LOWER SURFACE OF STRINGERS 16 AND 17 AT RIB 9

1. Purpose

A. To examine stringers 16 and 17 on the lower surface of the wing for cracks that extend 0.215 inch (5.46 mm) from the edge of the fastener hole. See Figure 1 for the inspection locations.

B. The inspection can be done from the dry cell side, inboard of rib 9. Some removal of sealant will be necessary to make space for the transducer to move.

C. MPD Appendix B DTR Check Form Reference:

(1) ITEM 57-20-I12A and B

2. Equipment

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

A. 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 defect in the reference standard as specified in the calibration instructions of this procedure.

(2) The instruments specified below were used to help prepare this procedure:

(a) Sonic 136; Staveley, Inc.

(b) USN 50; Krautkramer-Branson

(c) USL 38; Krautkramer-Branson

B. Ultrasonic Transducer

(1) The transducer must cause a shear wave of 70 degrees to occur in aluminum and operate at 5 MHz. The maximum length of the transducer is 0.75 inch (19 mm). The maximum width of the transducer is 0.33 inch (8.4 mm).

(2) The shear wave transducer specified below was used to help prepare this procedure.

(a) Staveley Sensors 5 MHz, 70 degree in aluminum transducer; part number 57A3066TC.

C. Reference Standard

(1) Make reference standard NDT614 as specified in Figure 2.

D. Couplant

(1) Use oil, grease or an equivalent couplant that will not damage the airplane structure.

3. Prepare for the Inspection

A. Remove the access panels (533AB and 633AB) on the lower surface of the wing to get access to stringers 16 and 17 on the outboard side of rib 9.

B. Identify the inspection locations. See Figure 1.

C. Clean the inspection surface. Remove sealant as necessary to allow movement of the transducer.

4. Instrument Calibration

NOTE: Refer to the instrument instruction manual for the instrument operation instructions.

A. Set the instrument frequency between 4 and 6 MHz, if applicable.

B. Apply couplant to reference standard NDT614 at the transducer position. See Figure 3.

C. Put the initial pulse signal at 0% of full screen width.

D. Put the transducer on the reference standard so that it points directly at the fastener hole. Make sure the front edge of the transducer does not go across the reference (scribe) line. See Figure 3.

E. Adjust the range and delay controls so that the signal from the fastener hole is at 80% of full screen width. Make sure that the initial pulse remains at 0% of full screen width.

F. Slowly turn the transducer until the signal from the reference standard notch shows at approximately 85% of full screen width.

G. Adjust the instrument gain so that the signal from the reference notch is between 30% and 70% of full screen height.

H. Adjust the position of the transducer to get the highest signal from the reference standard notch to occur on the screen display.

I. Adjust the instrument gain so that the notch signal is at 80% of full screen height.

J. Increase the gain by 6 dB.

K. Move and turn the probe along the reference line so the signals from the fastener hole and notch show on the screen. Identify the differences between these signals.

5. Inspection Procedure

A. Calibrate the equipment as specified in Paragraph 4.

B. Apply sufficient couplant on the inboard side of rib 9 at the stringer where the transducer will touch. This area is shown in Figure 1.

C. Put the transducer on the stringer at one of the locations shown in Figure 1. Make sure that the sound beam is pointed to the area outboard of rib 9. See Figure 1.

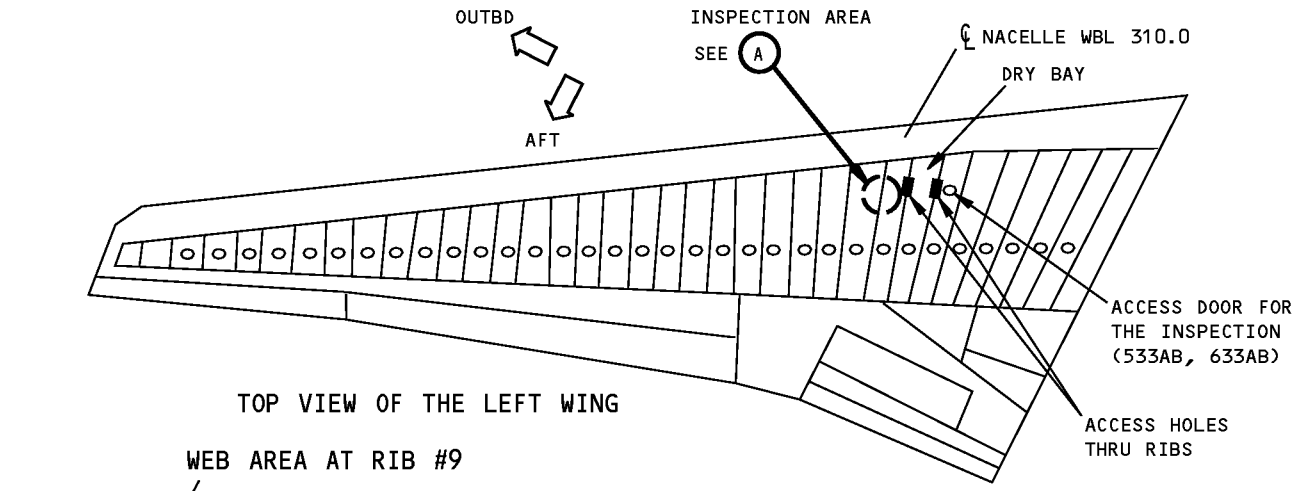
D. Make a scan on each side of the fastener on stringers 16 and 17 (four areas for each wing).

NOTE: The location of the signal on the screen display that occurs from the hole on the airplane can be different by a small quantity than the location you got for the signal of the reference standard hole. This could be because of a different hole diameter, and/or the edge of the hole to stringer differences.

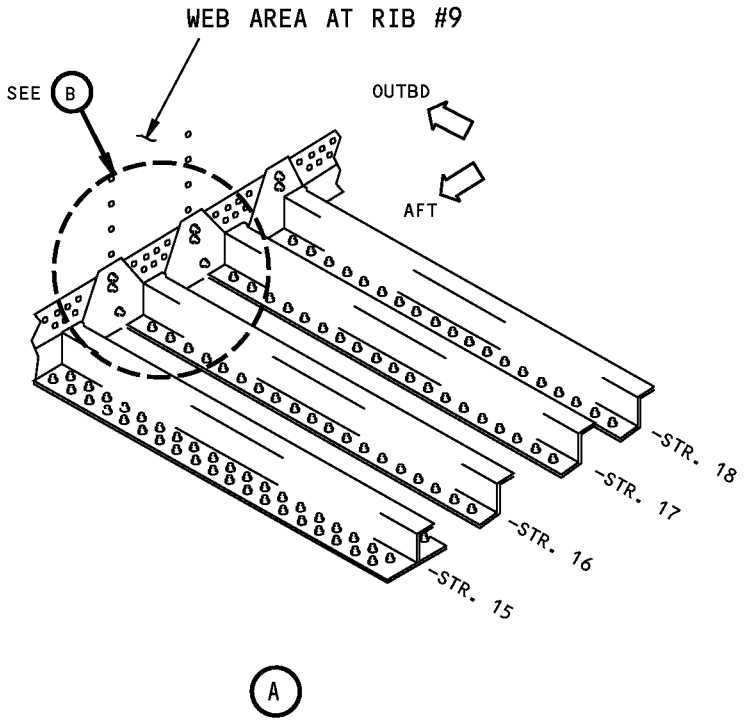
6. Inspection Results

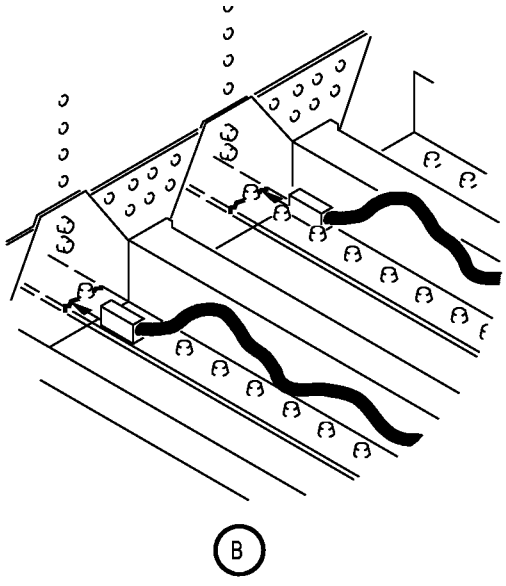
A. Signals that come into view that are 40% of full screen height or higher and are between 70% and 100% of full screen width are crack indications. Make sure the signal is not caused directly from the fastener hole.

B. To make sure of a crack indication, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-04, Part 6, 51-00-11 or Part 6, 51-00-16. It will be necessary to go into the fuel cell to do these procedures.



TOP VIEW OF THE LEFT WING

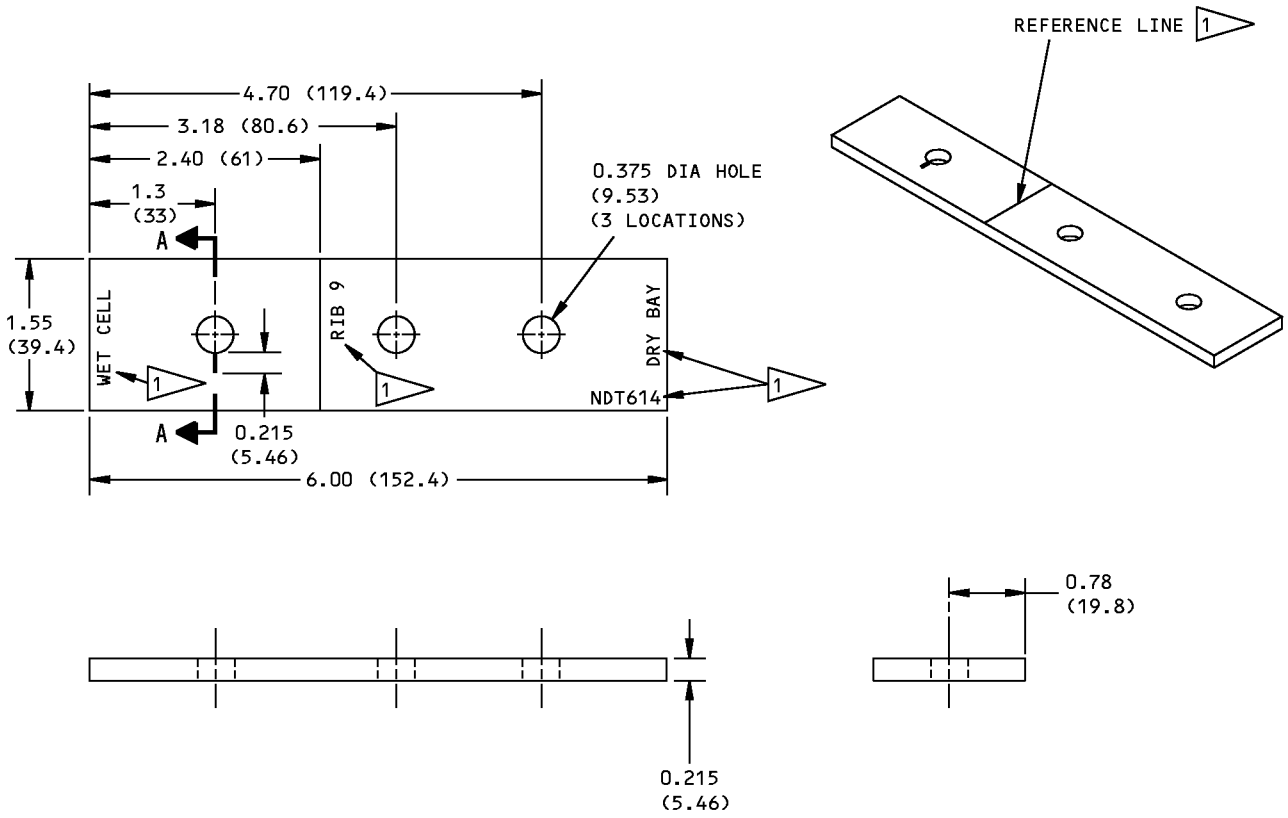




NOTES

- EXAMINE THE STRINGER ON EACH SIDE OF THE FASTENER AT STRINGERS 16 AND 17.
- SOME SEALANT REMOVAL WILL BE NECESSARY TO ALLOW TRANSDUCER MOVEMENT.

Examination Area for Stringers 16 and 17 at Rib 9
Figure 1



NOTES

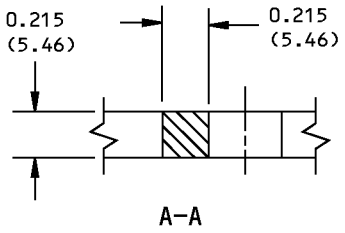
- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

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

ANGULAR: ±1.0

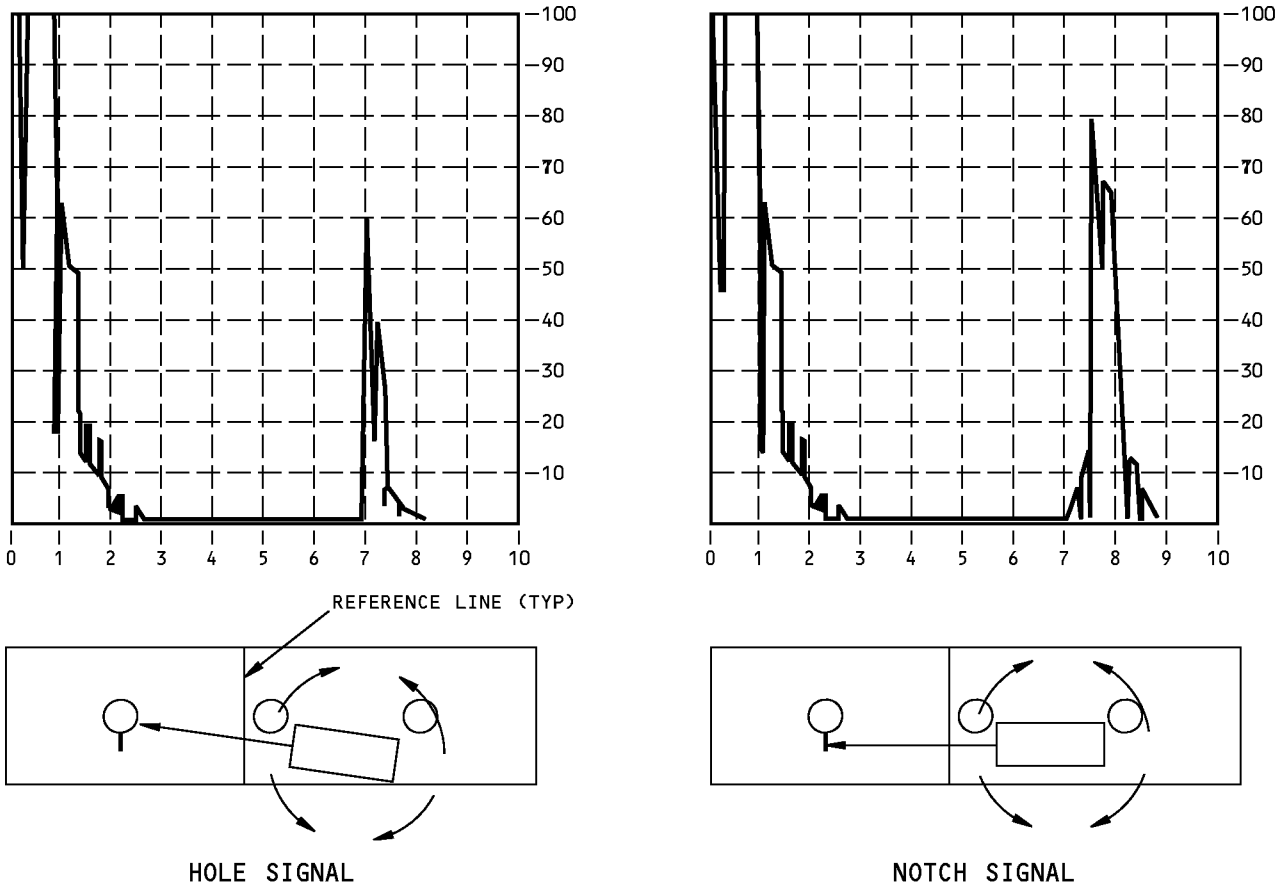
- MATERIAL: ALUMINUM, 2024-T3, 2024-T4 OR 7075-T6
- SURFACE ROUGHNESS: 125 Ra OR BETTER
- EDM NOTCH LOCATION TOLERANCE: THE NOTCH IS TO BE WITHIN ±0.005 (0.10) OF THE CENTER OF THE HOLE.
- EDM NOTCH DIMENSIONS AND TOLERANCES:
  WIDTH: 0.030 (0.80) MAXIMUM
  LENGTH: ±10% OF THE FULL LENGTH
  DEPTH: FULL PART THICKNESS

1 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT614, REFERENCE LINE AND OTHER DATA AS SHOWN.



EDM NOTCH DETAIL

Reference Standard NDT614
Figure 2



NOTES

- MAKE SURE THAT THE TRANSDUCER IS BEHIND THE REFERENCE LINE.
- TURN THE TRANSDUCER AS NECESSARY TO GET THE MAXIMUM SIGNAL.

Instrument Calibration
Figure 3

WING - LOWER CHORD OF THE REAR SPAR - HORIZONTAL FLANGE BETWEEN THE SIDE-OF-BODY AND RIB 10

1. Purpose

A. Use this procedure to do an inspection for cracks in the lower chord of the rear spar in the left and right wings. Cracks can start at the fastener holes in the horizontal flange of the lower chord and, if they occur, will grow in a forward and aft direction.

B. The areas of the lower chord to be examined are those where the fasteners go through the rib shear ties, trunnion fittings, nacelle fittings, and the inboard flap. The fastener hole locations are shown in Figure 1 and Figure 2.

C. Figure 2 identifies the fastener areas to be examined for each MPD Appendix B DTR Check Form Item.

D. MPD Appendix B DTR Check Form Reference:

(1) ITEM 57-20-I16B, C, E

2. Equipment

A. General

(1) All ultrasonic equipment that can be calibrated as specified in Paragraph 4. can be used to do this inspection.

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

B. Instruments

(1) Use an ultrasonic instrument that:

(a) Operates in the pulse-echo mode.

(b) Operates in a frequency range of 4 to 6 MHz.

NOTE: Broad band instruments can be used if they can satisfactorily do the calibration specified in this procedure.

(2) The instruments specified below were used to help prepare this procedure:

(a) USN 50; Krautkramer Branson

(b) Sonic 1200; Staveley Instruments, Inc.

C. Transducer

(1) Use a shear wave transducer that has these properties:

(a) Operates at a frequency of approximately 5 MHz.

(b) Sends sound at a refracted angle of 70 (± 2) degrees in aluminum.

(c) Has a maximum length of 0.75 inch (19 mm).

(d) Has a maximum width of 0.38 inch (9.5 mm).

(e) Has a top-mounted microdot connector.

(2) The transducer specified below was used to help prepare this procedure:

(a) 57A3065, Type SMZ; Staveley Sensors

(b) 389-020-490, KBA; Krautkramer Branson

(c) AP-HP-3/16-5.00-70; Xactex Corp.

D. Reference Standard

(1) Make reference standard NDT644 as shown in Figure 3.

E. Couplant

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

3. Preparation for Inspection

WARNING: PERSONNEL WHO ENTER A FUEL TANK MUST KNOW THE PRECAUTIONS AND SAFETY PROCEDURES CONTAINED IN CHAPTER 28 OF THE BOEING AIRCRAFT MAINTENANCE MANUAL. DANGEROUS FUMES AND THE POSSIBILITY OF AN EXPLOSION EXIST IN THE FUEL TANKS.

A. Get access to the lower chord of the rear spar through the access holes in the wing fuel tank.

B. Remove sealant from the inboard and outboard edges of the rib attach fittings at ribs 1 thru 6, and 8 thru 10. Also remove sealant from the two fasteners adjacent to the inboard and outboard ends of each rib attach fitting.

4. Instrument Calibration

A. Set the instrument frequency in the 4 to 6 MHz range.

B. Put couplant on the reference standard at transducer position 1 thru 6 as shown in Figure 4, Detail I.

NOTE: There are two scribe lines on the top surface of the reference standard. The distance between the scribe line at transducer position 5 and the fastener hole shows the maximum distance that can occur between the transducer and the far holes during the inspection. The scribe line at transducer position 3 shows the minimum distance that can occur between the transducer and the near holes during the inspection. At all times during the calibration of the instrument, keep the transducer behind the scribe lines.

C. Put the transducer at transducer position 1 (TP1 in Figure 4, Detail I) and get a signal from the far edge of the reference standard. Be sure to keep the transducer behind the scribe line, but near it, as shown in Figure 4, Detail I.

NOTE: Two signals will occur from the far edge of the reference standard as shown in Figure 4, Detail II. These signals are from the top and bottom corners of the reference standard.

D. Adjust the instrument delay and range controls so that the initial pulse signal is at 0 percent of full screen width (FSW) and the signal from the far edge is at 80 percent of FSW as shown in Figure 4, Detail II.

E. Move the transducer to transducer position 2 (TP2) as shown in Figure 4, Detail I and get a maximum signal from the 0.25 inch (6.4 mm) notch. This signal will be at approximately 38 percent of FSW as shown in Figure 4, Detail III.

F. Adjust the gain control to get this signal to 80 percent of full screen height (FSH). See Figure 4, Detail III.

G. Increase the gain by 18 dB.

NOTE: The additional gain is necessary because of the use of fay-surface-sealant between the skin and the lower chord.

H. Move the transducer to transducer position 3 (TP3) and get a signal from the near hole as shown in Figure 4, Details I and IV. Slowly turn the transducer in the direction of the EDM notch. See that the signal from the EDM notch is to the right of the hole signal and increases in FSH as the signal from the hole decreases in FSH.

I. To see how the crack and fastener hole signals will look from different transducer positions, examine the hole and reference notch signals from transducer positions 4, 5, and 6 as shown in Figure 4, Detail I.

5. Inspection Procedure

NOTE: For this inspection, fasteners will be identified as "near" and "far" fasteners. The near fasteners are those fasteners in the inspection area that are directly adjacent to the transducer. The near fastener locations are at Ribs 1 thru 6 and 8 thru 10 as shown in Figure 2. The far fasteners are those fasteners in the inspection area that are two fasteners away from the transducer. The far fastener locations are at Ribs 4 and 8 as shown in Figure 2.

A. Identify the inspection areas shown in Figure 2.

B. Make sure the instrument is calibrated as specified in Paragraph 4.

C. Put couplant on the upper surface of the horizontal flange of the lower chord in the rear spar at the inspection areas identified in Figure 2.

D. Put the transducer on the lower chord of the rear spar as near as possible to the fastener hole location to be examined. See Figure 2, flagnotes 2 and 3 for the typical transducer positions to use.

E. Move the transducer to get a maximum signal from the fastener hole. The signal from the near fastener holes will be at approximately 38 percent of FSW and the signals from the far fastener holes will be at approximately 60 percent of FSW.

NOTE: The FSW location of the hole signal will be different at many of the locations because the lower chord thickness changes along the length of the chord. Also, the hole signal FSW location will change when the transducer to fastener distance changes.

NOTE: It can be necessary to work around some fasteners to examine the fasteners in the inspection area. Try to stay as near as possible to the fitting and try to keep the sound beam as perpendicular to the expected crack location as possible.

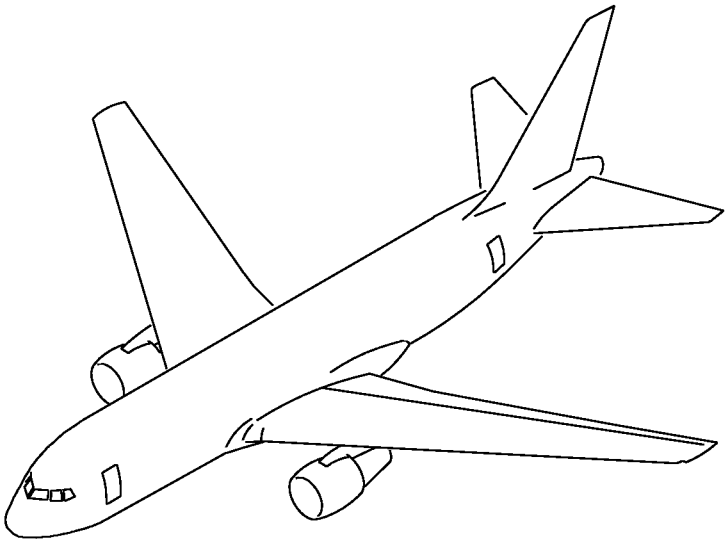
F. Slowly turn the transducer to point the sound beam to each side of the fastener hole and carefully monitor the signal from the hole. If there is a crack, the crack signal will occur directly behind the hole signal as seen during the instrument calibration.

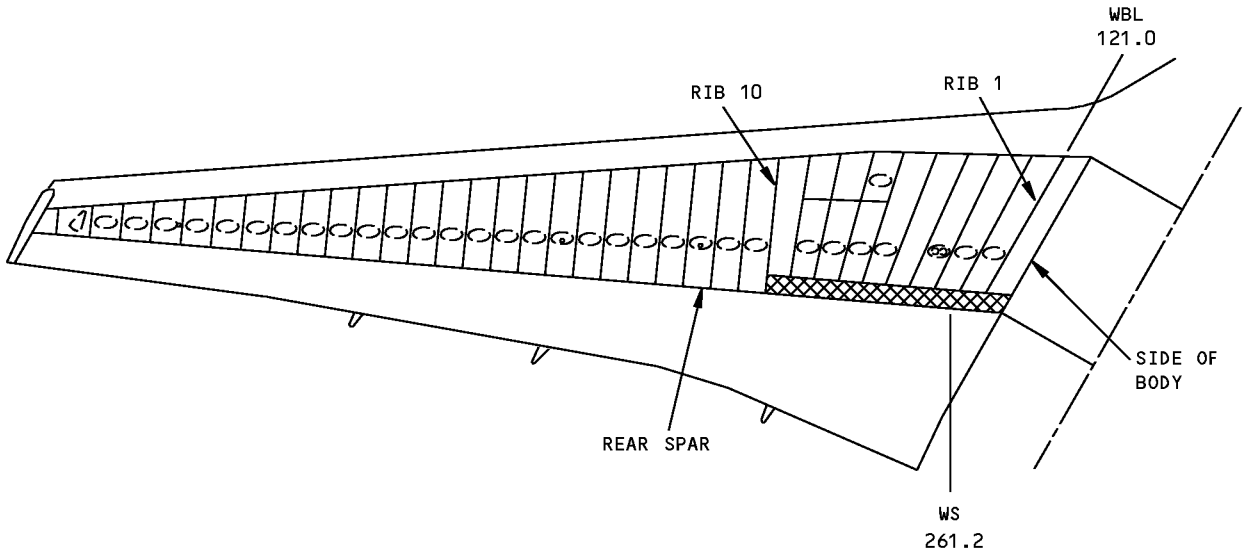
G. Do Paragraph 5.C. thru Paragraph 5.F. at all fastener locations identified in Figure 2 on the left and right wings.

6. Inspection Results

A. A signal that is 40 percent or more of FSH is an indication of a crack. Compare the crack signal to the signal you get from the notch in the reference standard to be sure it is a crack signal.

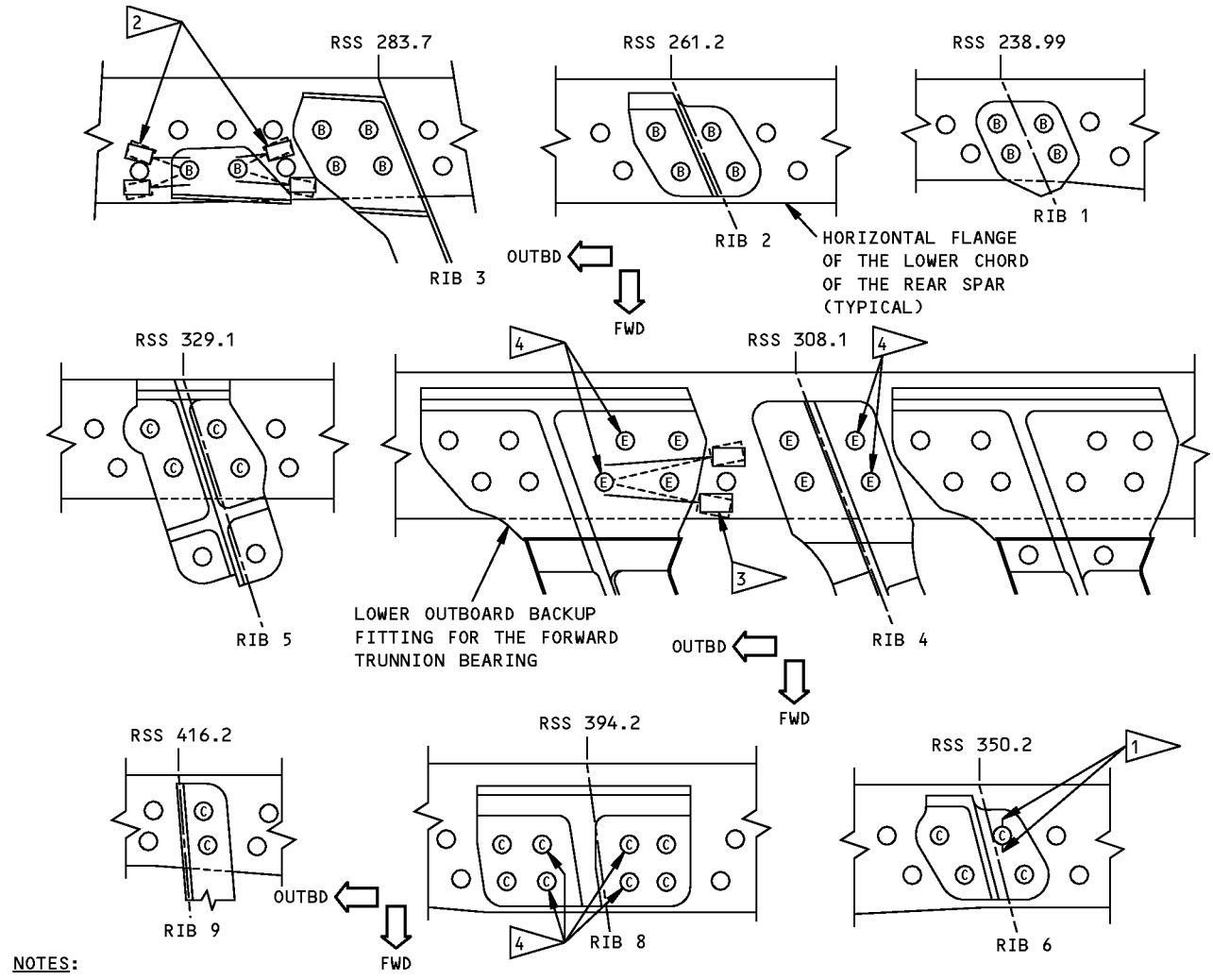
B. If a crack is found, ask Boeing for more instructions.





= AREA OF INSPECTION

Inspection Locations
Figure 1



NOTES:

(B)(C)(E) FASTENER HOLES TO EXAMINE FOR CRACKS -- RIGHT AND LEFT WING

(B) THESE FASTENER LOCATIONS ARE IDENTIFIED IN DTR CHECK FORM ITEM 57-20-I16B

(C) THESE FASTENER LOCATIONS ARE IDENTIFIED IN DTR CHECK FORM ITEM 57-20-I16C

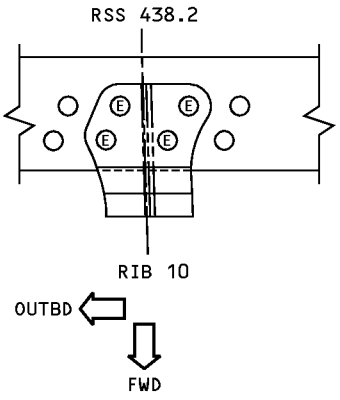
(E) THESE FASTENER LOCATIONS ARE IDENTIFIED IN DTR CHECK FORM ITEM 57-20-I16E

1 POSSIBLE CRACK LOCATION -- FORWARD AND AFT DIRECTION (±10° FROM CENTERLINE)

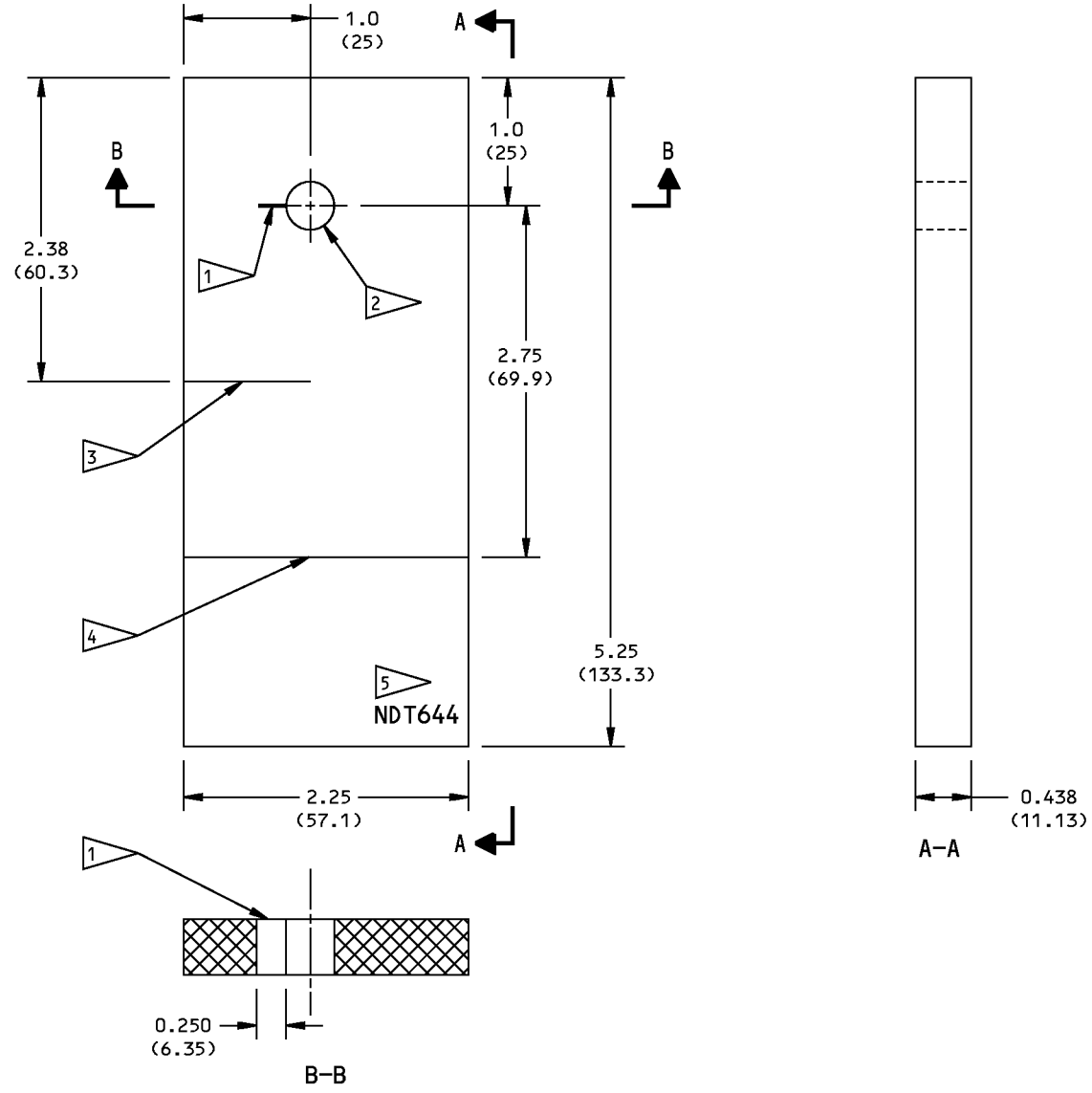
2 EXAMPLE TRANSDUCER LOCATIONS FOR ALL NEAR FASTENER HOLE LOCATIONS

3 EXAMPLE TRANSDUCER LOCATIONS FOR ALL FAR FASTENER HOLE LOCATIONS

4 FAR FASTENER INSPECTION AREAS -- SEE PARAGRAPH 5 NOTE (ALL OTHER FASTENER AREAS ARE NEAR FASTENER INSPECTION AREAS)



Inspection Details
Figure 2



NOTES

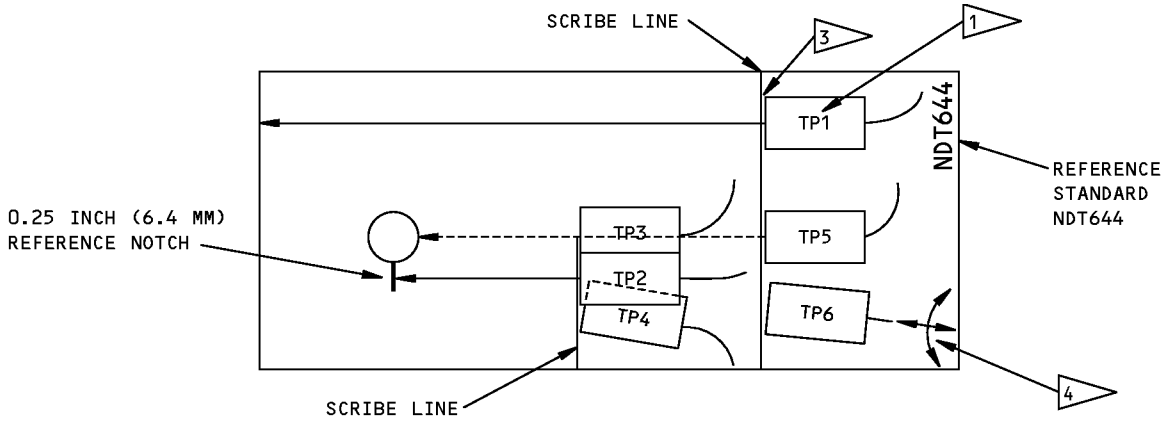
- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCE (UNLESS SPECIFIED DIFFERENTLY):

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

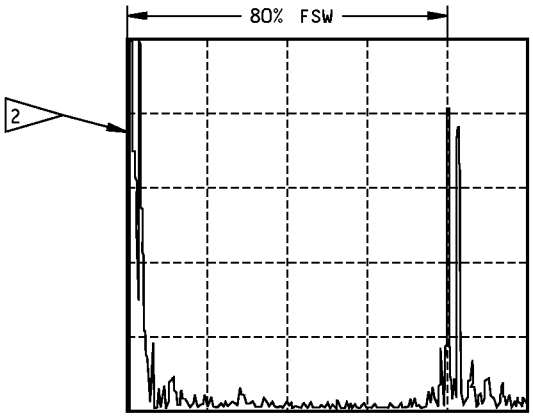
- MATERIAL: 2224-T3511; 2024-T3, -T4; 7075-T6XXX, -T735XX, -T74
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1. EDM NOTCH OR SAWCUT (THROUGH THICKNESS): 0.25 (6.4) LONG, 0.020 (0.51) MAXIMUM WIDTH.
2. 0.375 (9.53) DIAMETER HOLE
3. ETCH OR SCRIBE A REFERENCE LINE THAT IS 1.00 (25.4) LONG AT THE LOCATION SHOWN
4. ETCH OR SCRIBE A REFERENCE LINE AT THE LOCATION SHOWN
5. ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER AT APPROXIMATELY THIS LOCATION

Reference Standard NDT644
Figure 3

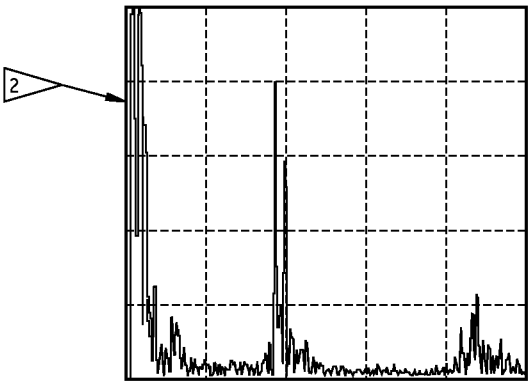


DETAIL I



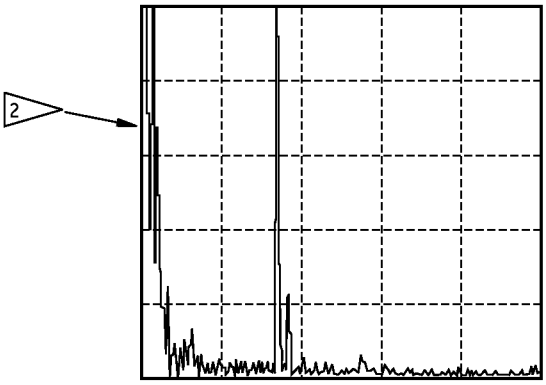
TP1: SET THE SIGNAL FROM THE FAR EDGE OF THE REFERENCE STANDARD TO 80% OF FULL SCREEN WIDTH (FSW).

DETAIL II



TP2: GET A MAXIMUM SIGNAL FROM THE 0.25 INCH (6.4 MM) NOTCH AND SET IT TO 80% OF FULL SCREEN HEIGHT (FSH); THEN ADD 18 dB MORE GAIN.

DETAIL III



THE SIGNAL FROM THE HOLE AT TP3

DETAIL IV

1 TP = TRANSDUCER POSITION (TYPICAL)

2 INITIAL PULSE SIGNAL

3 KEEP THE TRANSDUCER BEHIND AND NEAR THE SCRIBE LINE AT ALL TRANSDUCER POSITIONS

4 TRANSDUCER SCAN PATTERN

M46774 S00041154564_V3

Calibration Details
Figure 4

WING - LOWER CHORD OF THE FRONT SPAR - HORIZONTAL FLANGE AT RIBS 8 THRU 23

1. Purpose

A. Use procedure to do an inspection for cracks in the lower chord of the front spar on the left and right wings. Cracks can start at the fastener holes in the horizontal flange of the lower chord and, if they occur, will grow in a forward and aft direction.

B. The areas of the lower chord to be examined are where the fasteners occur for the rib shear ties at rib 8 thru 23 and where fasteners occur for the back-up fittings of the side brace support. See Figure 1 for the inspection locations and Figure 4 for the specific fastener holes to examine.

C. Figure 4 identifies which fastener holes are to be examined for each MPD Appendix B DTR Check Form Item.

D. MPD Appendix B DTR Check Form Reference:

(1) ITEM 57-20-I16G, H

2. Equipment

A. General

(1) All ultrasonic equipment that can be calibrated as specified in Paragraph 4. can be used to do this inspection.

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

B. Instrument

(1) Use an ultrasonic instrument that:

(a) Operates in the pulse-echo mode.

(b) Operates in a frequency range of 4 MHz to 6 MHz.

NOTE: Broad band instruments can be used if they can satisfactorily do the calibration specified in this procedure.

(2) The instrument specified below were used to help prepare this procedure.

(a) USD 10; Krautkramer Branson

(b) Sonic 1200; Staveley Instruments, Inc.

(c) Sonic 136; Staveley Instruments, Inc.

C. Transducer

(1) Use a shear wave transducer that has these properties:

(a) Operates at a frequency of approximately 5 MHz.

(b) Sends a signal at a refracted angle of 60 degrees (± 2 degrees) in aluminum.

(c) Has a maximum length of 0.60 inch (15.2 mm).

(d) Has a maximum width of 0.30 inch (7.6 mm).

(2) The transducer specified below was used to help prepare this procedure:

(a) 560AT, 5 MHz, 60° Aluminum; Search Unit Systems

D. Reference Standard

(1) Make reference standard NDT662 as shown in Figure 2.

E. Couplant

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

3. Preparation for Inspection

WARNING: PERSONNEL WHO ENTER A FUEL TANK MUST KNOW THE PRECAUTIONS AND SAFETY PROCEDURES CONTAINED IN CHAPTER 28 OF THE BOEING AIRCRAFT MAINTENANCE MANUAL. DANGEROUS FUMES AND THE POSSIBILITY OF AN EXPLOSION EXIST IN THE FUEL TANKS.

A. Get access to the lower chord of the front spar through the access holes in the wing fuel tank.

B. Remove sealant from the inboard and outboard edges of the rib shear tie fittings at ribs 8 thru 23, and from the back-up fitting of the side brace support. Also remove sealant from the two fasteners adjacent to the inboard and outboard ends at each of these locations.

4. Instrument Calibration

A. Set the instrument frequency in the 4 to 6 MHz range.

B. Put couplant on the reference standard at transducer positions 1 thru 5 (TP1 - TP5) as shown in Figure 3, Detail I.

C. Put the transducer at transducer position 1 (TP1 in Figure 3, Detail I) and get a maximum signal from the reference notch. Make sure the front of the transducer is at the edge of the reference line on the reference standard.

D. Adjust the instrument delay and range controls so that the left edge of the initial pulse signal is at 0 percent of full screen width (FSW) and the left edge of the signal from the reference notch is at approximately 70 percent of FSW as shown in Figure 3, Detail II.

E. Adjust the gain to get the maximum signal from the reference notch to 80 percent of full screen height (FSH). See Figure 3, Detail II.

F. Increase the gain by 12 dB.

NOTE: The additional gain is necessary because of the use of fay-surface-sealant between the skin and the lower chord. It also helps to decrease the signal loss that can occur when the transducer can not be positioned at approximately 90 degrees to the expected crack growth.

G. Move the transducer to transducer position 2 (TP2) and get a signal from the hole as shown in Figure 3, Details I and III.

H. Slowly turn the transducer in the direction of the reference notch. See that the signal from the reference notch is to the right of the hole signal and increases in height as the signal from the hole decreases in height.

I. To see how the crack and fastener hole signals will look from different transducer positions, examine the hole and reference notch from different transducer positions as shown in Figure 3, Detail I. See that the reference notch signal decreases when the transducer is moved from transducer position 3 (TP3) to transducer position 4 (TP4).

J. Put the transducer at transducer position 5 (TP5) and slowly move the transducer along the reference line to see the hole signal and then the reference notch signal come into view. Monitor how the hole signal increases and then decreases before the reference notch signal comes into view. Also compare the location of the reference notch signal to the location of the hole signal.

5. Inspection Procedure

A. Identify the inspection areas shown in Figure 1 and Figure 4.

B. Make sure the instrument is calibrated as specified in Paragraph 4.

C. Put couplant on the upper surface of the horizontal flange of the lower chord in the front spar at one of the inspection areas identified in Figure 4.

D. Put the transducer on the lower chord of the front spar and as near as possible to the fastener hole location to be examined. See Figure 4, Detail I for the typical transducer positions to use.

E. Move the transducer to get a maximum signal from the fastener hole. Stay near the fitting and try to keep the sound beam as perpendicular to the expected crack location as possible.

NOTE: The location for a signal from a hole will change when the transducer to fastener distance changes. To identify the correct location where a signal from a hole will occur, measure the transducer to fastener distance and compare it to the same distance on the reference standard.

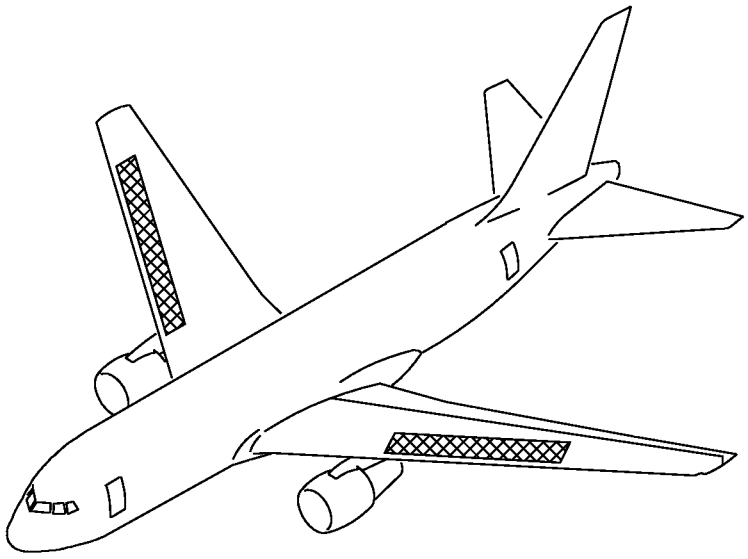
F. Turn the transducer as necessary to point the sound beam to each side of the fastener hole and carefully monitor the signal from the hole. If there is a crack, the crack signal will occur directly behind the hole signal as seen during the calibration of the instrument.

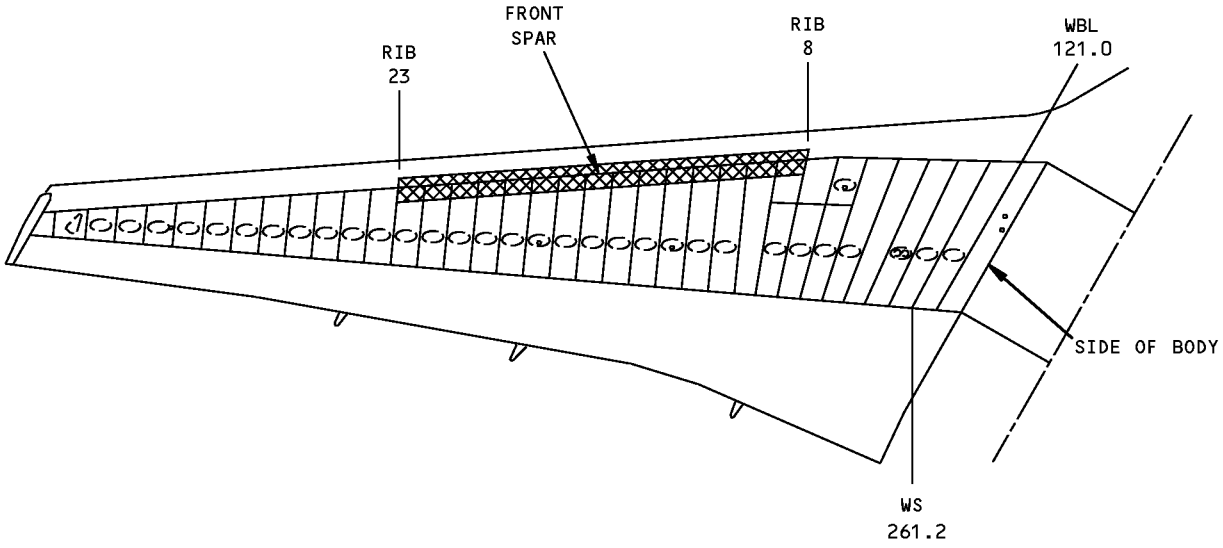
G. Do Paragraph 5.C. thru Paragraph 5.F. at all fastener locations identified in Figure 4 on the left and right wings.

6. Inspection Results

A. A signal that is 40 percent or more of FSH is an indication of a crack. Compare the crack signal to the signal you get from the notch in the reference standard to be sure it is a crack signal.

B. To make sure of a crack indication, remove the fastener and do an open hole eddy current inspection as specified in Part 6, 51-00-04, Part 6, 51-00-11, or Part 6, 51-00-16.





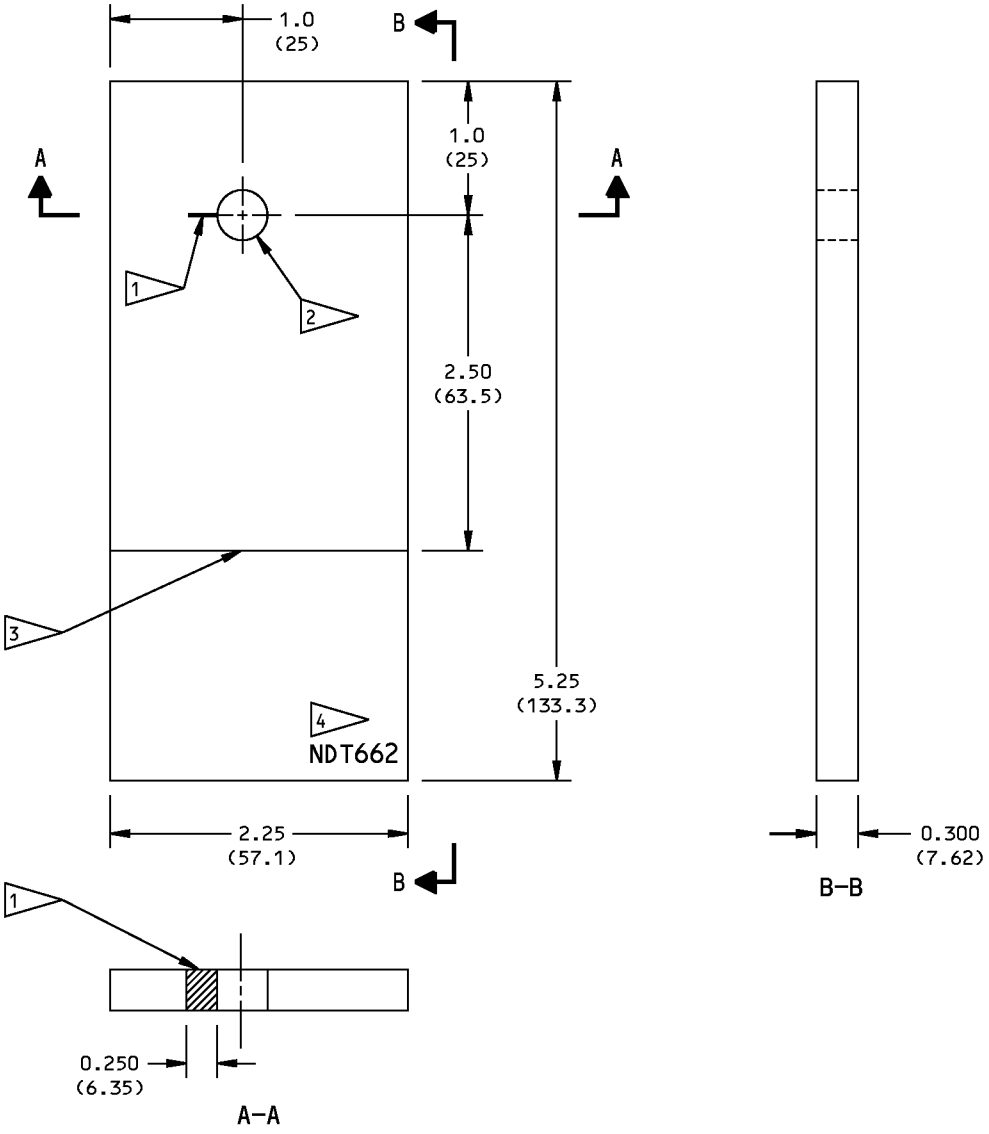
NOTE

AREA OF INSPECTION

FWD

INBD

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 DEGREE
X.XX = ± 0.025	X.X = ± 0.5	
X.X = ± 0.050	X = ± 1	

- MATERIAL: 2224-T3511; 2024-T3, -T4; 7075-T6XXX, -T735XX, -T74
- SURFACE ROUGHNESS: 63 Ra OR BETTER

1. EDM NOTCH OR SAWCUT (THROUGH THICKNESS): 0.25 (6.4) LONG, 0.020 (0.51) MAXIMUM WIDTH.
2. 0.3125 (7.94) DIAMETER HOLE
3. ETCH OR SCRIBE A REFERENCE LINE AT THIS LOCATION (0.005 MAXIMUM DEPTH)
4. ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT662 AT APPROXIMATELY THIS LOCATION

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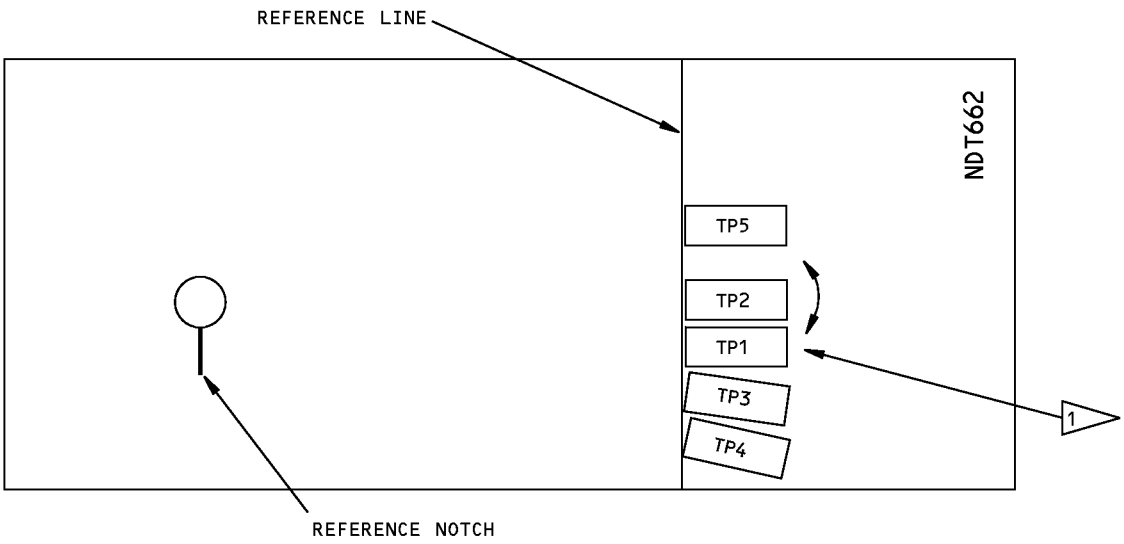
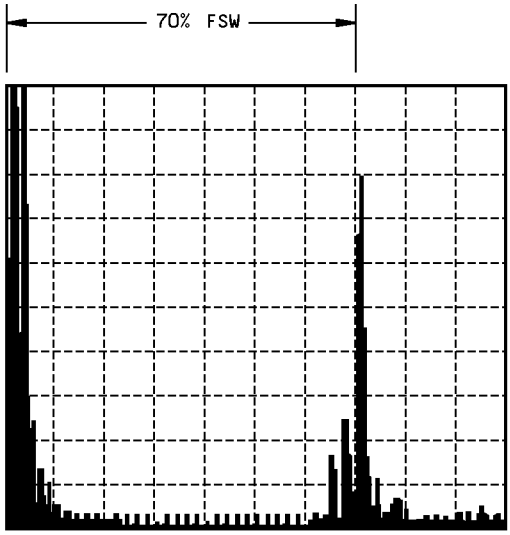
Reference Standard NDT662
Figure 2

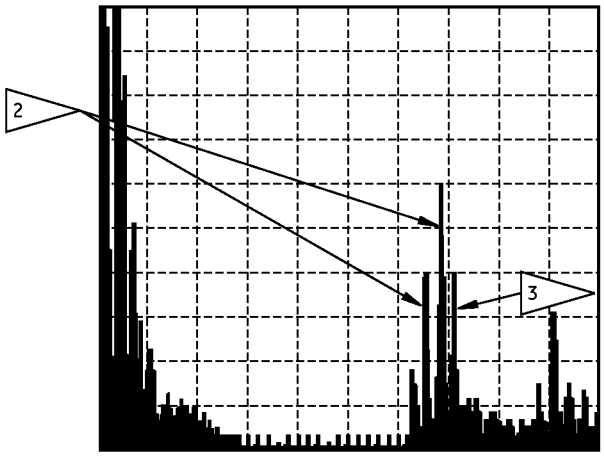


DETAIL I



GET A MAXIMUM SIGNAL FROM THE REFERENCE NOTCH AND SET TO 70% OF FULL SCREEN WIDTH AND 80% OF FULL SCREEN HEIGHT. ADD 12 dB GAIN.

DETAIL II

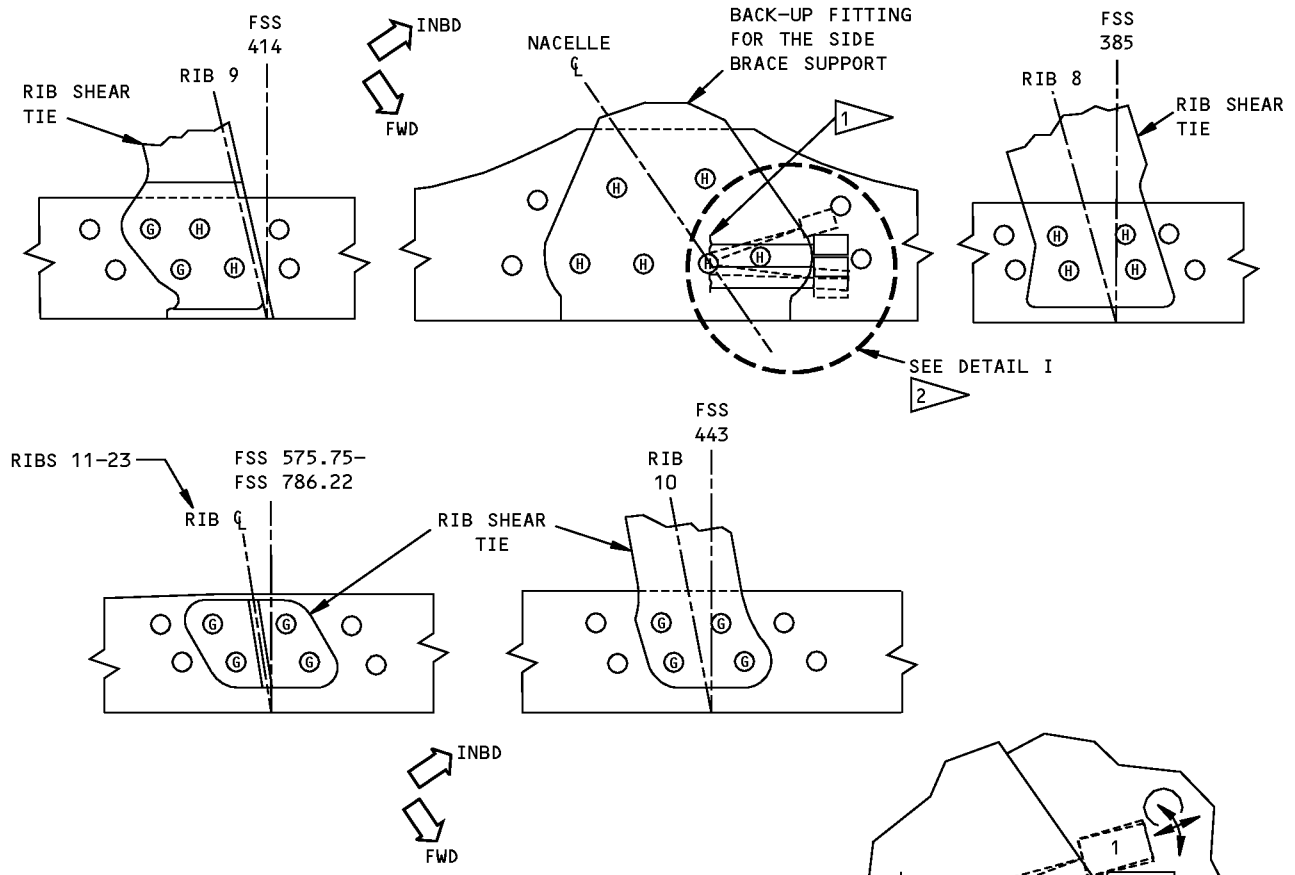


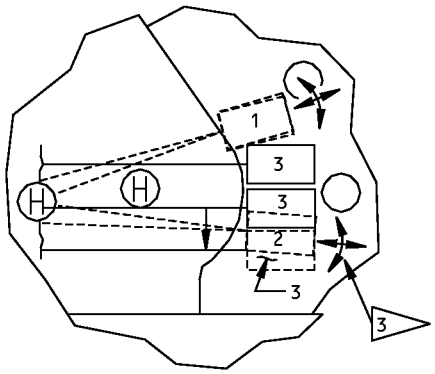
THE SIGNAL FROM THE HOLE AT TP2. SEE THAT THE HOLE SIGNAL COMES INTO VIEW TO THE LEFT OF THE NOTCH SIGNAL.

DETAIL III

1 TP = TRANSDUCER POSITION (TYPICAL)
2 SIGNALS FROM THE TOP AND BOTTOM EDGE OF THE HOLE
3 SIGNAL FROM THE REFERENCE NOTCH

Calibration Details
Figure 3





DETAIL I 2

NOTES

(G) (H) FASTENER HOLES TO EXAMINE FOR CRACKS -- RIGHT AND LEFT WING

(G) THESE FASTENER LOCATIONS ARE IDENTIFIED IN DTR CHECK FORM ITEM 57-20-I16G

(H) THESE FASTENER LOCATIONS ARE IDENTIFIED IN DTR CHECK FORM ITEM 57-20-I16H

1 POSSIBLE LOCATIONS FOR CRACKS TO OCCUR - TYPICAL AT ALL "G" AND "H" FASTENER LOCATIONS.

2 EXAMINE EACH FASTENER HOLE FROM THE TRANSDUCER POSITIONS SHOWN HERE (NEAR AND FAR FASTENERS). KEEP THE TRANDUCER 90° TO THE EXPECTED CRACK DIRECTION AS MUCH AS POSSIBLE.

3 USE THIS SCAN PATTERN AT TRANSDUCER POSITIONS 1 AND 2. TURN THE TRANSDUCER LEFT AND RIGHT APPROXIMATELY ±10% WHILE YOU MOVE THE TRANSDUCER AWAY FROM AND BACK TOWARD THE FASTENER HOLE APPROXIMATELY 0.5 INCH (12.7 MM).

Inspection Details
Figure 4

UPPER WING SKIN AT THE ATTACHMENT FOR THE FRONT SPAR PITCH-LOAD FITTINGS

1. Purpose

A. Use this procedure to examine the lower surface of the upper wing skin for cracks at the fastener attach holes for the front spar pitch-load-fittings. There are 24 fastener holes on each wing that are to be examined. See Figure 1 for the inspection locations.

B. This procedure supports Service Bulletin 767-57A0117.

C. If a strut modification was done on the airplane to be examined, then it is possible that a freeze plug was installed at one or more of the fastener locations to be examined by this procedure. To do this inspection, you must know the location of each freeze plug in the inspection area. Do a check of the airplane records to get this data.

2. Equipment

A. General

(1) All pulse-echo ultrasonic equipment that can be calibrated to the calibration instructions specified in Paragraph 4. can be used for this inspection.

(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.

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 Inc.

(b) Sonic 1200; Staveley Instruments, Inc.

C. Transducers

(1) At all locations but those where a freeze plug has been installed, use this 5 MHz special transducer:

(a) TEK-5086; Techna NDT

(2) At locations where a freeze plug is installed, use a 5 MHz transducer with a side or top mount connector that can put a 45 degree shear wave in aluminum. The dimensions of the transducer cannot be more than as follows:

(a) Maximum length of 0.375 inch (9.53 mm)

(b) Maximum width of 0.275 inch (7.00 mm)

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

(a) XA-455S; Techna NDT

D. Transducer Positioner (and included positioner guides)

(1) The transducer positioners that follow are necessary for this inspection.

(a) For airplane line numbers 1-663: NDT6036P1 (with included guide NDT6036G1); Techna NDT

(b) For airplane line numbers 664 and higher: NDT6036P2 (with included guide NDT6036G2); Techna NDT

E. Reference Standard

(1) Use reference standard NDT6036. See Figure 2 for data about the reference standard.

F. Calibration Guides

(1) See Figure 2 for data about the calibration guides. These can be ordered with the reference standard.

G. Couplant

(1) Use a light ultrasonic couplant that will not cause corrosion or other damage to the airplane.

3. Preparation for Inspection

A. Refer to Service Bulletin 767-57A0117 for instructions to get access to the inspection areas.

B. Identify the airplane's line number. Two different diameter fasteners were used for different airplane configurations, and it is necessary to know what diameter fasteners are installed to correctly do the instrument calibration.

C. Do a check of the airplane records to see if there are freeze plugs installed at the fasteners to be examined. Mark the diameter of the freeze plugs at all fastener locations that have a freeze plug installed.

D. Remove paint as necessary to clearly see each fastener where an inspection is necessary.

E. Fully clean the inspection surface with an approved cleaner.

4. Instrument Calibration

NOTE: This procedure uses a transducer positioner that moves around a positioner guide that is temporarily attached to the fastener. If one of the holes to be examined has a freeze plug installed, the transducer positioner cannot be used and thus it is necessary to do a manual hand scan of the hole. At locations with freeze plugs installed, calibrate the instrument as specified in Paragraph 4.B. and do the inspection as specified in Paragraph 5.B.

A. Instrument calibration with the transducer positioner.

(1) For airplane line numbers 1 thru 663, use transducer positioner NDT6036P1, calibration guide NDT6036CG1, and reference notch ''A''. For airplane line numbers 664 and higher, use transducer positioner NDT6036P2, calibration guide NDT6036CG2, and reference notch ''B''.

(2) Set the instrument frequency to 5 MHz or the nearest set frequency range.

(3) Put the calibration guide into the hole of reference standard NDT6036 that contains the necessary reference notch. Refer to Figure 3.

(4) Put couplant and then the transducer positioner on the reference standard with the calibration guide set in the hole of the transducer positioner as shown in Figure 3.

(5) Put the transducer identified in Paragraph 2.C.(1) fully into the notch in the transducer positioner and very lightly tighten the setscrew. Do not tighten the setscrew too much or damage to the transducer can occur.

(6) Turn the transducer positioner clockwise and counterclockwise as necessary to get a maximum signal from the reference notch and keep it at this location.

(7) Set the initial pulse signal at 0 percent of full screen width (FSW) and the maximum signal from the reference notch at 80 percent of FSW and 80 percent of full screen height (FSH). See Figure 3, Detail I.

(8) Turn the transducer positioner again to make sure the signal from the reference notch is at 80 percent of FSH. Adjust the gain again if necessary.

(9) Add 12 dB.

B. Instrument calibration for a manual hand scan at locations with a freeze plug installed.

(1) For airplane line numbers 1 thru 663, use calibration guides NDT6036CG1, and reference notch ''A''. For airplane line numbers 664 and higher, use calibration guides NDT6036CG2, and reference notch ''B''.

(2) Connect a transducer that agrees with the conditions of Paragraph 2.C.(2) and set the instrument frequency to 5 MHz or the nearest set frequency range.

(3) Put the applicable calibration guides into the correct holes in the reference standard as shown in Figure 4.

(4) Put couplant and then the transducer on the reference standard at TP1 for notch ''A'' and TP3 for notch ''B''. See Figure 4.

(5) Move the transducer to and away from the hole and turn the transducer as necessary to get a maximum signal from the lower edge of the hole. Adjust the gain to set this signal at approximately 80 percent of FSH.

(6) Set the initial pulse signal at 0 percent of FSW and the maximum signal from the hole at 80 percent of FSW. See Figure 4, Detail I.

(7) With the signal from the hole at a maximum, slowly turn the transducer in the direction of the reference notch. See that the signal from the reference notch comes into view to the right of the hole signal and increases in height as the signal from the hole decreases in height. See Figure 4, flag notes 3 thru 5.

(8) Adjust the gain to put the maximum signal from the reference notch at 80% of FSH as shown in Figure 4, Detail II.

(9) Add 12 db of gain.

5. Inspection Procedure

A. Inspection with the transducer positioner.

(1) Identify the fastener locations at the front spar pitch-load fittings to examine the wing skin for cracks. Refer to Figure 1.

(2) Make sure the instrument is calibrated as specified in Paragraph 4.A.

(3) Put couplant on the wing skin, around each fastener location to examine.

(4) Visually center the positioner guide on the fastener installed in the hole to be examined.

(5) Put the transducer positioner on the positioner guide and then put a finger on the positioner guide to help keep it centered on the fastener.

(6) Lightly turn the transducer positioner around the fastener and monitor the instrument screen for signals to come into view between 75 and 85 percent of FSW. Be sure to make a full 360 degree scan around the fastener to fully examine the lower surface of the wing skin at this hole location. Refer to Figure 5, Detail I.

(7) Refer to Paragraph 6. to make an analysis of all signals that are 40 percent or more of FSH and between 70 and 90 percent of FSW.

(8) Do Paragraph 5.A.(4) thru Paragraph 5.A.(7) to examine the other inspection fastener locations of the front spar pitch-load-fitting.

(9) Do Paragraph 5.A.(1) thru Paragraph 5.A.(8) at the opposite wing location.

B. Inspection with a manual hand scan at locations with a freeze plug installed.

NOTE: The location where cracks can occur is at the wing skin-to-freeze plug interface.

NOTE: It is possible that only one signal will occur when the transducer is first pointed at the fastener hole, or that two signals will occur. If two signals occur, one will be caused by the wing skin-to-freeze plug interface and one from the fastener hole. The signal from the wing skin-to-freeze plug interface will occur to the left of the hole signal. If only one signal occurs, it will be necessary to add gain until the two signals occur.

(1) Identify the fastener hole with the freeze plug installed. If necessary, do a high frequency surface eddy current (HFEC) inspection to make sure there is a freeze plug installed. HFEC inspection can help find the location of the wing skin-to-freeze plug interface.

(2) Make sure the instrument is calibrated as specified in Paragraph 4.B.

(3) Put a small amount of couplant around the fastener location to examine.

(4) Put the transducer on the wing skin, pointed at the fastener, and move it as necessary to get a maximum signal from the wing skin-to-freeze plug interface. If only one signal occurs, increase the gain to get the other signal to show. The signal from the wing skin-to-freeze plug interface will be to the left of the hole signal as it shows on the instrument screen.

(5) Add gain as necessary to set the maximum signal from the wing skin-to-freeze plug interface at 50 percent or more of FSH. If the additional gain causes too many noise signals, then decrease the gain as necessary to decrease the noise signals but continue to clearly see the signal from the wing skin-to-freeze plug interface.

(6) Move the transducer to or away from the fastener to set the signal from the wing skin-to-freeze plug interface at approximately 80 percent of FSW and then turn the transducer as necessary to point the sound beam to each side of the fastener. As you do this, carefully monitor the signals from the wing skin-to-freeze plug interface and the hole. If there is a crack, a signal will begin to occur to the right of the wing skin-to-freeze plug interface signal and it will increase in FSH as the signals from the wing skin-to-freeze plug interface and hole decrease in FSH. The FSW location of a crack signal will be near the location where the hole signal occurred.

(7) Move the transducer approximately one transducer width to the left or right and continue to examine the wing skin-to-freeze plug interface as specified in Paragraph 5.B.(6).

(8) Do Paragraph 5.B.(7) again and again to do a full 360 degree examination of the wing skin-to-freeze plug interface.

(9) Refer to Paragraph 6. to make an analysis of all signals that are 40 percent or more of FSH and are to the right of the decreased hole signals from the wing skin-to-freeze plug interface.

(10) Do Paragraph 5.B.(1) thru Paragraph 5.B.(9) at all locations where a freeze plug has been installed.

6. Inspection Results

A. A crack signal that is 40 percent or more of FSH and between 75 and 85 percent of FSW (between 80 and 90 percent FSW for locations with freeze plug) is cause for rejection. Do one or more of the steps that follow to make an analysis of these signals.

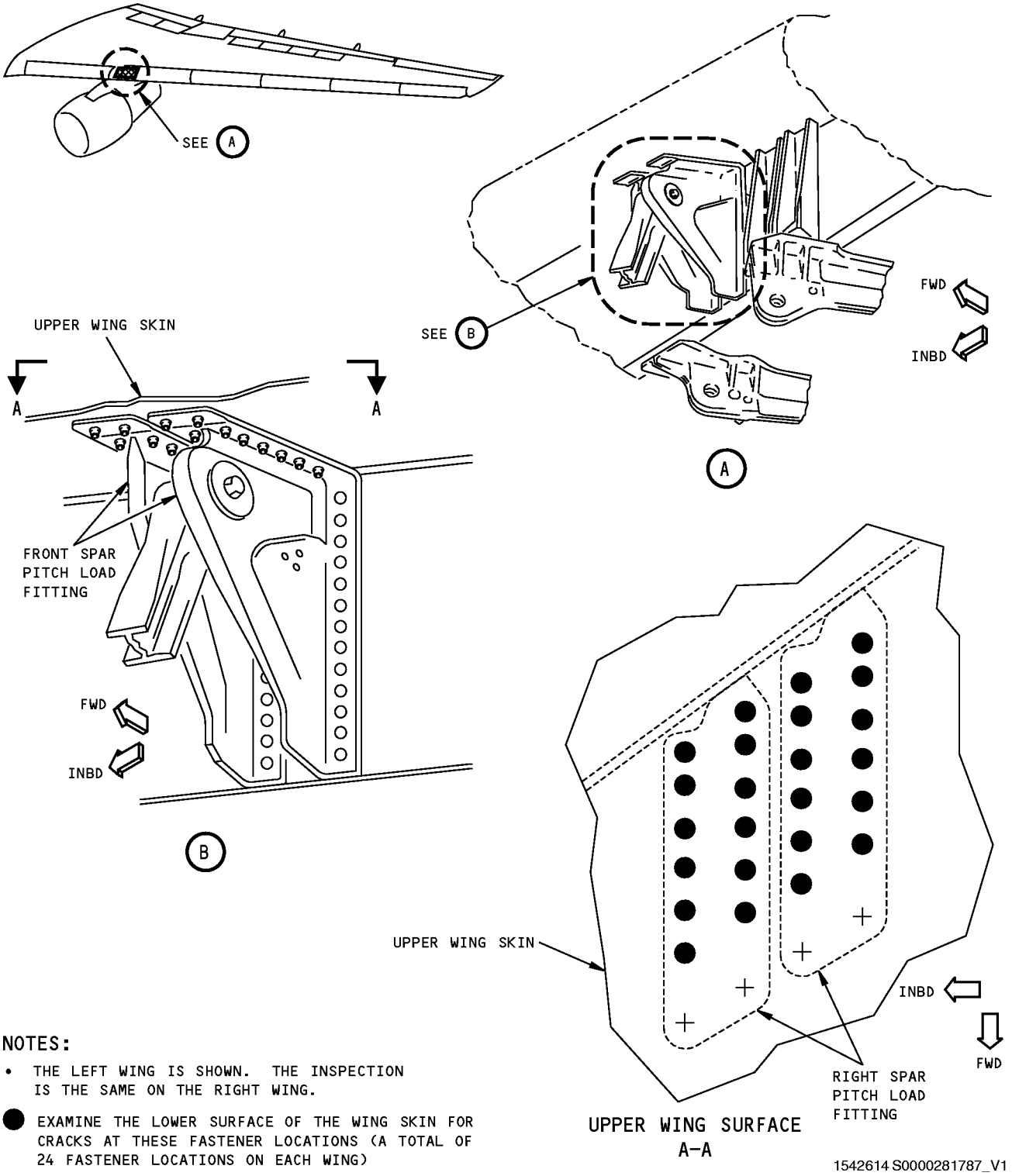
B. Do a check of the instrument calibration. If necessary, set the signal from the reference notch at 80 percent of FSH and evaluate the possible crack signal again. Also compare the crack signal to the signal from the reference notch. At locations where a freeze plug was installed, look to see that the signals from the wing skin-to-freeze plug interface and hole begin to decrease before or as the crack signal begins to occur.

C. Remove all couplant from the inspection surface. Put a small quantity of couplant on the bottom of the transducer and examine the location again. If the signal occurs again, continue to make an analysis.

D. Remove the paint from the surface the transducer will touch. Remove the gain added in Paragraph 4.A.(9) or Paragraph 4.B.(9) and do the inspection again.

E. At locations that do not have a freeze plug installed, remove the fastener and do a surface eddy current inspection of the hole. Refer to Part 6, 51-00-16. At locations that have a freeze plug installed, ask Boeing for instructions.

F. If a crack is found, refer to Service Bulletin 767-57A0117 for repair instructions.

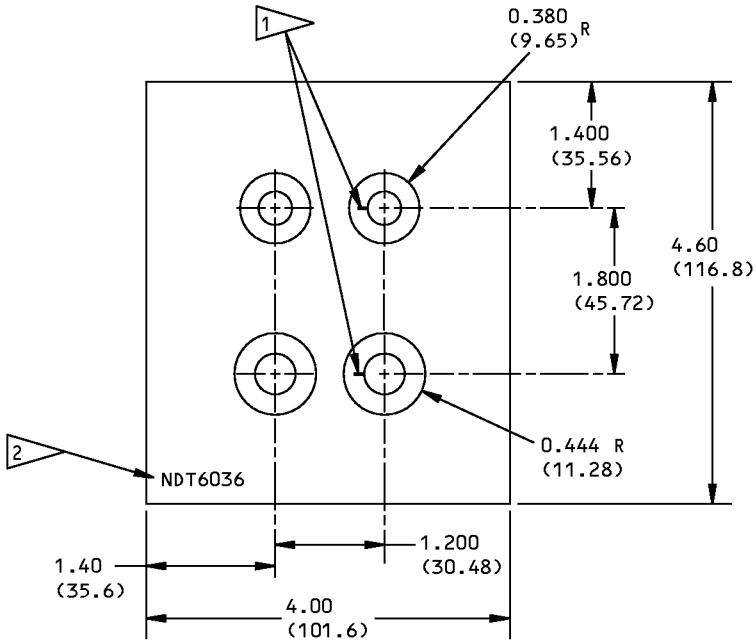


NOTES:

- THE LEFT WING IS SHOWN. THE INSPECTION IS THE SAME ON THE RIGHT WING.

● EXAMINE THE LOWER SURFACE OF THE WING SKIN FOR CRACKS AT THESE FASTENER LOCATIONS (A TOTAL OF 24 FASTENER LOCATIONS ON EACH WING)

Inspection Locations
Figure 1



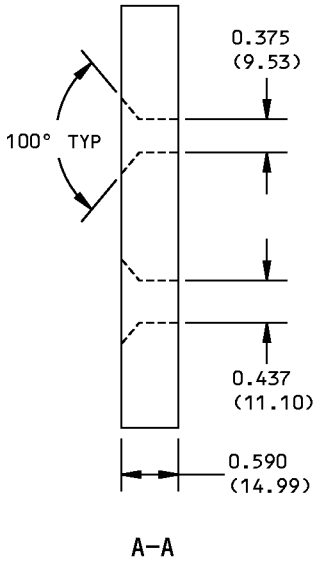
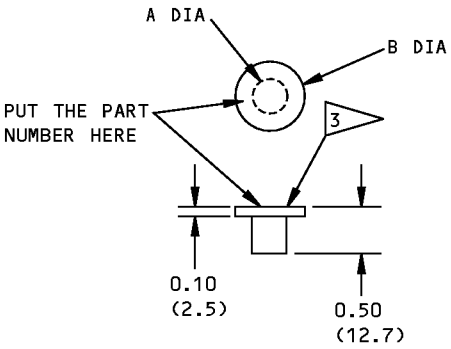


TABLE 1

AIRPLANE LINE NUMBER	CALIBRATION GUIDE	DIMENSION	
		* A DIA	** B DIA
1 THRU 663	NDT6036CG1	0.370 (9.40)	0.760 (19.30)
664 AND HIGHER	NDT6036CG2	0.432 (10.97)	0.880 (22.35)

* TOLERANCE: +0.003 (0.08), −0.002 (0.05)
** TOLERANCE: +0.00, −0.002 (0.05)



CALIBRATION GUIDES
NDT6036CG1 AND NDT6036CG2

NOTES:

- ALL DIMENSIONS ARE IN INCHES
  (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES (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: 7170-T6 ALUMINUM OR EQUIVALENT
  AIRPLANE QUALITY ALUMINUM.

1. EDM CORNER NOTCHES (FAR SIDE):
   0.100 (2.54) X 0.100 (2.54) X 0.010
   (0.25) WIDE (±0.002 (±0.05)).
2. ETCH OR STAMP THE REFERENCE STANDARD NUMBER, NDT6036, AT APPROXIMATELY THIS LOCATION.
3. MAKE TWO COPIES OF EACH GUIDE FROM LUCITE OR EQUIVALENT MATERIAL

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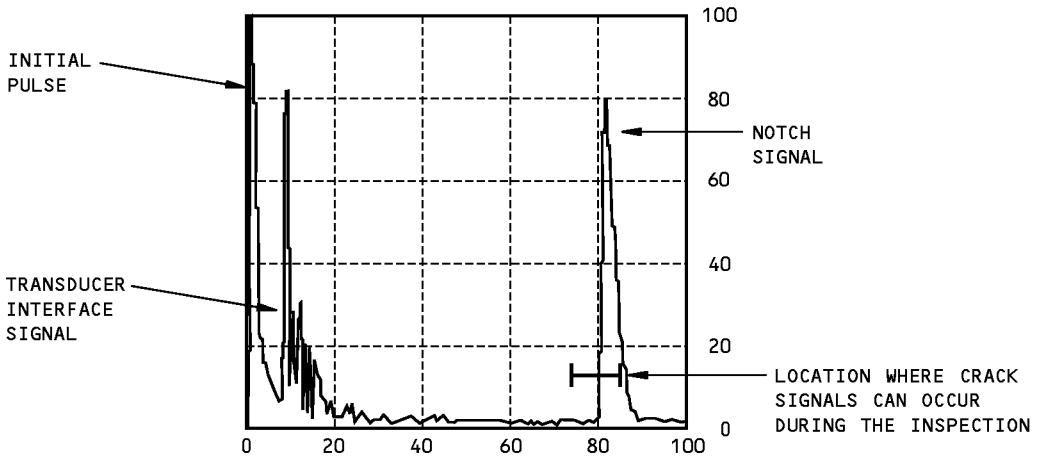
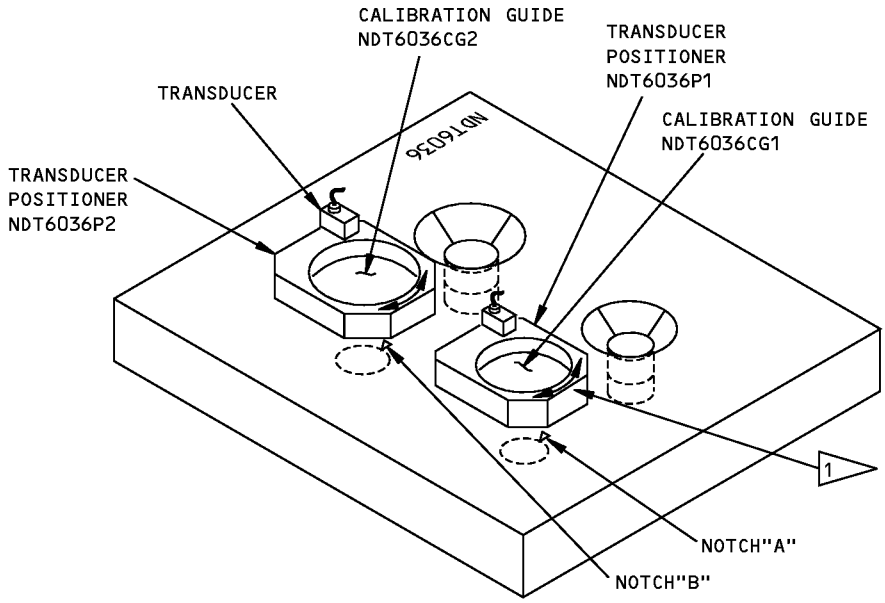
Reference Standard NDT6036 and Calibration Guides NDT6036CG1/CG2
Figure 2



MAXIMUM SIGNAL FROM THE REFERENCE NOTCH
DETAIL I



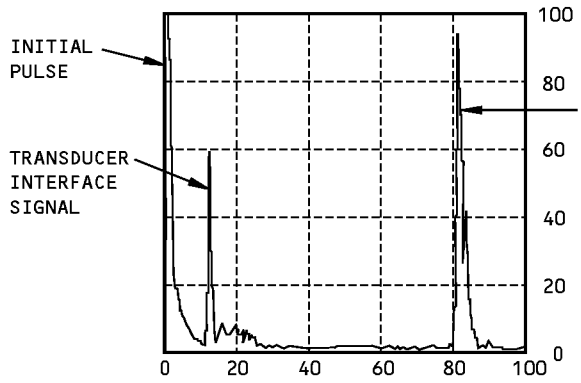
NOTES:

- TO CALIBRATE THE INSTRUMENT FOR AIRPLANE LINE NUMBERS 1 THRU 663, USE TRANSDUCER POSITIONER NDT6036P1, CALIBRATION GUIDE NDT6036CG1, AND REFERENCE NOTCH "A".
- TO CALIBRATE THE INSTRUMENT FOR AIRPLANE LINE NUMBERS 664 AND HIGHER, USE TRANSDUCER POSITIONER NDT6036P2, CALIBRATION GUIDE NDT6036CG2, AND REFERENCE NOTCH "B".

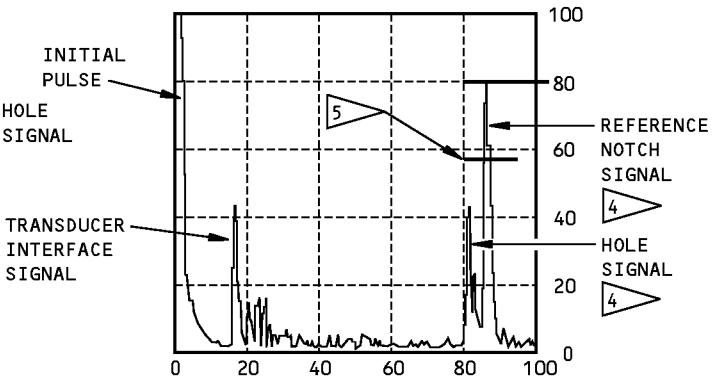
1 TURN THE TRANSDUCER POSITIONER CLOCKWISE AND COUNTER-CLOCKWISE AS NECESSARY TO GET A MAXIMUM SIGNAL FROM THE REFERENCE NOTCH. SET THE INITIAL PULSE AT ZERO PERCENT OF FSW AND THE SIGNAL FROM THE REFERENCE NOTCH AT 80% OF FSW. ADJUST THE GAIN TO SET THE SIGNAL FROM THE REFERENCE NOTCH AT 80% OF FULL SCREEN HEIGHT.

1543015 S0000281790_V1

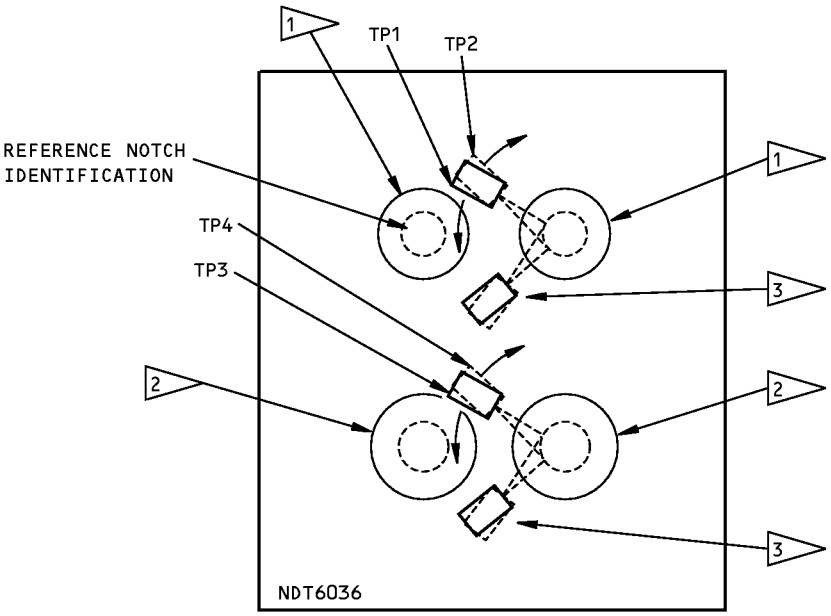
Instrument Calibration with the Transducer Positioner
Figure 3



SIGNAL FROM THE HOLE
AT TP1 OR TP3
DETAIL I



SIGNAL FROM THE REFERENCE NOTCH
SET TO 80 PERCENT OF FSH
DETAIL II



NOTES:

- TO CALIBRATE THE INSTRUMENT FOR AIRPLANE LINE NUMBERS 1 THRU 663, USE CALIBRATION GUIDES NDT6036CG1, TRANSDUCER POSITIONS TP1 AND TP2, AND REFERENCE NOTCH "A".
- TO CALIBRATE THE INSTRUMENT FOR AIRPLANE LINE NUMBERS 664 AND HIGHER, USE CALIBRATION GUIDES NDT6036CG2, TRANSDUCER POSITIONS TP3 AND TP4, AND REFERENCE NOTCH "B".

1 CALIBRATION GUIDE NDT6036CG1

2 CALIBRATION GUIDE NDT6036CG2

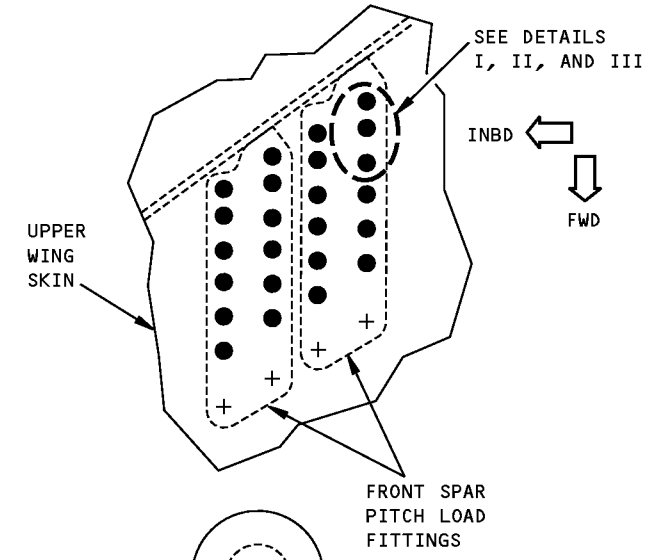
3 THE LOCATION WHERE THE HOLE SIGNAL OCCURS ON THE INSTRUMENT SCREEN WILL CHANGE AS THE TRANSDUCER IS MOVED FARTHER AWAY FROM THE CRACK.

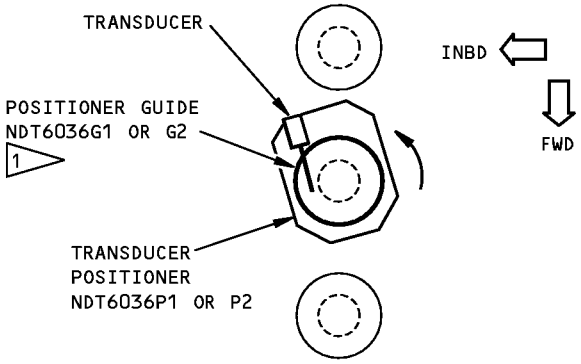
4 SEE THAT THE SIGNAL FROM THE REFERENCE NOTCH COMES INTO VIEW TO THE RIGHT OF THE HOLE SIGNAL AND INCREASES IN FSH AS THE SIGNAL FROM THE HOLE DECREASES IN FSH. SEE NOTE 2 IN PARAGRAPH 5.B.

5 LOCATION WHERE CRACK SIGNALS CAN OCCUR DURING THE INSPECTION OF THE WING SKIN-TO-FREZE PLUG INTERFACE.

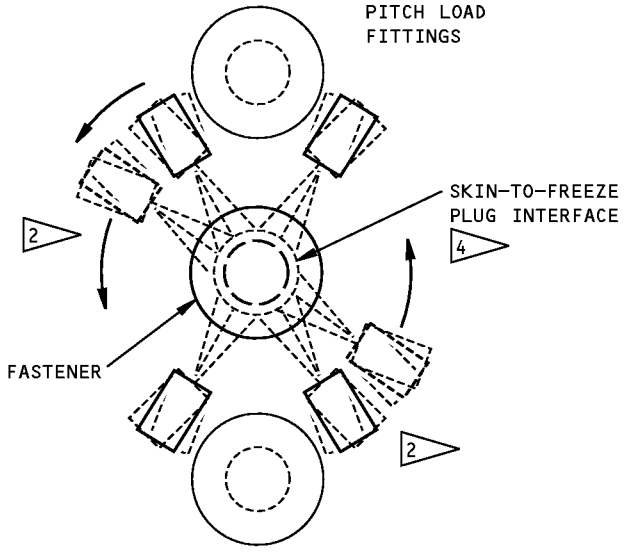
1543221 S0000281792_V1

Instrument Calibration for Freeze Plug Locations
Figure 4

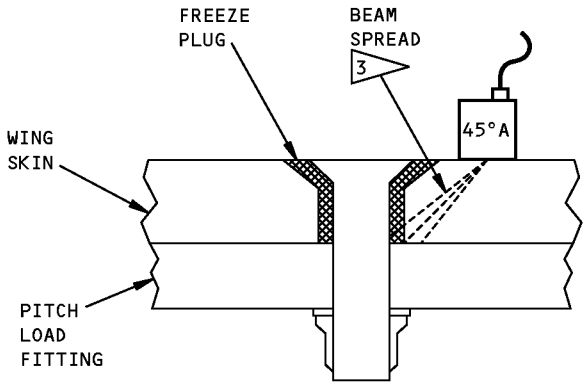




DETAIL I



DETAIL II



DETAIL III

NOTES:

- FASTENERS TO EXAMINE - 360 DEGREES AROUND EACH FASTENER
- YOU MUST CLEARLY SEE EACH FASTENER TO DO THIS INSPECTION. IF NECESSARY, REMOVE SOME OR ALL OF THE PAINT.
- THE DIRECTION OF THE SCAN CAN BE CLOCKWISE OR COUNTER-CLOCKWISE.

1. USE A FINGER TO LIGHTLY HOLD THE POSITIONER GUIDE IN POSITION AS YOU TURN THE TRANSDUCER POSITIONER AROUND THE GUIDE TO MAKE A FULL 360 DEGREE SCAN OF THE FASTENER HOLE.

2. DO A MANUAL HAND-SCAN OF FASTENER HOLES THAT HAVE A FREEZE PLUG INSTALLED. EXAMINE THE WING SKIN FOR CRACKS THAT CAN OCCUR AT THE LOWER, OUTER SURFACE OF THE FREEZE PLUG. DO THIS INSPECTION IN SMALL INCREMENTS AND FULLY AROUND THE FREEZE PLUG AS SHOWN.

3. SOME OF THE ULTRASOUND GOES INTO THE FREEZE PLUG AND CAUSES A SIGNAL TO OCCUR FROM THE FASTENER HOLE. THIS SIGNAL WILL OCCUR TO THE RIGHT OF THE SIGNAL FROM THE WING SKIN-TO-FREEZE PLUG INTERFACE. SEE NOTE 2 IN PARAGRAPH 5.B.

4. THE LOCATION OF THE WING SKIN-TO-FREEZE PLUG INTERFACE CAN BE DIFFERENT THAN WHAT IS SHOWN.

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Inspection Details
Figure 5