SKIN INSPECTION AT THE INTERSECTION OF THE WINGS AND THE CENTER SECTION

1. Purpose

A. Use this procedure to examine the lower skins for cracks at the intersections of the wings and the center section. The lower skin is examined between the outer and inner fastener rows that go from stringer 1 to stringer 10 at BBL 97.42 on the left and right sides of the airplane. The lower skin inspection area is behind the side-of-body splice plates. See Figure 2 for the inspection area.

B. This procedure looks for cracks in the lower skin that occur in a forward to aft direction.

C. MPD Appendix B DTR Check Form Reference:

(1) ITEM 57-10-I16

2. Equipment

A. General

(1) Use inspection equipment that can be calibrated on the reference standard as specified in Paragraph 4.

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

B. Instrument

(1) Use an instrument that will:

(a) Operate at 5 MHz.

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

1) Sonic-136; Staveley

2) USD-15; Krautkramer

C. Transducer - It is necessary to use a 5 MHz transducer that can put a 70 degree shear wave in aluminum. The transducer specified below was used to help prepare the procedure:

(1) Krautkramer - Gamma Series, 5 MHz, transducer part number 234-590, mounted in a Lucite shoe; part number 210-852-305.

D. Reference Standard - Use reference standard NDT621. Figure 1 shows how to make the reference standard.

E. Couplant - Use a couplant that will not damage the airplane structure.

3. Preparation for Inspection

A. Remove the underwing fairings to get access to the lower side-of-body splice plates on the left and right sides of the airplane.

B. Identify the inspection locations shown in Figure 2.

C. Make sure that the areas the transducer will touch are clean and free from loose paint or sealant ridges.

D. Remove sealant from the skin to 0.10 inch (2.5 mm) from the edge of the splice plates. It can be necessary to remove all of the sealant in some locations to make space for the transducer.

NOTE: If 0.10 inch (2.5 mm) of sealant is remaining, it is not necessary to apply more sealant.

NOTE: If ultrasound does not transmit easily into the skin, it can be necessary to smooth or remove the finish from the area that the transducer touches.

4. Calibration

A. Do the instrument startup procedures and set the frequency to 5 MHz.

B. Put couplant and the transducer on reference standard NDT621 at position 1 (Figure 3, Detail A) and get a signal from the hole.

C. Set the initial pulse to 0% of full screen width.

D. Move the transducer forward and back and from side to side to get the maximum signal from the hole.

NOTE: Do not let the transducer cross the line on the reference standard. The line on the reference standard identifies the location of the splice plate.

E. Put the signal at 60% of full screen width and adjust the signal to full screen height. See Figure 4, Detail A.

F. Put the transducer at position 2 on the reference standard (Figure 3, Detail A) and get a signal from the hole.

G. Move the transducer to the left of the hole and look for a signal from the notch. See Figure 4, Detail B.

H. Continue to move the transducer to the left and see that the hole signal gets smaller as the defect signal gets larger. The defect signal will be at its maximum at between 65% and 70% of full screen width. See Figure 4, Detail C.

I. Compare the signal at position 1 with the signals at position 2. Make sure you can identify the defect signal from the hole signal.

5. Inspection Procedure

A. Find the inspection area. See Figure 2.

B. Start at the aft inspection fastener in the center section, immediately forward of the rear spar.

C. Put couplant and the transducer on the skin adjacent to the splice plate and point the ultrasound at the inspection fastener. See Figure 3, Detail B for typical probe positions.

D. Move the transducer back and forward and from side to side, to get the maximum signal from the fastener hole. Adjust the signal to full screen height.

NOTE: To get a signal from the hole it can be necessary to add more gain. If you cannot get a satisfactory signal, remove the finish from the area that the transducer touches.

E. Move the transducer to do a scan from one side of the hole to the other side of the hole.

NOTE: Because the skin thickness in the inspection area can change, the hole signal can also change. The signal change that results from a skin thickness change will be small (less than 5% of full screen width).

F. Do Paragraph 5.C. thru Paragraph 5.E. again for all fastener hole locations along the center section, from stringer 1 to stringer 10. See Figure 2.

NOTE: See Figure 3, Detail B for the transducer positions at stringers 6 and 10.

G. Go to the aft inspection fastener on the wing side of the splice plate, immediately forward of the rear spar and do Paragraph 5.C. thru Paragraph 5.E.

H. Do par. Paragraph 5.C. thru Paragraph 5.E. again for all fastener hole locations on the wing side of the splice plate.

I. Do Paragraph 5.B. thru Paragraph 5.H. on the opposite side of the airplane.

6. Inspection Results

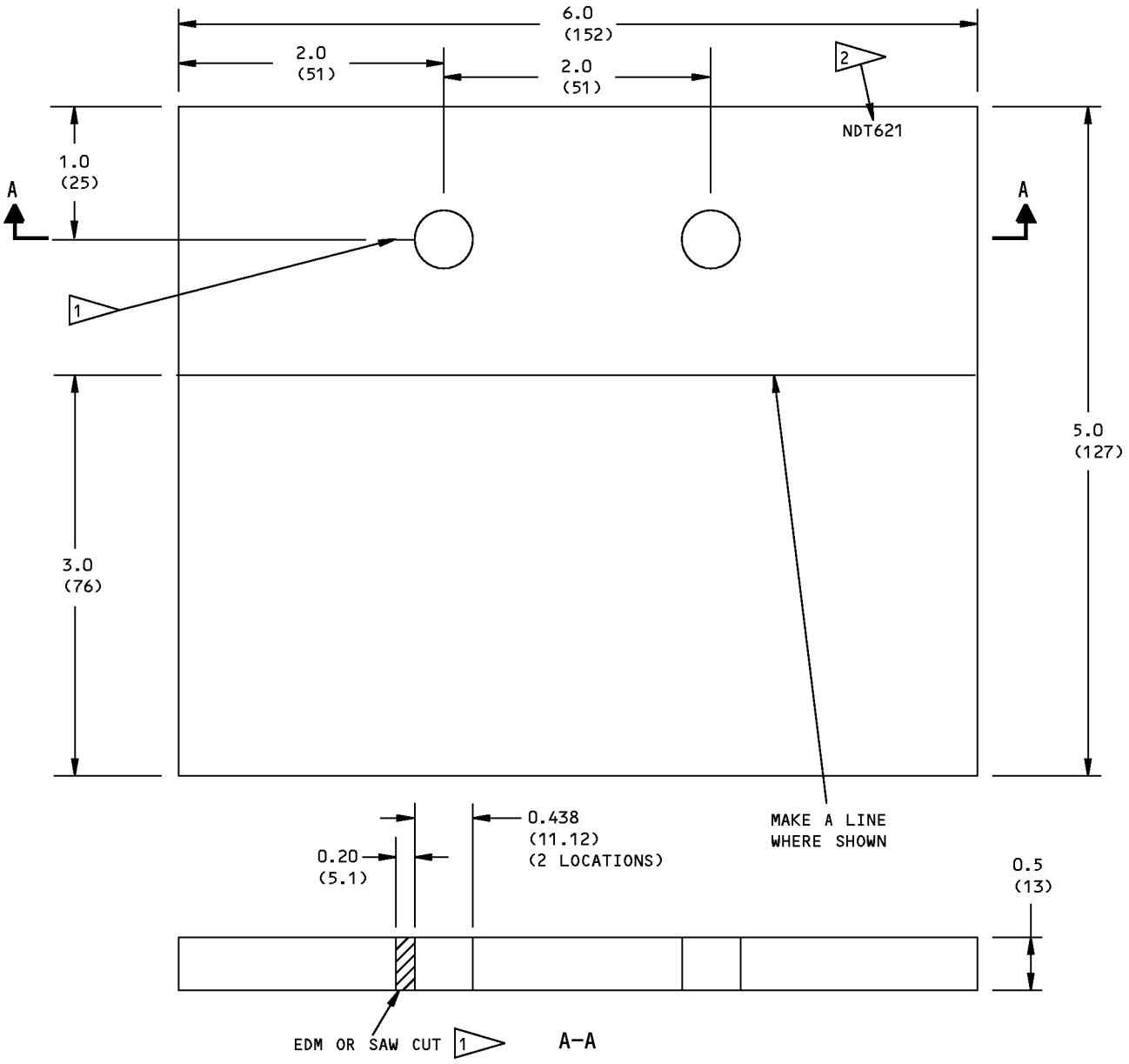
A. Signals that are 100% (or more) of full screen height and are immediately to the right of the hole signal on the screen display can be crack indications.

NOTE: Crack signals will increase in height as the hole signal decreases.

B. A procedure that can be used to make sure there is a crack is Part 6, 51-00-04. It is necessary to remove the fastener to do Part 6, 51-00-04.

NOTE: Crack signals can be nearer to the hole signal on the screen display than shown in Figure 4, Details B and C.

C. If you have questions about an ultrasonic signal, you can make a hard copy of the screen display and ask the Service Engineering Group at Boeing for help in the analysis.



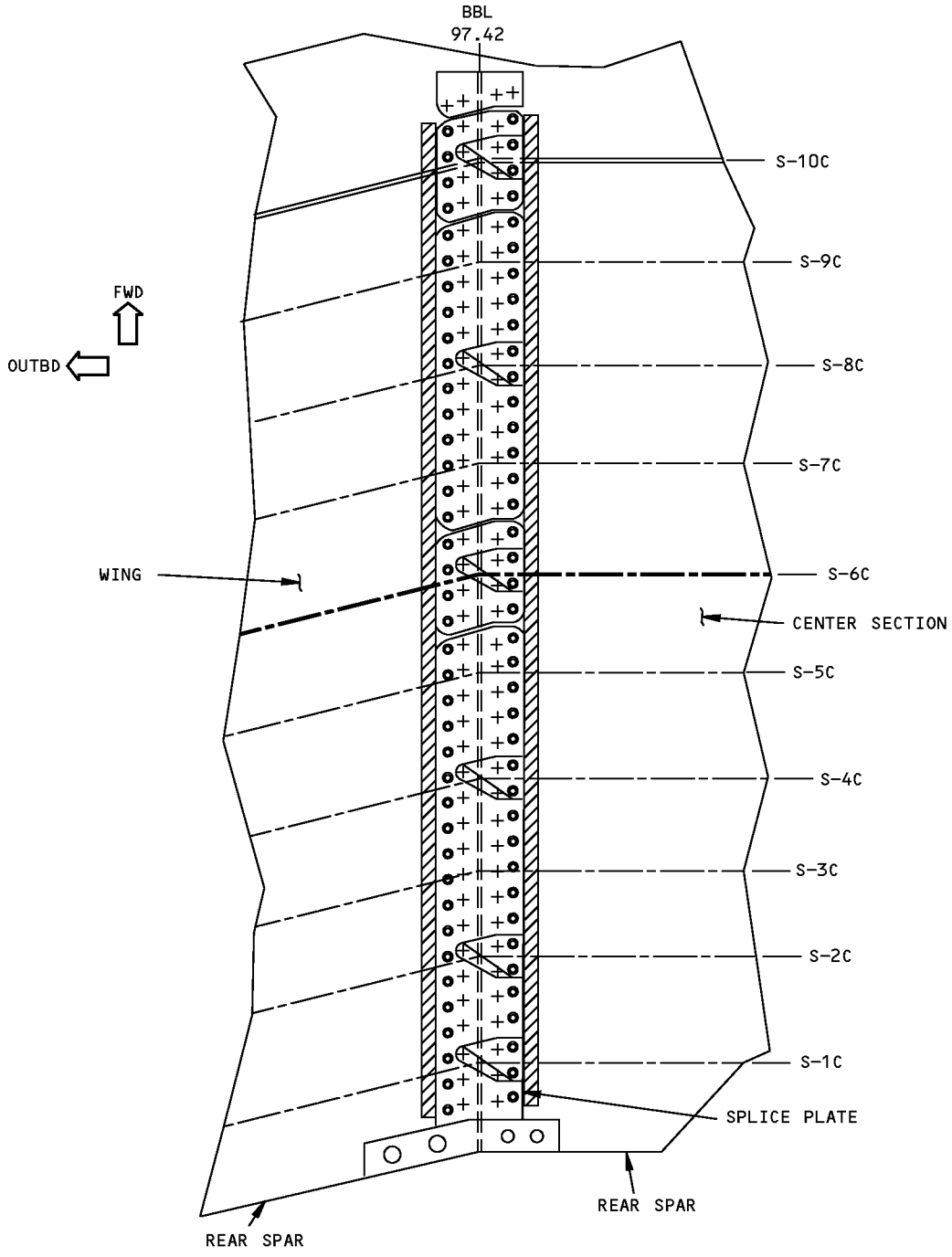
NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- TOLERANCES: ± 0.050 (± 1.27) UNLESS SPECIFIED DIFFERENTLY
- MATERIAL: ALUMINUM 2024-T3/T4 OR EQUIVALENT

1 EDM OR SAW CUT DIMENSIONS:
0.20 (5.1) LENGTH
0.010 (0.25) WIDTH

2 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT621 AND LINE WHERE SHOWN

Reference Standard NDT621
Figure 1



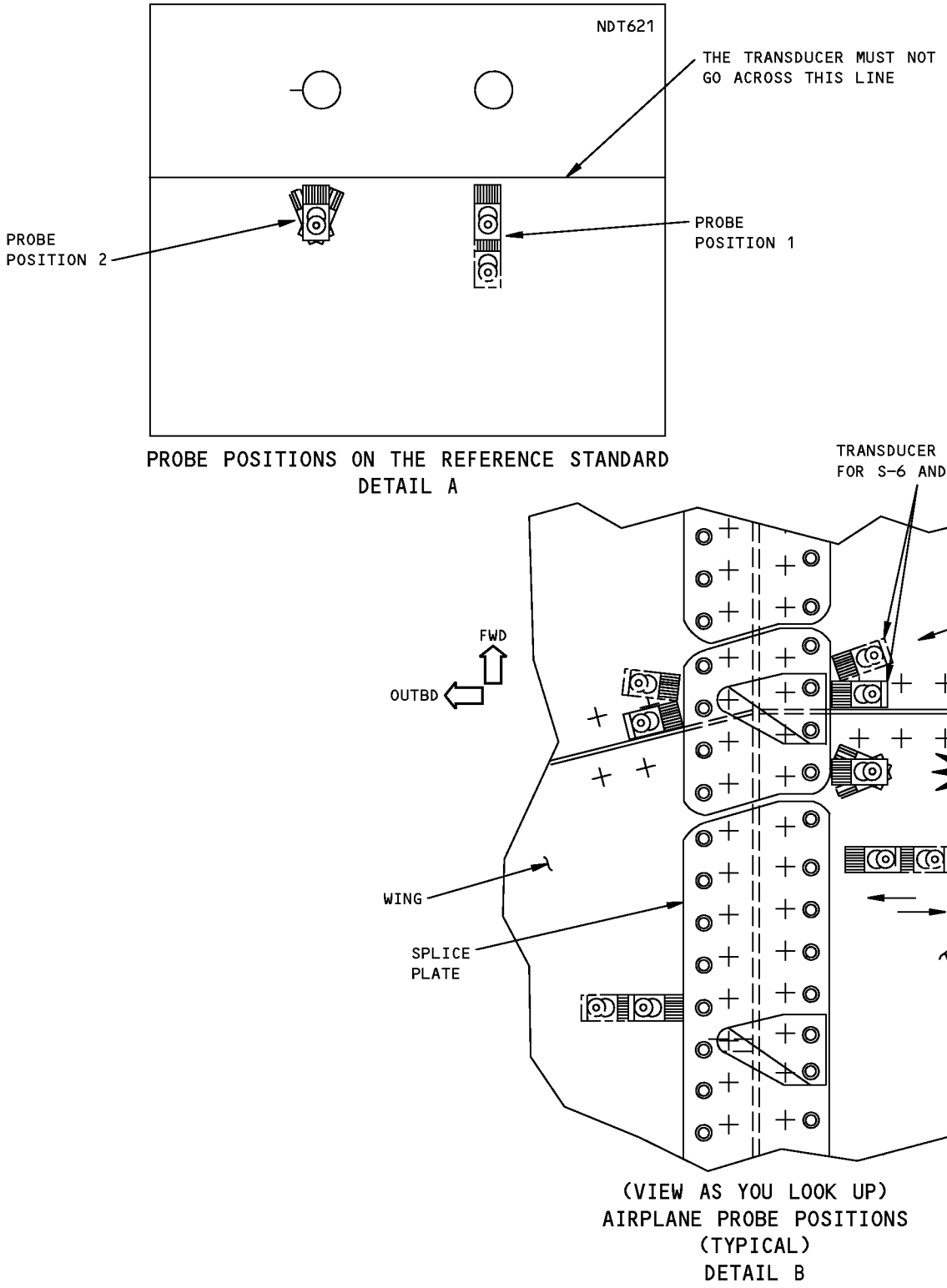
NOTES

VIEW AS YOU LOOK UP

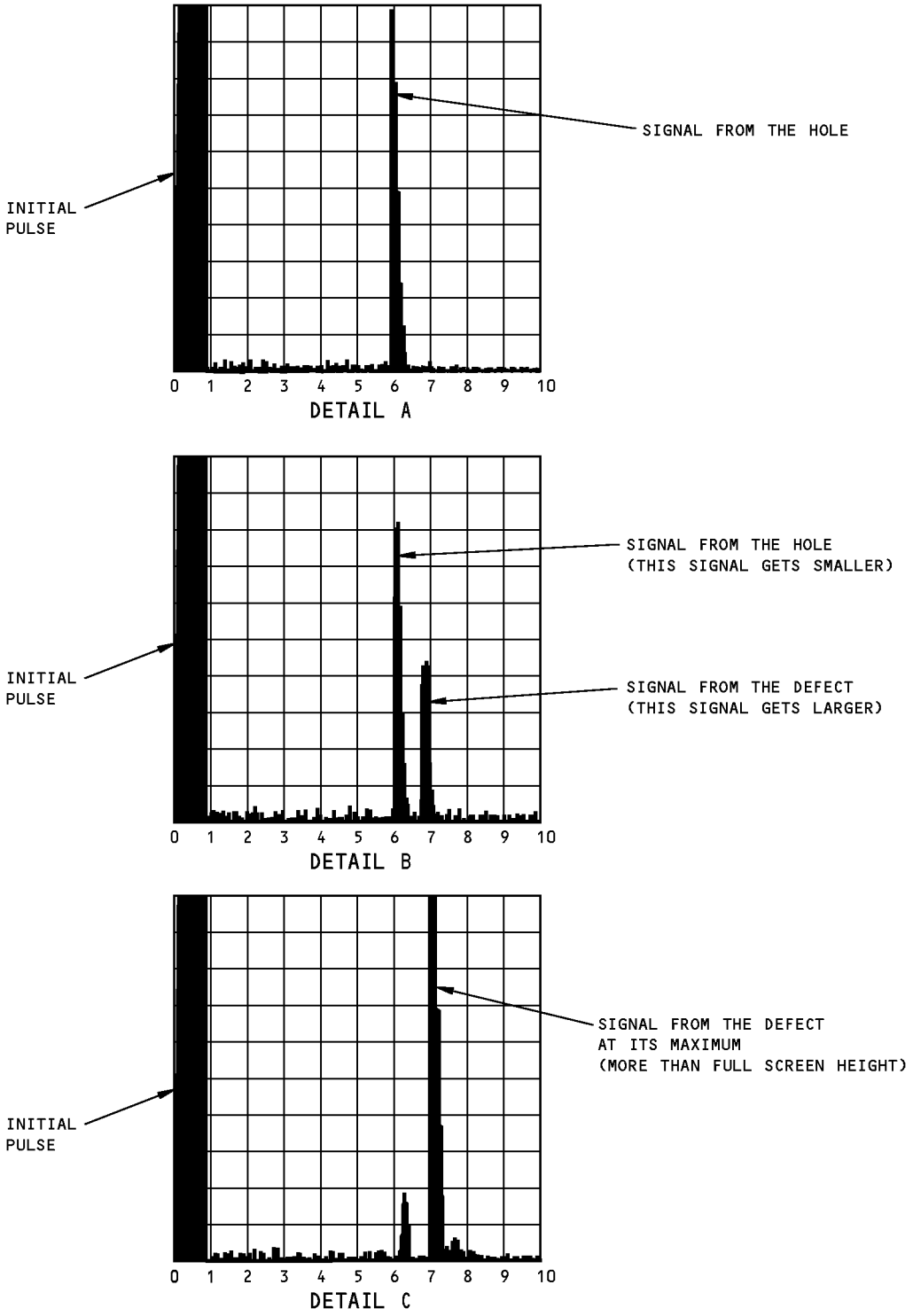
- o FASTENER INSPECTION LOCATION
- • RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE

AREAS THAT THE TRANSDUCER WILL TOUCH DURING THE INSPECTION.

Inspection Location
Figure 2



Calibration and Airplane Inspection Probe Positions
Figure 3



Screen Signal Displays During Calibration
Figure 4

WING CENTER SECTION - LOWER SKIN AT THE REAR SPAR

1. Purpose

A. To find cracks in the center section skin, below the rear spar at locations where the skin is behind structure. These locations are at BBL 49.5, BBL 62.5 and BBL 73.0 as shown in Figure 1.

B. This procedure will find cracks that travel in a forward and aft direction out of the fastener holes identified in Figure 2.

C. MPD Appendix B DTR Check Form Reference:

(1) ITEM 57-10-l03C

2. Equipment

A. General

(1) Use equipment that can be calibrated on the reference standard as specified in Paragraph 4.

(2) See Part 1, 51-01-00 for the equipment manufacturers.

B. Instrument

(1) Use an instrument that will operate at 5 MHz.

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

(a) Krautkramer USD-15

(b) Staveley Sonic-136

C. Transducer

(1) It is necessary to use a 5 MHz transducer that puts a 60 degree shear wave in aluminum.

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

(a) Staveley Sensors Type SMZ, part number 57A3065

D. Reference Standard

(1) Use reference standard NDT627. See Figure 3 for data about the reference standard.

E. Couplant - Use a couplant that will not damage the airplane structure.

3. Preparation for Inspection

A. Remove the side-of-body fairings to access the inspection area.

B. Identify the inspection locations. See Figure 1 and Figure 2.

C. Make sure the areas the transducer will touch to do the inspection are clean.

NOTE: If it is not easy to transmit ultrasound into the skin, it can be necessary to smooth or remove the finish from the areas that the transducer will touch.

4. Instrument Calibration

A. Do the instrument start up procedures and set the frequency to 5 MHz.

B. Set the initial pulse to 0% of full-screen width.

C. Put the transducer on the reference standard at Position 1 as shown in Figure 4.

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

E. Adjust the instrument controls so the hole signal is at 60% of full-screen width and 100% of full-screen height.

F. Put the transducer at Transducer Position 2 on the reference standard (as shown in Figure 4) and get a signal from the hole.

(1) Point the transducer at the EDM notch and monitor the signal that occurs from the notch.

G. Do a scan on each side of the hole and monitor the signals from the hole and the EDM notch.

5. Inspection Procedure

A. Find the inspection area of the center section skin at BBL 73. See Figure 1 and Figure 2.

B. Put couplant on the transducer and the areas the transducer will touch at BBL 73.

C. Put the transducer on one side of the hole and point the transducer so the sound goes to the inspection hole as shown in Figure 2, Detail 1.

NOTE: If you do not get a satisfactory signal from the inspection hole, remove the paint from the surfaces that the transducer touches.

D. With the hole signal at its maximum, use the instrument controls to adjust the signal to full-screen height.

E. Do a scan of each side of the fastener hole to look for crack signals that are the same as the notch signal you got from the reference standard.

F. Do the scan again on the opposite side of the fitting. Monitor the screen display for signals that are almost the same as the notch signal you got from the reference standard.

G. Do Paragraph 5.B. thru Paragraph 5.F. again to examine the skin for cracks in the area that is behind the fitting at BBL 62.5 at the four fastener holes as shown in Figure 2, Detail 2.

H. Do Paragraph 5.B. thru Paragraph 5.F. again to examine the skin for cracks in the area behind the fitting at BBL 49.5 at the two fastener holes as shown in Figure 2, Detail 3.

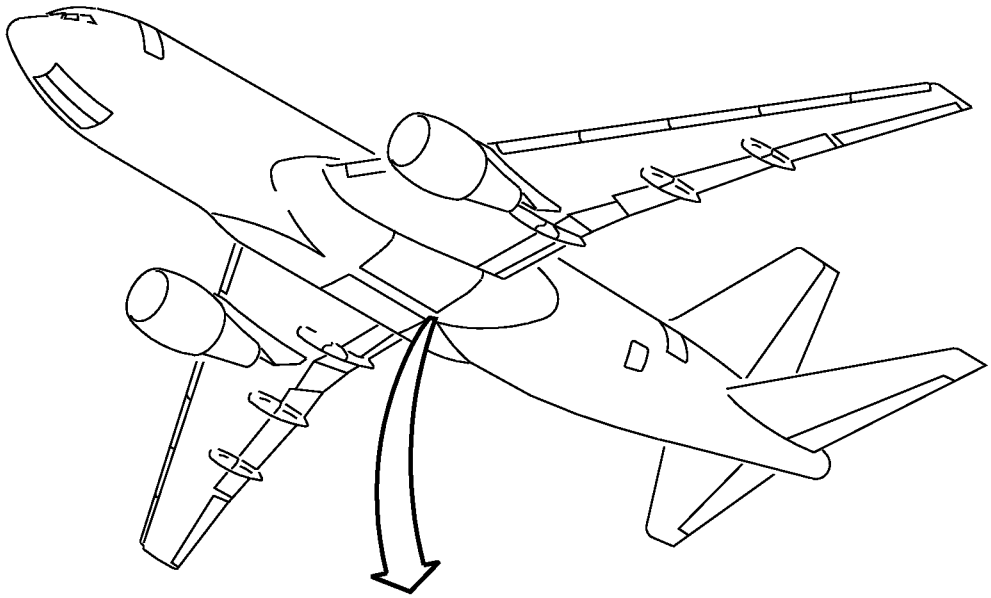
I. Do Paragraph 5.A. thru Paragraph 5.H. again on the opposite side of the airplane.

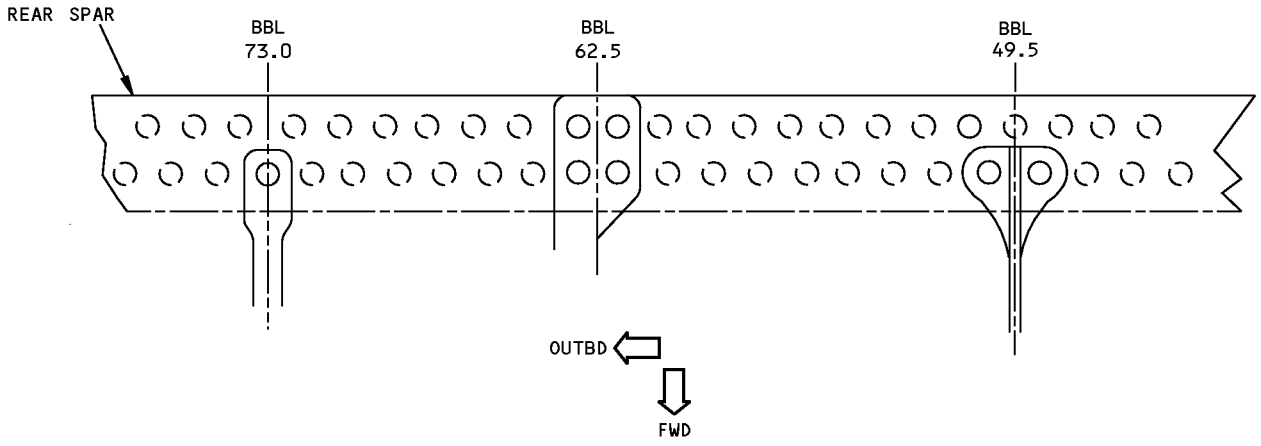
6. Inspection Results

A. Ultrasonic signals that are between 60 and 70% of full-screen width and are 50% (or more) of full-screen height are possible crack indications.

B. Compare the crack-type signals you get during the inspection with the signal you got from the reference standard notch during calibration.

C. If you have questions about an ultrasonic signal, you can make a hard copy of the screen display and ask Customer Service Engineering for help in the analysis.

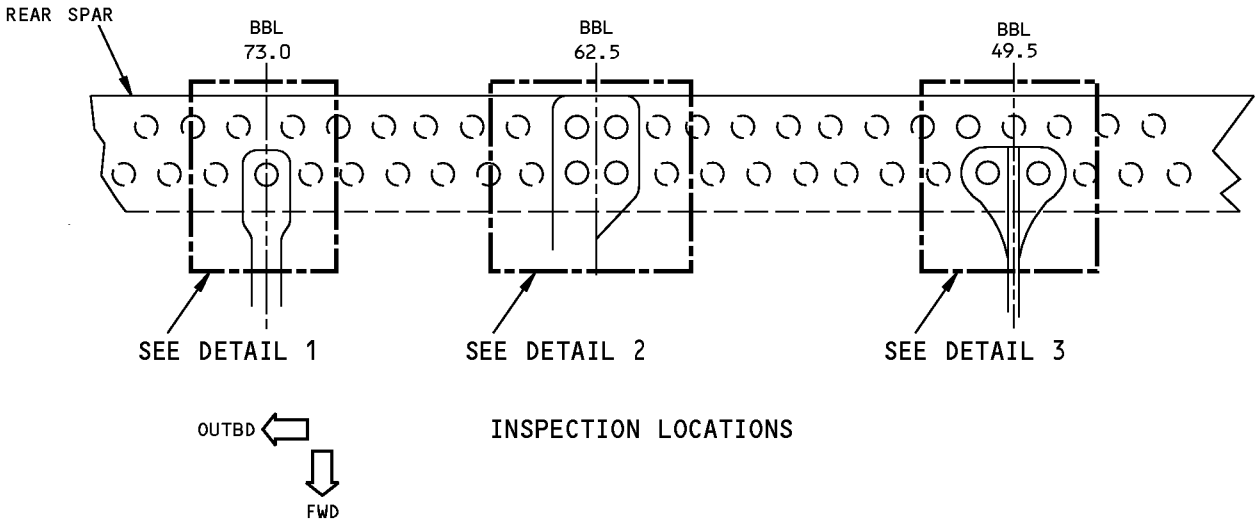


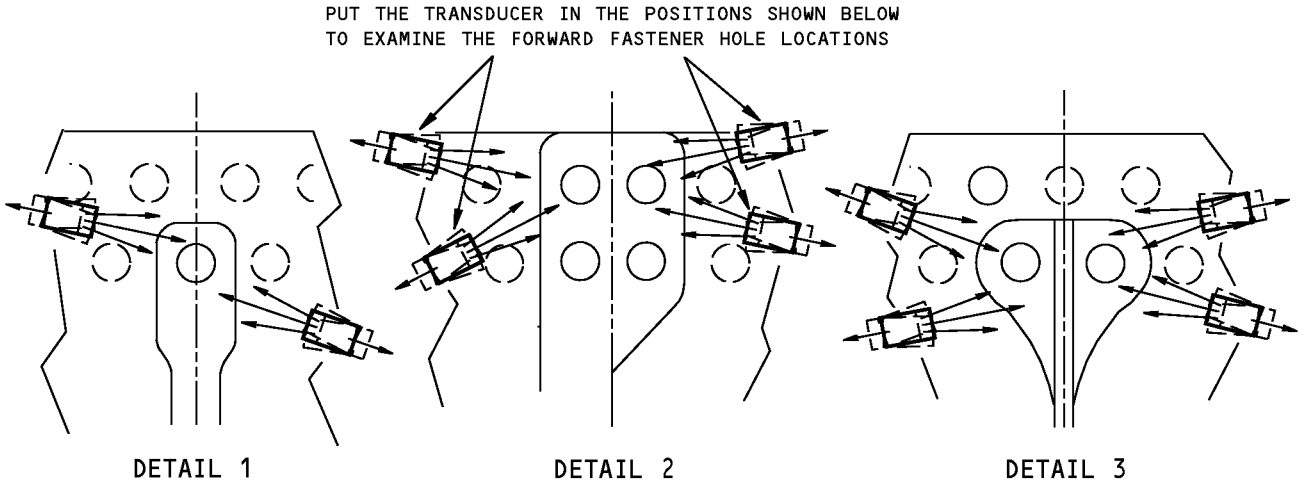


NOTES

- VIEW AS YOU LOOK UP

Inspection Location
Figure 1

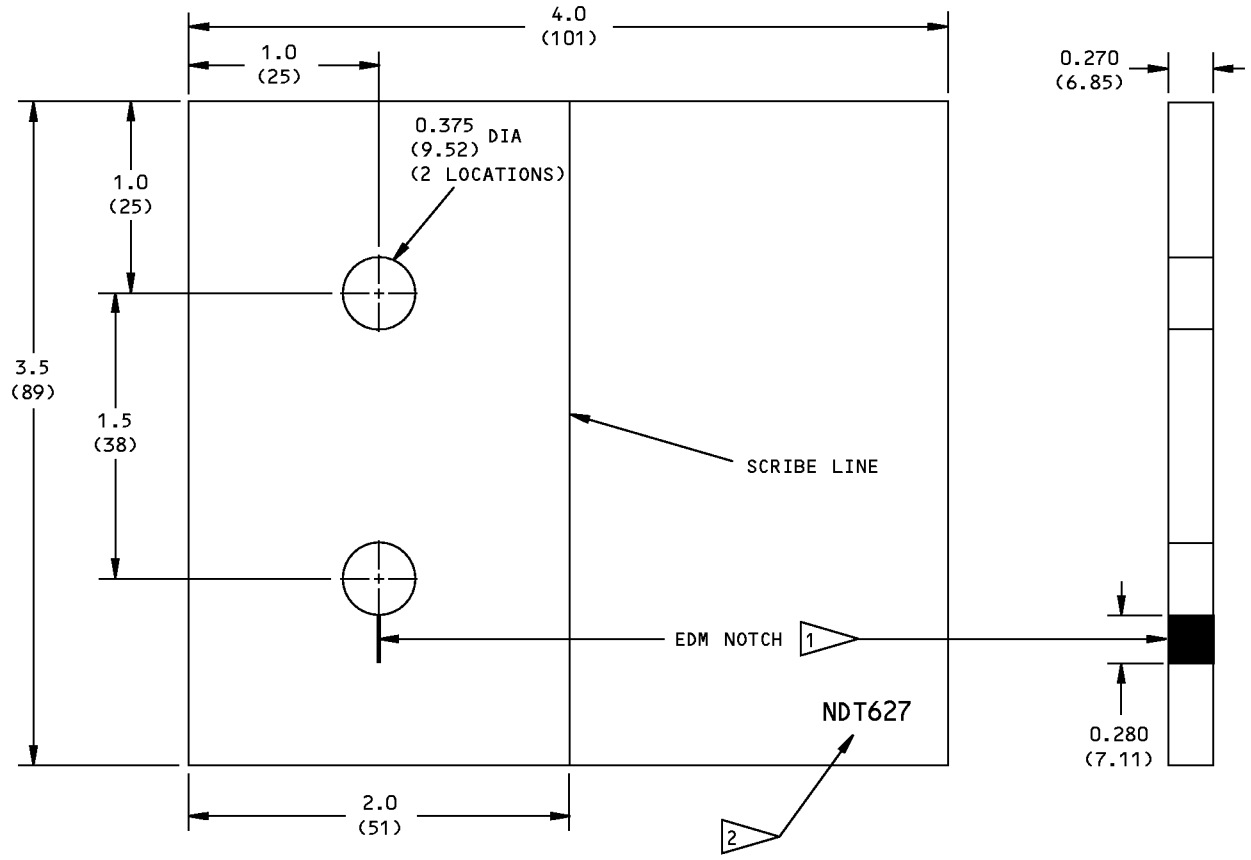




NOTES

- VIEW AS YOU LOOK UP
- THE LEFT SIDE OF THE AIRPLANE IS SHOWN;
  THE RIGHT SIDE OF THE AIRPLANE IS OPPOSITE

Transducer Scan Positions
Figure 2



NOTES

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

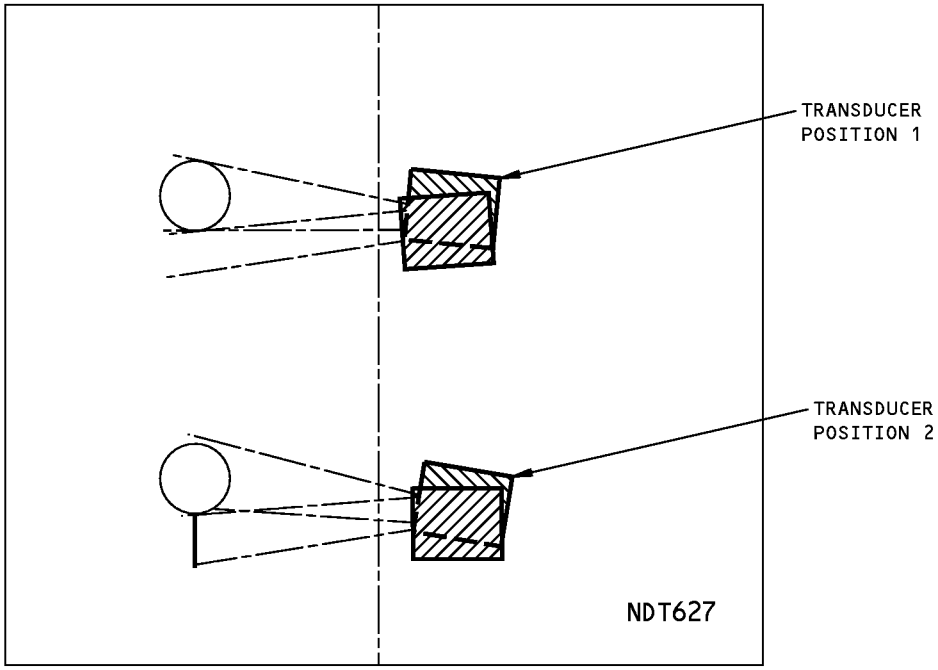
INCHES	MILLIMETERS
X.XXX = ± 0.005	X.XX = ± 0.13
X.XX = ± 0.05	X.X = ± 1.3
X.X = ± 0.1	X = ± 2.5

- MATERIAL: ALUMINUM 7075-T6 OR EQUIVALENT

1 THE MAXIMUM WIDTH OF THE EDM OR SAW CUT IS 0.010 (0.26).

2 ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT627 AT APPROXIMATELY THIS LOCATION

Reference Standard NDT627
Figure 3



NOTES

- MAKE SURE THE TRANSDUCER DOES NOT MOVE ACROSS THE SCRIBE LINE

 = TRANSDUCER SCAN POSITIONS

Transducer Calibration Positions
Figure 4

WING CENTER SECTION - LOWER SKIN AT THE UNDERWING LONGERON

1. Purpose

A. To find cracks in the lower skin, under the longeron fittings of the wing center section skin. See Figure 1 for the inspection areas.

B. This procedure will find cracks that run forward and aft, out of identified fastener holes, from the front spar to stringer 18, at BBL 70, on the left and right sides of the airplane.

C. MPD Appendix B DTR Check Form Reference:

(1) ITEM 57-10-I24

2. Equipment

A. General

(1) Use equipment that can be calibrated on the reference standard as specified in Paragraph 4.

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

B. Instrument

(1) Use an instrument that will operate at 5 MHz.

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

(a) USD-15; Krautkramer

(b) Sonic-136; Staveley

C. Transducer

(1) Use a 5 MHz transducer that can put a 75 degree shear wave in aluminum to do this procedure.

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

(a) 5 MHz transducer, Part No. ZP-1/4XL/4-10 75 AL-945180; Staveley/Nortec.

D. Reference Standard

(1) Use reference standard NDT623. Make reference standard NDT623 as shown in Figure 2.

E. Couplant - Use a couplant that will not damage the airplane structure.

3. Preparation for Inspection

A. Remove the underwing fairings to get access to the lower side-of-body longerons. The longerons are in the center section near the front spar at BBL 70 on the left and right sides of the airplane (Figure 1).

B. Identify the inspection locations (Figure 1).

C. Remove sealant from around the fastener heads in the areas the transducer will touch as shown in Figure 1 and Figure 5.

D. Make sure the areas the transducer will touch are clean.

NOTE: If it is not easy to transmit ultrasound into the skin, it can be necessary to smooth or remove the finish from the areas that the transducer touches.

4. Calibration

A. Set the instrument frequency to 5 MHz.

B. Put couplant and the transducer on reference standard NDT623 at position A1 (Figure 3) and get a signal from the hole identified as A.

NOTE: The transducer positions agree with the different configurations and transducer positions that will occur as the inspection is done on the airplane. The notch signals are examples of crack indications for all fastener diameters.

C. Set the initial pulse to 0% of full screen width.

D. Move the transducer forward and back and from side to side to get a maximum signal from the hole.

E. Put the maximum signal at 50% of full screen width and adjust the signal to full screen height (Figure 4, Detail A).

F. Put the transducer at position A2 on the reference standard (Figure 3) and get a signal from the hole.

G. Move the transducer to do a scan to the left and look for a signal from the notch. This signal will occur to the right of the hole signal and will be more than full screen height (Figure 4, Detail B).

H. Move the transducer to point the sound at the hole and the notch to see that the hole signal gets smaller as the notch signal gets larger (Figure 4, Detail B).

I. Compare the signal at position A1 with those at position A2. Make sure you can identify the crack signal from the hole signal.

J. Put the transducer at position B1 on the reference standard (Figure 3) and get a signal from hole B. Make sure the transducer does not get a signal from hole C.

NOTE: Hole C on the reference standard is a fastener collar location on the airplane. The transducer cannot be put at hole C on the reference standard or the airplane.

K. Put the transducer at position B2 on the reference standard and get a signal from hole B. The signal will occur at approximately 70% of full screen width.

L. Put the transducer at position D1 on the reference standard (Figure 3) and get a signal from hole D. To get the signal from hole D, make sure you find hole B and then do a scan to find the signal from hole D (Figure 4, Detail C).

NOTE: It is important to learn the relation between holes B and D, as hole D is for a fastener on the airplane that cannot be seen.

M. Put the transducer at position E1 on the reference standard (Figure 3) and get a signal from hole E. Then move the transducer to get a signal from the notch (Figure 4, Detail D).

N. Put the transducer at position F1 on the reference standard (Figure 3) and get a signal from the near F hole (Figure 4, Detail E).

O. Put the transducer at position F2 (Figure 3) so that the sound goes by the near F hole to get a signal from the far F hole (Figure 4, Detail F).

NOTE: Paragraph 4.O. calibrates the equipment for the inspection of the outboard hole at stringer 18 on the left side of the airplane where a bracket prevents access.

5. Inspection Procedure

A. Find the inspection area (Figure 1 and Figure 5).

NOTE: The skin inspection starts on the right side of the airplane at hole B1 (Figure 5, Detail 1).

B. Put couplant and the transducer on the skin at the forward and inboard side of the longeron and get a signal from hole B1 (Figure 5, Detail 1).

C. Get a maximum signal from the hole and adjust the gain to put the signal at 80% of full screen height (FSH).

D. Examine each side of the fastener hole for cracks in the skin.

(1) Remove the finish from the area that the transducer touches, if you do not get satisfactory signals.

E. Do Paragraph 5.C. thru Paragraph 5.D. again to examine each side of hole B2 from the outboard side (Figure 5, Detail 1).

F. Do Paragraph 5.C. thru Paragraph 5.D. again to examine each side of all the holes marked A (Figure 5, Detail 1). Refer to Figure 3, hole A transducer positions.

G. Do Paragraph 5.C. thru Paragraph 5.D. again to examine each side of holes D and E (Figure 5, Detail 1). Refer to Figure 3, holes D and E transducer positions.

NOTE: You cannot see these inspection holes on the airplane. It is important to refer to the reference standard to make sure of the correct hole location. It can be necessary to adjust the instrument range a small amount to keep the hole signals on the screen.

NOTE: Because of different fastener locations, it can be necessary to examine the top of hole D from the opposite side of the longeron.

H. Do Paragraph 5.C. thru Paragraph 5.D. again to examine all the holes marked F (Figure 5, Detail 2). Refer to Figure 3, hole F transducer positions.

I. Do Paragraph 5.A. thru Paragraph 5.H. again on the left side of the airplane. See Figure 5, Detail 3 for holes A, B, D and E, and Figure 5, Detail 4 for holes F.

NOTE: A bracket on the left side of the airplane at stringer 18 does not permit the transducer to be put on the outboard side of the longeron. It is necessary to examine holes F from the inboard side of the longeron (Figure 3, positions F1 and F2 and Figure 5, Detail 4).

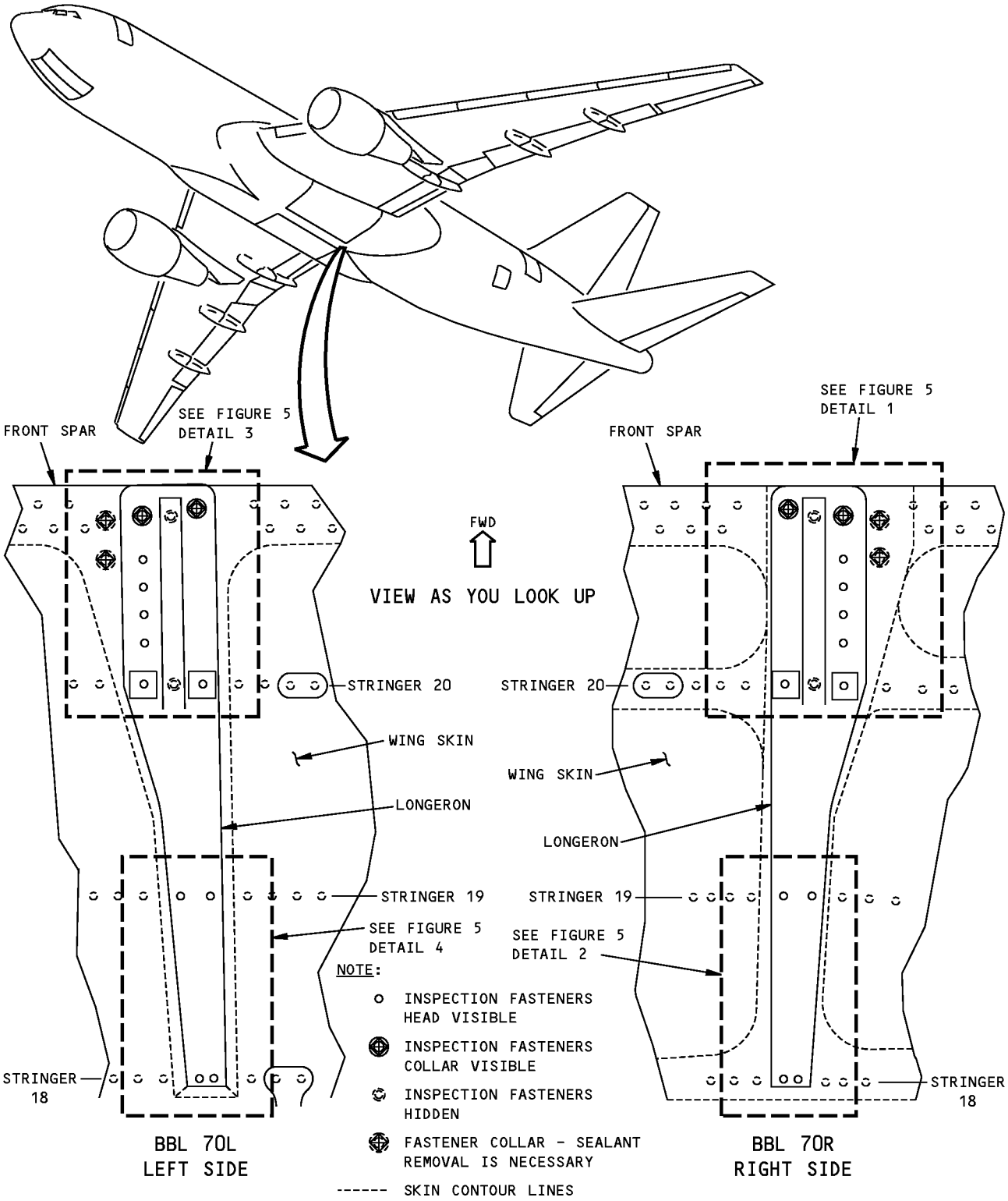
NOTE: The skin contours are different on the left and right sides of the airplane. Some transducer positions used to do the inspection on the left side of the airplane can be different from the positions used to examine the skin on the right side of the airplane.

6. Inspection Results

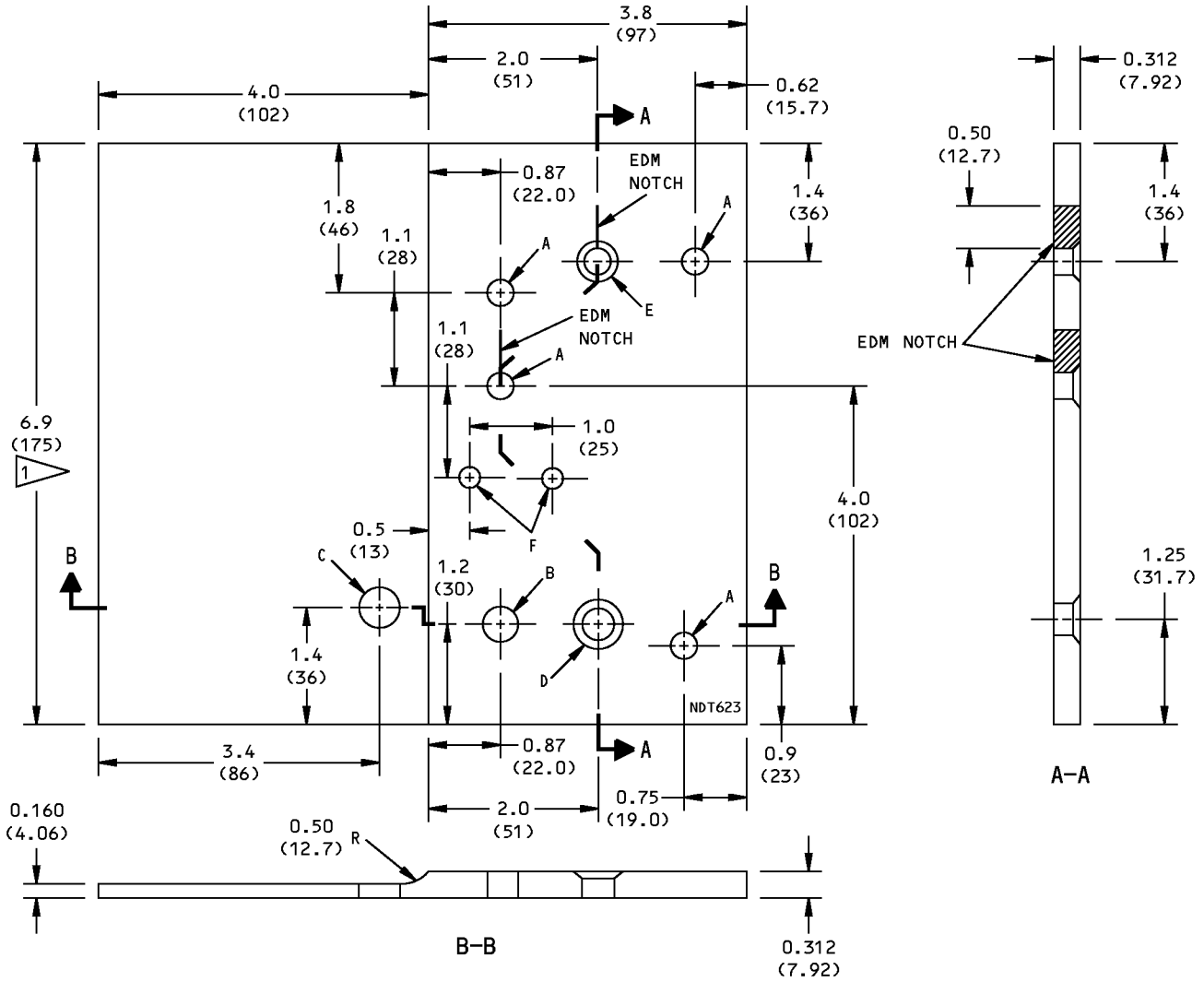
A. Signals that are 40% of FSH or more and are immediately to the right of the hole signal are crack indications.

NOTE: Crack indications will increase in height as the hole signal decreases in height.

B. To make sure a crack indication is from a crack, remove the fasteners and do an open hole eddy current inspection. Refer to Part 6, 51-00-04, Part 6, 51-00-11 or Part 6, 51-00-16.



Inspection Location
Figure 1



NOTES

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

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

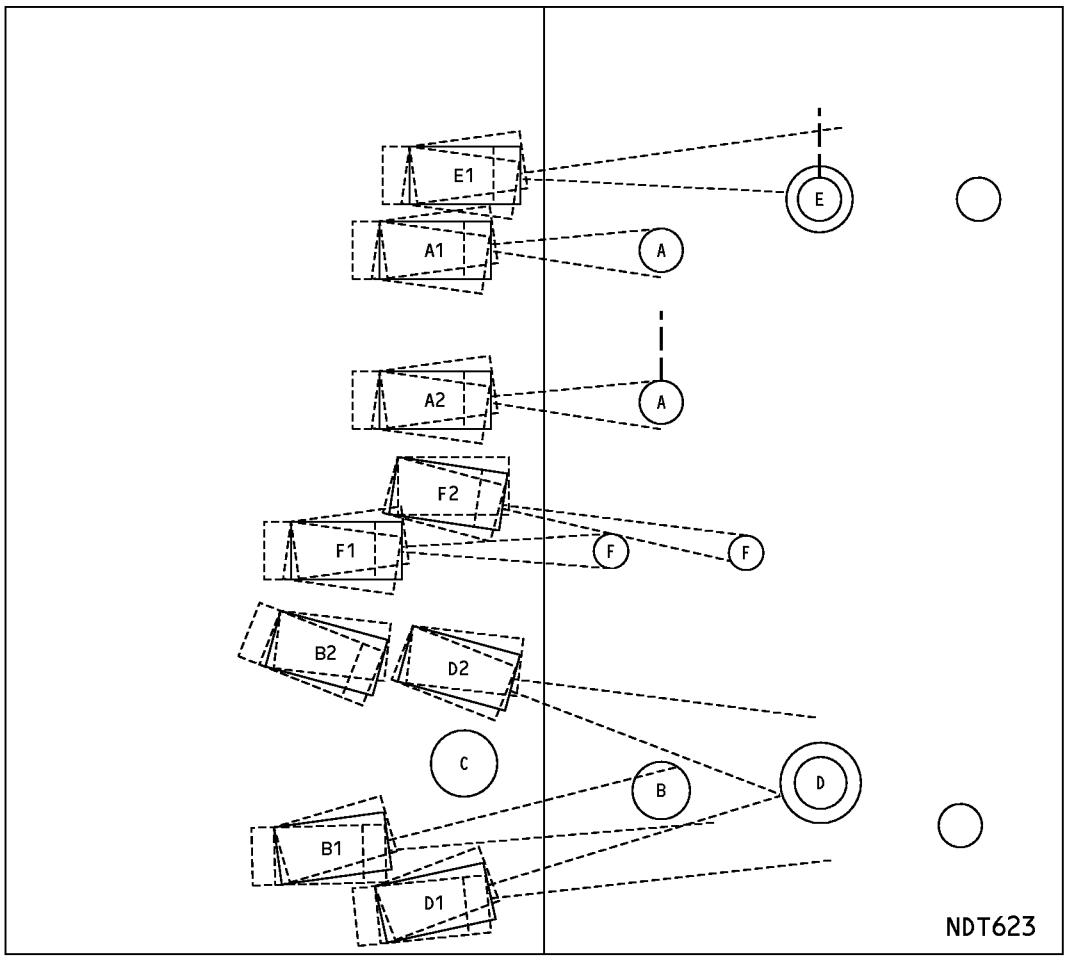
- MATERIAL: ALUMINUM 2024 OR EQUIVALENT
- ETCH OR STEEL STAMP THE REFERENCE STANDARD NUMBER NDT623 WHERE SHOWN
- EDM NOTCH OR SAW CUT 0.010 (0.25) WIDE X 0.50 (12.7) LONG

1 7.0 (178) WAS SPECIFIED BEFORE THE SEP 15/04 REVISION AND IS SATISFACTORY.

HOLE DIAMETERS:

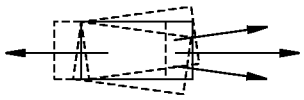
A = 0.3125 (8.153)
B = 0.375 (9.525)
C = 0.500 (12.70)
D = DRILL AND COUNTERSINK FOR BACB30NW12K*
E = DRILL AND COUNTERSINK FOR BACB30NW10K*
F = 0.25 (6.35)

Reference Standard NDT623
Figure 2



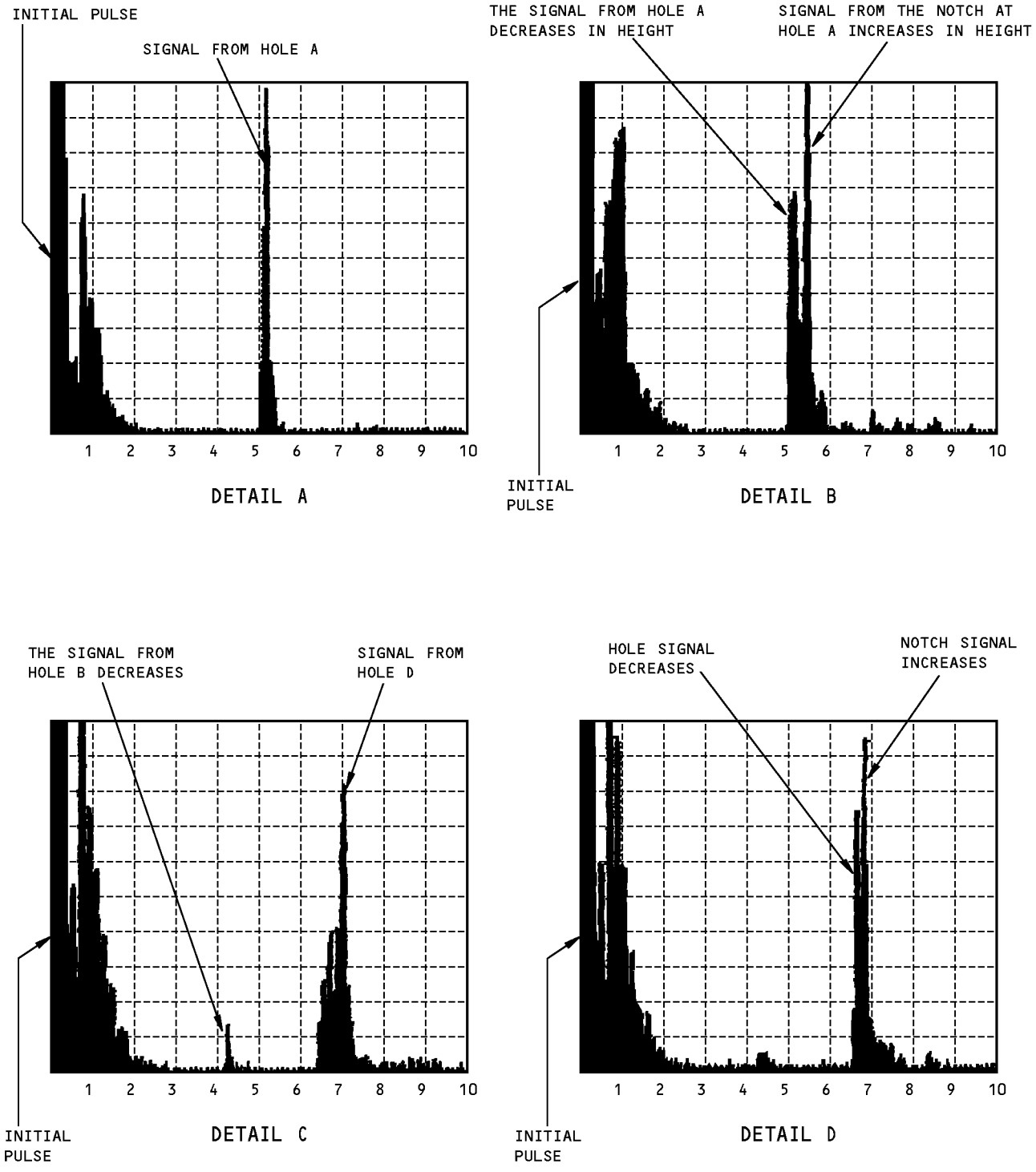
NOTES

- THE HOLES IDENTIFIED BY A ARE FOR THE FASTENER HOLES BETWEEN THE FRONT SPAR AND STRINGER S-20
- THE HOLE IDENTIFIED BY B IS FOR THE FORWARD FASTENER HOLES IN DETAILS I AND 3 OF FIGURES 1 AND 5
- THE HOLE IDENTIFIED BY C IS FOR THE FASTENER LOCATIONS AT THE TRANSDUCER POSITION
- THE HOLES IDENTIFIED BY D AND E ARE FOR THE HIDDEN COUNTERSUNK FASTENER HOLE LOCATIONS
- THE HOLES IDENTIFIED BY F ARE FOR THE FASTENER HOLE LOCATIONS AT STRINGERS 18 AND 19

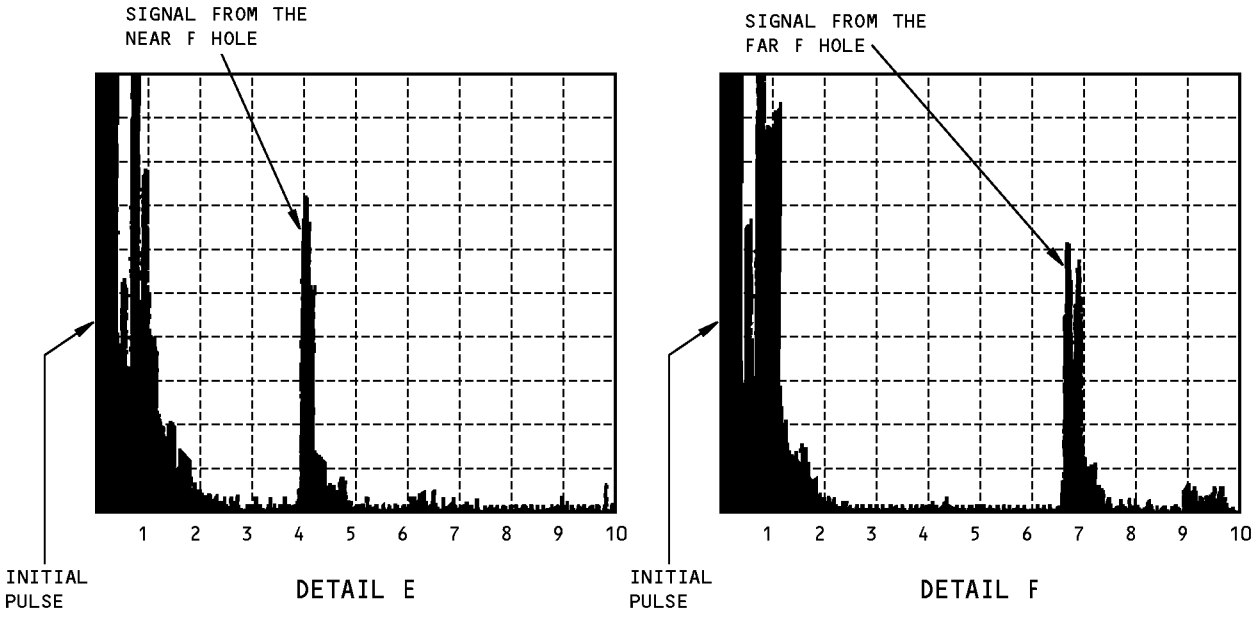


IDENTIFIES A TRANSDUCER SCAN MOVEMENT THAT GOES IN THE SIDE TO SIDE AND THE FORWARD TO BACK DIRECTIONS.

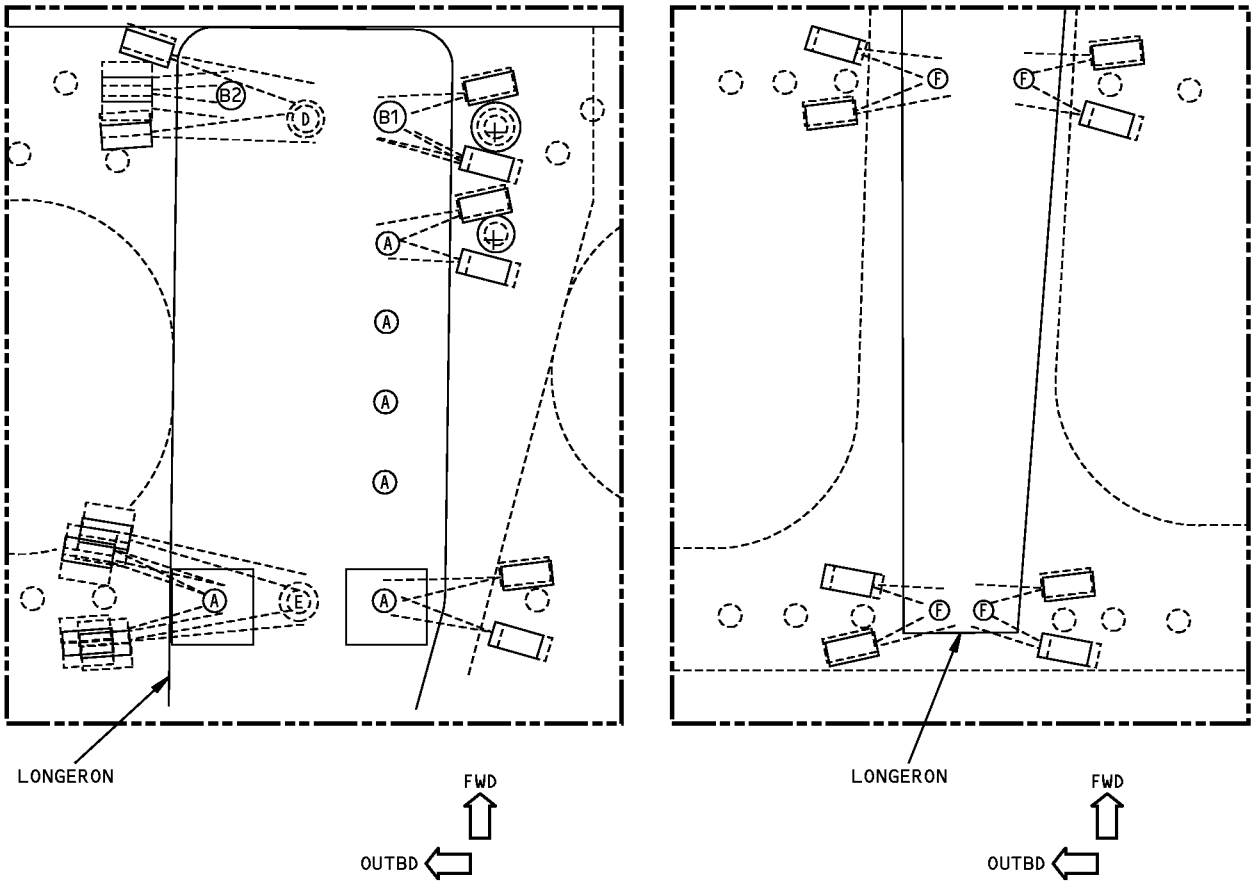
Calibration Transducer Positions
Figure 3



Instrument Screen Displays
Figure 4 (Sheet 1 of 2)



Instrument Screen Displays
Figure 4 (Sheet 2 of 2)



VIEW AS YOU LOOK UP
DETAIL 1

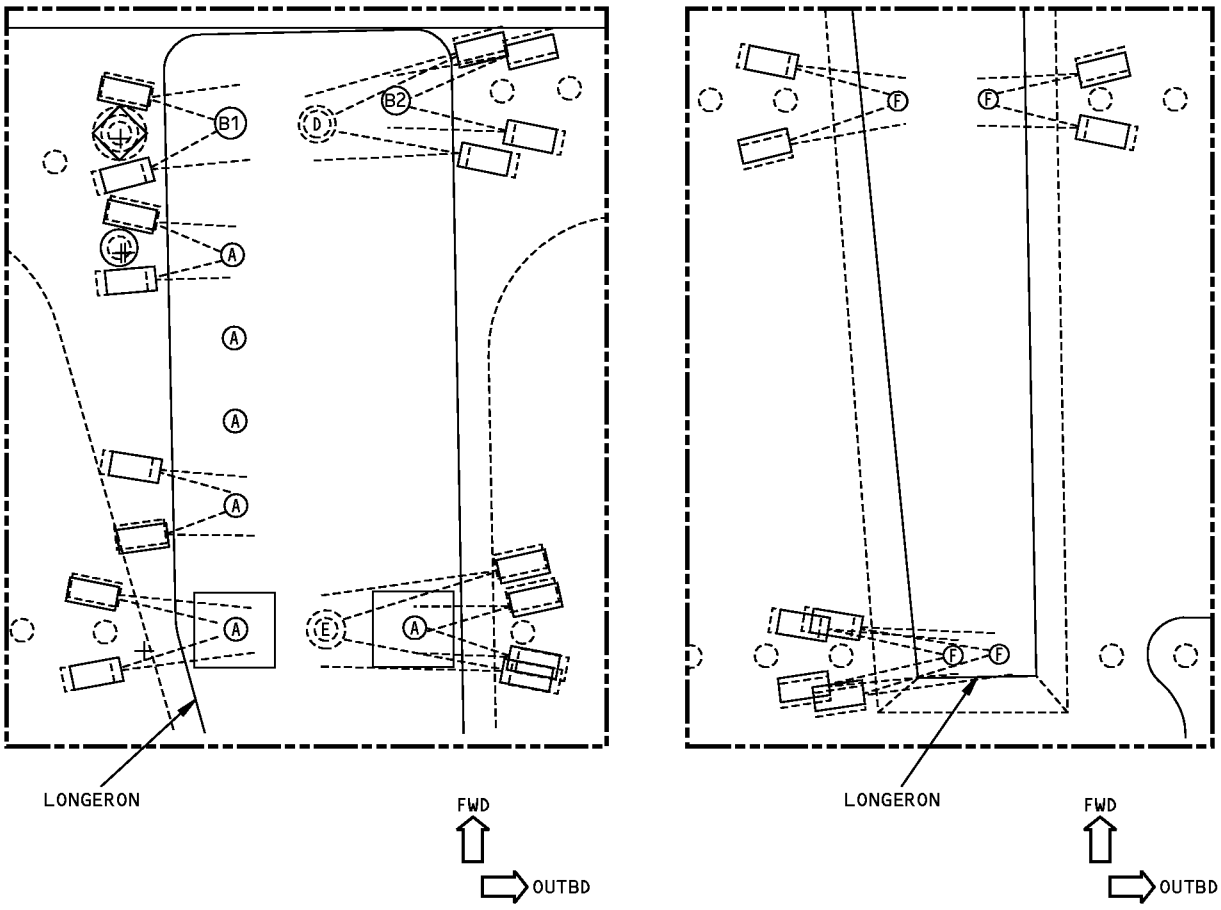
VIEW AS YOU LOOK UP
DETAIL 2

TRANSDUCER POSITIONS AT BBL 70 ON
THE RIGHT SIDE OF THE AIRPLANE

NOTES

- SEE FIGURE 1 FOR THE DETAIL LOCATIONS
- SOME STRUCTURE IS NOT SHOWN
- POSITIONS ARE APPROXIMATE; MOVE THE TRANSDUCER AS NECESSARY TO GET THE MAXIMUM SIGNAL

Transducer Positions on the Airplane
Figure 5 (Sheet 1 of 2)



VIEW AS YOU LOOK UP
DETAIL 3

VIEW AS YOU LOOK UP
DETAIL 4

TRANSDUCER POSITIONS AT BBL 70 ON
THE LEFT SIDE OF THE AIRPLANE

NOTES

- SEE FIGURE 1 FOR THE DETAIL LOCATIONS
- SOME STRUCTURE IS NOT SHOWN
- POSITIONS ARE APPROXIMATE; MOVE THE TRANSDUCER AS NECESSARY TO GET THE MAXIMUM SIGNAL

Transducer Positions on the Airplane
Figure 5 (Sheet 2 of 2)