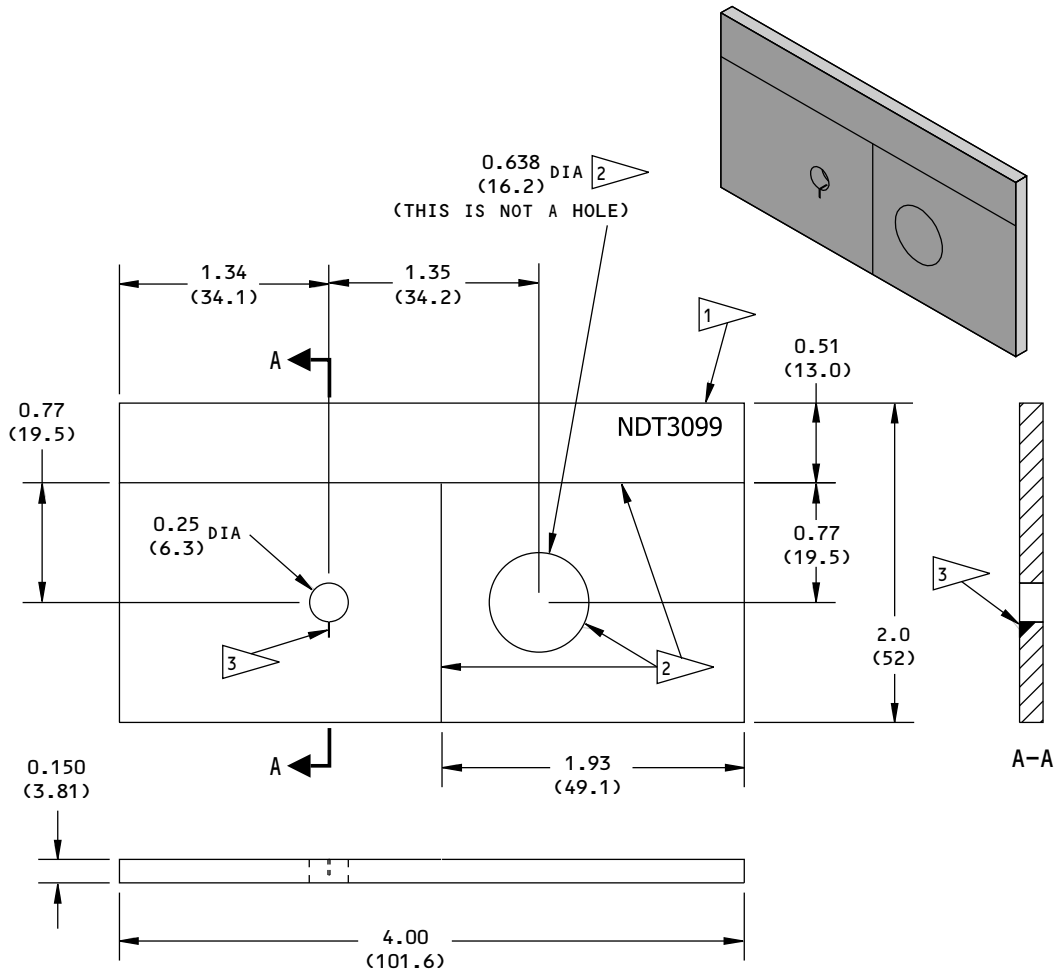
NOTES:

4 TURN THE TRANSDUCER A SMALL QUANTITY TO FIND THE HOLE AND CRACK SIGNALS.

5 MOVE THE TRANSDUCER TO AND AWAY FROM THE SHEAR TIE FITTING TO GET THE MAXIMUM HOLE AND NOTCH SIGNALS.

2158506 S0000471415_V1

Inspection Area
Figure 1 (Sheet 3 of 3)



NOTES:

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

INCHE	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.010
X.XX = ±0.025	X.X = ±0.05
X.X = ±0.050	X = ±1

- MATERIAL: Ti-6AL-4V
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- GRAIN DIRECTION RUNS FROM LEFT TO RIGHT ALONG THE LONG AXIS OF THE REFERENCE STANDARD

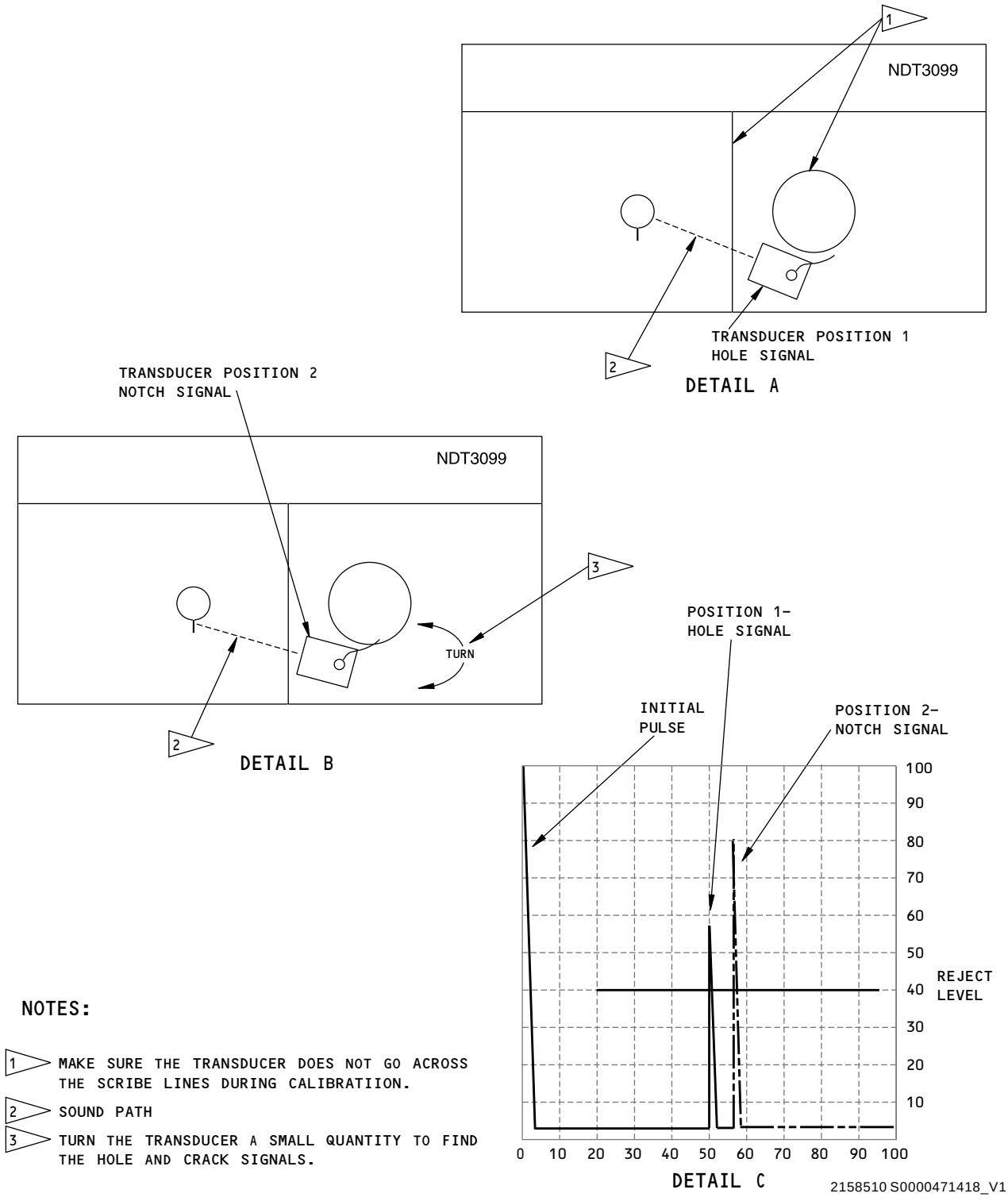
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER AT APPROXIMATELY THIS LOCATION.

2 ETCH A SCRIBE LINE AT THE LOCATION SHOWN TO A MAXIMUM DEPTH OF 0.005 (0.13).

3 EDM NOTCH: 0.100 (2.54) X 0.100 (2.54) CORNER NOTCH; 0.012 (0.030) MAXIMUM WIDTH

2158508 S0000471417_V1

Reference Standard NDT3099
Figure 2



Instrument Calibration with Reference Standard NDT3099
Figure 3

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER CENTER SECTION - UPPER CHORD OF THE REAR SPAR AT THE THRUST BEAM SPLICE FITTING

1. Purpose

A. Use this procedure to examine the upper chord of the rear spar of the horizontal stabilizer center section for cracks. The titanium upper chord is examined at eight holes where the thrust beam splice fitting attaches to the upper chord. See Figure 1 for the inspection areas.

B. 737 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-01-4

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) The pulse-echo, ultrasonic instruments that follow were used to help prepare this procedure.

(a) USN 60; GE Inspection Technologies

(b) USN 52L; GE Inspection Technologies

(c) Sonic 1200; Olympus NDT

C. Transducer

(1) Use a transducer that:

(a) Operates at 5 MHz.

(b) Causes a 60 degree shear wave in titanium.

(c) Has a top mounted connector.

(d) Has a maximum length of 0.55 inch (13.9 mm).

(e) Has a maximum width of 0.25 inch (6.3 mm).

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

(a) 57A3065; Staveley (Olympus NDT)

(b) SUSM560AT; Olympus NDT Engineering Corp.

D. Reference Standard

(1) Use reference standard NDT3098. Refer to Figure 2 for data about the reference standard.

E. Couplant

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

3. Prepare for the Inspection

A. Identify the inspection area. See Figure 1.

B. Remove sealant or loose paint. Clean the area that the transducer will touch.

4. Instrument Calibration

A. Connect the transducer to the instrument.

B. Put couplant on the reference standard at transducer position 1 as shown in Figure 3.

C. Set the initial pulse at 0% of full screen width (see Detail C in Figure 3).

D. Put the transducer on the reference standard at transducer position 1 (see Detail A in Figure 3).

E. Adjust the transducer to get a signal from the hole.

F. Adjust the hole signal so that it is at 50% of full screen width (see Detail C in Figure 3).

G. Turn the transducer to Position 2 (see Detail B in Figure 3) and monitor the signal that occurs from the EDM notch. If necessary, move the transducer toward and away from the notch approximately 0.5 inch (13 mm) or less to get a maximum signal from the notch.

NOTE: Do not move the transducer across the scribe line.

H. Adjust the gain so the notch signal is at 80 percent of full screen height.

I. Turn the transducer to the hole and monitor how the height of the notch signal decreases and the hole signal increases.

5. Inspection Procedure

A. Examine the upper chord for cracks behind the thrust beam splice fitting as follows:

(1) Find the inspection area. See Figure 1.

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

(3) Put couplant on the upper surface of the upper chord at the approximate transducer locations shown by flagnote 3 in Figure 1.

(4) Put the transducer on the upper chord at one of the transducer locations shown by flagnote 3 in Figure 1.

(5) Point the transducer so the sound is transmitted to the fastener hole in the inspection area as shown in Detail A in Figure 1.

(6) Move the transducer to get a signal from the hole (move the transducer to and away from the hole). If you cannot get a signal from the fastener hole, increase the gain until you get a signal that is 30% of full screen height.

(7) Turn the transducer away from the hole as shown in Detail B in Figure 1 and monitor the screen display for crack signals. Move the transducer toward and away from the hole a maximum of 0.5 inch (13 mm) to examine for corner cracks that can occur at the top of the hole.

(8) Do Paragraph 5.A.(5) thru Paragraph 5.A.(7) on the opposite side of the fastener hole.

(9) Do Paragraph 5.A.(5) thru Paragraph 5.A.(8) at the remaining seven fasteners shown in Figure 1.

6. Inspection Results

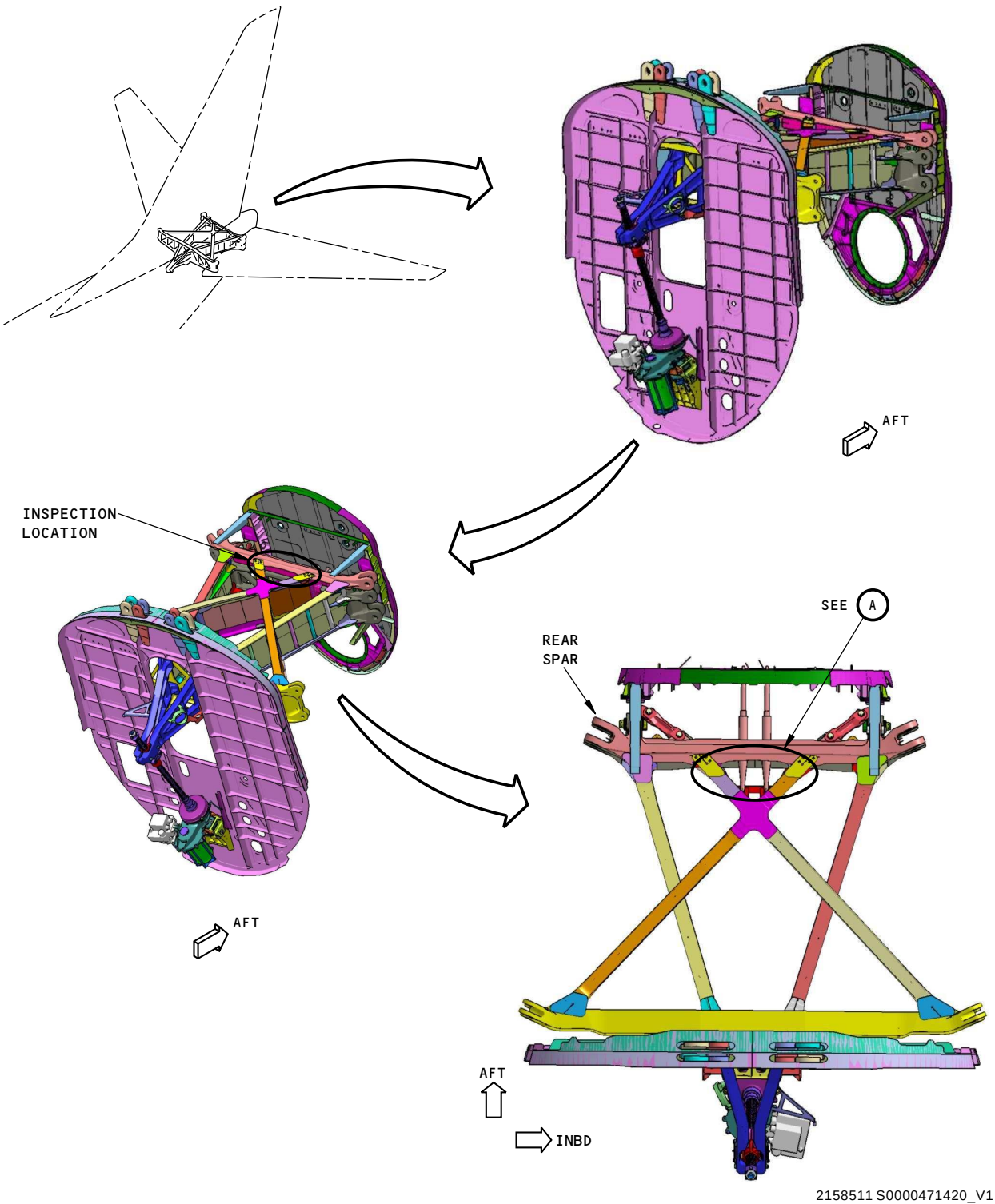
A. Signals that are 40 percent (or more) of full screen height and are immediately to the right of the hole signal can be crack indications.

B. If you get a crack indication, remove the couplant from the surface of the thrust beam splice fitting in front of the transducer and do the scan again. Too much couplant on the surface can cause an incorrect crack indication to occur.

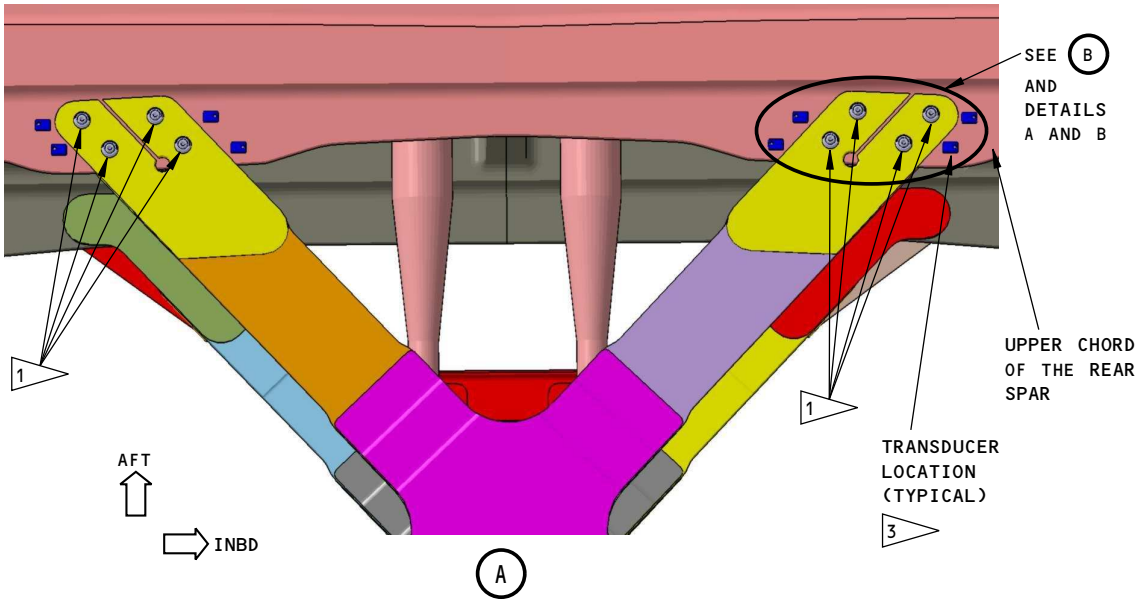
C. Compare the signal from the crack indication with the signal you get from the EDM notch in the reference standard. Put the transducer on the reference standard at the same distance from the fastener hole that it was on the airplane.

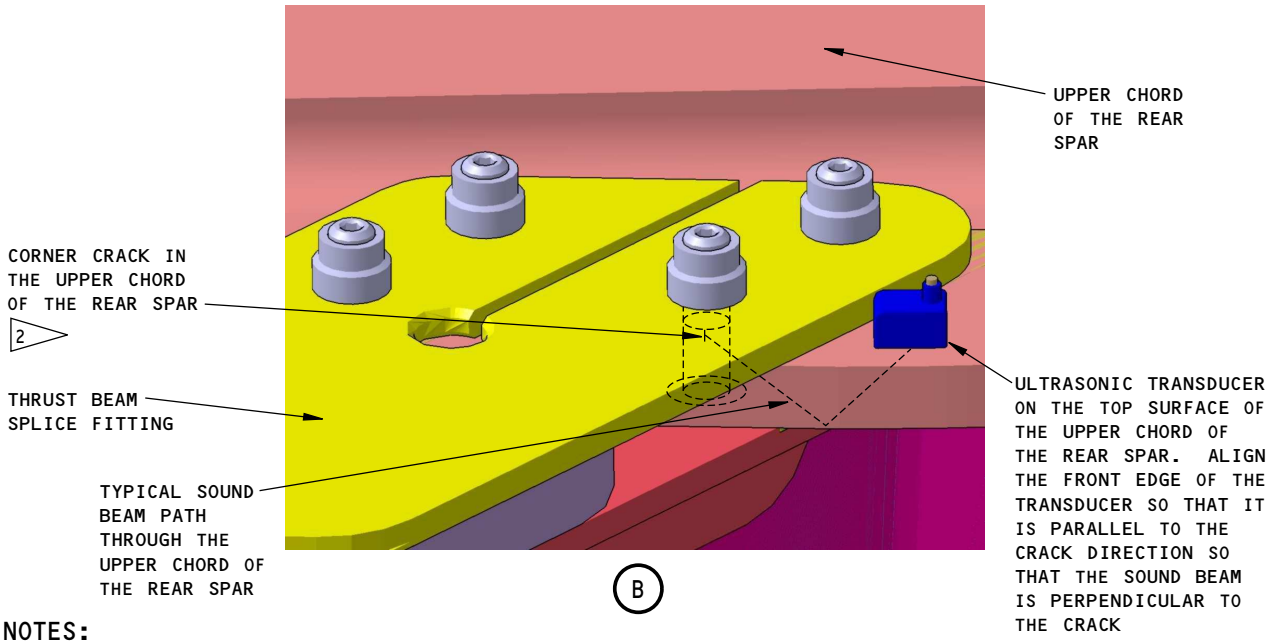
D. A signal that is almost the same as the one you got from the EDM notch in the reference standard is a crack indication.

E. Remove the fastener to do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17, to make sure there is a crack.



Inspection Area
Figure 1 (Sheet 1 of 3)





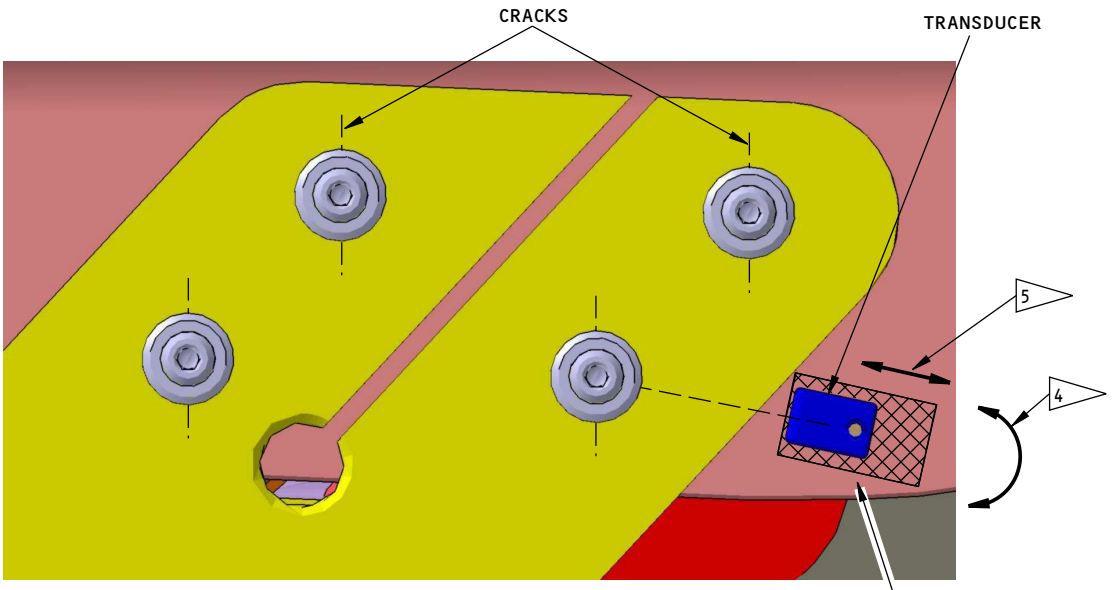
NOTES:

- EXAMINE THE UPPER CHORD OF THE REAR SPAR FOR CRACKS AT THE 8 FASTENER LOCATIONS OF THE THRUST BEAM SPLICE FITTING.

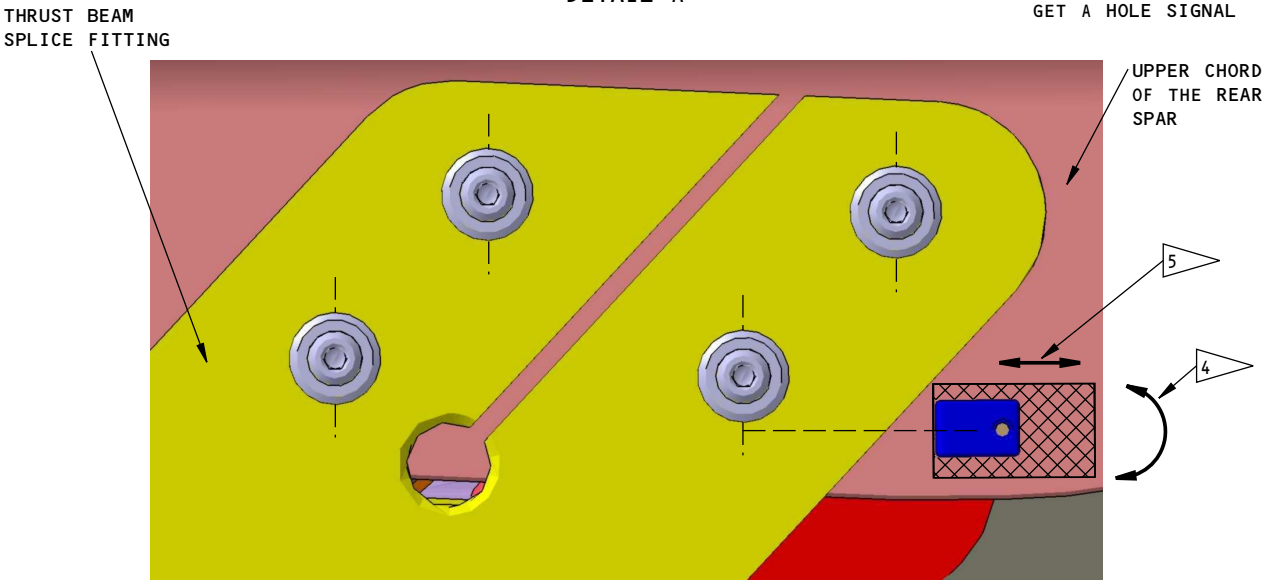
1. DTR CHECK FORM ITEM 55-10-01-4 INSPECTION AREA. THERE ARE 8 FASTENER LOCATIONS TO EXAMINE.
2. CORNER CRACKS CAN START ON THE UPPER SURFACE OF THE UPPER CHORD OF THE REAR SPAR BELOW THE THRUST BEAM SPLICE FITTING. THE CRACK DIRECTION DOES NOT FOLLOW THE EDGE OF THE THRUST BEAM SPLICE FITTING. THE CRACKS ARE IN THE FORWARD AND AFT DIRECTION AS SHOWN IN FIGURE 1 (SHEET 3).
3. APPROXIMATE TRANSDUCER LOCATION FOR INSPECTION (8 LOCATIONS)

2158514 S0000471421_V1

Inspection Area
Figure 1 (Sheet 2 of 3)



TYPICAL TRANSDUCER POSITION TO GET A HOLE SIGNAL
DETAIL A



TYPICAL TRANSDUCER POSITION TO GET A CRACK SIGNAL
DETAIL B

NOTES:

- CRACKS CAN OCCUR ON THE FORWARD AND AFT SIDES OF THE FASTENER HOLES AS SHOWN IN DETAILS A AND B.

4 TURN THE TRANSDUCER A SMALL QUANTITY TO FIND THE HOLE AND CRACK SIGNALS.

5 MOVE THE TRANSDUCER TO AND AWAY FROM THE THRUST BEAM SPLICE FITTING TO GET THE MAXIMUM HOLE AND NOTCH SIGNALS.

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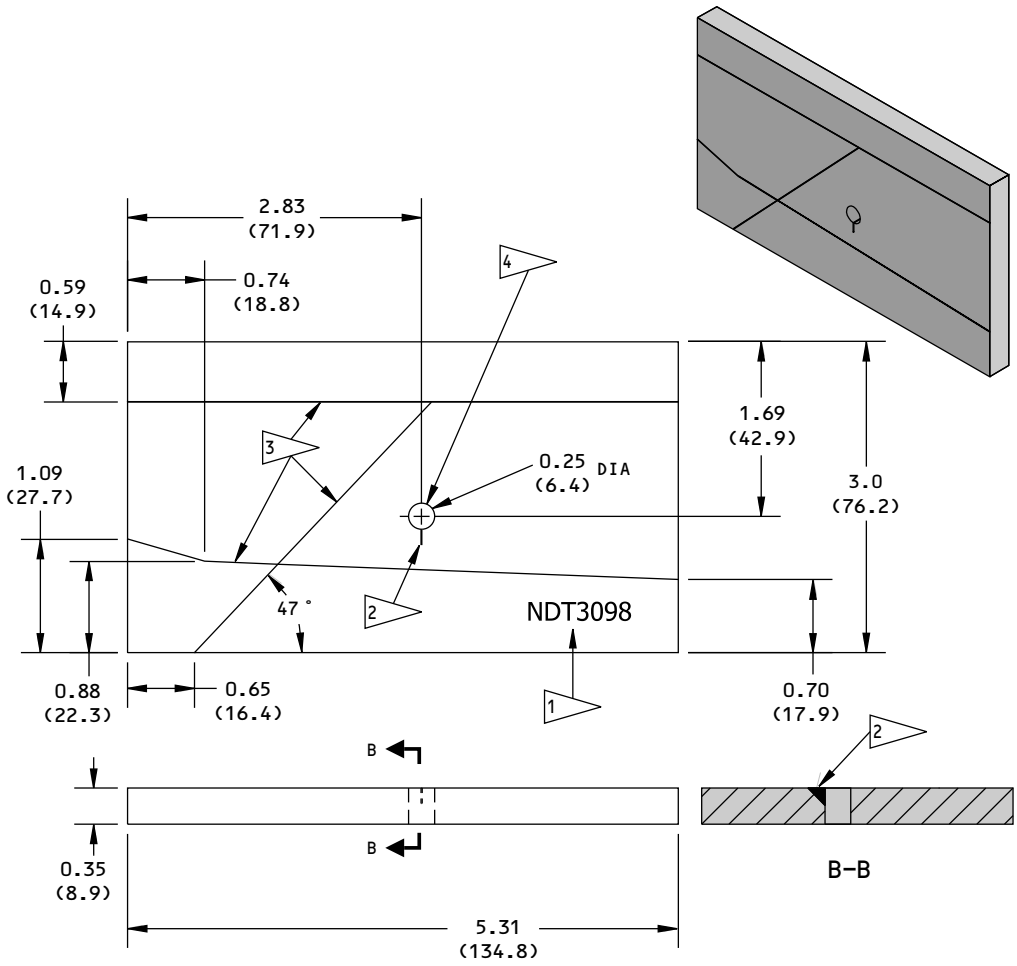
Inspection Area
Figure 1 (Sheet 3 of 3)



NOTES:

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

INCHES	MILLIMETERS	ANGLE TOLERANCE
X.XXX = ±0.005	X.XX = ±0.010	±1 DEGREE
X.XX = ±0.025	X.X = ±0.05	
X.X = ±0.050	X = ±1	

- MATERIAL: Ti-6AL-4V

1. ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3098, AT APPROXIMATELY THIS LOCATION
2. EDM NOTCH:
   0.150 X 0.150 (3.15 X 3.15) CORNER NOTCH
   0.012 (0.30) MAXIMUM WIDTH
   THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE OF THE HOLE AS SHOWN.
3. ETCH A SCRIBE LINE AT THE LOCATIONS SHOWN TO A MAXIMUM DEPTH OF 0.005 (0.13)
4. DRILL A 0.25 (6.4) DIA HOLE AT THE LOCATION SHOWN

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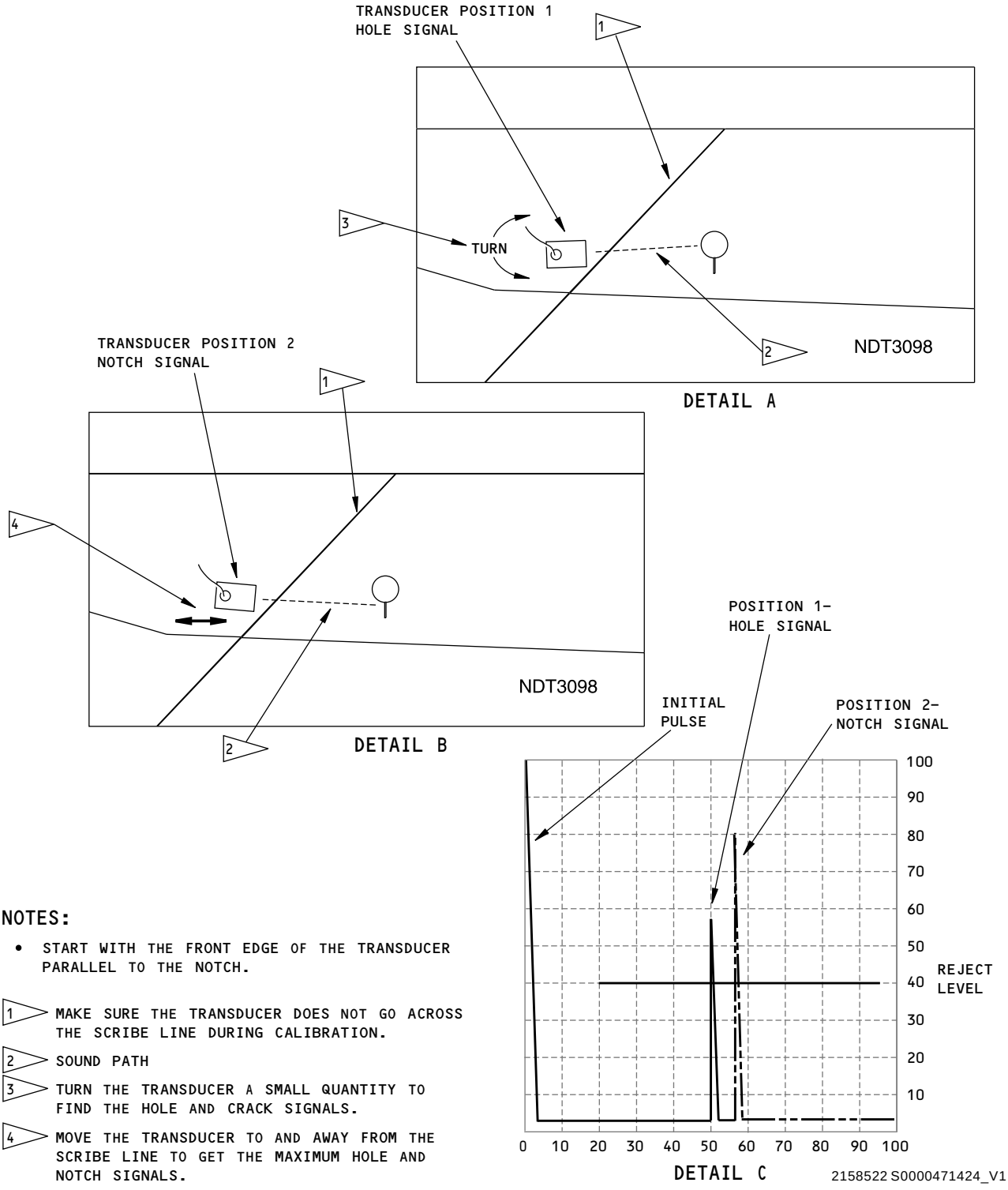
Reference Standard NDT3098
Figure 2



NOTES:

- START WITH THE FRONT EDGE OF THE TRANSDUCER PARALLEL TO THE NOTCH.

1. MAKE SURE THE TRANSDUCER DOES NOT GO ACROSS THE SCRIBE LINE DURING CALIBRATION.
2. SOUND PATH
3. TURN THE TRANSDUCER A SMALL QUANTITY TO FIND THE HOLE AND CRACK SIGNALS.
4. MOVE THE TRANSDUCER TO AND AWAY FROM THE SCRIBE LINE TO GET THE MAXIMUM HOLE AND NOTCH SIGNALS.

Instrument Calibration with Reference Standard NDT3098
Figure 3

HORIZONTAL STABILIZER CENTER SECTION - UPPER CLEVIS LUGS OF THE REAR SPAR

1. Purpose

A. Use this procedure to find cracks in the upper clevis lugs of the rear spar at the horizontal stabilizer center section. See Figure 1 for the inspection areas.

B. 737 Damage Tolerance Record (D626A001-DTR) Reference:

(1) Item: 55-10-12-2

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. Ultrasonic Instrument

(1) Use an ultrasonic instrument that:

(a) Can do a pulse echo inspection.

(b) Operates between 4 and 6 MHz.

(2) The instrument that follows was used to help prepare this procedure.

(a) Sonic 1200HR+; Olympus NW NDT Inc.

C. Transducer

(1) This procedure uses two 5 MHz angle beam transducers. The transducers that follow were used to help prepare this procedure.

(a) TEK-5129-T-1; Techna NDT

1) The transducer crystal is set at an angle to give a 30 degree refracted shear wave in titanium. Case dimensions: 1.0 inch (25 mm) long, 0.3 inch (7.6 mm) wide, 0.5 inch (12.7 mm) high at the connector end, 0.25 inch (6.4 mm) high at the opposite end, and a 2.0 inch (51 mm) radius inspection surface.

(b) TEK-5129-T-2; Techna NDT

1) The transducer crystal is set at an angle to give a 28 degree refracted shear wave in titanium. Case dimensions: 1.0 inch (25 mm) long, 0.3 inch (7.6 mm) wide, 0.5 inch (12.7 mm) high at the connector end and 0.2 inch (5.0 mm) high at the opposite end.

D. Reference Standard

(1) Use reference standard NDT3100. Refer to Figure 2 for data about this reference standard.

E. Couplant

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

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

(1) Get access to the top surface of the horizontal stabilizer.

(2) Remove the gap covers and sliding seals.

(3) Clean the areas that the probe will touch.

4. Instrument Calibration

NOTE: Two instrument calibrations are necessary to examine the clevis holes. Go to Paragraph 4.A. to calibrate the instrument to find cracks from (approximately) the vertical centerline of the hole to 30 degrees outboard of the centerline. You will have to examine the clevis from the upper and lower angled flat surfaces inboard of the hole. Go to Paragraph 4.B. to calibrate the instrument to find cracks from (approximately) the vertical centerline of the hole to 30 degrees inboard of the centerline. You will have to examine the clevis from the radius of the clevis.

A. Calibrate the instrument to examine the outboard side of the clevis lugs (see Detail 1 in Figure 3) for cracks as follows:

(1) Connect the TEK-5129-T2 transducer to the instrument.

(2) Set the instrument frequency between 4 and 6 MHz.

(3) Set the initial pulse signal to 0% of full screen width (FSW). See Figure 3, Screen Display 1.

(4) Put couplant on the reference standard in the general area of transducer positions 1 thru 3 shown in Figure 3.

(5) Put the transducer on the flat, angled surface of the reference standard so that the sound exit point is pointed at notch C and is approximately 1.1 inches (29 mm) from the vertical centerline of the hole. Move the transducer to and from the notch to get a maximum signal from the notch. Set the maximum signal from notch C at approximately 80% of FSW. See Detail 1 in Figure 3, Transducer Position 1.

NOTE: The transducer sound exit point can be different with each transducer. You will have to find the sound exit point for your transducer.

(6) Adjust the gain so the maximum signal from notch C is at 80% of full screen height (FSH).

(7) Move the transducer away from the radius of the reference standard and get a signal from center notch B. The maximum signal from notch B will occur at approximately 70% of FSW and the transducer sound exit point will be approximately 1.3 inches (34 mm) from the vertical centerline of the hole. See Detail 1 in Figure 3, Transducer Position 2.

(8) Put the transducer on the flat, angled surface of the reference standard so that the sound exit point is pointed at the reference standard hole and is 2.3 inches (60 mm) from the vertical centerline of the hole. See Detail 1 in Figure 3, Transducer Position 3.

NOTE: The hole and notch C signals will each occur at approximately 80% of FSW, but they are at different distances from the vertical centerline of the hole.

B. Calibrate the instrument to examine the inboard side of the clevis lugs (see Detail 2 in Figure 3) for cracks as follows:

(1) Do Paragraph 4.A.(1) thru Paragraph 4.A.(4) again but use transducer TEK-5129-T1. See Detail 2 in Figure 3.

(2) Put the transducer on the radius of the reference standard so that the sound exit point is approximately 1.0 inch (25 mm) from the vertical centerline of the hole. See Detail 2 in Figure 3, Transducer Position 4.

(3) Move the transducer to get a maximum signal from notch A. The maximum signal from notch A will occur at approximately 90% of FSW. See Detail 2 in Figure 3, Transducer Position 4 and Screen Display 2.

(4) Adjust the instrument gain to put the signal from the notch at 80% of FSH. See Figure 3, Screen Display 2.

5. Inspection Procedure

NOTE: It is necessary to do two inspections of the upper clevis lugs at the rear spar of the horizontal stabilizer center section. Go to Paragraph 5.A. to examine the clevis lug holes from the vertical centerline of the hole to 30 degrees outboard of the centerline. To examine this area you will have to examine the clevis from the upper and lower flat, angled surfaces. Go to Paragraph 5.B. to examine from the vertical centerline of the hole to approximately 30 degrees inboard of the centerline. To examine this area you will have to examine the clevis from the radius of the clevis.

A. Examine the outboard side of the clevis lug hole (see Figure 1 and Detail 2 in Figure 4) for cracks as follows:

NOTE: There is one pair of upper clevis lugs on each side of the rear spar for the horizontal stabilizer center section.

(1) Calibrate the instrument to examine the clevis lugs as specified in Paragraph 4.A.

(2) Start the inspection on the aft clevis lug on the left side of the rear spar. Put the transducer on the flat, angled, upper surface in the middle of the clevis lug. See Detail 1 in Figure 4, flagnote 1.

(3) Move the transducer outboard toward the hole to get a signal from the hole. Record the distance the transducer sound exit point is from the vertical centerline of the hole. See Detail 2 in Figure 4, flagnote 1.

NOTE: When you get a signal from the hole you will know that the sound has satisfactorily transmitted into the clevis lug.

(4) Put the transducer on the flat, angled, upper surface at the aft edge of the aft clevis lug so that the sound exit point is approximately 1.4 inches (35 mm) from the vertical centerline of the hole. Move the transducer outboard to examine the hole for cracks from the vertical centerline to (approximately) 30 degrees outboard of the centerline. Make sure the transducer does not extend across the edge of the clevis lug. See Details 1 and 2 in Figure 4, flagnote 2.

(5) Monitor the instrument screen display as you move the transducer. A crack indication from the vertical centerline to 30 degrees outboard of the vertical centerline can occur on the instrument screen from approximately 70 to 80% of FSW.

(6) Record the locations that cause signals to occur that are higher than 40% of FSH.

(7) Do Paragraph 5.A.(2) thru Paragraph 5.A.(6) again but on the forward side of the aft clevis lug.

(8) Do Paragraph 5.A.(2) thru Paragraph 5.A.(7) again but put the transducer on the lower surface of the aft clevis lug.

(9) Do Paragraph 5.A.(2) thru Paragraph 5.A.(8) again at the forward clevis lug.

(10) Do Paragraph 5.A.(2) thru Paragraph 5.A.(9) again but on the upper clevis lugs on the right side of the rear spar.

B. Examine the inboard side of the clevis lug hole (see Figure 1 and Detail 3 in Figure 4) for cracks as follows:

(1) Calibrate the instrument to examine the clevis lugs as specified in Paragraph 4.B.

(2) Start the inspection on the aft clevis lug on the left side of the rear spar. Put the transducer on the radius of the clevis lug along the upper surface as shown by flagnote 3 of Detail 3 in Figure 4.

(3) Move the sound exit point of the transducer up toward the clevis hole so that it is approximately 1.0 inch (25 mm) from the vertical centerline of the hole. Make sure the transducer does not extend across the edge of the clevis lug. See Detail 1, flagnote 4, and Detail 3, flagnote 3 in Figure 4.

(4) Monitor the instrument screen display as you move the transducer. A crack indication from (approximately) the vertical centerline of the hole to 30 degrees inboard of the centerline can occur on the instrument screen from approximately 80 to 90% of FSW at 40% of FSH.

(5) Record the locations that cause signals to occur that are higher than 40% of FSH.

(6) Do Paragraph 5.B.(2) thru Paragraph 5.B.(5) again but on the forward side of the aft clevis lug.

(7) Do Paragraph 5.B.(2) thru Paragraph 5.B.(6) again at the forward clevis lug.

(8) Do Paragraph 5.B.(2) thru Paragraph 5.B.(7) again but put the transducer on the lower surface of the aft clevis lug.

(9) Do Paragraph 5.B.(2) thru Paragraph 5.B.(8) again but on the upper clevis lugs on the right side of the rear spar.

6. Inspection Results

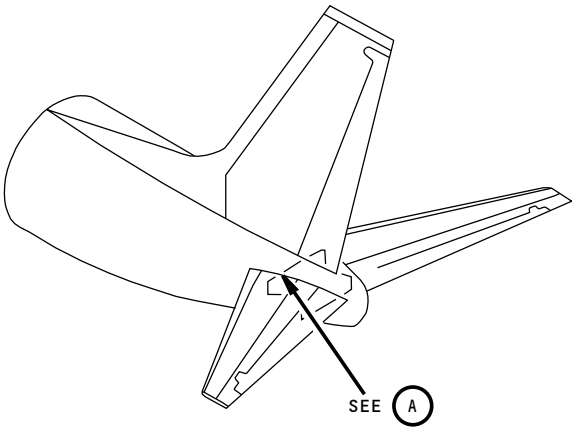
A. Locations that cause signals to occur that are 40% of FSH (or more) are locations of possible cracks and must be examined more fully.

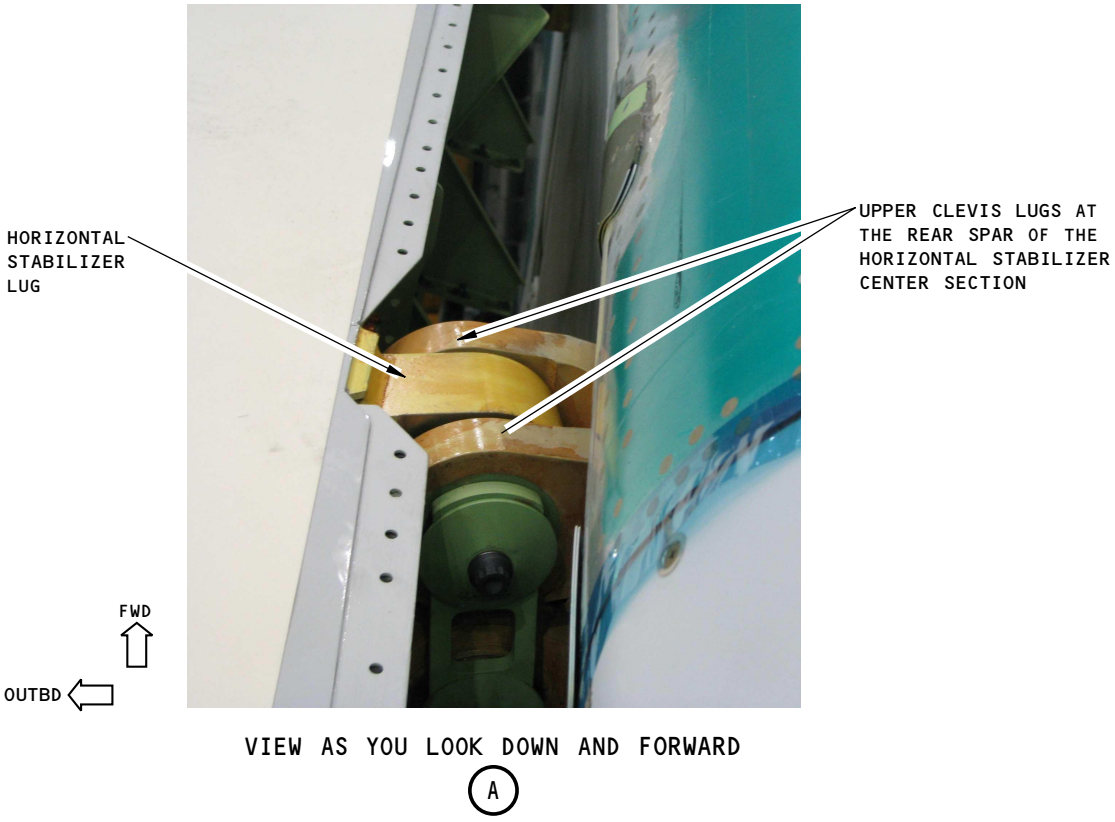
(1) Calibrate the instrument again and do the inspection again.

(2) Compare the signals that occur during the inspection to the signals you got from the reference standard.

B. To make sure that the clevis lug is cracked, do a surface eddy current inspection as follows:

(1) Remove the bolt and washer and do a surface eddy current inspection around the clevis hole as specified in Part 6, 51-00-00, Procedure 14. Use eddy current reference standard 1002, or an equivalent, with (approximately) equivalent notch dimensions.





VIEW AS YOU LOOK DOWN AND FORWARD

A

NOTES:

- THE LEFT SIDE IS SHOWN: THE RIGHT SIDE IS ALMOST THE SAME.
- EXAMINE THE UPPER CLEVIS LUGS OF THE REAR SPAR OF THE HORIZONTAL STABILIZER CENTER SECTION.

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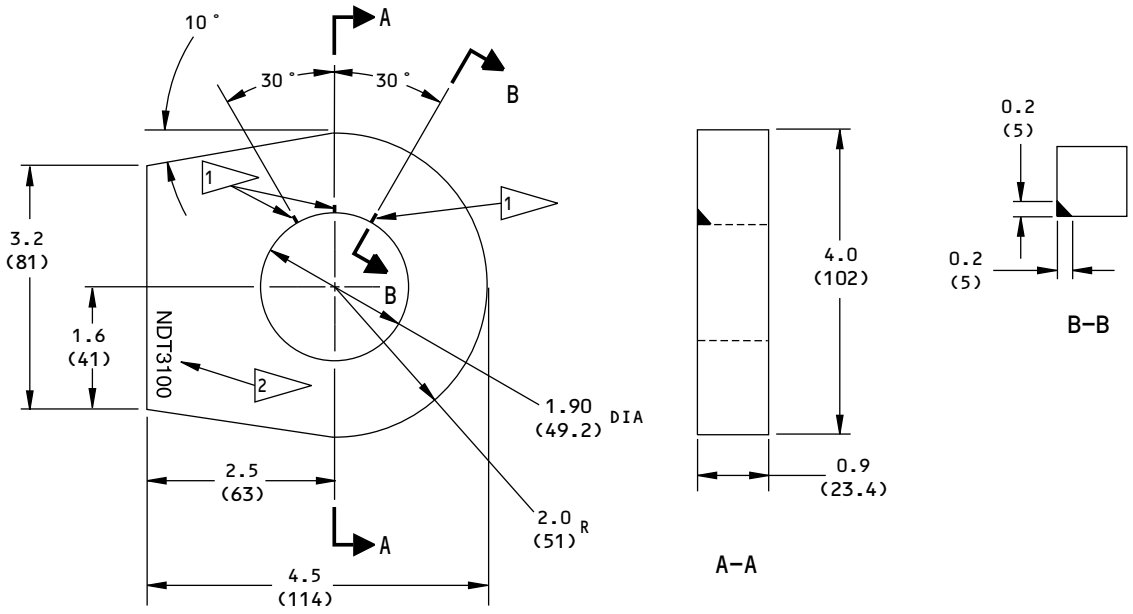
Inspection Area
Figure 1



NOTES:

- ALL DIMENSIONS ARE IN INCHES
  (MILLIMETERS ARE IN PARENTHESES)
- MATERIAL: TITANIUM 6AL-4V
- SURFACE ROUGHNESS: 63 Ra OR BETTER. INCLUDES THE HOLE
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.010
X.XX = ±0.025	X.X = ±0.05
X.X = ±0.050	X = ±1

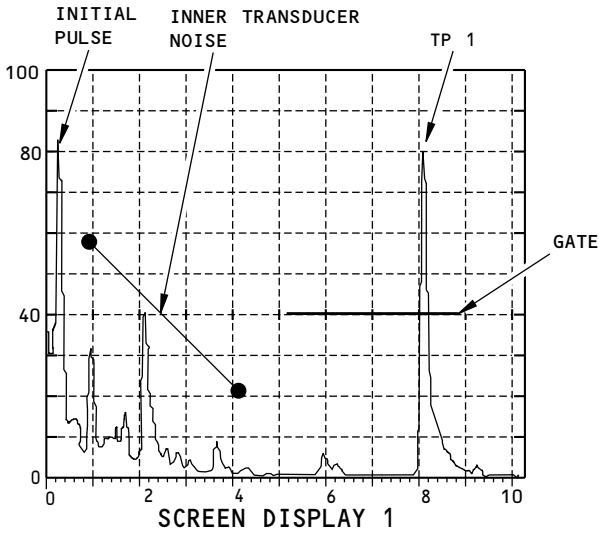
ANGULAR: ±1 DEGREE

1 CORNER EDM NOTCH 0.20 (5.0) X 0.20 (5.0): 0.015 (0.38) MAXIMUM WIDTH.
ALL 3 NOTCHES ARE ON THE SAME SIDE OF THE REFERENCE STANDARD HOLE.

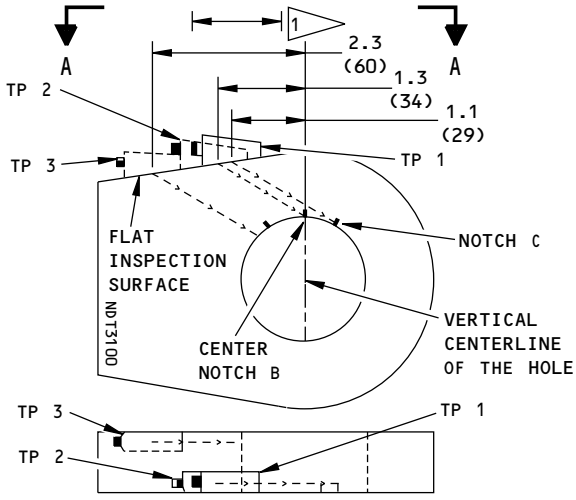
2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3100, WHERE SHOWN.

2158527 S0000471427_V1

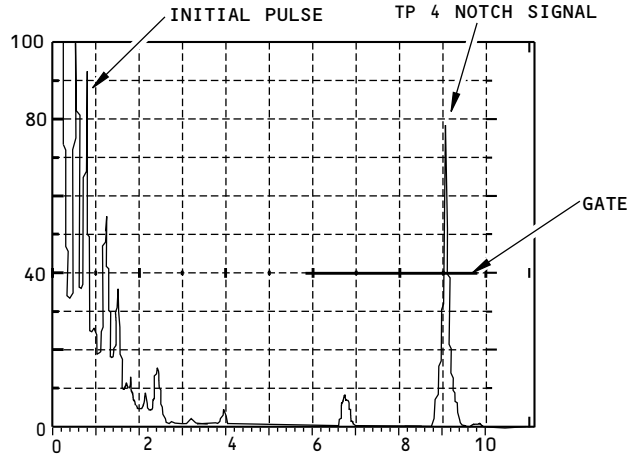
Reference Standard NDT3100
Figure 2



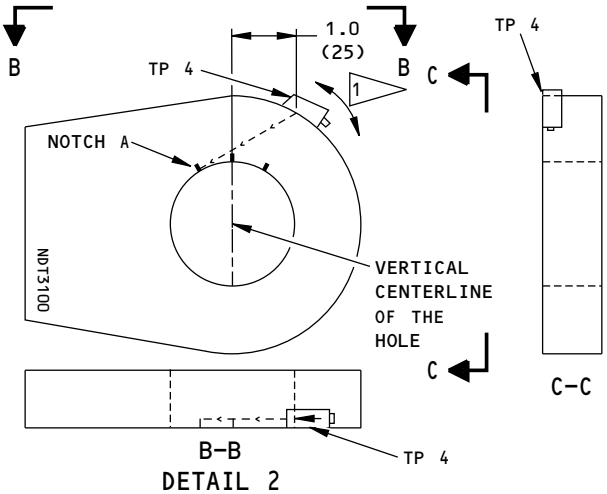
SCREEN DISPLAY 1



A–A
DETAIL 1



SCREEN DISPLAY 2



DETAIL 2

NOTES:

- TP = TRANSDUCER POSITION
- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES). ALL DIMENSIONS ARE MEASURED FROM WHERE THE SOUND EXITS THE TRANSDUCER.

INSPECTION FROM THE FLAT ANGLED SURFACE OF THE REFERENCE STANDARD:

- TRANSDUCER POSITION 1 - PUT THE TRANSDUCER AT TRANSDUCER POSITION 1. MOVE THE TRANSDUCER TOWARD THE RADIUS OF THE CLEVIS LUG TO GET A SIGNAL FROM NOTCH C.
- TRANSDUCER POSITION 2 - MOVE THE TRANSDUCER AWAY FROM THE RADIUS OF THE CLEVIS LUG TO GET A SIGNAL FROM NOTCH B.
- TRANSDUCER POSITION 3 - PUT THE TRANSDUCER AT TRANSDUCER POSITION 3. MOVE THE TRANSDUCER TOWARD THE HOLE TO GET A SIGNAL FROM THE HOLE WITH THE SOUND EXIT POINT OF THE TRANSDUCER APPROXIMATELY 2.3 INCHES (60 mm) FROM THE VERTICAL CENTERLINE OF THE HOLE.

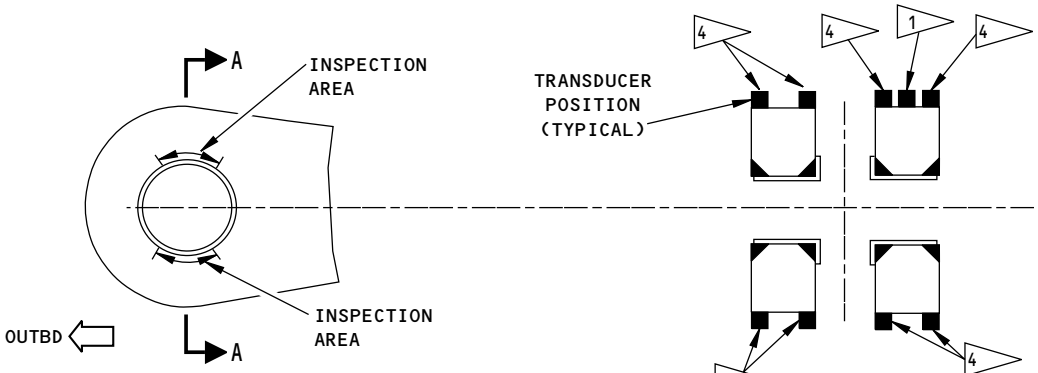
INSPECTION FROM THE RADIUS OF THE REFERENCE STANDARD:

- TRANSDUCER POSITION 4 - PUT THE TRANSDUCER AT TRANSDUCER POSITION 4. MOVE THE TRANSDUCER A SHORT DISTANCE TO GET A SIGNAL FROM NOTCH A (THE FARTHEST NOTCH FROM THE RADIUS).
- SOUND BEAM DIRECTION – – > – – > – – > –

1> TRANSDUCER SCAN DISTANCE

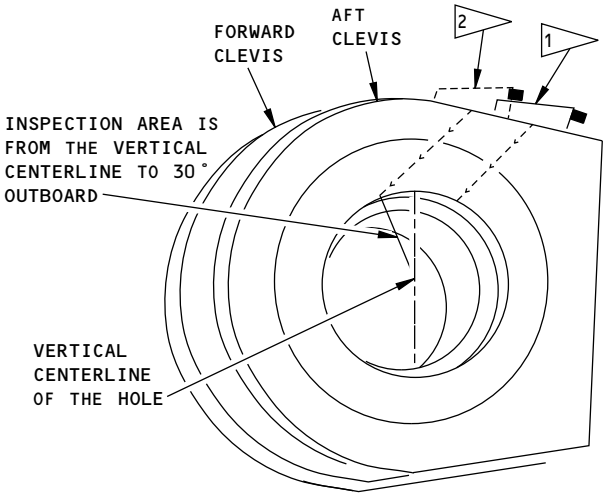
2158528 S0000471428_V1

Instrument Calibration
Figure 3



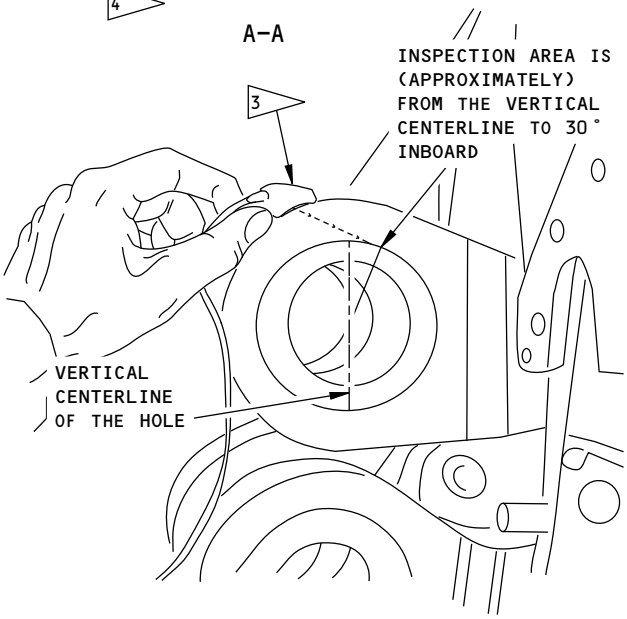
FORWARD AND AFT CLEVIS LUGS
DETAIL 1

A–A



(VIEW LOOKS FORWARD)
INSPECTION FROM THE TOP AND BOTTOM SIDES OF THE CLEVIS LUGS

DETAIL 2



(VIEW LOOKS FORWARD)
INSPECTION FROM THE RADIUS

DETAIL 3

NOTES:

- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS ALMOST THE SAME.
- THE HORIZONTAL STABILIZER HAS BEEN REMOVED FOR A GOOD VIEW OF WHERE TO PUT THE TRANSDUCERS.

1 PUT THE TRANSDUCER IN THE MIDDLE OF THE AFT CLEVIS LUG. MOVE THE TRANSDUCER A SHORT DISTANCE OUTBOARD AND INBOARD TO GET A SIGNAL FROM THE HOLE.

2 PUT THE TRANSDUCER ON THE AFT SIDE OF THE AFT CLEVIS LUG. MOVE THE TRANSDUCER OUTBOARD TO EXAMINE THE CLEVIS HOLE FROM THE VERTICAL CENTERLINE OF THE HOLE TO 30 DEGREES OUTBOARD.

3 PUT THE TRANSDUCER ON THE AFT CLEVIS RADIUS. MOVE THE TRANSDUCER INBOARD TO EXAMINE THE CLEVIS HOLE FROM (APPROXIMATELY) THE VERTICAL CENTERLINE OF THE HOLE TO 30 DEGREES INBOARD OF THE CENTERLINE.

4 THE TRANSDUCER MUST NOT EXTEND ACROSS THE CLEVIS EDGE WHEN YOU EXAMINE ALL 8 INSPECTION AREAS.

– – > – – > – – > – SOUND BEAM

2158529 S0000471429_V1

Clevis Lug Inspection at the Rear Spar of the Horizontal Stablizer Center Section
Figure 4

HORIZONTAL STABILIZER CENTER SECTION - UPPER AND LOWER CHORDS OF THE THRUST BEAMS

1. Purpose

A. To examine the upper and lower chords of the thrust beams for cracks that can occur at fastener holes in the thrust-beam-to-thrust-beam joint of the horizontal stabilizer center section. A total of 16 fastener locations are examined; 8 in the upper chords of the thrust beams, and 8 in the lower chords of the thrust beams. See Figure 1 for the inspection areas.

B. 737 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-14-6

2. Equipment

A. General

(1) Use ultrasonic 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 – Use an ultrasonic instrument that can:

(1) Operate in the frequency range of 4 to 6 MHz.

(2) Be calibrated as specified in the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

(a) USN60; Krautkramer

(b) Masterscan 380; Sonatest

C. Transducer – Use a 5 MHz transducer that can put a 70 degree shear wave into aluminum. The distance between the sound exit point of the transducer and the front edge of the transducer must be no more than 0.42 inches (10.7 mm). The transducers that follow were used to help prepare this procedure.

(1) 57A3066; Staveley Sensors

(2) SU 570AS; NDT Engineering Corp.

D. Reference Standard – Use reference standard NDT3107. See Figure 2 for data about the reference standard.

E. Couplant – Use an ultrasonic couplant that will not damage the airplane.

3. Prepare for the Inspection

A. Identify and clean the inspection area shown in Figure 1.

B. If necessary, smooth the paint in the inspection areas to get a flat surface for the transducer.

4. Instrument Calibration

NOTE: The reference standard has a scribe line on the top and bottom surfaces. This scribe line shows where the edge of the splice plate is in relation to the fastener holes in the inspection area. The splice plate will not let the transducer get nearer to the fastener holes to be examined.

A. Set the instrument frequency to 5 MHz or a frequency range that includes 5 MHz.

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

C. Move the transducer as necessary to get a maximum signal from the top of the hole.

D. Adjust the range and delay controls to set the initial pulse signal at 0% of full screen width (FSW) and the maximum signal from the hole at 70% of FSW as shown in Detail II in Figure 3.

NOTE: When you set the signals to a specified location on the instrument display, always use the front edge of the signal.

E. Slowly turn the transducer to TP2 as shown in Detail I in Figure 3 and get a maximum signal from the reference notch. The signal from the reference notch will occur to the right of the hole signal at approximately 75% of FSW. As you turn the transducer from TP1 to TP2, see that the signal from the hole decreases in full screen height (FSH) as the signal from the reference notch increases in FSH.

F. Adjust the gain to set the maximum signal from the reference notch at 80% of FSH as shown in Detail III in Figure 3.

G. Put the top surface of the reference standard down, so the reference notch is on the far side as shown in Detail IV in Figure 3.

H. Put couplant and then the transducer at TP3 as shown in Detail IV in Figure 3 and move the transducer as necessary to get a signal from the bottom of the hole. Do not adjust the gain. The signal from the hole will come into view at approximately 35% of FSW as shown in Detail V in Figure 3.

I. Slowly turn the transducer to TP4 as shown in Detail IV in Figure 3 and get a maximum signal from the reference notch. This signal will come into view at approximately 40% of FSW as shown in Detail VI in Figure 3. If the maximum signal from the reference notch is more than 80% of FSH, then the instrument calibration is done. If the maximum signal from the reference notch is less than 80% of FSH, then adjust the gain to set the maximum signal at 80% of FSH.

J. If the gain was adjusted in Paragraph 4.I., do a check of the instrument sensitivity with the transducer back at TP2 (with the top surface of the reference standard up) to make sure the maximum signal from the reference notch is at 80% or more of FSH. If more gain is necessary, do Paragraph 4.I. and Paragraph 4.J. again until the minimum FSH of the two signals is 80%.

K. Add 6 dB and make a record of the total quantity of instrument gain.

5. Inspection Procedure

NOTE: The top and bottom surfaces of each thrust beam chord must be examined at the applicable fastener hole locations. Thus, two different scans of each fastener hole are necessary to fully examine each fastener hole.

A. Put couplant on the upper chord of the thrust beam at the transducer contact surfaces shown in Figure 1, View A.

B. Put the transducer on the upper chord of the thrust beam, adjacent to one of the fastener locations to examine as shown by flagnote 2 in Figure 1.

C. Move the transducer as necessary to get a maximum signal from the top surface of the fastener hole. The maximum signal from the hole will occur at approximately 70% of FSW.

NOTE: If you cannot easily see the signal from the hole, add gain as necessary to set the signal from the top of the fastener hole at 35% or more of FSH. Set the instrument gain back to the quantity recorded in Paragraph 4.K. before you examine a different fastener hole location.

D. Turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero% of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal. Refer to Paragraph 6. to make an analysis of all possible crack signals.

E. Do Paragraph 5.D. again but examine the other side of the hole.

F. At this same fastener location, put the transducer near the splice plate as shown by flagnote 3 in Figure 1 and move the transducer as necessary to get a maximum signal from the bottom surface of the fastener hole. Turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero percent of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal. Refer to Paragraph 6. to make an analysis of all possible crack signals.

G. Do Paragraph 5.F. again but examine the other side of the hole.

H. Do Paragraph 5.A. thru Paragraph 5.G. at each fastener location in the upper chords of the thrust beams that must be examined. See Figure 1.

I. Do Paragraph 5.A. thru Paragraph 5.H. at each fastener location in the lower chords of the thrust beams that must be examined. See Figure 1.

6. Inspection Results

A. Signals that are 40% (or more) of FSH that occur at the screen locations that follow are possible crack signals that must be examined more fully.

(1) Between the signal from the bottom surface of the fastener hole (approximately 35% of FSW) and 45% of FSW (10% of FSW from where the hole signal occurs).

(2) Between the signal from the top surface of the fastener hole (approximately 70% of FSW) and 80% of FSW.

NOTE: You can remove the 6 dB that was added in Paragraph 4.K. to make an analysis of possible crack signals if the thrust beam is painted with primer only.

B. See if the signal is caused by couplant on the part surface as follows:

(1) Get a maximum signal from the possible crack and keep the transducer at that location.

(2) Remove all couplant between the front of the transducer and the inspection area.

(3) If the signal goes away, no more analysis is necessary. If the signal stays, go to Paragraph 6.C. and continue to make an analysis of the possible crack signal.

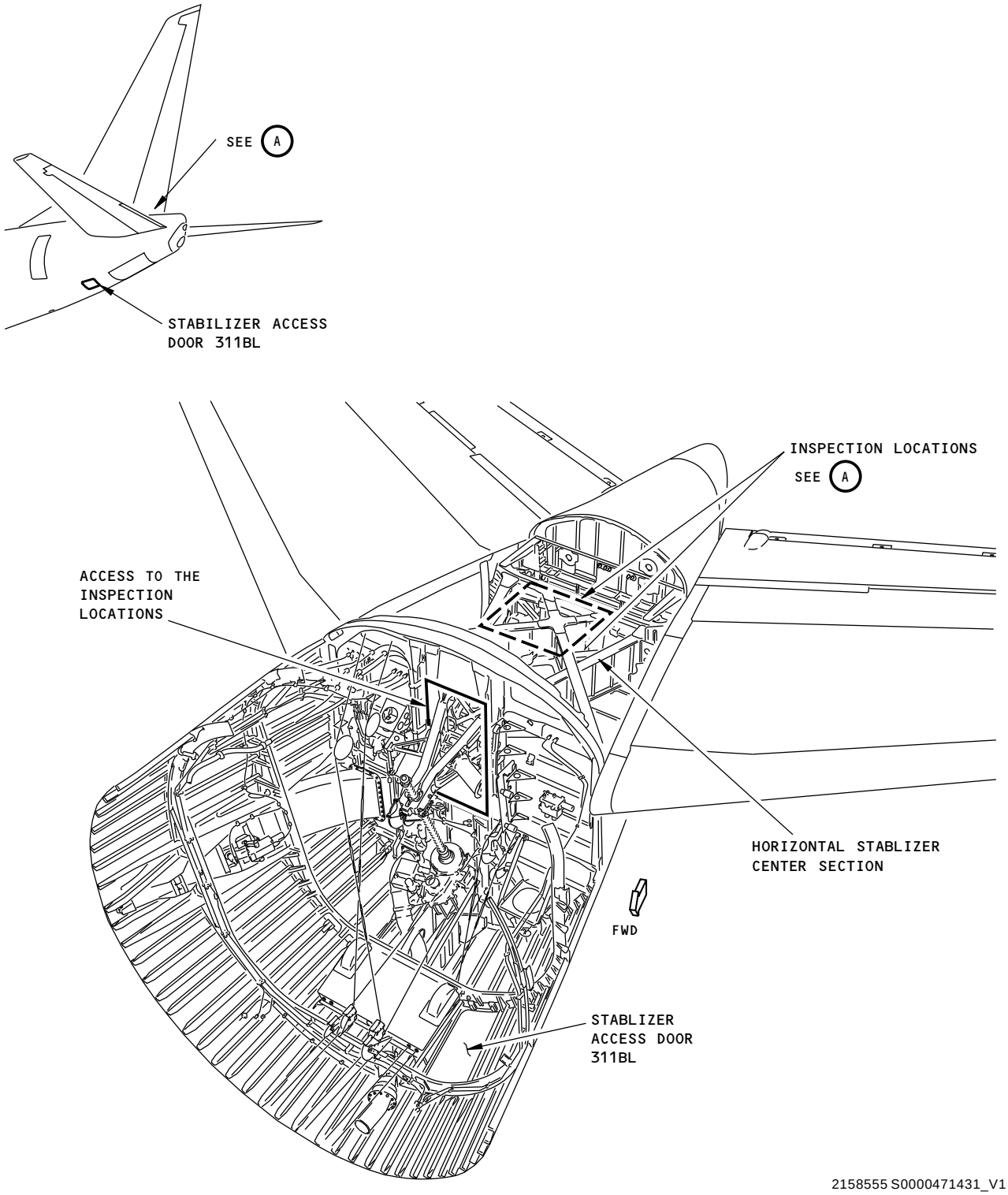
C. Compare the possible crack signal to the signal that you get from the notch in the reference standard. Use the same distance between the transducer and the fastener hole that you had on the airplane when the possible crack signal occurred. A signal from a crack can occur nearer to the signal from the fastener hole, or farther from the signal from the fastener hole by a small distance. This will only occur when it is not possible to put the transducer in a position that is 90 degrees to the crack.

D. 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 make an analysis of the possible crack signals again. Go to Paragraph 6.F. and continue to make an analysis of possible crack signals that are 40% or more of FSH.

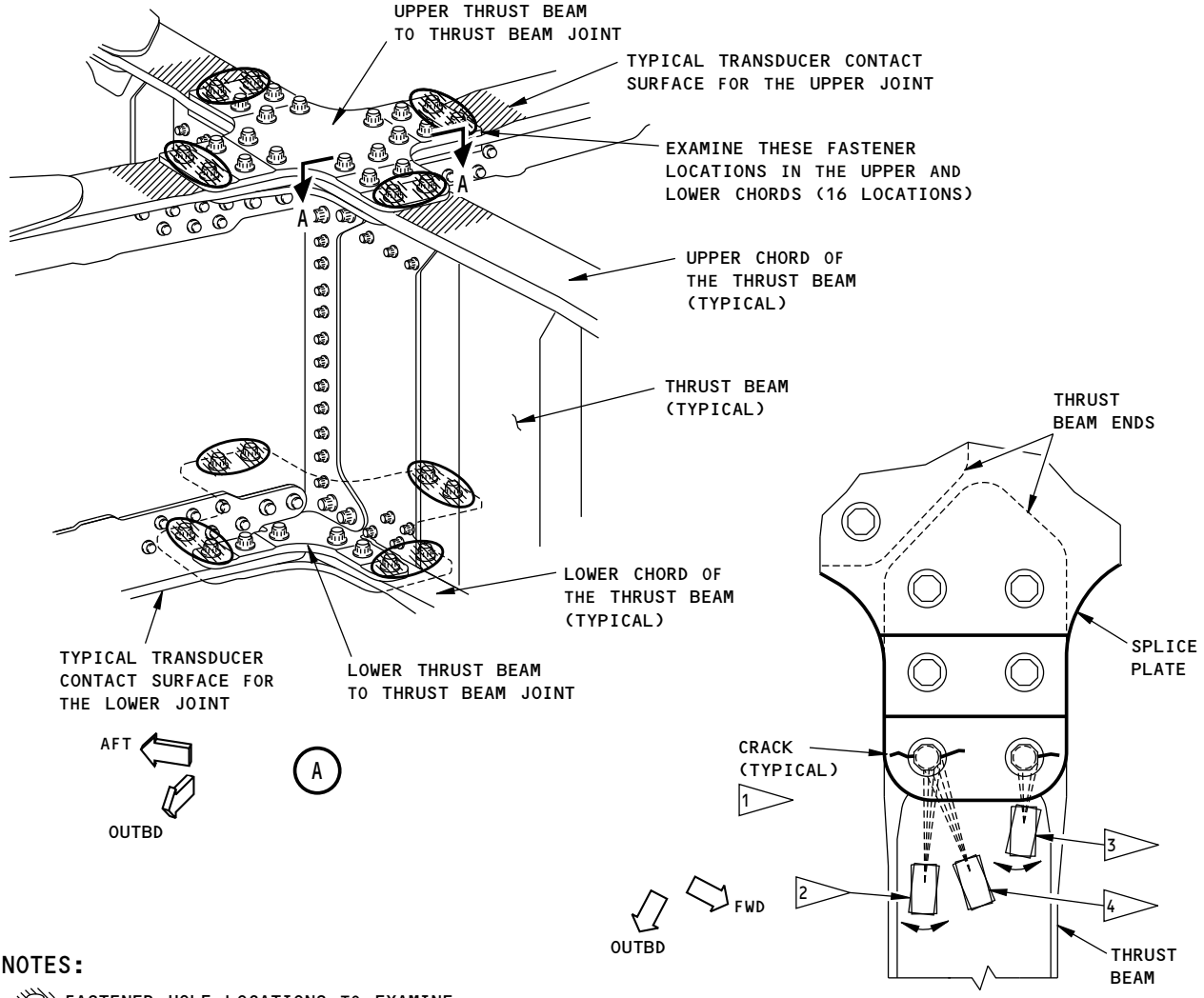
E. At fastener holes where possible crack signals occur that are less than 40% of FSH, do more scans of these fastener holes at different angular directions as shown in Figure 1, flagnote 4. This can only be done where there is sufficient access. Do the instructions given in Paragraph 6.F. to make an analysis of possible crack signals that are 40% or more of FSH.

NOTE: It is very possible that cracks that are smaller than the reference notch will not have a signal that is more than 40% of FSH. Thus, make a careful record of all possible cracks that are less than 40% of FSH and report this data to your Engineering group.

F. Remove the fastener and do an open hole eddy current inspection, as specified in Part 6, 51-00-00, Procedure 16, to make sure there is a crack.



Inspection Area
Figure 1 (Sheet 1 of 2)



A-A
(TYPICAL)

NOTES:

FASTENER HOLE LOCATIONS TO EXAMINE. EIGHT LOCATIONS IN THE UPPER JOINT, AND EIGHT LOCATIONS IN THE LOWER JOINT.

TRANSDUCER CONTACT SURFACE. THIS IS THE SAME FOR THE LOWER CHORD.

1 THE DIRECTION THAT CRACKS CAN GROW. IT IS POSSIBLE FOR CRACKS TO GROW DIFFERENTLY BY A SMALL AMOUNT. THUS, AT FASTENER HOLE LOCATIONS WHERE A POSSIBLE CRACK SIGNAL OCCURS, EXAMINE THE FASTENER HOLE AT DIFFERENT ANGULAR DIRECTIONS. SEE FLAG NOTE 4.

2 THE APPROXIMATE TRANSDUCER LOCATION TO EXAMINE THE TOP SURFACE OF THE FASTENER HOLE. THIS TRANSDUCER POSITION WILL BE ALMOST THE SAME AS THE TP1 POSITION THAT WAS USED DURING THE INSTRUMENT CALIBRATION.

3 THE APPROXIMATE TRANSDUCER LOCATION TO EXAMINE THE BOTTOM SURFACE OF THE FASTENER HOLE. THIS TRANSDUCER POSITION WILL BE ALMOST THE SAME AS THE TP3 POSITION THAT WAS USED DURING THE INSTRUMENT CALIBRATION.

4 AT EACH FASTENER LOCATION WHERE A POSSIBLE CRACK SIGNAL OCCURS, MAKE MORE SCANS AT DIFFERENT LOCATIONS. AN INSPECTION OF THE UPPER SURFACE OF THE FASTENER HOLE IS SHOWN. THE TRANSDUCER WILL BE NEAR THE SPLICE PLATE TO EXAMINE THE LOWER SURFACE OF THE FASTENER HOLE.

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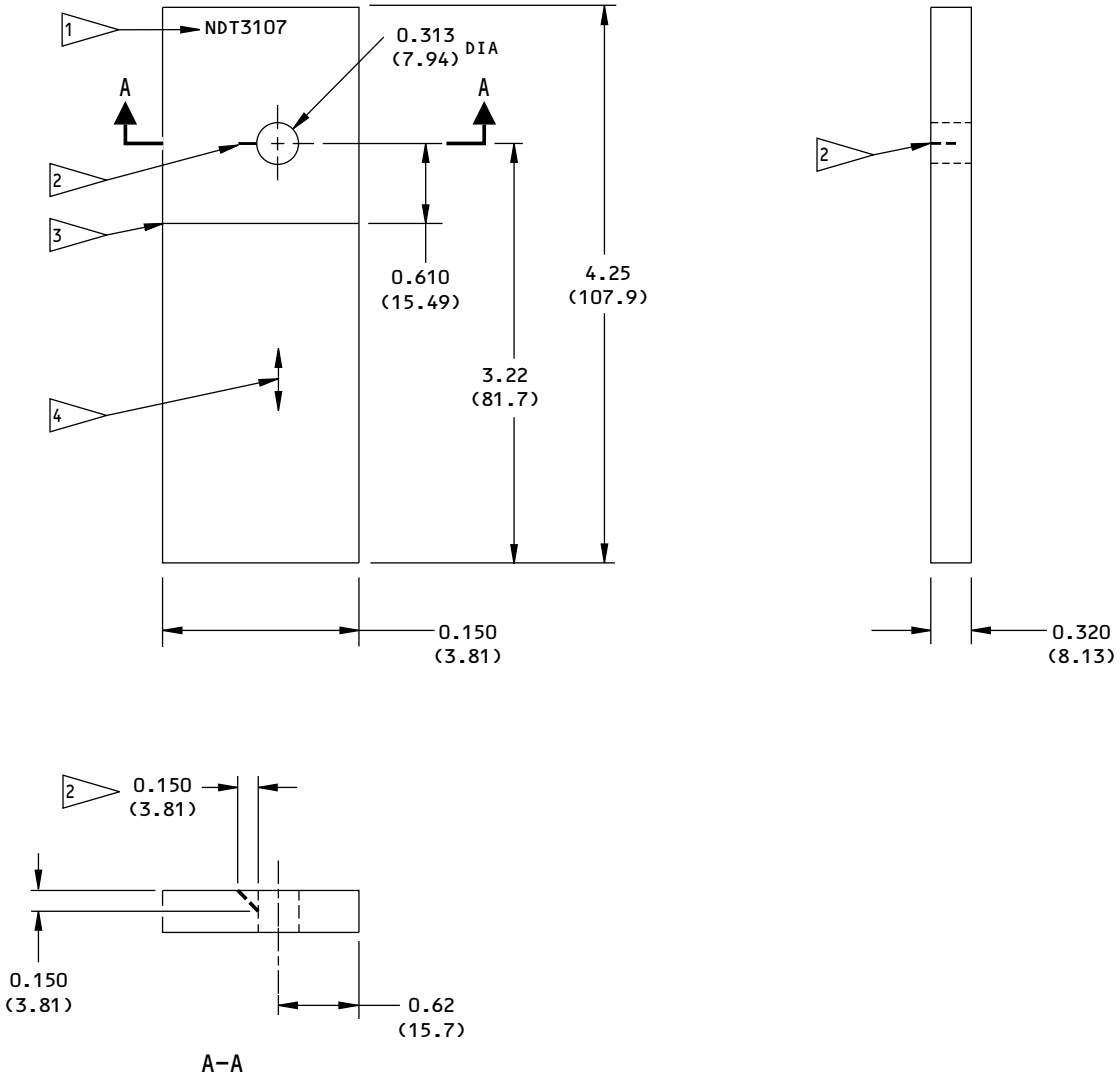
Inspection Area
Figure 1 (Sheet 2 of 2)



NOTES:

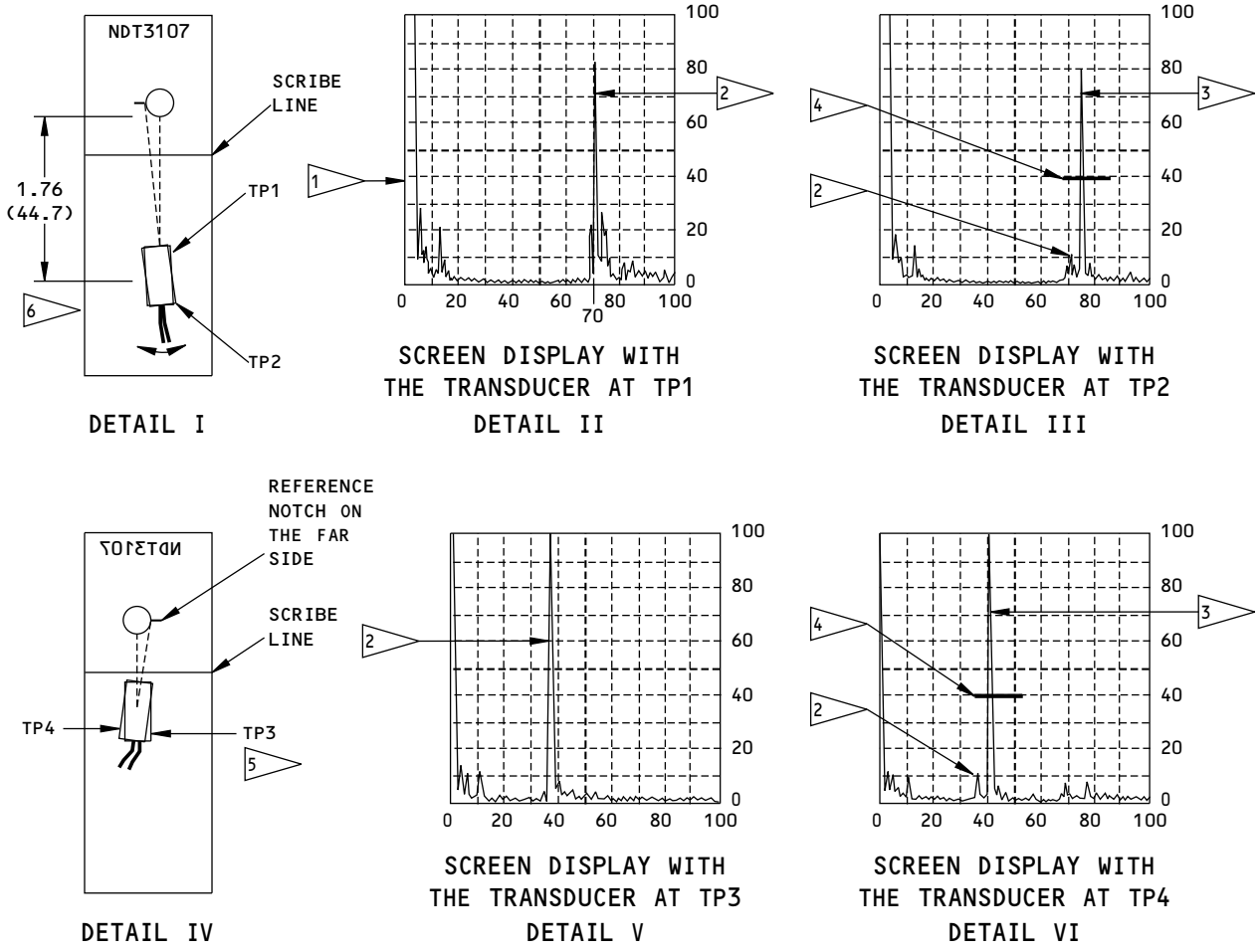
- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T6 OR 2024 ALUMINUM
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

INCHES	MILLIMETERS	ANGULAR
X.XXX = ± 0.005	X.XX = ± 0.10	± 1 °
X.XX = ± 0.025	X.X = ± 0.05	
X.X = ± 0.050	X = ± 1	

1. ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3107, AT APPROXIMATELY THIS LOCATION
2. EDM CORNER NOTCH (NEAR SURFACE): 0.150 (3.81) X 0.150 (3.81) X 0.007 (0.18) WIDE (±0.002 (0.05))
3. SCRIBE THIS LINE ON THE UPPER AND LOWER SURFACES TO A MAXIMUM DEPTH OF 0.005 (0.13)
4. GRAIN DIRECTION

2158560 S0000471433_V1

Reference Standard NDT3107
Figure 2



NOTES:

- TP = TRANSDUCER POSITION
- THE SCRIBE LINES SHOW WHERE THE EDGE OF THE SPLICE PLATE IS IN RELATION TO THE FASTENER HOLES. DO NOT MOVE THE TRANSDUCER ACROSS THIS LINE DURING THE INSTRUMENT CALIBRATION.
- IN DETAIL IV, THE NOTCH IN THE REFERENCE STANDARD IS ON THE FAR SIDE.

1. INITIAL PULSE SIGNAL (TYPICAL)
2. SIGNAL FROM THE HOLE.
3. SIGNAL FROM THE REFERENCE NOTCH.
4. REJECT LEVEL AND APPROXIMATE LOCATION WHERE CRACK SIGNALS CAN OCCUR (PLUS 10% OF FSW FROM WHERE THE HOLE SIGNAL OCCURS).
5. THE LOCATION OF THE TRANSDUCER WHEN THE MAXIMUM SIGNAL FROM THE HOLE OCCURS CAN BE DIFFERENT FOR DIFFERENT TRANSDUCERS. IF THE SIGNAL FROM THE HOLE CONTINUES TO INCREASE WHEN THE TRANSDUCER GETS TO THE SCRIBE LINE, THEN KEEP THE TRANSDUCER AT THE SCRIBE LINE OR USE A DIFFERENT TRANSDUCER.
6. THE SURFACE DISTANCE DIMENSION IS MEASURED FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE NEAR SURFACE OF THE HOLE. THIS DIMENSION IS FOR A TRANSDUCER THAT PUTS THE SOUND INTO THE PART AT 70 DEGREES. THIS DIMENSION WILL BE DIFFERENT BY A SMALL AMOUNT FOR TRANSDUCERS THAT ARE NOT EXACTLY 70 DEGREES.

2158561 S0000471434_V1

Instrument Calibration
Figure 3

HORIZONTAL STABILIZER CENTER SECTION - THRUST BEAM CHORD AT THE PRIMARY BEAM JOINT

1. Purpose

A. To examine the thrust beam chord for cracks that can occur at fastener holes in the thrust-beam-to-primary-beam joint of the horizontal stabilizer center section. There are two thrust-beam-to-primary-beam joints to examine. Each joint has 8 fastener locations to examine; four at the upper chord of the thrust beam, and four at the lower chord of the thrust beam. See Figure 1 for the inspection location.

B. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) (D626A001 DTR) Check Form Reference:

(1) Item: 55-10-14-8

2. Equipment

A. General

(1) Use ultrasonic 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 - Use an ultrasonic instrument that can:

(1) Operate in the frequency range of 4 to 6 MHz.

(2) Be calibrated as specified in the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

(a) Phasor XS; GE Inspection Technologies

(b) Masterscan 380; Sonatest

C. Transducer - Use a 5 MHz transducer that can put a 70 degree shear wave into aluminum. The transducer that follows was used to help prepare this procedure.

(1) SUSM 570AT, 5 MHz; NDT Engineering Corp.

D. Reference Standard - Use reference standard NDT3102. See Figure 2 for data about the reference standard.

E. Couplant - Use an ultrasonic couplant that will not damage the airplane.

3. Prepare for the Inspection

A. Get access to the inspection area.

B. Identify and clean the inspection area shown in Figure 1.

C. If necessary, smooth the paint in the inspection areas to get a flat surface for the transducer.

4. Instrument Calibration

NOTE: The reference standard has two scribe lines on the top and bottom surfaces. The horizontal scribe line shows where the radius begins at the outer edges of the thrust beam and will prevent movement of the transducer in that direction. The other scribe line is used to help align the transducer to the hole and position the transducer at 90 degrees to the reference notch.

A. Set the instrument frequency to 5 MHz or a frequency range that includes 5 MHz.

B. Put couplant and then the transducer on the reference standard at transducer position 1 (TP1). Use the scribe line to help set the transducer at approximately 90 degrees to the reference notch as shown in Detail I in Figure 3.

C. Move the transducer to or away from the hole to get a maximum signal from the top edge of the hole.

D. Adjust the instrument controls to set the initial pulse at 0% of full screen width (FSW) and the maximum signal from the top edge of the hole at 70% of FSW. Refer to Detail II in Figure 3. Always use the front edge of ultrasonic signals to set them at a specified location on the instrument display.

NOTE: If the transducer interface signal can be clearly seen, this signal can be used as an alternative to the initial pulse signal. Thus, you would set the transducer interface signal at 0% of FSW and the maximum signal from the top edge of the hole at 70% of FSW. This will give a calibrated screen display.

E. Slowly turn the transducer to TP2 to get a maximum signal from the reference notch. See Detail I in Figure 3. Do not move the transducer to or away from the hole when you do this. The signal from the reference notch will occur to the right of the hole signal at approximately 75 percent of FSW. As you turn the transducer from TP1 to TP2, see that the signal from the hole decreases in full screen height (FSH) as the signal from the reference notch increases in FSH.

F. With the transducer at TP2, adjust the gain to set the maximum signal from the reference notch to 80 percent of FSH as shown in Detail III in Figure 3 and make a temporary record of the gain that is used.

G. Adjust the reference standard so the bottom surface is up, as shown in Detail IV in Figure 3.

H. Put couplant and then the transducer at TP3 as shown in Detail IV in Figure 3. Use the scribe line to help set the transducer at approximately 90 degrees to the reference notch.

I. Move the transducer as necessary to get a signal from the bottom edge of the hole. The maximum signal from the bottom edge of the hole will occur at approximately 40 percent of FSW as shown in Detail V in Figure 3. It will be necessary to remove some gain to see this signal at a maximum FSH. Make a temporary mark on the instrument screen (or make a record) of the FSW location where this hole signal occurs. If the gain was changed, be sure to set the gain back to the quantity used in Paragraph 4.F.

NOTE: If the transducer interface signal was used to set the screen calibration in Paragraph 4.D. NOTE, then the maximum signal from the bottom edge of the hole will occur at approximately 35% of FSW. Thus, the signal from the reference notch will occur at approximately 40% of FSW.

J. Slowly turn the transducer to TP4 as shown in Detail IV in Figure 3 and get a maximum signal from the reference notch. Do not adjust the gain. This signal will come into view at approximately 45 percent of FSW as shown in Detail VI in Figure 3 and will be higher than 80 percent of FSH.

K. Add 6 dB and make a record of the instrument gain.

5. Inspection Procedure

NOTE: The thrust beam chord must be examined to find cracks on the near and far sides of the thrust beam chord at each of the applicable fastener hole locations. Thus, two different scans of each fastener hole are necessary to fully examine each fastener hole.

A. Put couplant on the upper chord of the thrust beam at the transducer contact surface shown in Figure 4, View A-A.

B. Put the transducer on the upper chord of the thrust beam, adjacent to one of the fastener locations to examine. Align the transducer so that it is pointed 90 degrees to the direction that cracks can grow as shown in Figure 4, View A-A, flagnote 2.

C. Move the transducer as necessary to get a maximum signal from the top surface of the fastener hole. The signal will occur at approximately 70 percent of FSW.

NOTE: If you cannot easily see the signal from the hole, add gain as necessary to set the signal at 30 percent of FSH. If you add gain, make sure that you set the instrument gain back to the quantity recorded in Paragraph 4.K. before you examine subsequent fastener holes.

D. Turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero percent of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

E. Do Paragraph 5.D. again but examine the other side of the hole.

F. At this same fastener location, put the transducer nearer the hole as shown in Figure 4, flagnote 3 and move the transducer as necessary to get a maximum signal from the bottom surface of the fastener hole. Turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero percent of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

G. Do Paragraph 5.F. again but examine the other side of the hole.

H. Do Paragraph 5.A. thru Paragraph 5.G. at each of the fastener locations that remain to be examined (see Figure 4).

I. Do Paragraph 5.A. thru Paragraph 5.H. at each fastener location in the lower chords of the thrust beams that must be examined (see Figure 4).

6. Inspection Results

A. Signals that are equal to or more than 40 percent of FSH and occur at the FSW locations that follow, are possible crack signals that must be examined more fully.

(1) Between the signal from the top surface of the fastener hole (approximately 70 percent of FSW) and 80 percent of FSW.

(2) Between the signal from the bottom surface of the fastener hole (approximately 35 percent of FSW) and 45 percent of FSW.

NOTE: You can remove the 6 dB that was added in Paragraph 4.K. to help make an analysis of possible crack signals if the thrust beam has the original paint.

B. Identify if the crack signal is caused by couplant on the part surface as follows:

(1) Get a maximum signal from the possible crack and keep the transducer at that location.

(2) Remove all couplant between the front of the transducer and the inspection area.

(3) If the signal goes away, no more analysis is necessary. If the signal continues to stay, go to Paragraph 6.C. and continue to make an analysis of the possible crack signal.

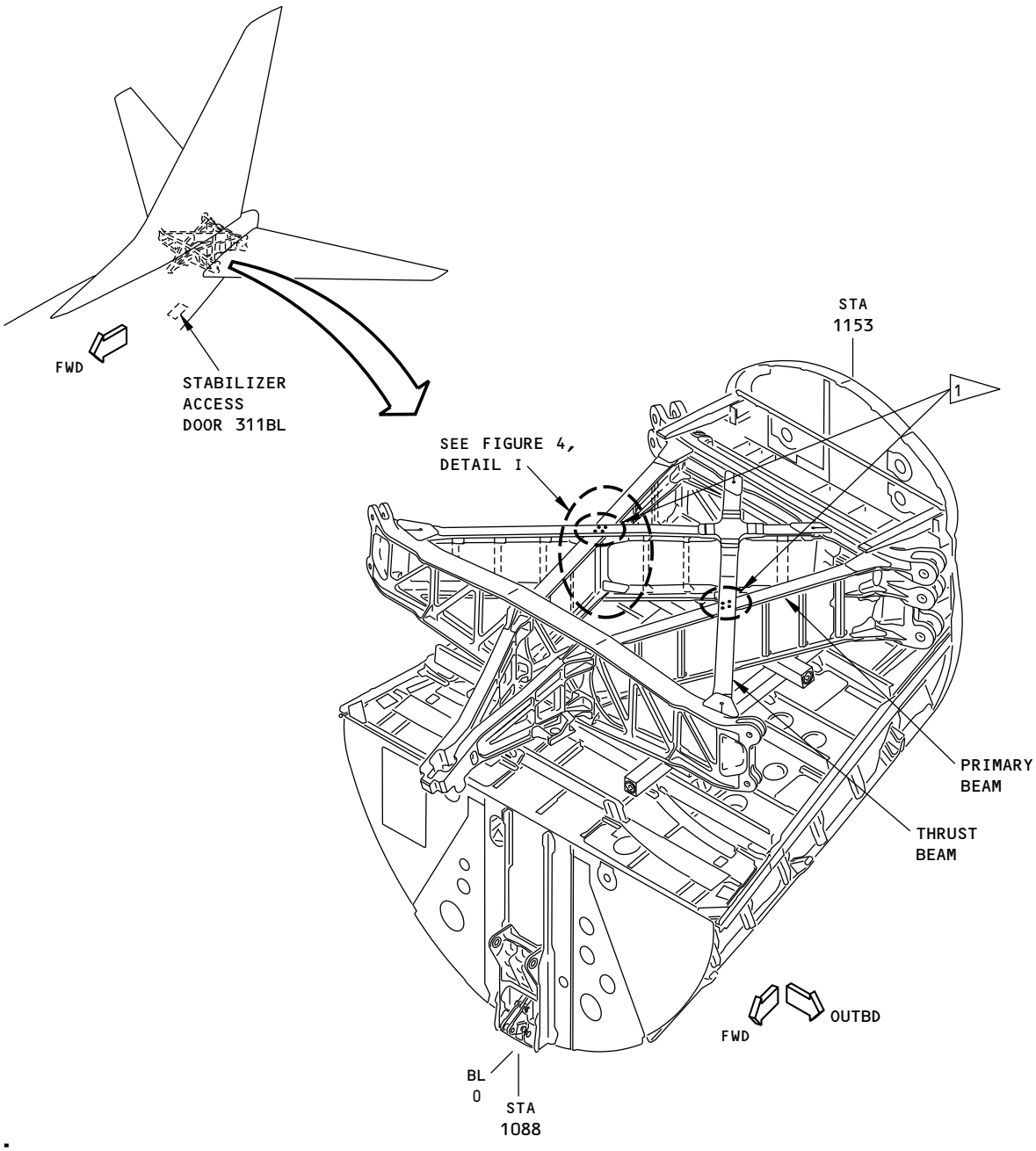
C. Compare the possible crack signal to the signal that you get from the notch in the reference standard. Use the same distance between the transducer and the fastener hole that you had on the airplane when the possible crack signal occurred. A signal from a crack can occur at a FSW location that is nearer to or farther from the signal from the fastener hole by a small distance on the screen display.

D. 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 make an analysis of the possible crack signals again. Go to Paragraph 6.F. and continue to make an analysis of possible crack signals that are 40 percent or more of FSH.

E. At fastener holes where possible crack signals occur that are less than 40 percent of FSH, do more scans of these fastener holes at different angular directions as shown in Figure 4, flagnote 4. This can only be done where there is sufficient access. Do the instructions given in Paragraph 6.F. to make an analysis of possible crack signals that are 40 percent or more of FSH.

NOTE: It is very possible that cracks that are smaller than the reference notch will not have a signal that is more than 40 percent of FSH. Thus, make a careful record of all possible cracks that are less than 40 percent of FSH and report this to your Engineering group.

F. Remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 11 to make sure there is a crack.

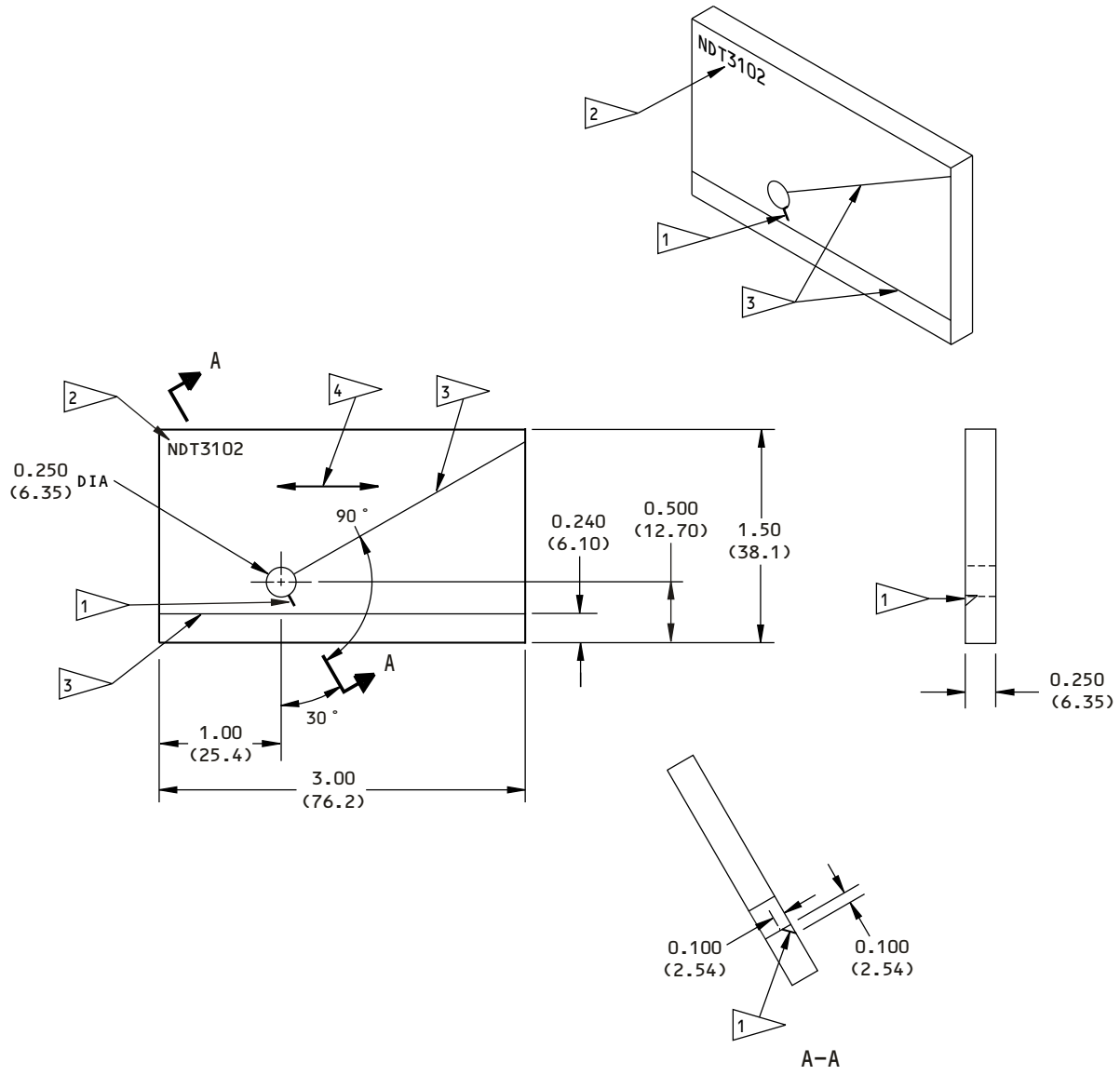


NOTES:

1 THE UPPER CHORD OF THE THRUST BEAM IS EXAMINED AT THESE TWO THRUST-BEAM-TO-PRIMARY-BEAM JOINTS. EACH JOINT HAS EIGHT FASTENER HOLES TO EXAMINE (4 FASTENER HOLES ARE AT THE UPPER CHORD AND 4 ARE AT THE LOWER CHORD AT EACH THRUST BEAM LOCATION). A TOTAL OF 16 FASTENER HOLES ARE EXAMINED DURING THIS INSPECTION. SEE FIGURE 4 FOR MORE DETAILS.

2158562 S0000471438_V1

Inspection Location
Figure 1



NOTES:

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

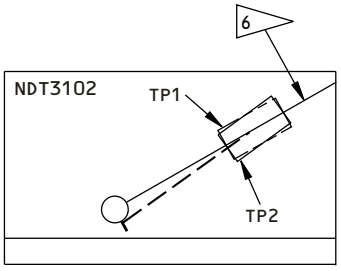
INCHES	MILLIMETERS	ANGULAR
X.XXX = ±0.005	X.XX = ±0.10	± 1 °
X.XX = ±0.025	X.X = ±0.5	
X.X = ±0.050	X = ±1	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T6 OR 2024 ALUMINUM

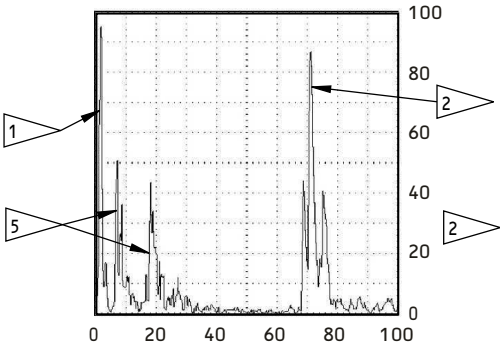
1. EDM CORNER NOTCH: 0.100 (2.54) X 0.100 (2.54) X 0.007 (0.18) WIDE (±0.002 (±0.05))
2. ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3102, AT APPROXIMATELY THIS LOCATION.
3. SCRIBE A LINE ON THE UPPER AND LOWER SURFACES TO A MAXIMUM DEPTH OF 0.005 (0.13).
4. GRAIN DIRECTION

2158564 S0000471439_V1

Reference Standard NDT3102
Figure 2

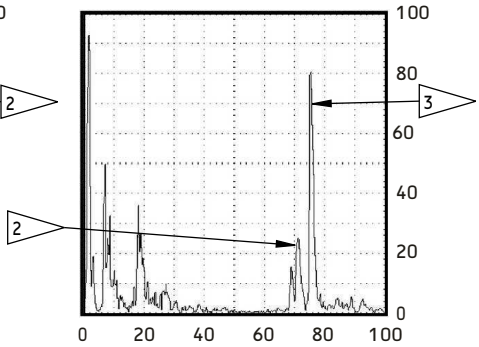


DETAIL I



SCREEN DISPLAY WITH
THE TRANSDUCER AT TP1

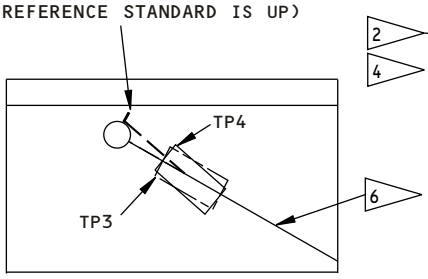
DETAIL II



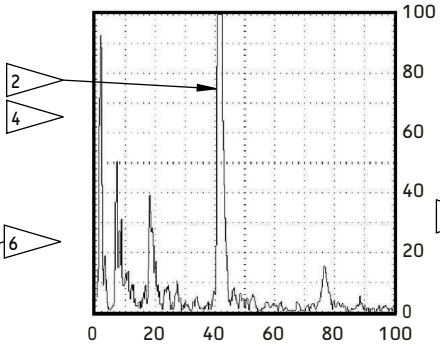
SCREEN DISPLAY WITH
THE TRANSDUCER AT TP2

DETAIL III

THE REFERENCE NOTCH IS
ON THE FAR SIDE (THE
BOTTOM SURFACE OF THE
REFERENCE STANDARD IS UP)

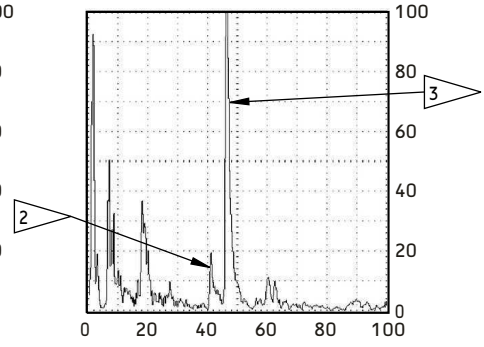


DETAIL IV



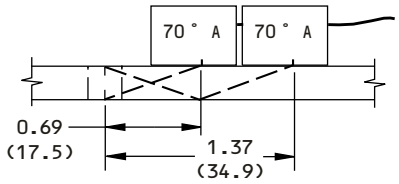
SCREEN DISPLAY WITH
THE TRANSDUCER AT TP3

DETAIL V

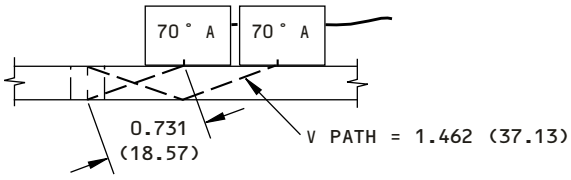


SCREEN DISPLAY WITH
THE TRANSDUCER AT TP4

DETAIL VI



SURFACE DISTANCE DATA FOR A 70 DEGREE
SHEAR WAVE TRANSDUCER IN ALUMINUM



SOUND PATH DATA FOR A 70 DEGREE
SHEAR WAVE TRANSDUCER IN ALUMINUM

NOTES:

- TP = TRANSDUCER POSITION
- IN DETAIL IV, THE TOP SURFACE OF THE REFERENCE STANDARD IS DOWN.
- THE SOUND PATH AND SURFACE DIMENSIONS WILL BE DIFFERENT FOR TRANSDUCERS THAT ARE NOT EXACTLY 70 DEGREES.

1 INITIAL PULSE

2 SIGNAL FROM THE HOLE

3 SIGNAL FROM THE REFERENCE NOTCH

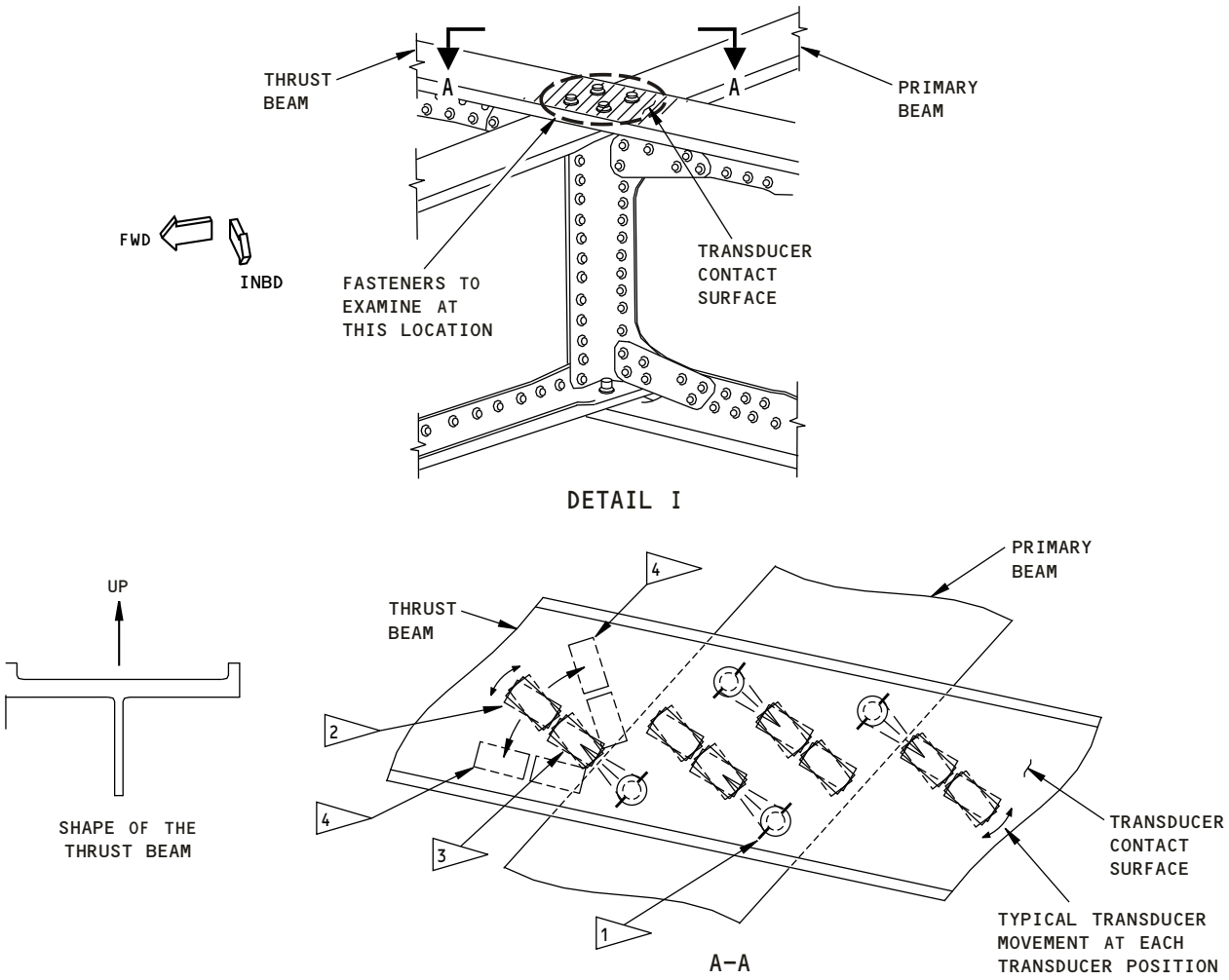
4 THE LOCATION OF THIS SIGNAL CAN BE DIFFERENT WITH OTHER TRANSDUCERS.

5 FIRST AND SECONDARY TRANSDUCER INTERFACE SIGNAL (TYPICAL). THESE SIGNALS CAN BE DIFFERENT FOR OTHER TRANSDUCERS.

6 USE THIS SCRIBE LINE TO HELP ALIGN THE TRANSDUCER TO THE HOLE AND BE AT 90 DEGREES TO THE REFERENCE NOTCH.

2158567 S0000471440_V1

Instrument Calibration
Figure 3



NOTES:

- EXAMINE EACH FASTENER HOLE LOCATION AS SHOWN. A TOTAL OF 16 FASTENER HOLE LOCATIONS MUST BE EXAMINED. REFER TO FIGURE 1 FOR THE FASTENER LOCATIONS.

1. THE CALCULATED DIRECTION THAT CRACKS WILL GROW IS PARALLEL TO THE PRIMARY BEAM. THUS, TO EXAMINE EACH FASTENER HOLE, SET THE TRANSDUCER TO POINT THE SOUND AT 90 DEGREES TO THE PRIMARY BEAM. ALSO EXAMINE THE FASTENER HOLE AT DIFFERENT ANGULAR DIRECTIONS. SEE FLAG NOTE 4.

2. THE APPROXIMATE TRANSDUCER LOCATION TO EXAMINE THE TOP SURFACE OF THE FASTENER HOLE. THIS TRANSDUCER POSITION WILL BE ALMOST THE SAME AS THE TP1 POSITION THAT WAS USED DURING THE INSTRUMENT CALIBRATION.

3. THE APPROXIMATE TRANSDUCER LOCATION TO EXAMINE THE BOTTOM SURFACE OF THE FASTENER HOLE. THIS TRANSDUCER POSITION WILL BE ALMOST THE SAME AS THE TP3 POSITION THAT WAS USED DURING THE INSTRUMENT CALIBRATION.

4. MAKE A CLOCKWISE AND COUNTERCLOCKWISE SCAN AROUND EACH FASTENER AS SHOWN, TO FIND CRACKS THAT CAN OCCUR AT DIFFERENT ANGULAR POSITIONS.

2158568 S0000471441_V1

Inspection Details
Figure 4

PART 4 - ULTRASONIC

UPPER CHORD OF THE REAR SPAR BETWEEN THE TITANIUM FITTING OF THE HORIZONTAL STABILIZER

1. Purpose

A. Use this procedure to help find cracks around fasteners in the upper chord of the rear spar in the area that is between the titanium fitting of the horizontal stabilizer. Two fastener hole locations must be examined at each inspection area. See Figure 1 to identify the inspection area.

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

(1) Item: 55-10-04-1 (UT)

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 an instrument that operates between 4 and 6 MHz in the pulse echo mode.

(2) The pulse-echo ultrasonic instruments that follow were used to help prepare this procedure.

(a) USN 50; Krautkramer Branson

(b) USD 15; Krautkramer Branson

C. Transducer

(1) Use a transducer that:

(a) Operates at 5 MHz.

(b) Causes a 45 degree shear wave in aluminum.

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

(a) AP-HP-3/16, 5 MHz; Xactex

(b) SUSM 545AT, 5 MHz; NDT Engineering Corp.

D. Reference Standard

(1) Use reference standard NDT3094. See Figure 2 for data about the reference standard.

E. Couplant

(1) Use an ultrasonic couplant that is permitted for use with airplane structure.

3. Prepare for the Inspection

A. Identify the inspection area. See Figure 1.

B. Clean the area that the transducer will touch.

4. Instrument Calibration

A. Connect the transducer to the instrument and set the frequency to 5 MHz.

B. Put couplant on reference standard NDT3094 in the area of transducer position 1 (TP1) shown in Figure 3.

C. Put the transducer on the reference standard at TP1 (see Detail A in Figure 3) so the sound is pointed at the hole.

D. Set the initial pulse at 0% of full screen width (FSW) (see Detail B in Figure 3).

E. Move the transducer a small distance forward and backward along the surface as necessary to get a maximum signal from the hole.

NOTE: The sound exit point is approximately 1.87 inches (47.5 mm) from the hole.

F. Adjust the hole signal so that it is at approximately 65% of FSW and 80% (or more) of full screen height (FSH) (see Detail B in Figure 3).

G. Move the transducer to TP2 (see Detail A in Figure 3) and monitor the signal that occurs from the EDM notch. The notch signal will occur at approximately 60% of FSW.

H. Move the transducer a small distance forward and backward along the surface as necessary to get a maximum signal from the notch.

I. Adjust the notch signal so that it is at 60% of FSW and 80% of FSH.

J. Increase the gain 6 dB. Do not remove the 6 dB gain during the inspection.

5. Inspection Procedure

A. Examine the upper chord of the rear spar of the horizontal stabilizer for cracks as follows:

(1) Find the upper chord inspection area shown in Figure 1.

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

(3) Put couplant on the upper surface of the upper chord. See Figure 1.

(4) Put the transducer on the upper surface of the upper chord. Refer to the distance between the transducer and the hole that you identified during calibration. Point the transducer so sound is transmitted to one of the two fastener holes in the inspection area.

NOTE: If you cannot get a satisfactory signal from the fastener hole, increase the gain until the signal from the hole is at 30% of FSH.

(5) Move the transducer forward and backward to do a scan for cracks on the near side of the fastener hole. Refer to the transducer positions you identified on the reference standard during calibration to identify the applicable distance between the fastener hole and the transducer.

NOTE: Signals that occur after the hole signal begins to decrease that are at approximately 60% of FSW and more than 40% of FSH are crack indications.

(6) Examine the full width of the upper chord between the titanium fitting.

(7) Do an inspection from the opposite side of the fastener hole to make a complete inspection of the hole.

(8) Move the transducer to the other fastener hole in the inspection area. Do Paragraph 5.A.(3) thru Paragraph 5.A.(7) for the other fastener hole in the inspection area.

(9) Do Paragraph 5.A.(1) thru Paragraph 5.A.(8) for the other side of the airplane.

6. Inspection Results

A. Look for cracks that start at the near side of the fastener hole and grow toward the upper surface of the upper chord.

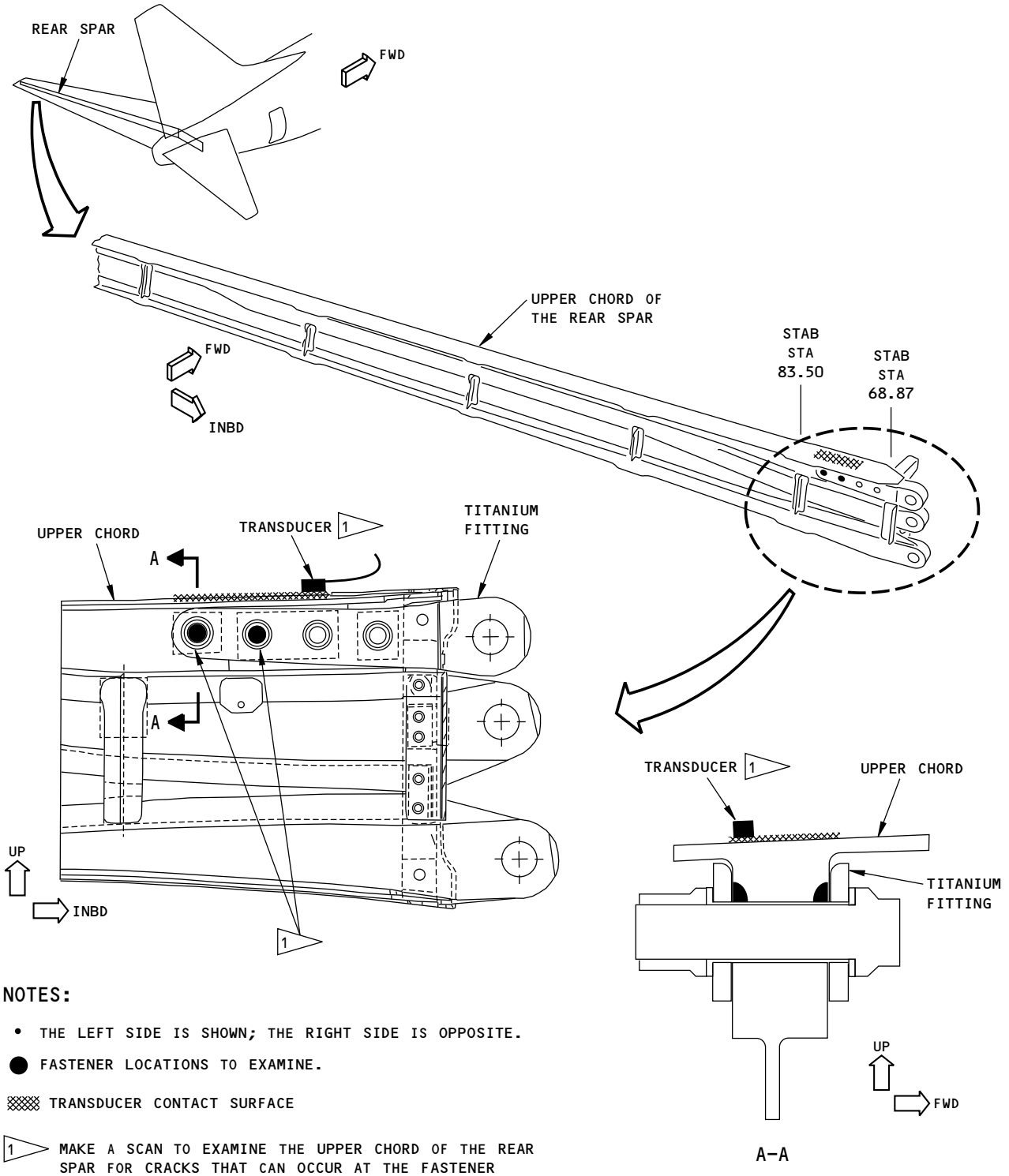
B. If you get a crack indication, remove the couplant from the surface of the fitting in front of the transducer and do the scan again. Too much couplant on the surface can cause an incorrect indication.

C. Compare the signal from the crack indication with the signal you got from the EDM notch in the reference standard. Use the same distance between the fastener hole and the transducer that you had on the airplane.

D. Crack indications will occur to the left of the hole signal at the screen width locations you identified during calibration.

E. A signal that is almost the same as the one you got from the EDM notch in the reference standard is a crack indication.

F. Remove the fastener to do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17 to make sure there is a crack.

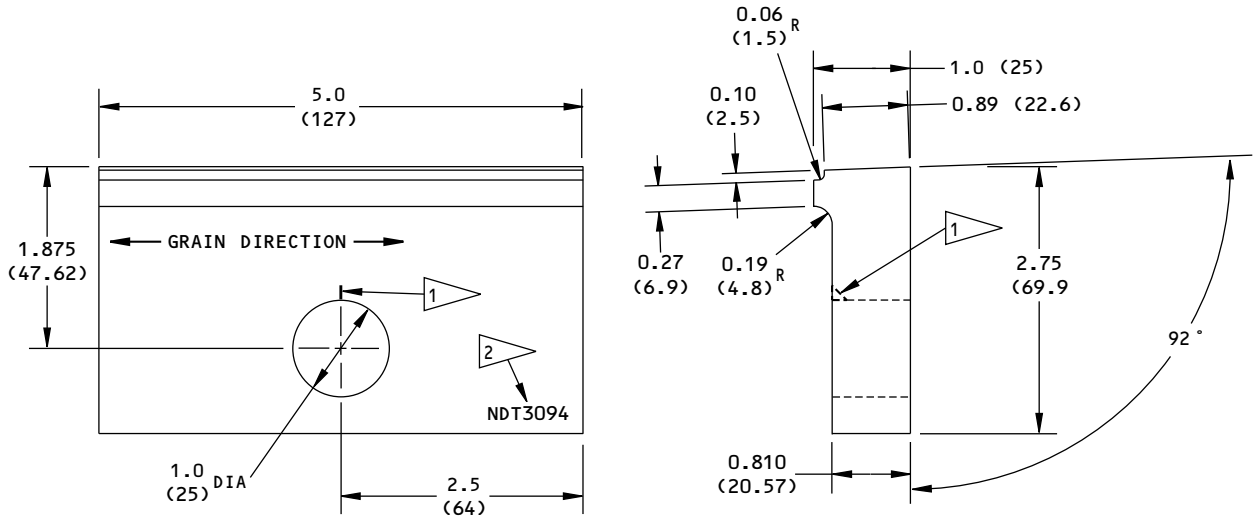


NOTES:

- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE.
- ● FASTENER LOCATIONS TO EXAMINE.
- ▨ TRANSDUCER CONTACT SURFACE
- 1 MAKE A SCAN TO EXAMINE THE UPPER CHORD OF THE REAR SPAR FOR CRACKS THAT CAN OCCUR AT THE FASTENER LOCATIONS IDENTIFIED.

2158569 S0000471443_V1

Inspection Locations
Figure 1



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	

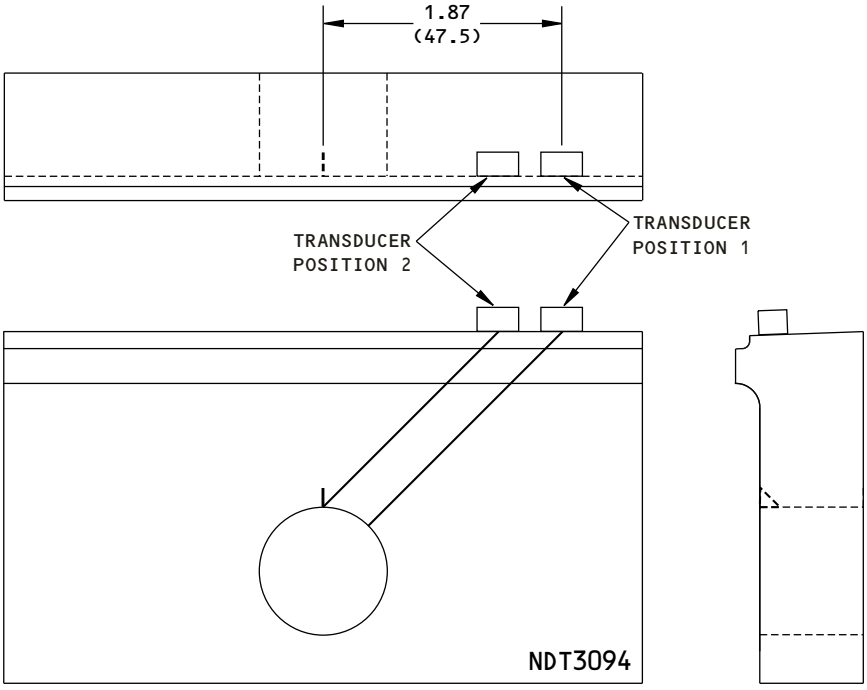
- SURFACE ROUGHNESS = 125 Ra OR BETTER.
- MATERIAL: 2024 OR 7075-T6 ALUMINUM

1 EDM CORNER NOTCH: 0.150 (3.81) X 0.150 (3.81) X 0.010 (0.25) MAXIMUM WIDTH

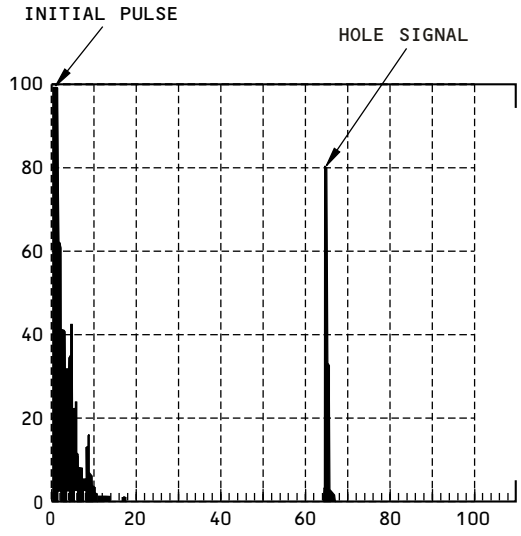
2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3094, AT APPROXIMATELY THIS LOCATION.

2158570 S0000471444_V1

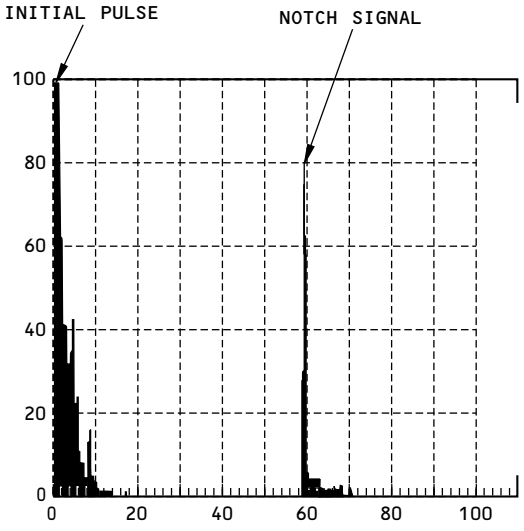
Reference Standard NDT3094
Figure 2



DETAIL A



SIGNAL FROM THE HOLE



SIGNAL FROM THE CRACK

DETAIL B

NOTES:

- DIMENSIONS ARE IN INCHES
  (MILLIMETERS ARE IN PARENTHESES)

2158571 S0000471445_V1

Instrument Calibration to Examine the Upper Chord of the Rear Spar
Figure 3

PART 4 - ULTRASONIC

AFT FLANGE OF THE UPPER CHORD AT THE REAR SPAR OF THE HORIZONTAL STABILIZER AT ELEV STA 213.32, 250.04, 265.45, AND STAB BL 254.66

1. Purpose

A. Use this procedure to help find cracks in the aluminum upper chord of the rear spar of the horizontal stabilizer at ELEV STA 213.32, 250.04, 265.45 and STAB BL 254.66. Two fastener holes in the aft flange of the upper chord must be examined at each inspection area. See Figure 1 for the inspection areas.

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

(1) Item: 55-10-04-3

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 an instrument that operates between 4 and 6 MHz in the pulse echo mode.

(2) The pulse-echo, ultrasonic instruments that follow were used to help prepare this procedure.

(a) USN 50; Krautkramer Branson

(b) USD 15; Krautkramer Branson

C. Transducer

(1) Use a transducer that:

(a) Operates at a frequency of 5 MHz.

(b) Causes a 70 degree shear wave to occur in aluminum.

(2) The transducer that follows was used to help prepare this procedure.

(a) SUSM 570AT, 5MHz, 70 Degree Aluminum; NDT Engineering Corp.

D. Reference Standard

(1) Use reference standard NDT3101. See Figure 2 for data about the reference standard.

E. Couplant

(1) Use an ultrasonic couplant that is permitted for use with airplane structure.

3. Prepare for the Inspection

A. Identify the inspection area shown in Figure 1.

B. Remove the lower skin panels that are aft of the rear spar to get access to the inspection areas.

C. Lightly smooth rough surfaces and sharp edges of chipped paint.

D. Clean the area that the transducer will touch.

4. Instrument Calibration

A. Connect the transducer to the instrument and set the frequency to 5 MHz.

B. Put couplant on the reference standard in the general area of the transducer positions shown in Detail C in Figure 3.

C. Put the transducer on the reference standard at transducer position 1 (TP1) as shown in Detail C in Figure 3 so that it is aligned with the notch and behind the scribe line.

D. Move the transducer to and away from the notch and monitor how the height and horizontal location of the notch signal changes.

E. Get a maximum signal from the EDM notch, but do not move the transducer across the scribe line.

F. Adjust the instrument controls to set the initial pulse at 0% of full screen width (FSW) and the notch signal at 70% of FSW. See Detail A in Figure 3.

G. Add gain until the notch signal is at 80% full screen height (FSH). See Detail A in Figure 3.

H. Turn the transducer on the surface at TP2, as shown in Detail C in Figure 3, and monitor the signals that occur from the EDM notch and hole. The hole signal will occur to the left of the notch signal. Compare Details A and B in Figure 3 to see the differences.

I. Make a record of the gain setting and add 6 dB of gain.

J. Move the transducer to TP3 (see Detail C in Figure 3) and monitor the hole signal that occurs at approximately 65% of FSW. See Detail B in Figure 3.

5. Inspection Procedure

A. Examine the upper chord of the rear spar at the hinge ribs for cracks as follows:

(1) Put couplant on the bottom surface of the upper chord at the rear spar of the horizontal stabilizer at one of the inspection locations identified in Figure 1.

(2) Put the transducer on the bottom surface of the upper chord. Point the transducer so sound is transmitted to one of the fastener holes in the inspection area.

(3) Move the transducer up against the hinge fitting and get a signal from the hole.

(a) If you cannot get a satisfactory signal from the fastener hole, add gain to set the hole signal at 30% of FSH.

(4) Use the hinge fitting as a guide to make a lateral scan for cracks on each side of the fastener hole as shown in Figure 1, View B-B. As you make a lateral scan, look for a crack signal to come into view to the right of where the fastener hole signal occurred. Signals that occur to the right of the hole signal and are approximately 70% of FSW are possible crack indications. Do an angular scan at the location where a possible crack indication occurs as shown in Figure 1, View B-B.

(5) Examine the fastener on the other side of the hinge fitting.

(6) Do Paragraph 5.A.(1) thru paragraph Paragraph 5.A.(5) to examine the fastener holes at the other hinge fitting to be examined.

(7) Set the gain to the setting that was recorded in Paragraph 4.I. and do Paragraph 4.C. and Paragraph 4.D. to make sure the notch signal is at 80% of FSH. If the notch signal is less than 60% of FSH, do Paragraph 4. and examine all locations since the last calibration.

(8) Do Paragraph 5.A.(1) thru Paragraph 5.A.(7) on the other horizontal stabilizer.

6. Inspection Results

A. Signals that are equal to or more than 40% of FSH that are between the hole signal and 75% of FSW are possible crack signals. Areas that cause possible crack signals to occur must be examined more fully.

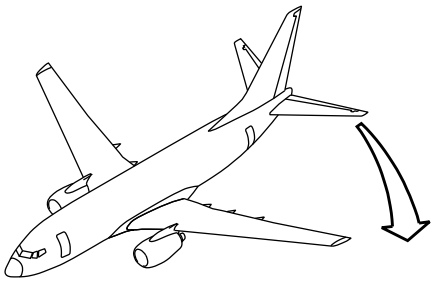
B. If you get a crack indication, remove the couplant from the surface of the fitting in front of the transducer and do the scan again. Too much couplant on the surface can cause a crack type signal to occur.

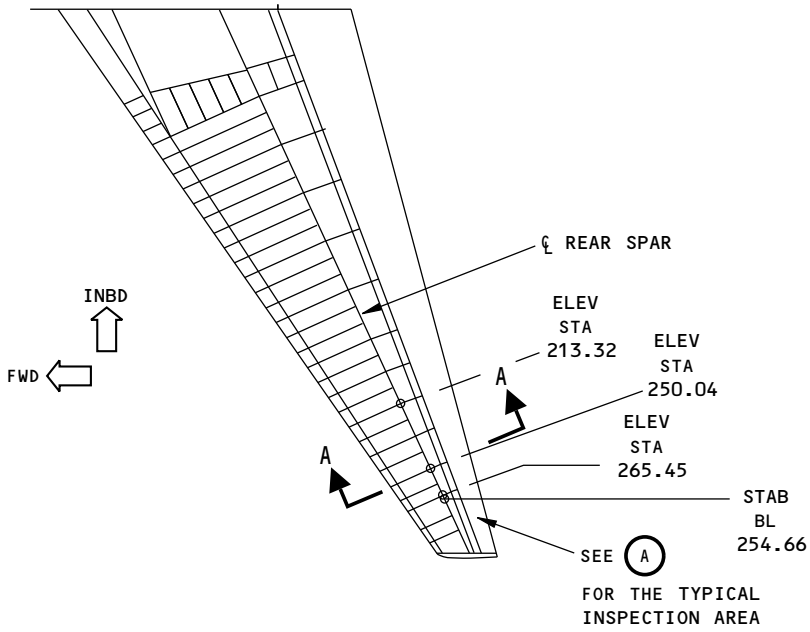
C. Compare the signal from the possible crack with the signal you got from the EDM notch in the reference standard. Use the same distance between the fastener hole and the transducer that you had on the airplane.

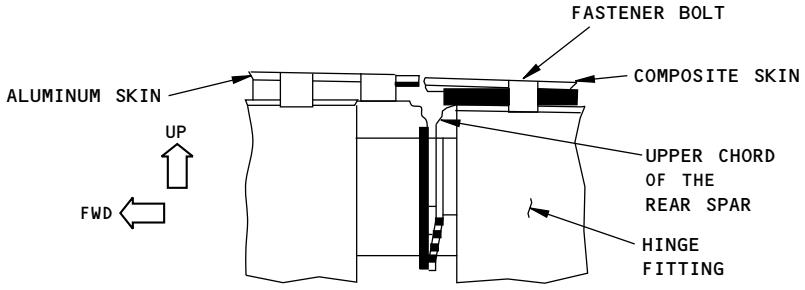
D. Crack indications will occur at the screen width locations you identified during calibration.

E. A signal that is almost the same as the one you got from the EDM notch in the reference standard is a crack indication.

F. Remove the fastener to do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 16, to make sure there is a crack.







A–A

NOTES:

- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE.

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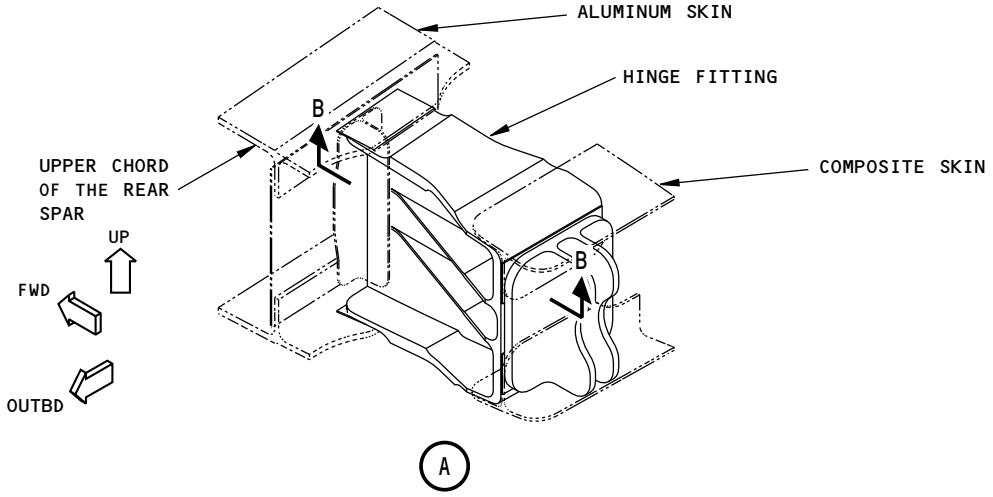
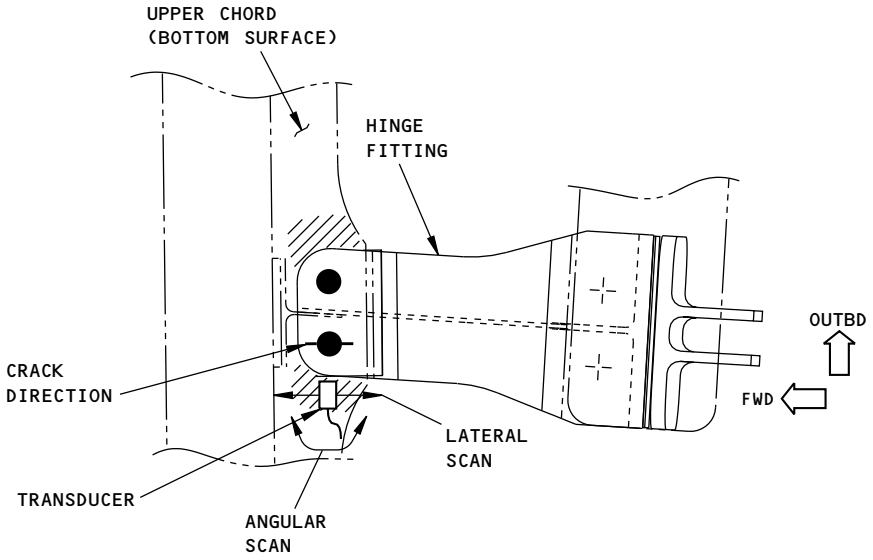
Inspection Areas
Figure 1 (Sheet 1 of 2)





B–B
(VIEW AS YOU LOOK UP)

NOTES:

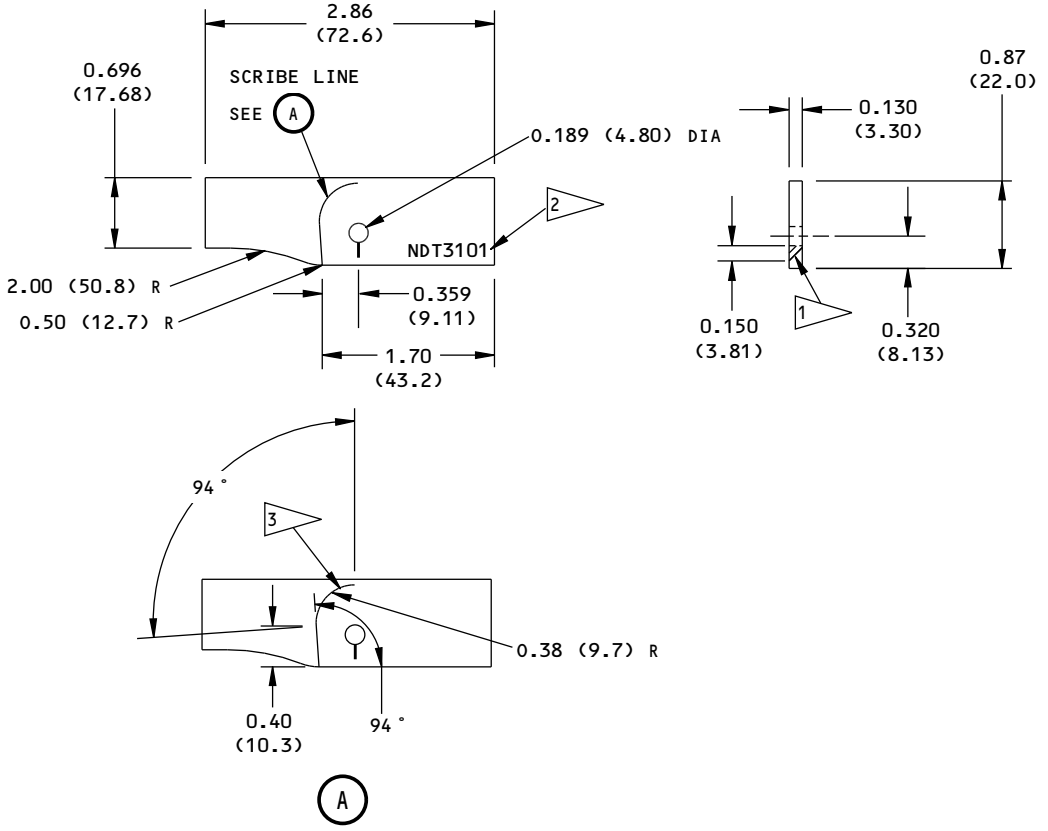
- THE LEFT SIDE IS SHOWN; THE RIGHT SIDE IS OPPOSITE.

● FASTENER HOLE TO EXAMINE

TRANSDUCER INSPECTION SURFACE

2158576 S0000471450_V1

Inspection Areas
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	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 2024 OR 7075-T6 ALUMINUM

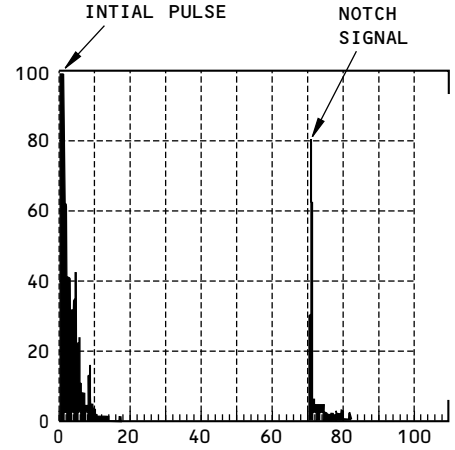
1 EDM CORNER NOTCH: 0.150 (3.81) X 0.150 (3.81) X 0.010 (0.25) MAXIMUM WIDTH

2 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3101, AT APPROXIMATELY THIS LOCATION

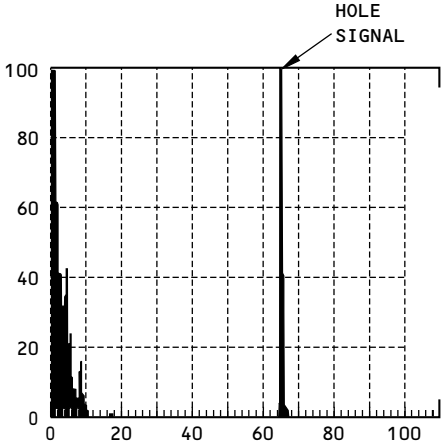
3 SCRIBE LINE

2158578 S0000471451_V1

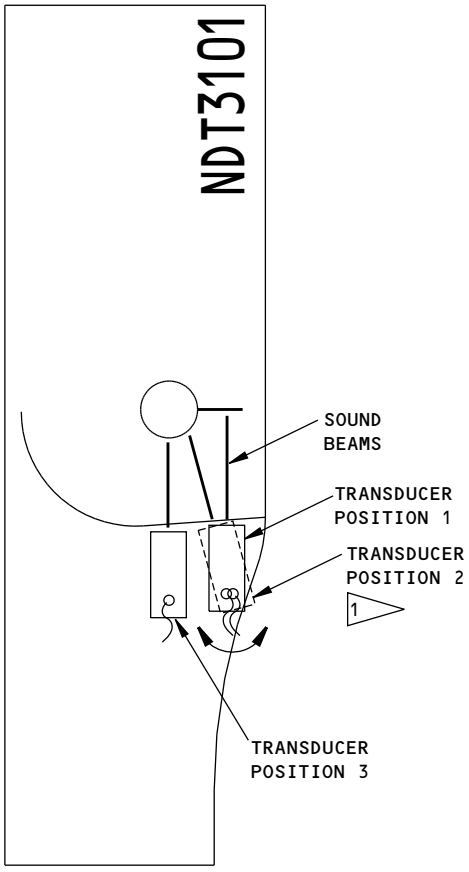
Reference Standard NDT3101
Figure 2



SIGNAL FROM TRANSDUCER POSITION 1
DETAIL A



SIGNAL FROM TRANSDUCER POSITION 2
DETAIL B



DETAIL C

NOTES:

- WITH THE TRANSDUCER AT TRANSDUCER POSITION 1 AND THE NOTCH SIGNAL AT 80 PERCENT OF FULL SCREEN HEIGHT, INCREASE THE GAIN BY 6 dB.

1 TRANSDUCER POSITION 2 IS AT THE TRANSDUCER POSITION 1 LOCATION, BUT THE TRANSDUCER IS TURNED TO POINT AT THE HOLE.

2158580 S0000471452_V1

Calibration Signals and Transducer Positions
Figure 3

HORIZONTAL STABILIZER - REAR SPAR - TERMINAL FITTINGS OF THE UPPER CHORD

1. Purpose

A. Use this procedure to find cracks in the upper terminal fittings of the rear spar at the upper chord. See Figure 1 for the inspection area.

B. This inspection procedure examines the forward and aft sides of the terminal fitting at the three most inboard fastener locations where the terminal fitting is attached to the upper chord of the rear spar. See Figure 1 for the inspection area.

C. This procedure examines the edge of the three fastener holes, at the mating surface of the terminal fitting and the upper chord, for corner cracks. Figure 1 shows the transducer positions and inspection areas around the fastener hole.

D. This procedure uses a specially designed, ring type transducer positioner that fits on the fastener head and nut. The transducer positioner contains two 5 MHz transducers. One transducer points the sound beam at the center of the fastener hole to get a signal from the hole. This hole signal is used to make sure the transducer has good contact with the inspection surface of the terminal fitting. Refer to Paragraph 3.C.(4) to adjust the instrument to get the hole signal. The other transducer is pointed at the far edge of the fastener hole to examine for possible corner cracks.

E. Access to the inspection areas on the forward side of the rear spar is made through an access hole (332EB/342EB) in the lower skin, nearest to the rear spar. Access to the inspection areas on the aft side of the rear spar is made through the lower trailing edge panel (333BB/343BB).

F. The equipment specified in Paragraph 2. such as the transducer, reference standard, transducer guide and sealant scraper are all included in a kit, part number TEKIT-1014, made by Techna NDT. The sealant scraper is made to fit on the fastener head and collar to remove the sealant from all around the transducer inspection surface and from the outer edge of the fastener head and nut. Because access to the inspection areas on the forward side of the rear spar through the access hole in the lower skin is not easy, it is recommended to use the sealant scraper included in the kit.

G. Service Bulletin Reference: 737-55-1090

H. 737-600, -700, -800, -900 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-05-2A

2. Equipment

A. General

(1) All ultrasonic equipment that can do the calibration instructions of this procedure can be used.

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

B. Instrument

(1) Use an ultrasonic instrument that can operate between 4 and 6 MHz. Broadband instruments can be used if they can do the calibration instructions of this procedure.

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

(a) Sonic 1000/1200; Staveley Instruments, Inc.

(b) USN 50, 52L, 60; Krautkramer Branson

(c) EPOCH 4; Panametrics, Inc.

C. Transducer

(1) Use the specially designed transducer positioner, which contains two 5 MHz transducers, that was used to help prepare this procedure.

(a) TEK-5154; Techna NDT

D. Reference Standard

(1) Make or buy reference standard NDT3141. See Figure 2.

E. Transducer Guide

(1) Make or buy transducer guide NDT3141G1. See Figure 3.

F. Sealant Scraper

(1) The TEK-5154-SC scraper is made of plastic with adjustable plastic blades and is included in kit TEKIT-1014.

G. Couplant

(1) All ultrasonic couplant that will not damage the airplane structure can be used.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Get access to the inspection areas.

(1) Remove access door 332EB or 342EB, as applicable, to get access to the inspection areas on the forward side of the rear spar.

(2) Remove the lower trailing edge access panel, 333BB or 343BB, as applicable, to get access to the inspection areas on the aft side of the rear spar.

C. Clean all inspection surfaces as follows:

(1) Remove all sealant and corrosion preventative coating from around the fastener head and nut. It is very important to remove all sealant from the transducer inspection surface and around the outer edge of the fastener head and nut so the transducer positioner can make good contact with the inspection surface. It is recommended to use the sealant scraper that is included in equipment kit TEKIT-1014. See Figure 1 for the typical transducer positions on the terminal fitting and Figure 5 for the correct adjustment of the scraper blades.

(2) If the surface is rough, make it smooth by approved procedures. It is not necessary to remove paint unless it is loose.

(3) Do a fit and visual check with the transducer positioner to help identify if the inspection surface is free of sealant.

(4) To make sure the transducer inspection surface on the terminal fitting is sufficiently clean, do the steps that follow to prepare the instrument to monitor a signal from the edge of the hole.

(a) Connect the instrument cable to transducer “A” (pointed at the center of the fastener hole) in transducer positioner TEK-5154.

(b) Set the instrument frequency between 4 and 6 MHz if a broadband instrument is not used.

(c) Put transducer guide NDT3141G1 in the reference standard hole of step “A”.

(d) Put a sufficient quantity of couplant on the inspection surface of the reference standard, all around the transducer guide. See Detail I in Figure 4 for the typical transducer positions.

(e) Put the transducer positioner on the reference standard and do the steps that follow:

1) Adjust the instrument gain, delay and range controls as necessary to get a signal from the hole to occur on the screen display.

2) Turn the transducer positioner a small quantity as necessary to get a maximum signal from the hole.

3) Adjust the instrument delay and range controls to get the signal from the hole set to 50% of full screen width (FSW) with the initial pulse set to 0% of FSW. See Detail II in Figure 4 for the screen display.

4) Adjust the instrument gain to get the hole signal to be 80% of full screen height (FSH). See Detail II in Figure 4.

NOTE: Do not use reject.

(f) Put a sufficient quantity of couplant on the inspection surface of the terminal fitting. See Figure 1 for the code “A” fastener location.

(g) Put the transducer positioner on the inspection surface and monitor the screen display for the hole signal.

(h) If a signal occurs that is 20% of FSH or higher, turn the transducer positioner fully around the inspection area and monitor the screen display to see if the signal stays at 20% of FSH or higher.

NOTE: It can be necessary to add couplant many times during the complete scan, as the transducer positioner can wipe away the couplant.

(i) If a signal is below 20% of FSH or does not show, turn the transducer positioner to other locations around the fastener head or nut to get a signal to show. Make sure there is sufficient couplant on the inspection surface.

(j) If a hole signal does not show, try to clean the inspection surface again and do Paragraph 3.C.(4)(e) thru Paragraph 3.C.(4)(h) again.

NOTE: The paint on the surface and the sealant at the faying surface can cause as much as 12 dB of attenuation.

(k) Add gain to get the signal to 80% of FSH and record the gain that was necessary to add. The added gain will be used during the inspection procedure.

(5) Do Paragraph 3.C.(4) again, but use step “B” on the reference standard, shown in Detail I in Figure 4, and the applicable code “B” fastener locations, shown in Figure 1.

4. Instrument Calibration

A. Two instrument calibrations are necessary to fully examine the code “A” and “B” fastener locations identified in Figure 1.

B. Calibrate the instrument to examine the code “A” fastener locations as follows:

(1) Connect the instrument cable to transducer “B” in transducer positioner TEK-5154.

(2) Set the instrument frequency between 4 and 6 MHz if a broadband instrument is not used.

(3) Put transducer guide, NDT3141G1, in the hole on the top surface of step “A” of reference standard NDT3141.

(4) Put a sufficient quantity of couplant on the inspection surface of the reference standard. See Detail I in Figure 4 for the transducer position.

(5) Put the transducer positioner on the inspection surface as shown in Detail I in Figure 4 and do the steps that follow:

(a) Make sure the transducer “B” sound beam is pointed in the direction of the notch.

(b) Adjust the instrument gain, delay and range controls as necessary to get a signal from the notch to occur on the screen display.

(c) Turn the transducer positioner a small quantity as necessary to get a maximum signal from the notch.

(d) Adjust the instrument delay and range controls to get the signal from the notch set to 70% of full screen width (FSW) with the initial pulse set to 0% of FSW. See Detail III in Figure 4 for the screen display.

(e) Adjust the instrument gain to get the notch signal to be 80% of full screen height (FSH) and record the gain level. See Detail III in Figure 4.

NOTE: Do not use reject.

C. Calibrate the instrument to examine the code "B" fastener locations as follows:

(1) Do Paragraph 4.B.(3) thru Paragraph 4.B.(5) again, but use step "B" of the reference standard.

5. Inspection Procedure

A. Examine the terminal fitting for cracks at the code "A" fastener location at the upper and lower edges of the fastener hole and on the forward and aft sides of the rear spar as identified in Figure 1 as follows:

(1) Calibrate the instrument as specified in Paragraph 4.B. to examine the code "A" fastener location.

(2) Examine the upper or lower edges of the fastener hole at one inspection area at a time.

(3) Put a sufficient quantity of couplant on the transducer inspection surface. See Figure 1.

(4) Examine the fastener hole as follows:

(a) Add the gain that was recorded in Paragraph 3.C.(4)(k) to the calibration gain set in Paragraph 4.B.(5)(e). Do not remove this gain during the inspection.

(b) Put the transducer positioner on the inspection surface with the transducer at the minimum scan start location. See Figure 1.

(c) Make a scan of the 60 degree inspection area as follows:

1) Slowly turn the transducer in a counterclockwise direction to the minimum scan stop location to examine the inspection area. See Figure 1 for the typical transducer positions. During the scan:

a) Make sure to keep the transducer flat on the inspection surface.

b) Monitor the screen display (baseline) at all times for small signals that can occur from the edge of the fastener hole at the opposite surface of the terminal fitting. These signals show that the transducer is flat on the inspection surface.

c) Monitor the screen display at all times for signals that are 40% of FSH (or more) and between 50 and 90% of FSW.

d) Remove the transducer positioner and apply couplant to the inspection surface on the opposite half of the fastener hole and do Paragraph 5.A.(4)(c) again.

(5) Do Paragraph 5.A.(2) thru Paragraph 5.A.(4) again to examine the terminal fitting on the opposite side of the rear spar for cracks.

(6) Go to Paragraph 6. for instructions to help make an analysis of the ultrasonic signals that occur during this inspection.

B. Examine the terminal fitting for cracks at the upper and lower edges of the fastener holes at the code "B" fastener locations from the forward and aft sides of the rear spar as identified in Figure 1 as follows:

(1) Calibrate the instrument as specified in Paragraph 4.C. to examine the code "B" fastener locations.

(2) Do Paragraph 5.A.(2) thru Paragraph 5.A.(6) again.

6. Inspection Results

A. Signals that are 40% of FSH (or more) and between 50 and 90% of FSW are possible crack signals.

B. It is possible to get a crack type signal to occur between 50 and 90% of FSW that is caused by couplant when the transducer is not flat on the inspection surface. If a crack type signal occurs between 50 and 90% of FSW, do the steps that follow:

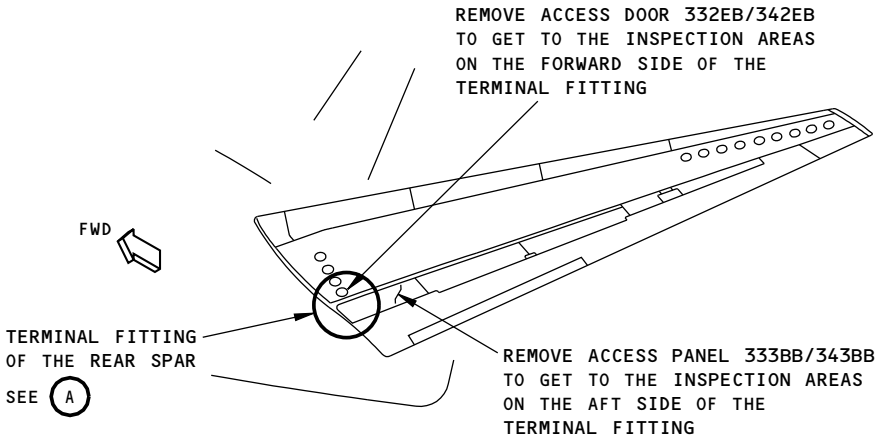
(1) Make sure the inspection surface is clean.

(2) Make sure there is sufficient couplant on the inspection surface.

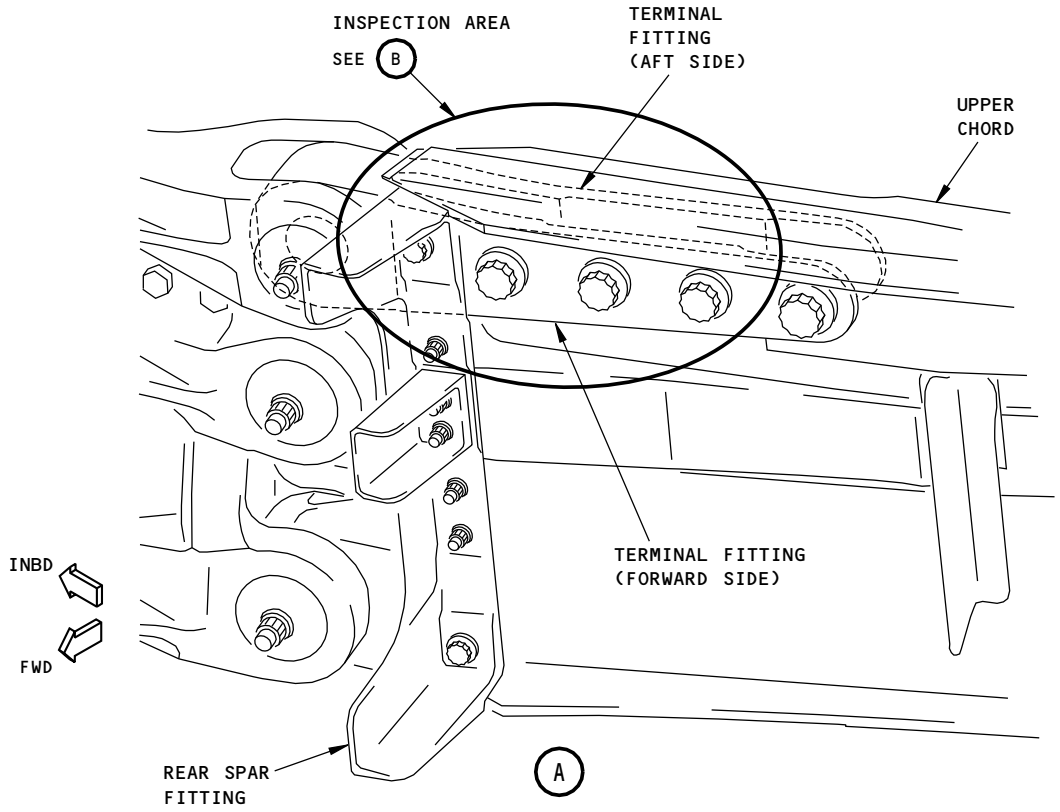
(3) Put the transducer flat on the inspection surface and make a scan of the area again in each direction.

(a) If the ultrasonic signal does not go below the reject level or go away, do as follows:

1) Remove the fastener and bushing and do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17.



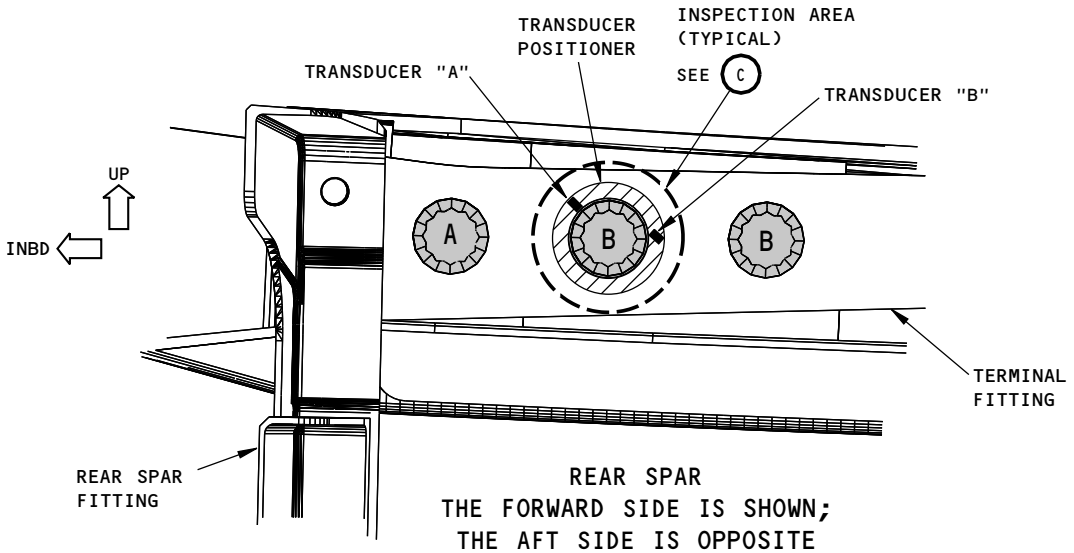
VIEW FROM BELOW
THE LEFT SIDE IS SHOWN;
THE RIGHT SIDE IS OPPOSITE



REAR SPAR
THE FORWARD SIDE IS SHOWN;
THE AFT SIDE IS OPPOSITE

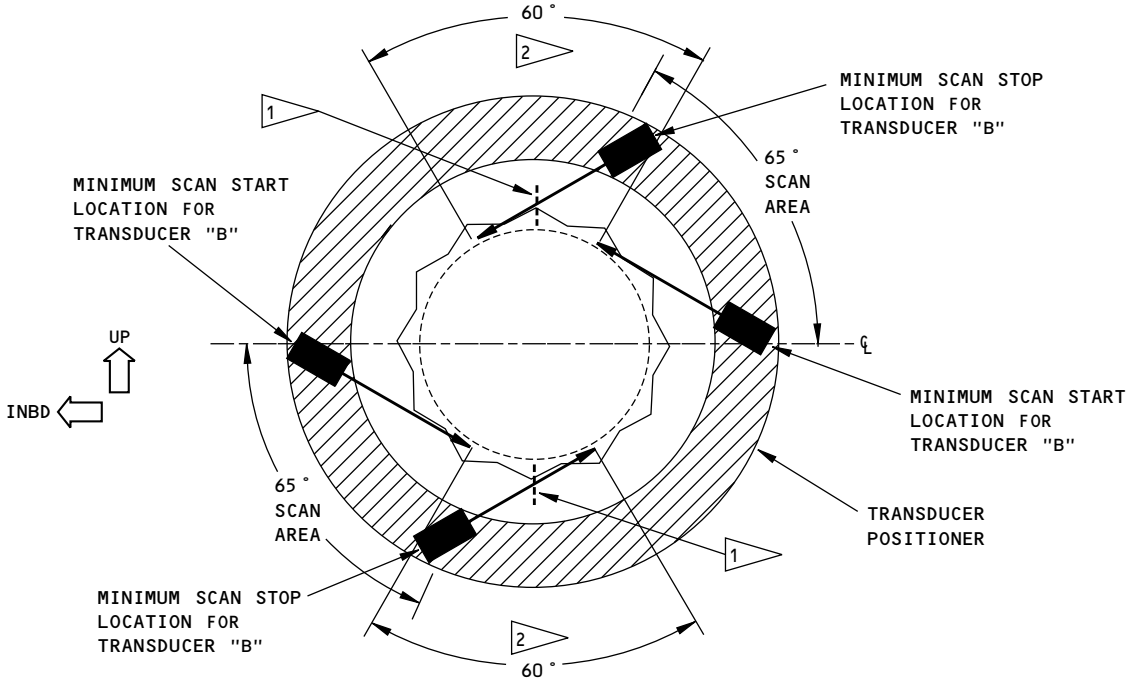
2158582 S0000471457_V1

Horizontal Stabilizer - Rear Spar - Inspection Area of the Upper Terminal Fitting
Figure 1 (Sheet 1 of 2)



REAR SPAR
THE FORWARD SIDE IS SHOWN;
THE AFT SIDE IS OPPOSITE

B



C

NOTES:

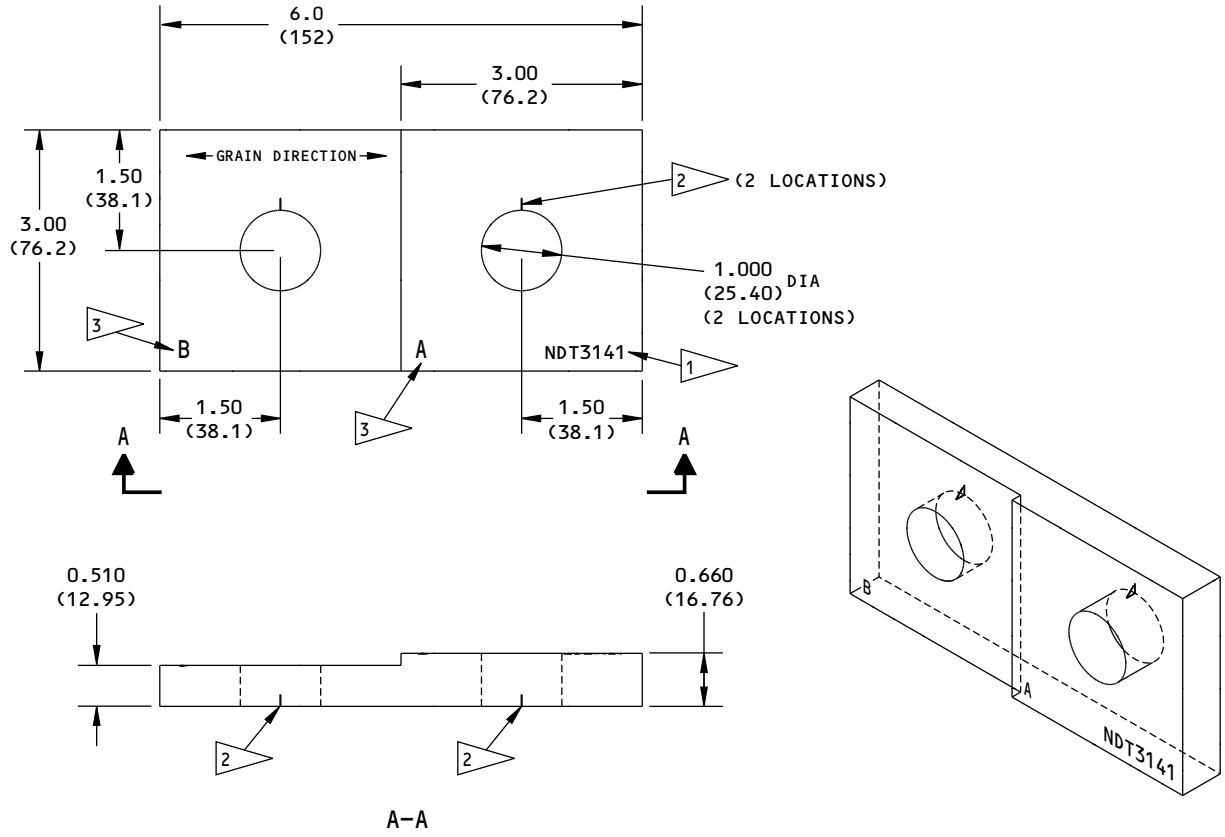
X FASTENER LOCATIONS TO EXAMINE WITH THE CALIBRATION CODE. CODE "A" FASTENER LOCATION, USE STEP "A" ON THE REFERENCE STANDARD. CODE "B" FASTENER LOCATION, USE STEP "B" ON THE REFERENCE STANDARD.

1 TYPICAL CRACK DIRECTION FROM THE FASTENER HOLE.

2 INSPECTION AREA. THE INSPECTION AREA IS 30 DEGREES ON THE INBOARD AND OUTBOARD SIDES OF THE TYPICAL CRACK DIRECTION.

2158584 S0000471459_V1

Horizontal Stabilizer - Rear Spar - Inspection Area of the Upper Terminal Fitting
Figure 1 (Sheet 2 of 2)



NOTES:

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

INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.13
X.XX = ±0.025	X.X = ±0.5
X.X = ±0.050	X = ±1

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

1 ETCH, ENGRAVE OR STAMP THE REFERENCE STANDARD NUMBER, NDT3141, AT APPROXIMATELY THIS LOCATION.

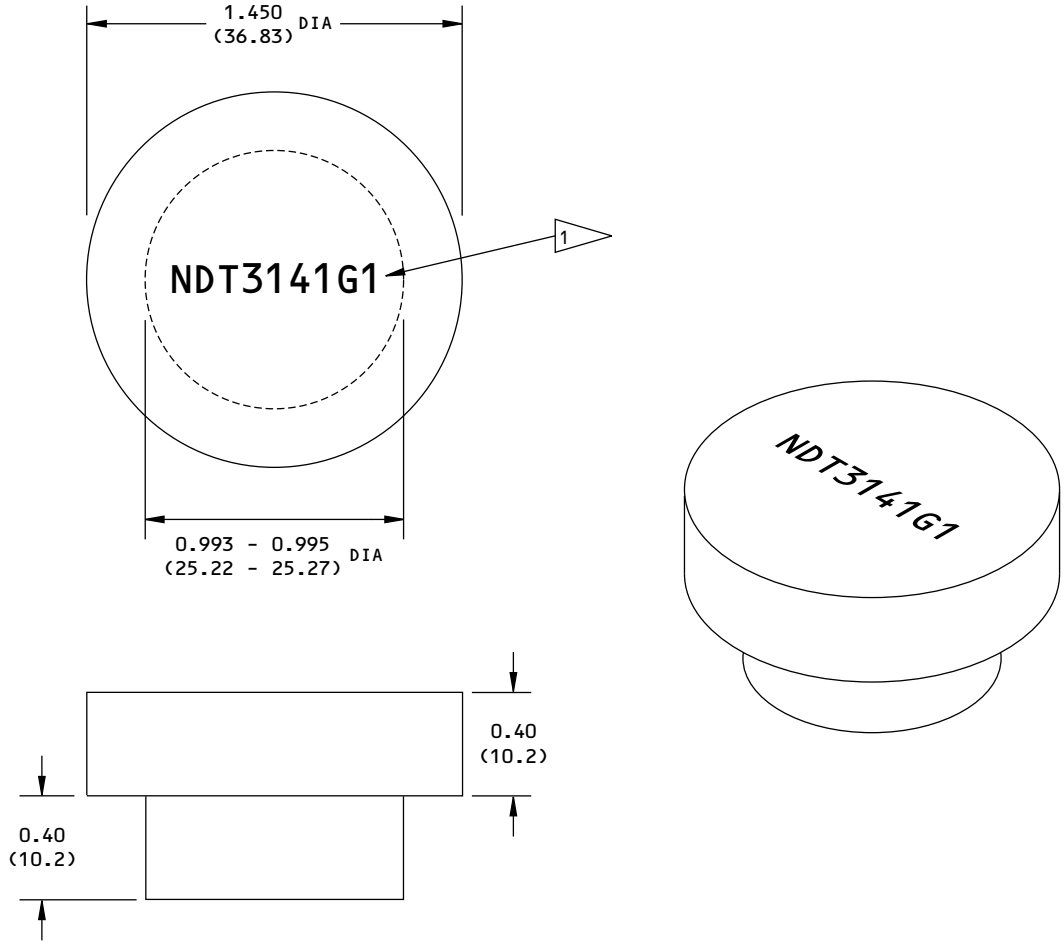
2 CORNER EDM NOTCH LOCATION AND TOLERANCE: THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE OF THE HOLE AS SHOWN.

CORNER EDM NOTCH DIMENSIONS AND TOLERANCE:
WIDTH = 0.007 (0.18) ±0.002 (0.05)
LENGTH = 0.150 (3.81)
DEPTH = 0.150 (3.81)

3 ETCH, ENGRAVE OR STAMP THE LETTER THAT IDENTIFIES THE TRANSDUCER POSITION USED FOR CALIBRATION AT APPROXIMATELY THIS LOCATION.

2158585 S0000471461_V1

Reference Standard NDT3141
Figure 2



NOTES:

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

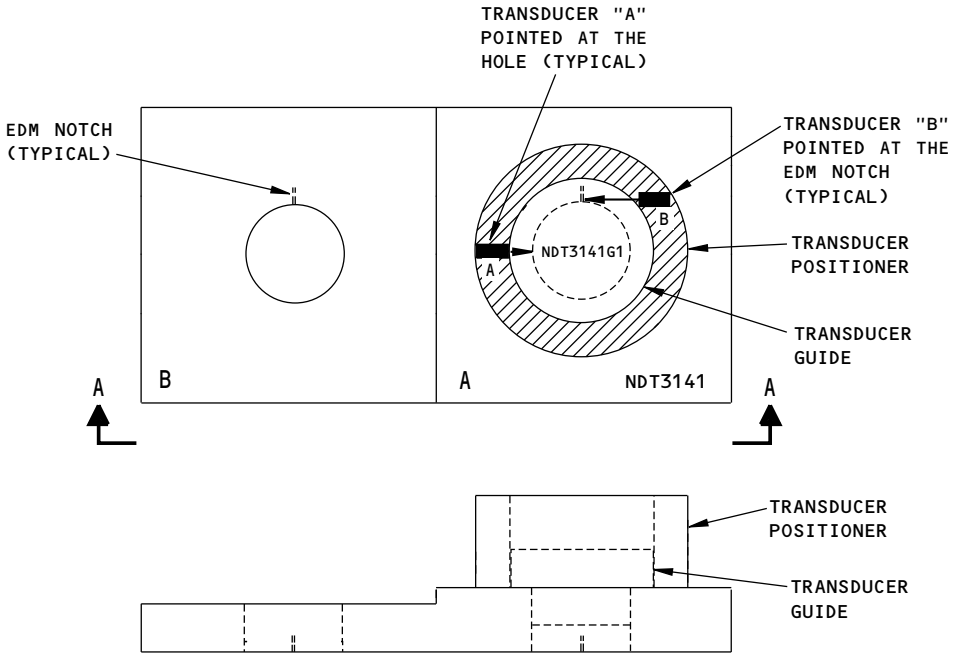
INCHES	MILLIMETERS
X.XXX = ±0.005	X.XX = ±0.13
X.XX = ±0.010	X.X = ±0.3
X.X = ±0.020	X = ±0.5

- SURFACE ROUGHNESS: 63 Ra OR BETTER
- MATERIAL: PLASTIC OR EQUIVALENT

1 ETCH OR ENGRAVE THE TRANSDUCER GUIDE NUMBER, NDT3141G1, AT APPROXIMATELY THIS LOCATION.

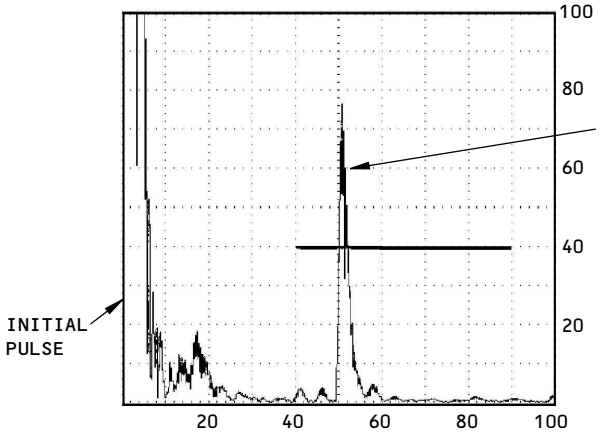
2158586 S0000471463_V1

Transducer Guide NDT3141G1
Figure 3

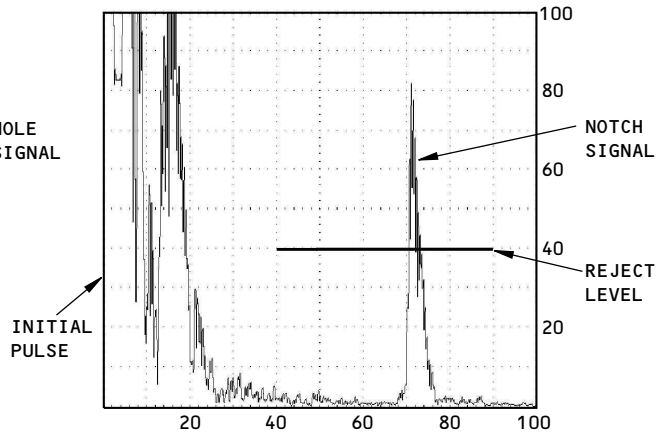


A–A

TRANSDUCER POSITIONS ON THE REFERENCE STANDARD
DETAIL I



SCREEN DISPLAY OF THE HOLE SIGNAL
DETAIL II



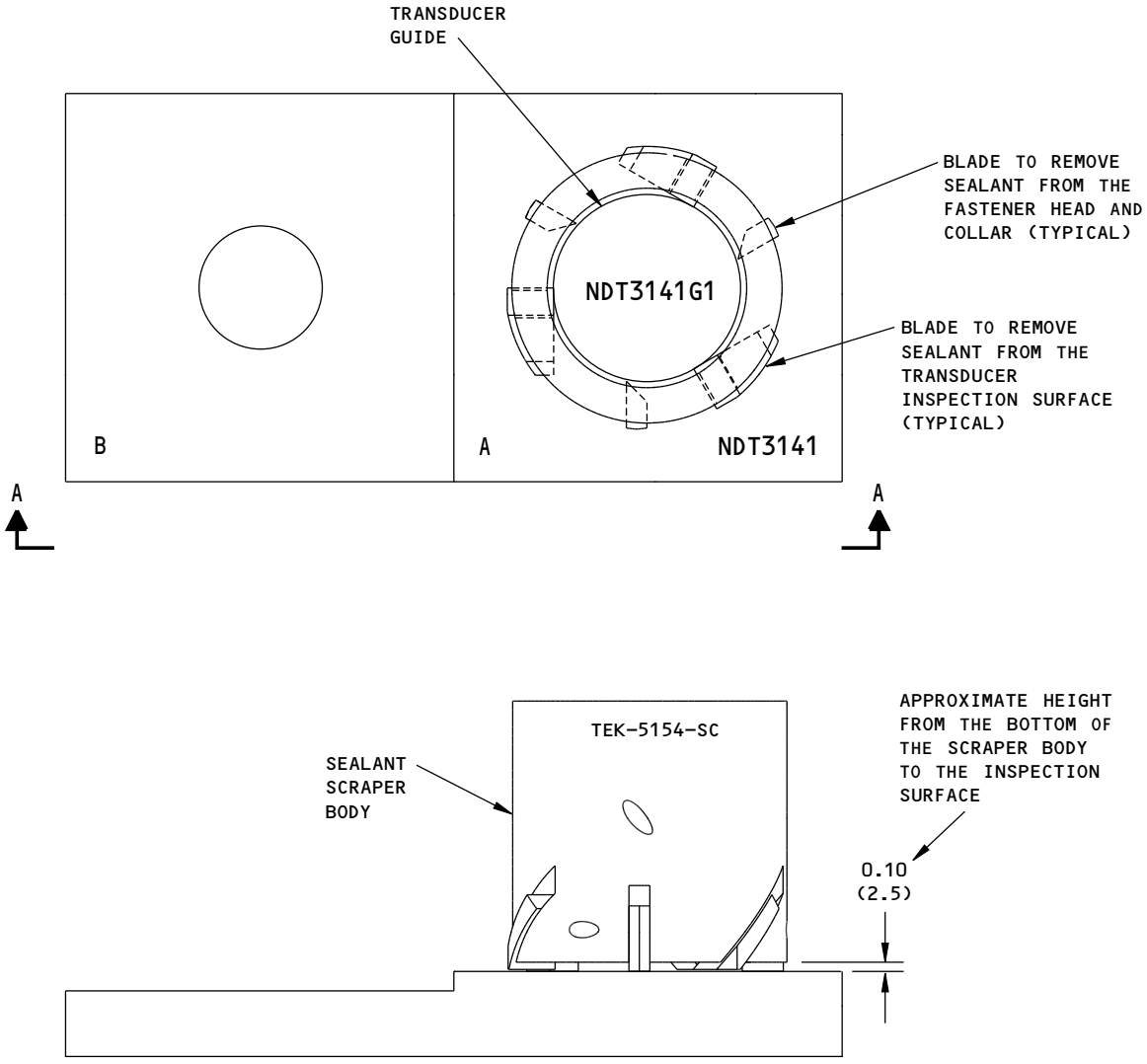
SCREEN DISPLAY OF THE EDM NOTCH SIGNAL
DETAIL III

NOTES:

- THE DETAIL II AND III SCREEN DISPLAYS ARE EXAMPLES. THE SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

2158587 S0000471464_V1

Instrument Calibration
Figure 4



A-A

SEALANT SCRAPER POSITION ON
THE REFERENCE STANDARD

NOTES:

- SET THE HEIGHT OF ALL THE BLADES (TRANSDUCER INSPECTION SURFACE AND FASTENER) TO BE THE SAME.
- MAKE SURE TO CENTER THE BODY OF THE SEALANT SCRAPER TO THE TRANSDUCER GUIDE BEFORE YOU TIGHTEN THE SETSCREWS TO SET THE BLADES SO THAT THEY TOUCH THE TRANSDUCER GUIDE.

2158590 S0000471465_V1

Adjustment of the Sealant Scraper Blades
Figure 5

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER CENTER SECTION - UPPER CHORD OF THE PRIMARY BEAM

1. Purpose

A. To examine the upper chord of the primary beam for cracks that can occur at fastener holes in the thrust-beam-to-primary-beam joint of the horizontal stabilizer center section. There are two thrust-beam-to-primary-beam joints to examine. Each joint has 4 fastener locations to examine. See Figure 1 for the inspection locations.

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

(1) Item: 55-10-14-03

2. Equipment

A. General

(1) Use ultrasonic 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 – Use an ultrasonic instrument that can:

(1) Operate in the frequency range of 4 to 6 MHz.

(2) Be calibrated as specified in the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

(a) Phasor XS; GE Inspection Technologies

(b) USM Go; GE Inspection Technologies

C. Transducer – Use a 5 MHz transducer that can put a 70 degree shear wave into aluminum. Because near access to the inspection area is limited, the distance from the exit point of the transducer to the front surface of the transducer must not be more than 0.375 inch (9.53 mm). The transducer that follows was used to help prepare this procedure.

(1) 57A3066, 5 MHz, type SMZ; Automation Industries

D. Reference Standard – Use reference standard NDT3136. See Figure 2 for data about the reference standard.

E. Couplant – Use an ultrasonic couplant that will not damage the airplane.

3. Prepare for the Inspection

A. Get access to the inspection area.

B. Identify and clean the inspection area shown in Figure 1.

C. If necessary, smooth the paint in the inspection areas to get a flat surface for the transducer.

4. Instrument Calibration

NOTE: The reference standard has two scribe lines, one on the top surface and one on the bottom surface. These scribe lines simulate the edge of the thrust beam. Do not move the transducer across the scribe line during the instrument calibration.

A. Set the instrument frequency to 5 MHz or a frequency range that includes 5 MHz.

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

C. Move the transducer to or away from the hole to get a maximum signal from the top edge of the hole.

D. Adjust the instrument controls to set the initial pulse at 0% of full screen width (FSW) and the maximum signal from the top edge of the hole at 80% of FSW as shown in Detail II in Figure 3.

E. Slowly turn the transducer to TP2 to get a maximum signal from the reference notch. See Detail I in Figure 3. Do not move the transducer to or away from the hole when you do this. The signal from the reference notch will occur to the right of the hole signal at approximately 85 percent of FSW. As you turn the transducer from TP1 to TP2, see that the signal from the hole decreases in full screen height (FSH) as the signal from the reference notch increases in FSH.

F. With the transducer at TP2, adjust the gain to set the maximum signal from the reference notch to 80 percent of FSH as shown in Detail III in Figure 3. Be sure that you do not move the transducer nearer to the reference notch during this step.

G. Make a temporary record of the instrument gain.

H. Adjust the reference standard so the bottom surface is up, as shown in Detail IV in Figure 3.

I. Put couplant and then the transducer at TP3 as shown in Detail IV in Figure 3.

J. Move the transducer as necessary to get a maximum signal from the bottom edge of the hole and hold the transducer at this location. It will be necessary to remove some gain to see this signal at a maximum FSH. The maximum signal from the bottom edge of the hole will occur at approximately 50 percent of FSW as shown in Detail V in Figure 3.

K. Slowly turn the transducer to TP4 as shown in Detail IV in Figure 3 and get a maximum signal from the reference notch. This signal will come into view at approximately 55 percent of FSW as shown in Detail VI in Figure 3. Adjust the gain as necessary to set this signal to 80 percent of FSH.

L. If the gain is now less than the value recorded in Paragraph 4.G., then set the gain back to the value recorded in Paragraph 4.G.

M. Put the transducer back at TP2 and make sure the signal from the reference notch is at 80 percent of FSH.

N. Add 6 dB and make a temporary record of the instrument gain.

5. Inspection Procedure

A. Put couplant on the upper chord of the thrust beam at the transducer contact surface shown in Detail I in Figure 1.

B. Put the transducer on the upper chord of the thrust beam, adjacent to one of the fastener locations to examine, at approximately the TP1 transducer position that was used during the instrument calibration. Align the transducer so that it is pointed 90 degrees to the direction that cracks can grow as shown in Figure 1, Section A-A, flagnote 2.

C. Move the transducer as necessary to get a maximum signal from the top surface of the fastener hole. This signal will occur at approximately 80 percent of FSW.

NOTE: If you cannot easily see the signal from the hole, then add gain as necessary to set the signal at 30 percent of FSH. If you add gain, make sure that you set the instrument gain back to the quantity recorded in Paragraph 4.N. before you examine the subsequent fastener hole location.

D. Slowly turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero percent of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal, almost the same as the reference notch signal occurred during the instrument calibration. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

E. Do Paragraph 5.D. again but examine the other side of the hole. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

F. At this same fastener location, put the transducer nearer the hole as shown in Figure 1, flagnote 4. This transducer position is the same as TP3 that was used during the instrument calibration. Move the transducer as necessary to get a maximum signal from the bottom surface of the fastener hole.

G. Turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero percent of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

H. Do Paragraph 5.G. again but examine the other side of the hole. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

I. Do Paragraph 5.A. thru Paragraph 5.H. at each of the fastener locations that remain to be examined. Refer to Figure 1 as necessary. Refer to Paragraph 6. to make an analysis of all possible crack signals that occur.

6. Inspection Results

A. Signals that are equal to or more than 40 percent of FSH and occur at the FSW locations that follow, are possible crack signals that must be examined more fully.

(1) Between the signal from the top surface of the fastener hole (approximately 80 percent of FSW) and 90 percent of FSW.

(2) Between the signal from the bottom surface of the fastener hole (approximately 50 percent of FSW) and 60 percent of FSW.

NOTE: You can remove the 6 dB that was added in Paragraph 4.N. to help make an analysis of possible crack signals if the thrust beam has the original paint.

B. Identify if the signal is caused by couplant on the part surface as follows:

(1) Get a maximum signal from the possible crack and keep the transducer at that location.

(2) Remove all couplant between the front of the transducer and the inspection area.

(3) If the signal goes away, no more analysis is necessary. If the signal continues to stay, go to Paragraph 6.C. and continue to make an analysis of the possible crack signal.

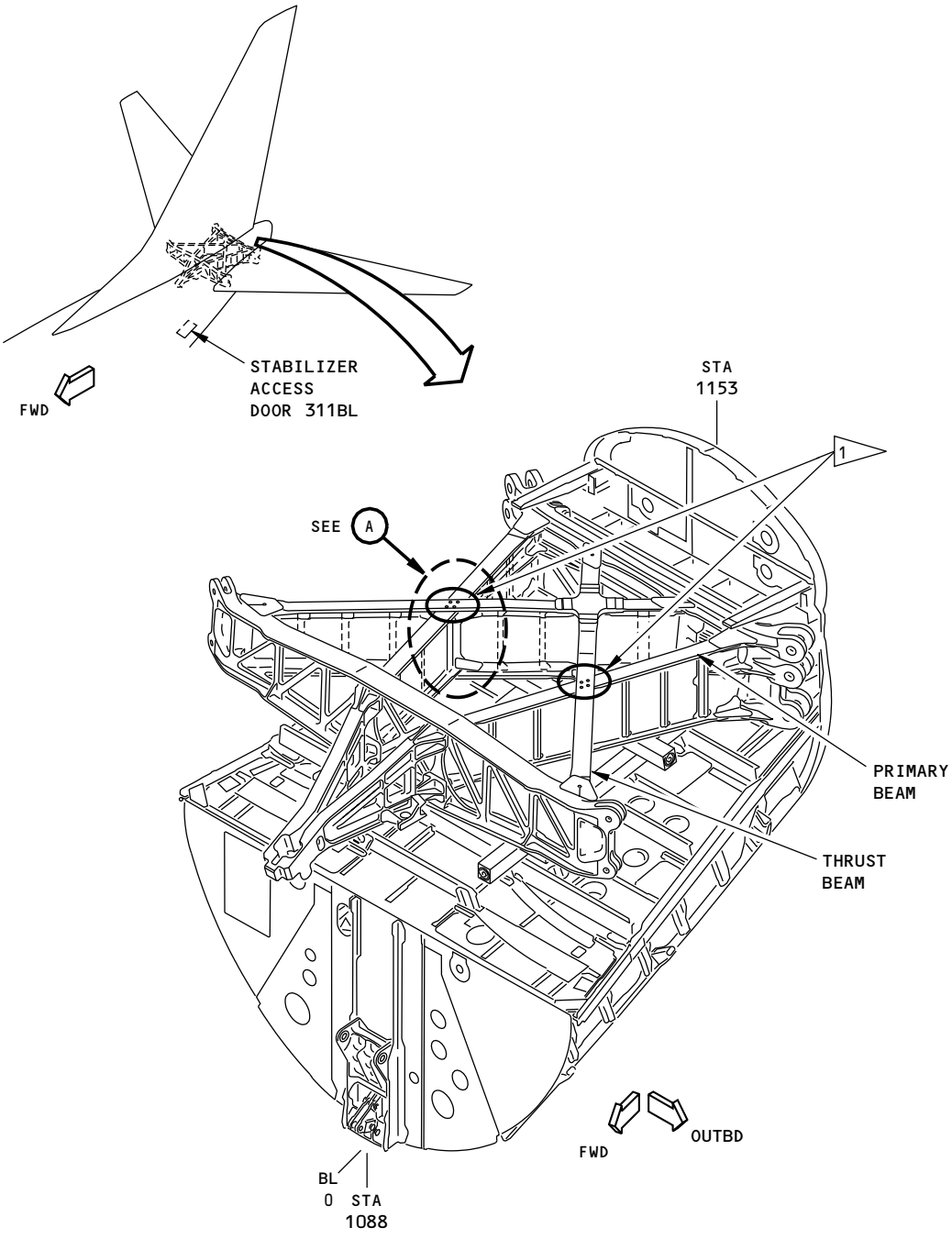
C. Compare the possible crack signal to the signal that you get from the notch in the reference standard. Use the same distance between the transducer and the fastener hole that you had on the airplane when the possible crack signal occurred.

D. 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 make an analysis of the possible crack signals again. Go to Paragraph 6.F. and continue to make an analysis of possible crack signals that are 40 percent or more of FSH.

E. At fastener holes where possible crack signals occur that are less than 40 percent of FSH, do more scans of these fastener holes at different angular directions as shown in Figure 1, flagnote 5. This can only be done where there is sufficient access. Do the instructions given in Paragraph 6.F. to make an analysis of possible crack signals that are 40 percent or more of FSH.

NOTE: It is very possible that cracks that are smaller than the reference notch will not have a signal that is more than 40 percent of FSH. Thus, make a careful record of all possible cracks that are less than 40 percent of FSH and report this to your Engineering group.

F. Remove the fastener and do an open hole eddy current inspection as given in Part 6, 51-00-00, Procedure 11, to make sure there is a crack.

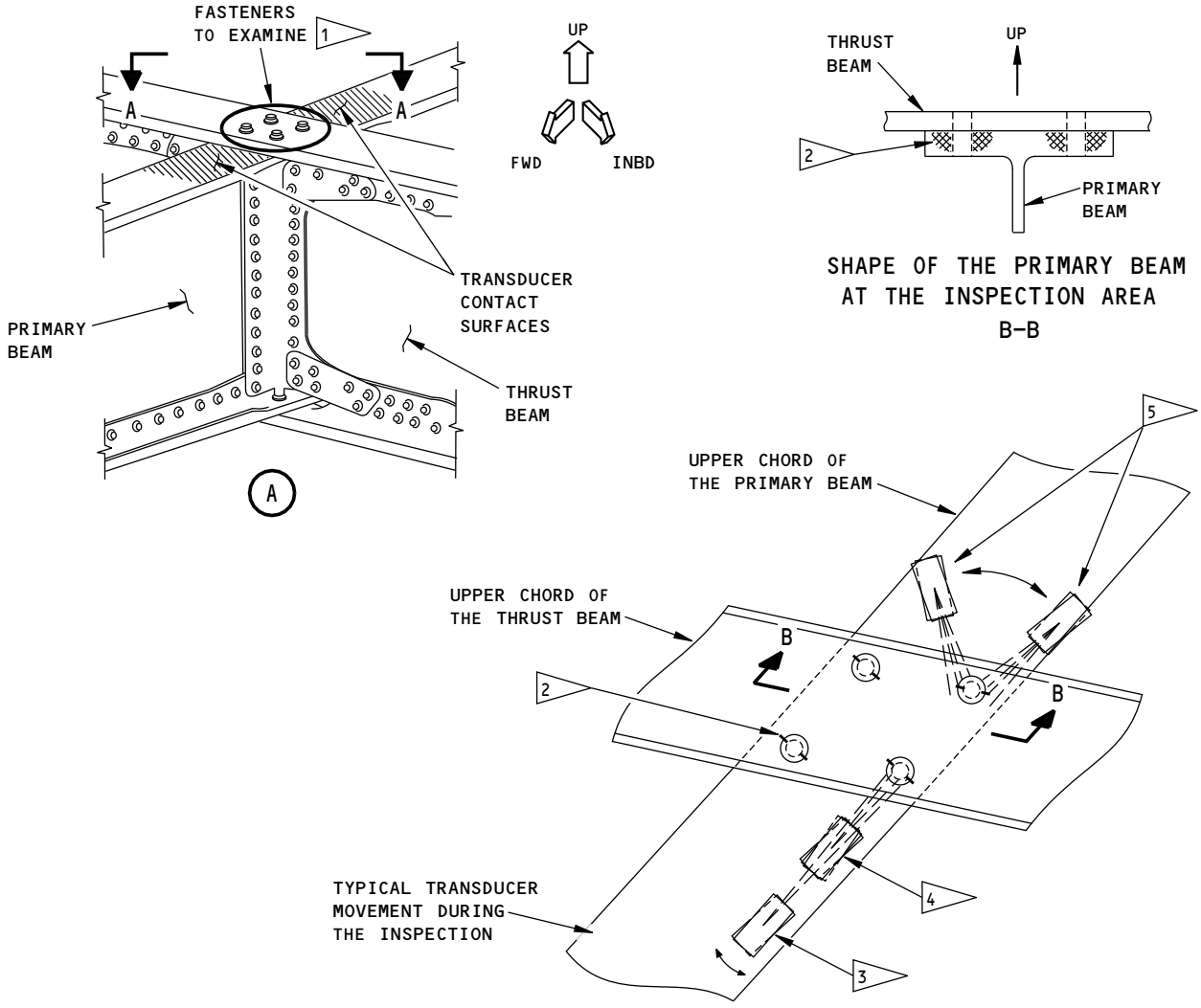


NOTES:

1 THE UPPER CHORD OF THE PRIMARY BEAM IS EXAMINED AT THESE TWO THRUST-BEAM-TO-PRIMARY-BEAM JOINTS. EACH JOINT HAS FOUR FASTENER HOLE LOCATIONS TO EXAMINE (8 TOTAL).

2158594 S0000471471_V1

Inspection Areas
Figure 1 (Sheet 1 of 2)



NOTES:

- MAKE A SCAN TO THE LEFT AND TO THE RIGHT SIDES OF THE FASTENER TO FULLY EXAMINE EACH FASTENER HOLE LOCATION.

TRANSDUCER CONTACT SURFACE

2 THE CALCULATED DIRECTION THAT CRACKS WILL GROW

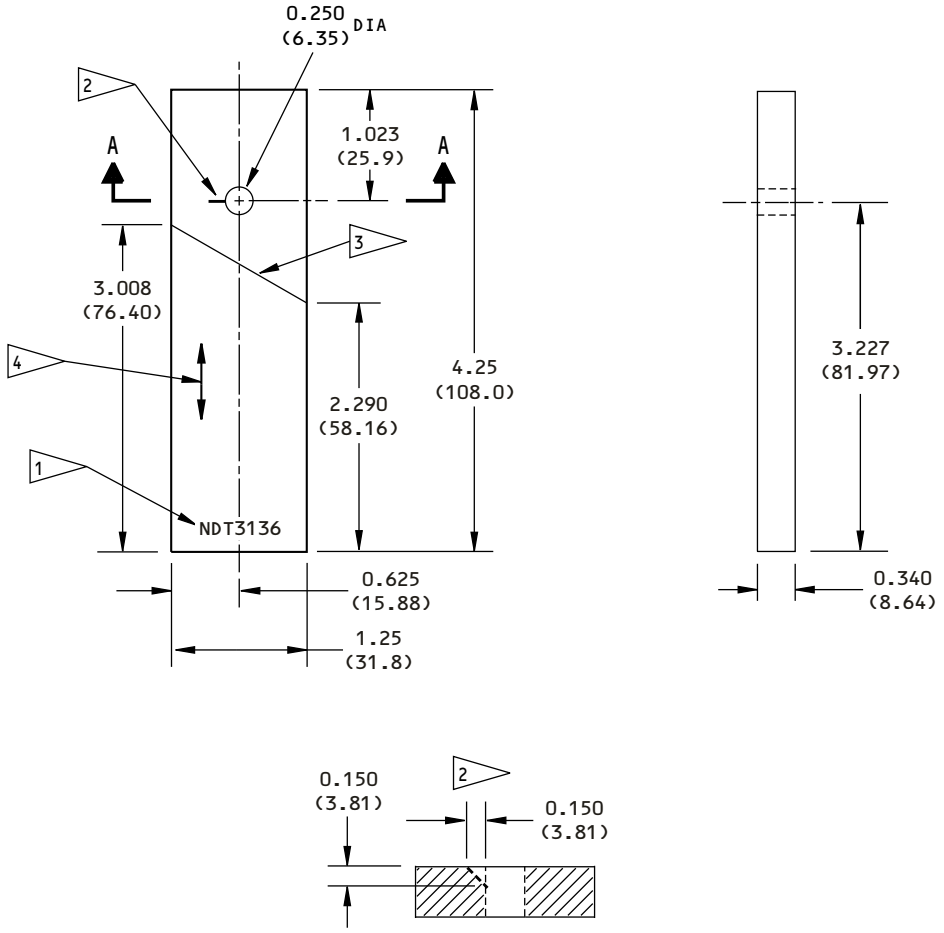
3 THE APPROXIMATE TRANSDUCER LOCATION TO EXAMINE THE TOP SURFACE OF THE FASTENER HOLE. THIS TRANSDUCER POSITION WILL BE ALMOST THE SAME AS THE TP1 AND TP2 POSITIONS THAT WERE USED DURING THE INSTRUMENT CALIBRATION.

4 THE APPROXIMATE TRANSDUCER LOCATION TO EXAMINE THE BOTTOM SURFACE OF THE FASTENER HOLE. THIS TRANSDUCER POSITION WILL BE ALMOST THE SAME AS THE TP3 AND TP4 POSITIONS THAT WERE USED DURING THE INSTRUMENT CALIBRATION.

5 MAKE MORE SCANS AROUND THE FASTENER, AS FAR AS POSSIBLE, AT LOCATIONS WHERE POSSIBLE CRACK SIGNALS OCCUR THAT ARE LESS THAN 40% OF FSH.

2158596 S0000471472_V1

Inspection Areas
Figure 1 (Sheet 2 of 2)



A–A

NOTES:

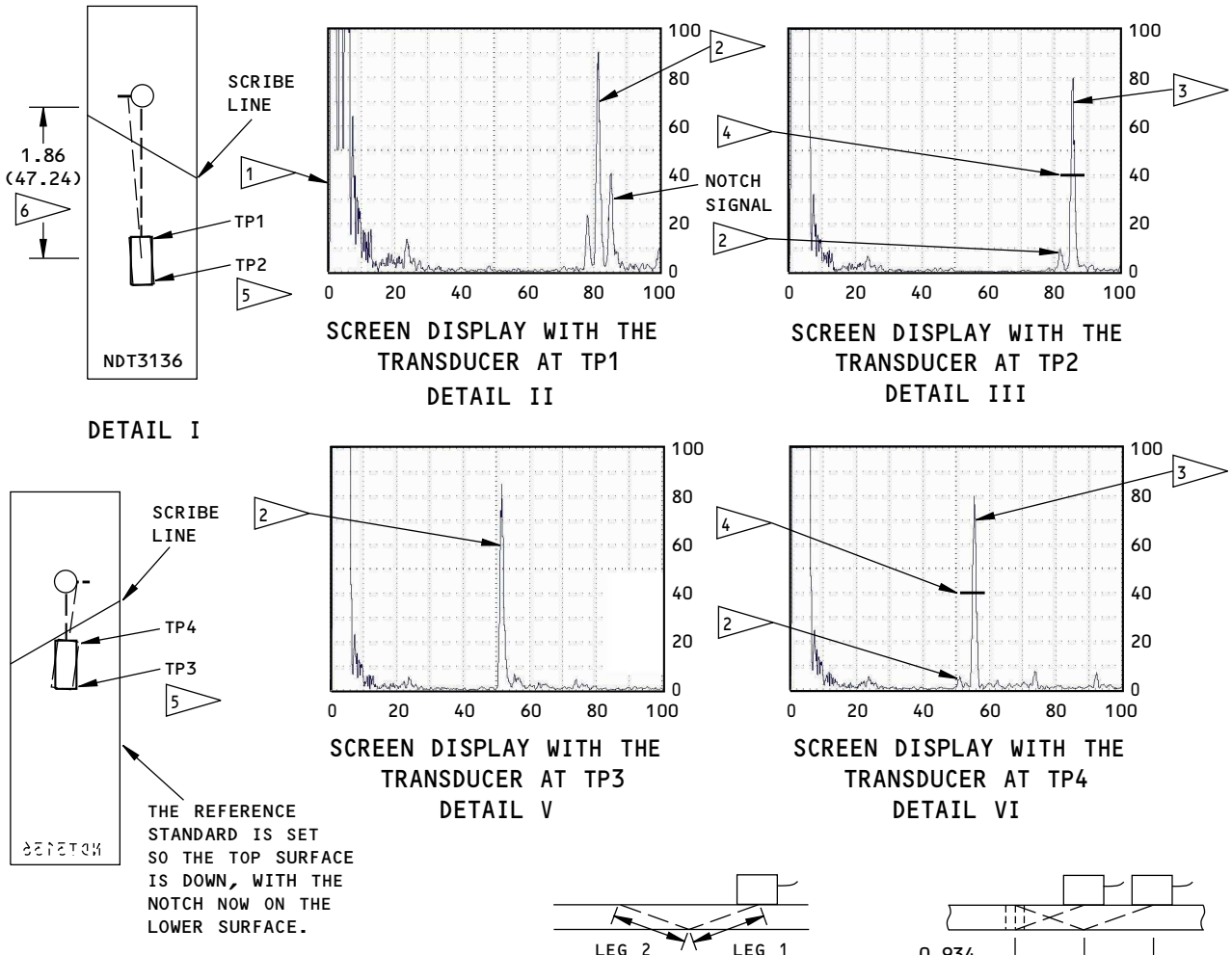
- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T6 OR 2024 ALUMINUM
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

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	

1. ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3136, AT APPROXIMATELY THIS LOCATION.
2. EDM CORNER NOTCH (NEAR SURFACE): 0.150 (3.81) X 0.150 (3.81) X 0.007 (0.18) WIDE (±0.002 (±0.05))
3. SCRIBE A LINE AS SHOWN ON THE UPPER AND LOWER SURFACES TO A MAXIMUM DEPTH OF 0.010 (0.25).
4. GRAIN DIRECTION

2158598 S0000471473_V1

Reference Standard NDT3136
Figure 2



NOTES:

- TP = TRANSDUCER POSITION
- THE SCRIBE LINES SIMULATE THE EDGE OF THE THRUST BEAM. DO NOT MOVE THE TRANSDUCER ACROSS THIS LINE DURING THE INSTRUMENT CALIBRATION.
- IN DETAIL IV, THE NOTCH IN THE REFERENCE STANDARD IS ON THE FAR SIDE.

1 INITIAL PULSE SIGNAL (TYPICAL)

2 SIGNAL FROM THE HOLE

3 SIGNAL FROM THE REFERENCE NOTCH

4 REJECT LEVEL AND APPROXIMATE LOCATION WHERE CRACK SIGNALS CAN OCCUR (PLUS 10% OF FSW FROM WHERE THE HOLE SIGNAL OCCURS).

5 THE LOCATION OF THE TRANSDUCER WHEN THE MAXIMUM SIGNAL FROM THE HOLE OCCURS CAN BE DIFFERENT FOR DIFFERENT TRANSDUCERS.

6 THE SURFACE DISTANCE IS MEASURED FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE NEAR SURFACE OF THE HOLE. THIS DIMENSION IS FOR A TRANSDUCER THAT PUTS THE SOUND INTO THE PART AT 70 DEGREES. THIS DIMENSION WILL BE DIFFERENT BY A SMALL QUANTITY FOR TRANSDUCERS THAT DO NOT PUT THE SOUND INTO THE PART AT 70 DEGREES.

2158599 S0000471474_V1

Instrument Calibration
Figure 3

PART 4 - ULTRASONIC

TERMINAL FITTING LUGS AT THE REAR SPAR OF THE HORIZONTAL STABILIZER

1. Purpose

A. Use this procedure to examine the terminal fitting lugs for cracks at the upper spar of the rear spar of the horizontal stabilizer. This procedure uses an ultrasonic longitudinal wave to examine the lugs for cracks that can grow from the lug hole. See Figure 1 for the inspection areas.

B. An ultrasonic longitudinal wave transducer is put on the radius of the lug to examine the lug hole for cracks that are 0.10 inch (2.5 mm) long. A total of two lug holes are examined on each airplane. The terminal fitting lug is made from titanium. See Figure 1 for the inspection areas, example probe positions and example crack directions.

C. 737-600, -700, -800, -900 Damage Tolerance Rating (D626A001-DTR) Reference:

(1) Item: 55-10-05-1

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 instrument. The instrument that follows was used to help prepare the procedure.

(a) Phasor XS; GE Inspection Technologies

C. Transducers

(1) Use a 10 MHz transducer that can put a sound wave into the terminal fitting lug at 11 degrees to the surface of the terminal fitting lug. The transducer that follows was used to help prepare this procedure.

(a) TEK 5133; Techna NDT.

D. Reference Standards

(1) Use reference standard NDT3105 as shown in Figure 2.

E. Couplant

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

3. Prepare for the Inspection

A. Remove the horizontal stabilizer and identify and get access to the inspection area shown in Figure 1.

B. Remove sealant, loose paint and dirt and fully clean the inspection area that the ultrasonic transducer will touch on the surface of the terminal fitting lug shown in Figure 1. It can be necessary to smooth or remove the finish so the transducer can put sufficient sound in the terminal fitting lug. See Figure 1.

4. Instrument Calibration

A. Set the instrument frequency to 10 MHz. A frequency adjustment is not necessary if you use a broadband instrument. Make sure the reject is set to off.

B. Apply a sufficient quantity of couplant to the transducer calibration positions on reference standard NDT3105 as shown in Detail I in Figure 3.

C. Put the transducer at transducer position 1 (TP1) on the reference standard as shown in Detail I in Figure 3 so that the sound beam points at the notch.

D. Move the transducer a small distance up and down the radius and to the left and right until the notch signal is at a maximum height on the screen display.

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 notch at 80 percent of FSW. See Detail II in Figure 3.

F. Adjust the gain to set the notch signal at 80 percent of full screen height (FSH). See Detail II in Figure 3.

G. Turn the transducer 180 degrees and put it at transducer position 2 (TP2) on the reference standard as shown in Detail I in Figure 3. Make sure the sound beam points at the notch.

H. Move the transducer a small distance up and down the radius and to the left and right until the notch signal is at a maximum height on the screen display. It is permitted to extend the transducer across the edge of the reference standard. See Detail I in Figure 3.

NOTE: The notch signal will occur on the screen display at approximately 80 percent of FSW.

I. If the maximum signal from the reference notch is less than the maximum signal from transducer position 1, adjust the gain to put the signal at 80 percent of FSH. See Detail II in Figure 3.

NOTE: Do not adjust the gain if the maximum signal from TP2 is 80 percent (or more) of FSH.

J. Make a record of the gain setting.

K. Add 6 dB of gain to adjust for paint.

5. Inspection Procedure

A. Identify the terminal fitting lugs to examine for cracks at the upper spar of the rear spar of the horizontal stabilizer. See Figure 1.

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

C. Calibrate the instrument as specified in Paragraph 4.

D. Put the transducer on the inspection surface of one of the terminal fitting lugs and make a scan of the inspection area as follows:

(1) Move the transducer from transducer position 1 (TP1) to transducer position 2 (TP2) as shown in Figure 1, View C and monitor the screen display for cracks signals.

(a) As you make a scan, monitor the baseline of the screen display for noise signals. You can be sure that sound goes into the terminal fitting lug if you see noise signals while you do the scan.

(b) To make sure the terminal fitting lug hole is fully examined, let the transducer overlap the edge of the lug a small quantity on the first and last scans.

(2) Move the transducer in increments that are a maximum of one-half the transducer width and continue to examine the terminal fitting lug for cracks as specified in Paragraph 5.D.(1) until the full width of the lug has been examined. See Figure 1, Section A-A.

(3) Turn the transducer 180 degrees and do Paragraph 5.D.(1) and Paragraph 5.D.(2) again but move the transducer from transducer position 2 to transducer position 1. See Figure 1, View C.

E. After each terminal fitting lug is examined, set the gain to the value recorded in Paragraph 4.J. and use the reference standard to do a calibration check to make sure that the signals from the notches are 70 percent of FSH or more. If a signal from a calibration notch is less than 70 percent of FSH, do the calibration and inspection again.

F. Examine the terminal fitting lug on the other side of the airplane for cracks as specified in Paragraph 5.D. and Paragraph 5.E.

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

6. Inspection Results

A. Ultrasonic signals that are 40 percent (or more) of FSH and occur between 70 to 90 percent of FSW are possible crack indications. Areas that cause possible crack indications to occur must be examined more fully.

B. To examine the terminal fitting lugs more fully, do the steps that follow:

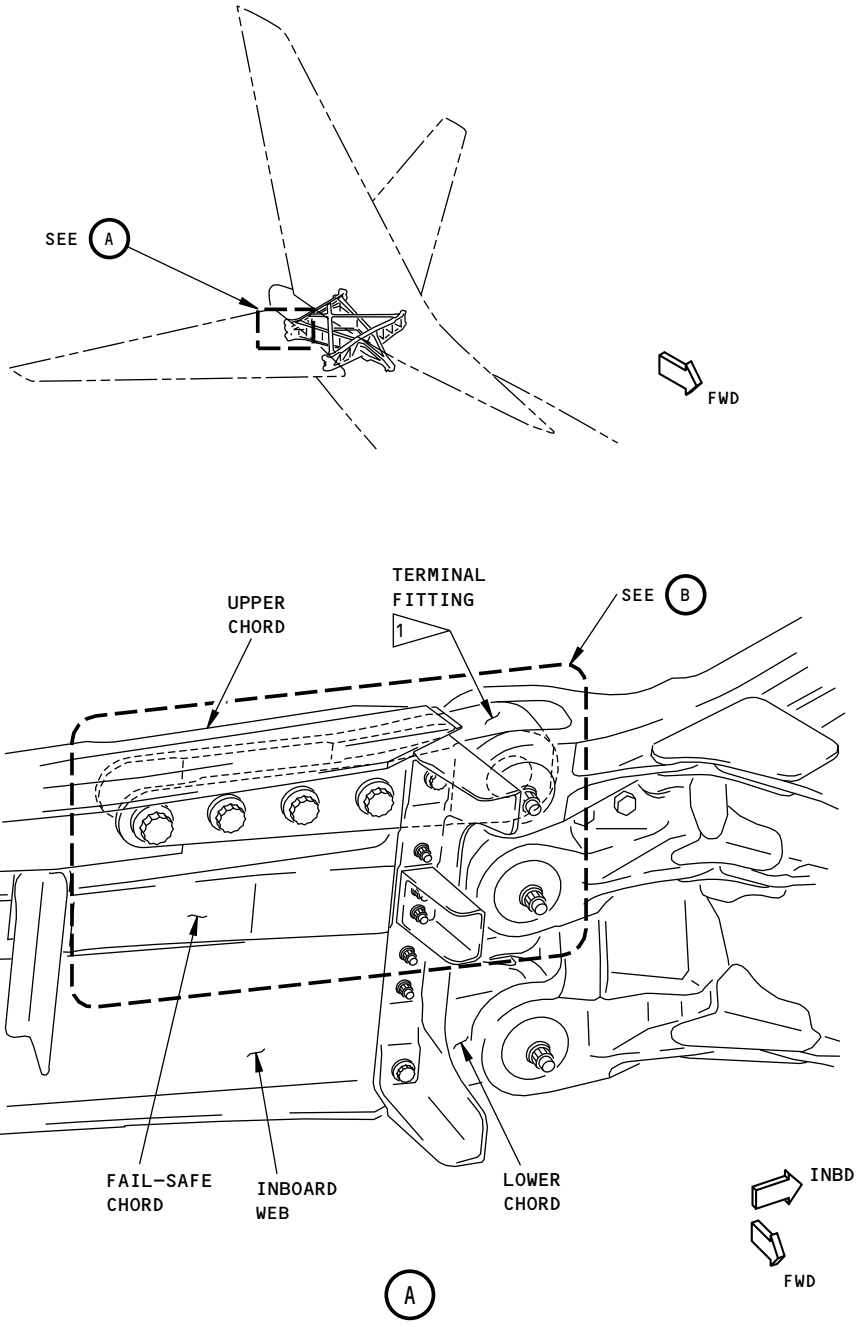
(1) Remove all the couplant and grease from the surfaces of the terminal fitting lug. Put couplant only on the surface that the transducer will touch and do the inspection again.

(2) Monitor the instrument screen as you move the transducer across the area where the crack indication occurs. See if the crack indication moves at the same rate as the transducer, or rises and falls quickly. A crack signal will rise and fall quickly; an indication from the shape of the part will usually rise and fall slowly.

(3) If the crack indication stays above the reject level, remove the paint from the surface that the transducer touches. Set the gain to the value recorded in Paragraph 4.J. and do the inspection again. If the signal stays at 40 percent (or more) of FSH, go to Paragraph 6.C.

NOTE: Remove paint carefully to prevent damage to the surface of the part. See the Airplane Maintenance Manual (AMM) for more instructions if necessary.

C. To make sure of a crack indication, remove the bushing from the hole and do a surface eddy current inspection on the inner diameter of the terminal fitting lug hole as specified in Part 6, 51-00-00, Procedure 14 or do an open hole eddy current inspection as specified in Part 6, 51-00-00, Procedure 17.



NOTES

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

1 TERMINAL FITTING TO BE EXAMINED

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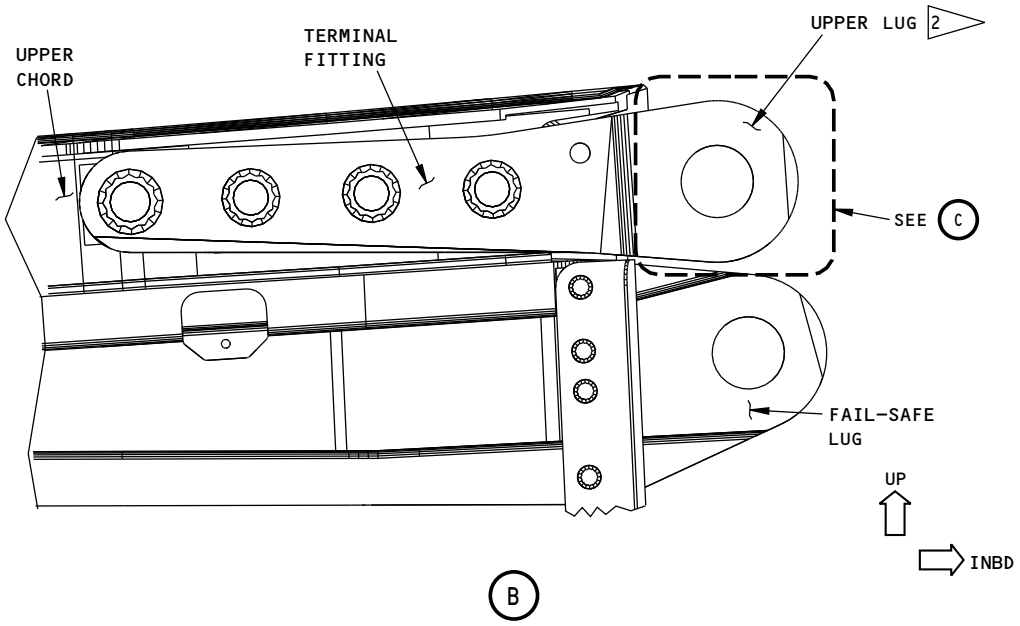
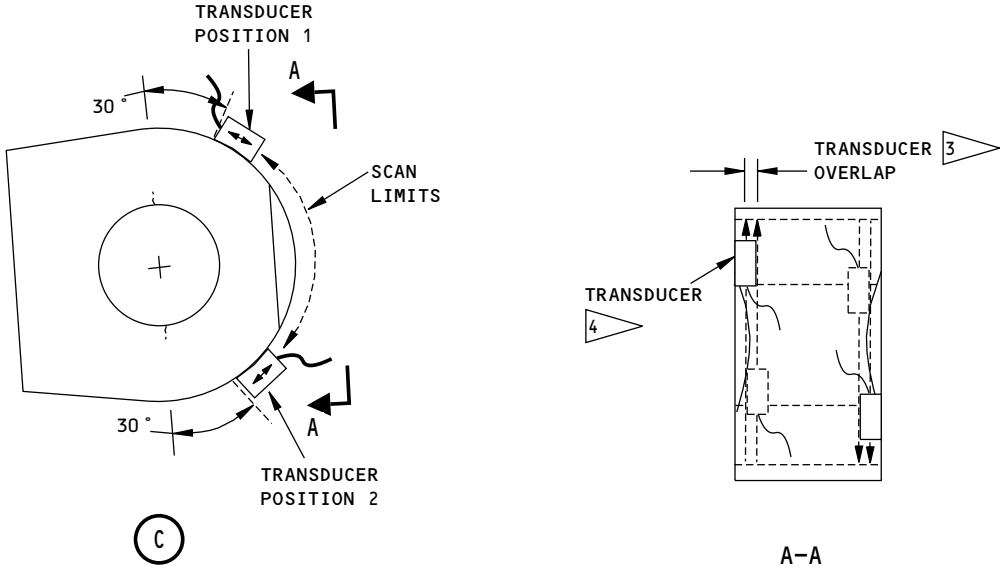
Inspection Areas
Figure 1 (Sheet 1 of 2)





NOTES

2 LUG TO BE EXAMINED

3 OVERLAP THE TRANSDUCER A MAXIMUM OF ONE HALF THE TRANSDUCER WIDTH. MAKE SCANS IN ONE DIRECTION UNTIL THE FULL WIDTH OF THE LUG HAS BEEN EXAMINED. TURN THE TRANSDUCER 180° AND MAKE SCANS IN THE OPPOSITE DIRECTION UNTIL THE FULL WIDTH OF THE LUG HAS BEEN EXAMINED AGAIN.

4 IT WILL BE NECESSARY FOR THE TRANSDUCER TO EXTEND ABOVE THE CHAMFER ON THE INBOARD END OF THE LUG.

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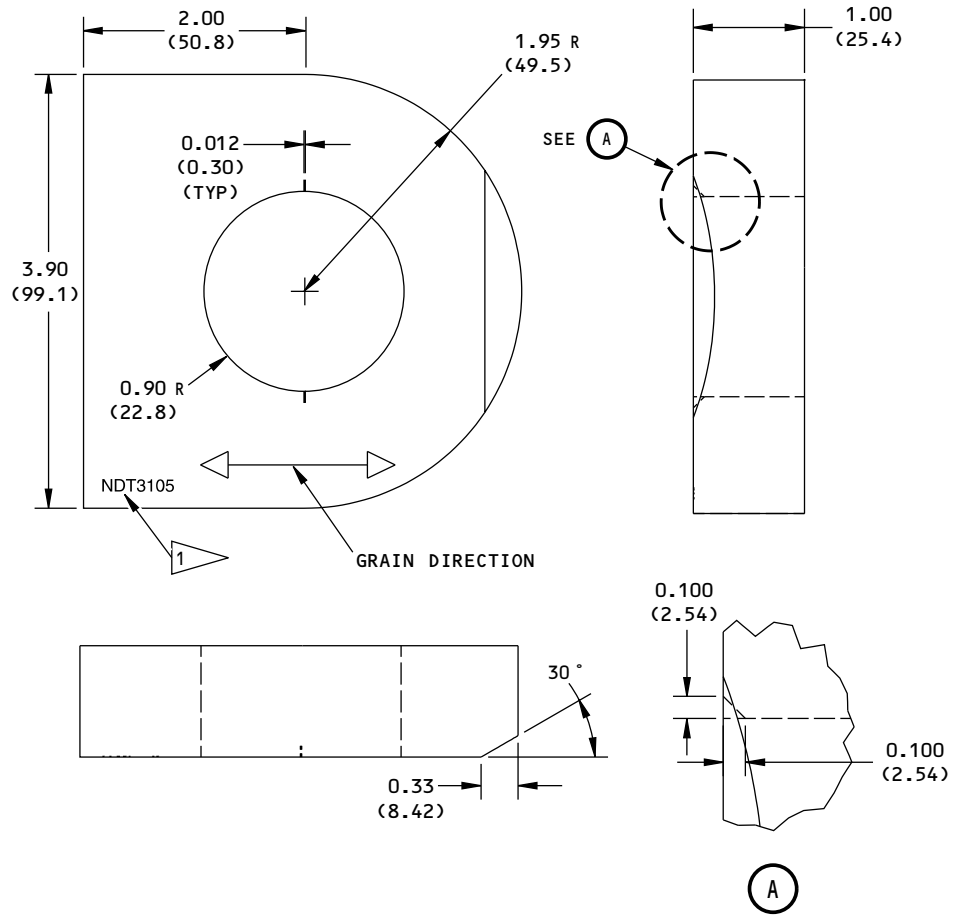
Inspection Areas
Figure 1 (Sheet 2 of 2)



NOTES:

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

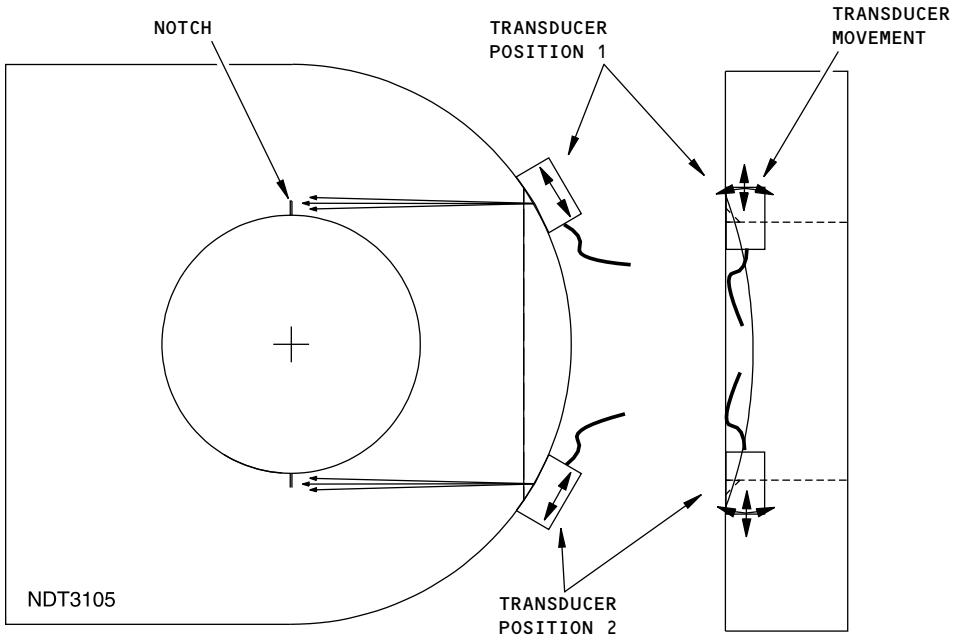
INCHES	MILLIMETERS	ANGLES
X.XXX = ±0.005	X.XX = ±0.010	±2°
X.XX = ±0.025	X.X = ±0.05	
X.X = ±0.050	X = ±1	

- MATERIAL: 6AL-4V TITANIUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER
- EDM NOTCHES:
  0.100 X 0.100 (2.54 X 2.54) CORNER NOTCHES (2 LOCATIONS);
  0.012 (0.30) MAXIMUM WIDTH

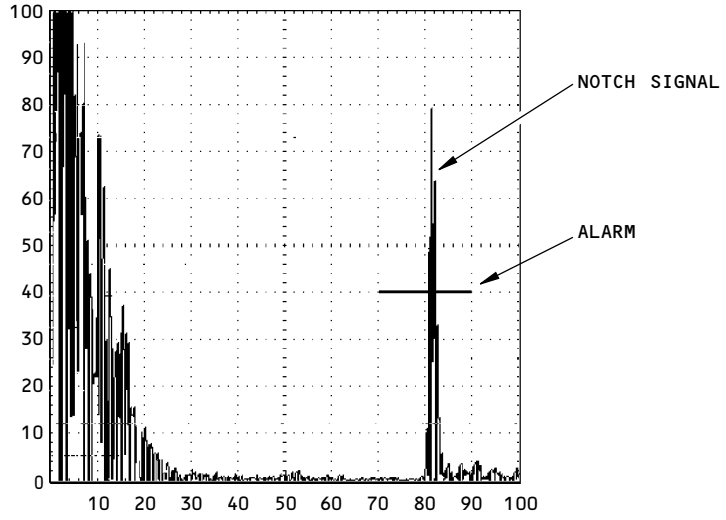
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER AT APPROXIMATELY THIS LOCATION

2158605 S0000471490_V1

Reference Standard NDT3105
Figure 2



CALIBRATION TRANSDUCER POSITIONS
DETAIL I



TRANSDUCER POSITION 1 AND POSITION 2 SIGNALS
DETAIL II

2158606 S0000471491_V1

Calibration Details
Figure 3

PART 4 - ULTRASONIC

UPPER LUGS OF THE FRONT SPARS FOR THE HORIZONTAL STABILIZERS AND THE FRONT SPAR OF THE CENTER SECTION FOR THE HORIZONTAL STABILIZER AT BS 1093.5

1. Purpose

A. Use this procedure to help find cracks in the upper clevis lugs of the front spar of the center section for the horizontal stabilizer and the mating lugs in the front spars of the left and right horizontal stabilizers.

B. 737 Supplemental Structural Inspection Document, Appendix B DTR Check Form Reference:

(1) Item: E-21

2. Equipment

A. General

(1) All ultrasonic flaw detector 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) Use a pulse-echo ultrasonic instrument that can operate in the 4-6 MHz frequency range.

NOTE: Broadband instruments can be used if they can satisfactorily do the calibration specified in this procedure.

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

(a) Masterscan 380; Sonatest

(b) USM Go; GE

C. Transducers

(1) Two special, low-profile, 5 MHz transducers are necessary to do this inspection. Use the transducers that follow to do this inspection:

(a) TEK-5162; Techna NDT

(b) TEK-5163; Techna NDT

D. Reference Standards

(1) Three reference standards, NDT3144, NDT3145 and NDT3146, are necessary to do this inspection. See Figure 2 thru Figure 4 for data about the reference standards.

E. Couplant

(1) Use an ultrasonic couplant that will not damage the airplane structure.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Put the horizontal stabilizer in the full down position and lock the controls.

C. Fully clean the transducer contact areas of the applicable lugs. See Figure 1.

4. Instrument Calibration

A. Get the necessary reference standard and transducer for the airplane and lug(s) to examine, as identified in Table 1.

Table 1: Reference Standards and Transducers

Airplane Basic Effectivity	Upper Lug of the Front Spar of the Horizontal Stabilizer		Upper Clevis Lugs of the Center Section for the Horizontal Stabilizers	
	Reference Standard	Transducer	Reference Standard	Transducer
P5501-P6613, P7001-P7389, P7801-P8092, P8151-P8344	NDT3144	TEK-5162	NDT3146	TEK-5163
P0001-P0025, P0901-P0905, P2501-P2600, P2602-P2609, P2611-P2690, P2692-P2694, P2696, P2698-P2714, P2716, P2801-P2807, P2810-P2814, P2815-P2821, P3501-P3513, P3601, P3603-P3605, P3608-P3618, P3620-P3623, P3624-P3880, P3881-P4326, P4327-P4353, P4401-P4419, P8501-P8502, P8801-P8820, P8822-P8825, P8908-P8955, P8901-P8907, P8956-P8978	NDT3144	TEK-5162	NDT3145	TEK-5162

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

C. Put couplant and then the transducer at transducer position 1 (TP1) and get a maximum signal from reference notch ‘A’ as shown in Figure 5.

D. Set the initial pulse to 0 percent of full screen width (FSW) and the maximum signal from reference notch ‘A’ at 80 percent of FSW and 80 percent of full screen height (FSH). See Detail I in Figure 5.

E. Move the transducer to TP2 as shown in Figure 5 and get a maximum signal from reference notch ‘B’. If the maximum signal from reference notch “B” is less than 80 percent of FSH, then adjust the gain to set the signal to 80 percent of FSH.

F. If the gain was changed in Paragraph 4.E., do a check of the instrument sensitivity at notch ‘A’ again to be sure the calibration is correct.

G. Add 6 dB.

5. Inspection Procedure

A. Examine each applicable upper lug at the attach fittings on the left and right sides of the horizontal stabilizer as follows:

NOTE: During this inspection, do a check of the instrument calibration every 30 minutes to make sure that the sensitivity has not changed. If the sensitivity has changed by 10 percent or more, then calibrate the instrument again and examine all areas again that were examined since the last sensitivity check.

(1) Calibrate the equipment to the instructions given in Paragraph 4.

(2) Put couplant on the transducer contact surfaces as shown in Figure 6.

(3) Put the transducer on the lug and fully examine the top and bottom inspection areas as shown in Figure 6. Make a minimum of two scans at each inspection area, one scan each along the forward and aft edges of the lug. Be sure to keep the transducer positioned at the edge of the lug for each scan. As you make a scan, look for signals to occur between approximately 65 percent and 95 percent of FSW.

(4) Make an analysis of all signals that are 40 percent or more of FSH and between approximately 65 and 95 percent of FSW with the instructions given in Paragraph 6.

(5) Do Paragraph 5.A.(1) thru Paragraph 5.A.(4) on each lug identified in Figure 1.

6. Inspection Results

A. Signals that are 40% or more of FSH that occur between 65 and 95 percent of FSW are indications of possible cracks and more analysis is necessary. Go to Paragraph 6.B. to continue the analysis of all possible crack signals.

(1) Make a record of all possible crack signals that are less than 40 percent of FSH for use during subsequent inspections of these lugs.

B. Compare the possible crack signals to the signal that you get from the notch in the applicable reference standard to be sure it is a possible crack signal. Go to Paragraph 6.C. to continue the analysis of all possible crack signals.

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 examine the lug with the possible crack again. If the signal is 40 percent or more of FSH, then go to Paragraph 6.D. See the note in Paragraph 5.

(1) If the possible crack signal occurred during the inspection of an upper clevis lug of the center section for the horizontal stabilizer, and the transducer is at the chamfered area near the TP1 location that was used during calibration, then use notch 'A' to set the sensitivity. If not, then use notch 'B' to set the sensitivity.

D. Remove all couplant from the inspection area and then put a small quantity of couplant on the surface of the lug, but only at the transducer location where the crack type signal occurred. If the maximum signal is still 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 the different surfaces of the lug. The signal will move up and down when the finger touches a specific area of the lug that has caused the ultrasonic signal. If you can not dampen the signal, then go to Paragraph 6.F. and continue to make an analysis of the signal. Read the note that follows.

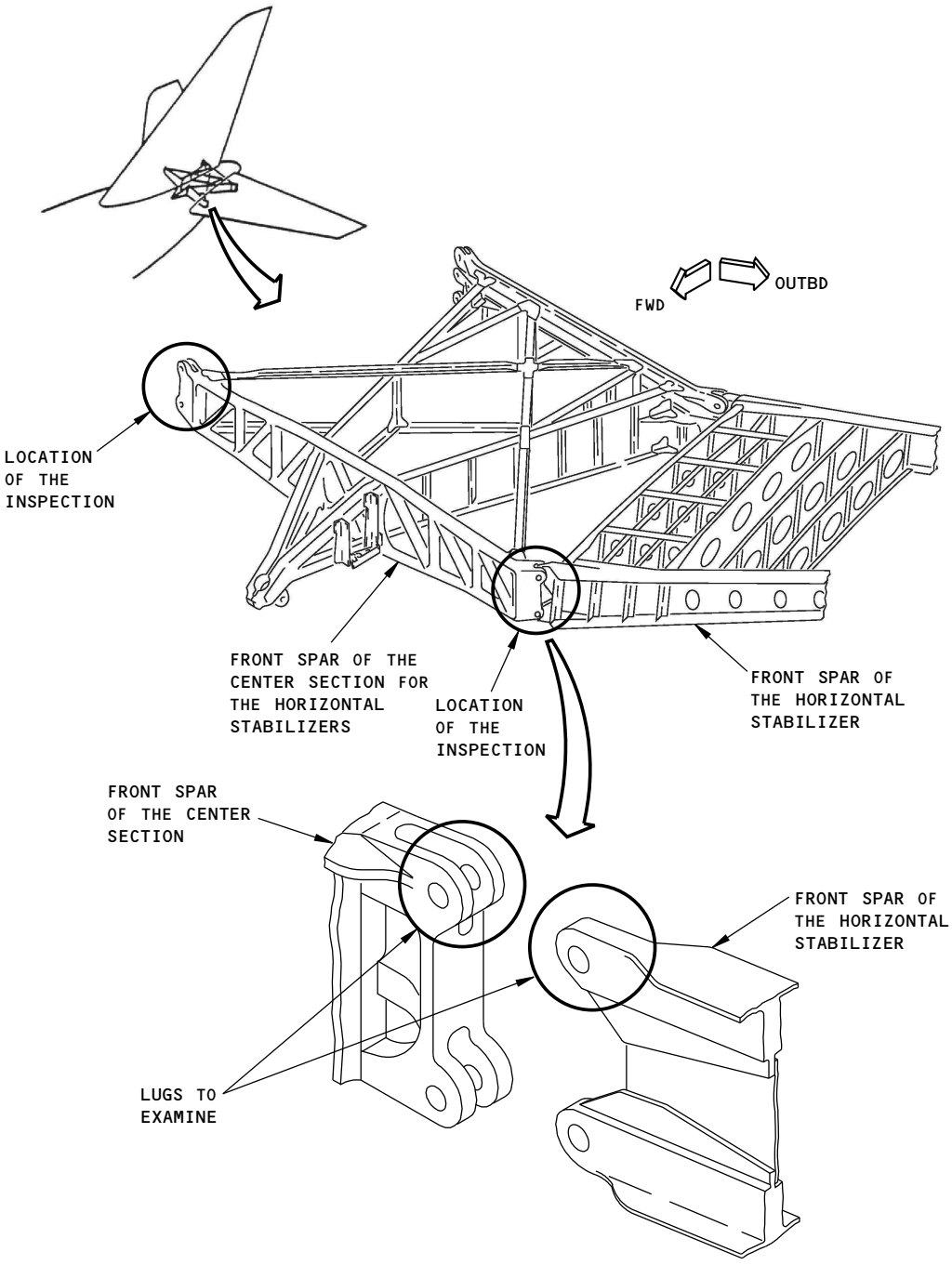
NOTE: Because it is also possible to dampen a signal from a crack, more analysis is necessary if the location where you can dampen a signal is at the location where cracks can occur. If you can dampen the signal at an inspection area, go to Paragraph 6.F. and continue to make an analysis of the signal.

F. Mark the location of the transducer on the lug when the possible crack signal occurs. Remove the paint from the lug at that location. Then remove the 6 dB that was added during the instrument calibration and make one more analysis of the possible crack signal. If the maximum signal is still 40 percent or more of FSH, go to Paragraph 6.G. and continue to make an analysis of the signal. If the signal goes away or is less than 40 percent of FSH, no more analysis is necessary. Make a record of all possible crack signals that are less than 40 percent of FSH for reference during subsequent inspections of the lug(s).

G. Do a surface eddy current inspection of the area where the signal occurs as specified in Part 6, 51-00-00, Procedure 23. If no cracks are found, do the instructions given in Paragraph 6.H. to examine the lug for cracks.

H. Remove the bushings and do a penetrant inspection as specified in Standard Overhaul Practices Manual (SOPM), D6-51702, subject 20-20-02.

NOTE: It is possible to get better results from penetrant inspections on areas with metal smear or on tight fatigue cracks if you etch the surface. It is necessary to get local engineering approval to do this.

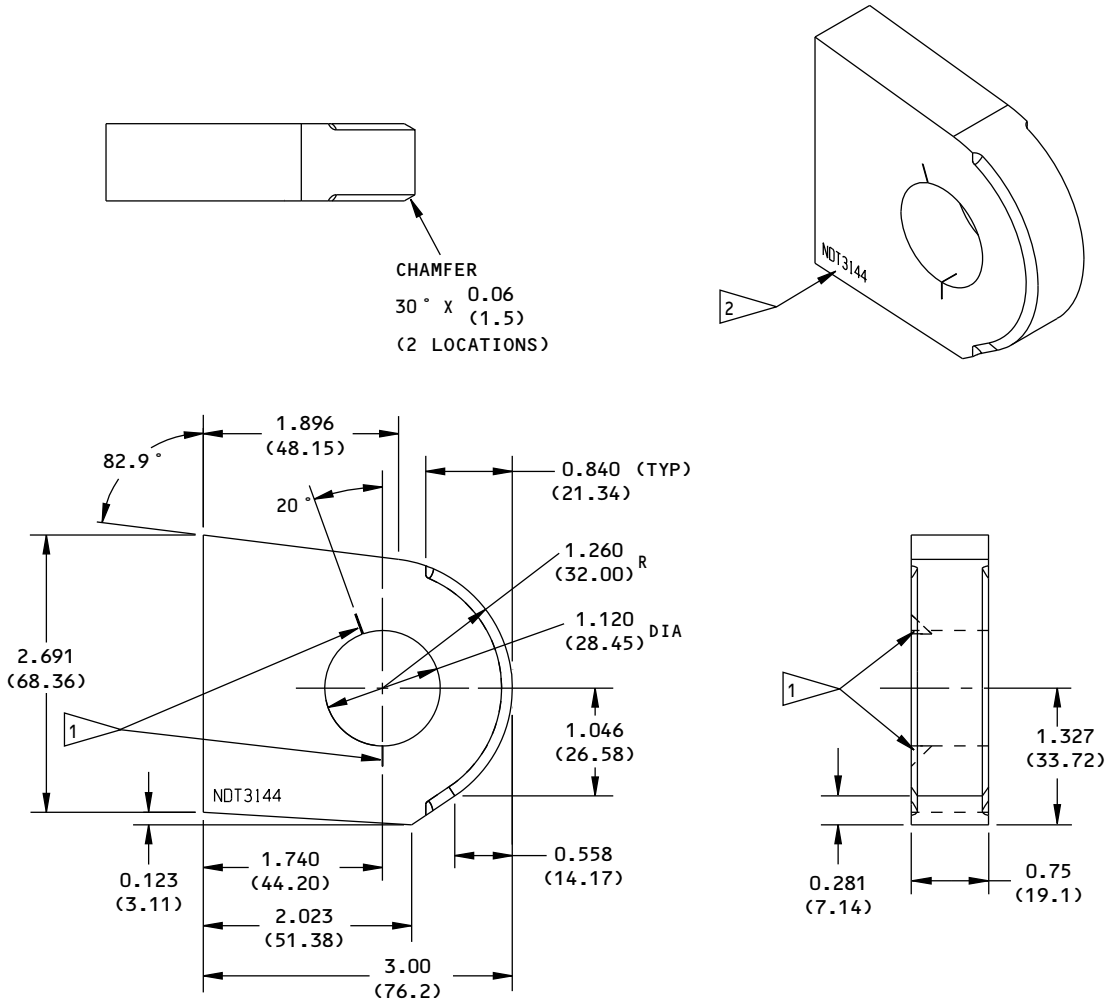


NOTES:

- EXAMINE THE UPPER LUGS OF THE ATTACH FITTINGS FOR CRACKS AT THE FRONT SPARS OR THE LEFT AND RIGHT HORIZONTAL STABILIZERS AND THE CENTER SECTION OF THE HORIZONTAL STABILIZER.

2158608 S0000471496_V1

Inspection Areas
Figure 1



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	

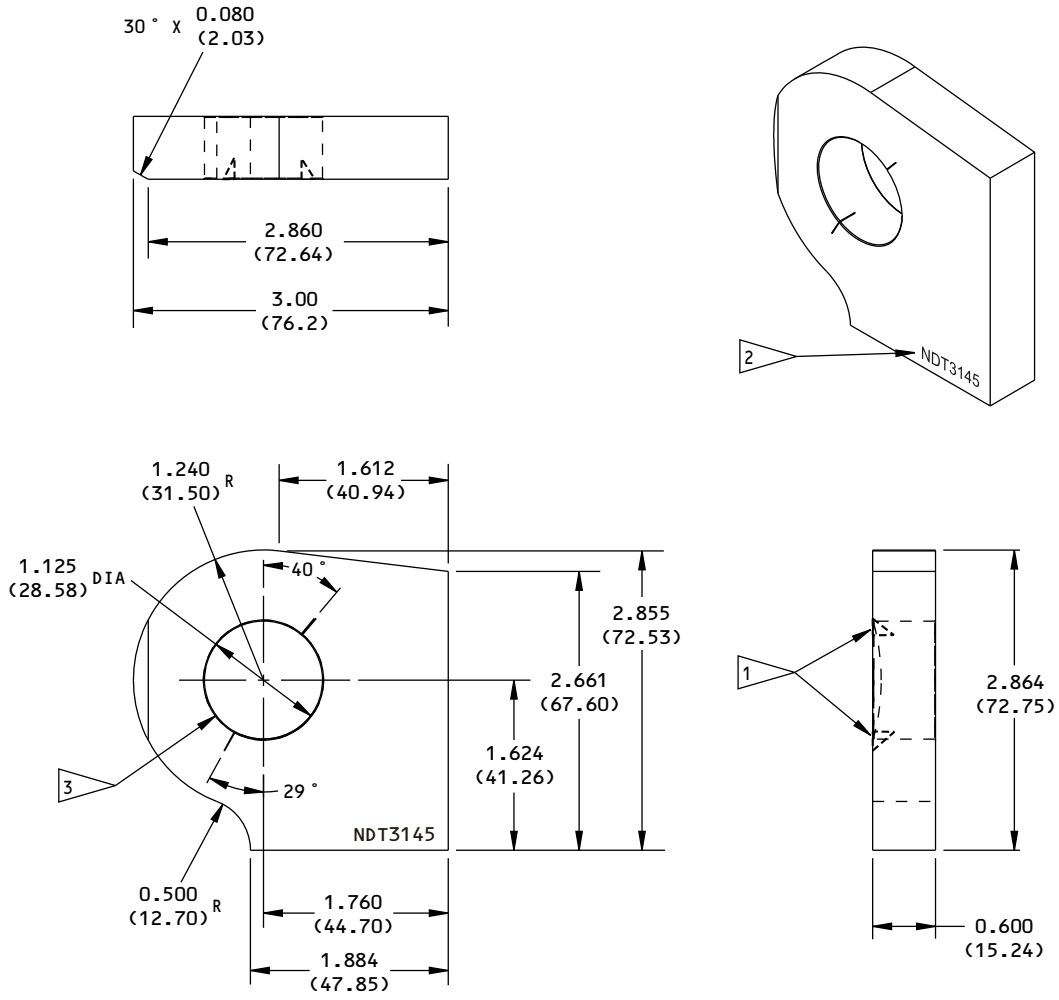
- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T6 ALUMINUM OR EQUIVALENT AIRPLANE QUALITY ALUMINUM

1 EDM CORNER NOTCHES: 0.200 (5.08) X 0.200 (5.08) LONG X 0.007 (0.18) WIDE (±0.003 (±0.08))

2 ETCH OR ENGRAVE THE REFERENCE STANDARD NUMBER, NDT3144, AT APPROXIMATELY THIS LOCATION

2158609 S0000471497_V1

Reference Standard NDT3144
Figure 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	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T6 ALUMINUM OR EQUIVALENT AIRPLANE QUALITY ALUMINUM

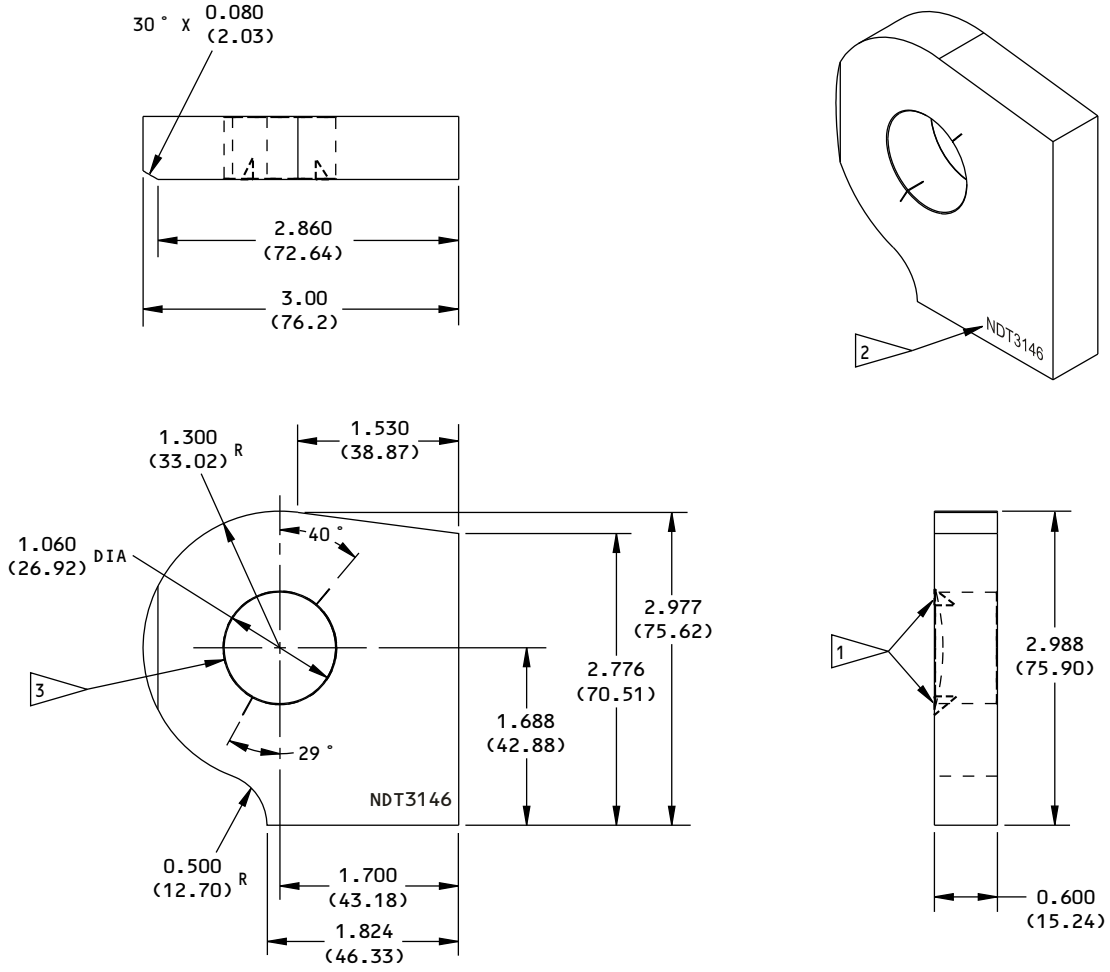
1 EDM CORNER NOTCHES: 0.200 (5.08) X 0.200 (5.08) LONG X 0.007 (0.18) WIDE (±0.003 (±0.08))

2 ETCH OR ENGRAVE THE REFERENCE STANDARD NUMBER, NDT3145, AT APPROXIMATELY THIS LOCATION

3 CHAMFER HOLE EDGES: 0.01 (0.3) X 45 °

2158611 S0000471498_V1

Reference Standard NDT3145
Figure 3



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	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T6 ALUMINUM OR EQUIVALENT AIRPLANE QUALITY ALUMINUM

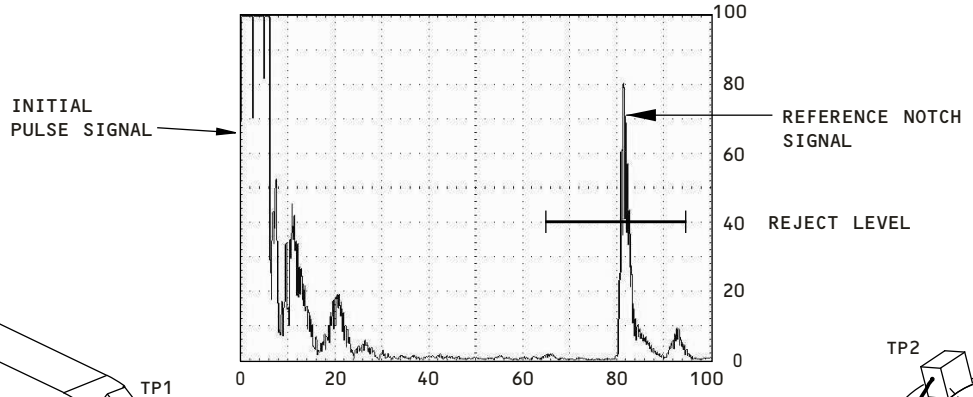
1 EDM CORNER NOTCHES: 0.200 (5.08) X 0.200 (5.08) LONG X 0.007 (0.18) WIDE (±0.003 (±0.08))

2 ETCH OR ENGRAVE THE REFERENCE STANDARD NUMBER, NDT3146, AT APPROXIMATELY THIS LOCATION

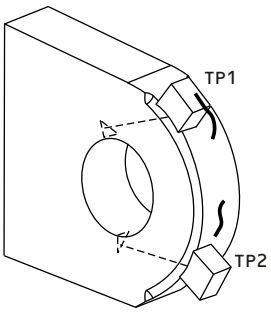
3 CHAMFER HOLE EDGES: 0.01 (0.3) X 45 °

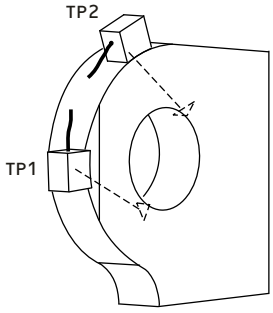
2158612 S0000471499_V1

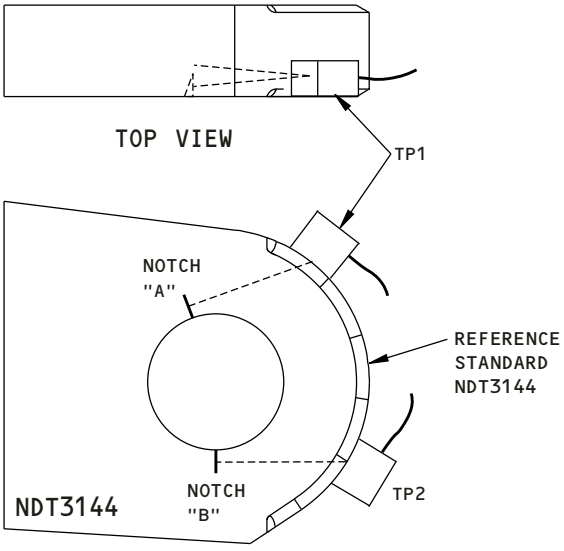
Reference Standard NDT3146
Figure 4



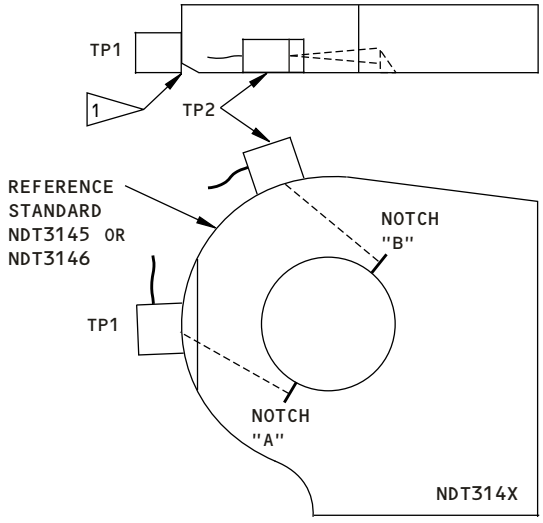
CALIBRATION SCREEN DISPLAY
DETAIL I







HORIZONTAL STABILIZER - UPPER
LUGS OF THE FRONT SPAR



HORIZONTAL STABILIZER CENTER
SECTION - UPPER CLEVIS LUGS

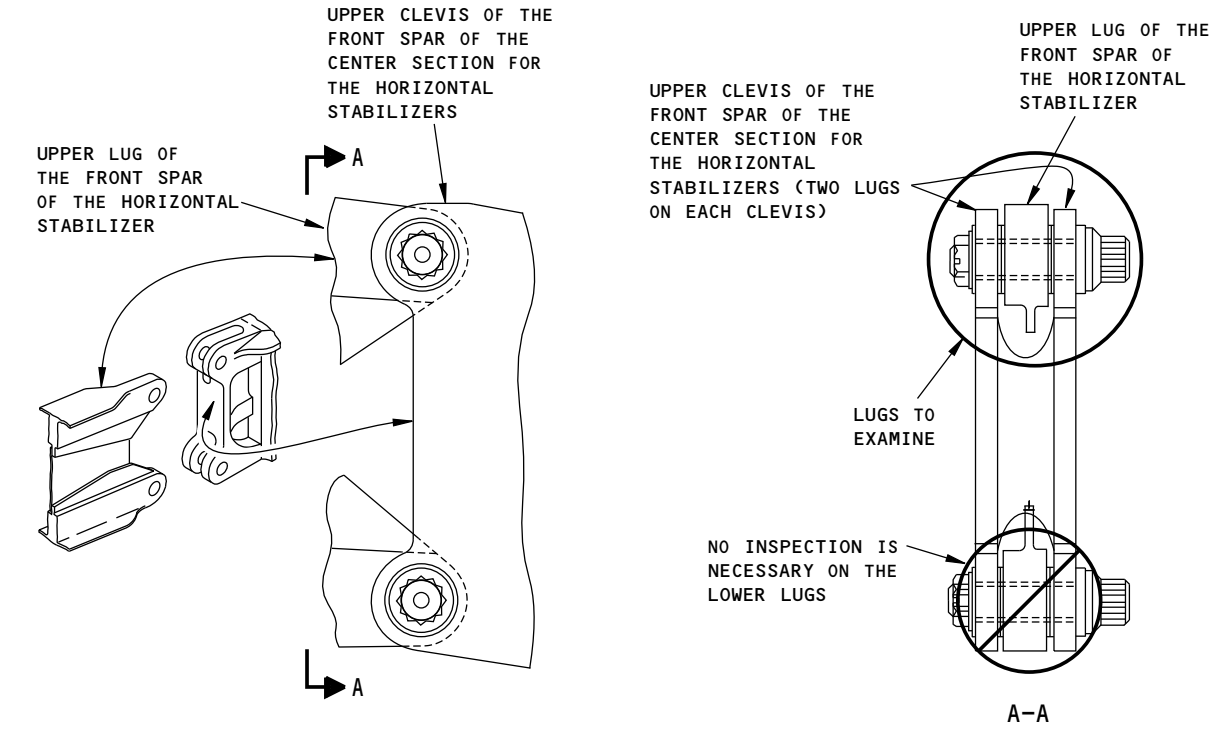
NOTES:

- THE DETAIL I SCREEN DISPLAY IS AN EXAMPLE OF THE CALIBRATION ON ONE OF THE REFERENCE STANDARDS. THE SCREEN DISPLAY WITH THE OTHER REFERENCE STANDARDS WILL LOOK ALMOST THE SAME. THE DISPLAY CAN LOOK DIFFERENT WITH OTHER INSTRUMENTS AND TRANSDUCER MIXES.

1 KEEP THE EDGE OF THE TRANSDUCER ALIGNED WITH THE FAR EDGE OF THE REFERENCE STANDARD.

2158613 S0000471500_V1

Instrument Calibration
Figure 5



UPPER LUG OF THE FRONT SPAR OF THE HORIZONTAL STABILIZER

UPPER CLEVIS OF THE FRONT SPAR OF THE CENTER SECTION FOR THE HORIZONTAL STABILIZERS

NOTES:

- DO THIS INSPECTION ON THE LEFT AND RIGHT SIDES OF THE AIRPLANES.
- THERE ARE A TOTAL OF SIX LUGS TO EXAMINE ON EACH AIRPLANE, THREE LUGS ON THE RIGHT SIDE, AND THREE LUGS ON THE LEFT SIDE.

1 MAKE A SCAN OF THE UPPER INSPECTION AREA, THEN TURN THE TRANSDUCER 180° AND MAKE A SCAN OF THE LOWER INSPECTION AREA

2158615 S0000471501_V1

Inspection Details
Figure 6

PART 4 - ULTRASONIC

UPPER LUGS OF THE REAR SPARS FOR THE HORIZONTAL STABILIZERS AND THE REAR SPAR OF THE CENTER SECTION FOR THE HORIZONTAL STABILIZER

1. Purpose

A. Use this procedure to help find cracks in the upper clevis lugs of the rear spar of the center section for the horizontal stabilizer and the mating lugs in the rear spars of the left and right horizontal stabilizers. See Figure 1.

B. This inspection procedure examines the lug holes for corner type cracks at the outer edges of each lug. The lug holes must have the same diameter as the production design diameter to use this procedure. See Figure 2 for the inspection areas for the 737-100 and -200 airplanes. See Figure 3 for the inspection areas for the 737-300 thru -500 airplanes.

C. This procedure uses five different 5 MHz transducers that can put shear waves in aluminum. The areas to be examined with the five transducers are as follows:

(1) To examine the clevis lugs of the center section and the lugs of the horizontal stabilizer for the 737-100/-200 airplanes, use the 22 degree transducer, TEK-5825, identified in Paragraph 2.C.(1).

(2) To examine the clevis lugs of the center section for the 737-300 thru -500 airplanes, use the 31 degree transducer, TEK-5826, identified in Paragraph 2.C.(2) and the 45 degree transducer identified in Paragraph 2.C.(5) or an equivalent.

(3) To examine the horizontal stabilizer lug for the 737-300 thru -500 airplanes, use the 26 degree transducer, TEK-5828, identified in Paragraph 2.C.(4) and the 33 degree transducer, TEK-5827, identified in Paragraph 2.C.(3).

D. This procedure uses three reference standards.

(1) Reference standard NDT3195 is used to examine the clevis lugs of the center section and the lugs of the horizontal stabilizer for the 737-100/-200 airplanes.

(2) Reference standard NDT3196 is used to examine the clevis lugs of the center section for 737-300 thru -500 airplanes.

(3) Reference standard NDT3197 is used to examine the lugs of the horizontal stabilizer for the 737-300 thru -500 airplanes.

E. Service Bulletin 737-55A1033 is related to this procedure.

2. Equipment

A. General

(1) Use ultrasonic equipment that 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 - Use an ultrasonic instrument that can:

(1) Operate in the frequency range of 4 and 6 MHz.

(2) Be calibrated as specified in the calibration instructions of this procedure. The instruments that follow were used to help prepare this procedure.

(a) Sonic 1200; Olympus NDT

(b) USN 60, USMGO; GE Inspection Technologies

(c) EPOCH 600; Olympus NDT

C. Transducer - Use 5 MHz transducers that have the properties that follow:

(1) Puts a 22-degree shear wave in aluminum and has a 0.38 inch (9.7 mm) element, a 2.0 inch (51 mm) radius contact surface and a rear mounted connector. The case dimensions must not be more than 0.75 inch (19.1 mm) in length by 0.50 inch (12.7 mm) in width by 0.25 inch (6.4 mm) in height. The transducer that follows was used to help prepare this procedure.

(a) TEK-5825; Techna NDT

(2) Puts a 31-degree shear wave in aluminum and has a 0.38 inch (9.7 mm) element, a 2.0 inch (51 mm) radius contact surface and a rear mounted connector. The case dimensions must not be more than 0.75 inch (19.1 mm) in length by 0.50 inch (12.7 mm) in width by 0.25 inch (6.4 mm) in height. The transducer that follows was used to help prepare this procedure.

(a) TEK-5826; Techna NDT

(3) Puts a 33-degree shear wave in aluminum and has a 0.38 inch (9.7 mm) element, a 2.0 inch (51 mm) radius contact surface and a rear mounted connector. The case dimensions must not be more than 0.75 inch (19.1 mm) in length by 0.50 inch (12.7 mm) in width by 0.25 inch (6.4 mm) in height. The transducer that follows was used to help prepare this procedure.

(a) TEK-5827; Techna NDT

(4) Puts a 26-degree shear wave in aluminum and has a 0.38 inch (9.7 mm) element, a 2.0 inch (51 mm) radius contact surface and a rear mounted connector. The case dimensions must not be more than 0.75 inch (19.1 mm) in length by 0.50 inch (12.7 mm) in width by 0.25 inch (6.4 mm) in height. The transducer that follows was used to help prepare this procedure.

(a) TEK-5828; Techna NDT

(5) Puts a 45-degree shear wave in aluminum and has a 0.38 inch (9.7 mm) element and a rear mounted connector. The case dimensions must not be more than 0.75 inch (19.1 mm) in length by 0.50 inch (12.7 mm) in width by 0.65 inch (16.5 mm) in height. The transducer that follows was used to help prepare this procedure.

(a) LA-455S; Techna NDT

D. Transducer Adapter - It is recommended to use a flexible adapter to hold the transducer at inspection areas where it is not easy to access the inspection area. The transducer adapter that follows was used to help prepare this procedure.

(1) MFLX-6 (straight); Techna NDT

E. Reference Standards - Use the reference standards that follow:

(1) Use reference standard NDT3195 to examine the center section clevis and horizontal stabilizer lugs on all 737-100/-200 airplanes. See Figure 4 for the reference standard drawing.

(2) Use reference standard NDT3196 to examine the center section clevis lugs on all 737-300 thru -500 airplanes. See Figure 5 for the reference standard drawing.

(3) Use reference standard NDT3197 to examine the horizontal stabilizer lug on all 737-300 thru -500 airplanes. See Figure 6 for the reference standard drawing.

F. Couplant - Use an ultrasonic couplant that will not damage the airplane structure.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Get access to the top surface of the horizontal stabilizer.

(1) Remove gap covers 9123L (left side) and 9223R (right side) to get access to the inspection areas for the 737-100 and -200 airplanes.

(2) Remove gap covers 9124L (left side) and 9224R (right side) to get access to the inspection areas for the 737-300 thru -500 airplanes.

C. Clean all the surfaces that the transducers will touch. See Figure 1 for the transducer inspection surfaces.

(1) If necessary, remove sealant and corrosion preventive compound from the transducer inspection surface.

(2) If the surface is rough, make it smooth by approved procedures. It is not necessary to remove paint unless it is loose.

4. Instrument Calibration

NOTE: The calibration instructions in Paragraph 4.A. are used to examine all the inspection areas identified in Figure 2 for the 737-100/-200 airplanes. The calibration instructions in Paragraph 4.B. are used to examine the clevis lugs of the center section at the inspection areas identified in Figure 3, Detail II, for the 737-300 thru -500 airplanes. The calibration instructions in Paragraph 4.C. are used to examine the horizontal stabilizer lug at the inspection areas identified in Figure 3, Detail III, for the 737-300 thru -500 airplanes.

A. Calibrate the instrument to examine the center section clevis and horizontal stabilizer lugs for the 737-100/-200 airplanes as follows:

(1) Connect the transducer identified in Paragraph 2.C.(1) to the instrument.

(2) Set the instrument frequency between 4 and 6 MHz, if a broadband instrument is not used.

(3) Put a sufficient quantity of couplant on the outer radius surface of reference standard NDT3195 at transducer positions “A” and “B”. See Figure 7, Detail I for the transducer positions.

(4) Put the transducer on the outer radius surface at transducer position “A” as shown in Figure 7, Detail I and do the steps that follow:

(a) Make sure the sound beam is pointed in the direction of notch “A” and the transducer extends across the edge of the reference standard approximately 0.10 inch (0.25 mm) as shown in Figure 7, section A-A.

(b) Adjust the instrument gain, delay and range controls as necessary to get a signal from the notch to occur on the screen display.

(c) Move the transducer up or down as necessary to get a maximum signal from the notch.

(d) Adjust the instrument delay and range controls to get the signal from the notch set to 80% of full screen width (FSW) with the initial pulse set to 0% of FSW. See Figure 7, Detail II for the screen display.

(e) Adjust the instrument gain to get the notch signal to be 80% of full screen height (FSH) and make a record of the gain value. See Figure 7, Detail II.

NOTE: Do not use reject.

(f) Move the transducer to position “B” to get a maximum signal from notch “B”. If the signal is less than 80% of FSH, adjust the gain to set the signal to 80% of FSH and make a record of the gain value.

(g) If the gain was changed from that set in Paragraph 4.A.(4)(e), do a check of the sensitivity at notch “A” again to make sure the calibration is correct.

B. Calibrate the instrument to examine the clevis lugs of the center section for the 737-300 thru -500 airplanes as follows:

(1) To examine the inspection areas that are outboard of the vertical centerline of the inner diameter with transducer T4, as shown in Figure 3, Detail II, do the steps that follow:

(a) Connect the transducer identified in Paragraph 2.C.(5) to the instrument.

(b) Set the instrument frequency between 4 and 6 MHz, if a broadband instrument is not used.

(c) Put a sufficient quantity of couplant on the inspection surface of reference standard NDT3196 at transducer positions “A” and “B” as shown in Figure 8, Detail I.

(d) Put the transducer on the inspection surface of reference standard NDT3196 at transducer position “A” as shown in Figure 8, Detail I and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of the ID of the reference standard and the transducer extends across the edge of the reference standard approximately 0.10 inch (0.25 mm) as shown in Figure 8, section A-A.

2) Adjust the instrument gain, delay and range controls as necessary to get a signal from the ID to occur on the screen display.

3) Move the transducer up or down as necessary to get a maximum signal from the ID.

4) Adjust the instrument delay and range controls to get the signal from the ID set to 80% of full screen width (FSW) with the initial pulse set to 0% of FSW. See Figure 8, Detail II for the screen display.

(e) Move the transducer to transducer position “B” as shown in Figure 8, Detail I and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of notch “A” and the transducer extends across the front edge of the reference standard as shown in Figure 8, section A-A.

2) Move the transducer up or down as necessary to get a maximum signal from notch “A”. The maximum signal will occur at approximately 76% of FSW. See Figure 8, Detail II.

3) Adjust the instrument gain to get the notch “A” signal to be 80% of full screen height (FSH) and make a record of the gain value. See Figure 8, Detail II.

NOTE: Do not use reject.

(f) Keep the transducer at transducer position “B” and move the transducer to the opposite edge of the reference standard.

(g) Slowly move the transducer in the direction of transducer position “A” until you get a maximum signal from notch “B”. See Figure 8, Detail I, section A-A for the approximate transducer position and Detail II for the notch signal FSW location.

1) If the signal is less than 80% of FSH, adjust the gain to set the signal to 80% of FSH and make a record of the gain value.

(h) If the gain was changed from that set in Paragraph 4.B.(1)(e)3), do a check of the sensitivity at notch “A” again to make sure the calibration is correct.

(2) To examine the inspection areas that are inboard of the vertical centerline of the inner diameter with transducer T5, as shown in Figure 3, Detail II, do the steps that follow:

(a) Connect the transducer identified in Paragraph 2.C.(2) to the instrument.

(b) Set the instrument frequency between 4 and 6 MHz, if a broadband instrument is not used.

(c) Put a sufficient quantity of couplant on the inspection surface of reference standard NDT3196 at transducer positions “C” and “D”. See Figure 8, Detail I for the transducer positions.

(d) Put the transducer on the inspection surface of reference standard NDT3196 at transducer position “D” as shown in Figure 8, Detail I, and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of notch “B” and the transducer extends across the edge of the reference standard approximately 0.10 inch (0.25 mm) as shown in Figure 8, section A-A.

2) Adjust the instrument gain, delay and range controls as necessary to get a signal from notch “B” to occur on the screen display.

3) Move the transducer up or down as necessary to get a maximum signal from notch “B”.

4) Adjust the instrument delay and range controls to get the signal from notch “B” set to 80% of full screen width (FSW) with the initial pulse set to 0% of FSW. See Figure 8, Detail III for the screen display.

5) Adjust the instrument gain to get the notch signal to be 80% of full screen height (FSH) and make a record of the gain value. See Figure 8, Detail III.

NOTE: Do not use reject.

(e) Move the transducer to transducer position “C” as shown in Figure 8, Detail I and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of notch “C” and the transducer extends across the front edge of the reference standard as shown in Figure 8, section A-A.

2) Move the transducer up or down as necessary to get a maximum signal from notch “C”.

a) Monitor the screen width location of the notch signal to occur at approximately 76% of FSW. See Figure 8, Detail III.

b) If the signal is less than 80% of FSH, adjust the gain to set the signal to 80% of FSH and make a record of the gain value. It is not necessary to adjust the gain if the signal is more than 80% of FSH.

3) If the gain was changed from that set in Paragraph 4.B.(2)(d)5), do a check of the sensitivity at notch “B” again to make sure the calibration is correct.

C. Calibrate the instrument to examine the horizontal stabilizer lug for the 737-300 thru -500 airplanes as follows:

(1) To examine the inspection areas that are inboard of the vertical centerline of the inner diameter with transducer T2, as shown in Figure 3, Detail III, do the steps that follow:

(a) Connect the transducer identified in Paragraph 2.C.(4) to the instrument.

(b) Set the instrument frequency between 4 and 6 MHz, if a broadband instrument is not used.

(c) Put a sufficient quantity of couplant on the inspection surface of reference standard NDT3197 at transducer positions “A” and “B”. See Figure 9, Detail I for the transducer positions.

(d) Put the transducer on the inspection surface of reference standard NDT3197 at transducer position “A”, as shown in Figure 9, Detail I, and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of notch “A” and the transducer is flush with the edge of the reference standard as shown in Figure 9, section A-A.

2) Adjust the instrument gain, delay and range controls as necessary to get a signal from notch “A” to occur on the screen display.

3) Move the transducer up or down as necessary to get a maximum signal from notch “A”.

4) Adjust the instrument delay and range controls to get the signal from the notch set to 80% of FSW with the initial pulse set to 0% of FSW. See Figure 9, Detail II for the screen display.

5) Adjust the instrument gain to get the notch signal to be 80% of full screen height (FSH) and make a record of the gain value. See Figure 9, Detail II.

NOTE: Do not use reject.

(e) Put the transducer on the inspection surface of reference standard NDT3197 at transducer position “B”, as shown in Figure 9, Detail I, and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of notch “B” and the transducer is flush with the edge of the reference standard as shown in Figure 9, section A-A.

2) Move the transducer up or down as necessary to get a maximum signal from notch “B”. The maximum signal will occur at approximately 80% of FSW.

a) If the signal is less than 80% of FSH, adjust the gain to set the signal to 80% of FSH and make a record of the gain value. It is not necessary to adjust the gain if the signal is more than 80% of FSH.

3) If the gain was changed from that set in Paragraph 4.C.(1)(d)5), do a check of the sensitivity at notch “A” again to make sure the calibration is correct.

(2) To examine the inspection areas that are outboard of the vertical centerline of the inner diameter with transducer T3, as shown in Figure 3, Detail III, do the steps that follow:

(a) Connect the transducer identified in Paragraph 2.C.(3) to the instrument.

(b) Set the instrument frequency between 4 and 6 MHz, if a broadband instrument is not used.

(c) Put a sufficient quantity of couplant on the inspection surface of reference standard NDT3197 at transducer positions “B” and “C”. See Figure 9, Detail I for the transducer positions.

(d) Put the transducer on the inspection surface at transducer position “B” as shown in Figure 9, Detail I, and do the steps that follow:

1) Make sure the sound beam points in the direction of notch “B” and the transducer extends across the edge of the reference standard approximately 0.10 inch (0.25 mm) as specified by flagnote 1 in Figure 9, section A-A.

2) Adjust the instrument gain, delay and range controls as necessary to get a signal from notch “B” to occur on the screen display.

3) Move the transducer up or down as necessary to get a maximum signal from notch “B”.

4) Adjust the instrument delay and range controls to get the signal from notch “B” set to 80% of full screen width (FSW) with the initial pulse set to 0% of FSW. See Figure 9, Detail II for the screen display.

5) Adjust the instrument gain to get the notch signal to be 80% of full screen height (FSH) and make a record of the gain value. See Figure 9, Detail II.

NOTE: Do not use reject.

(e) Move the transducer to transducer position “C” as shown in Figure 9, Detail I and do the steps that follow:

1) Make sure the sound beam is pointed in the direction of notch “C” and the transducer extends across the edge of the reference standard approximately 0.10 inch (0.25 mm) as shown in Figure 9, section A-A.

2) Move the transducer up or down as necessary to get a maximum signal from notch “C”.

a) Monitor the screen display for the notch signal to occur at approximately 76% of FSW. See Figure 9, Detail II.

b) If the signal is less than 80% of FSH, adjust the gain to set the signal to 80% of FSH and make a record of the gain value. It is not necessary to adjust the gain if the signal is more than 80% of FSH.

3) If the gain was changed from that set in Paragraph 4.C.(2)(d)5), do a check of the sensitivity at notch “B” again to make sure the calibration is correct.

5. Inspection Procedure

NOTE: The inspection instructions in Paragraph 5.A. are used to examine the center section clevis and horizontal stabilizer lugs for the 737-100/-200 airplanes. The inspection instructions in Paragraph 5.B. are used to examine the clevis lugs of the center section for the 737-300 thru -500 airplanes. The inspection instructions in Paragraph 5.C. are used to examine the horizontal stabilizer lugs for the 737-300 thru -500 airplanes.

A. Examine the center section clevis and horizontal stabilizer lugs for the 737-100/-200 airplanes as follows:

(1) Calibrate the instrument as specified in Paragraph 4.A.

(2) Increase the gain 6 dB to adjust for paint.

(3) Put a sufficient quantity of couplant on the transducer inspection surfaces. See Figure 2, Detail II for the clevis lugs of the center section and Figure 2, Detail III for the horizontal stabilizer lug.

(4) Make a complete scan of the inspection area as follows:

(a) Identify the transducer positions for the minimum start and stop locations; see Figure 2, flagnote 1.

(b) Put the transducer on the inspection surface at the 10 degree angular dimension below the horizontal centerline of the ID (start position) and with the sound beam pointed up towards the inspection area.

(c) Make sure the edge of the transducer is flush with the outer edge of the lug.

(d) Move the transducer down approximately 10 degrees to start the scan.

(e) Move the transducer up to the 30 degree angular dimension of the ID (stop position) and 10 degrees more, if possible, to complete the scan. During the scan:

1) Monitor the screen display for ultrasonic signals that occur between 60 and 100% of FSW.

2) Monitor the screen display for ultrasonic signals that are not in the inspection area to make sure the transducer always touches the inspection surface.

(5) Do Paragraph 5.A.(4)(a) thru Paragraph 5.A.(4)(e) again on the opposite edge of the same lug and on each edge of the lugs to be examined.

(6) Do Paragraph 5.A.(4) and Paragraph 5.A.(5) again to examine the inspection areas on the lower side of the ID horizontal centerline.

B. Examine the clevis lugs of the center section for the 737-300 thru -500 airplanes as follows:

(1) Examine the inspection areas that are outboard of the vertical centerline of the lug holes with transducer T4, as shown in Figure 3, Detail II, as follows:

(a) Calibrate the instrument as specified in Paragraph 4.B.(1).

(b) Increase the gain 6 dB to adjust for paint.

(c) Put a sufficient quantity of couplant on the transducer inspection surfaces. See Figure 3, Detail II for the clevis lugs of the center section.

(d) Make a complete scan of the inspection area as follows:

1) Identify the transducer positions for the minimum start and stop locations; see Figure 3, flagnotes 3 and 4.

2) Put the transducer on the inspection surface at the position identified as flagnote 3 and with the sound beam pointed at the ID.

3) Make sure the edge of the transducer is flush with the outer edge of the lug.

4) Move the transducer up or down as much as necessary to get a maximum signal from the lug hole. The signal will occur at approximately 80% of FSW.

5) Move the transducer up to the minimum stop position identified as flagnote 4 and more, if possible, to complete the scan. During the scan:

a) Monitor the screen display for ultrasonic signals that occur between 60 and 100% of FSW.

b) Monitor the screen display for ultrasonic signals that are not in the inspection area to make sure the transducer always touches the inspection surface.

(e) Do Paragraph 5.B.(1)(d)1) thru Paragraph 5.B.(1)(d)5) again on the opposite edge of the same lug and on each edge of the adjacent lug.

(f) Do Paragraph 5.B.(1)(d) and Paragraph 5.B.(1)(e) again to examine the inspection areas on the lower side of the lug holes.

(2) Examine the inspection areas that are inboard of the vertical centerline of the lug holes with transducer T5, as shown in Figure 3, Detail II, as follows:

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

(b) Increase the gain 6 dB to adjust for paint.

(c) Put a sufficient quantity of couplant on the transducer inspection surfaces. See Figure 3, Detail II for the clevis lugs of the center section.

(d) Make a complete scan of the inspection area as follows:

1) Identify the transducer positions for the minimum start and stop locations; see Figure 3, flagnote 1.

2) Put the transducer on the inspection surface at the 60 degree angular dimension outboard of the vertical centerline of the lug hole (start position) and with the sound beam pointed up towards the inspection area.

3) Make sure the edge of the transducer is flush with the outer edge of the lug.

4) Move the transducer down approximately 10 degrees to start the scan.

5) Move the transducer up to the 30 degree angular dimension outboard of the vertical centerline of the lug hole (stop position) and 10 degrees more, if possible, to complete the scan. During the scan:

a) Monitor the screen display for ultrasonic signals that occur between 60 and 100% of FSW.

b) Monitor the screen display for ultrasonic signals that are not in the inspection area to make sure the transducer always touches the inspection surface.

NOTE: It is possible to get a signal from the lug hole to occur as the scan is made. If the signal is caused from the ID, it will show at all times along the full width of the lug.

(e) Do Paragraph 5.B.(2)(d)1) thru Paragraph 5.B.(2)(d)5) again on the opposite edge of the same lug and on each edge of the adjacent lug.

(f) Do Paragraph 5.B.(2)(d) and Paragraph 5.B.(2)(e) again to examine the inspection areas on the lower side of the lug holes.

C. Examine the horizontal stabilizer lug for the 737-300 thru -500 airplanes as follows:

(1) Examine the inspection areas that are inboard of the vertical centerline of the lug hole with transducer T2, as shown in Figure 3, Detail III, as follows:

(a) Calibrate the instrument as specified in Paragraph 4.C.(1).

(b) Increase the gain 6 dB to adjust for paint.

(c) Put a sufficient quantity of couplant on the transducer inspection surfaces. See Figure 3, Detail III, for the horizontal stabilizer lug.

(d) Make a complete scan of the inspection area as follows:

1) Identify the transducer positions for the minimum start and stop locations; see Figure 3, Detail III, flagnotes 1 and 2 for transducer T2.

2) Put the transducer on the inspection surface at the horizontal centerline of the lug hole (start position) and with the sound beam pointed up towards the inspection area.

3) Make sure the edge of the transducer is flush with the outer edge of the lug.

4) Move the transducer down approximately 10 degrees to start the scan.

5) Move the transducer up to a minimum of 30 degrees, see flagnote 2 in Figure 3, Detail III, for the transducer stop position to complete the scan. During the scan:

a) Monitor the screen display for ultrasonic signals that occur between 60 and 100% of FSW.

b) Monitor the screen display for ultrasonic signals that are not in the inspection area to make sure the transducer always touches the inspection surface.

NOTE: It is possible to get a signal from the ID to occur as the scan is made. If the signal is caused from the ID, it will show at all times along the full width of the lug.

(e) Do Paragraph 5.C.(1)(d)1) thru Paragraph 5.C.(1)(d)5) again on the opposite edge of the same lug.

(f) Do Paragraph 5.C.(1)(d) and Paragraph 5.C.(1)(e) again to examine the inspection area on the lower side of the lug holes.

(2) Examine the inspection areas that are outboard of the vertical centerline of the inner diameter with transducer T3, as shown in Figure 3, Detail III, as follows:

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

(b) Increase the gain 6 dB to adjust for paint.

(c) Put a sufficient quantity of couplant on the transducer inspection surfaces. See Figure 3, Detail III, for the horizontal stabilizer lug.

(d) Make a complete scan of the inspection area as follows:

1) Identify the transducer positions for the minimum start and stop locations; see Figure 3, Detail III, flagnotes 1 and 2 for transducer T3.

2) Put the transducer on the inspection surface at the 30 degree angular dimension above the horizontal centerline of the lug hole (start position) for transducer T3 and with the sound beam pointed down towards the inspection area.

3) Make sure the edge of the transducer is flush with the outer edge of the lug.

4) Move the transducer down approximately 10 degrees to start the scan.

5) Move the transducer up to the 30 degree angular dimension for transducer T3 that is inboard of the vertical centerline of the lug hole (stop position) and 10 degrees more, if possible, to complete the scan. During the scan:

a) Monitor the screen display for ultrasonic signals that occur between 60 and 100% of FSW.

b) Monitor the screen display for ultrasonic signals that are not in the inspection area to make sure the transducer always touches the inspection surface.

NOTE: It is possible to get a signal from the ID to occur as the scan is made. If the signal is caused from the ID, it will show at all times along the full width of the lug.

(e) Do Paragraph 5.C.(2)(d)1) thru Paragraph 5.C.(2)(d)5) again on the opposite edge of the same lug and on each edge of the adjacent lug.

(f) Do Paragraph 5.C.(2)(d) and Paragraph 5.C.(2)(e) again to examine the inspection areas on the lower side of the lug holes.

6. Inspection Results

A. Signals that are 40% of FSH (or more) and between 60 and 100% of FSW are possible crack signals.

(1) Make a record of all possible crack signals that are less than 40% of FSH for use during subsequent inspections of these lugs.

B. If you get an ultrasonic signal that is 40% (or more) of FSH, do more analysis as follows. As you do the instructions that follow, monitor the screen display to look for the ultrasonic signal to go away.

(1) Compare the possible crack signals to the signal that you get from the notch in the applicable reference standard to be sure it is a possible crack signal. Go to Paragraph 6.B.(2) to continue the analysis of all possible crack signals.

(2) 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 examine the lug with the possible crack again. If the signal is 40% of FSH or more, then go to Paragraph 6.B.(3).

(3) Couplant that is in front of the transducer can cause ultrasonic signals to occur on the screen display. Remove the couplant to see if the signals go away. If the signal does not go away and is 40% of FSH or more, then go to Paragraph 6.B.(4).

(4) Do a visual inspection for grease in the general area that causes the ultrasonic signal to occur. If possible, remove the grease or rub the area to see if the signal goes away. If the signal does not go away and is 40% of FSH or more, then go to Paragraph 6.B.(5).

(5) Make a mark on the lug at the transducer location where the possible crack signal occurs and do the steps that follow:

(a) Remove the paint from the lug at that location.

(b) Remove the 6 dB that was added during the instrument calibration.

(c) Make one more analysis of the possible crack signal. If the maximum signal is still 40% of FSH or more, go to Paragraph 6.B.(6).

(d) If the signal goes away or is less than 40% of FSH, no more analysis is necessary. Make a record of all possible crack signals that are less than 40 percent of FSH for reference during subsequent inspections of the lug(s).

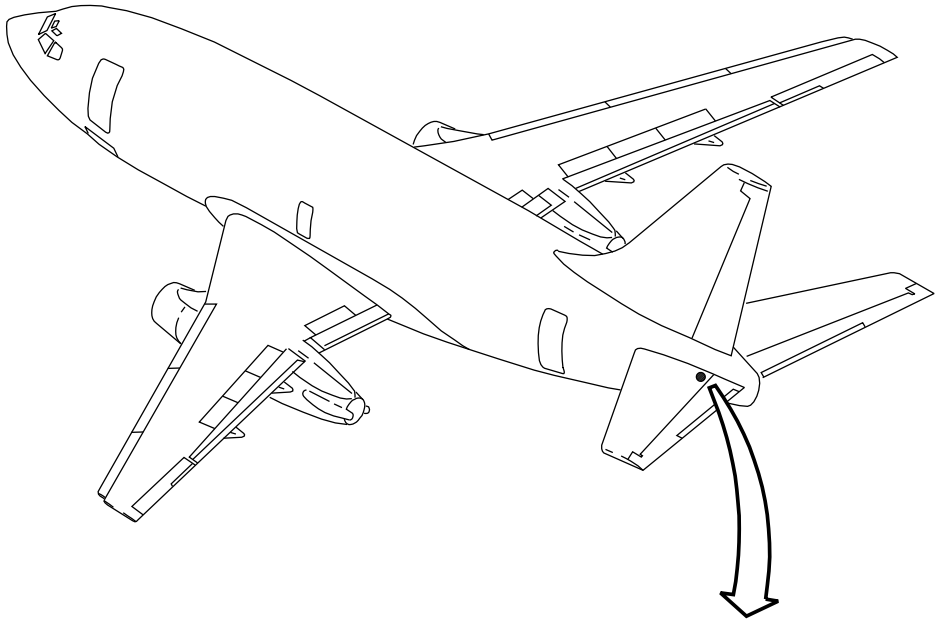
(6) Do a surface eddy current inspection as specified in Part 6, 51-00-00, Procedure 23, along the edge of the bushing in the area where the possible crack signal occurs. If no cracks are found, do the instructions given in Paragraph 6.B.(7) to examine the lug for cracks.

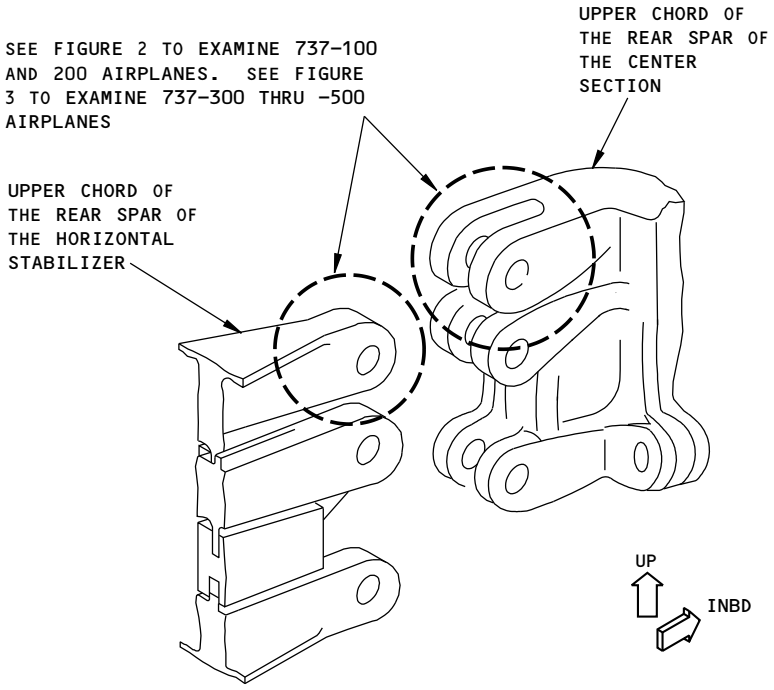
(7) Remove the bushings and do the steps that follow:

(a) Do a scan again with the bushings removed. If the possible crack signal does not go away, do one of the procedures that follow to make sure the signal is the result of a crack.

1) Do a surface eddy current inspection of the area as specified in Part 6, 51-00-00, Procedure 23.

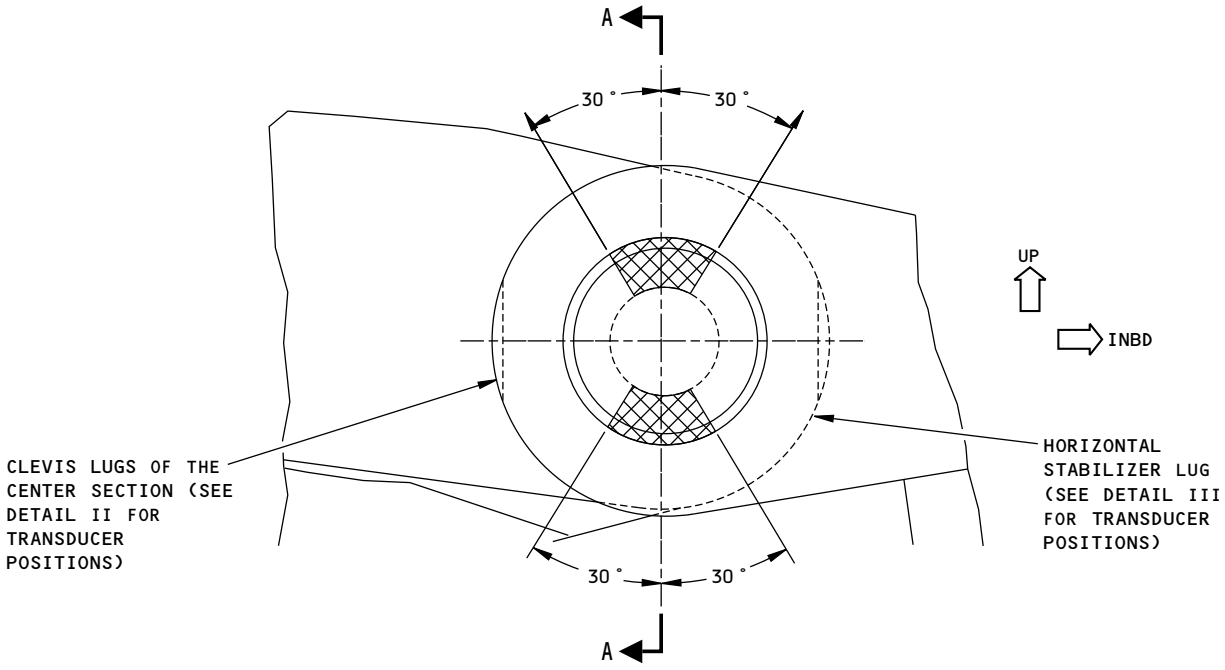
2) Do a penetrant inspection of the area as specified in Standard Overhaul Practices Manual, Subject 20-20-02.



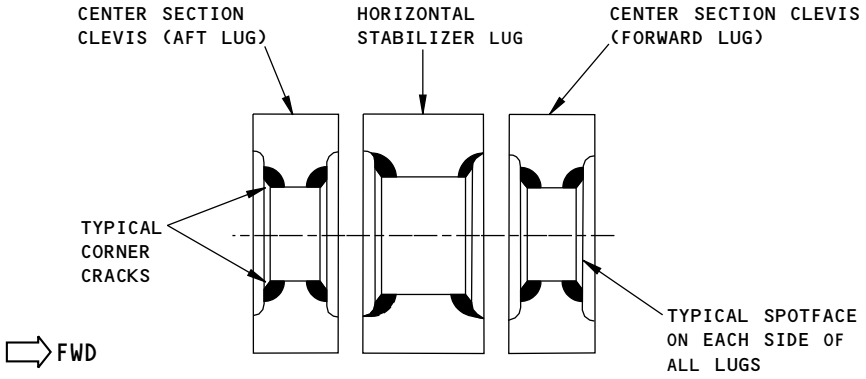


2217176 S0000494787_V1

Inspection Areas
Figure 1



737-100/-200 UPPER CHORD - REAR SPAR JOINT
DETAIL I



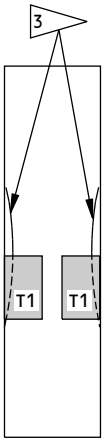
A-A

NOTE

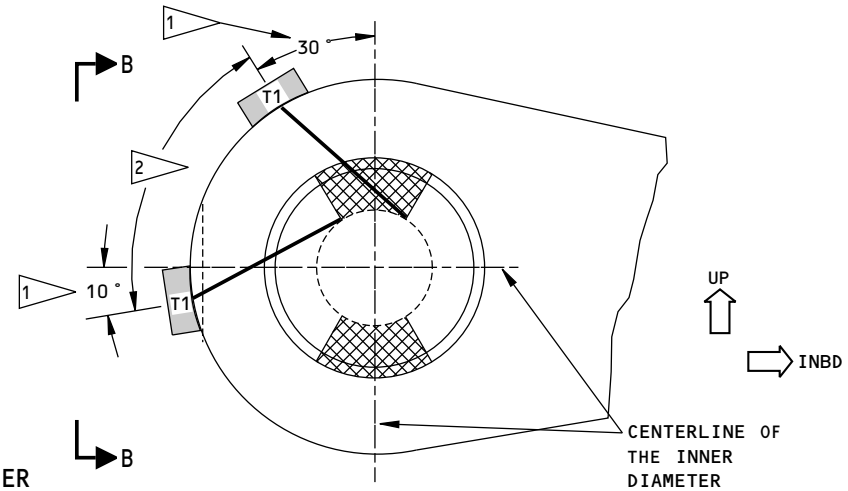
INSPECTION AREAS

2217327 S0000494788_V2

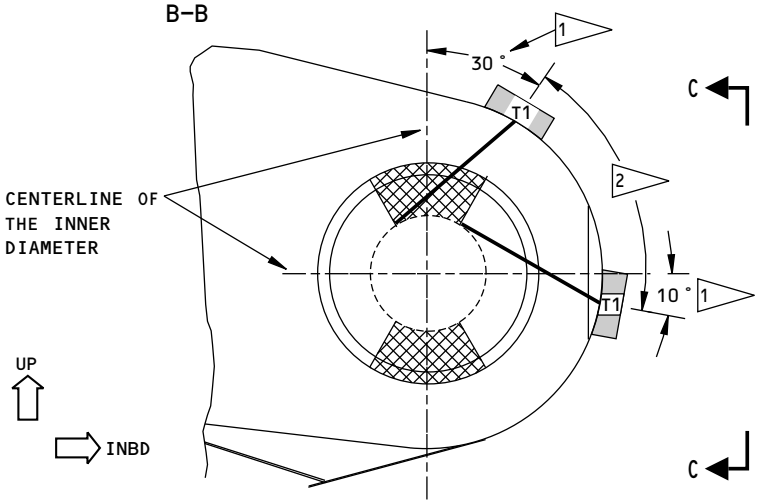
Inspection Areas for 737-100/-200 Airplanes
Figure 2 (Sheet 1 of 2)



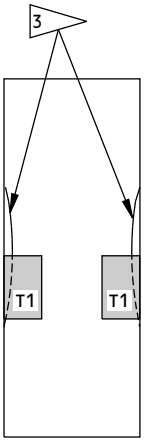
TYPICAL TRANSDUCER POSITIONS FOR LUGS WITH LARGE AND SMALL CHAMFERED EDGES
B–B



TRANSDUCER POSITIONS ON THE CLEVIS LUGS OF THE CENTER SECTION
DETAIL II



TRANSDUCER POSITIONS ON THE LUGS OF THE HORIZONTAL STABILIZER
DETAIL III



TYPICAL TRANSDUCER POSITIONS ON EDGES THAT ARE CHAMFERED AND NOT CHAMFERED
C–C

NOTES

- THE TRANSDUCER POSITIONS SHOWN IN DETAILS II AND III EXAMINE THE INSPECTION AREA ON THE UPPER SIDE OF THE HORIZONTAL CENTERLINE OF THE BORE. USE THE SAME ANGULAR DIMENSIONS TO EXAMINE THE INSPECTION AREA ON THE LOWER SIDE OF THE HORIZONTAL CENTERLINE.
- TRANSDUCER IDENTIFICATION FOR CALIBRATION AND INSPECTION DATA:

T1 TEK–5825

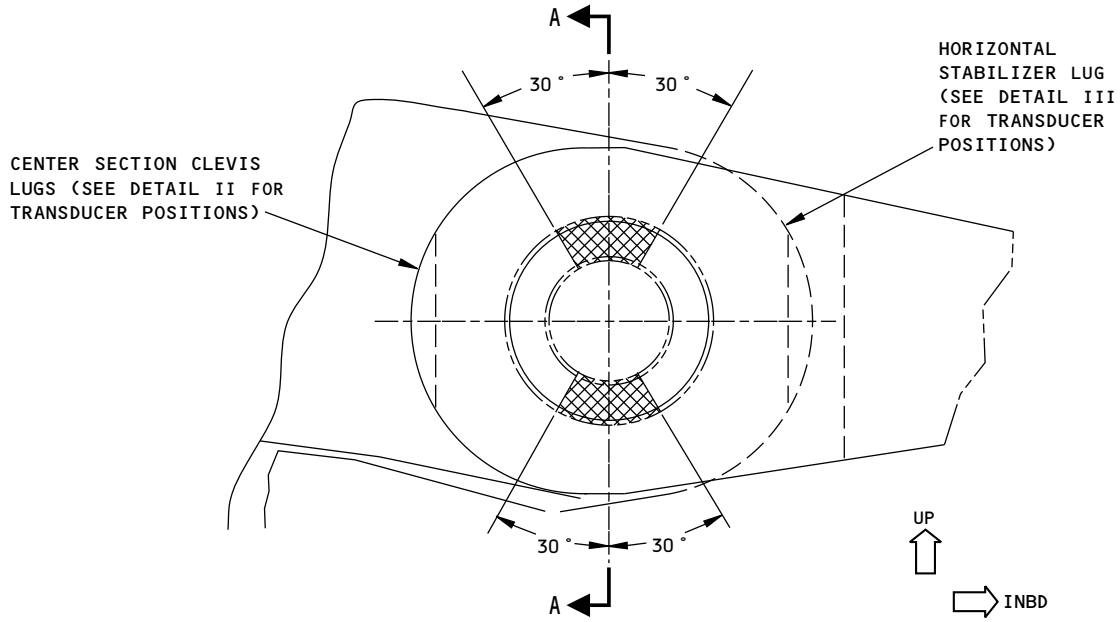
1 MINIMUM START AND STOP TRANSDUCER POSITIONS.

2 MINIMUM SCAN DISTANCE.

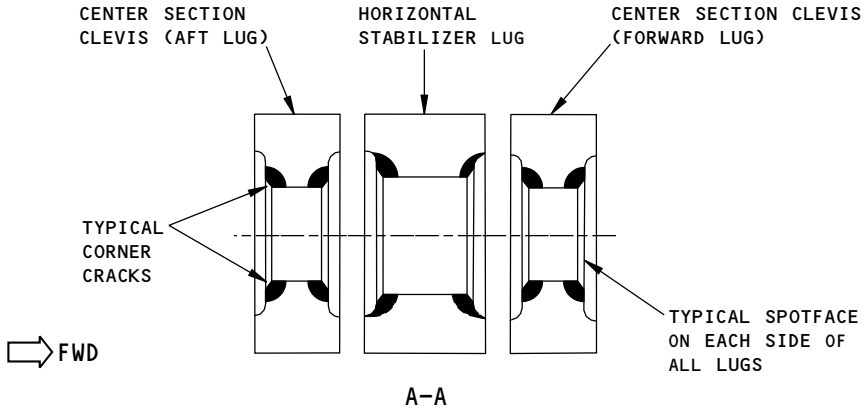
3 TYPICAL CHAMFERED EDGE.

2217395 S0000494789_V1

Inspection Areas for 737-100/-200 Airplanes
Figure 2 (Sheet 2 of 2)



737-300 THRU 500 UPPER CHORD
REAR SPAR JOINT
DETAIL I



A-A

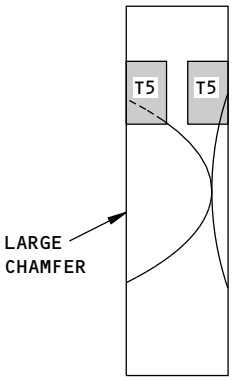
NOTES

INSPECTION AREAS

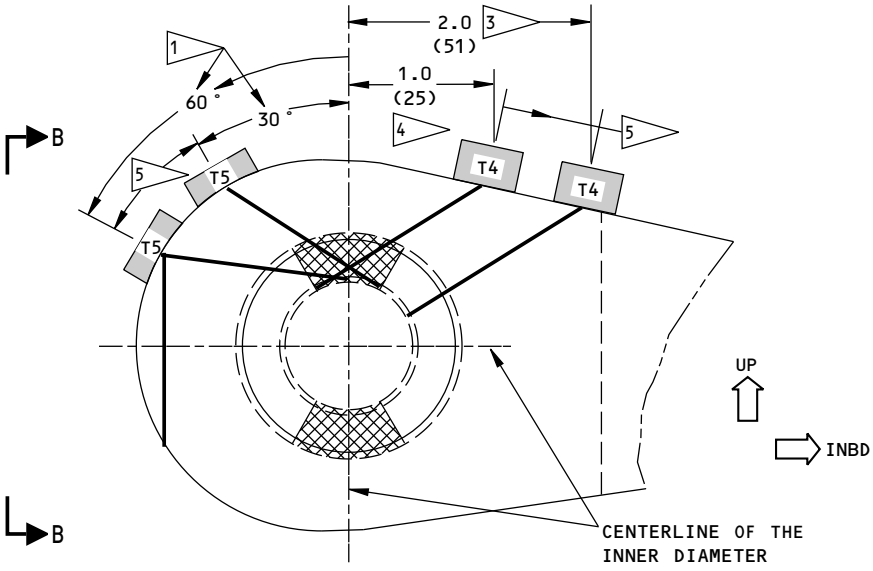
- TRANSDUCER IDENTIFICATION FOR CALIBRATION AND INSPECTION DATA:
  - T2 TEK-5828
  - T3 TEK-5827
  - T4 LA-455S OR EQUIVALENT
  - T5 TEK-5826

2217442 S0000494790_V1

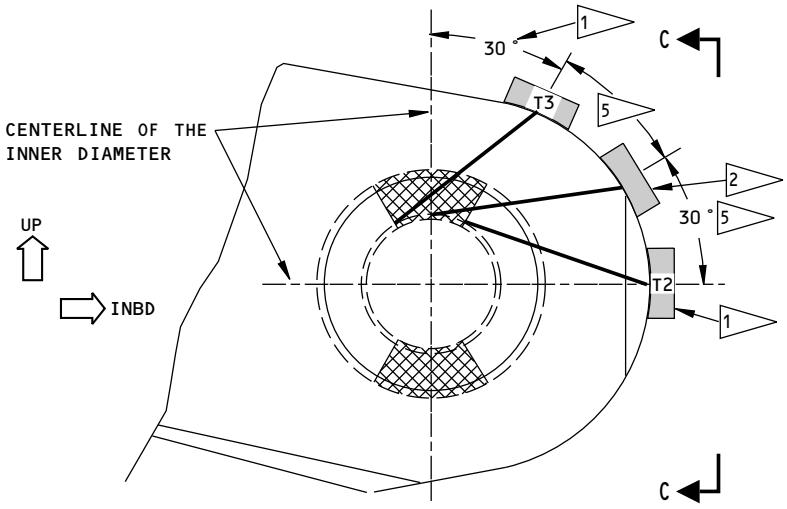
Inspection Areas for 737-300 thru -500 Airplanes
Figure 3 (Sheet 1 of 3)



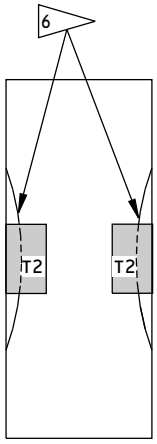
TYPICAL TRANSDUCER POSITIONS FOR LUGS WITH LARGE AND SMALL CHAMFERED EDGES
B–B



TRANSDUCER POSITIONS ON THE CLEVIS LUGS OF THE CENTER SECTION
DETAIL II



TRANSDUCER POSITIONS ON THE HORIZONTAL STABILIZER LUGS
DETAIL III



TYPICAL TRANSDUCER POSITIONS ON EDGES THAT ARE CHAMFERED AND NOT CHAMFERED
C–C

2217515 S0000494792_V2

Inspection Areas for 737-300 thru -500 Airplanes
Figure 3 (Sheet 2 of 3)

NOTES

- ALL DIMENSIONS ARE IN INCHES
  (MILLIMETERS ARE IN PARENTHESES)
- THE TRANSDUCER POSITIONS SHOWN IN DETAILS II AND III EXAMINE THE INSPECTION AREA ON THE UPPER SIDE OF THE HORIZONTAL CENTERLINE OF THE HOLE. USE THE SAME ANGULAR DIMENSIONS TO EXAMINE THE INSPECTION AREA ON THE LOWER SIDE OF THE HORIZONTAL CENTERLINE.

1 MINIMUM START AND STOP TRANSDUCER POSITIONS.

2 MINIMUM STOP POSITION FOR THE T2 TRANSDUCER AND MINIMUM START POSITION FOR THE T3 TRANSDUCER.

3 INITIAL TRANSDUCER POSITION TO GET A SIGNAL FROM THE HOLE.

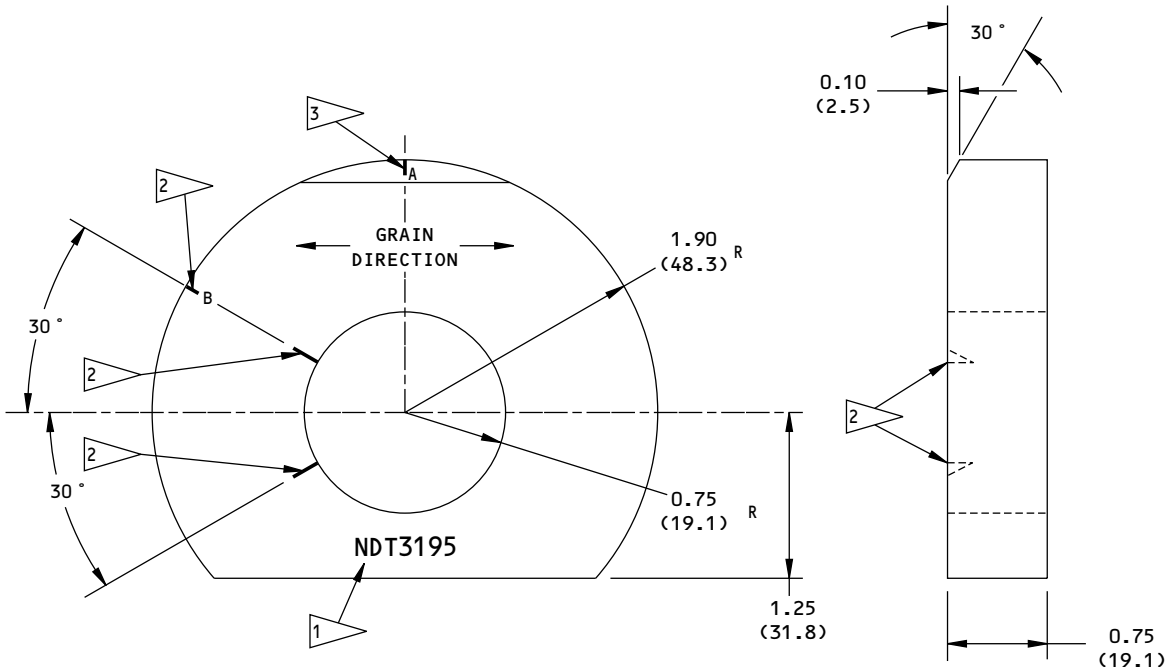
4 MINIMUM STOP POSITION.

5 MINIMUM SCAN DISTANCE.

6 TYPICAL CHAMFERED EDGE.

2218164 S0000497655_V1

Inspection Areas for 737-300 thru -500 Airplanes
Figure 3 (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 = ± 0.1
X.XX = ± 0.025	X.X = ± 0.5
X.X = ± 0.050	X = ± 1

- ANGULAR TOLERANCE: ±2 DEGREES
- MATERIAL: 7075-T6 OR EQUIVALENT AIRCRAFT QUALITY ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

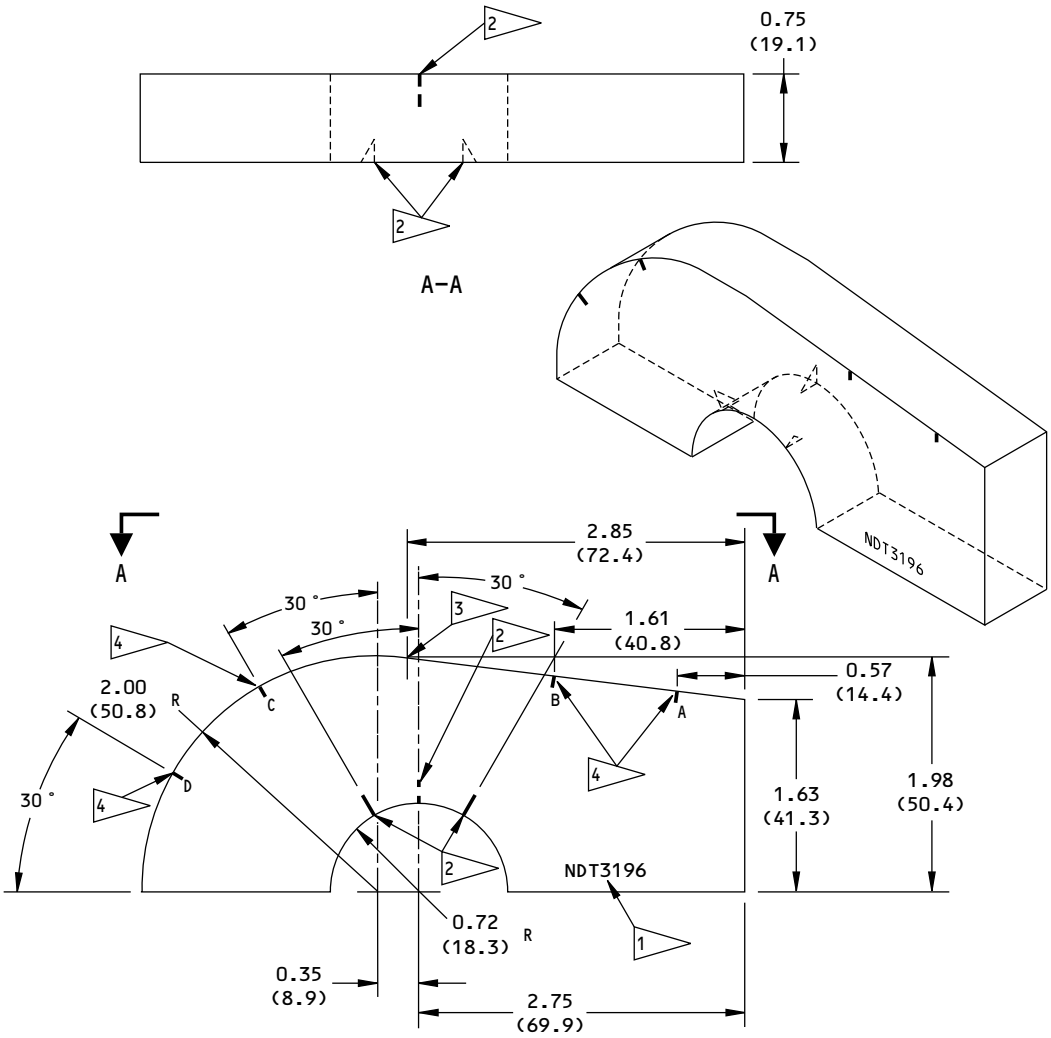
1 ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3195, AT APPROXIMATELY THIS LOCATION

2 EDM CORNER NOTCH:
WIDTH - 0.010 (0.3) ±0.002 (0.05)
LENGTH - 0.200 (5.08)
DEPTH - 0.200 (5.08)
THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE AS SHOWN

3 ETCH OR SCRIBE A 0.10 (2.5) LONG LINE AND A LETTER TO IDENTIFY THE TRANSDUCER POSITION FOR THE INSTRUMENT CALIBRATION

2217735 S0000494794_V1

Reference Standard NDT3195
Figure 4



NOTES

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

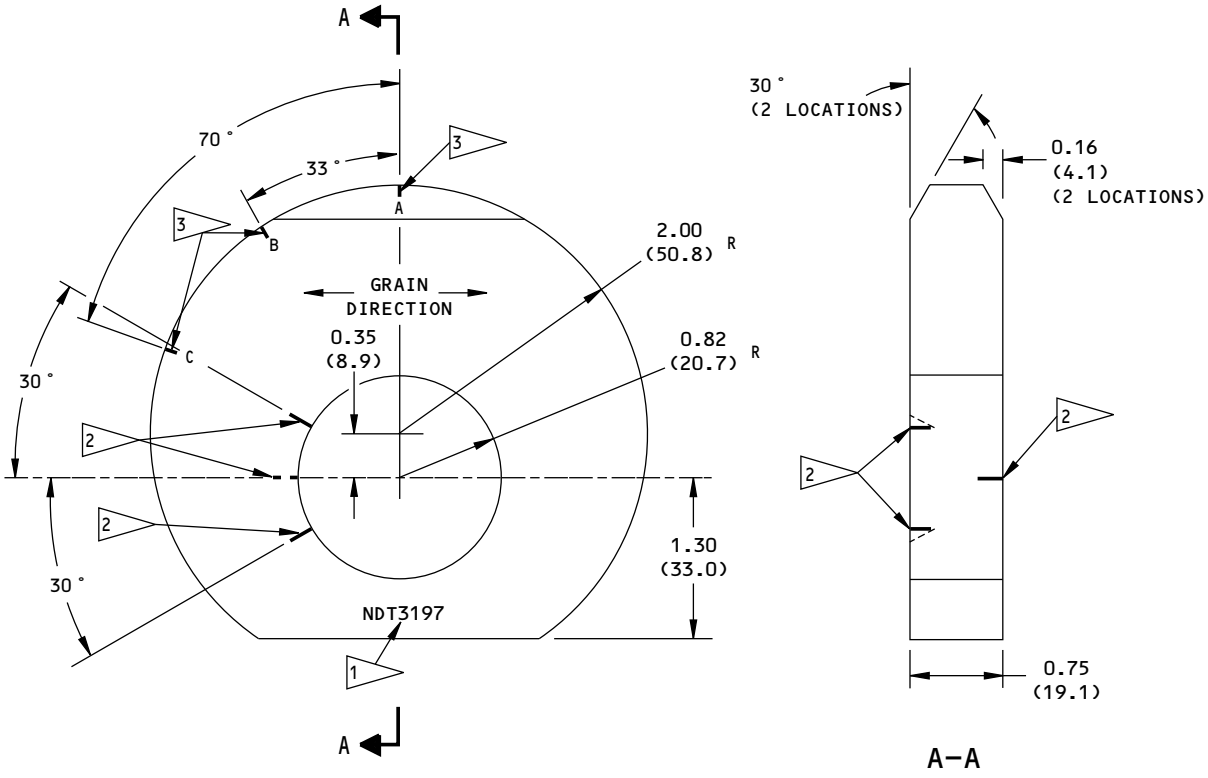
INCHES	MILLIMETERS
X.XXX = ± 0.005	X.XX = ± 0.1
X.XX = ± 0.025	X.X = ± 0.5
X.X = ± 0.050	X = ± 1

- ANGULAR TOLERANCE: ±2.0 DEGREES
- MATERIAL: 7075-T6 OR EQUIVALENT AIRCRAFT QUALITY ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1. ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3196, AT APPROXIMATELY THIS LOCATION
2. EDM CORNER NOTCH:
   WIDTH - 0.010 (0.3) ±0.002 (0.05)
   LENGTH - 0.200 (5.08)
   DEPTH - 0.200 (5.08)
   THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE AS SHOWN
3. TANGENT POINT
4. ETCH OR SCRIBE A 0.10 (2.5) LONG LINE AND A LETTER TO IDENTIFY THE TRANSDUCER POSITION FOR THE INSTRUMENT CALIBRATION

2217753 S0000494796_V1

Reference Standard NDT3196
Figure 5



NOTES

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

INCHES	MILLIMETERS
X.XXX = ± 0.005	X.XX = ± 0.1
X.XX = ± 0.025	X.X = ± 0.5
X.X = ± 0.050	X = ± 1

- ANGULAR TOLERANCE: ±2 DEGREES
- MATERIAL: 7075-T6 OR EQUIVALENT AIRCRAFT QUALITY ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

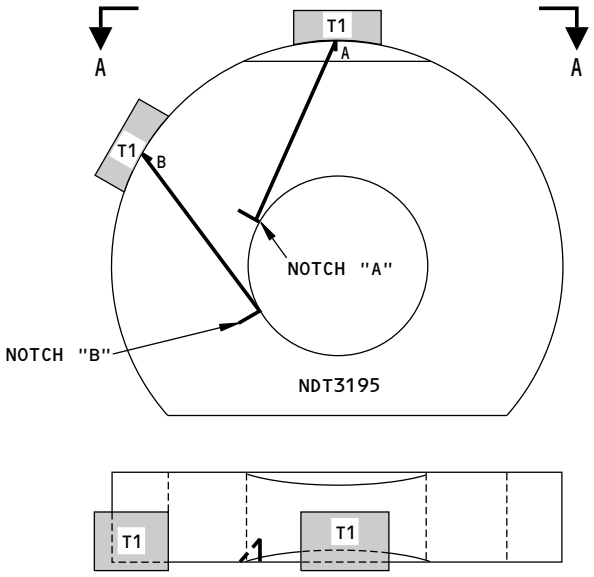
1 ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3197, AT APPROXIMATELY THIS LOCATION

2 EDM CORNER NOTCH:
WIDTH - 0.010 (0.3) ±0.002 (0.05)
LENGTH - 0.200 (5.08)
DEPTH - 0.200 (5.08)
THE NOTCH MUST BE WITHIN ±0.005 (±0.10) OF THE CENTERLINE AS SHOWN.

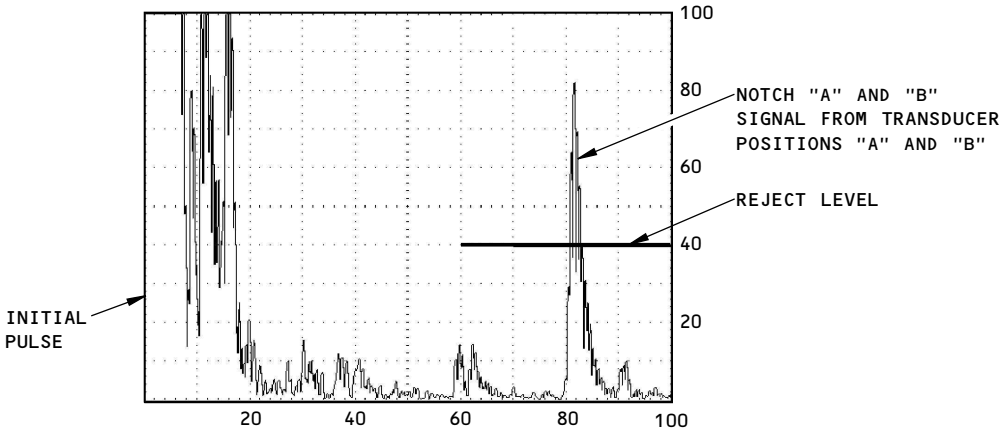
3 ETCH OR SCRIBE A 0.10 (2.5) LONG LINE AND A LETTER TO IDENTIFY THE TRANSDUCER POSITION FOR THE INSTRUMENT CALIBRATION.

2217828 S0000494797_V1

Reference Standard NDT3197
Figure 6



TRANSDUCER POSITIONS FOR THE CALIBRATION FOR
THE UPPER LUGS OF THE HORIZONTAL STABILIZER
AND THE CLEVIS LUGS OF THE CENTER SECTION
DETAIL I
A–A



CALIBRATION WITH THE T1 TRANSDUCER
DETAIL II

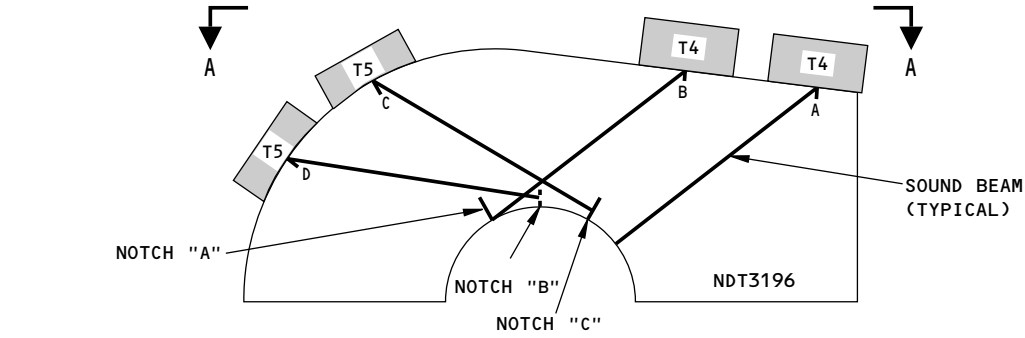
NOTES

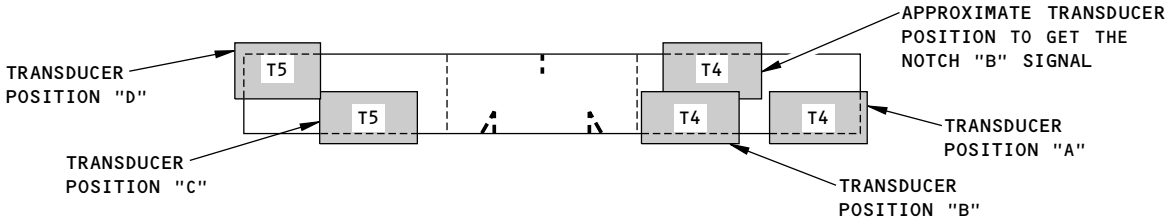
T1 TEK–5825

- THE DETAIL II SCREEN DISPLAY SHOWS THE NOTCH "A" SIGNAL WITH THE T1 TRANSDUCER. THE NOTCH "B" SIGNAL WILL OCCUR AT THE SAME FSW LOCATION. THE SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

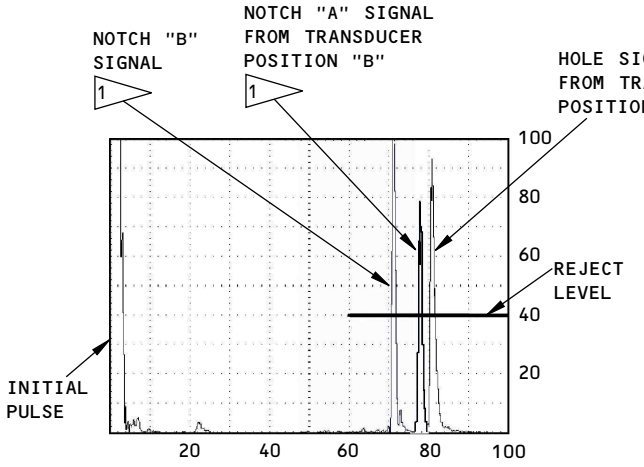
2217863 S0000494800_V1

Instrument Calibration for 737-100/-200 Airplanes
Figure 7

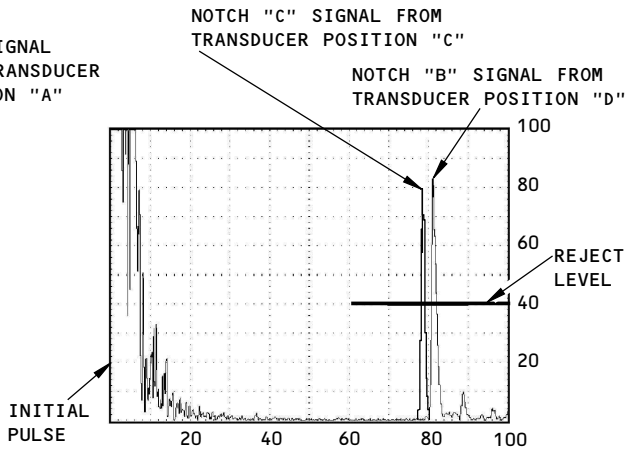




TRANSDUCER POSITIONS FOR CALIBRATION FOR THE
UPPER CLEVIS LUGS OF THE CENTER SECTION
DETAIL II
A–A



CALIBRATION WITH THE T4 TRANSDUCER
DETAIL II



CALIBRATION WITH THE T5 TRANSDUCER
DETAIL III

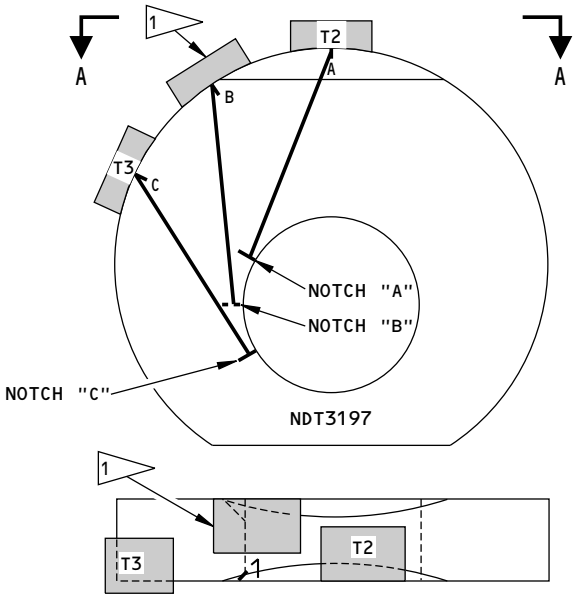
NOTES

- TRANSDUCER IDENTIFICATION FOR CALIBRATION AND INSPECTION DATA:
  - T4 LA–455S OR EQUIVALENT
  - T5 TEK–5826
- THE DETAIL II SCREEN DISPLAY SHOWS THE HOLE AND THE NOTCH "A" AND "B" SIGNALS WITH THE T4 TRANSDUCER.
- THE DETAIL III SCREEN DISPLAY SHOWS THE NOTCH "B" AND "C" SIGNALS WITH THE T5 TRANSDUCER.
- THE SIGNALS CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

1 THE NOTCH SIGNAL IS ADDED TO SHOW THE SCREEN WIDTH AND HEIGHT.

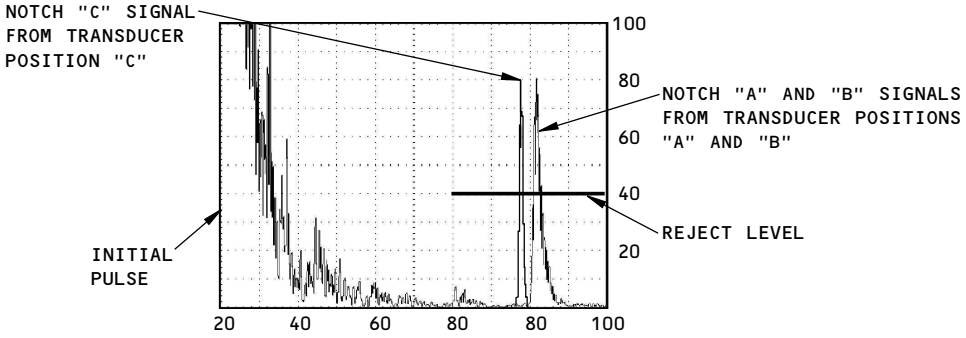
2218067 S0000494802_V1

Instrument Calibration for 737-300 thru -500 Airplanes - Upper Clevis Lugs of the Center Section
Figure 8



A–A

TRANSDUCER POSITIONS FOR THE CALIBRATION FOR
THE UPPER LUG OF THE HORIZONTAL STABILIZER
DETAIL I



CALIBRATION WITH THE T2 AND T3 TRANSDUCERS
DETAIL II

NOTES

- TRANSDUCER IDENTIFICATION FOR CALIBRATION AND INSPECTION DATA:
  - T2 TEK–5828
  - T3 TEK–5827

1 APPROXIMATE POSITION WITH TRANSDUCERS T2 AND T3 TO SHOW NOTCH "B". TRANSDUCER T2 IS FLUSH WITH THE EDGE OF THE REFERENCE STANDARD AT POSITION "B". TRANSDUCER T3 EXTENDS ACROSS THE EDGE OF THE REFERENCE STANDARD AT POSITION "B", THE SAME AS AT POSITION "C".

- THE NOTCH SIGNALS SHOWN IN DETAIL II ARE EXAMPLES OF NOTCH SIGNALS "A", "B" AND "C" AND CAN LOOK DIFFERENT WITH OTHER INSTRUMENT AND TRANSDUCER MIXES.

2218117 S0000494803_V1

Instrument Calibration for 737-300 thru -500 Airplanes - Upper Lugs of the Horizontal Stabilizer
Figure 9

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER - WEB FLANGE OF THE LOWER CHORD WHERE THE RIBS ATTACH TO THE REAR SPAR FROM STAB STA 212.3 TO 310.54 (UT)

1. Purpose

A. Use this procedure to look for cracks in the vertical flange of the lower chord at the rear spar of the horizontal stabilizers. The vertical flange of the lower chord is examined where the ribs at STAB STA 221, 239, 258, 276, 295, and 310 are attached to the lower chord and rear spar of the horizontal stabilizer. At each rib location but STAB STA 310, the areas around one fastener hole on the inboard and outboard sides of each rib are examined. At STAB STA 310, only the inboard fastener location is examined by this procedure; the outboard fastener location at STAB STA 310 is examined by the DTR Item 55-10-04-08 internal inspection. See Figure 1 for the inspection areas.

B. The lower chords are aluminum.

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

(1) Item: 55-10-04-4

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) All ultrasonic instruments are permitted for use if they:

(a) Can operate at a frequency that is between 4 and 6 MHz.

(b) Can find the notch in the reference standard.

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

(a) Epoch LTC; Panametrics

(b) USM 35; GE

C. Transducer

(1) Use a transducer that:

(a) Operates at 5 MHz.

(b) Causes a 70 degree shear wave to occur in aluminum (+/-2 degrees).

(c) Has a top mounted connector.

(d) Has a maximum length of 0.375 inch (9.53 mm).

(e) Has a maximum width of 0.25 inch (6.3 mm).

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

(a) A5068 5.0/70; Panametrics

(b) SX 570AT; NDT Engineering Corp.

D. Reference Standard

(1) Use reference standard NDT3189. See Figure 2 for data about reference standard NDT3189.

E. Couplant

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

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Get access to the inspection areas.

C. Clean the areas that the transducer will touch.

4. Calibrate the Instrument

A. Connect the transducer to the instrument.

B. Put couplant on the reference standard in the general area of transducer position 1 (TP1) (see Figure 3, Detail A).

C. Set the initial pulse at 0% of full screen width (FSW) (see Figure 3, Detail B).

D. Put the transducer on the reference standard at TP1 (see Figure 3, Detail A).

E. Adjust the hole signal so that it is at 70% of FSW (see Figure 3, Detail B).

F. Turn the transducer to TP2, as shown in Figure 3, Detail A, and monitor the signal that occurs from the notch. Move the transducer to and away from the notch approximately 0.5 inch (13 mm) to get a maximum signal from the notch (see Figure 3, Detail C).

NOTE: Do not move the transducer across the scribe line.

G. Adjust the gain to put the notch signal at 80% of full screen height (FSH).

H. Turn the transducer to the hole and monitor how the height of the notch signal decreases and the hole signal increases.

I. Record the gain setting and then add 6 dB of gain.

5. Inspection Procedure

A. Examine the vertical flange of the lower chord for cracks behind the rib attachment locations at STAB STA 221, 239, 258, 276, 295, and 310 at the rear spar of the horizontal stabilizer as follows:

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

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

(3) Put couplant on the vertical flange of the lower chord at the approximate transducer locations shown by flagnote 3 in Figure 1.

(4) Put the transducer on the inboard side of the lower chord at the rib attach point as shown by flagnote 3 in Figure 1.

(5) Point the transducer to transmit sound at the fastener hole in the inspection area.

(6) Move the transducer as necessary to get a signal from the hole. If you cannot get a signal from the fastener hole, increase the gain until you get a signal from the fastener hole that is 30% of FSH.

(7) Slowly turn the transducer to point the sound to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to zero percent of FSH. As you do this, look for a crack signal to come into view to the right of the fastener hole signal at almost the same position that the notch signal occurred during the instrument calibration. See Paragraph 6. for instructions to help make an analysis of all possible crack signals that are 40% or more of FSH.

(8) Do Paragraph 5.A.(4) thru Paragraph 5.A.(7) again but examine the other side of the hole. See Paragraph 6. for instructions to help make an analysis of all possible crack signals that occur.

(9) Do Paragraph 5.A.(3) thru Paragraph 5.A.(8) but examine the fastener location on the outboard side of the rib at all STAB STA's but STAB STA 310.

(10) Do Paragraph 5.A.(3) thru Paragraph 5.A.(9) at all other inspection locations given in Figure 1.

B. Do Paragraph 5.A. again to examine the vertical flange of the lower chord for cracks at the other horizontal stabilizer.

6. Inspection Results

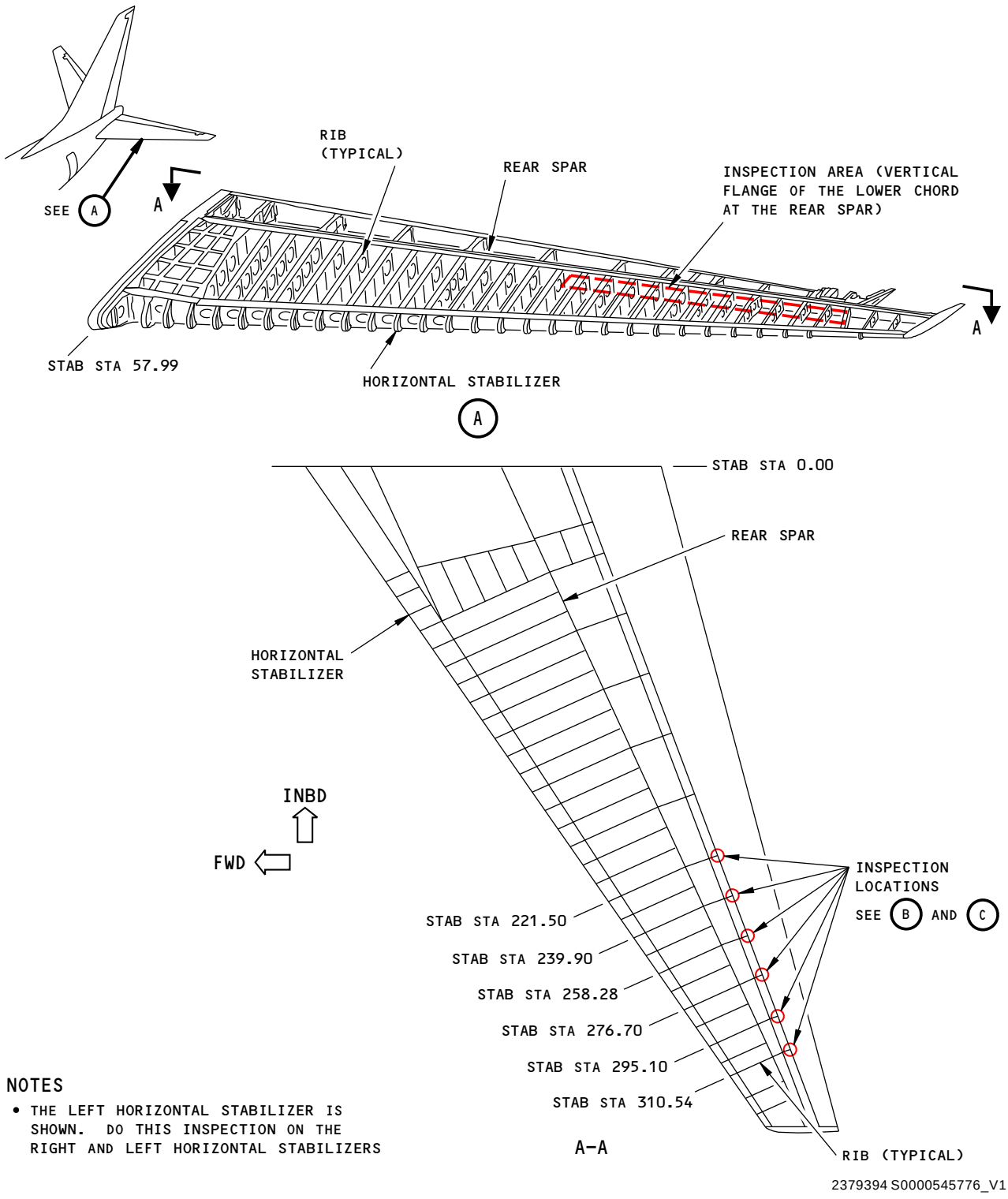
A. Signals that are 40% (or more) of FSH and are immediately to the right of the hole signal can be crack indications and more analysis is necessary.

B. If you get a crack indication, remove the couplant from the surface of the lower chord in front of the transducer and do the scan again. Too much couplant on the surface can cause an incorrect indication.

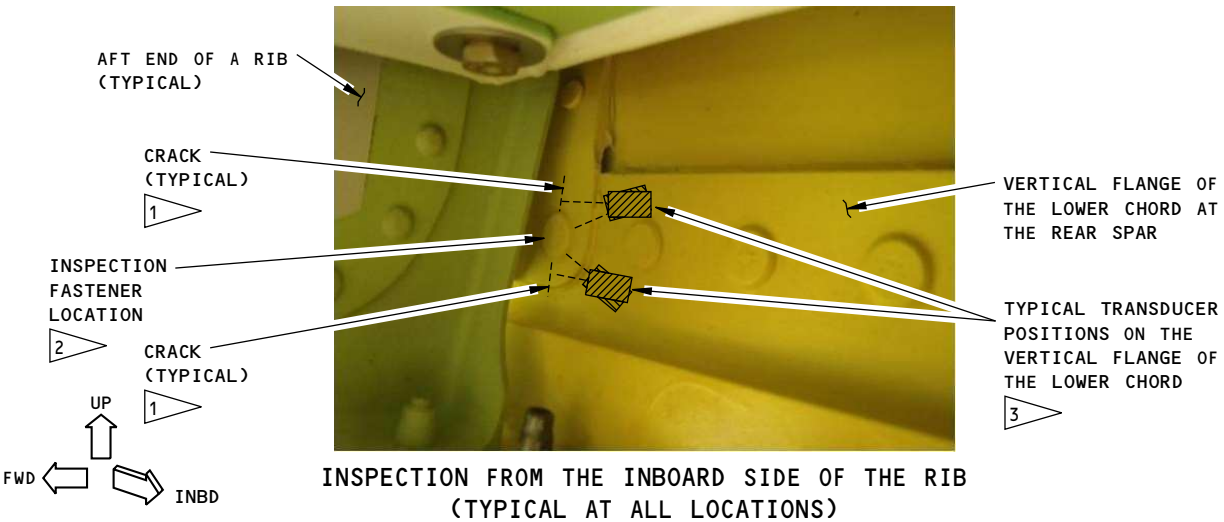
C. Compare the signal from the crack indication with the signal you got from the notch in the reference standard.

D. A signal that is almost the same as the one you got from the notch in the reference standard is a crack indication.

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

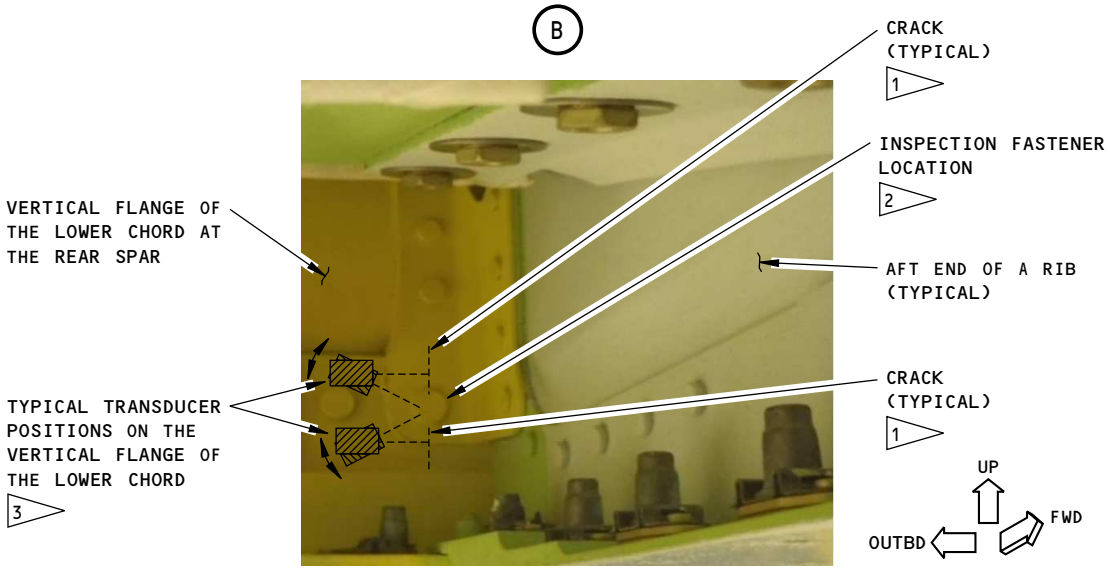


Inspection Areas
Figure 1 (Sheet 1 of 2)



INSPECTION FROM THE INBOARD SIDE OF THE RIB
(TYPICAL AT ALL LOCATIONS)

B



INSPECTION FROM THE OUTBOARD SIDE OF THE RIB
(TYPICAL AT ALL LOCATIONS BUT STA 310)

C

NOTES

- AT EACH RIB INSPECTION LOCATION, EXAMINE THE VERTICAL FLANGE OF THE LOWER CHORD AT THE REAR SPAR FOR CRACKS AT THE TWO FASTENER LOCATIONS SHOWN. ONE FASTENER IS ON THE INBOARD SIDE OF THE RIB AND ONE FASTENER IS ON THE OUTBOARD SIDE OF THE RIB

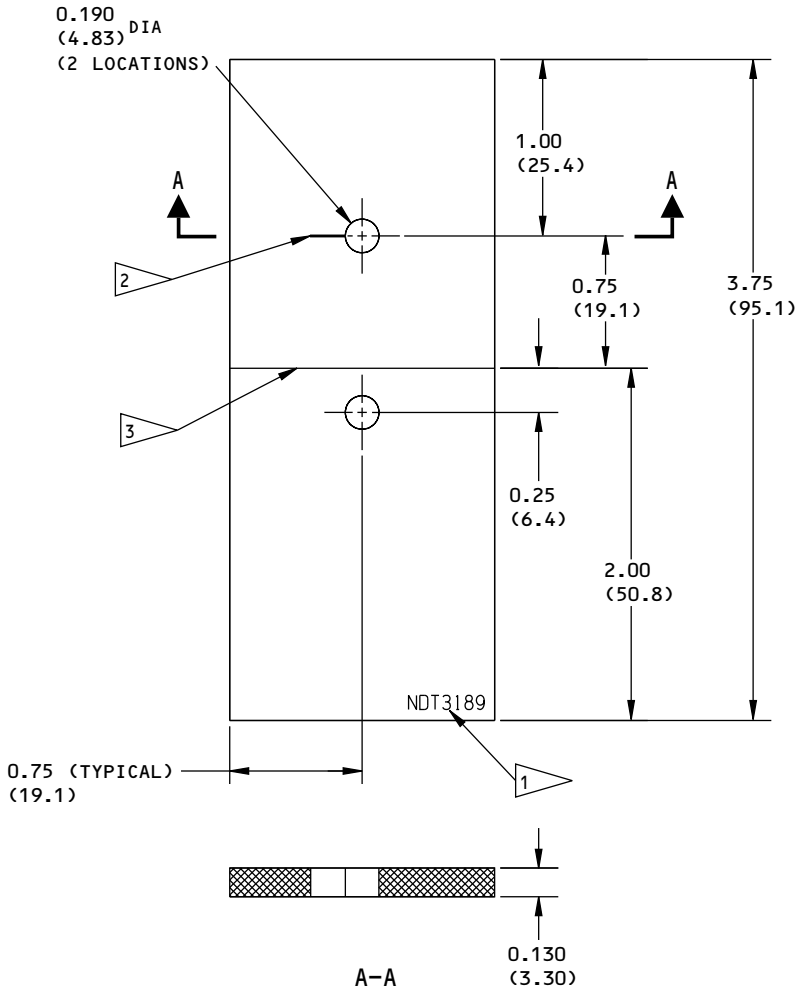
1 CRACK DIRECTION IN THE VERTICAL FLANGE OF THE LOWER CHORD AT THE REAR SPAR

2 THE OTHER FASTENER LOCATION TO EXAMINE (TYPICAL AT ALL OF THE INSPECTION LOCATIONS) IS ON THE OTHER SIDE OF THE RIB.

3 APPROXIMATE TRANSDUCER POSITIONS TO EXAMINE THE FASTENER HOLES AT EACH INSPECTION AREA.

2379434 S0000545777_V1

Inspection Areas
Figure 1 (Sheet 2 of 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: 7075-T6, 2024 OR EQUIVALENT ALUMINUM
- SURFACE ROUGHNESS: 125 Ra OR BETTER

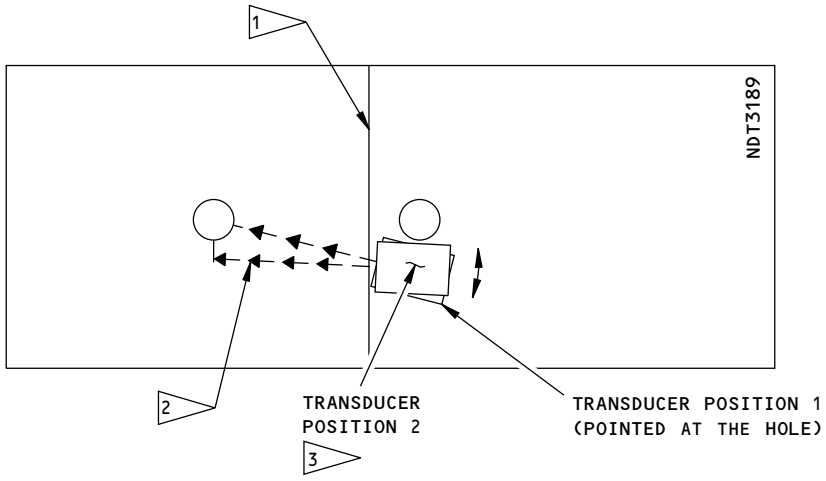
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3189, AT APPROXIMATELY THIS LOCATION

2 EDM THROUGH NOTCH: 0.200 (5.08) LONG X 0.010 (0.25) WIDE; THROUGH THE THICKNESS

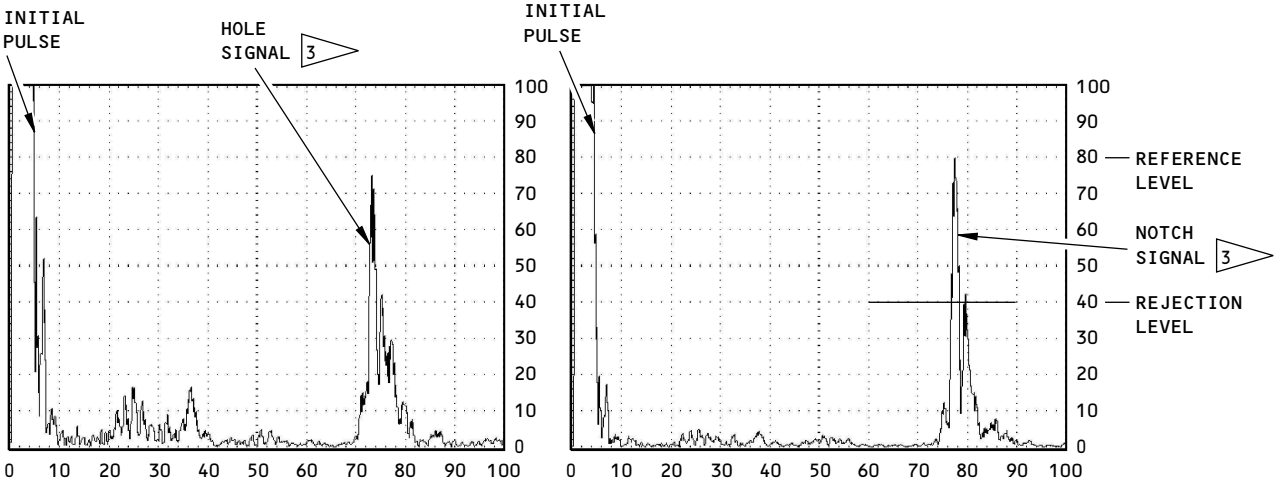
3 SCRIBE THIS LINE TO A MAXIMUM DEPTH OF 0.005 (0.13)

2379468 S0000545778_V2

Reference Standard NDT3189
Figure 2



DETAIL A



SCREEN DISPLAY EXAMPLE OF THE SIGNAL FROM THE HOLE AT TP1

DETAIL B

SCREEN DISPLAY EXAMPLE OF THE SIGNAL FROM THE NOTCH AT TP2

DETAIL C

NOTES

- TP = TRANSDUCER POSITION
- USE THE THROUGH NOTCH FOR THIS CALIBRATION.

1 MAKE SURE THE TRANSDUCER DOES NOT MOVE ACROSS THE SCRIBE LINE DURING THE INSTRUMENT CALIBRATION

2 ULTRASOUND DIRECTION

3 TURN THE TRANSDUCER A SMALL QUANTITY TO GET THE NOTCH SIGNAL. MONITOR HOW AND WHERE THE NOTCH SIGNAL OCCURS ON THE SCREEN DISPLAY IN RELATION TO THE HOLE SIGNAL.

2379548 S0000545779_V1

Instrument Calibration
Figure 3

PART 4 - ULTRASONIC

HORIZONTAL STABILIZER - WEB FLANGE OF THE UPPER CHORD AT THE REAR SPAR

1. Purpose

A. Use this procedure to examine the web flange of the upper chord at the rear spar of the horizontal stabilizer for cracks from STAB STA 203.10 to 310.54. See Figure 1 for the inspection areas.

B. This procedure uses ultrasonic shear waves to examine the web flange for cracks that can start at the stiffener fastener locations.

C. The upper chord is aluminum.

D. This inspection is done externally to the airplane.

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

(1) Item: 55-10-04-11C

(2) Item: 55-10-04-13A

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) USMGo; GE Inspection Technologies

(c) USN 60; GE Inspection Technologies

C. Transducers

(1) Use a 5 MHz transducer that can put a 70 shear wave in aluminum. The transducer must have a minimum width of 0.25 inch (6.4 mm) and a length of approximately 0.38 inch (9.7 mm) with a top mount connector. The transducer that follows was used to help prepare this procedure.

(a) XA-705T; Techna NDT

(b) AFX-570AT; Aerofab NDT

D. Reference Standards

(1) Use reference standard NDT3221. See Figure 2 for data about reference standard NDT3221.

E. Couplant

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

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Remove the elevators.

C. Remove trailing edge panels 333DB, 343DB, 333EB, 343EB, 333FB and 343FB.

D. Remove the cove installation panels.

E. Clean the inspection surfaces.

(1) Remove loose paint and dirt from the inspection surfaces.

4. Instrument Calibration

A. Calibrate the instrument to examine the web flange of the upper chord for cracks at the stiffener fastener locations from STAB STA 203.10 to 310.54.

(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 the reference standard at transducer position 1 (TP1) and TP2 as shown in Figure 3, Detail I.

(4) Put the transducer at TP1 on the reference standard with the sound beam pointed at the hole. See Figure 3, Detail I.

NOTE: Make sure the front of the transducer does not go above the scribe line.

(5) Adjust the instrument gain and range controls as necessary to put the signal from the hole at approximately 70% of full screen width (FSW). See Figure 3, Detail II.

(6) Turn the transducer to TP2 so that the sound beam points at the notch. See Figure 3, Detail I.

(a) If necessary, adjust the instrument gain to keep the signal on the screen display.

(b) Move and turn the transducer along the scribe line to get a maximum signal from the notch. The notch signal will occur at approximately 80% of FSW. See Figure 3, Detail III for the screen display.

(c) Adjust the instrument gain to put the highest notch signal at 80% of full screen height (FSH). See Figure 3, Detail III for the screen display.

5. Inspection Procedure

A. Examine the web flange of the upper chord for cracks at the rear spar of the horizontal stabilizer at the stiffener and bracket fastener locations from STAB STA 203.10 thru 310.54. See Figure 1 for the typical inspection areas.

(1) Identify the inspection areas on the web flange.

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

(3) Apply a thin layer of couplant on the inspection surface.

(4) Examine all of the inspection fastener locations for cracks that extend from the fastener hole in the up and down directions shown in Figure 1 as follows:

(a) Increase the gain 6 dB above what was set in Paragraph 4.A.(6)

(b) Put the transducer on the web flange so that the front of the transducer is against the stiffener or bracket and is pointed at the fastener location to be examined. See Figure 1 for the typical transducer positions.

(c) Monitor the screen display for a fastener hole signal that is a minimum of 20% of FSH.

NOTE: Increase the gain if the signal from the fastener hole is below 20% of FSH.

1) Examine the web for cracks as follows (see Figure 1 for the typical crack directions):

a) Turn the transducer away from the hole in the direction of the typical crack.

b) As you turn the transducer away from the hole, monitor the screen display for a crack signal to occur between 70 and 80% of FSW.

<1> The signal from the fastener hole will decrease quickly as the transducer is turned away. Look for a signal that will occur immediately to the right of the hole signal as you move and/or turn the transducer.

<2> Carefully monitor the direction and position of the transducer at all times to help identify signals that occur.

NOTE: Compare the distances the transducer is moved during the inspection with the distances the transducer was moved from the fastener hole during calibration.

(5) Do Paragraph 5.A.(3) and Paragraph 5.A.(4) to examine the upper and lower sides of each fastener location to be examined as shown in Figure 1.

(a) Make sure to examine the inboard and outboard fastener locations at all stiffener locations from STAB STA 203.10 to 310.54.

B. Do Paragraph 5.A. again to examine the web flange of the upper chord for cracks at the rear spar of the opposite horizontal stabilizer.

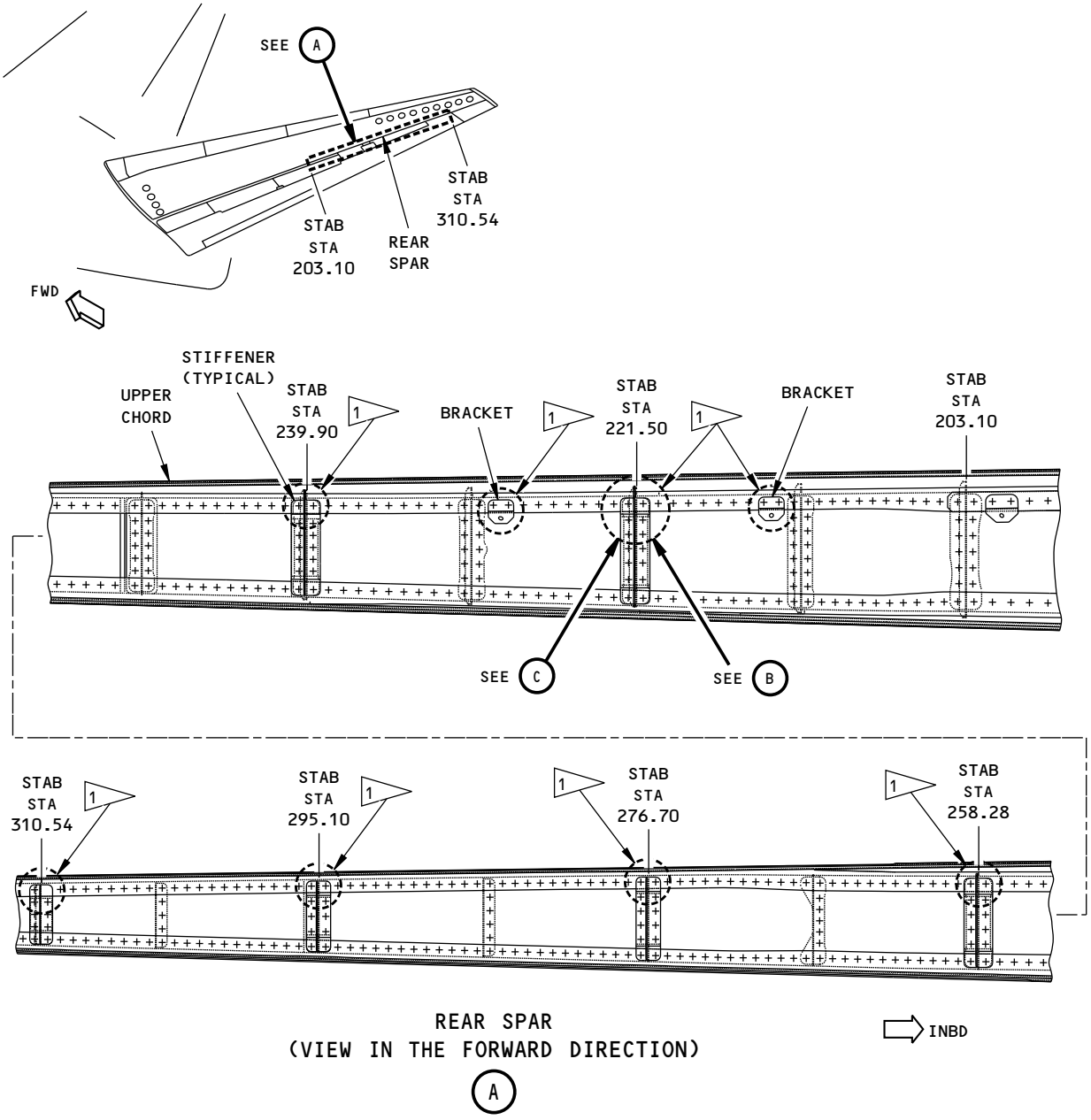
6. Inspection Results

A. Signals that are 40% (or more) of FSH are indications of possible cracks. Inspection areas that cause these signals to occur must be rejected for possible cracks and must be examined some more.

(1) Compare the signals with the signals you get from the reference standard.

(2) Compare the signals with the signals you get if you examine a structure that is almost the same but is at a different area of the airplane or on a different airplane.

B. To make sure a crack indication is from a crack, remove the fastener and do an open hole eddy current inspection of the web flange of the upper chord as specified in Part 6, 51-00-00, Procedure 16.



NOTES:

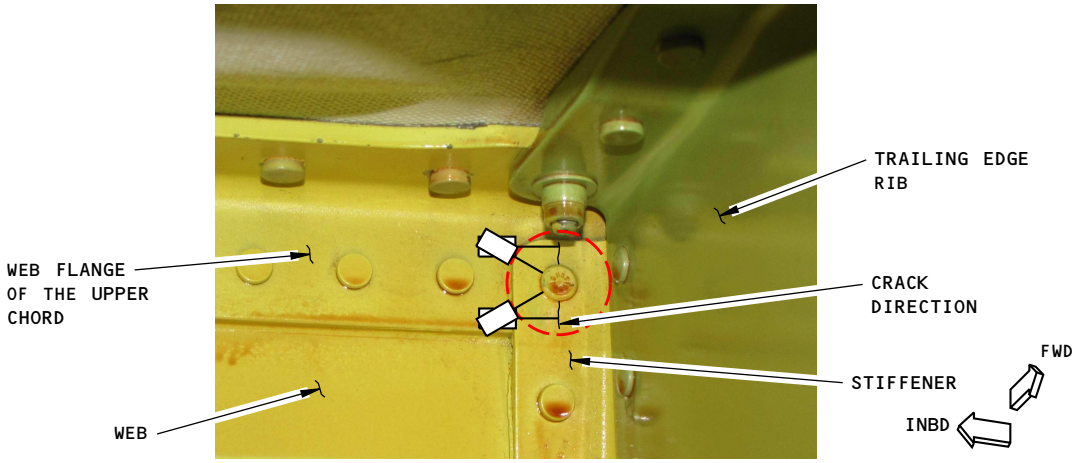
- THE LEFT HORIZONTAL STABILIZER IS SHOWN; THE RIGHT HORIZONTAL STABILIZER IS EQUIVALENT.

INSPECTION AREA

1 EXAMINE THE WEB FLANGE OF THE UPPER CHORD FOR CRACKS AT EACH STIFFENER AND BRACKET FASTENER LOCATION IN THE INSPECTION AREAS.

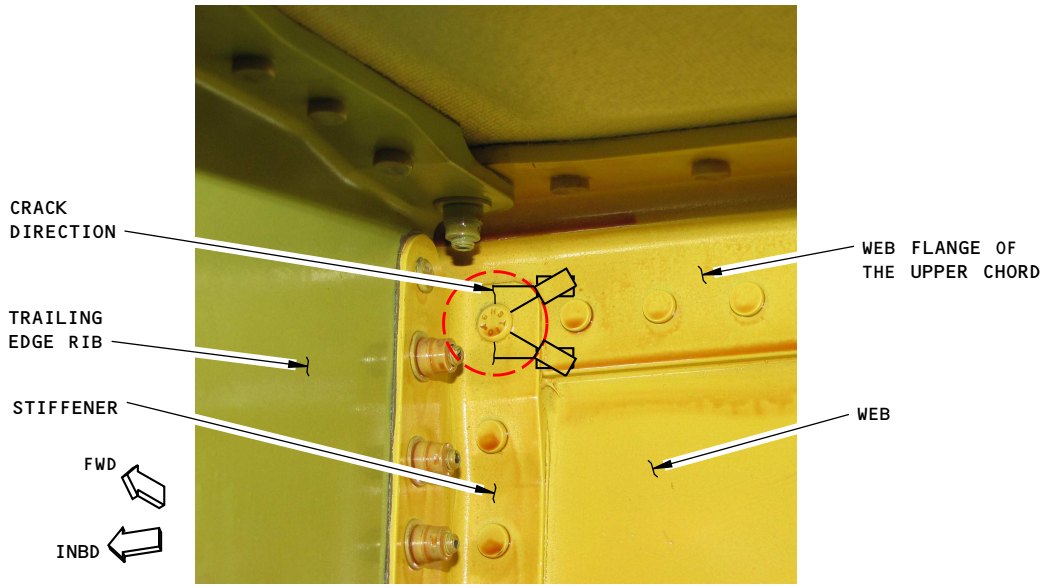
2378803 S0000545618_V2

Inspection Area
Figure 1 (Sheet 1 of 2)



TYPICAL TRANSDUCER POSITIONS AT THE STIFFENERS AND BRACKETS
(THE INBOARD SIDE OF THE STIFFENER IS SHOWN)

B



TYPICAL TRANSDUCER POSITIONS AT THE STIFFENERS AND BRACKETS
(THE OUTBOARD SIDE OF THE STIFFENER IS SHOWN)

C

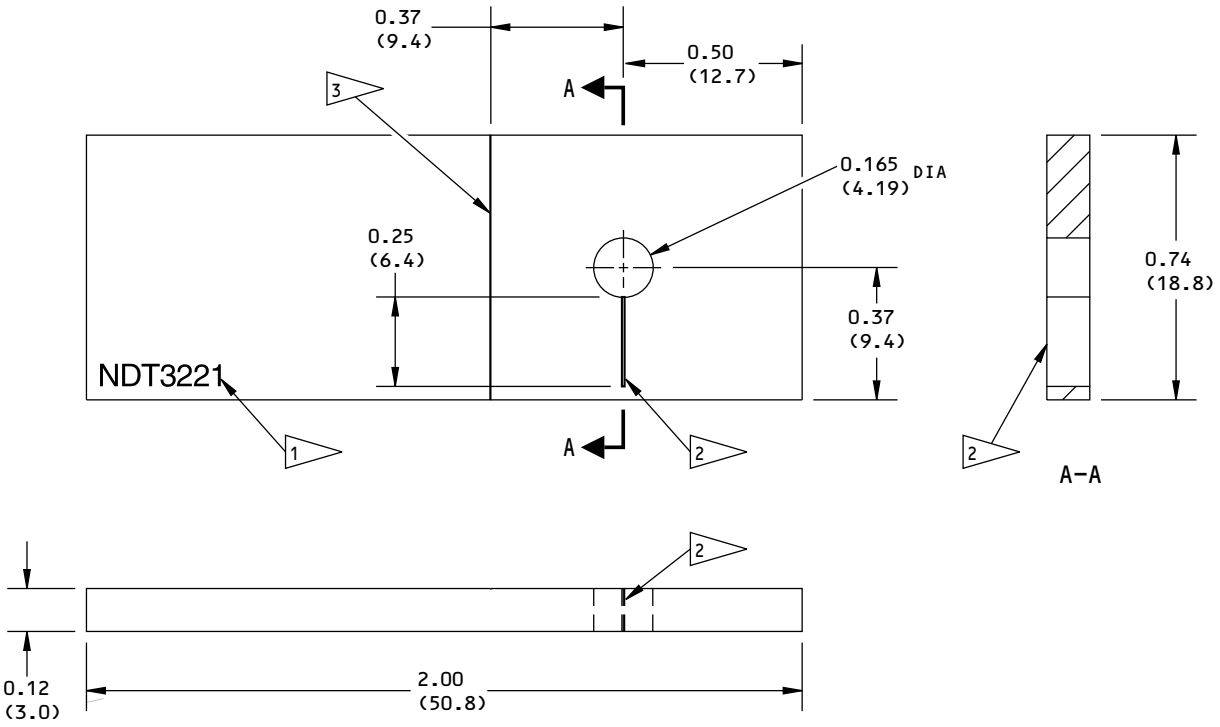
NOTES:

▭ TRANSDUCER INSPECTION POSITION

- TYPICAL STIFFENER LOCATIONS WITH THE TRAILING EDGE RIBS ARE SHOWN. EXAMINE THE TWO BRACKET LOCATIONS SHOWN IN VIEW A, WITH THE SAME TRANSDUCER POSITIONS USED TO EXAMINE THE STIFFENER LOCATIONS.

2378829 S0000545619_V2

Inspection Area
Figure 1 (Sheet 2 of 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: 2024-T3 OR EQUIVALENT AIRCRAFT GRADE ALUMINUM
- SURFACE ROUGHNESS: 63 Ra OR BETTER

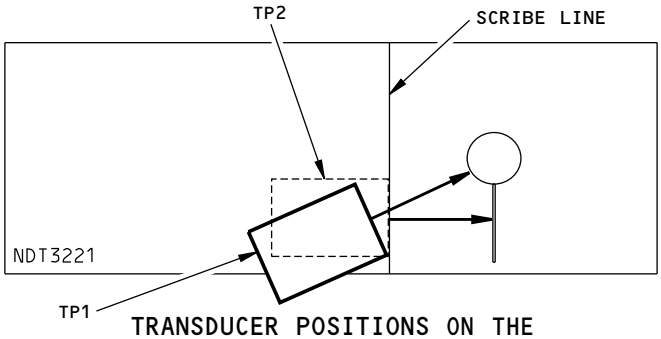
1 ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT3221, AT APPROXIMATELY THIS LOCATION

2 EDM NOTCH:
LENGTH: 0.250 (6.35)
WIDTH: 0.007 (0.18) MAXIMUM
DEPTH: THROUGH THE THICKNESS

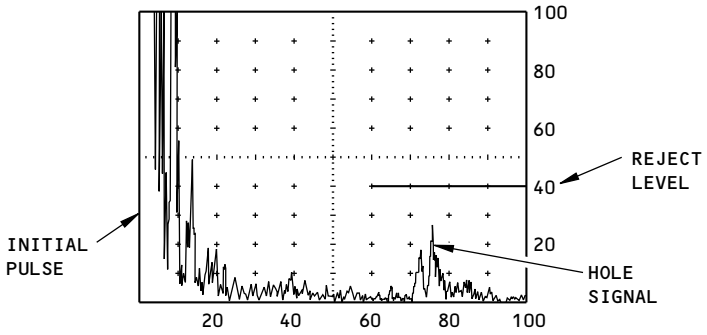
3 PUT A SCRIBE LINE THAT HAS A DEPTH THAT IS LESS THAN 0.005 (0.13) AT THIS LOCATION

2378846 S0000545620_V2

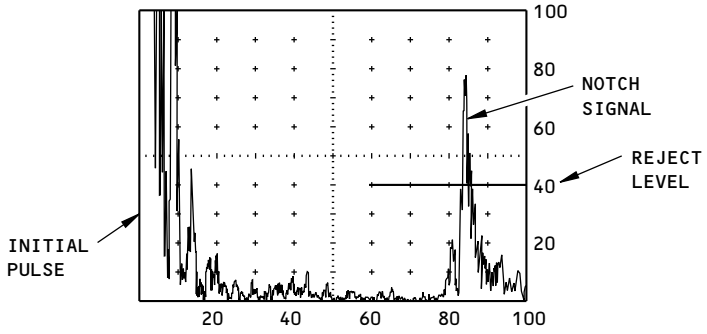
Reference Standard NDT3221
Figure 2



TRANSDUCER POSITIONS ON THE
REFERENCE STANDARD
DETAIL I



SCREEN DISPLAY OF THE HOLE SIGNAL (TP1)
DETAIL II



SCREEN DISPLAY OF THE NOTCH SIGNAL (TP2)
DETAIL III

NOTES:

TP = TRANSDUCER POSITION

- THE DETAIL II AND III SCREEN DISPLAYS ARE EXAMPLES. THE SIGNALS CAN LOOK DIFFERENT WITH DIFFERENT INSTRUMENTS AND TRANSDUCERS.

2378858 S0000545621_V2

Calibration Screen Display
Figure 3

HORIZONTAL STABILIZER CENTER SECTION - UPPER AND LOWER CHORDS OF THE PRIMARY BEAMS AT THE FRONT AND REAR SPARS

1. Purpose

A. Use this procedure to examine the aluminum upper and lower chords of the two primary beams of the horizontal stabilizer center section for cracks. Each primary beam has two joints at the front spar and two joints at the rear spar. There are two fastener locations to be examined for cracks at each joint. See Figure 1 for the inspection areas.

B. It is necessary to get internal access to the horizontal stabilizer center section to do this procedure.

C. 737 Maintenance Planning Document (MPD) Damage Tolerance Rating (DTR) (D626A001-DTR) Check Form Reference:

(1) Item: 55-10-14-1

2. Equipment

A. General

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

B. Instrument

(1) Use an ultrasonic instrument that:

(a) Can operate in the frequency range of 4 to 6 MHz.

(b) Can be calibrated as specified in the calibration instructions of this procedure.

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

(a) USM Go; GE Inspection Technologies

(b) Masterscan 380; Sonatest

C. Transducers

(1) Use a transducer that:

(a) Operates at 5 MHz.

(b) Causes a 45 degree shear wave to occur in aluminum.

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

(a) AFS-545AT; Aerofab NDT

(b) AFS-0521; Aerofab NDT

(c) 57A3064; Staveley Sensors

D. Reference Standards

(1) Three reference standards are necessary to do this inspection.

(a) Use reference standard NDT3122 to examine the forward end of the upper and lower chords of the two primary beams. See Figure 2 for data about reference standard NDT3122.

(b) Use reference standard NDT3123 to examine the aft end of the upper chord of the two primary beams. See Figure 3 for data about reference standard NDT3123.

(c) Use reference standard NDT3124 to examine the aft end of the lower chord of the two primary beams. See Figure 4 for data about reference standard NDT3124.

E. Ultrasonic Couplant

(1) Use an ultrasonic couplant that will not damage the airplane.

3. Prepare for the Inspection

A. Get access to the inspection area through stabilizer access door 311BL shown in Figure 1.

B. Identify and clean the inspection areas shown in Figure 1.

C. If necessary, make the paint smooth in the inspection areas to get a flat surface for the transducer.

4. Instrument Calibration

NOTE: The reference standards have scribe lines on their surface. These lines show where the gusset plate, splice fittings, or other parts prevent transducer movement. Do not let the transducer move across these scribe lines during the instrument calibration.

NOTE: The forward end of the upper and lower chords are almost the same shape and thickness and are examined with one instrument calibration. The aft end of the Upper and lowers chords are different in shape and thickness, and are different from the forward ends. Thus, two different calibrations and inspections are necessary to examine the aft ends of the upper and lower chords of the two primary beams. Three different calibrations are necessary to examine all of the inspection areas.

A. Calibrate the instrument for the inspection of the forward ends of the upper and lower chords of the two primary beams at the front spar location.

(1) Use reference standard NDT3122 for this instrument calibration. Make sure that the sloped surface on the reference standard is up.

(2) Connect the transducer to the instrument and do the initial adjustments of the instrument. Set the reject to 0% and set the damping to the highest value.

(3) Set the instrument frequency to 5 MHz or a frequency range that includes 5 MHz.

(4) Put couplant and then the transducer on the reference standard at transducer position 1 (TP1). Make sure the sound exit point of the transducer is approximately 1.2 inches (30 mm) from the center of the hole as shown in Detail I in Figure 5.

(5) Move the transducer as necessary to get a maximum signal from the top edge of the hole.

(6) Adjust the instrument controls to put the initial pulse at 0% of full screen width (FSW) and the maximum signal from the top edge of the hole at 80% of FSW. See Detail II in Figure 5.

(7) Slowly turn the transducer to TP2 to get a maximum signal from the top notch. Do not move the transducer to or away from the notch when you do this. The signal from the top notch will occur to the right of the hole signal at approximately 85% of FSW as shown in Detail III of Figure 5. As you turn the transducer from TP1 to TP2, see that the signal from the hole decreases in full screen height (FSH) as the signal from the top notch increases in FSH.

(8) With the transducer at TP2, adjust the gain to put the maximum signal from the top notch at 80% of FSH. See Detail III in Figure 5.

(9) Put couplant and then the transducer at TP3. Make sure the sound exit point of the transducer is approximately 0.9 inch (23 mm) from the center of the hole as shown in Detail IV of Figure 5.

(10) Move the transducer as necessary to get a maximum signal from the bottom edge of the hole. Do not let the transducer move across the scribe lines. The maximum signal from the bottom edge of the hole will occur at approximately 64% of FSW as shown in Detail V of Figure 5.

(11) Slowly turn the transducer to TP4 as shown in Detail IV of Figure 5 to get a maximum signal from the bottom notch. Do not move the transducer to or away from the notch when you do this. This signal will come into view at approximately 69% of FSW as shown in Detail VI of Figure 5. If the signal from the bottom notch is less than 80% of FSH, then add gain to put this signal at 80% of FSH. Do not change the gain if this signal is more than 80% of FSH.

(12) Add 6 dB of gain and make a record of the total gain that is used.

B. Calibrate the instrument for the inspection of the aft end of the upper chord of the two primary beams at the rear spar location.

NOTE: The two holes to examine at the aft end of the upper chord are different distances from the transducer contact area and are identified as the near hole and far hole in the instructions that follow. The far hole in the reference standard is used to calibrate the instrument screen range. A sensitivity check is made at all of the notches in the near and far holes to find the notch that uses the most gain to get the signal to 80% of FSH. This notch is then used to set the sensitivity for the inspection. If a possible crack signal occurs during the inspection, the instrument sensitivity is then set for the applicable hole and notch location during the analysis of the possible crack signal.

NOTE: Do not let the transducer move across a scribe line at all times during the instructions that follow.

(1) Use reference standard NDT3123 for this instrument calibration.

(2) Connect the transducer to the instrument and do the initial adjustments of the instrument. Set the reject to 0% and the damping to the highest value.

(3) Set the instrument frequency to 5 MHz or a frequency range that includes 5 MHz.

(4) Put couplant and then the transducer on the reference standard at TP1. Make sure the sound exit point of the transducer is approximately 2.4 inches (61 mm) from the center of the far hole as shown in Detail I in Figure 6.

(5) Move the transducer to or away from the far hole to get a maximum signal from the bottom of the hole.

(6) Adjust the instrument controls to put the initial pulse at 0% of FSW and the maximum signal from the bottom of the hole at 80% of FSW. See Detail II in Figure 6.

(7) Slowly turn the transducer to TP2 to get a maximum signal from the bottom notch. Do not move the transducer to or away from the notch when you do this. The signal from the bottom notch will occur to the right of the hole signal at approximately 83% of FSW as shown in Detail III in Figure 6. As you turn the transducer from TP1 to TP2, see that the signal from the reference notch increases in FSH as the signal from the hole decreases in FSH.

(8) Adjust the gain to put the maximum signal from the bottom notch at 80% of FSH as shown in Detail III in Figure 6.

(9) Put couplant and then the transducer at TP3 as shown in Detail IV in Figure 6. Make sure the sound exit point of the transducer is approximately 2.1 inches (53 mm) from the center of the far hole.

(10) Move the transducer to or away from the far hole to get a maximum signal from the top of the hole. The maximum signal from the top of the hole will occur at approximately 69% of FSW as shown in Detail V in Figure 6.

(11) Slowly turn the transducer to TP4 to get a maximum signal from the top notch in the hole. Do not move the transducer to or away from the notch when you do this. The signal from the top notch will occur to the right of the hole signal at approximately 72% of FSW as shown in Detail VI in Figure 6. If the signal from the notch is less than 80% of FSH, then add gain to put this signal at 80% of FSH.

(12) Put couplant and then the transducer on the reference standard at TP5 so the sound exit point of the transducer is approximately 1.6 inches (41 mm) from the center of the near hole as shown in Detail VII in Figure 6.

(13) Move the transducer to or away from the near hole to get a maximum signal from the bottom of the hole. The maximum signal from the bottom of the hole will occur at approximately 53% of FSW as shown in Detail VIII in Figure 6.

(14) Slowly turn the transducer to TP6 to get a maximum signal from the bottom notch in the near hole. Do not move the transducer to or away from the notch when you do this. The signal from the bottom notch will occur to the right of the hole signal at approximately 56% of FSW as shown in Detail IX in Figure 6. If the signal from the bottom notch is less than 80% of FSH, then add gain to put this signal at 80% of FSH.

(15) Put couplant and then the transducer at TP7 as shown in Detail X in Figure 6. Make sure the sound exit point of the transducer is approximately 1.9 inches (48 mm) from the center of the near hole.

(16) Move the transducer to or away from the near hole to get a maximum signal from the top of the hole. The maximum signal from the top of the hole will occur at approximately 64% of FSW as shown in Detail XI in Figure 6.

(17) Slowly turn the transducer to TP8 to get a maximum signal from the top notch in the hole. Do not move the transducer to or away from the hole when you do this. The signal from the top notch will occur to the right of the hole signal at approximately 67% of FSW as shown in Detail XII in Figure 6. If the signal from the top notch is less than 80% of FSH, then add gain to put this signal at 80% of FSH.

(18) Add 6 dB of gain and make a record of the total gain that is used.

C. Calibrate the instrument for the inspection of the aft end of the lower chord of the two primary beams at the rear spar location.

NOTE: See the notes in Paragraph 4.B. These notes are also applicable to the aft end of the lower chord.

(1) Use reference standard NDT3124 for this instrument calibration.

(2) Connect the transducer to the instrument and do the initial adjustments of the instrument. Set the reject to 0% and the damping to the highest value.

(3) Set the instrument frequency to 5 MHz or a frequency range that includes 5 MHz.

(4) Put couplant and then the transducer on the reference standard at TP1. Make sure the sound exit point of the transducer is approximately 2.5 inches (64 mm) from the center of the far hole as shown in Detail I in Figure 7.

(5) Move the transducer to or away from the far hole to get a maximum signal from the top of the hole. Do not let the transducer move across the scribe line.

(6) Adjust the instrument controls to put the initial pulse at 0% of FSW and the maximum signal from the top of the hole at 80% of FSW as shown in Detail II in Figure 7.

(7) Slowly turn the transducer to TP2 to get a maximum signal from the top notch in the far hole. Do not move the transducer to or away from the notch when you do this. The signal from the notch will occur to the right of the hole signal at approximately 83% of FSW as shown in Detail III in Figure 7. As you turn the transducer from TP1 to TP2, see that the signal from the hole decreases in FSH as the signal from the reference notch increases in FSH.

(8) Adjust the gain to put the maximum signal from the top notch at 80% of FSH as shown in Detail III in Figure 7.

(9) Put couplant and then the transducer at TP3 as shown in Detail IV in Figure 7. Make sure the sound exit point of the transducer is approximately 2.2 inches (56 mm) from the center of the far hole.

(10) Move the transducer to or away from the far hole to get a maximum signal from the bottom of the hole. The maximum signal from the bottom of the hole will occur at approximately 69% of FSW as shown in Detail V in Figure 7.

(11) Slowly turn the transducer to TP4 to get a maximum signal from the bottom notch in the far hole. Do not move the transducer to or away from the notch when you do this. The signal from the bottom notch will occur to the right of the hole signal at approximately 72% of FSW as shown in Detail VI in Figure 7. If the signal from the bottom notch is less than 80% of FSH, then add gain to set this signal to 80% of FSH.

(12) Put couplant and then the transducer on the reference standard at TP5. Make sure the sound exit point of the transducer is approximately 2.2 inches (56 mm) from the center of the near hole as shown in Detail VII in Figure 7.

(13) Move the transducer to or away from the near hole to get a maximum signal from the bottom of the hole. The maximum signal from the bottom of the near hole will occur at approximately 69% of FSW as shown in Detail VIII in Figure 7.

(14) Slowly turn the transducer to TP6 to get a maximum signal from the bottom notch in the near hole. Do not move the transducer to or away from the notch when you do this. The signal from the bottom notch will occur to the right of the hole signal at approximately 72% of FSW as shown in Detail IX in Figure 7. If the signal from the notch is less than 80% of FSH, then add gain to put this signal at 80% of FSH.

(15) Put couplant and then the transducer at TP7 as shown in Detail X in Figure 7 so the sound exit point of the transducer is approximately 1.8 inches (46 mm) from the center of the near hole.

(16) Move the transducer to or away from the hole to get a maximum signal from the top of the hole. The maximum signal from the top of the hole will occur at approximately 56% of FSW as shown in Detail XI in Figure 7.

(17) Slowly turn the transducer to TP8 to get a maximum signal from the top notch in the near hole. Do not move the transducer to or away from the hole when you do this. The signal from the top notch will occur to the right of the hole signal at approximately 59% of FSW as shown in Detail XII in Figure 7. If the signal from the top notch is less than 80% of FSH, then add gain to put this signal at 80% of FSH.

(18) Add 6 dB of gain and make a record of the total gain that is used.

5. Inspection Procedure

A. Use Table 1 and the instructions that follow to examine the applicable fastener holes in the forward and aft ends of the upper and lower chords of the two primary beams.

NOTE: At each fastener hole to be examined, make one scan to examine the top area of the fastener hole and one scan to examine the bottom area of the fastener hole. Table 1 identifies the FSW location where fastener hole and crack signals will occur during the inspection. Put couplant on the transducer contact surface before you examine each fastener hole.

Table 1:

Inspection Area	Surface Examined		Location of Fastener Hole Signal (% of FSW)	Location of Crack Signal (% of FSW)	Approximate Distance from the Transducer Exit Point to the Fastener Center Point *[1]	
	Top	Bottom			Near Fastener	Far Fastener
Forward End of the Upper and Lower Chords (use Paragraph 4.A. and NDT3122 to calibrate the instrument)	X		80	85	1.2 (30)	NONE
		X	64	69	0.9 (23)	NONE
Aft End of the Upper Chords (use Paragraph 4.B. and NDT3123 to calibrate the instrument)	X		69	72		2.1 (53)
		X	80	83		2.4 (61)
	X		64	67	1.9 (48)	
		X	53	56	1.6 (41)	
Aft End of the Lower Chords (use Paragraph 4.C. and NDT3124 to calibrate the instrument)	X		80	83		2.5 (64)
		X	69	72		2.2 (56)
	X		56	59	1.8 (46)	
		X	69	72	2.2 (56)	

*[1] All dimensions are in inches (millimeters are in parentheses)

(1) Calibrate the instrument for the inspection area to be examined as given in Table 1.

(2) Refer to Table 1 to see where the hole and crack signals will occur at each applicable fastener hole to be examined.

(3) Put the transducer on the applicable upper or lower chord of the primary beam. Make sure the sound beam points at the fastener hole to be examined.

(4) Move the transducer as necessary to get a signal from the fastener hole at the FSW location given in Table 1 for the applicable fastener hole and the surface to be examined (top or bottom surface).

(5) Slowly turn the transducer to point the sound beam to one side of the fastener hole and continue to turn the transducer until the fastener hole signal decreases to 0% of FSH. As you do this, look for a crack signal to occur to the right of the fastener hole signal at the FSW location given in Table 1. Also do a lateral scan at this fastener hole location as shown in Detail I in Figure 1.

(6) Do Paragraph 5.A.(3) thru Paragraph 5.A.(5) again, but examine the opposite side of the fastener hole.

(7) Do Paragraph 5.A.(3) thru Paragraph 5.A.(6) again, but examine the opposite surface of the fastener hole. See Table 1 for the applicable FSW location where the fastener hole signal and the crack signal will occur.

(8) Do Paragraph 5.A.(1) thru Paragraph 5.A.(7) at each fastener hole location that must be examined.

6. Inspection Results

A. Possible crack signals that are 40% (or more) of FSH and occur at the applicable FSW location for the fastener hole, are possible crack signals. Areas that cause crack type signals to occur must be examined more fully.

B. Couplant on the part surface near the fastener can cause crack type signals to occur. Remove all couplant in the area of the fastener and see if the signal goes away. If the signal stays, go to Paragraph 6.C. and continue to make an analysis of the possible crack signal.

C. Calibrate the instrument again with the applicable reference standard, hole, and notch location (top or bottom surface). Again examine the fastener hole location where the possible crack signal occurred. A signal from a crack can occur at a FSW location that is nearer to or farther from the signal from the fastener hole by a small distance on the screen display. If the possible crack signal is less than 40% of FSH, do more scans of the fastener hole at different angular directions where there is access to do this. If the possible crack signal continues to be 40% (or more) of FSH, go to Paragraph 6.F. and continue to make an analysis of the possible crack.

D. Possible crack signals that occur in the aft end of the lower chord at the fastener hole locations shown in flagnote 11 of Figure 1 must be examined more fully from the edge of the lower chord as shown by flagnote 12 in Figure 1. Calibrate the instrument and examine as follows:

(1) Put the transducer on the edge of reference standard NDT3124 as shown in Detail V of Figure 1.

(2) Move the transducer as necessary to get a maximum signal from the hole. Set this signal to 50% of FSW.

(3) Make a scan to the hole and get a maximum signal from the reference notch. This signal will occur at approximately 60% of FSW.

(4) Set the notch signal to 80% of FSH.

(5) Put the transducer on the edge of the lower chord, at the fastener location where the possible crack signal occurred, as shown in Figure 1, flagnote 12.

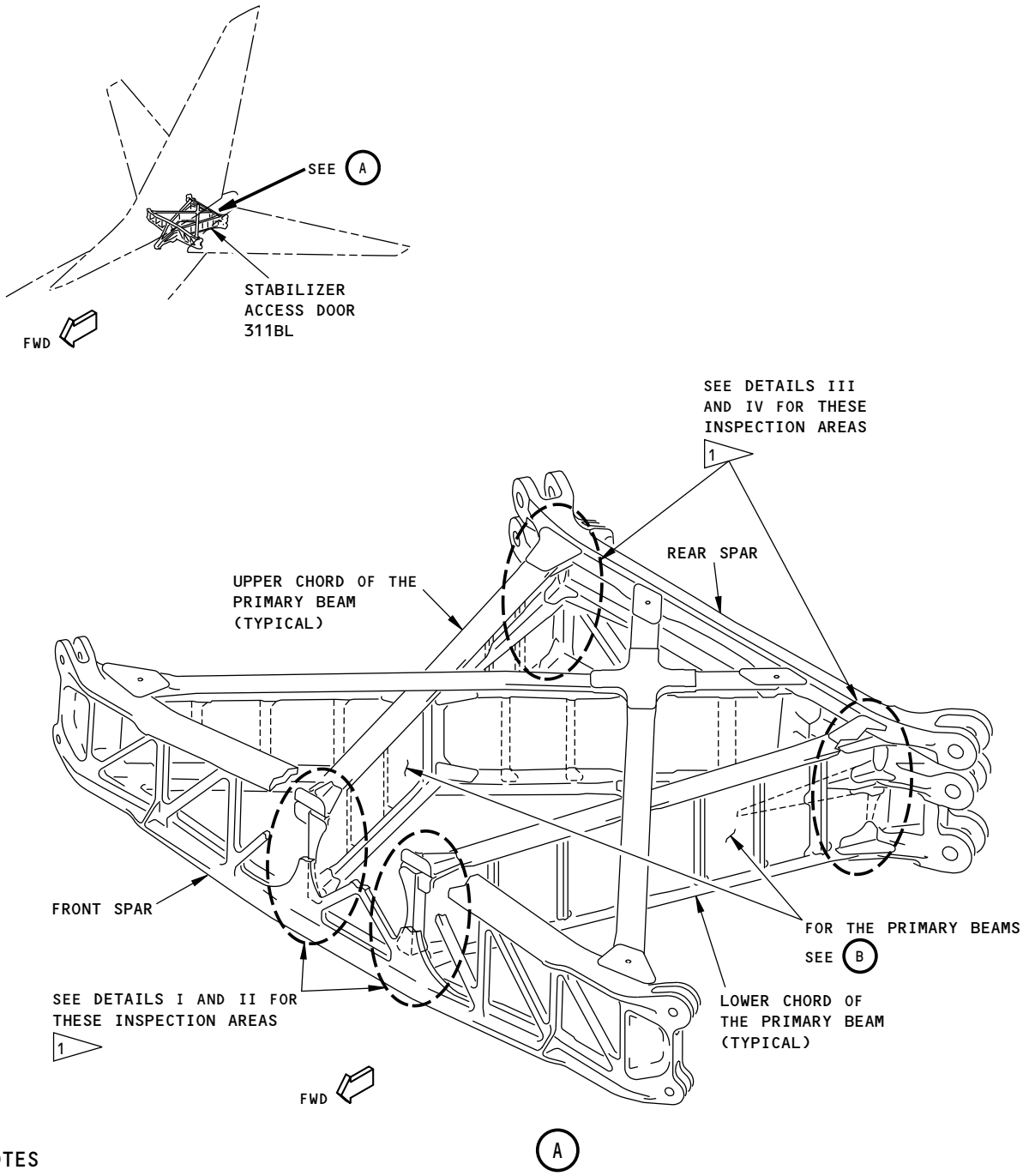
(6) Move the transducer as necessary to get the signal from the hole to occur at approximately 50% of FSW.

(7) Make a scan in the direction of the hole and look for a crack signal to occur to the right of the hole signal at approximately 60% of FSW. A signal from a possible crack will come into view to the right of the fastener hole signal as the signal from the fastener hole decreases (or decreases fully).

(8) Go to Paragraph 6.F. to make an analysis of all possible crack signals that are 40% (or more) of FSH.

E. Make an accurate record of all possible crack signals that are less than 40% of FSH for use during a future inspection of this part.

F. To make sure the signal 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 23.

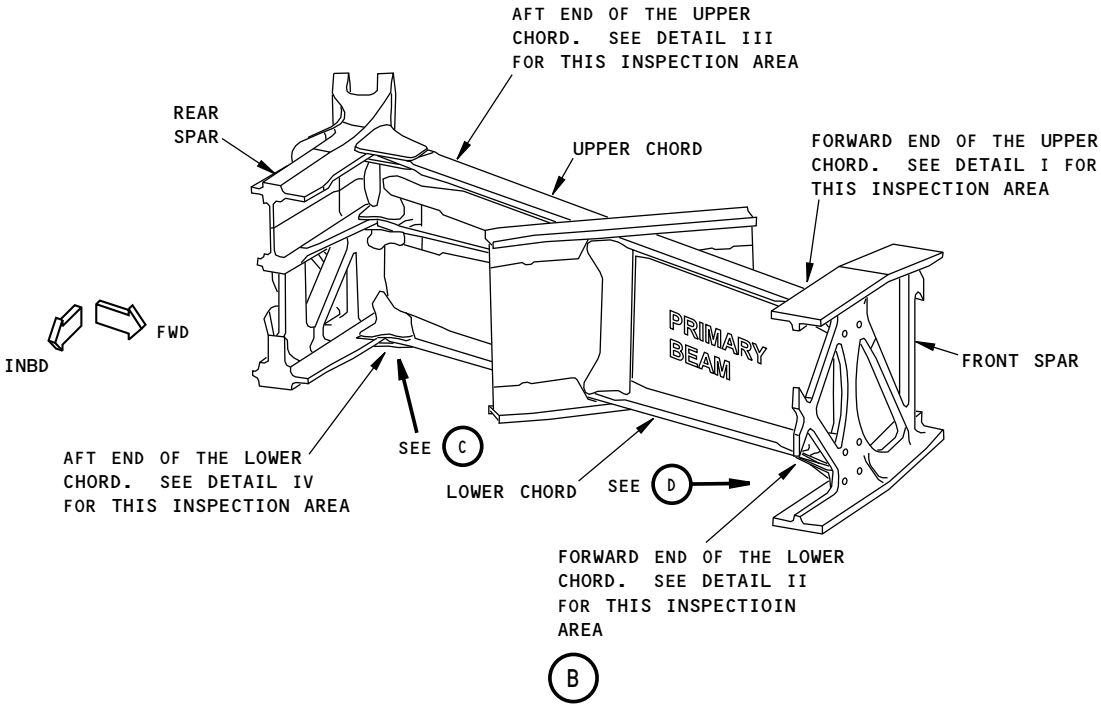


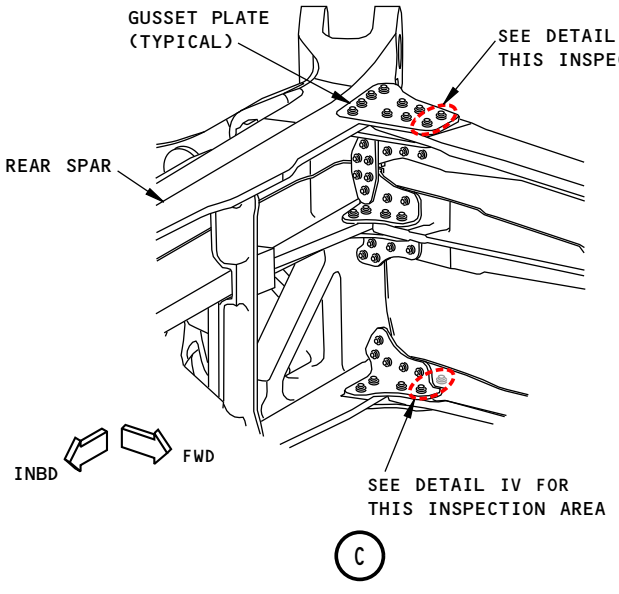
NOTES

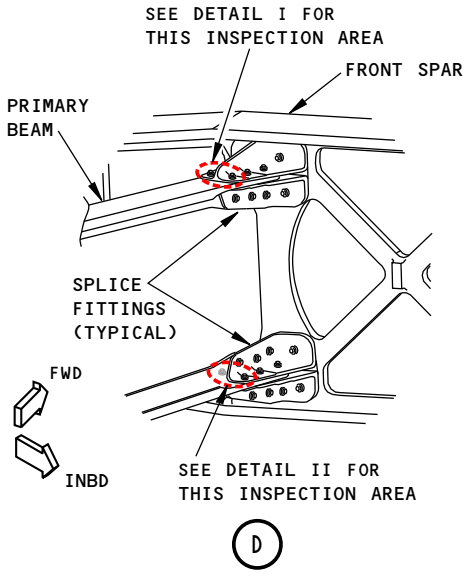
1 EXAMINE THE UPPER AND LOWER CHORDS OF THE PRIMARY BEAMS FOR CRACKS WHERE THEY CONNECT TO THE SPLICE FITTINGS AT THE FRONT AND REAR SPARS.

2435037 S0000564445_V1

Inspection Areas
Figure 1 (Sheet 1 of 5)





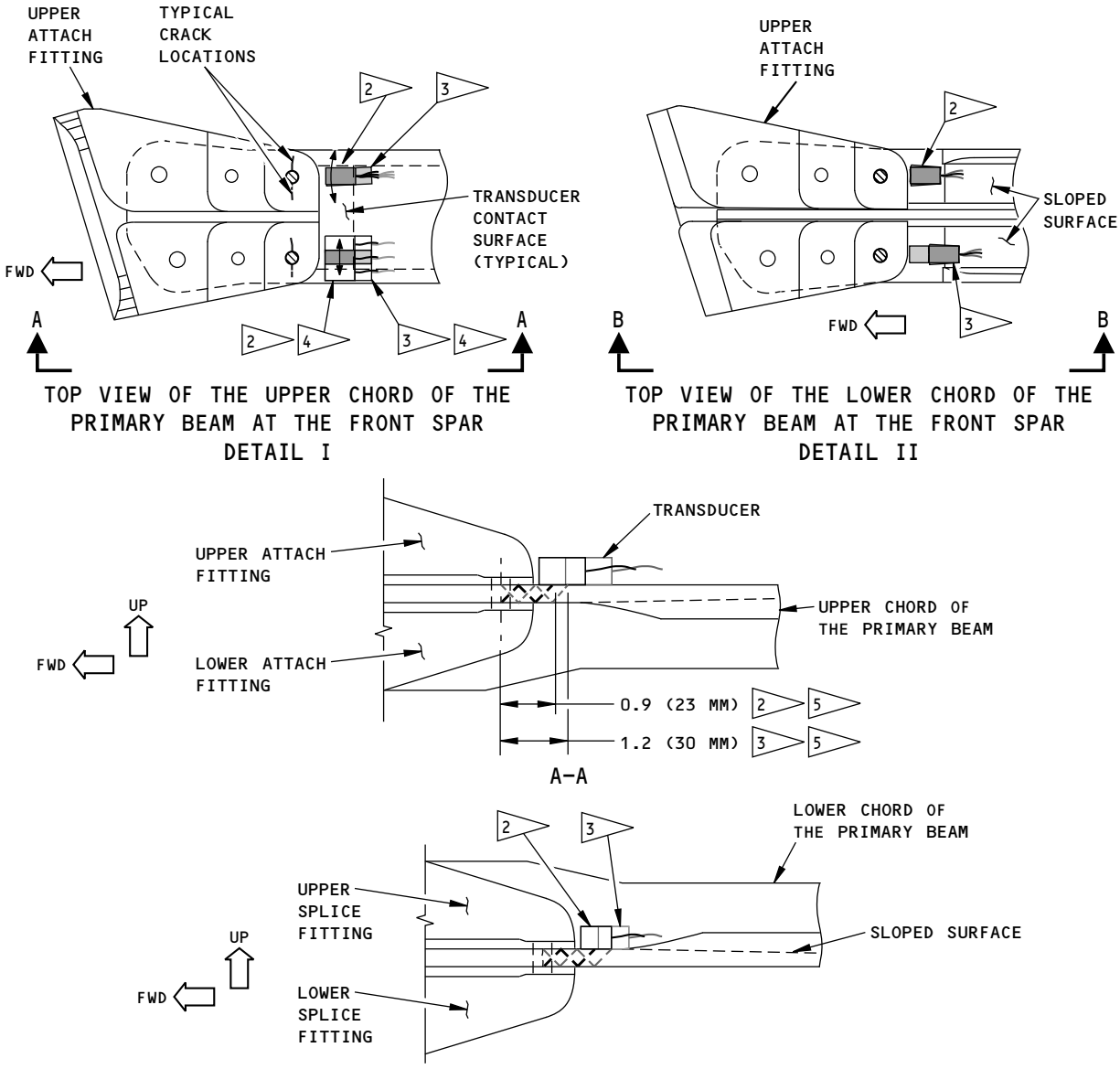


NOTES

- THE PRIMARY BEAM ON THE LEFT SIDE IS SHOWN; THE PRIMARY BEAM ON THE RIGHT SIDE IS THE SAME, BUT OPPOSITE.

2435060 S0000564446_V1

Inspection Areas
Figure 1 (Sheet 2 of 5)



NOTES

- FASTENER HOLE LOCATIONS TO BE EXAMINED
- GO TO PARAGRAPH 5.A FOR THE INSPECTION INSTRUCTIONS

2 APPROXIMATE DISTANCE FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE CENTER OF THE HOLE TO EXAMINE THE BOTTOM SURFACE OF THE HOLES

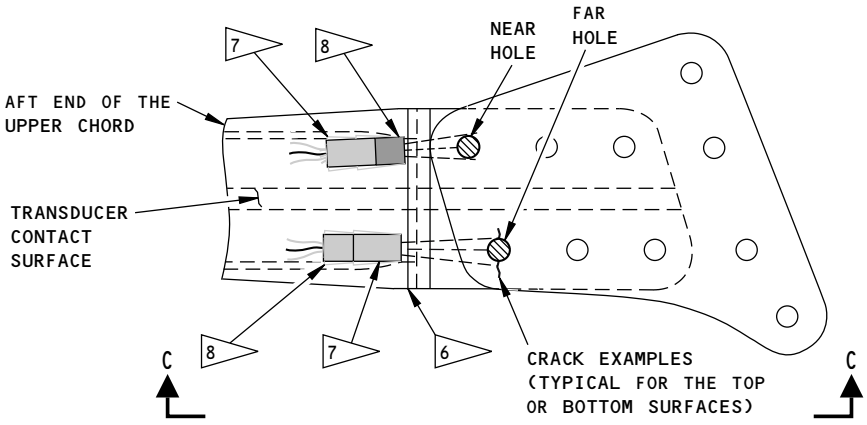
3 APPROXIMATE DISTANCE FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE CENTER OF THE HOLE TO EXAMINE THE TOP SURFACE OF THE HOLES

4 LATERAL SCAN EXAMPLES

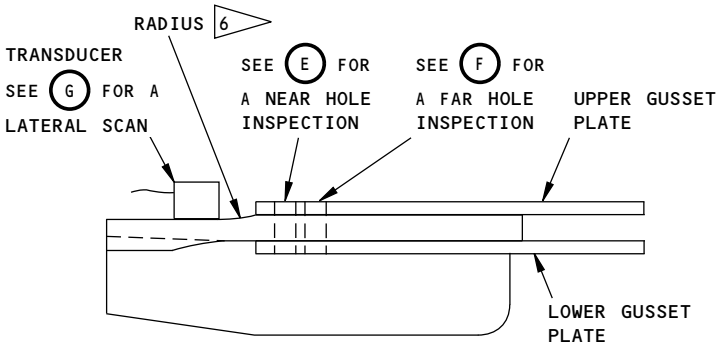
5 THESE DISTANCES ARE ALSO APPLICABLE TO THE LOWER CHORDS

2435195 S0000564447_V1

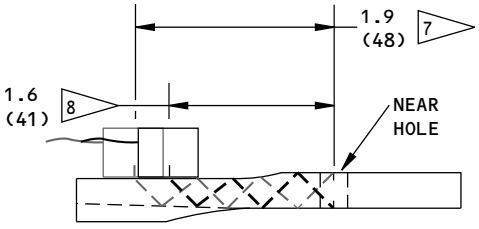
Inspection Areas
Figure 1 (Sheet 3 of 5)



DETAIL III

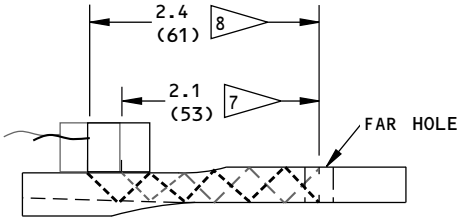


C–C



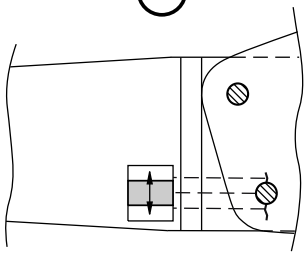
INSPECTION OF THE NEAR HOLE

E



INSPECTION OF THE FAR HOLE

F



EXAMPLE OF A LATERAL SCAN

G

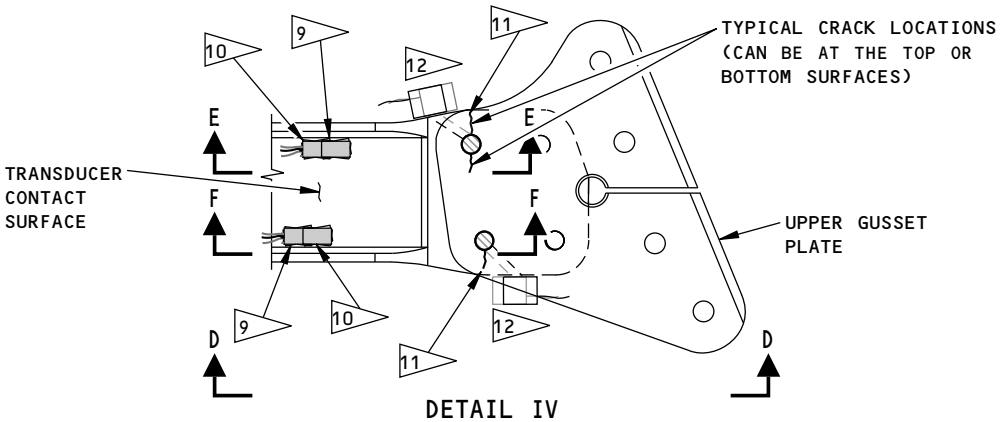
INSPECTION AREA FOR THE AFT END
OF THE UPPER CHORD OF THE TWO PRIMARY BEAMS

NOTES

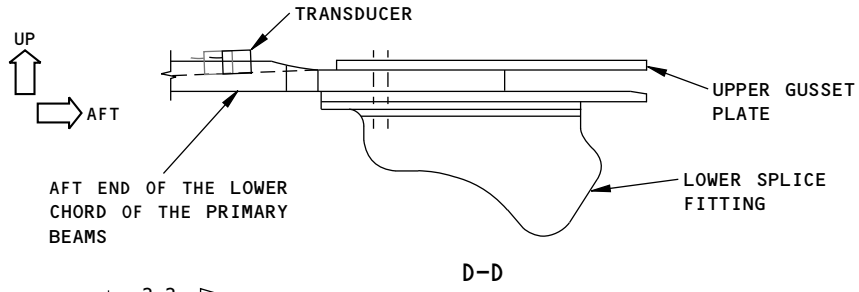
- FASTENER HOLE LOCATIONS TO BE EXAMINED.
  - GO TO PARAGRAPH 5.B FOR THE INSPECTION INSTRUCTIONS
- 6 THE RADIUS STOPS THE TRANSDUCER MOVEMENT TO THE FASTENERS
- 7 APPROXIMATE DISTANCE FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE CENTER OF THE HOLE TO EXAMINE THE TOP SURFACE OF THE HOLE
- 8 APPROXIMATE DISTANCE FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE CENTER OF THE HOLE TO EXAMINE THE BOTTOM SURFACE OF THE HOLE

2435255 S0000564448_V1

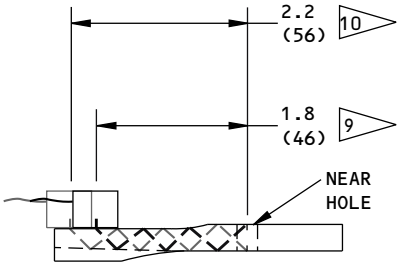
Inspection Areas
Figure 1 (Sheet 4 of 5)



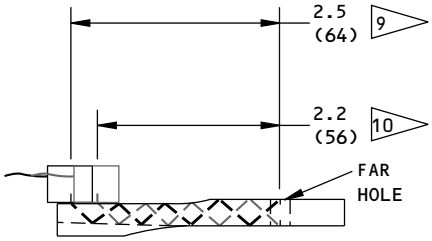
DETAIL IV



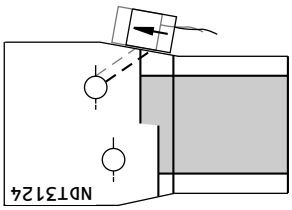
D–D



INSPECTION OF THE NEAR HOLE
E–E



INSPECTION OF THE FAR HOLE
F–F



DETAIL V

INSPECTION AREA FOR THE AFT END
OF THE LOWER CHORD OF THE TWO PRIMARY BEAMS

NOTES

⊘ FASTENER HOLE LOCATIONS TO BE EXAMINED.

- GO TO PARAGRAPH 5.C FOR THE INSPECTION INSTRUCTIONS

9 APPROXIMATE DISTANCE FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE CENTER OF THE HOLE TO EXAMINE THE TOP SURFACE OF THE HOLE.

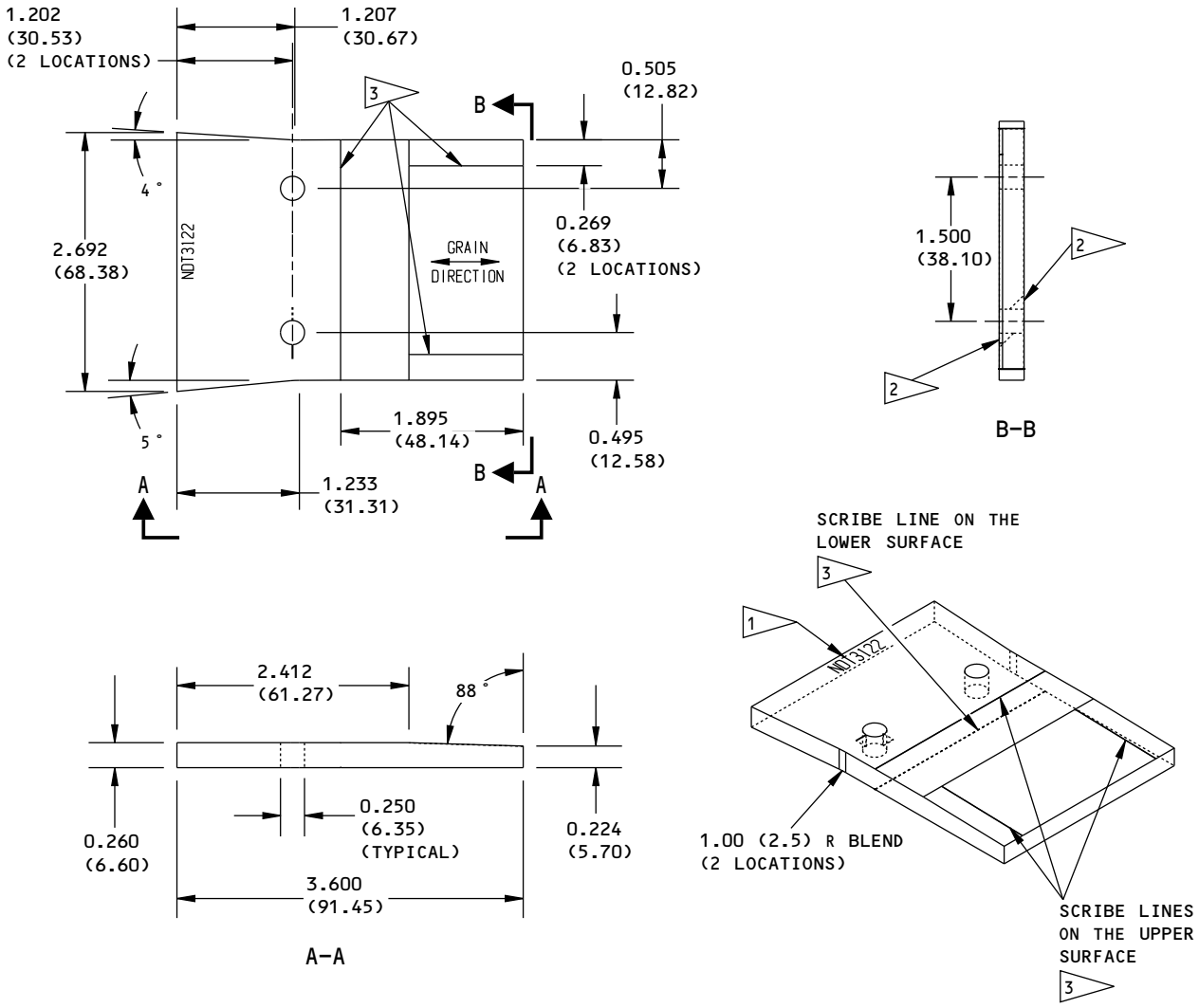
10 APPROXIMATE DISTANCE FROM THE SOUND EXIT POINT OF THE TRANSDUCER TO THE CENTER OF THE HOLE TO EXAMINE THE BOTTOM SURFACE OF THE HOLE.

11 AREAS THAT CAUSE SIGNALS TO OCCUR AT ONE OF THE TWO LOCATIONS SHOWN THAT ARE BETWEEN 20 AND 40% OF FSH MUST BE EXAMINED SOME MORE FROM THE EDGE OF THE PRIMARY BEAM AS SHOWN IN FLAGNOTE 12.

12 DO MORE ANALYSIS OF ALL SIGNALS THAT OCCUR AT THE FLAGNOTE 11 AREA FROM THIS LOCATION. GO TO PARAGRAPH 6.D FOR INSTRUCTIONS ON HOW TO CALIBRATE THE INSTRUMENT TO EXAMINE THESE HOLES.

2435302 S0000564449_V1

Inspection Areas
Figure 1 (Sheet 5 of 5)



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	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T73511 ALUMINUM OR EQUIVALENT AIRPLANE QUALITY ALUMINUM

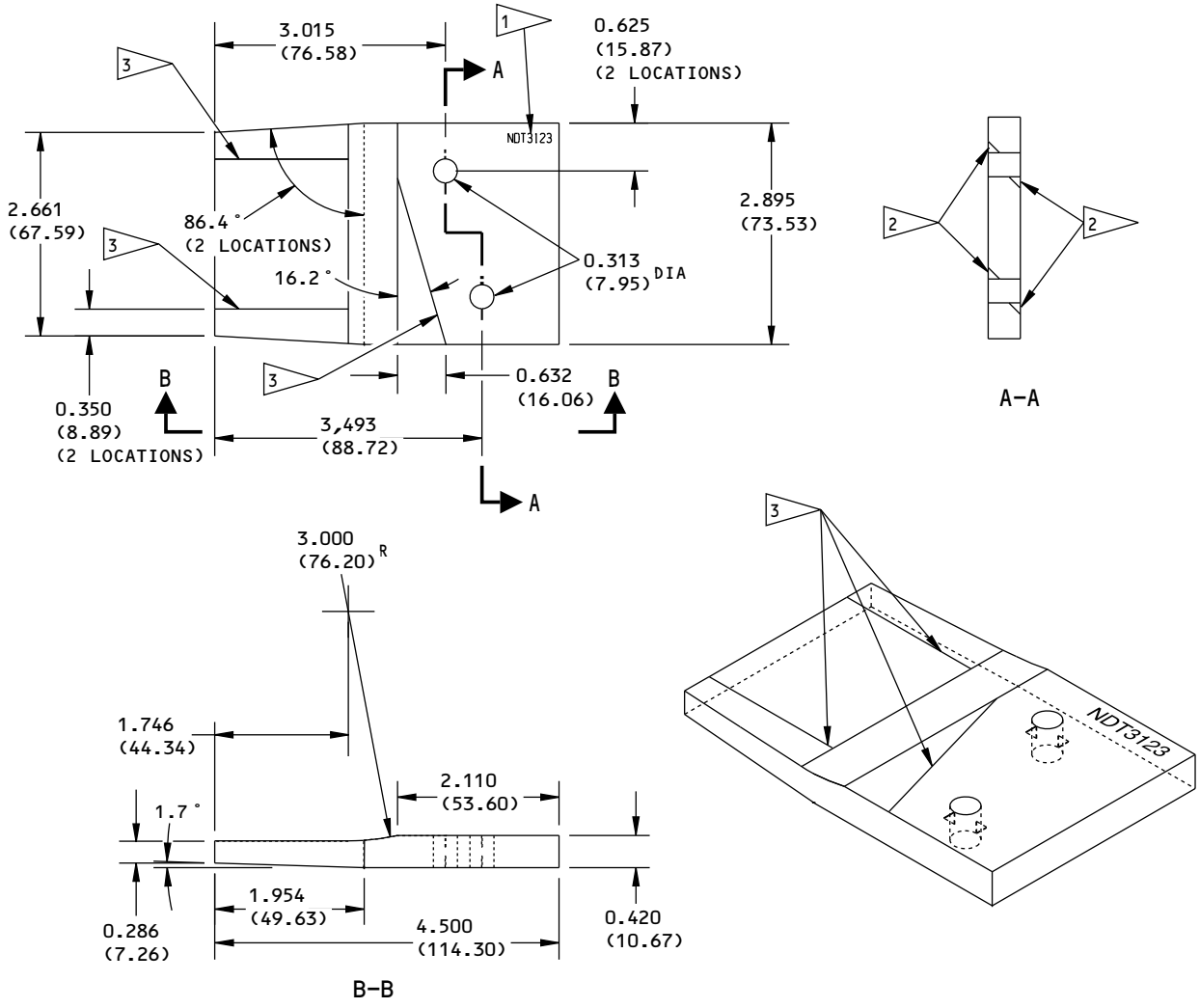
1 ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3122, AT APPROXIMATELY THIS LOCATION

2 EDM CORNER NOTCH: 0.15 (3.81) X 0.15 (3.81) X 0.010 (0.25) WIDE

3 SCRIBE A LINE AS SHOWN TO A DEPTH OF APPROXIMATELY 0.005 (0.13)

2435396 S0000564450_V1

Reference Standard NDT3122
Figure 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	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T73511 ALUMINUM OR EQUIVALENT

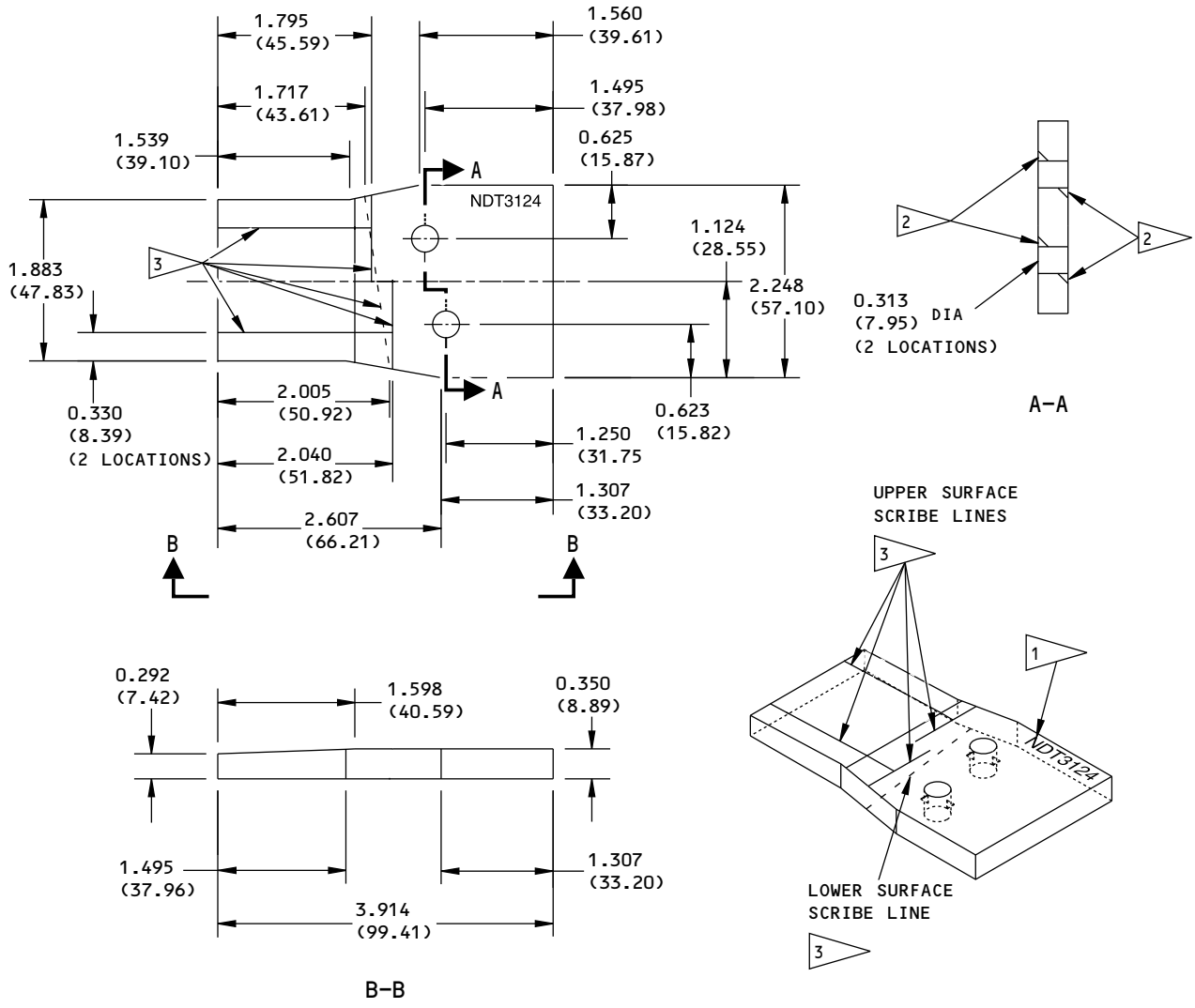
1 ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3123, AT APPROXIMATELY THIS LOCATION

2 EDM CORNER NOTCH: 0.15 (3.81) X 0.15 (3.81) X 0.010 (0.25) MAXIMUM WIDTH

3 SCRIBE A LINE AS SHOWN TO A DEPTH OF APPROXIMATELY 0.005 (0.13)

2435409 S0000564452_V1

Reference Standard NDT3123
Figure 3



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	

- SURFACE ROUGHNESS: 125 Ra OR BETTER
- MATERIAL: 7075-T73511 ALUMINUM OR EQUIVALENT

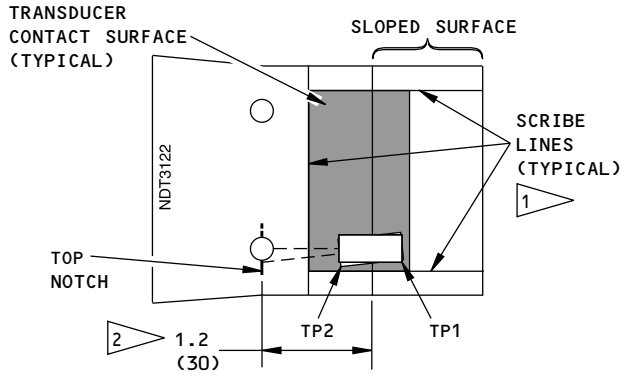
1 ETCH OR SCRIBE THE REFERENCE STANDARD NUMBER, NDT3124, AT APPROXIMATELY THIS LOCATION

2 EDM CORNER NOTCH: 0.15 (3.81) X 0.15 (3.81) X 0.007 (0.18) WIDE

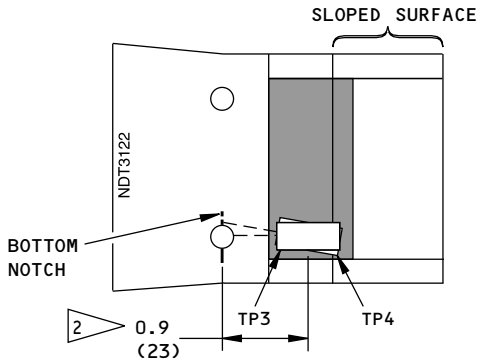
3 SCRIBE A LINE AS SHOWN TO A DEPTH OF APPROXIMATELY 0.005 (0.13)

2435446 S0000564453_V1

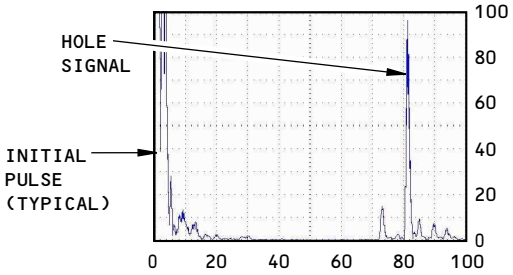
Reference Standard NDT3124
Figure 4



DETAIL I

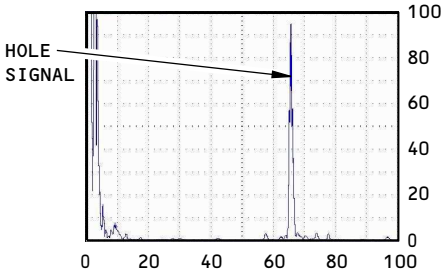


DETAIL IV



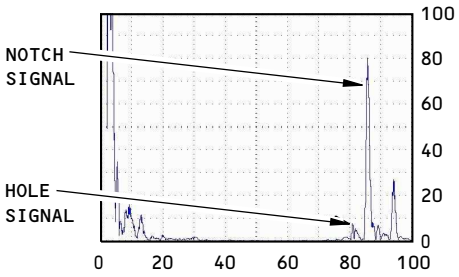
SIGNAL FROM THE TOP
OF THE HOLE AT TP1

DETAIL II



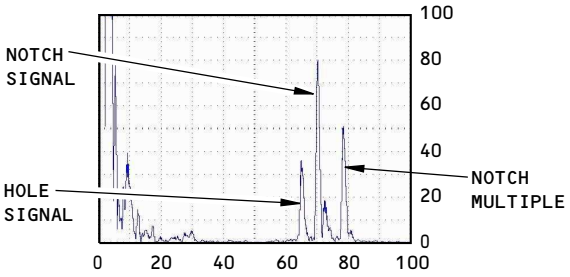
SIGNAL FROM THE BOTTOM
OF THE HOLE AT TP3

DETAIL V



SIGNAL FROM THE TOP
NOTCH AT TP2

DETAIL III



SIGNAL FROM THE BOTTOM
NOTCH AT TP4

DETAIL VI

NOTES

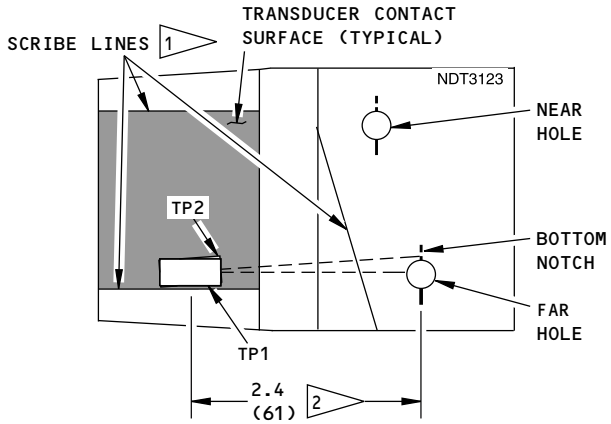
- SEE PARAGRAPH 4.A FOR THE CALIBRATION INSTRUCTIONS

1 DO NOT LET THE TRANSDUCER MOVE ACROSS THE SCRIBE LINES.

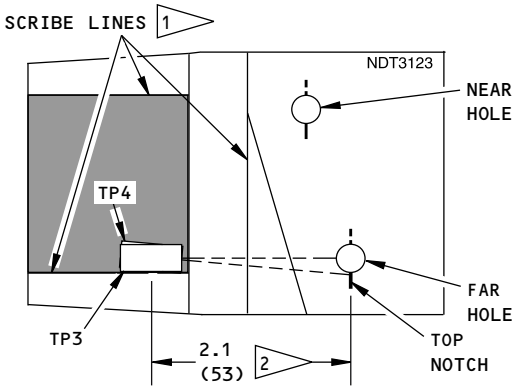
2 APPROXIMATE DISTANCE FROM THE TRANSDUCER SOUND EXIT POINT TO THE CENTER OF THE HOLE

2435476 S0000564454_V1

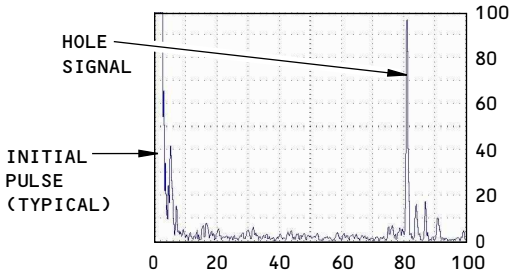
Instrument Calibration for the Forward End of the Upper and Lower Chords of the Primay Beam Inspection Areas
Figure 5



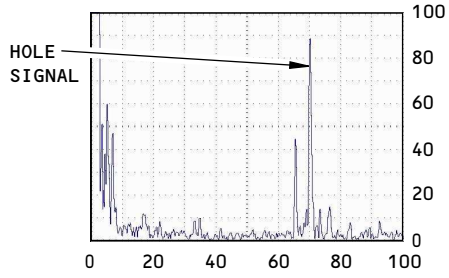
DETAIL I



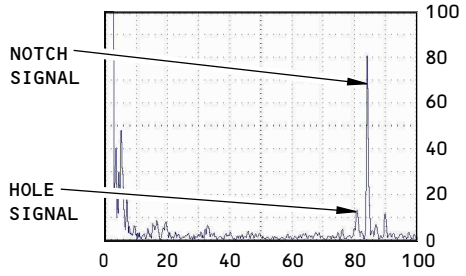
DETAIL IV



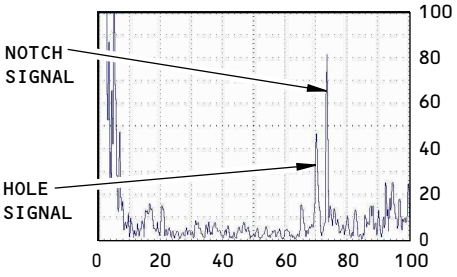
SIGNAL FROM THE HOLE AT TP1
DETAIL II



SIGNAL FROM THE HOLE AT TP3
DETAIL V



SIGNAL FROM THE BOTTOM NOTCH
AT TP2 SET AT 80% OF FSH
DETAIL III



SIGNAL FROM THE TOP NOTCH
AT TP4 SET AT 80% OF FSH
DETAIL VI

NOTES

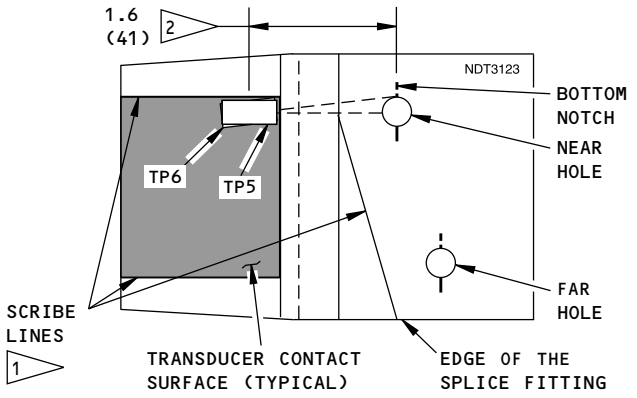
- USE THE FAR HOLE AND TP1 TO CALIBRATE THE INSTRUMENT SCREEN DISPLAY. SEE DETAIL I AND PARAGRAPH 4.B.

1 DO NOT LET THE TRANSDUCER MOVE ACROSS THE SCRIBE LINES.

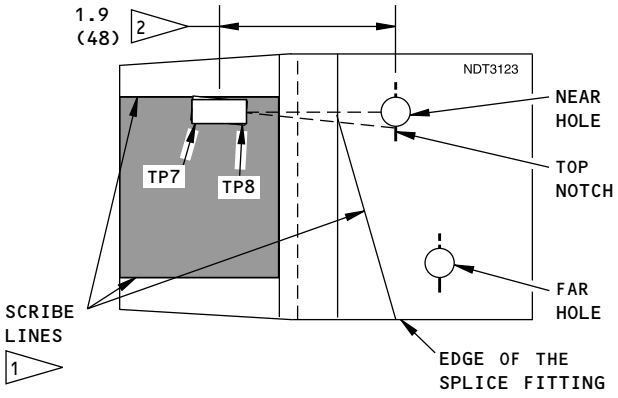
2 APPROXIMATE DISTANCE FROM THE TRANSDUCER SOUND EXIT POINT TO THE CENTER OF THE HOLE.

2435554 S0000564457_V1

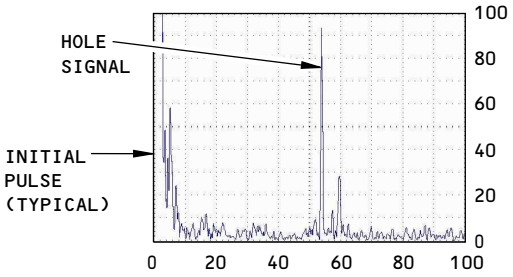
Instrument Calibration for the Aft End of the Upper Chord of the Two Primary Beam Inspection Areas
Figure 6 (Sheet 1 of 2)



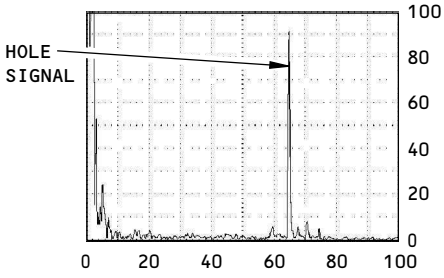
DETAIL VII



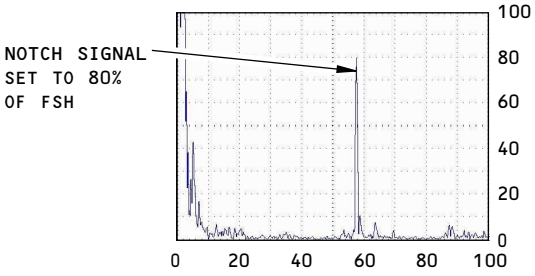
DETAIL X



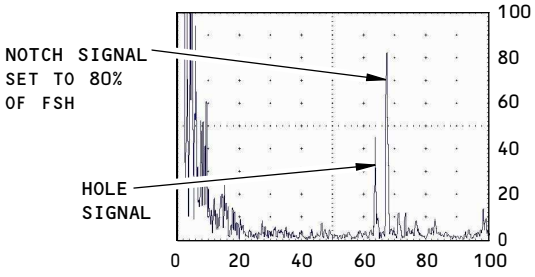
SIGNAL FROM THE BOTTOM
OF THE HOLE AT TP5
DETAIL VIII



SIGNAL FROM THE TOP OF
THE HOLE AT TP7
DETAIL XI



SIGNAL FROM THE BOTTOM
NOTCH AT TP6
DETAIL IX



SIGNAL FROM THE TOP
NOTCH AT TP8
DETAIL XII

NOTES

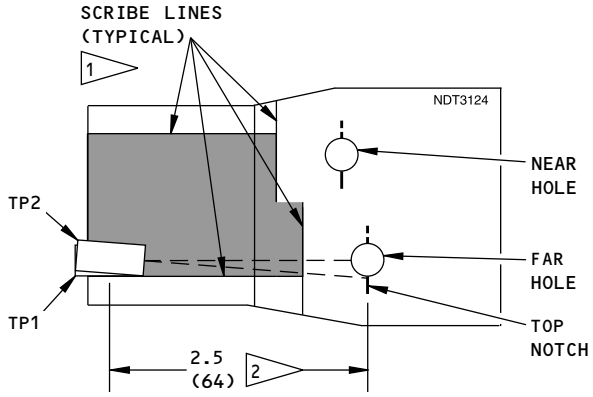
- SEE PARAGRAPH 4.B. FOR THE CALIBRATION INSTRUCTIONS.

1 DO NOT LET THE TRANSDUCER MOVE ACROSS THE SCRIBE LINES.

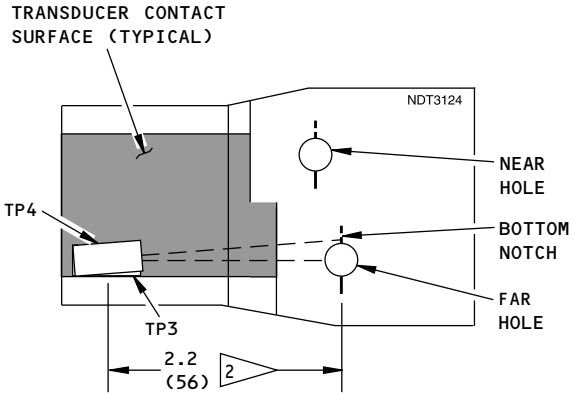
2 APPROXIMATE DISTANCE FROM THE TRANSDUCER SOUND EXIT POINT TO THE CENTER OF THE HOLE.

2435556 S0000564458_V1

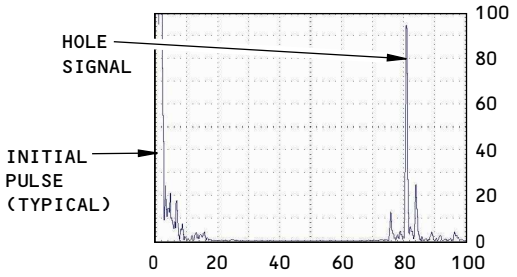
Instrument Calibration for the Aft End of the Upper Chord of the Two Primary Beam Inspection Areas
Figure 6 (Sheet 2 of 2)



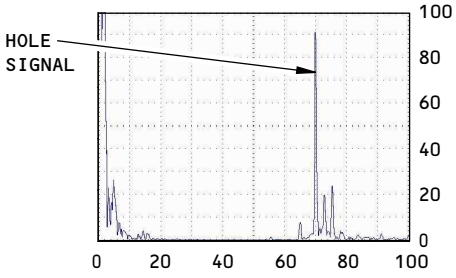
DETAIL I



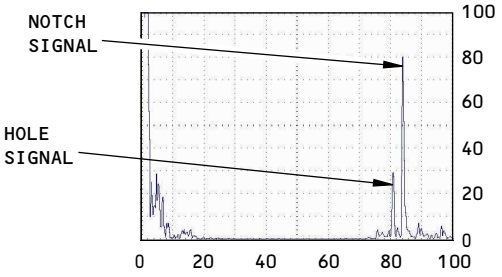
DETAIL IV



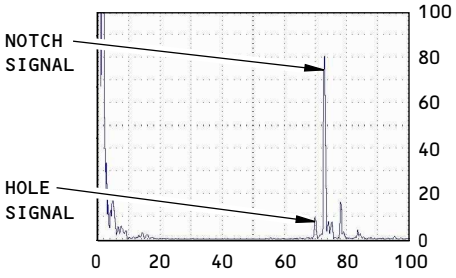
SIGNAL FROM THE TOP
OF THE HOLE AT TP1
DETAIL II



SIGNAL FROM THE BOTTOM
OF THE HOLE AT TP3
DETAIL V



SIGNAL FROM THE TOP
NOTCH AT TP2
DETAIL III



SIGNAL FROM THE BOTTOM
NOTCH AT TP4
DETAIL VI

NOTES

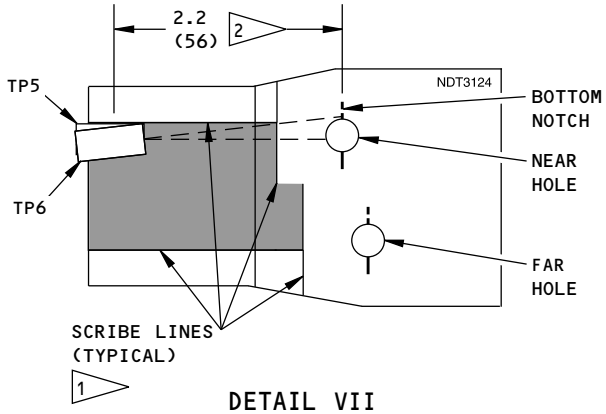
- USE THE FAR HOLE AND TP1 TO CALIBRATE THE INSTRUMENT SCREEN DISPLAY. SEE DETAIL I AND PARAGRAPH 4.C.
- SET THE INSTRUMENT SENSITIVITY ON THE NOTCH (TOP OR BOTTOM) THAT USES THE MOST GAIN TO PUT THE SIGNAL AT 80 PERCENT OF FSH. SEE FIGURE 7 (SHEET 2) TO CONTINUE THE SENSITIVITY CALIBRATION.

1 DO NOT LET THE TRANSDUCER MOVE ACROSS THE SCRIBE LINES.

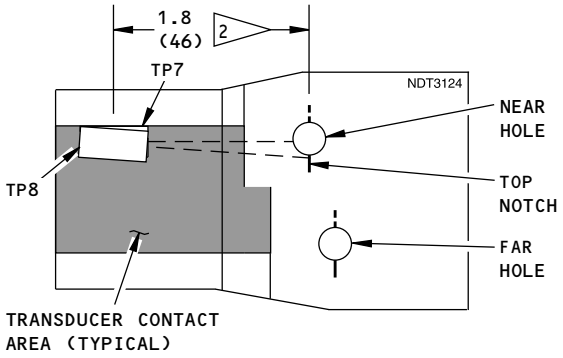
2 APPROXIMATE DISTANCE FROM THE TRANSDUCER SOUND EXIT POINT TO THE CENTER OF THE HOLE.

2435560 S0000564459_V1

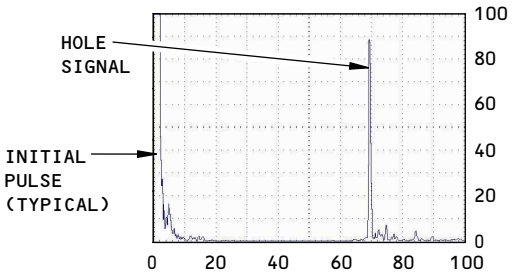
Instrument Calibration for the Aft End of the Lower Chord of the Two Primary Beam Inspection Areas
Figure 7 (Sheet 1 of 2)



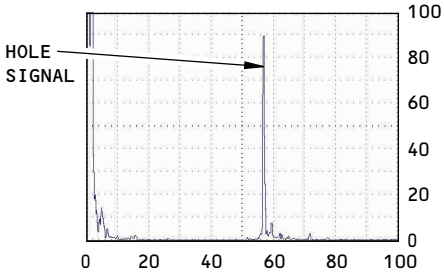
DETAIL VII



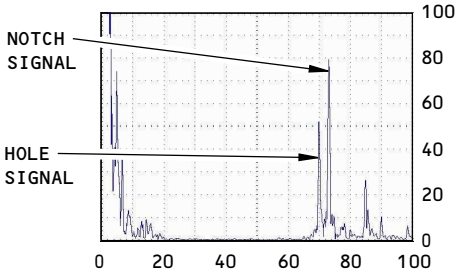
DETAIL X



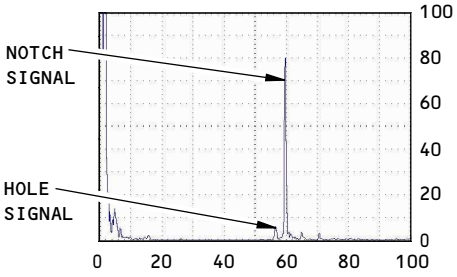
SIGNAL FROM THE HOLE AT TP5
DETAIL VIII



SIGNAL FROM THE HOLE AT TP7
DETAIL XI



SIGNAL FROM THE BOTTOM
NOTCH AT TP6
DETAIL IX



SIGNAL FROM THE TOP
NOTCH AT TP8
DETAIL XII

NOTES

- DO NOT CHANGE THE INSTRUMENT CALIBRATION FOR THE INSPECTION OF THE NEAR HOLES. THE NEAR HOLE SIGNALS AND APPLICABLE NOTCH SIGNALS WILL OCCUR AT APPROXIMATELY THE FSW LOCATIONS SHOWN ABOVE.
- SEE PARAGRAPH 4.C FOR THE CALIBRATION INSTRUCTIONS.

1 DO NOT LET THE TRANSDUCER MOVE ACROSS THE SCRIBE LINES.

2 APPROXIMATE DISTANCE FROM THE TRANSDUCER SOUND EXIT POINT TO THE CENTER OF THE HOLE.

2435563 S0000564460_V1

Instrument Calibration for the Aft End of the Lower Chord of the Two Primary Beam Inspection Areas
Figure 7 (Sheet 2 of 2)

PART 4 - ULTRASONIC

UPPER AND LOWER CHORD LUGS OF THE FRONT SPARS FOR THE HORIZONTAL STABILIZERS

1. Purpose

A. Use this procedure to help find intergranular-stress-corrosion-cracks in the upper and lower chord lugs of the front spars for the left and right horizontal stabilizers.

B. The chord lugs are examined from the edge of the inboard clevis lugs (the inboard clevis lugs are lugs of the front spar of the center section for the horizontal stabilizer) to the closure rib of the horizontal stabilizer. See Figure 1 and Figure 3 for the inspection area.

C. The upper and lower chords are 7075-T6511 aluminum.

D. Service Bulletin reference: 737-55A1092

2. Equipment

A. General

(1) All ultrasonic flaw detector 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) Use a pulse echo ultrasonic instrument that can operate in the 4 to 6 MHz frequency range. Broadband instruments are permitted.

(2) The instrument that follows was used to help prepare this procedure.

(a) USM Go; GE Inspection Technologies

C. Transducers

(1) Use a longitudinal wave transducer that has these properties:

(a) Operates in the 4 to 6 MHz frequency range.

(b) Has a crystal diameter between 0.250 and 0.375 inch (6.40 and 9.53 mm).

(c) Has a side-mounted connector.

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

(a) TC-375-6; Techna NDT

(b) AFC-518S; Aerofab NDT

D. Reference Standard

(1) Use one of the aluminum test blocks that follow to do this inspection.

(a) Use a flat block of 7075-T6 aluminum, or an aluminum that has the equivalent ultrasonic velocity as 7075-T6, that has the properties that follow:

1) Is 0.500 inch (12.70 mm) (± 0.005 inch / 0.127 mm) or 1.000 inch (25.40 mm) (± 0.005 inch / 0.127 mm) thick.

2) Has a surface roughness of 125 Ra or better.

3) Have parallel upper and lower surfaces.

4) Has a width and length that is a minimum of 1.5 times larger than the diameter of the transducer.

5) Does not contain defects that cause a signal to occur at the location where you will put the transducer to do the instrument calibration.

(b) Use a known reference standard (Boeing NDTXXXX reference standard, IIW block, step wedge, angle beam calibration block, ASTM reference block) that have the properties given in Paragraph 2.D.(1)(a).

E. Couplant

(1) Use an ultrasonic couplant that will not damage the airplane structure. Use the same couplant for the instrument calibration and inspection.

3. Prepare for the Inspection

A. Identify the inspection areas shown in Figure 1.

B. Fully clean the inspection areas of all dirt, loose paint, grease, and sealant. Use an approved procedure to make sure that all chipped paint on the inspection surface is smooth.

4. Instrument Calibration

A. Set the instrument to the pulse echo mode.

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

C. Set the reject to zero and damping to the highest value.

D. Set the initial pulse at 0% of full screen width (FSW) and the signals from the back surface as follows:

(1) When a 0.500 inch (12.70 mm) thick aluminum test block is used, set the first back surface signal and the other back surface signals as follows:

(a) Set the first back surface signal at 25% of FSW.

(b) Set the second back surface signal at 50% of FSW.

(c) Set the third back surface signal at 75% of FSW.

(d) Set the fourth back surface signal at 100% of FSW and between 50 and 80% of FSH.

(2) When a 1.000 inch (25.40 mm) thick aluminum test block is used, set the first back surface signal and the other back surface signal as follows:

(a) Set the first back surface signal at 50% of FSW.

(b) Set the second back surface signal at 100% of FSW and FSH.

E. This calibration makes the total screen display 2 inches (50.8 mm). If the baseline on the instrument's screen display has 50 divisions, then the value of each small division is 0.04 inch (1.02 mm). If the baseline on the instrument's screen display has 100 divisions, then the value of each small division is 0.02 inch (0.51 mm).

5. Inspection Procedure

A. Calibrate the equipment as specified in Paragraph 4.

B. Put couplant on the inspection area of the chord to be examined (see Figure 3).

C. Put the transducer on the chord at the inspection area and add gain to put the signal from the back surface at 100% of FSH. Put a small quantity of couplant on a finger and try to dampen the back surface signal to make sure the signal that occurs is caused by the back surface of the chord.

D. Fully examine the inspection area of the chord from the edge of the inboard clevis lug (of the front spar for the center section of the horizontal stabilizer) to the closure rib as shown in Figure 1 and Figure 3. Move the transducer approximately one-half the width of the transducer to do each new scan. During each scan, monitor the screen display for:

(1) One or more signals to occur to the left of the signal from the back surface of the lug.

(2) A decrease in the FSW location of the signal from the back surface of the lug.

(3) A decrease in FSH of the back surface signal, with or without one or more signals to the left of the back surface signal.

(4) A back surface signal that does not occur on the screen display. At all locations where this occurs, examine the same area again, but from the opposite direction. Make sure the inspection surface is clean so the ultrasound can get into the lug.

E. Go to Paragraph 6. for instructions to help make an analysis of signals that occur during the inspection.

F. Do Paragraph 5.B. thru Paragraph 5.E. again to examine the other chord of the front spar on this horizontal stabilizer.

G. Do Paragraph 5.B. thru Paragraph 5.F. again to examine the chords of the front spar for cracks on the opposite horizontal stabilizer.

6. Inspection Results

A. If one or more of the signals that follow occur during the inspection, it is a sign of internal stress corrosion cracks or internal exfoliation corrosion and is not permitted. Refer to Service Bulletin 737-55A1092 for more instructions.

(1) A signal occurs to the left of the signal from the back surface of the chord.

(2) The back surface signal decreases in FSW.

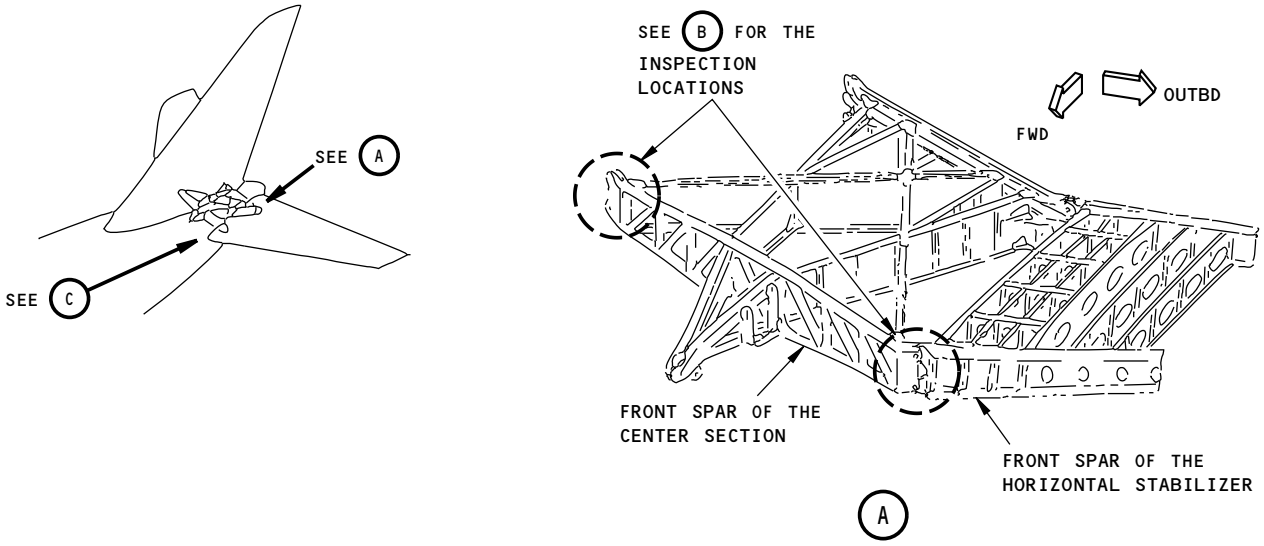
NOTE: It is possible that the chord has had surface corrosion removed that has decreased the full thickness of the chord at this location. Look for signs of a repair (a blend-out area, for example) on the back surface of the chord where this signal occurred. Put a small quantity of couplant on a finger and try to dampen the signal. If there is a sign of a repair and the signal will dampen when the back surface is touched with a finger that has couplant, then this change in FSW is not caused by internal corrosion or cracks and the chord is serviceable.

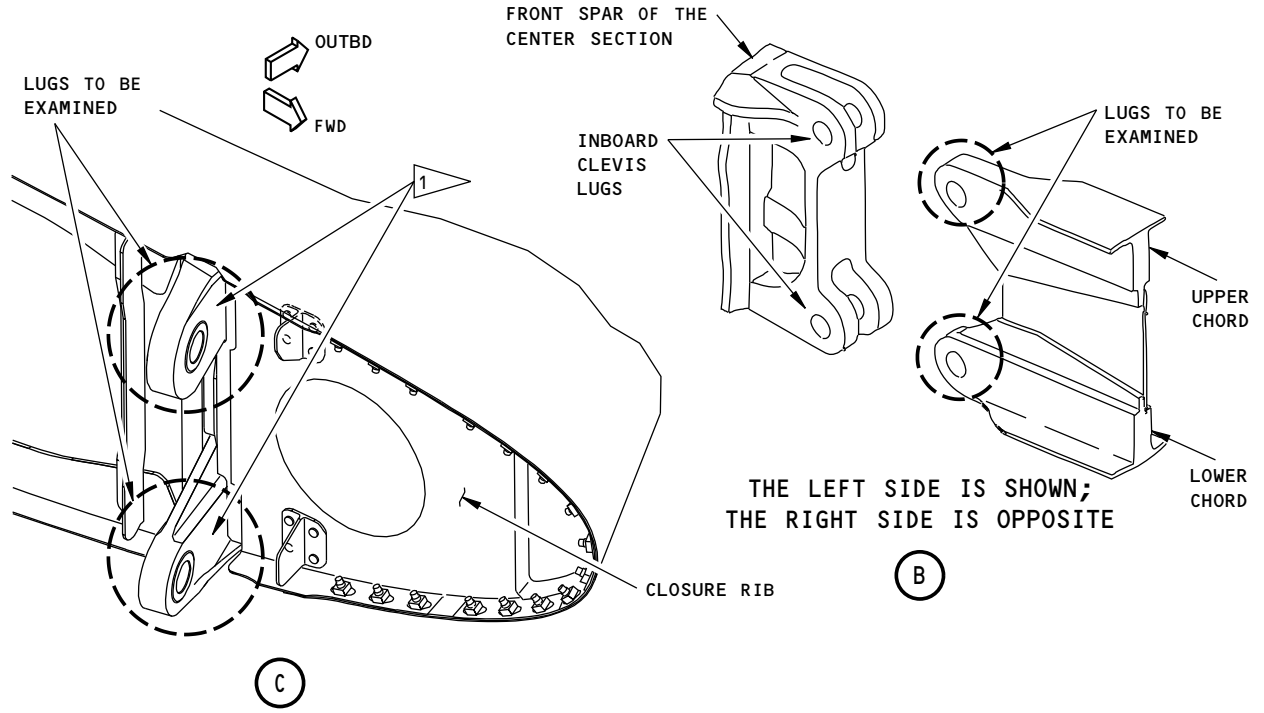
(3) A decrease in FSH of the back surface signal, with or without one or more signals that occur to the left of the back surface signal.

NOTE: This can be caused by internal corrosion or cracks that are not perpendicular to the inspection surface and thus there is no reflection of the ultrasound back to the transducer. If the corrosion or crack is small, it will not fully block the signal from the back wall but will cause it to decrease in FSH.

(4) A back surface signal does not occur on the screen display.

NOTE: It is possible that a defect near the inspection surface is the cause for a missing back surface signal and the defect signal is hidden in the initial pulse area of the screen display. Examine this area from the opposite surface to see if a signal near the back surface signal occurs. Also, make sure the surface condition of the part (front and back) is not the cause for the missing back surface signal. Clean or sand the surface to make it smooth so the transducer can make good contact with the lug.





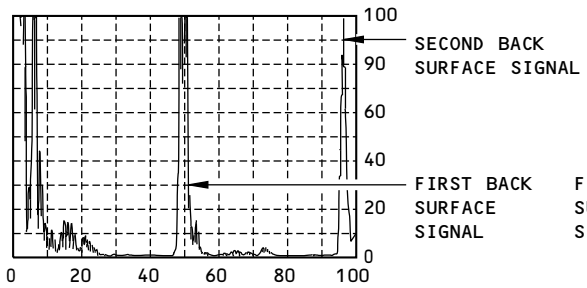
NOTES

- EXAMINE THE UPPER AND LOWER CHORDS OF THE FRONT SPARS FOR CRACKS AT THE LEFT AND RIGHT HORIZONTAL STABILIZERS (FOUR AREAS TOTAL)

1 THE UPPER AND LOWER CHORDS ARE EXAMINED IN THE AREA BETWEEN THE EDGE OF THE INBOARD CLEVIS LUGS AND THE CLOSURE RIB (SEE FIGURE 3 FOR THE INSPECTION AREA).

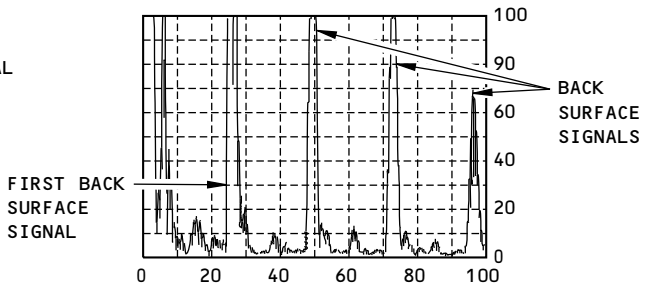
2422421 S0000560440_V1

Inspection Areas
Figure 1



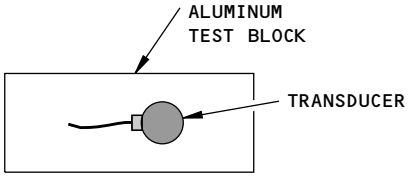
INSTRUMENT CALIBRATION EXAMPLE WHEN A 1.000 INCH (24.40 MM) THICK ALUMINUM TEST BLOCK IS USED

DETAIL I

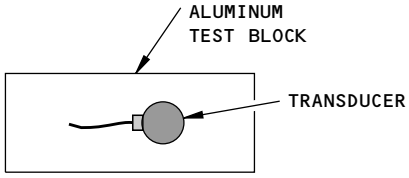


INSTRUMENT CALIBRATION EXAMPLE WHEN A 0.500 INCH (12.70 MM) THICK ALUMINUM TEST BLOCK IS USED

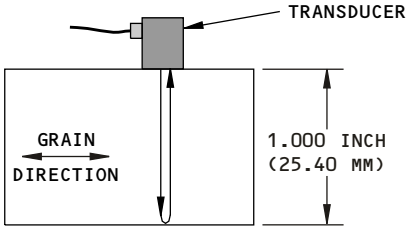
DETAIL II



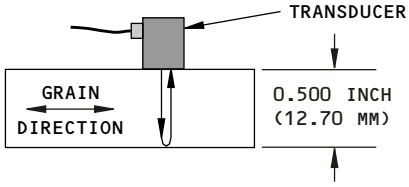
TOP VIEW



TOP VIEW



CALIBRATION WITH A 1.000 INCH (25.40 MM) THICK ALUMINUM TEST BLOCK



CALIBRATION WITH A 0.500 INCH (12.70 MM) THICK ALUMINUM TEST BLOCK

NOTES

- USE A 1.000 INCH (25.40 MM) OR A 0.500 INCH (12.70 MM) THICK BLOCK OF 7075-T6511 ALUMINUM (OR EQUIVALENT) TO HELP CALIBRATE THE INSTRUMENT TO A 2 INCH (50.8 MM) SCREEN DISPLAY.
- IF A 1.000 INCH (25.40 MM) THICK BLOCK OF ALUMINUM IS USED DURING CALIBRATION, SET THE SIGNALS AS FOLLOWS: FIRST BACK SURFACE SIGNAL - SET AT 50% OF FSW; SECOND BACK SURFACE SIGNAL - SET AT 100% OF FSW AND APPROXIMATELY 100% OF FSH.
- IF A 0.500 INCH (12.70 MM) THICK BLOCK OF ALUMINUM IS USED DURING CALIBRATION, SET THE SIGNALS AS FOLLOWS: FIRST BACK SURFACE SIGNAL - SET AT 25% OF FSW; SECOND BACK SURFACE SIGNAL - SET AT 50% OF FSW; THIRD BACK SURFACE SIGNAL - SET AT 75% OF FSW; FOURTH BACK SURFACE SIGNAL - SET AT 100% OF FSW AND BETWEEN 50 AND 80% OF FSH.

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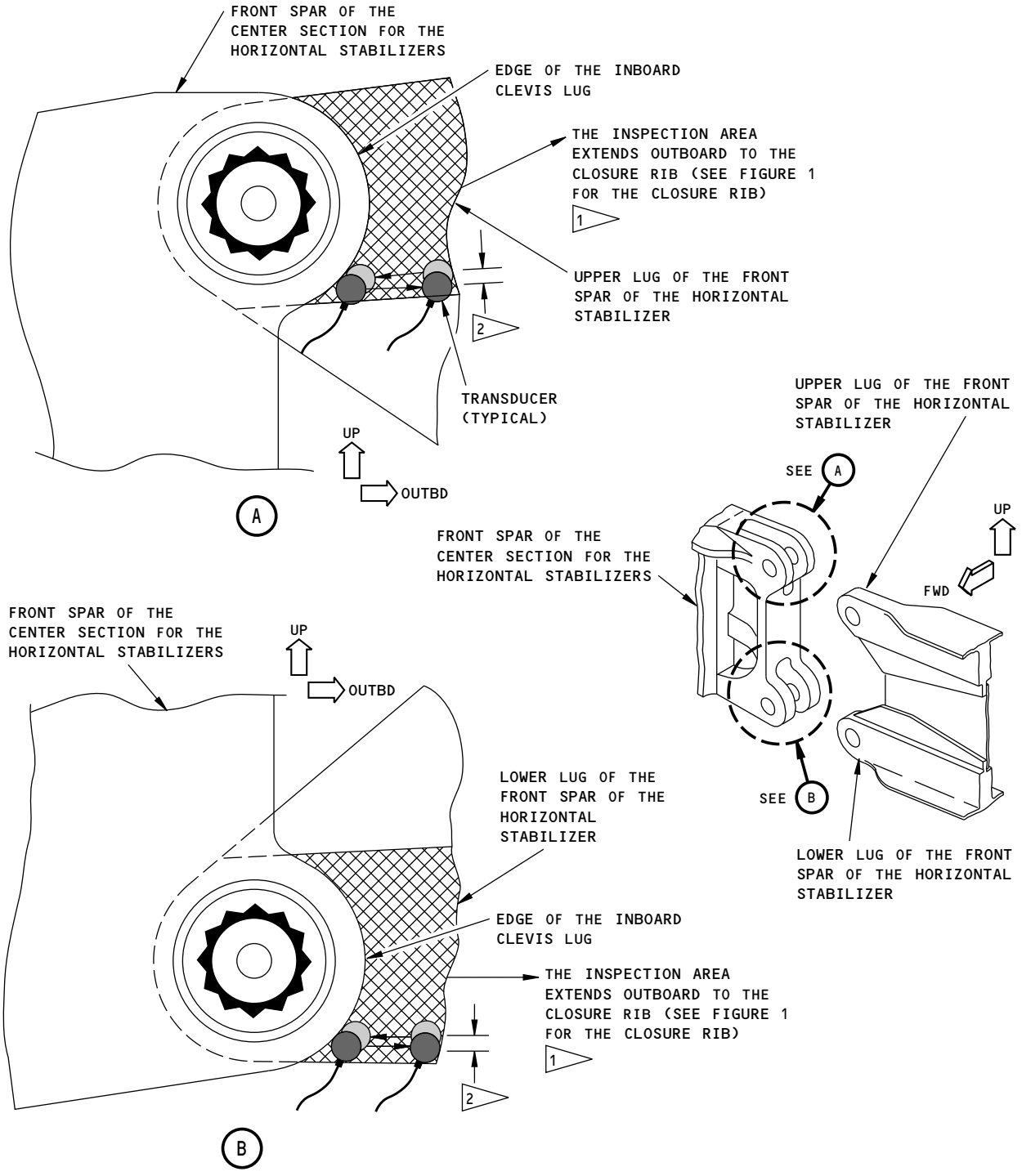
Instrument Calibration
Figure 2



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Inspection Instructions
Figure 3 (Sheet 1 of 2)

NOTES

INSPECTION AREA (THE CHORD AREA BETWEEN THE EDGE OF THE INBOARD CLEVIS LUG AND THE CLOSURE RIB)

- DO THIS INSPECTION ON THE LEFT AND RIGHT HORIZONTAL STABILIZERS. THE LEFT HORIZONTAL STABILIZER IS SHOWN.
- THERE ARE FOUR INSPECTION AREAS TO BE EXAMINED ON EACH AIRPLANE; TWO ON THE LEFT HORIZONTAL STABILIZER AND TWO ON THE RIGHT HORIZONTAL STABILIZER.

1 EXAMINE 100% OF THE INSPECTION AREA FOR THE UPPER AND LOWER CHORDS AT EACH HORIZONTAL STABILIZER.

2 MOVE THE TRANSDUCER APPROXIMATELY ONE-HALF THE WIDTH OF THE TRANSDUCER TO DO EACH SUBSEQUENT SCAN.

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Inspection Instructions
Figure 3 (Sheet 2 of 2)