



737 NON-DESTRUCTIVE TEST MANUAL

PART 1 - GENERAL

ORIENTATION AND PREPARATION FOR TESTING

1. Qualifications of Operator

- A. Interpretations of radiographs and the readout of other nondestructive testing equipment, such as ultrasonic and eddy current, require much skill, and must be performed only by trained and experienced personnel. The operator must have training in both the basic theory and the practical application of the NDT methods he is using and have a good working knowledge of aircraft structure. He also must have good comprehension of the failure characteristics of the various metals and types of parts used in aircraft structure, and be aware of limitations and capabilities of the nondestructive testing methods available to him.

2. Selection of Inspection Method

- A. Selection of the correct inspection method and equipment required depends upon several factors; accessibility, material of structure or part and type of defect sought. Before making selection, review sections Part 1, 51-02-00 thru Part 1, 51-06-00 for discussions of the various types of nondestructive testing. See Figure 1 for a comparison of advantages and disadvantages of each type of test.

3. Coordination with Structural Repair Manual

- A. The structural repair manual for the aircraft being inspected should be used in conjunction with the nondestructive testing document for identification of materials and structural items.

4. Aircraft Structure and Component Location and Accessibility

- A. Many individual parts of the aircraft, which require inspection, are located in inaccessible areas. Structural components of the fuselage are generally beneath soundproofing blankets, or behind interior decorative panels. Many structural components of the wings, empennage, and other areas are also relatively inaccessible. Where access to an area requiring inspection is difficult, instructions for gaining access to the area are given with the specific inspection procedure. Inspection personnel should familiarize themselves with the layout of the airplane shown in airplane reference data illustrations. More detailed layouts of specific areas are shown in applicable structural repair manuals.

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

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Page 1
Nov 15/2015

NON-DESTRUCTIVE TEST MANUAL

METHOD	APPLICATIONS	ADVANTAGES	DISADVANTAGES
X-RAY	USED FOR DETECTION OF DISCONTINUITIES (CRACKS, VOIDS, POROSITY, INCLUSIONS ETC.), EXAMINATION OF WELDS, INSPECTION FOR FOREIGN BODIES OR DEBRIS, DIAGNOSTIC EXAMINATION OF COMPONENTS (E.G. SWITCHES, ACTUATORS ETC.) AND DETECTION OF WATER IN HONEYCOMB STRUCTURE.	1. ABILITY TO INSPECT FOR BOTH INTERNAL AND SURFACE DEFECTS 2. ABILITY TO INSPECT COVERED OR HIDDEN PARTS OR STRUCTURE 3. PROVIDES PERMANENT TEST RECORD 4. MINIMUM AREA PREPARATION REQUIRED	1. EXPENSIVE 2. AIRPLANE MAY HAVE TO BE DEFUELED 3. AREA MUST BE CLEARED OF OTHER PERSONNEL TO AVOID RADIATION HAZARD 4. METHOD IS PARTIALLY DIRECTIONAL, DEPENDS ON CRACK-X-RAY BEAM ORIENTATION 5. HIGH DEGREE OF SKILL REQUIRED FOR VARIOUS TECHNIQUE DEVELOPMENT, AND RADIOGRAPHIC INTERPRETATION 6. ACCESS TO BOTH SIDES REQUIRED
EDDY CURRENT	1. USED TO DETECT SURFACE CRACKS 2. USED TO DETECT SUBSURFACE CRACKS AND CORROSION ON AN INNER SURFACE 3. USED FOR DETERMINATION OF ALLOY AND HEAT TREAT CONDITION AND THE EVALUATION OF FIRE DAMAGE	1. PORTABILITY 2. MODERATE COST 3. PROVIDES IMMEDIATE RESULTS 4. SENSITIVE TO SMALL IMPERFECTIONS 5. MINIMUM PART PREPARATION REQUIRED	1. SURFACE MUST BE ACCESSIBLE TO CONTACT BY PROBE 2. SUITABLE FOR INSPECTION OF METALS ONLY 3. NO PERMANENT RECORD 4. HIGH DEGREE OF SKILL AND FAMILIARITY REQUIRED IN HANDLING TEST EQUIPMENT
ULTRA-SONIC	USED TO DETECT SURFACE AND SUBSURFACE IMPERFECTIONS (E.G. CRACKS, DELAMINATIONS, POROSITY). USED TO MEASURE MATERIAL THICKNESS.	1. SUITABLE FOR SURFACE AND SUBSURFACE IMPERFECTIONS 2. SENSITIVE TO SMALL IMPERFECTIONS 3. PROVIDES IMMEDIATE RESULTS 4. MINIMUM PART PREPARATION REQUIRED 5. MODERATE COST 6. INSPECTION FROM ONE SURFACE ONLY	1. SURFACE OF PART MUST BE ACCESSIBLE TO SONIC PROBE 2. ROUGH SURFACES INTERFERE WITH TEST RESULTS 3. METHOD IS DIRECTIONAL DEPENDING UPON SOUND BEAM - DEFECT ORIENTATION 4. HIGH DEGREE OF SKILL AND EXPERIENCE REQUIRED TO MAKE SET UP AND INTERPRET RESULTS FOR VARIOUS TEST CONDITIONS

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Comparison of Methods
Figure 1

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 2
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

5. Preparation for Testing

- A. Normally little preparation is necessary. When an inspection is required in a fuel tank area, it may be necessary to defuel the airplane. Preparation may consist of gaining access to the inspection area by removal of access doors, structural items, equipment or furnishings. With the exception of X-ray inspection, it may be necessary to clean the inspection area and in some cases the removal of finish, such as paint or sealant, will be required. Precautions must be taken to prevent unauthorized personnel from entering the area during X-ray inspection because of the radiation hazard.
- B. When it is necessary to strip paint or finish from parts, determine the type of material from which the part is made, then refer to 20-30-02 of the appropriate overhaul manual for stripping procedures.

NOTE: Restore finish after inspection.

6. Equipment Manufacturers and/or Suppliers

- A. The following is a partial list of manufacturers and/or suppliers of nondestructive inspection equipment identified in this manual. This list does not include all the manufacturers/suppliers of nondestructive inspection equipment and is not intended to exclude the use of others who produce equipment of equal performance characteristics (as called out in the applicable inspection procedure).

NONDESTRUCTIVE TEST EQUIPMENT SUPPLIERS

EDDY CURRENT INSTRUMENT AND PROBE MANUFACTURERS

FOERSTER INSTRUMENTS, INC.
140 INDUSTRY DRIVE
RIDC PARK WEST
PITTSBURGH, PA 15275
USA
PHONE: [412] 788-8976
FAX: [412] 788-8964

HOCKING KRAUTKRAMER BRANSON
50 INDUSTRIAL PARK ROAD
LEWISTOWN, PA 17044
USA
PHONE: [717] 242-0327
FAX: [717] 242-2606

HOCKING NDT, LTD.
129-135 CAMP ROAD
ST. ALBANS
HERTFORDSHIRE, AL15HP UK
ENGLAND
PHONE: [0727] 40321
FAX: [0727] 45058

INSTITUTE DR. FORSTER
PRUFGERATEBAU
GMBH & CO. KG
IN LAISEN 70 POSTFACH 1564
D-7410 REUTLINGEN
GERMANY
PHONE: [07121] 140-0
FAX: [07121] 140488

QUEST INTEGRATED
1012 CENTRAL AVENUE SOUTH
KENT, WA 98032
USA
PHONE: [253] 872-9500
FAX: [253] 872-8967
E-MAIL: contactqi2@qi2.com

ROHMANN GMBH
RUDOLF-DIESEL-STR. 13
D-67227 FRANKENTHAL
GERMANY
PHONE: 0 62 33-3789-0
FAX: 0 62 33-3789-77

STAVELEY INSTRUMENTS
421 NORTH QUAY
KENNEWICK, WA 99336
USA
PHONE: [509] 735-7550
FAX: [509] 735-4672

STAVELEY NDT
SUITE 205 SUNBEAM STUDIOS
SUNBEAM STREET
WOLVERHAMPTON, WV2 4NU UK
ENGLAND
PHONE: [01902] 20772
FAX: [01902] 20808

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

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Page 3
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

NONDESTRUCTIVE TEST EQUIPMENT SUPPLIERS (Continued)

EDDY CURRENT INSTRUMENT AND PROBE MANUFACTURERS

MAGNAFLUX
CENTURION NDT INC.
707 REMINGTON RD. SUITE 9
SCHAUMBURG, ILLINOIS 60173
USA
PHONE: [847] 884-4949
FAX: [847] 884-8772

NDT ENGINEERING CORP.
(OLYMPUS NDT)
421 N. QUAY STREET
KENNEWICK, WA 99336
USA
PHONE: [509] 736-2751
FAX: [509] 735-4672

TECHNA NDT
6707 S. 216TH STREET
KENT, WA 98032
USA
PHONE: [253] 872-2415
FAX: [253] 872-2416

UNIWEST
330 WEST CLARK STREET
PASCO, WA 99301
USA
PHONE: [509] 544-0720
FAX: [509] 544-0868

EDDY CURRENT PROBE MANUFACTURERS

AEROFAB NDT
8629 S 212TH ST
KENT, WA 98031
USA
PHONE: [253] 395-8706
EMAIL: fstearns@aerofabndt.com

ALL INSPECTION NDT, LTD.
59 LYNCHFORD ROAD
FARNBOROUGH, HANTS
ENGLAND
PHONE: [252] 514721
FAX: [252] 518030

EC/NDT
1020 SOUTH 344TH STREET
SUITE 214
FEDERAL WAY, WA 98003
USA
PHONE: [253] 815-0797
FAX: [253] 815-0827

GK ENGINEERING CORP.
21610 UNIT 1
LASSEN STREET
CHATSWORTH, CA 91311
USA
PHONE: [818] 347-1373
FAX: [818] 407-1983

TECHNA NDT
6707 S. 216TH STREET
KENT, WA 98032
USA
PHONE: [253] 872-2415
FAX: [253] 872-2416

VM PRODUCTS, INC.
P.O. BOX 44926
TACOMA, WA 98444
USA
PHONE: [253] 841-2939
FAX: [253] 841-3016

XACTEX CORP.
3704 STEARMAN AVE.
PASCO, WA 99301
USA
PHONE: [509] 545-6364
FAX: [509] 545-6597

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

BOEING PROPRIETARY - Copyright © Unpublished Work - See title page for details

Page 4
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

(Continued)

EDDY CURRENT PROBE MANUFACTURERS

NDT ENGINEERING CORP.
(OLYMPUS NDT)
421 N. QUAY STREET
KENNEWICK, WA 99336
USA
PHONE: [509] 736-2751
FAX: [509] 735-4672

ZETEC, INC.
1370 N.W. MALL
P.O. BOX 140
ISSAQUAH, WA 98027
USA
PHONE: [425] 392-5316
FAX: [425] 392-2086

NONDESTRUCTIVE TEST EQUIPMENT SUPPLIERS (CONT)

ULTRASONIC TRANSDUCER MANUFACTURERS ^{*[1]}

AEROFAB NDT
8629 S 212TH ST
KENT, WA 98031
USA
PHONE: [253] 395-8706
EMAIL: fstearns@aerofabndt.com

ALL INSPECTION NDT, LTD.
59 LYNCHFORD ROAD
FARNBOROUGH, HANTS
ENGLAND
PHONE: [252] 514721
FAX: [252] 518030

NDT ENGINEERING CORP.
(OLYMPUS NDT)
421 N. QUAY STREET
KENNEWICK, WA 99336
USA
PHONE: [509] 736-2751
FAX: [509] 735-4672

SEARCH UNIT (SU) SYSTEMS
DIVISION OF NDT ENGINEERING CORP.
(OLYMPUS NDT)
421 N. QUAY STREET
KENNEWICK, WA 99336
USA
PHONE: [509] 736-2751
FAX: [509] 735-4672

STAVELEY SENSORS, INC. ^{*[2]}
91 PRESTIGE PARK CIRCLE
EAST HARTFORD, CT 06108
USA
PHONE: [860] 289-5428
FAX: [860] 289-3189

TECHNA NDT
6707 S. 216TH STREET
KENT, WA 98032
USA
PHONE: [253] 872-2415
FAX: [253] 872-2416

XACTEX CORP.
3704 STEARMAN AVE.
PASCO, WA 99301
USA
PHONE: [509] 545-6364
FAX: [509] 545-6597

^{*[1]} SEE ALSO "ULTRASONIC INSTRUMENT AND TRANSDUCER MANUFACTURERS" (Table 1).

^{*[2]} AUTOMATION INDUSTRIES INC. TRANSDUCERS CAN BE PURCHASED FROM STAVELEY SENSORS, INC. USE THE AUTOMATION INDUSTRIES INC. PART NUMBER AS WRITTEN IN THE NDT INSPECTION PROCEDURE WHEN YOU ORDER THE TRANSDUCER.

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

BOEING PROPRIETARY - Copyright © Unpublished Work - See title page for details

Page 5
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

Table 1:

ULTRASONIC INSTRUMENT AND TRANSDUCER MANUFACTURERS

DUPONT NDT SYSTEMS, INC.
NDT INSTRUMENTS DIVISION
17811 GEORGETOWN LANE
HUNTINGTON BEACH, CA 92647
USA
PHONE: [714] 893-2438
FAX: [714] 897-3840

KRAUTKRAMER BRANSON
KB AEROTECH
50 INDUSTRIAL PARK ROAD
LEWISTOWN, PA 17044
USA
PHONE: [717] 242-0327
FAX: [717] 242-2606
TELEX: 842354

KRAUTKRAMER GMBH
ROBERT BOSCH STRASSE 3
P.O. BOX 1363
D-5030 HUERTH 5 (EFFEREN)
GERMANY
PHONE: 2233-6010
TELEX: 88866955

MAGNAFLUX
CENTURION NDT INC.
707 REMINGTON RD. SUITE 9
SCHAUMBURG, ILLINOIS 60173
USA
PHONE: [847] 884-4949
FAX: [847] 884-8772

PANAMETRICS
221 CRESCENT STREET
WALTHAM, MA 02254
USA
PHONE: [617] 899-2740
FAX: [617] 899-1552

SONATEST
4734 RESEARCH DRIVE
SAN ANTONIO, TEXAS 78240
USA
PHONE: [210] 697-0335
FAX: [210] 697-0767

STAVELEY INSTRUMENTS
421 NORTH QUAY
KENNEWICK, WA 99336
USA
PHONE: [509] 735-7550
FAX: [509] 735-4672

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SUITE 205 SUNBEAM STUDIOS
SUNBEAM ST
WOLVERHAMPTON, WV2 4NU UK
ENGLAND
PHONE: [01902] 20772
FAX: [01902] 20808

TOKIMEC INC.
2-16, MINAMI-KAMATA
OHTA-KU, TOKYO 144
JAPAN
PHONE: 03-3737-8621
FAX: 03-3737-8665
OR

C/O TECHNOPORT U.S.A., INC.
445 SOUTH FIGUEROA, SUITE 3770
LOS ANGELES, CA 90071
USA
PHONE: [213] 689-4747
FAX: [213] 689-0303

YOU CAN GET TOKIMEC INC. OR
TECHNOPORT INSTRUMENTS FROM:
ANA TRADING CORP. U.S.A.
AVIATION & MACHINERY DEPT.
333 SOUTH HOPE STREET
SUITE 3100
LOS ANGELES, CA 90071
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PHONE: [213] 620-1504
FAX: [213] 620-1448

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 6
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

X-RAY EQUIPMENT MANUFACTURERS

ANDREX RADIATION PRODUCTS
HALFDANSGADE 8 DK-2300
COPENHAGEN S.
DENMARK
PHONE: 45 3154 1540
FAX: 45 3154 9960

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FAX: [847] 884-8772

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FAX: 1 [203] 468-3017

INTERNATIONAL:
PANTAK SEIFERT
BOGENSTRABE 41
D-22926 AHRENSBURG
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PHONE: 49 4102/807-0
FAX: 49 4102/807-189

PHILIPS
INDUSTRIAL X-RAY SYSTEMS
ROENTGENSTRASSE 24-26 D 2000
HAMBURG 63
GERMANY
PHONE: [040] 50 78-0

PHILIPS ELECTRONIC INSTRUMENTS
INSPECTION SYSTEMS GROUP
5110 MEGINNES FERRY RD.
ALPHARETTA, GA 30202
USA
PHONE: [770] 751-4420
FAX: [770] 751-4456

STAVELEY INSTRUMENTS/QUALCORP
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KENNEWICK, WA 99336
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PHONE: [509] 735-7550
FAX: [509] 735-4672

X-IT
7676 CHARLES PAGE BLVD.
TULSA, OK 74127
USA
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FAX: [213] 948-5904

CONDUCTIVITY MEASUREMENT MANUFACTURERS

FISCHER TECHNOLOGY
750 MARSHALL PHELPS ROAD
WINDSOR, CT 06095
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PHONE: [860] 683-0781
FAX: [860] 688-8496

HOCKING KRAUTKRAMER BRANSON
50 INDUSTRIAL PARK ROAD
LEWISTOWN, PA 17044
USA
PHONE: [717] 242-0327
FAX: [717] 242-2606

INSTITUTE DR. FORSTER
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POSTFACH 1564
D-7410 REUTLINGEN
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K.J. LAW
42300 W. NINE MILE ROAD
NOVI, MI 48375-4103
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ALL

EFFECTIVITY

D6-37239

PART 1 51-01-00

Page 7
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

(Continued)

CONDUCTIVITY MEASUREMENT MANUFACTURERS

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NONDESTRUCTIVE TEST EQUIPMENT SUPPLIERS (CONT)

REFERENCE STANDARD MANUFACTURERS ^{*[1]}

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PHONE: [253] 395-8706
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FARNBOROUGH, HANTS
ENGLAND
PHONE: [252] 514721
FAX: [252] 518030

EC/NDT
1020 S. 344TH ST. STE 214
FEDERAL WAY, WA 98003
USA
PHONE: [253] 815-0797
FAX: [253] 815-0827

IDEAL SPECIALTY COMPANY
2531 E. INDEPENDENCE STREET
TULSA, OK 74100
USA
PHONE: [918] 834-1657
FAX: [918] 834-5338
TELEX: 350548 (ISCO.TUL)

YAMAMOTO SEIKI CO., LTD
HEAD OFFICE: 3-28-21 AKEBONO-CHO TACHIKAWA-
CITY
FACTORY: 2-7-2 NAGAOKA MIZUHO-CHO NISHITAMA-
GUN
TOKYO
JAPAN
PHONE: (81) 42-557-5761
FAX: (81) 42-557-5770
E-MAIL: kyosuke-yamamoto@yskjet.com
WEBSITE: <http://www.yskjet.com/>

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VM PRODUCTS, INC.
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USA
PHONE: [253] 841-2939
FAX: [253] 841-3016

^{*[1]} THESE ARE MANUFACTURERS OF REFERENCE STANDARDS THAT ARE SPECIFIED IN BOEING NDT PROCEDURES.

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

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737 NON-DESTRUCTIVE TEST MANUAL

FASTENER SUPPLIERS ^{*[1]}

ALLFAST FASTENING SYSTEMS, INC.
15200 DON JULIAN ROAD
CITY OF INDUSTRY, CA 91745
USA
PHONE: [626] 968-9388
FAX: [626] 968-9393

SIERRA PACIFIC SUPPLY
1801 WEST EL SEGUNDO BOULEVARD
COMPTON, CA 90222-1096
USA
PHONE: [310] 638-9318
FAX: [310] 638-8105

*[1] THESE ARE SUPPLIERS OF FASTENERS THAT ARE SPECIFIED IN BOEING REFERENCE STANDARD DRAWINGS.

NONDESTRUCTIVE TEST EQUIPMENT SUPPLIERS (CONT)

ULTRASONIC BOND INSPECTION EQUIPMENT

DUPONT NDT SYSTEMS, INC.
NDT INSTRUMENTS DIVISION
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PHONE: [714] 893-2438
FAX: [714] 897-3840

STAVELEY INSTRUMENTS
421 NORTH QUAY
KENNEWICK, WA 99336
USA
PHONE: [509] 735-7550
FAX: [509] 735-4672

FOKKER B.V - DEPT. INDUSTRIAL
PRODUCTS/APS
POSTBOX 12222
1100 AE AMSTERDAM - ZUIDOOST
THE NETHERLANDS
PHONE: 020-5647302

STAVELEY NDT TECHNOLOGIES
THE TECHNOLOGY CENTER
GLAISHER DRIVE
WOLVERHAMPTON SCIENCE PARK
WOLVERHAMPTON, WV10 9RU UK
ENGLAND
PHONE: [01902] 824180
FAX: [01902] 824181

JR TECHNOLOGY LTD.
81 NORTH END
MELDRETH, ROYSTON
HERTS, SG8 6NU UK
ENGLAND
PHONE: [01763] 260721
FAX: [01763] 260809

UNIWEST
330 WEST CLARK STREET
PASCO, WA 99301
USA
PHONE: [509] 544-0720
FAX: [509] 544-0868

MITSUMI (U.S.A.)
1001 FOURTH AVENUE
SUITE 3950
SEATTLE, WA 98154-1196
USA
PHONE: [206] 223-5636
FAX: [206] 223-5651

WICHITECH INDUSTRIES, INC.
8980-L ROUTE 108
COLUMBIA, MARYLAND 21045-2115
USA
PHONE: [410] 715-1076 OR [800] 776-4277 TOLL FREE
FAX: [410] 715-1078

ROHMANN INC.
154 BROAD STREET
NASHUA, NH 03063
USA
PHONE: [603] 595-4220
FAX: [603] 595-4221

ZETEC, INC.
1370 N.W. MALL
P.O. BOX 140
ISSAQUAH, WA 98027
USA
PHONE: [425] 392-5316
FAX: [425] 392-2086

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

BOEING PROPRIETARY - Copyright © Unpublished Work - See title page for details

Page 9
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

NONDESTRUCTIVE TEST EQUIPMENT SUPPLIERS (CONT)

PORTABLE C-SCAN EQUIPMENT MANUFACTURERS

ABB AMDATA, INC.
1000 DAY HILL ROAD
WINDSOR, CONNECTICUT 06095
USA
PHONE: [860] 688-2400
FAX: [860] 688-2722

INSPECTION RESEARCH &
TECHNOLOGIES LTD.
5 CONGRESS STREET
NASHUA, NH 03062
USA
PHONE: [603] 598-6688
FAX: [603] 598-6699

BOEING-MCDONNELL AIRCRAFT
AND MISSILES SYSTEMS
DEPT. 257, BLDG 102, M/S 1021111
P.O. BOX 516
ST. LOUIS, MO 63166
USA
PHONE: [314] 234-9028
FAX: [314] 777-2650

KRAUTKRAMER BRANSON
50 INDUSTRIAL PARK ROAD
LEWISTON, PA 17044-9990
USA
PHONE: [717] 242-0327 OR [717] 242-0331
TELEX: 842-354 KB AERO
FAX: [717] 242-2606

DUPONT NDT SYSTEMS, INC.
NDT INSTRUMENTS DIVISION
17811 GEORGETOWN LANE
HUNTINGTON BEACH, CA 92647
USA
PHONE: [714] 893-2438
FAX: [714] 897-3840

COMPOSITE REFERENCE STANDARD MANUFACTURERS ^{*[1]}

METALLIC AND NON-METALLIC REFERENCE STANDARDS:

APPLIED AEROSPACE STRUCTURES CORP.
3437 SOUTH AIRPORT WAY
STOCKTON, CA 95206
USA
PHONE: [209] 983-3245
FAX: [209] 983-3375

NDT ENGINEERING CORP.
(OLYMPUS NDT)
421 N. QUAY STREET
KENNEWICK, WA 99336
USA
PHONE: [509] 736-2751
FAX: [509] 735-4672

NON-METALLIC REFERENCE STANDARDS ONLY:

PRECISION AEROSPACE COMPOSITES
1516 FRYAR AVENUE
SUMNER, WA 98390
USA
PHONE: [206] 863-7868
FAX: [206] 863-7875

^{*[1]} THESE ARE MANUFACTURERS OF REFERENCE STANDARDS THAT ARE SPECIFIED IN BOEING NDT PROCEDURES.

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 10
Nov 15/2015



737 NON-DESTRUCTIVE TEST MANUAL

THERMOGRAPHY INSTRUMENT MANUFACTURERS

INFRARED CAMERA MANUFACTURERS

INDIGO SYSTEMS CORPORATION
5385 HOLLISTER AVE #103
SANTA BARBARA, CA 93111
USA
PHONE: [805] 964-9797
FAX: [805] 964-7708
WEBSITE: <http://www.indigosystems.com>

FLIR SYSTEMS, BOSTON
16 ESQUIRE ROAD
NORTH BILLERICA, MA 01862
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E-MAIL: infrared@raytheon.com

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FAX: [201] 405-0090
WEBSITE: <http://www.IRimaging.com/>

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TACHIKAWA-SHI, TOKYO 190-8537
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THERMAL IMAGING NDT SYSTEMS

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845 LIVERNOIS STREET
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FAX: 248-414-3764
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OPTICAL EQUIPMENT MANUFACTURERS

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7. Reference Standards, Transducer and Probe Positioners

- A. The majority of inspection procedures in this manual require the use of one or more reference standards and/or positioners to accomplish instrument calibration. The detailed construction of each item can be found in the specific procedure in which it is used. Each item may be manufactured locally or procured from one of the suppliers listed in Paragraph 6. A copy of the drawing page in the manual should be sent with each order to ensure that the items are made per the current drawing revision. Upon receipt of the order, it is the responsibility of the using facility to ensure that all items conform to the drawing requirements.
- B. Most of the reference standards in this manual are made from the same material as the part to be examined. Alternative materials can be used if the materials agree with the conditions that follow and the conditions (such as grain direction) that are specified on the reference standard drawings.

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

BOEING PROPRIETARY - Copyright © Unpublished Work - See title page for details

Page 11
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

- (1) The electrical conductivity is the significant property for reference standards that are used during eddy current inspections of aluminum materials. The material is not important if the electrical conductivity is in the range of the material specified. Each reference standard drawing identifies the material to use to make the reference standard. All other materials with equivalent electrical conductivity can be used.
 - (2) Steel reference standards that are used for eddy current inspections must be identified as magnetic or non-magnetic. The specific type of steel material is not important. What is important is that magnetic steel reference standards must be used to do a test of magnetic parts and non-magnetic reference standards must be used to do tests of non-magnetic parts.
 - (3) For reference standards used during ultrasonic inspections of aluminum, the electrical conductivity is not important. The electrical conductivity (that is, the heat treat condition) of aluminum does not have a large effect on the velocity of ultrasonic sound. The velocity of ultrasonic sound in all of the usual aluminum alloys such as 2024 and 7075 is almost equal. These aluminum alloys are interchangeable for use as reference standards for ultrasonic inspections.
 - (4) For reference standards used during ultrasonic inspections of steel, the type of steel material (which includes if it is magnetic or non-magnetic) is not important. The velocity of ultrasonic sound in all of the typical steel alloys is the same. Thus, all steels are interchangeable for use as reference standards during ultrasonic inspections of steels. Operators can use corrosion resistant steel (CRES) materials for protection from surface corrosion and pitting.
- C. There have been reports of very high ultrasonic sound attenuation in materials used to make ultrasonic reference standards. The reports have all been related to alloy steel materials (for example, 4330, 4340) that were examined at 10 MHz. This high sound attenuation causes very strong noise signals to occur and very high instrument gain. In some reports, it was not possible to calibrate the instrument.
- (1) A solution to this problem is to normalize the reference standard. To normalize the material, heat it in a furnace to 1650 degrees Fahrenheit for the time specified below and cool the part in air.

Part Thickness (inches)	Minimum Time (minutes)
Up to 0.25	35
0.251 to 0.500	55
0.501 to 1.000	70
1.001 to 1.500	90
1.501 to 2.000	105
2.001 to 2.500	130
2.501 to 3.000	150
more than 3.000	150 plus 23 for each 0.5 inch of added thickness

- (2) During normalization, a black oxide layer can occur on the parts. It is best to normalize the material before you machine so you can remove the oxide layer. To prevent the oxide layer during normalization, use a vacuum furnace and fill the furnace with an inert gas such as Argon to cool the part. Refer to BAC5617 for more data about normalization of alloy steels.
 - (3) It is necessary to normalize some, not all, of the ultrasonic reference standards in this manual as shown on the reference standard drawings. Normalize other reference standards if they attenuate too much of the sound.
- D. Reference Standards and the procedures that use them are identified in the table that follows for all airplane models.

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 12
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
1	707	6	57-10-07, FIG.5
1	707	6	57-10-07, FIG.21
2	707	6	57-10-07, FIG.5
3	707	6	57-10-07, FIG.5
4	707	6	57-10-07, FIG.5
5	707	6	57-10-07, FIG.8
6	707	6	57-10-07, FIG.6
7	707	6	57-10-07, FIG.6
8	707	6	57-10-07, FIG.6
9	707	6	57-10-07, FIG.6
11	707	6	57-10-07, FIG.21
12	707	6	57-10-07, FIG.41
13	707	6	57-10-07, FIG.41
14	707	6	57-10-07, FIG.30
15	707	6	57-10-07, FIG.30
16	707	6	57-10-07, FIG.30
17	707	6	57-10-07, FIG.22
18	707	6	57-10-07, FIG.22
19	707	6	57-10-07, FIG.18
20	707	6	57-10-07, FIG.11
21	707	6	57-10-07, FIG.11
22	707	6	57-10-07, FIG.17
23	707	6	57-10-07, FIG.17
24	707	6	57-10-07, FIG.19
25	707	6	57-10-07, FIG.19
26	707	6	57-10-07, FIG.40
27	707	6	57-10-07, FIG.40
28	707	6	57-10-07, FIG.39
29	707	6	57-10-07, FIG.39
30	707	6	57-10-07, FIG.27
31	707	6	57-10-07, FIG.28
32	707	6	57-10-07, FIG.28
33	707	6	57-10-07, FIG.28
A34	707	6	57-10-07, FIG.31
35	707	6	57-10-07, FIG.32
36	707	6	57-10-07, FIG.32
37	707	6	57-30-07, FIG.5
38	707	6	57-30-07, FIG.8
39	707	6	57-30-07, FIG.8
40	707	6	57-30-07, FIG.12
41	707	6	57-10-07, FIG.70

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
41	707	6	57-30-07, FIG.10
42	707	6	57-10-07, FIG.61
43	707	6	57-10-07, FIG.55 AND FIG.70
44	707	4	57-30-07, FIG.7
45	707	4	57-30-07, FIG.7
46	707	4	57-30-07, FIG.7
47	707	4	57-30-07, FIG.8
48	707	4	57-30-07, FIG.8 AND FIG.9
49	707	4	57-30-07, FIG.8
50	707	4	57-30-07, FIG.9
51	707	6	57-10-07, FIG.48
52	707	6	57-10-07, FIG.48
53	707	6	57-10-07, FIG.46
54	707	6	57-10-07, FIG.46
55	707	6	57-10-07, FIG.47
56	707	6	57-10-07, FIG.47
57	707	6	57-10-07, FIG.54
58	707	6	57-10-07, FIG.66
59	707	6	57-10-07, FIG.66
60	707	6	57-10-07, FIG.57 AND FIG.66
61	707	6	57-10-07, FIG.66
62	707	6	57-10-07, FIG.57
63	707	6	57-10-07, FIG.50
64	707	6	57-10-07, FIG.50
65	707	6	57-10-07, FIG.50
66	707	6	57-10-07, FIG.50
67	707	6	57-10-07, FIG.49
68	707	6	57-10-07, FIG.49
69	707	6	57-10-07, FIG.56
70	707	6	57-10-07, FIG.56
71	707	6	57-10-07, FIG.56
72	707	6	57-10-07, FIG.56
73	707	6	57-10-07, FIG.56
74	707	4	57-10-07, FIG.2
75	707	6	57-10-07, FIG.68

2125184 S0000458352_V2

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 1 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239





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Page 13
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
A76	707	6	57-10-07, FIG.73
77	707	4	57-10-07, FIG.3
78	707	4	57-10-07, FIG.3
79	707	4	57-10-07, FIG.5 AND FIG.10
80	707	4	57-10-07, FIG.5
81	707	4	57-10-07, FIG.4 AND FIG.9
82	707	4	57-10-07, FIG.4
A83	707	6	52-30-07, FIG.3
A84	707	6	52-30-07, FIG.2
A85	707	6	53-30-07, FIG.3 AND FIG.5
87	707	6	57-10-07, FIG.65
88	707	6	57-10-07, FIG.65
89	707	6	57-10-07, FIG.65
90	707	6	57-10-07, FIG.65
91	707	6	57-10-07, FIG.65
92	707	6	57-10-07, FIG.83
93	707	4	57-10-07, FIG.6
94	707	4	57-10-07, FIG.2 AND FIG.6
95,PF4	707	4	57-10-07, FIG.2
95,PF1,PF2	707	4	57-10-07, FIG.3 AND FIG.6
96	707	4	57-10-07, FIG.6 AND FIG.7
97	707	4	57-10-07, FIG.7
98	707	4	57-10-07, FIG.9
98PF3	707	4	57-10-07, FIG.7
99	707	6	57-10-07, FIG.63
100	707	4	57-10-07, FIG.8
101	707	6	57-10-07, FIG.74
102	707	6	57-10-07, FIG.74
103	707	6	57-10-07, FIG.72
104	707	4	57-40-07, FIG.2
105	707	4	57-40-07, FIG.2
106	707	4	57-40-07, FIG.2
107	707	4	57-40-07, FIG.2
108	707	4	57-40-07, FIG.2
109	707	4	57-40-07, FIG.3
110	707	6	57-10-07, FIG.76
111	707	6	57-10-07, FIG.76
112	707	6	57-10-07, FIG.82
113	707	6	57-10-07, FIG.78
114	707	6	57-10-07, FIG.81
115	707	6	57-10-07, FIG.86 FIG.88 AND FIG. 89
117	707	4	57-10-07, FIG.11
118	707	4	57-10-07, FIG.11
119	707	4	57-10-07, FIG.11
120	707	4	55-10-07, FIG.4
120P	707	4	55-10-07, FIG.4
121	707	6	53-10-07, FIG.17
121G	707	6	53-10-07, FIG.17
122	707	4	57-30-07, FIG.11
123	707	4	52-10-07, FIG.1
123	727	4	52-10-27, FIG.1

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
123	737	4	52-10-01
124	707/727	4	56-20-27, NO.1
125		6	51-00-00, NO.2
125		6	51-00-05
126		6	51-00-00, NO.4 AND NO.23
126		6	51-00-01
126	707	6	53-10-07, FIG.19
126	727	6	57-10-07, FIG.13
126	737	6	53-10-27, NO.51
			53-10-08,
			53-10-33,
			53-10-39,
			53-10-43,
			53-10-45,
			53-10-48,
			53-10-49,
			53-10-55,
			53-10-57,
			53-10-64,
			53-10-65,
			53-10-67,
			53-10-85,
			53-10-86,
			53-10-87,
			53-10-88,
			53-10-91,
			53-10-93,
			53-11-03,
			53-11-04,
			53-11-06,
			53-11-07,
			53-11-09,
			53-11-11,
			53-11-15,
			53-11-17,
			53-11-21,
			53-11-22,
			53-11-24,
			53-11-30,
			53-11-33,
			53-11-35,
			53-30-28,
			53-30-32,
			53-30-34,
			53-30-43,
			53-30-48,
			53-40-05,
			55-10-02,
			55-10-05,
			55-10-09,
			55-10-13,
			55-10-23,
			55-10-24,
			55-10-27,
			55-10-29,
			55-10-33,
			55-10-36,
			55-10-37,

2125327 S0000458353_V6

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 2 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 14
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
126	737	6	55-10-58, 55-10-60, 55-30-05, 55-50-06, 55-50-07, 55-50-08, 55-50-09, 57-10-19, 57-10-20, 57-10-22, 57-10-24, 57-10-27, 57-10-28, 57-10-33, 57-10-34, 57-10-36, 57-10-37, 57-10-43, 57-10-44, 57-10-46, 57-10-49, 57-10-50, 57-10-51, 57-10-65, 57-10-66, 57-10-67, 57-10-68, 57-10-69, 57-10-70, 57-10-76, 57-10-78, 57-10-80, 57-10-82, 57-10-84, 57-30-05, 57-30-07, 57-30-08, 57-30-09, 57-30-10, 57-50-03, 57-50-10, 57-50-11, 57-50-12, 57-50-21, 57-50-28
126	747	6	53-10-37, 53-10-38, 53-10-40, 53-10-53, 53-10-55, 53-30-00, FIG. 2 53-30-24, 57-10-36, 57-10-39
126	757	6	52-30-03, 53-10-10, 53-10-11, 53-10-13, 53-10-14,

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
126	757	6	53-10-17, 53-10-22, 53-10-23, 53-10-90, 53-40-01, 53-40-04, 53-40-05, 53-60-07, 53-60-08, 53-60-10, 55-10-04, 57-10-56, 57-10-57, 57-50-05, 57-50-06, 57-50-07, 57-51-07, 57-51-10, 71-20-02
126	767	6	53-10-04, 53-10-07, 53-10-08, 53-10-10, 53-30-15, 53-30-16, 53-50-05, 53-50-06, 53-60-05, 55-10-03, 55-10-04, 55-10-05, 57-10-03, 57-10-04, 57-20-05, 57-50-03, 57-50-05
126	777	6	51-00-01 NO.1,2 52-30-03, 53-10-13, 53-30-01, 53-30-02, 53-30-03, 53-30-04, 53-30-05, 53-30-06, 53-40-01, 53-40-06, 53-50-04, 53-50-05, 53-60-01, 53-60-05, 53-60-07, 53-60-08, 53-60-09, 53-60-10, 53-60-11, 53-60-12,

2125356 S0000458354_V8

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 3 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

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Page 15
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
126	777	6	53-60-13, 53-70-04, 53-80-02, 53-80-05, 54-51-12, 54-51-14, 54-51-29, 54-51-30, 54-51-35, 55-27-01, 57-10-03, 57-20-02, 57-20-08, 57-50-02, 57-50-03, 57-50-05, 57-50-06, 57-50-07, 57-50-08, 57-50-09, 57-50-11, 57-50-12, 57-50-15, 57-50-16, 57-50-17
126	787	6	51-00-01 NO.1
127	1	6	51-00-00 NO.5, NO.12 AND NO.21
127	2	6	51-00-02 AND 51-00-10
127A	1	6	51-00-00 NO.5 AND NO.12
127A	2	6	51-00-02 AND 51-00-10
128	1	6	51-00-00 NO.7
128	2	6	51-00-06
128P	1	6	51-00-00 NO.7
128P	2	6	51-00-06
130-XXX	1	6	53-50-00 NO.1
130-350	2	6	53-10-01
130A,B,C	1	6	53-50-00 NO.1
130A,B,C	2	6	53-10-01
130C	777	6	53-10-01
131	707	4	53-10-07, FIG.2
131P	707	4	53-10-07, FIG.2
132	707	4	53-10-07, FIG.3
132PR,PL	707	4	53-10-07, FIG.3
133P1,P2	707	4	53-40-07, FIG.1
133	707	4	53-40-07, FIG.1
134P1,P2	707	4	53-40-07, FIG.2
134	707	4	53-40-07, FIG.2
135	707	4	53-10-07, FIG.4
136A,B	707	4	57-40-07, FIG.1
137A-C	707	4	57-30-07, FIG.4
138	707	4	32-20-07, FIG.2

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
138P	707	4	32-20-07, FIG.2
139	707	4	32-20-07, FIG.2
139P	707	4	32-20-07, FIG.2
140	707	4	55-10-07, FIG.1
140P1A,P2	707	4	55-10-07, FIG.1
141	707	4	55-10-07, FIG.2
141P1,P2	707	4	55-10-07, FIG.2
142	707	4	57-10-07, FIG.1
143	707	4	57-10-07, FIG.1
144	707	4	57-10-07, FIG.1
145	707	4	57-10-07, FIG.1
146	707	4	57-30-07, FIG.1
147P	707	4	57-30-07, FIG.3
147	707	4	57-30-07, FIG.2
148	707	4	57-30-07, FIG.5
149	707	4	57-30-07, FIG.6
150P1,P2	707	4	54-40-07, FIG.1
150	707	4	54-40-07, FIG.1
151	707	4	54-40-07, FIG.1
152	707	4	54-40-07, FIG.1
153	707	4	54-40-07, FIG.1
154	707	4	54-40-07, FIG.1
155	707	4	54-40-07, FIG.1
156	707	4	57-30-07, FIG.10
156P	707	4	57-30-07, FIG.10
157	707	4	53-10-07, FIG.5
158	707	4	57-40-07, FIG.4
159	707	4	55-30-07, FIG.1
160	707	4	57-40-07, FIG.5
A161	707	6	53-10-07, FIG.2
162	707	6	55-10-07, FIG.4
163	707	6	57-10-07, FIG.2
164	707	6	57-10-07, FIG.3
165	707	6	57-10-07, FIG.3
166	707	6	57-10-07, FIG.3
167	707	6	57-10-07, FIG.3
168	707	6	57-10-07, FIG.4
169	707	6	57-10-07, FIG.4
170	707	6	57-10-07, FIG.4
171	707	6	57-10-07, FIG.4
172	707	6	57-10-07, FIG.4
173	707	6	57-30-07, FIG.1 AND FIG.2
174A-C	707	6	57-30-07, FIG.3
175	707	6	57-10-07, FIG.29
176	707	6	57-30-07, FIG.6
177	707	6	53-10-07, FIG.12
178	707	6	57-10-07, FIG.1
179	707	6	57-10-07, FIG.1
180	707	6	57-10-07, FIG.1
A181	707	6	55-10-07, FIG.1 AND FIG.2
182	707	6	55-10-07, FIG.3 AND FIG.8

2125357 S0000458356_V8

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 4 of 20)

ALL EFFECTIVITY








PART 1 51-01-00

D6-37239

Page 16
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
183	707	4	32-10-07, FIG.2
184P1,P2	707	4	57-30-07, FIG.1
185		6	51-00-00 NO.13 AND NO.24
185		6	51-00-12, 51-00-21
185	727	6	57-40-27 NO.2, 57-53-01, 57-53-02
185	737	6	53-10-72, 54-40-04, 54-40-05, 54-40-06, 54-40-07, 55-10-35, 57-50-03, 57-50-04, 57-50-05, 57-50-06, 57-50-09, 57-50-10, 57-50-22, 57-50-26
185	747	6	53-10-43
185	757	6	57-50-04
185	767	6	57-50-14, 57-50-15, 57-50-16
185	777	6	51-00-04 NO.1,2, 54-51-05, 54-51-08, 54-51-10, 54-51-35, 57-50-01, 57-50-11, 57-50-13, 57-50-15
185	787	6	51-00-01 NO.1
186A THRU F		6	51-00-00 NO.1
186A THRU F		6	51-00-04
186A THRU F	777	6	53-10-12
186A	767	6	53-50-08
186A,B	767	6	53-30-09
186B	767	6	53-30-11
186C	777	6	53-40-02
187		6	51-00-00 NO.4 AND NO.23
187		6	51-00-01
188A		6	51-00-00 NO.4 AND NO.23
188A	727	6	55-30-27, 57-10-28
188A	737	6	53-10-50, 53-10-57, 53-10-64, 53-10-73,

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
188A	737	6	53-10-75, 53-10-77, 53-10-78, 53-10-79, 53-10-82, 53-10-83, 53-10-84, 53-10-88, 53-10-92, 53-10-95, 53-10-96, 53-10-97, 53-10-98, 53-10-99, 53-11-01, 53-11-02, 53-11-05, 53-11-06, 53-11-09, 53-11-11, 53-11-14, 53-11-17, 53-11-19, 53-11-20, 53-11-23, 53-11-25, 53-11-26, 53-11-28, 53-11-31, 53-11-35, 53-11-38, 53-30-32, 53-30-35, 53-30-36, 53-30-47, 53-40-05, 55-10-20, 55-10-25, 55-10-31, 55-10-38, 55-10-39, 55-10-41, 55-10-52, 55-10-54, 55-10-58, 55-10-59, 57-10-64, 57-10-73, 57-10-74, 57-10-77, 57-10-83, 57-30-10, 57-50-11, 57-50-14
188A	747	6	53-10-37, 53-10-48, 53-10-53, 53-10-55, 53-30-12,

2125364 S0000458357_V9

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 5 of 20)

ALL EFFECTIVITY

PART 1 51-01-00


D6-37239


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Page 17
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
188A	747	6	53-30-24, 57-40-11, 57-40-12
188A		6	51-00-01, 51-00-19
188A	757	6	52-30-03, 53-10-02, 53-10-03, 53-10-09, 53-10-18, 53-10-21, 53-10-22, 53-40-01, 53-40-02, 53-40-03, 53-60-02, 53-60-03, 53-60-05, 53-60-06, 53-60-10, 53-60-12, 54-40-04, 54-40-07, 55-10-14, 57-20-04, 57-51-06, 57-51-07, 57-51-09, 57-51-10, 71-20-02
188A	767	6	52-32-04, 53-10-05, 53-10-07, 53-10-08, 53-10-10, 53-10-19, 53-30-07, 53-30-08, 53-30-10, 53-30-13, 53-50-05, 53-50-06, 53-50-07, 53-50-10, 53-50-11, 53-60-02, 53-60-05, 53-60-06, 53-60-07, 53-60-08, 53-60-09, 53-80-05, 55-10-05, 57-10-01, 57-10-04, 57-50-07, 57-50-17

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
188A	777	4 6	57-20-04 51-00-01 NO.1 52-30-01, 52-30-02, 52-30-04, 53-10-13, 53-10-14, 53-30-04, 53-30-05, 53-30-07, 53-40-04, 53-50-05, 53-60-01, 53-60-02, 53-60-04, 53-60-05, 53-60-09, 53-60-10, 53-60-11, 53-60-13, 53-60-14, 53-70-04, 53-80-01, 53-80-02, 54-51-17, 54-51-22, 54-51-28, 54-51-36 55-18-01, 57-10-01, 57-20-06, 57-20-07, 57-54-02, 57-50-03, 57-50-05, 57-50-10, 57-50-16
188A 189	787 737	6 6	51-00-01 NO.1 53-10-65, 53-10-67, 53-10-85, 53-11-03, 53-11-12, 55-10-58, 55-10-65, 57-10-52, 57-50-12, 57-50-13, 57-50-14
189	747	6	53-10-37, 53-10-53, 53-30-24, 55-10-12
189		6	51-00-00 NO.4 AND NO.23

2125365 S0000458358_V9

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 6 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 18
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
189	2	6	51-00-01
189	757	6	51-00-19, 53-10-17, 53-40-01, 53-40-02
189	767	6	51-00-19, 53-10-07, 53-10-08, 53-30-10, 53-50-06, 55-10-05
189	777	6	51-00-01 NO.1 53-10-10, 53-10-11, 53-10-13, 53-10-14, 53-30-01, 53-30-02, 53-30-04, 53-30-05, 53-40-03, 53-40-04, 53-40-05, 53-50-05, 53-60-02, 53-60-03, 53-60-04, 53-60-10
189	787	6	51-00-01 NO.1
190 THRU 192	1	6	51-00-00 NO.13 AND NO.24
190 THRU 192	2	6	51-00-12, 51-00-21
192	737	6	57-50-06
192	777	6	51-00-04 NO.1,2
192	787	6	51-00-03 NO.1
194,194A	1	6	53-30-00 NO.1, NO.3 AND NO.4
194,194A	757	6	53-30-02, 53-30-03, 53-30-04
194,194A	767	6	53-30-01, 53-30-02, 53-30-03
194,194A	777	6	53-00-01
196	727	4	53-10-27 NO.5
198ABCDEF	727	6	20-10-27
198ABCDEF	737,757	6	20-10-01
A201	727	6	55-10-27 NO.3
202A,B	727	6	57-10-27 NO.8
203	727	6	57-10-27 NO.8
204	727	6	57-10-27 NO.8
205A,B	727	6	57-10-27 NO.8
206	727	6	57-10-27 NO.19
208	727	6	57-10-27 NO.19

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
A210	727	6	52-30-27, FIG.1
216	727	6	55-30-27, FIG.2
220A,B	727	6	53-10-27, FIG.36
230	727	6	53-10-27, FIG.21
231	727	6	53-10-27, FIG.28
233	727	6	53-10-27, FIG.15
236A-E	727	6	53-10-27, FIG.30
238SE,SSE	727	6	53-10-27, FIG.8
238SA-SD	727	6	53-10-27, FIG.8
238SSA-SSD	727	6	53-10-27, FIG.8
239	727	6	57-10-27, FIG.18
240	727	6	57-10-27, FIG.18
241	727	6	53-40-27, FIG.1
242	727	6	53-40-27, FIG.1
243	727	6	53-40-27, FIG.1
248	727	4	53-10-27, FIG.3
249	727	6	53-10-27, FIG.37
250,M	727	6	57-30-27, FIG.2
251 AND 251A	727	6	57-30-27, FIG.3
251A	727	4	57-30-27, FIG.1
253	727	4	53-10-27, FIG.4
254	727	6	57-40-27, FIG.2
255	727	6	53-10-27, FIG.29
A256	727	6	53-10-27, FIG.40
A257	727	6	53-10-27, FIG.40
A258	727	6	53-10-27, FIG.40
A259	727	6	53-10-27, FIG.40
A260	727	6	53-10-27, FIG.40
261	727	6	53-10-27, FIG.27
262	727	6	53-10-27, FIG.11
262A	727	6	53-10-27, FIG.11
263	727	6	53-10-27, FIG.6
264	727	6	53-10-27, FIG.42
A265A-E	727	6	52-30-27, FIG.4
A266	727	6	57-50-27, FIG.1
270A-B	727	6	54-20-27, FIG.1
271	727	6	32-30-27, FIG.2
272	727	6	55-10-27, FIG.2
273	727	6	53-10-27, FIG.26
275	727	4	32-30-27, FIG.1
275P	727	4	32-30-27, FIG.1
276	727	4	32-30-27, FIG.2
276P	727	4	32-30-27, FIG.2
277	727	4	32-30-27, FIG.2
278P	727	4	32-30-27, FIG.3
278	727	4	32-30-27, FIG.3
279P	727	4	32-30-27, FIG.3
279	727	4	32-30-27, FIG.3
280PA,PB,PC	727	4	32-30-27, FIG.4
280	727	4	32-30-27, FIG.4
281A-C	727	4	53-30-27, FIG.1
282	727	4	57-10-27, FIG.1
284P	727	6	57-10-27, FIG.21
284	727	6	57-10-27, FIG.21

2125367 S0000458359_V5

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 7 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

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Page 19
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
285	727	6	57-10-27, FIG.20
286	727	6	57-10-27, FIG.20
287	727	4	32-10-27, FIG.1
290	727	6	53-30-27, FIG.5
291	727	6	54-40-27, FIG.1
292	727	6	53-10-27, FIG.46
293A,B	727	6	53-30-27, FIG.9
A294	727	6	53-30-27, FIG.10
295	727	4	53-30-27, FIG.2
295	727	6	53-30-27, FIG.8
2962	727	6	53-30-27, FIG.7
298	727	4	32-30-27, FIG.5
A299	727	6	53-10-27, FIG.47
A305	737	6	57-10-18 AND 57-30-03
A306	737	6	57-10-07
312	737	6	53-10-17
313A,B	737	6	53-10-17
315	737	4	55-30-01
316	737	4	55-30-01
317	737	6	53-10-16
320	737	6	53-10-19
321	737	6	53-10-19
323A,B AND P	737	6	55-50-01
326	737	4	53-10-28
328A-D	737	6	53-10-38
335	737	6	53-10-31
336A-B	737	6	57-30-02
338A-B	737	6	53-10-35
341	737	6	53-10-40
343A-B	737	6	55-10-01
345	737	4	57-40-01
349	737	6	32-10-01
350	737	4	32-20-01
350P	737	4	32-20-01
351A,B	737	4	53-10-01
A352	737	6	53-10-04
353A-D	737	6	53-10-12 AND 53-10-15
354A-C	737		57-30-04
355A-C	737	6	57-30-04
356	737	6	53-30-04
357	737	6	55-30-04
358	737	6	55-10-06
359	737	6	55-10-06
362	737	4	53-20-01
363	737	4	53-30-03
365,G	737	4	71-20-01
367	737	6	71-20-01
A368	737	6	53-10-42
369	727	6	53-30-27, FIG.4 AND FIG.6
369	737	6	53-30-05, 53-30-41
369A	727	6	53-30-27, FIG.5

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
370	737	4	53-30-01, 53-30-02
373A,P2	737	4	32-10-02
375	737	4	55-10-02
A376	737	6	53-10-45
378	737	6	53-10-44
379	737	6	57-40-02
380X	737	6	32-10-01
383,PX.X	737	6	53-30-07
384A,B	737	6	53-40-04
A386	737	6	53-10-45
A389A	737	6	53-10-64
A389A,B,C	737	6	53-10-41
401	747	4	57-10-01, 57-30-02
402	747	4	57-10-04
403A,B	747	4	57-10-04
404	747	6	57-10-08
405	747	4	57-10-02
406	747	6	57-10-09
408	747	4	57-10-03
409	747	4	54-30-03
410	747	4	57-10-05
411	747	6	55-10-04
412	747	6	55-10-01
413	747	4	54-40-03
413A,AP	747	4	54-40-03
414	747	4	54-40-03
419P	747	4	54-40-03
419	747	4	54-40-03
420P	747	4	54-40-02
423	747	6	57-10-17
424	747	6	57-10-17
425A-C	747	4	54-40-03
426	747	4	55-10-01
A428	747	6	53-10-15
A429	747	6	53-10-15
A430	747	6	53-10-15
431	747	6	53-10-19
432	747	6	57-30-02
433	747	4	32-10-01
434A,B	747	6	53-10-06
435	747	6	57-10-20
436	747	6	57-10-20
437	747	4	53-10-01
438	747	4	53-10-01
439	747	6	57-10-22
440	747	4	57-10-11
441	747	4	57-10-10
442	747	4	53-10-02
443	747	4	53-10-02
446	747	4	57-10-13
447	747	4	57-10-13
448	747	4	57-10-13
449	747	4	57-10-13

2125369 S0000458360_V5

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 8 of 20)

ALL EFFECTIVITY







PART 1 51-01-00

D6-37239

Page 20
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER	REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
450PA	747	4	54-40-05, 54-40-06, AND 54-40-21	604A-B	767	6	53-60-01
451P	747	4	54-40-04	605,605A	767	6	22-10-01
452P	747	4	54-40-04	A607	767	6	53-80-02
453P	747	4	54-40-04	A607A	767	6	53-80-02
454/454P	747	4	54-40-01	608P1,P2	767	4	27-80-01
455	747	4	53-40-01	608	767	4	27-80-01
456	747	4	53-40-01	610	767	4	32-20-01
457	747	4	54-40-07	1000A,B	707	6	55-10-07
458A-C	747	6	53-10-10	1001		6	51-00-00, FIG.15
A459	747	6	53-10-13			6	51-00-15
460	747	6	57-10-28	1002		6	51-00-00, FIG.14
461PL	747	4	57-40-01			6	51-00-13
461P/461PR	747	4	57-40-01		737	6	53-30-47, 54-40-08, 55-10-19, 55-10-21, 55-10-40, 57-50-20, 57-50-23, 57-50-24, 57-50-25, 57-50-27
461-6,-9	747	4	57-40-01	1002	747	6	57-40-07, 57-40-10
462PL50	747	4	57-40-01		757	6	53-10-13, 57-50-03
462PR50	747	4	57-40-01		747	6	57-40-08
462G	747	4	57-40-01		767	6	57-50-09
462PR29	747	4	57-40-01		777	6	53-10-04, 53-10-08, 53-10-15, 54-51-03, 54-51-05, 54-51-06, 54-51-11, 54-51-16, 54-51-33, 55-12-01, 55-17-01, 55-17-02, 57-50-01, 57-50-04, 57-50-06
462PL29	747	4	57-40-01				51-00-00, FIG.14
463	747	6	53-10-27	1003 THRU 1005		6	51-00-13
464A-B	747	6	53-10-01			6	53-10-04, 53-10-15
471	747	4	57-30-02	1004	737	6	53-10-71, 53-10-74, 53-30-47, 55-10-16, 55-10-18
474	747	6	53-10-20				
475	747	6	57-10-27				
476	747	6	53-10-18				
477	747	6	53-10-18				
478	747	6	53-10-18				
479	747	6	53-10-22				
480	747	6	53-10-22				
481	747	6	53-10-22				
482	747	6	55-10-08				
483	747	6	55-10-08				
484A,B	747	6	53-10-25				
485A,B	747	6	53-10-23				
486	747	4	54-40-08				
486PA,PB	747	4	54-40-08				
490	747	4	57-30-06				
491A-C	747	6	53-10-16 AND 53-10-21				
497	767	6	53-00-04				
497C,G,P	747	6	53-30-00, FIG.2				
497C,G,P	767	6	53-00-04				
499	747	2	57-40-02				
499	747	2	57-40-01				
503	757	6	53-30-01				
504	757	6	54-40-01				
505	757	4	54-30-01				
506	757	4	57-40-01				
601PA,PF	767	4	52-30-01				
601	767	4	52-30-01				
602	767	4	32-10-01				
603	767	4	55-10-01				
603P	767	4	55-10-01				

2125372 S0000458361_V7

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 9 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

BOEING PROPRIETARY - Copyright © Unpublished Work - See title page for details

Page 21
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
1004	737	6	55-10-34, 57-50-09, 57-50-25
1004	747	6	57-40-10
1004	767	6	57-50-12
1004	777	6	54-51-14, 54-51-27, 54-51-34, 55-12-01, 57-50-04, 57-50-07
2001	727	4	28-10-27, FIG.1
2002	727	4	53-10-27, FIG.6
2004ABCD	727	6	28-10-27, FIG.1
2005	727	4	28-10-27, FIG.2
2006	727	6	57-10-27, FIG.20
4001A-E	747	4	54-30-02
4001P	747	4	54-30-02
4003	747	4	53-40-01
4004	747	4	53-40-01
4005	747	6	53-10-31
4007P	747	4	54-40-05 AND 54-40-06
4007P (M)	747	4	54-40-05
4008	747	6	53-10-28
4009	747	6	32-10-01
A4010	747	6	53-10-33
4011	747	4	54-40-03
4012	747	4	54-40-03
4016	747	4	54-40-03
4018P	747	4	54-40-02
4019	747	6	53-30-04
4020	747	4	53-30-01
4021P	747	4	54-40-03
A4024	747	6	53-10-33
4025	747	6	53-10-36
4027	747	4	54-40-10
4028G,P	747	4	57-40-03
4028	747	4	57-40-03
4028P	747	4	57-40-05
4029	747	4	55-50-01
4029P	747	4	55-50-01
4030,A,B	747	4	54-40-08
4031,A,B	747	4	54-40-08
4032	747	4	54-40-08
4033	747	6	53-10-35
4034	747	4	53-40-02
4035	747	4	53-40-02
4036G	747	4	57-40-05
4036	747	4	57-40-05
4037PA	747	4	54-40-05
4039PA	747	4	54-40-05
4047P1,P2	747	4	54-40-05
4047P3,P4	747	4	54-40-05
4052	747	6	57-40-03, 57-40-04
4053A,B,C	747	4	53-40-03

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
4057	747	6	53-30-02, 53-30-03, 53-30-06
4059	747	4	57-10-12
4061	747	4	57-10-15
4062A,B,C	747	6	57-10-23
4064	747	6	53-30-02, 53-30-06
4065	747	6	53-30-08
4068	747	6	53-30-09
4071	747	4	54-40-10
4072,C	747	6	53-30-05
4074	747	4	54-40-02
4075	747	4	54-40-02
4076	747	4	54-40-05, 54-40-06, 54-40-15
4077	747	4	54-40-04
4078	747	4	54-40-04
4079	747	4	54-40-04
4080	747	4	57-40-01
4081	747	4	57-40-01
4083	747	4	54-40-06, 54-40-15
4084	747	4	54-40-02
4085	747	4	54-40-05
4086	747	4	54-40-05
4087	747	4	54-40-05
4088	747	4	54-40-05
4089	747	4	54-40-05
4243	747	6	57-10-31
CHRS-2-3	787	4	51-00-17
CHRS-2-3-.5D	787	4	51-00-17
CHRS-2-6	787	4	51-00-17
CHRS-2-6-.5D	787	4	51-00-17
CHRS-2-9	787	4	51-00-17
CHRS-2-9	787	4	55-10-02, 55-30-02
CHRS-2-9-.5D	787	4	51-00-17
CHRS-2-12	787	4	51-00-17
C12-DIS-3C2N	787	4	55-10-02, 55-30-02
G11-STD-1,-2	787	4	55-30-01
G11-STD-1,-2	787	6	55-10-01
G11-STD-3	787	6	57-40-01
MIT BH-STD-1, -2,-3	737,747	6	51-00-29
MIT BH-STD-1, -2,-3	757,767	6	51-00-25
MIT BH-STD-1, -2,-3	777	6	51-00-18
NDT194B		6	53-30-00,FIG.1, FIG.3 AND FIG.4
NDT194B	757	6	53-30-02, 53-30-03, 53-30-04

2125373 S0000458363_V5

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 10 of 20)

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 22
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER	REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT194B	767	6	53-30-01, 53-30-02, 53-30-03	NDT539	757	6	55-10-02
NDT194B	777	6	53-00-01	NDT542	757	4	55-10-07
NDT297	727	4	32-30-27, FIG.5	NDT546	757	4	57-20-02
NDT298	727	4	32-30-27, FIG.5	NDT549	757	6	57-20-02
NDT298PR, PL	727	4	32-30-27, FIG.5	NDT552	757	4	57-20-01
NDT322A	737	6	53-10-25	NDT553	757	6	52-30-02
ANDT388	737	6	53-10-48, 53-10-49	NDT554	757	6	53-10-07
ANDT390A	737	6	53-10-46, 53-10-47	NDT555	757	6	53-10-19
ANDT390B	737	6	53-10-46 53-10-47	NDT558	737	6	53-30-40
NDT391	737	6	53-10-51	NDT558	757	6	53-30-12
NDT392	737	4	53-30-03	NDT559	757	6	57-51-01
NDT394,P	737	6	54-30-01	NDT560	757	4	57-50-02
NDT396	737	6	53-30-09, 53-30-18, 55-10-07	NDT560P1,P2	757	4	57-50-02
NDT396-XX/XX	737	6	53-30-44	NDT561	757	4	57-50-02
NDT398	737	4	53-10-01	NDT561P1,P2	757	4	57-50-02
NDT504A	757	6	54-40-01, 54-40-02	NDT562	757	4	57-25-01
NDT504B	757	6	54-40-01, 54-40-02	NDT564A,B	757	4	57-50-01
NDT504C	757	6	54-40-01, 54-40-02	NDT566	757	4	54-50-03
NDT504D	757	6	54-40-01, 54-40-02	NDT568	757	6	57-51-05
NDT511	757	6	57-10-02	NDT569	757	6	53-40-07
NDT512	757	4	57-10-01	NDT570	757	6	53-60-09
NDT514	757	6	57-20-01	NDT572	757	6	53-10-23
NDT515	757	4	57-21-01	NDT573	757	6	53-40-06
NDT516	757	6	57-23-01	NDT574	757	6	53-60-11
NDT518	757	4	57-21-02	NDT575	757	6	53-60-12
NDT519	757	6	52-30-01	NDT576	757	4	54-50-04
ANDT520	757	6	52-30-02	NDT577	757	6	53-10-12
NDT521	757	4	55-10-02	NDT578	757	6	55-10-04
NDT522, P1	757	4	53-80-01	NDT579	757	6	54-40-05
NDT523	757	6	53-60-04	NDT580	757	6	54-40-06
NDT524	757	6	53-10-06, 53-10-08	NDT581	757	6	57-50-09
NDT525	757	4	54-50-01	NDT582	757	6	57-50-08
ANDT527	757	6	53-30-06	NDT583	757	6	57-50-10
NDT528	757	4	55-10-04	NDT596	727	4	52-30-01
NDT530	757	6	53-10-04	NDT611 THRU	767	6	54-51-01
NDT531	757	6	53-30-07, 53-60-01	NDT613			
NDT532	757	4	55-10-05	NDT614	767	4	57-20-01
NDT533	757	4	55-10-03	NDT615	767	4	53-80-01
NDT535	757	4	55-10-01	NDT616	767	4	27-40-01
NDT536	757	4	53-40-01	NDT616P	767	4	27-40-01
NDT537	757	4	57-10-02	NDT617	767	6	53-80-03
NDT538	757	6	55-10-05	NDT618	767	6	53-80-03
				NDT618A	767	6	53-80-03
				NDT619	767	4	27-40-01
				NDT619P	767	4	27-40-01
				NDT620	767	4	53-60-01
				NDT621	767	4	57-10-01
				NDT622	767	6	57-20-01
				NDT623	767	4	57-10-03
				NDT625	767	4	55-10-03
				NDT627	767	4	57-10-02
				NDT628	767	4	53-50-01
				NDT629	767	4	57-40-01
				NDT630	767	4	55-10-02
				NDT631	767	4	71-20-01
				NDT632	767	4	71-20-01
				NDT636	767	6	32-10-02, 32-10-03

2125374 S0000458364_V5

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 11 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

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Page 23
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT636	767	4	32-10-01,
			32-10-02
NDT637	767	6	32-10-04
NDT638	767	4	57-40-02
NDT642	767	4	53-50-02,
			53-50-03
NDT643	767	6	57-20-03
NDT644	767	4	57-20-02
NDT648	767	6	53-30-06
NDT650	767	6	57-04-01
NDT651	767	6	57-04-01
NDT652	767	6	57-20-07
NDT655,G	767	4	54-50-03
NDT656,G	767	4	54-50-03
NDT657	767	6	53-10-09
NDT658	767	4	53-10-01
NDT660	767	6	53-80-04
NDT661	767	4	53-30-01
NDT662	767	4	57-20-03
NDT663A,B	767	6	53-10-13
NDT664	767	6	57-20-06
NDT665	767	6	53-10-06
NDT666A,B,C	767	6	57-20-08
NDT667	767	4	54-50-05
NDT668	767	6	57-50-01
NDT669	767	4	32-10-05
NDT670	767	4	53-10-02
NDT671	767	4	53-30-12
NDT672	767	6	54-50-01
NDT674	767	4	54-50-06
NDT675	767	4	54-50-06
NDT676	767	4	54-50-07
NDT679	767	4	53-50-05
NDT680	767	4	32-10-06
NDT684	767	6	52-32-02
NDT685	767	6	52-32-01,
			52-32-04,
			53-10-18,
			53-10-19
NDT686	767	6	53-50-09
NDT687	767	4	57-50-08
NDT688	767	4	57-50-03
NDT690	767	4	57-50-04
NDT691	767	6	57-50-08
NDT693	767	4	53-50-04
NDT694	767	4	57-50-05
NDT695	767	4	57-50-05
NDT697	767	4	57-50-07
NDT698	767	4	57-50-03
NDT702	787	4	51-00-09
NDT703	777	6	57-60-01
NDT706	777	6	53-10-01
NDT706P	777	6	53-10-01
NDT707	777	4	52-80-01
NDT709	777	4	57-60-01
NDT710	777	6	54-51-01

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT711	777	6	54-51-01
NDT712	777	6	54-51-01
NDT713	777	6	53-10-02
NDT714	777	6	53-10-03
NDT722-P1,	777	6	55-17-02
-P2,-P3			
NDT723	777	4	78-30-03
NDT724	777	4	78-30-03
NDT725,P1,P2	777	4	55-17-01
NDT726	777	6	54-51-04
NDT727G	777	6	54-51-06
NDT728	777	4	57-20-02,
			57-20-06
	777	6	57-20-05
NDT729	777	4	53-10-03
NDT730	777	4	57-54-01
NDT731	777	4	53-40-01,
			53-40-04
NDT732A	777	6	55-17-03
NDT733	777	4	53-40-03
NDT734	777	4	57-54-02
NDT734P1	777	4	57-54-02
NDT734P2L	777	4	57-54-02
NDT734P2R	777	4	57-54-02
NDT735	777	4	53-40-02
NDT736	777	4	53-60-01
NDT737	777	6	53-50-03
NDT738	777	4	53-10-02
NDT739	777	4	53-10-02
NDT740	777	4	53-10-01
NDT741	777	4	57-12-01
NDT741-1,-2	777	6	53-00-11
NDT744	777	4	53-10-09
NDT745	777	6	57-20-01
NDT746	777	6	53-60-07
NDT748	777	4	54-51-01
NDT753	777	4	57-20-04
NDT754	777	6	53-80-03
NDT755	777	6	53-60-07
NDT756	777	6	53-60-07
NDT760	777	6	53-60-06
NDT761	777	4	53-80-01
NDT762	777	4	54-51-02
NDT763	777	4	54-51-04
NDT766	777	4	57-10-02,
			57-10-03
NDT767	777	4	57-10-02,
			57-10-03
NDT768	777	4	57-10-01
NDT769	777	4	57-10-01
NDT770	777	4	57-20-05
NDT771	777	4	57-10-05
NDT772	777	4	57-10-04
NDT773	777	4	57-10-04
NDT773-G1	777	4	57-10-04

2125379 S0000458365_V6

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 12 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 24
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER	REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT774	777	4	57-10-05	NDT1017	767	6	53-30-11,
NDT775	777	6	54-51-15,				53-60-09
			54-51-24	NDT1018	767	6	53-50-12
NDT776	777	4	54-51-03	NDT1018	777	6	53-40-02
NDT778	777	4	78-30-05	NDT1019	737	6	57-10-72
NDT779	777	4	54-51-01	NDT1019	757	6	53-60-13
NDT780-X	777	4	57-50-01	NDT1019	767	6	57-50-04
NDT781	777	6	57-40-02	NDT1020	737	6	57-10-71
NDT786-X	777	6	57-10-04	NDT1020	767	6	57-50-04
NDT787	777	6	53-80-06	NDT1021	737	6	55-10-48,
NDT802A,B	777	4	51-00-07,				57-10-71
			51-00-09,	NDT1021	767	6	53-50-12
			51-00-12	NDT1022 THRU	1	6	51-00-00 NO.17
NDT803A	787	4	51-00-20	NDT1027			
NDT803A,B	787	4	51-00-07,	NDT1022 THRU	2	6	51-00-14
			51-00-09,	NDT1027	777	6	51-00-07
			51-00-11,	NDT1027			
			51-00-12,	NDT1022 THRU	787	6	51-00-06
			51-00-15,	NDT1027			
			51-00-16,	NDT1024	737	6	55-10-22
			51-00-19	NDT1025	737	6	55-10-22
NDT809	787	4	51-00-10	NDT1027	737	6	55-10-49
NDT1002 THRU	787	6	51-00-05 NO.1	NDT1027	777	6	54-51-32
NDT1005				NDT1027-0.9125	777	6	54-51-23
NDT1006 THRU	1	6	53-30-00 NO.5	ANDT1028	707	6	53-10-07, FIG.18
NDT1009				ANDT1029A	707	6	53-30-07, FIG.12
NDT1006 THRU	2	6	53-00-06	ANDT1029B	707	6	53-30-07, FIG.12
NDT1009				NDT1031	707	6	57-10-07, FIG.93
NDT1008	727	6	53-30-27 NO.15	NDT1033	1	4	51-40-00 NO.1
NDT1008	747	6	53-30-10	NDT1033	2	4	51-00-01
NDT1009	727	6	53-30-27 NO.15	NDT1033-N	787	4	51-00-01
			AND NO.16	NDT1034	707	6	53-30-07, FIG.13
ANDT1015	1	6	51-00-26,	NDT1036,	707	4	54-40-07, FIG.2
			53-30-00 NO.5	-P1, -P2 AND			
ANDT1015	2	6	51-00-23,	-P4			
			53-00-06	NDT1037	1	6	51-00-00 NO.21
ANDT1015	777	6	51-00-16,	NDT1038	1	1	51-05-01
			53-00-06	NDT1038	707,787	4	51-00-05
NDT1016	737	6	53-10-80,	NDT1038	2	1	51-05-01
			55-10-51	NDT1038	777,787	1	51-05-01
NDT1016	757	6	53-60-13	NDT1039-t ₁ /t ₂	1,787	4	51-00-05
NDT1016	767	6	53-50-08	NDT1039-t ₁ /t ₂	757	4	53-30-01
NDT1016 THRU	1	6	51-00-00 NO.16	NDT1040	1	6	51-00-00 NO.19
NDT1021				NDT1040	767	6	54-50-02
NDT1016 THRU	2	6	51-00-16	NDT1040 THRU	2	6	51-00-17
NDT1021				NDT1045			
NDT1016 THRU	777	6	51-00-02 NO.3	NDT1040 THRU	787	6	51-00-04 NO.1
NDT1021				NDT1045			
NDT1016 THRU	787	6	51-00-02 NO.1				
NDT1021							
NDT1016 THRU	737	6	53-10-81,				
NDT1017			53-11-13,				
			55-10-54				
NDT1017	757	6	53-60-13				
NDT1017	757	6	57-50-02				

2125382 S0000458366_V7

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 13 of 20)

ALL EFFECTIVITY

PART 1 51-01-00















D6-37239

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Page 25
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER	REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT1041		6	51-00-00 NO.19	NDT1048	777	6	53-30-01, 53-30-04, 53-30-05, 53-40-05, 53-50-05, 53-60-02, 53-60-04, 54-51-14, 57-10-02, 57-20-05
NDT1041	737	6	57-50-16	NDT1048	787	6	51-00-01 NO.1
NDT1042		6	51-00-00 NO.19	NDT1049	737	6	53-30-33
NDT1042	737	6	57-50-16	ANDT1049	737	6	53-30-33
NDT1043		6	51-00-00 NO.19	ANDT1049 THRU	727	6	53-30-27, FIG.18
NDT1043	737	6	57-50-17	ANDT1052			
NDT1044		6	51-00-00 NO.19	ANDT1049 THRU		6	51-00-26, 53-30-00 NO.5
NDT1044	777	6	54-51-09	ANDT1057			
NDT1045		6	51-00-00 NO.19	ANDT1049 THRU		6	51-00-23, 53-00-06
NDT1046		9	51-00-01, 51-00-02	ANDT1057 THRU	777	6	51-00-23
NDT1046	767	9	57-50-01	ANDT1057			
NDT1046	777	9	51-00-01	ANDT1051	737	6	53-10-76
NDT1046-X	787	9	51-00-01, 51-00-02	ANDT1051	747	6	53-10-56, 53-30-10, 53-30-15
NDT1047		6	51-00-00 NO.22	ANDT1052	737	6	53-10-83, 53-11-37
NDT1048		6	51-00-00 NO.4 AND NO.23	ANDT1052	747	6	53-30-15
NDT1048	737	6	53-10-89, 53-30-42, 53-30-43, 53-30-48, 53-30-51, 57-10-75, 57-30-11, 57-50-12	ANDT1052	777	6	53-50-02
NDT1048	747	6	53-10-49, 53-30-12, 53-30-24, 55-10-11	ANDT1053	737	6	53-11-27, 53-30-49
NDT1048		6	51-00-01, 51-00-19	ANDT1053	757	6	53-10-16
NDT1048	757	6	53-10-05, 53-10-16, 57-51-08, 57-51-09, 57-51-10, 57-51-11	ANDT1055	737	6	53-11-36
NDT1048	767	6	53-32-01, 53-10-07, 53-10-08, 53-10-18, 53-50-06, 53-60-06, 53-60-07, 55-10-05	ANDT1056	737	6	53-30-49
NDT1048	777	6	51-00-01 NO.1, 53-10-10, 53-10-13, 53-10-14,	ANDT1056	777	6	53-50-02
				ANDT1057	737	6	57-10-48
				NDT1061		6	51-00-00 NO.13 AND NO.24
				NDT1061	727	6	57-53-01
				NDT1061	737	6	57-50-09
				NDT1061		6	51-00-12, 51-00-21
				NDT1061	777	6	51-00-04 NO.1,2
				NDT1061	787	6	51-00-03 NO.1
				NDT1062		6	51-00-00 NO.13 AND NO.24
				NDT1062	727	6	57-53-01
				NDT1062	737	6	54-40-05, 54-40-07, 54-40-09, 54-40-10, 57-10-90, 57-50-22, 57-50-26

2125384 S0000458367_V9

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 14 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 26
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT1062	2	6	51-00-12, 51-00-21
NDT1062	767	6	57-50-15, 57-50-16
NDT1062	777	6	51-00-04 NO.1,2, 54-51-10, 54-51-18
NDT1062	787	6	51-00-03 NO.1
ANDT1068	707	6	53-10-07, FIG.21
NDT1069A,B	737	6	53-30-19, 53-30-25
NDT1070A,B	727	6	53-30-27 NO.19
NDT1071	1	6	51-00-00 NO.25
NDT1071	2	6	51-00-22
NDT1071	777	6	51-00-12
NDT1072 THRU NDT1075	1	6	51-00-00 NO.13
NDT1072 THRU NDT1075	2	6	51-00-12, 51-00-21
NDT1072 THRU NDT1075	777	6	51-00-04 NO.1,2
NDT1072 THRU NDT1075	787	6	51-00-03 NO.1
ANDT1077	1	6	51-00-26, 53-30-00
ANDT1077	2	6	51-00-23, 53-00-06
ANDT1077	777	6	51-00-16, 53-00-06
ANDT1079 ANDT1079 THRU ANDT1082	767 1	6	53-80-06
ANDT1079 THRU ANDT1082	2	6	53-30-00 NO.7
NDT1083	757	6	57-50-07
NDT1083	2	6	51-00-17
NDT1083	777	6	51-00-05 NO.2
NDT1083	787	6	51-00-04 NO.1
NDT1083-0.880	757	6	71-20-01
NDT1083-0.913	757	6	71-20-01
NDT1083-1.286	757	6	54-40-03
NDT1084	737	6	55-10-26
NDT1084	757	6	57-50-06, 57-50-07
NDT1084	2	6	51-00-16
NDT1084	777	6	51-00-02 NO.3, 54-51-13, 54-51-31, 57-10-02, 57-50-15
NDT1084	787	6	51-00-02 NO.1

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT1085-XXX	1	6	53-30-23
NDT1085-XXX	2	6	53-00-10
NDT1085-XXX	777	6	53-00-08
NDT1086-P1,-P2	757	4	53-00-01
NDT1086-XXX	1	4	53-30-05
NDT1086-XXX	757	4	53-00-01
NDT1086-XXX	767	4	53-00-01
NDT1087-1	727	6	53-30-27 NO.23
NDT1087-1	737	6	53-30-08
NDT1087-3	727	6	53-30-27 NO.23
NDT1087-3	737	6	53-30-17
NDT1087-6	767	6	53-10-20
NDT1087-9	767	6	52-32-03
NDT1087-P1	1	6	53-30-00, NO.9
NDT1087-P1	737	6	53-30-08, 53-30-50
NDT1087-P1	757	6	53-30-13
NDT1087-P1	2	6	53-00-11
NDT1087-P1	767	6	52-32-03
NDT1087-P1	777	6	53-00-09
NDT1087-X	1	6	53-30-00 NO.9
NDT1087-X	737	6	53-30-50
NDT1087-X	757	6	53-30-13
NDT1087-X	2	6	53-00-11
NDT1087-X	777	6	53-00-09
NDT1088-050/063	747	6	53-30-17
NDT1088-050/063	757	6	53-00-13
NDT1088-062/071	747	6	53-30-17
NDT1088-072/050	727,737	6	53-30-24
NDT1088-072/050	757	6	53-30-09
NDT1088-095/071	747	6	53-30-17
NDT1088-112/100	747	6	53-30-17
NDT1088-112/100	777	4	53-00-02
NDT1088-133/071	747	6	53-30-17
NDT1088-144/050	727,737	6	53-30-24
NDT1089	737	6	54-40-03
NDT1091	1	6	51-00-00 NO.15
NDT1092-t ₁ /t ₂	1	9	51-00-03, 51-00-04
NDT1092-t ₁ /t ₂	757-777	9	51-00-03, 51-00-04
NDT1093-t ₁ /t ₂	1	9	51-00-03, 51-00-04
NDT1093-t ₁ /t ₂	757-777	9	51-00-03, 51-00-04
NDT1094-040,-A	737	4	53-30-07, 53-30-09
NDT1094-040,-A	757	4	53-30-02, 53-30-03
NDT1094-XXX,-A	737	4	53-30-07, 53-30-09
NDT1094-XXX,-A	1	4	53-30-06

2125386 S0000458368_V8

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 15 of 20)

ALL EFFECTIVITY

PART 1 51-01-00



D6-37239



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Page 27
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT1094-XXX,-A	757	4	53-30-02,
			53-30-03
NDT1094-XXX,-A	757-777	4	53-00-02
NDT1095	727-747	6	53-30-30
NDT1095	757	6	53-00-16
NDT1095	767	6	53-00-14
NDT1095	777	6	53-00-10
NDT1096-XXX		4	53-30-08
NDT1096-XXX		4	53-00-03
NDT1096-XXX	777	4	53-00-03
NDT1096-110	777	4	53-00-04
NDT1096-130	777	4	53-00-04
NDT1096-155	777	4	53-00-04
NDT1097-A	737	6	53-30-25
NDT1097-B	737	6	53-30-25
NDT1097-C	737	6	53-30-25
NDT1099	757	6	53-30-14
NDT1099F	757	4	53-30-04
NDT1099F-P1	757	4	53-30-04
NDT1102-XXX	787	6	51-00-11
NDT1106	727-747	4	51-00-05
ANDT2007	727	6	53-10-27 NO.48
			AND NO.49
ANDT2008	727	6	52-30-27 NO.7
NDT2011-A	727	6	53-30-27 NO.13
NDT2011-B	727	6	53-30-27 NO.13
NDT2011-C	727	6	53-30-27 NO.13
NDT2011-D	727	6	53-30-27 NO.13
NDT2012	727	6	53-30-27 NO.14
NDT2013	727	4	32-10-27 NO.2
NDT2013-P2	727	4	32-10-27 NO.2
NDT2014	727	4	53-30-27 NO.3
NDT2015	727	4	53-30-27 NO.4
NDT2016	727	6	54-40-27 NO.2
NDT2017	727	4	57-10-27 NO.3
NDT2018-A	727	6	53-30-27 NO.13
NDT2018-B	727	6	53-30-27 NO.13
NDT2018-C	727	6	53-30-27 NO.13
NDT2018-D	727	6	53-30-27 NO.13
NDT2019	727	6	57-40-27 NO.3
NDT2023A,B,C	727	6	53-30-00 NO.21
NDT2024 THRU	727	6	53-30-27 NO.22
NDT2029			
NDT2031	727	6	55-30-27
NDT2032-A	727	6	57-10-28
NDT3001	727	4	53-10-27 NO.7
NDT3001	737	4	53-10-02
NDT3004	737	6	53-30-10,
			53-30-11
ANDT3004	737	6	53-30-12
NDT3005	737	6	53-30-13
ANDT3006	737	6	53-30-14
NDT3008 THRU	737	6	54-40-01,
NDT3010			54-40-02
NDT3011	737	6	53-30-10
NDT3012	737	4	53-10-03

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT3014-A,-B	737	4	27-00-01
NDT3015	737	6	53-30-15
ANDT3016-B	737	6	53-10-54
NDT3019	727	6	53-30-27 NO.17
NDT3019	737	6	53-30-16
NDT3021	737	4	57-50-01
NDT3021	737	6	57-50-01
NDT3023,	737	4	32-10-02
P1,P2,P3			
NDT3023	737	4	32-10-03
NDT3024	737	4	53-10-04
NDT3024A	737	4	53-10-04
NDT3030	737	4	57-10-01
NDT3036	737	6	55-10-08
NDT3038,-P1	737	4	57-50-02
NDT3039	737	4	53-30-04
NDT3041	737	6	57-50-15
NDT3043	737	4	57-50-03
NDT3044	737	4	57-50-03
NDT3045	737	6	57-50-19
NDT3046	737	4	53-20-01
NDT3047	737	6	53-10-62
NDT3048	737	6	53-10-56
NDT3049	737	6	53-10-67
NDT3050	727	6	53-30-21
NDT3050	737	6	53-30-20,
			53-30-29
NDT3052	737	6	57-10-25,
			57-10-26
NDT3053	737	6	53-30-21
NDT3054	737	4	57-10-04
NDT3062	737	4	57-10-02
NDT3065		6	53-30-22
NDT3065	747	6	53-30-18
NDT3065		6	53-00-09
NDT3065	777	6	53-00-04,
			53-00-07
NDT3065-STL	777	6	53-00-07
NDT3068	737	4	52-10-02
NDT3070	737	6	57-10-30
NDT3071	737	6	53-10-65
NDT3073	737	6	57-10-31
NDT3075	727	6	53-30-25,
			53-30-26
NDT3075	737	6	53-30-26,
			53-30-27
NDT3075	747	6	53-30-20
NDT3077	737	6	53-10-69
NDT3078	737	6	53-10-38
NDT3080	737	4	55-30-02
NDT3080-B	737	4	55-30-02
NDT3081	737	4	55-10-01
NDT3082A,B,C	737	6	53-10-70
NDT3083	737	4	55-10-03
NDT3085A,B,C	737	6	57-10-32
NDT3086A,B,C	737	6	57-10-32

2125387 S0000458369_V10

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 16 of 20)

ALL

EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 28
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER	REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT3090A	737	6	53-10-52	NDT3166-006	737	4	57-10-09,
NDT3090B	737	6	53-10-52				57-10-14
NDT3090C	737	6	53-10-52	NDT3166-007	737	4	57-10-08,
NDT3091	737	6	53-30-27				57-10-10,
NDT3091	747	6	53-30-20				57-10-13,
NDT3092	737	4	53-10-05				57-10-15
NDT3094	737	4	55-10-11	NDT3167-X	737	6	57-10-58
NDT3098	737	4	55-10-07	NDT3168	737	6	57-10-53
NDT3099	737	4	55-10-06	NDT3169	737	6	57-10-48
NDT3100	737	4	55-10-08	NDT3170	737	4	57-10-06
NDT3101	737	4	55-10-12	NDT3171	737	4	57-10-06
NDT3102	737	4	55-10-10	NDT3172	737	4	57-10-05
NDT3104	737	4	55-10-04	NDT3176-X	737	6	57-10-59
NDT3105	737	4	55-10-15	NDT3178-X	737	6	57-10-62
NDT3106	737	6	55-10-30	NDT3179-X	737	6	53-30-39
NDT3107	737	4	55-10-09	NDT3180-X	737	6	57-10-61
NDT3109	737	4	53-80-01	NDT3181-A	737	6	57-10-63
NDT3111	737	4	55-10-05	NDT3181-B	737	6	57-10-63
NDT3114	737	6	53-30-31	NDT3181G	737	6	57-10-63
NDT3115	737	6	53-30-31	NDT3182-A	737	6	57-10-63
NDT3116	737	4	53-10-06	NDT3182-B	737	6	57-10-63
NDT3117	737	6	54-40-03	NDT3182G	737	6	57-10-63
NDT3118	737	6	52-30-01	NDT3183	737	6	57-10-63
NDT3120	737	6	55-10-28	NDT3184	737	6	57-10-63
NDT3121	737	6	55-10-28,	NDT3185-A	737	6	57-10-63
			55-10-32	NDT3185-B	737	6	57-10-63
NDT3129	737	6	53-30-38	NDT3185G	737	6	57-10-63
NDT3130	737	6	53-30-37	NDT3185G/	737	6	57-10-63
NDT3131	737	6	53-11-10	NDT3184G			
NDT3132	737	6	53-11-18	NDT3186	737	4	57-10-17
NDT3132B	737	6	53-11-18	NDT3187	737	4	57-10-17,
NDT3133	737	6	53-11-16				57-10-18
NDT3136	737	4	55-10-14	NDT3189	737	4	55-10-18
NDT3139	737	4	53-10-07	NDT3191	737	6	55-10-28,
NDT3141	737	4	55-10-13				55-10-55
NDT3141G1	737	4	55-10-13	NDT3192	737	6	55-10-28
NDT3142	737	6	53-11-08	NDT3193	727	6	51-00-28
NDT3144	737	4	55-10-16	NDT3193	737	6	51-00-28
NDT3145	737	4	55-10-16	NDT3193	747	6	51-00-28
NDT3146	737	4	55-10-16	NDT3194-XX/XX	737	6	53-30-45
NDT3147	737	4	53-30-10	NDT3202-E	737	6	55-10-57
NDT3148	737	6	55-10-43	NDT3202-F	737	6	55-10-56
NDT3149	737	6	53-30-41	NDT3202-G	737	6	55-10-53
NDT3150	737	6	55-10-42	NDT3204	737	4	53-10-08
NDT3151	737	6	53-30-46	NDT3207	737	6	55-10-50
NDT3152-X	737	6	57-10-55	NDT3208-C	737	6	55-10-55
NDT3153-X	737	6	57-10-54	NDT3210	737	6	57-10-81
NDT3156	737	6	57-10-60	NDT3211	737	6	57-10-81
NDT3157	737	6	57-10-60	NDT3212	737	6	57-10-81
NDT3159	737	6	57-10-60	NDT3214	737	4	53-10-09
NDT3161	737	6	57-10-60	NDT3217-A	737	6	57-10-79
NDT3162	737	6	57-10-60	NDT3217-B	737	6	57-10-79
NDT3163	737	6	57-10-60	NDT3218	737	6	55-10-53
NDT3164	737	6	57-10-60	NDT3220	737	4	57-50-04
NDT3166-003	737	4	57-10-07,	NDT3220-P	737	4	57-50-04
			57-10-09,	NDT3221	737	4	55-10-19
			57-10-11,				
			57-10-16				

2125389 S0000458370_V7

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 17 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

BOEING PROPRIETARY - Copyright © Unpublished Work - See title page for details

Page 29
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT3223	737	6	53-11-34
NDT3224	737	4	54-40-01
NDT3228-A,-B, -C	737	6	57-10-87
NDT3229	737	6	53-30-50
NDT3230	737	4	53-30-11
NDT3231	737	4	53-10-10
NDT3232-A,-B, -C	737	6	57-10-86
NDT3233	737	4	53-30-11
NDT3234	737	6	57-10-89
NDT3236	737	6	57-10-85, 57-10-88
NDT3237-XXX -XXX,-P1	737	4	53-30-12
NDT3240	737	6	57-10-90
NDT4058	747	6	27-10-02
NDT4090	747	6	54-40-08
NDT4093	747	6	54-40-06
NDT4094	747	6	54-40-08
NDT4096	747	6	54-40-12
NDT4097	747	6	54-40-12
NDT4098	747	6	54-40-07, 54-40-10, 54-40-11, 54-40-12, 57-40-05 54-40-11,
NDT4099	747	6	54-40-12
NDT4100	747	6	57-40-06
NDT4101	747	6	54-40-09
NDT4104	747	4	53-10-06
NDT4105	747	6	57-10-35
NDT4106-G1, -G2,-G3	747	4	54-30-05
NDT4107,-G5	747	4	54-30-06
NDT4108	747	4	54-30-06
NDT4109	747	4	54-30-08
NDT4115	747	4	54-30-07, 54-30-09, 54-30-10
NDT4116	747	4	54-40-02
NDT4117	747	4	54-40-02
NDT4118	747	4	54-40-02
NDT4121	747	6	54-40-13
NDT4123	747	4	54-30-10
ANDT4125	747	6	53-10-39
ANDT4126		6	53-30-00, FIG. 6
ANDT4126		6	53-30-05
NDT4128	747	4	54-40-12
NDT4129	747	4	54-40-12
NDT4130	747	6	54-40-13
NDT4131,P	747	4	54-40-11
NDT4132	747	4	54-40-11
NDT4133	747	4	54-40-11
NDT4144	747	6	57-40-09

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT4147	747	4	54-40-13
NDT4147P	747	4	54-40-13
NDT4147PL	747	4	54-40-13
NDT4147PR	747	4	54-40-13
NDT4150	747	4	57-22-01
NDT4151	747	4	57-10-17, 57-10-21
NDT4152	747	4	53-10-07
NDT4153	747	4	57-30-08
NDT4153	747	4	57-30-09
NDT4154	747	4	54-40-14
NDT4155	747	4	54-40-14
NDT4156	747	4	54-40-14
NDT4157	747	4	54-40-14
NDT4162P	747	4	54-40-14
NDT4163P	747	4	54-40-14
NDT4164P	747	4	54-40-14
NDT4165P	747	4	54-40-14
NDT4170	747	4	53-30-02
NDT4171	747	4	54-40-09
NDT4171G	747	4	54-40-09
NDT4171P	747	4	54-40-09
NDT4173	747	6	53-30-11
NDT4174G1, G2,P	747	4	54-40-15
NDT4175	747	6	53-10-41
NDT4176	747	6	53-10-41
NDT4178	747	4	53-40-05
NDT4179	747	4	53-40-04
NDT4180	747	6	57-10-37, 57-10-38
NDT4182	747	4	54-40-16, 54-40-18
NDT4183	747	4	53-30-03
NDT4185	747	4	54-40-17
NDT4187	747	4	57-10-18
NDT4188	747	4	54-40-19
NDT4188G	747	4	54-40-19
NDT4189	747	4	54-40-20
NDT4190,A	747	6	53-10-34
NDT4191	747	4	54-40-21
NDT4192	747	4	54-40-21
NDT4195 THRU NDT4199	747	6	54-40-14
NDT4200	747	4	57-10-20
NDT4201	747	6	54-40-07
NDT4202	747	6	54-40-13
NDT4203	747	6	54-40-10 AND 54-40-13
NDT4204	747	6	53-10-45
NDT4205	747	4	57-40-07
NDT4206	747	4	54-40-22
NDT4208	747	4	54-40-23
NDT4209	747	4	53-10-08
NDT4210	747	4	51-20-01

2232616 S0000497935_V6

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 18 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 30
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT4211	747	4	53-10-08
NDT4212	747	4	53-10-09
NDT4214	747	6	53-30-08
NDT4215	747	6	53-10-15
NDT4217	747	6	53-30-14
ANDT4218	747	6	53-10-51
NDT4219	747	4	53-10-11
NDT4220	747	6	53-30-13
NDT4221	747	6	53-30-12
NDT4222	747	6	54-40-15
ANDT4223	747	6	53-10-33
NDT4224	747	4	54-40-24
NDT4224	767	4	54-50-05
NDT4225	747	6	53-10-47
NDT4226	747	4	57-10-22
NDT4228	747	6	54-40-16
NDT4229	747	6	54-40-16
NDT4230	747	4	53-10-10
NDT4231	747	4	57-10-18
NDT4232	747	4	55-10-03
NDT4233	747	4	55-10-03
NDT4234	747	4	55-10-03
NDT4235	747	4	55-10-03
NDT4236	747	6	53-30-16
NDT4237	747	6	53-30-16
NDT4238	747	6	53-30-16
NDT4239	747	6	53-30-16
NDT4240	747	4	27-20-01
NDT4240P	747	4	27-20-01
NDT4241	747	4	53-30-04
NDT4243	747	6	57-10-31
NDT4244	747	4	53-10-12
NDT4245	747	4	54-40-25
NDT4246	747	6	53-10-34
NDT4247	747	4	27-60-01
NDT4248	747	4	53-10-13
NDT4249	747	6	53-30-19
NDT4250	747	4	57-30-10
NDT4252	747	4	57-10-23
NDT4253	747	6	53-30-25
NDT4254	747	4	57-10-24
NDT4255	747	6	53-10-59
NDT4256	747	4	53-10-14
NDT4257	747	4	53-10-15
NDT4258	747	4	53-10-16
NDT4259	747	4	53-10-17
NDT4260	747	4	53-10-17, 53-10-19
NDT4261	747	4	53-10-18
NDT4262	747	4	53-10-20
NDT6000-EC	767	4	57-50-02
NDT6000X	767	4	57-50-02
NDT6001	767	4	57-50-23
NDT6002	767	4	57-50-24
NDT6004	767	4	57-50-09
NDT6005	767	4	57-50-09
NDT6006	767	4	57-50-09
NDT6007	767	4	57-50-11

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
NDT6008	767	4	57-50-11
NDT6009	767	4	52-30-05
NDT6010	767	4	52-30-04
NDT6011,G	767	4	57-50-20
NDT6012	767	4	57-50-26
NDT6013	767	4	57-50-26
NDT6014	767	4	57-50-16
NDT6015	767	4	57-50-16
NDT6017	767	4	57-50-22
NDT6018	767	4	57-50-22
NDT6019	767	6	52-32-06
NDT6020	767	4	57-50-14
NDT6021	767	4	57-50-14
NDT6022	767	4	57-50-15
NDT6023	767	4	57-50-21
NDT6023P	767	4	57-50-21
NDT6024	767	6	57-50-10
NDT6025-X	767	4	57-50-17
NDT6027	767	4	57-50-10
NDT6027P	767	4	57-50-10
NDT6028	767	4	57-50-10
NDT6029	767	4	57-50-10
NDT6029P	767	4	57-50-10
NDT6030	767	4	57-50-10
NDT6030P	767	4	57-50-10
NDT6031-X	767	4	57-50-18
NDT6032-X	767	4	57-50-19
NDT6033-1,-2	767	4	57-50-12
NDT6034	767	4	57-50-13
NDT6035-1,-2	767	4	57-50-13
NDT6036	767	4	57-20-04
NDT6036G1,G2	767	4	57-20-04
NDT6036P1,P2	767	4	57-20-04
NDT6038	767	4	57-50-25
NDT6041	767	4	57-20-03
NDT6046	767	4	53-30-02
P6020A,B	767	4	57-50-14
P6021A,B,C	767	4	57-50-14

2322147 S0000526899_V4

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 19 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

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Page 31
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER
ST8870D	737	4	78-30-01
ST8870-1,-4	787	1	51-04-00, 51-05-01 4 51-00-05
ST8870-7,-8	777	4	71-11-01
ST8870-7,-8, -9	747	4	51-00-07
ST8870-7,-8, -9	777	4	78-30-01
ST8870-7,-8, -9	787	1	51-04-00
		4	51-00-01, 51-00-02, 51-00-14
ST8871	777	1	51-04-00
ST8871	777	4	51-00-06, 51-00-08
ST8871	787	1	51-04-00
ST8871	787	4	51-00-06, 51-00-07, 51-00-08, 51-00-09, 51-00-11, 51-00-12, 51-00-13, 51-00-15, 51-00-16, 51-00-18, 51-00-19, 57-40-02
ST8871D	737	4	78-30-02
ST8871D	777	4	78-30-06

REFERENCE STANDARD BOEING PART NUMBER	AIRPLANE MODEL	MANUAL PART	PROCEDURE NUMBER

- 1 707, 727, 737, 747
2 757, 767
3 707,727,737,747,757,767,777,787

2384036 S0000547382_V1

Reference Standard to Non-Destructive Test Procedure Cross-Reference
Figure 2 (Sheet 20 of 20)

ALL EFFECTIVITY

PART 1 51-01-00

D6-37239

Page 32
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL
PART 1 - GENERAL

INSPECTION OF REPAIRS TO COMPOSITE STRUCTURES

1. Purpose

- A. To find delaminations or disbonds in repaired metallic and non-metallic composite structure.
- B. This procedure has been written to help operators identify inspection procedures that can be used to examine repairs made to composite structure. Calibration disbond diameters for each inspection are given. This procedure does not stop the use of other inspection procedures. Different inspection procedures that have been evaluated and found to be acceptable by the airline can be used. Alternate inspection procedures must be applicable to the repair to be examined.
- C. For the 747-8, if the repaired area is BMS 8-256 laminate material such as the edgeband of a honeycomb part, do not use this procedure. Refer to Part 4, 51-00-07 to examine the solid laminate area.

2. Equipment

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

A. Reference Handbook

- (1) The Society of Automotive Engineers (SAE) has a handbook that can be referred to for more data related to the inspection of composite repairs. This handbook, the "Composite Repair NDT/NDI Handbook", document number ARP 5089, can be purchased from SAE at:

SAE

400 Commonwealth Dr.

Warrendale, Pa 15096-0001

USA

Phone: (724) 776-4970

Fax: (724) 776-0790

B. Reference Standard

- (1) To help with inspections of non-metallic composite repairs, repair reference standards are available from Boeing. As an alternative, new Commercial Airplane Composite Repair Committee (CACRC) reference standards are also available from SAE. You can use these reference standards to cause example indications with bondtesters, pulse-echo instruments, through-transmission instruments, and tap testers. The reference standards are not calibration standards, which are used to set the instrument sensitivity. Refer to the procedures specified in Figure 9 for data about calibration standards.

(a) Boeing reference standards

- 1) You can make the reference standards shown in Figure 1 thru Figure 6 or make an order for them from composite reference standard manufacturers.
- 2) The repair reference standards are available in many configurations (see Figure 2). For general composite repair inspections, Boeing recommends the basic set of four reference standards below:
 - a) Reference standard C12-DIS-3C1N (carbon skins with honeycomb core and skin-to-core disbonds).

ALL

EFFECTIVITY

PART 1 51-01-01

D6-37239

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Page 1
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

- b) Reference standard C12-DEL-3C1N (carbon skins with honeycomb core and with interply delaminations).
 - c) Reference standard C12-PCS-3C1N (carbon skins with honeycomb core and with potting and core splice areas).
 - d) Reference standard C12-POT-3C1N (carbon skins with honeycomb core and skin-to-potting disbonds).
- 3) For solid laminate inspections, it is permitted to use the laminate step wedges specified in Part 4, 51-00-01.

NOTE: These laminate step wedges are cured in an autoclave. They have less ultrasonic attenuation than repaired laminate structure cured with a vacuum bag.

- (b) Commercial Aircraft Composite Repair Committee (CACRC) reference standards
 - 1) The CACRC committee has designed industry reference standards (see Figure 7 and Figure 8 for examples) applicable to aircraft from all manufacturers. You can make these reference standards or make an order for them from manufacturers of composite reference standards. The instructions shown in Figure 7 for CACRC reference standards is only an example. Instructions to make and certify CACRC reference standards can be found in SAE Aerospace Recommended Practices (ARP) documents ARP5605 and ARP5606.
 - 2) Drawings and instructions for CACRC reference standards can be purchased from the Society of Automotive Engineers (SAE). Use the document numbers specified below:
 - a) Aerospace Recommended Practice ARP5606 (composite honeycomb NDI reference standards)
 - b) Aerospace Recommended Practice ARP5605 (solid composite laminate NDI reference standards)

3. Prepare for the Inspection

- A. If you cannot get access on the part to do the inspection, remove it from the airplane.
- B. Get the repair records that show the initial damage location, the repair dimensions and the type of repair.
- C. Try to find out how the repair was made. Identify the thickness of the repair plies or doublers used, the location of core plugs and potting compound, and the surface area of the part where heat was applied.
- D. Get the engineering drawings, if possible, that show the part structure in the repair area.
- E. Examine the repair and use the flowchart in Figure 9 to identify the correct inspection procedure or procedures to use. Use the procedures specified in the flowchart to do the inspection.

4. Instrument Calibration

- A. Use the calibration disbond diameters shown in Figure 10 to calibrate your instrument. Refer to the procedures shown in Figure 9 for data about the reference standards to use.

5. Inspection Procedure

- A. Do a scan of the repair area and the area around the repair as follows:
 - (1) Use one of the scan patterns shown in Figure 11. Use scan pattern 1 for inspection with through-transmission or low-frequency bondtest procedures. Use scan pattern 2 for inspection with pulse-echo or high-frequency bondtest procedures. For tap test inspections, refer to Part 1, 51-05-01 for the correct scan pattern.

ALL

EFFECTIVITY

PART 1 51-01-01

D6-37239

Page 2
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

- (2) Use scan increments that are one third of the defect's diameter when you do scan pattern 1 or 2. For example: to find 1-inch (25 mm) defects, do the scan in increments of 0.30 inch (8 mm) (see Figure 11). When possible, we recommend that you use a guide or a straightedge to control the movement of the transducer during these inspections.
- (3) Examine at least 6 inches (152 mm) all around the area where heat was applied to be sure that the heat application did not damage the structure near the repair. See Figure 12.

6. Inspection Results

- A. If you get disbond indications larger than what is permitted, you must examine the repair area some more. Disbonds in the repair area will cause responses that are almost the same as the response you got during calibration when you examined the calibration defect.
- B. You can use other inspection procedures to examine the indication, but the procedure shown in the flowchart for the repair type must be the procedure you use to accept or reject the indication. For example: you cannot accept an indication with a bondtester that you have rejected with a through-transmission inspection.

ALL

EFFECTIVITY

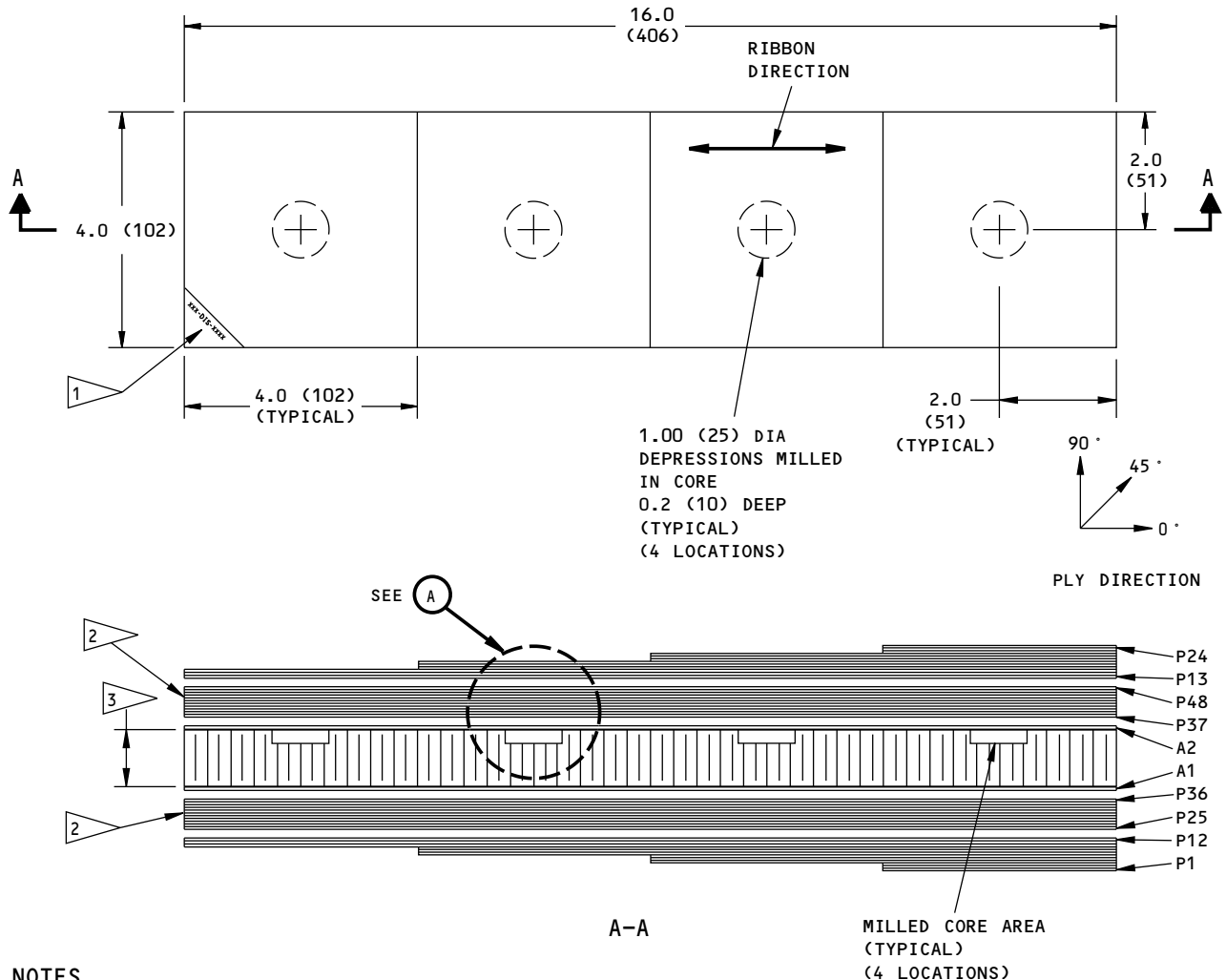
PART 1 51-01-01

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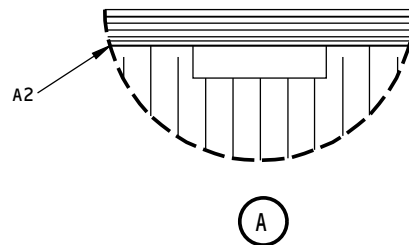
Page 3
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- HOW TO MAKE THE DEFECTS FOR THIS REFERENCE STANDARD:
 1. CUT THE HONEYCOMB WITH A 1.00 (25) TREPPANING TOOL. THEN MILL THE CORE TO A DEPTH OF 0.2 (5) WITH A CIRCULAR SANDING DISK IN A DRILL PRESS.
 2. SECONDARY BOND THE MILLED CORE TO THE PRE-CURED SKINS. MAKE SURE THAT THE MILLED SIDE OF THE HONEYCOMB IS ON THE TOOL (SO THE ADHESIVE FILM STAYS AGAINST THE SKIN).
- SEE FIGURE 1 (SHEET 5) FOR INSTRUCTIONS ABOUT HOW TO MAKE THIS REFERENCE STANDARD.



XXX-DIS-XXXX SERIES REFERENCE STANDARD

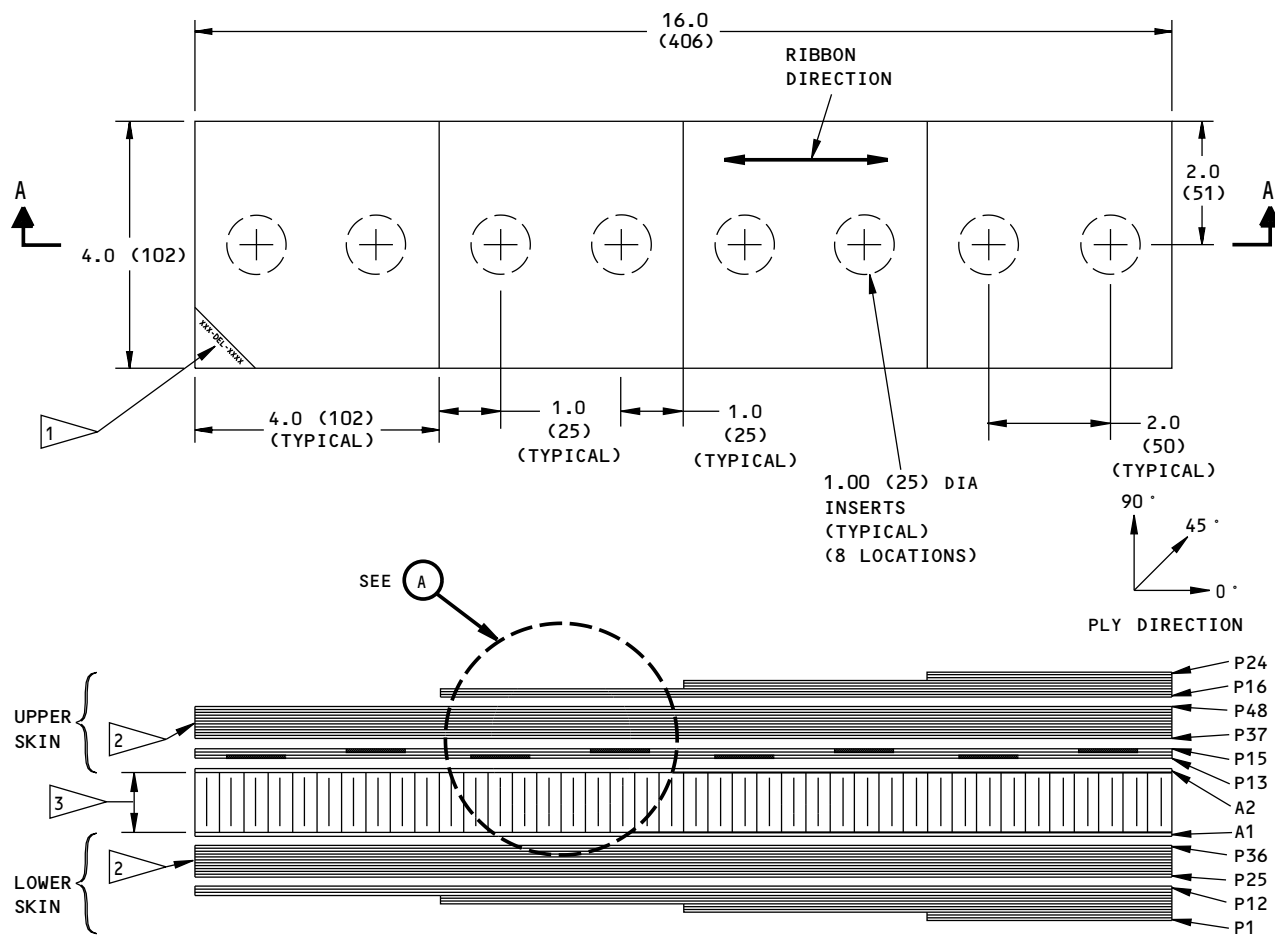
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Repair Reference Standards
Figure 1 (Sheet 1 of 5)

ALL EFFECTIVITY

PART 1 51-01-01

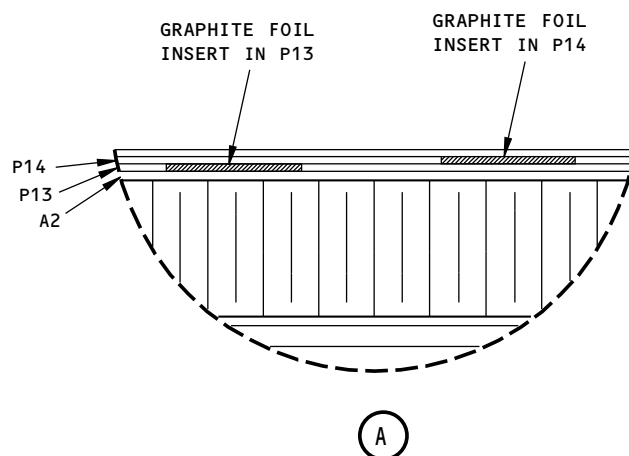
737 NON-DESTRUCTIVE TEST MANUAL



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- HOW TO MAKE THE DEFECTS FOR THIS REFERENCE STANDARD:
 1. PUT THE DEFECTS IN THE UPPER SKIN WHEN YOU PRE-CURE THE SKINS.
 2. USE 0.010 (0.25) GRAPHITE FOIL INSERTS FOR THE DEFECTS IF THE REFERENCE STANDARD HAS CARBON SKINS. CUT 1.0 (25) HOLES IN PLYS 13 AND 14 TO ACCEPT THE INSERTS. (REFER TO 4)
 3. DIP THE INSERTS IN A RELEASE AGENT BEFORE YOU PUT THEM IN THE PLY LAYUP. USE TWEEZERS TO HOLD THE INSERTS.
 4. USE 0.001 (0.03) CLEAR PARTING FILM INSERTS IF THE REFERENCE STANDARD HAS FIBERGLASS SKINS. PUT INSERTS BETWEEN P13 AND P14 AND BETWEEN P14 AND P15.
- SEE FIGURE 1 (SHEET 5) FOR INSTRUCTIONS ABOUT HOW TO MAKE THIS REFERENCE STANDARD.

A-A



XXX-DEL-XXXX SERIES REFERENCE STANDARD

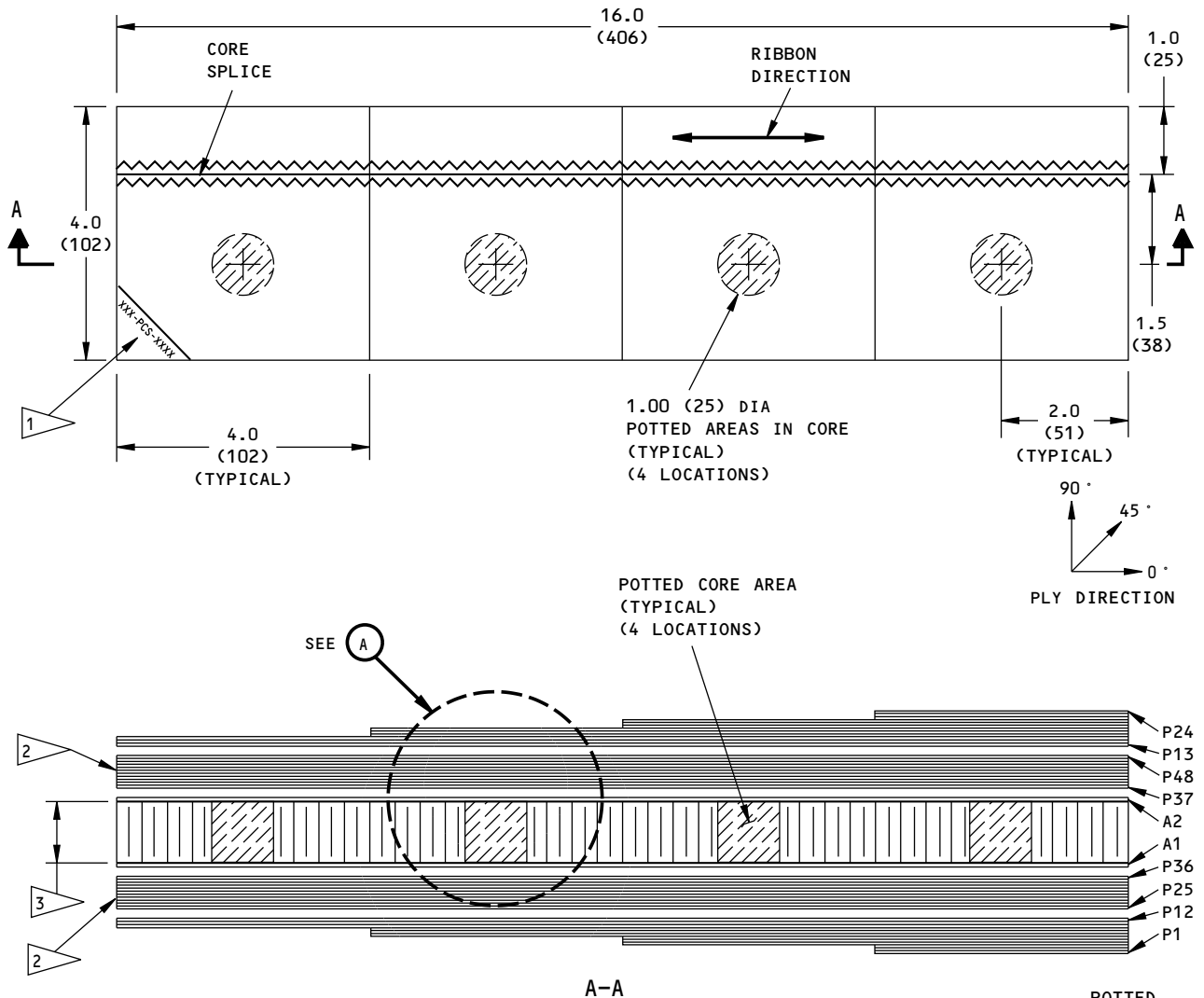
2124295 S0000457950_V1

Repair Reference Standards
Figure 1 (Sheet 2 of 5)

ALL EFFECTIVITY

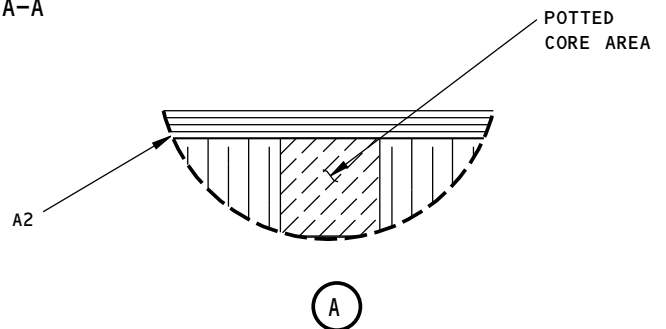
PART 1 51-01-01

737 NON-DESTRUCTIVE TEST MANUAL



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- HOW TO MAKE THE AREAS FOR THIS REFERENCE STANDARD THAT WILL CAUSE INDICATIONS DURING CALIBRATION:
 1. POT AND SPLICE THE HONEYCOMB CORE. CURE THE CORE.
 2. SECONDARY BOND THE PRE-CURED SKINS TO THE CORE.
- SEE FIGURE 1 (SHEET 5) FOR INSTRUCTIONS ABOUT HOW TO MAKE THIS REFERENCE STANDARD.



XXX-PCS-XXXX SERIES REFERENCE STANDARD

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Repair Reference Standards
Figure 1 (Sheet 3 of 5)

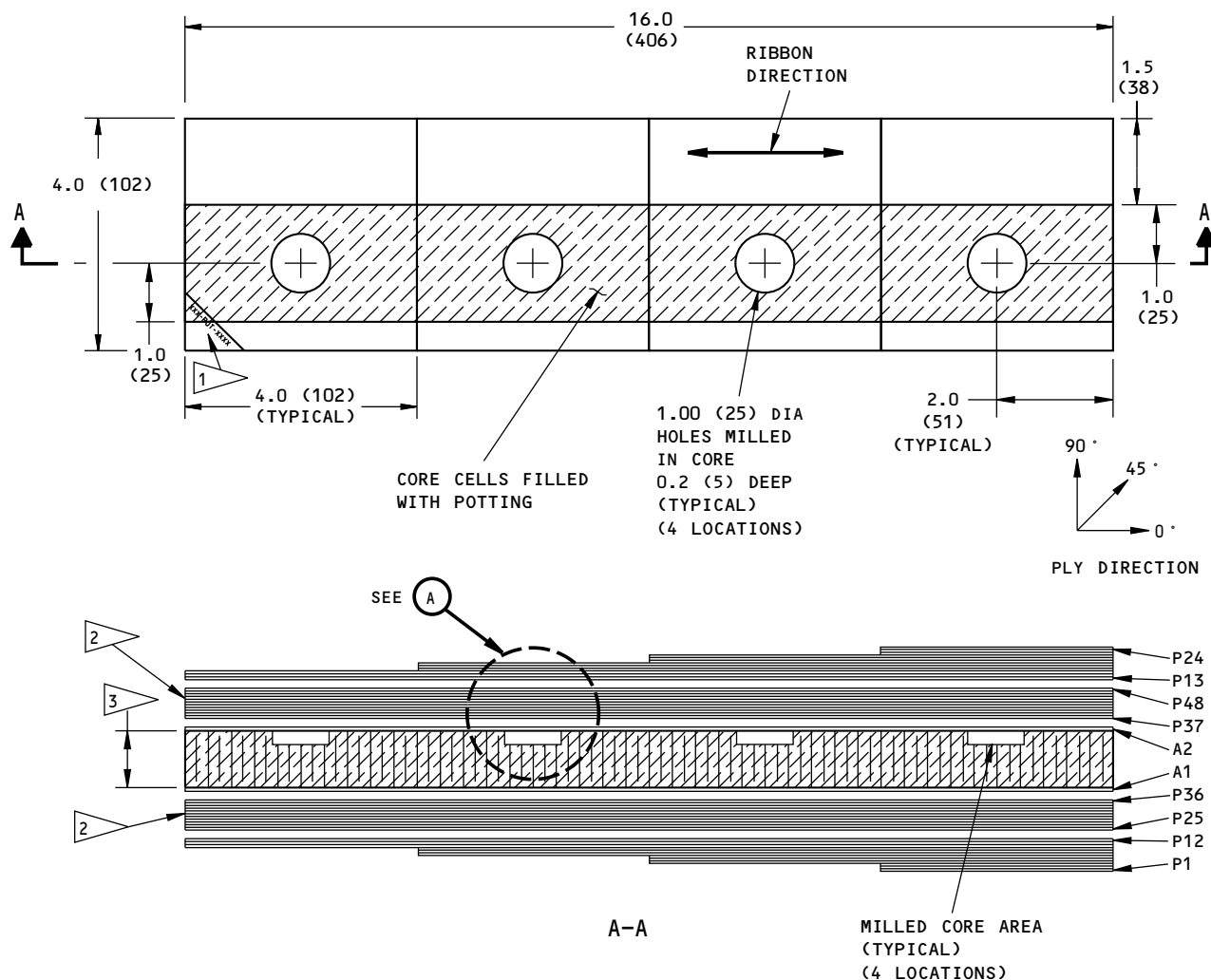
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PART 1 51-01-01

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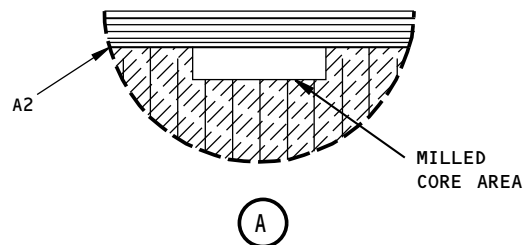
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737 NON-DESTRUCTIVE TEST MANUAL



NOTES

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)
- HOW TO MAKE THE DEFECTS FOR THIS REFERENCE STANDARD:
 1. POT THE HONEYCOMB CORE. CURE THE CORE.
 2. MILL 1.0 (25) DIAMETER HOLES IN THE POTTED AREA IN THE CORE TO A DEPTH OF 0.2 (5).
 3. SECONDARY BOND THE MILLED CORE TO THE PRE-CURED SKINS. MAKE SURE THAT THE MILLED SIDE OF THE CORE IS ON THE TOOL (SO THE ADHESIVE FILM STAYS AGAINST THE SKIN).
- SEE FIGURE 1 (SHEET 5) FOR INSTRUCTIONS ABOUT HOW TO MAKE THIS REFERENCE STANDARD.



XXX-POT-XXXX SERIES REFERENCE STANDARD

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Repair Reference Standards Figure 1 (Sheet 4 of 5)

EFFECTIVITY
ALL

PART 1 51-01-01

D6-37239




737 NON-DESTRUCTIVE TEST MANUAL

PROCEDURE TO MAKE THE REFERENCE STANDARDS:


CORE

1. Identify your core properties (see Fig. 2).
2. Get the correct core material (see Fig. 3).
3. Cut the core to the correct dimensions (see Fig. 4).
4. Prepare and cure the core if necessary (see Fig. 1).

SKINS

1. Identify your skin properties (see Fig. 2).
2. Get the correct skin material (see Fig. 3).
3. Cut the plies to the correct dimensions (see Fig. 4).
4. Cut two peel ply layers (see Fig. 4).
5. Lay up the plies and peel ply for the upper and the lower skins (note, for XXX-DEL-XXXX reference standards, see Fig. 1, Sheet 2 for insert locations).
6. Cure the two skin assemblies on a stepped tool with a vacuum bag. Use an oven (recommended) or heat blankets. 

SKIN-TO-CORE ASSEMBLY

1. Get the correct adhesive film (see Fig. 3).
2. Cut two adhesive layers A1 and A2 (see Fig. 4).
3. Remove the peel ply from the skins.
4. Secondary bond the skins to the core. Use a stepped tool and a vacuum bag.
5. After the assembly is cured, put a 0.50 inch (13 mm) by 0.50 inch (13 mm) square of foam tape on each step of the reference standard. The tape is used as an attenuation reference during the ultrasonic inspection. 
6. Do an ultrasonic inspection of the honeycomb sandwich assembly. See Fig. 6 for the acceptance limits.







NOTES

A = Adhesive Film
P = Plies

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES)

- TOLERANCES:

<u>INCHES</u>	<u>MILLIMETERS</u>
X.XX = ± 0.025	X.X = ± 0.5
X.X = ± 0.050	X = ± 1.0

-  LABEL EACH REFERENCE STANDARD WITH THE CORRECT CODE AS SPECIFIED IN FIG. 2.
-  ADD THESE EXTRA PLIES FOR X24-XXX-XXXX SERIES REFERENCE STANDARDS ONLY.
-  MAKE A SELECTION OF THE CORE DEPTH FROM FIG. 2.
-  YOU CAN GET 0.010 (0.25) GRAPHITE FOIL FROM:
EGC ENTERPRISES INC.
7315 INDUSTRIAL PARKWAY
MENTOR, OHIO 44060, U.S.A.
TEL. 800-324-0211
(ASK FOR GTB SHEET MATERIAL)
-  IT IS RECOMMENDED THAT YOU USE THE COATED FIBERGLASS RELEASE FILM ON THE TOOL IF YOU MAKE FIBERGLASS REFERENCE STANDARDS. YOU CAN GET THIS FILM FROM:
 - AIRTECH INTERNATIONAL
2542 EAST DEL AMO BLVD
P.O. BOX 6207
CARSON, CA 90749
PHONE: (213) 603-9683
PRODUCT NAME: A012
 - CHEMFAB
HI-TEMP MATERIALS GROUP
509 EAST STATE PARKWAY
SCHAUMBURG, IL 60173
PHONE: (708) 490-9800
PRODUCT NAME: 350-10S
-  USE VINYL FOAM TAPE, PART NUMBER 4416, MADE BY THE 3M COMPANY, OR AN EQUIVALENT TAPE THAT DOES NOT TRANSMIT ULTRASOUND.

MANUFACTURING PROCEDURE FOR THE REPAIR REFERENCE STANDARDS

2124301 S0000457953_V1

Repair Reference Standards Figure 1 (Sheet 5 of 5)

ALL

EFFECTIVITY

PART 1 51-01-01

D6-37239

Page 8
Nov 15/2015



737 NON-DESTRUCTIVE TEST MANUAL

PROPERTY	AVAILABLE OPTIONS (CHOOSE ONE)	IDENTIFICATION CODE
SKIN MATERIAL	CARBON FIBERGLASS	C F
SKIN THICKNESS	3,6,9 AND 12 PLIES 15,18,21 AND 24 PLIES	12 24
INDICATION GENERATOR	SKIN-TO-CORE DISBONDS INTERPLY DELAMINATIONS POTTING AND CORE SPLICE SKIN-TO-POTTING DISBONDS	DIS DEL PCS POT
CORE DENSITY (GRADE)	2.0 LBS (GRADE 2.0) 3.0 LBS (GRADE 3.0) 4.0 LBS (GRADE 4.0) 5.0 LBS (GRADE 5.0) 6.0 LBS (GRADE 6.0) 9.0 LBS (GRADE 9.0) 12.0 LBS (GRADE 12.0)	2 3 4 5 6 9 12
CORE DEPTH	0.25 INCH 0.5 INCH 1 INCH 1.5 INCH 2 INCH 2.5 INCH 3 INCH	A B C D E F G
CORE CELL SIZE (TYPE)	0.125 (TYPE V) 0.187 (TYPE I) 0.25 (TYPE II)	1 2 3
CORE MATERIAL (CLASS)	NOMEX (CLASS 4) GLASS REINFORCED (CLASS 1)	N G

EXAMPLE: PART NUMBER C12-DEL-3C2N IS A 3 PLY TO 12 PLY INTERPLY DELAMINATION REFERENCE STANDARD WITH 3.0 LB DENSITY, 1 INCH THICK CORE. THE SKIN IS MADE OF CARBON MATERIAL. THE CORE IS NOMEX AND HAS A CELL SIZE OF 0.187.

2124304 S0000457954_V1

Reference Standard Options
Figure 2

EFFECTIVITY
ALL

PART 1 51-01-01


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
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Page 9
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

MATERIAL	BOEING SPECIFICATION
CARBON SKIN	BMS 8-256, TYPE IV, CLASS 2, 3K-70-PW (350 °F CURE)
FIBERGLASS SKIN	BMS 8-139, CLASS 1 OR 2, GRADE 2, TYPE 1581 (350 °F CURE)
HONEYCOMB CORE	BMS 8-124 (SEE FIG. 2 FOR GRADE TYPE AND CLASS)
ADHESIVE FILM	BMS 5-129, GRADE 5 (250 °F CURE) BMS 8-245, GRADE 3 (250 °F CURE). FIBERGLASS STEP WEDGES ONLY 
PEEL PLY (DRY)	BURLEASE CODE 51789 (BURLINGTON CO.) OR EQUIVALENT
POTTING	BMS 5-28, TYPE 7
CORE SPLICE	BMS 5-90, TYPE III, CLASS 250, GRADE 100

 BMS 8-245 MAKES A SATISFACTORY BOND IF YOU CURE IT AT 250 °F (121 °C) AS SPECIFIED IN THE STRUCTURAL REPAIR MANUAL SECTION FOR GLASS FABRIC 250 °F CURE REPAIRS. USE BMS 8-245 BECAUSE IT WILL NOT BLEED THROUGH THE FIBERGLASS SKINS.

2124306 S0000457955_V1

Material Specifications
Figure 3

ALL EFFECTIVITY

PART 1 51-01-01

D6-37239

Page 10
Nov 15/2015



737 NON-DESTRUCTIVE TEST MANUAL

PLY NUMBER	CUT SIZE (BEFORE CURE)	TRIMMED SIZE (AFTER CURE)	PLY DIRECTION
P1,P3	6.0 (152) X 5.0 (127)	4.0 (102) X 4.0 (102)	0 OR 90 DEGREES
P2	6.0 (152) X 5.0 (127)	4.0 (102) X 4.0 (102)	+ OR - 45 DEGREES
P4,P6	6.0 (152) X 9.0 (229)	4.0 (102) X 8.0 (203)	+ OR - 45 DEGREES
P5	6.0 (152) X 9.0 (229)	4.0 (102) X 8.0 (203)	0 OR 90 DEGREES
P7,P9	6.0 (152) X 13.0 (330)	4.0 (102) X 12.0 (305)	0 OR 90 DEGREES
P8	6.0 (152) X 13.0 (330)	4.0 (102) X 12.0 (305)	+ OR - 45 DEGREES
P10,P12	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	+ OR - 45 DEGREES
P11	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	0 OR 90 DEGREES
P13,P15	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	+ OR - 45 DEGREES
P14	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	0 OR 90 DEGREES
P16,P18	6.0 (152) X 13.0 (330)	4.0 (102) X 12.0 (305)	0 OR 90 DEGREES
P17	6.0 (152) X 13.0 (330)	4.0 (102) X 12.0 (305)	+ OR - 45 DEGREES
P19,P21	6.0 (152) X 9.0 (229)	4.0 (102) X 8.0 (203)	+ OR - 45 DEGREES
P20	6.0 (152) X 9.0 (229)	4.0 (102) X 8.0 (203)	0 OR 90 DEGREES
P22,P24	6.0 (152) X 5.0 (127)	4.0 (102) X 4.0 (102)	0 OR 90 DEGREES
P23	6.0 (152) X 5.0 (127)	4.0 (102) X 4.0 (102)	+ OR - 45 DEGREES
P25,P27,P29,P31,P33,P35	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	0 OR 90 DEGREES
P26,P28,P30,P32,P34,P36	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	+ OR - 45 DEGREES
P37,P39,P41,P43,P45,P47	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	+ OR - 45 DEGREES
P38,P40,P42,P44,P46,P48	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	0 OR 90 DEGREES
A1,A2	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	N.A.
PEEL PLY	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	N.A.
HONEYCOMB CORE	6.0 (152) X 18.0 (457)	4.0 (102) X 16.0 (406)	N.A.

NOTE: N.A. = NOT APPLICABLE

2124307 S0000457956_V1

**Adhesive, Core and Ply Dimensions
Figure 4**

ALL EFFECTIVITY

PART 1 51-01-01

D6-37239

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Page 11
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

**THIS FIGURE WAS DELETED DURING THE
NOVEMBER 5, 1996 REVISION**

2124308 S0000457957_V1

**Acceptance Limits for the Ultrasonic Inspection of the Pre-Cured Skins Before the Peel Ply is
Removed
Figure 5**

ALL EFFECTIVITY





PART 1 51-01-01

D6-37239

Page 12
Nov 15/2015



737 NON-DESTRUCTIVE TEST MANUAL

REFERENCE STANDARD	ACCEPTANCE LIMITS
XXX-DIS-XXXX	THE ULTRASONIC ATTENUATION OF THE DEFECT AREAS MUST BE AT LEAST 12 dB LARGER THAN THE ATTENUATION OF HONEYCOMB AREAS WITHOUT DEFECTS. 
XXX-POT-XXXX	THE ULTRASONIC ATTENUATION OF THE DEFECT AREAS MUST BE AT LEAST 6 dB LARGER THAN THE ATTENUATION OF HONEYCOMB AREAS WITHOUT DEFECTS. THE ULTRASONIC ATTENUATION OF THE POTTED AREAS MUST BE AT LEAST 6 dB LESS THAN THE ATTENUATION OF THE ADJACENT HONEYCOMB AREAS WITHOUT DEFECTS. 
XXX-PCS-XXXX	THE ULTRASONIC ATTENUATION OF THE POTTED AREAS MUST BE AT LEAST 6 dB LESS THAN THE ATTENUATION OF THE ADJACENT HONEYCOMB AREAS WITHOUT DEFECTS. 
XXX-DEL-XXXX	THE ULTRASONIC ATTENUATION OF THE DEFECT AREAS MUST BE AT LEAST 6 dB LARGER THAN THE ATTENUATION OF THE ADJACENT HONEYCOMB AREAS WITHOUT DEFECTS. 

 USE A 1 MHz THROUGH-TRANSMISSION ULTRASONIC INSPECTION SYSTEM.

- NOTES:**
- (1) THE ULTRASONIC ATTENUATION OF HONEYCOMB AREAS WITHOUT DEFECTS MUST BE AT LEAST 12 dB LESS THAN THE ATTENUATION OF THE FOAM TAPE ON THE REFERENCE STANDARD.
 - (2) ULTRASONIC INDICATIONS OUTSIDE THE DEFECT AREAS MUST BE NO LARGER THAN 0.50 INCH (13 MM) IN DIAMETER. AN ULTRASONIC INDICATION IS AN AREA WITH ULTRASONIC ATTENUATION THAT IS AT LEAST 6 dB LARGER THAN THE ATTENUATION OF THE ADJACENT AREAS WITHOUT DEFECTS.

2124310 S0000457958_V1

Acceptance Limits for the Ultrasonic Inspection of the Reference Standards
Figure 6

ALL EFFECTIVITY

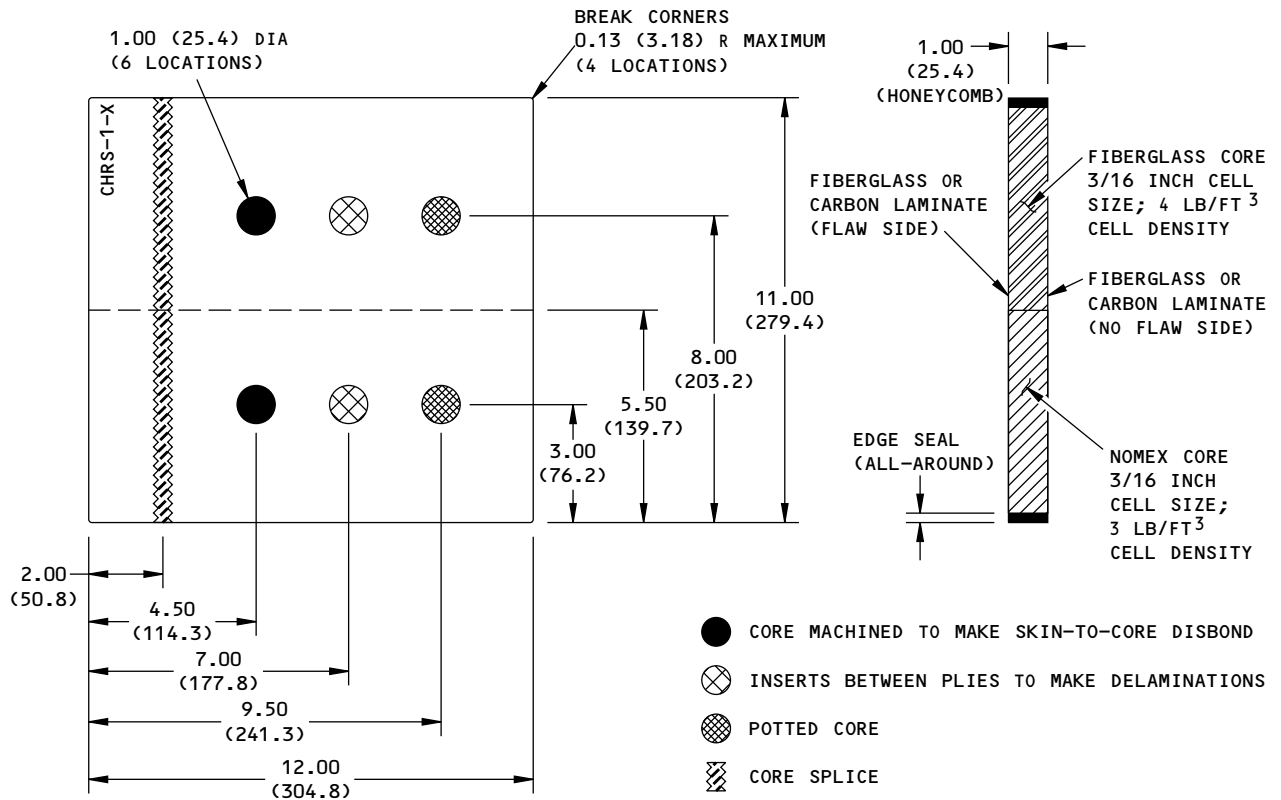
PART 1 51-01-01

D6-37239

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Page 13
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



NOTES:

- ALL DIMENSIONS ARE IN INCHES (MILLIMETERS ARE IN PARENTHESES).
- THERE ARE FOUR SPECIMENS MADE WITH THIS DESIGN, EACH WITH A DIFFERENT SKIN THICKNESS. THE NUMBER OF PLIES FOR THE DIFFERENT THICKNESSES ARE 3, 6, 9 AND 12. ONE SIDE WILL CONTAIN FLAW INSERTS AND THE OTHER SIDE WILL HAVE NO FLAWS
- REFERENCE STANDARDS ARE AVAILABLE WITH CARBON SKINS OR FIBERGLASS SKINS

2124312 S0000457959_V1

CACRC Composite Honeycomb Reference Standards (Example)
Figure 7

ALL EFFECTIVITY

PART 1 51-01-01

D6-37239

Page 14
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL



FRONT SIDE



BACK SIDE

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CACRC Composite Laminate Reference Standards (Example)
Figure 8

	EFFECTIVITY
ALL	

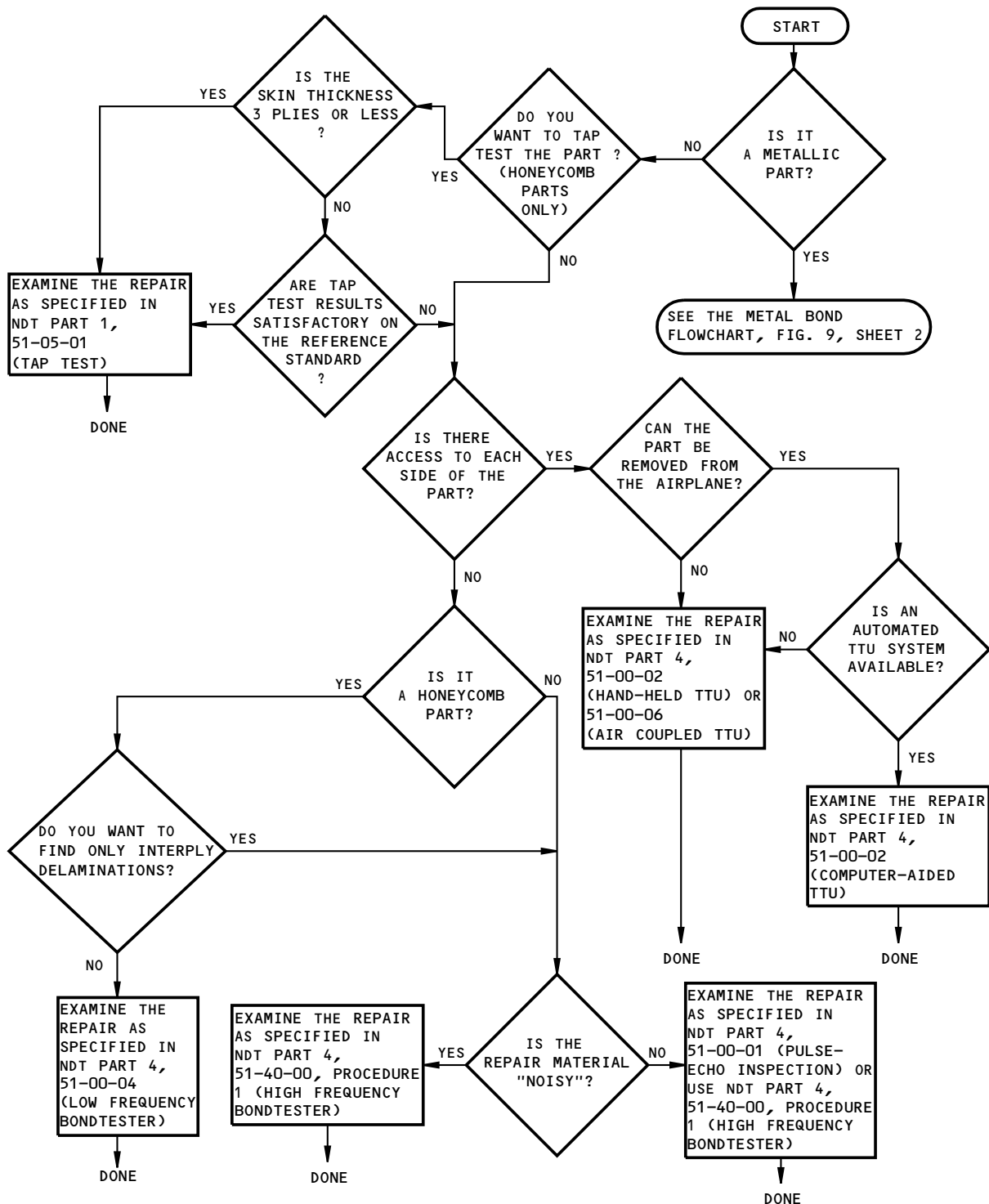
PART 1 51-01-01

D6-37239

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Page 15
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



REPAIR INSPECTION FLOWCHART - NON-METALLIC STRUCTURE

2124313 S0000457961_V2

Repair Inspection Flowcharts
Figure 9 (Sheet 1 of 2)

EFFECTIVITY

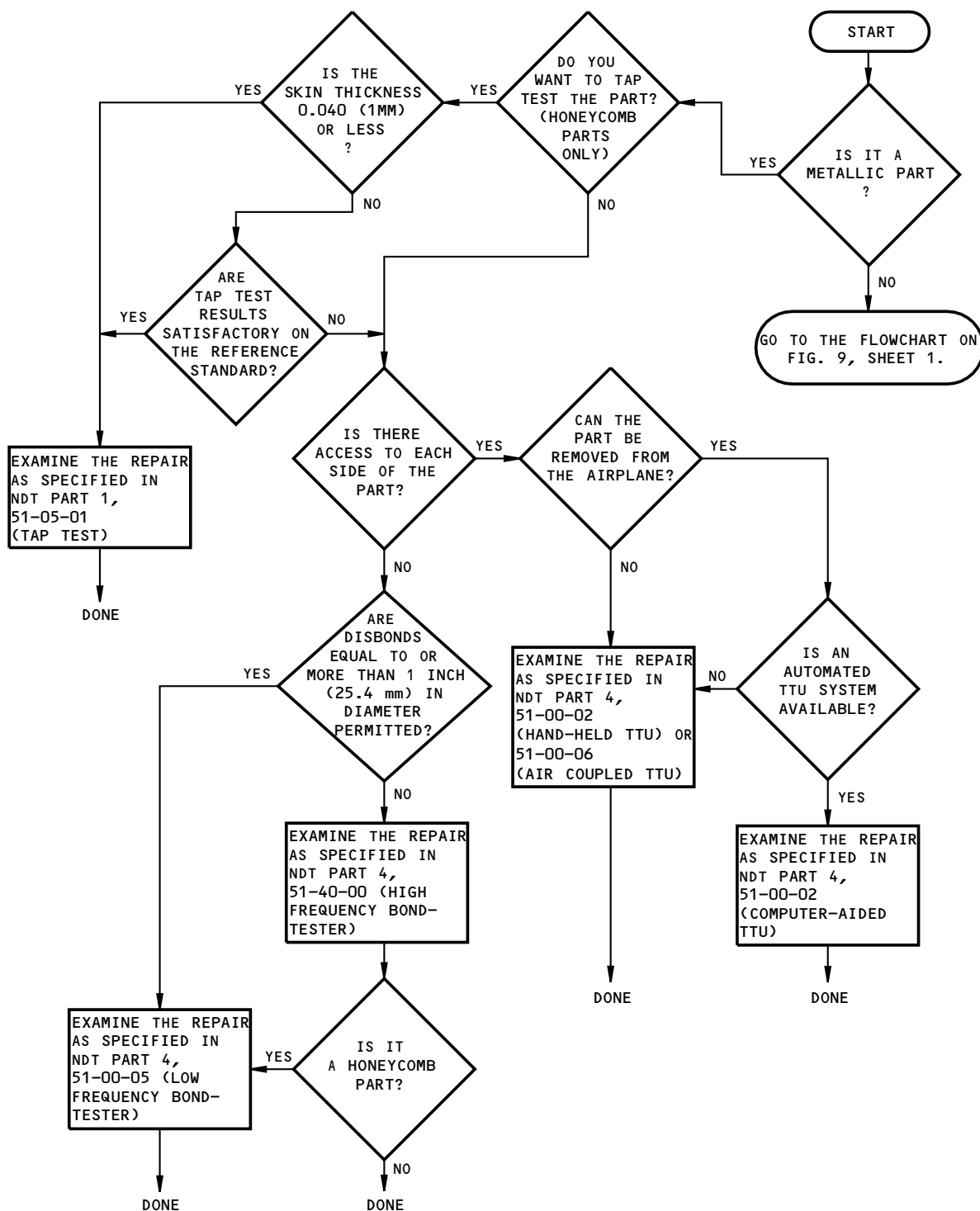
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PART 1 51-01-01

D6-37239

Page 16
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



REPAIR INSPECTION FLOWCHART - METALLIC STRUCTURE

2124314 S0000457962_V1

Repair Inspection Flowcharts
Figure 9 (Sheet 2 of 2)

ALL EFFECTIVITY

PART 1 51-01-01

D6-37239

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Page 17
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL

INSPECTION PROCEDURE	CALIBRATION DISBOND DIAMETERS ¹	
	METAL AND NON-METAL LAMINATES (DELAMINATION)	METAL AND NON-METAL HONEYCOMB SANDWICH (SKIN-TO-CORE DISBOND)
THROUGH-TRANSMISSION ULTRASONIC	0.50 INCH (12.7 mm)	0.50 INCH (12.7 mm)
LOW FREQUENCY BONDTESTER (NO COUPLANT)	1.00 INCH (25.4 mm)	1.00 INCH (25.4 mm)
HIGH FREQUENCY BONDTESTER (COUPLANT)	0.50 INCH (12.7 mm)	NOT RECOMMENDED
PULSE-ECHO ULTRASONIC	0.50 INCH (12.7 mm)	NOT RECOMMENDED
TAP TEST	NOT RECOMMENDED	1.00 INCH (25.4 mm) ²

¹ THESE ARE THE DEFECT DIAMETERS TO BE USED FOR CALIBRATION. THEY ARE NOT ACCEPTANCE LIMITS. REFER TO THE STRUCTURAL REPAIR MANUAL (SRM) OR YOUR ENGINEERING GROUP FOR ACCEPTANCE LIMITS FOR REPAIRS.

² REFERENCE STANDARDS ARE NOT NECESSARY WHEN THE SKIN THICKNESS IS LESS THAN OR EQUAL TO 3 PLIES FOR NONMETALLIC STRUCTURE OR LESS THAN OR EQUAL TO 0.040 INCH FOR METALLIC STRUCTURE. REFER TO NDT PART 1, 51-05-01 FOR TAP TEST REFERENCE STANDARD DATA.

2124315 S0000457963_V1

Calibration Disbond Diameters for the Inspection of Repairs
Figure 10

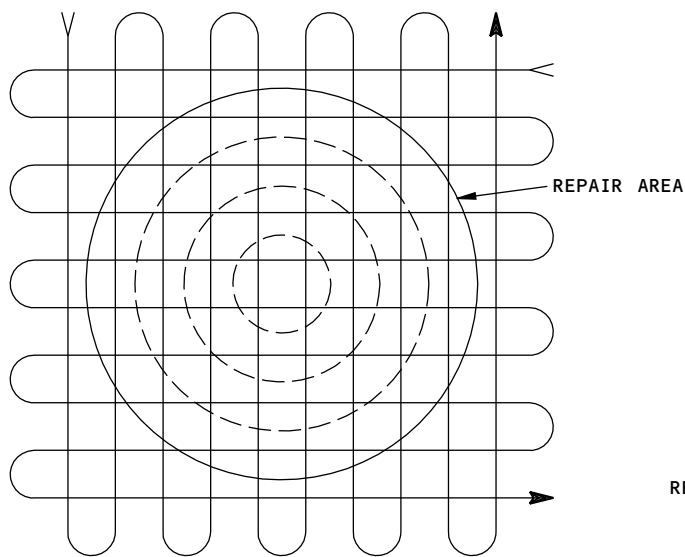
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PART 1 51-01-01

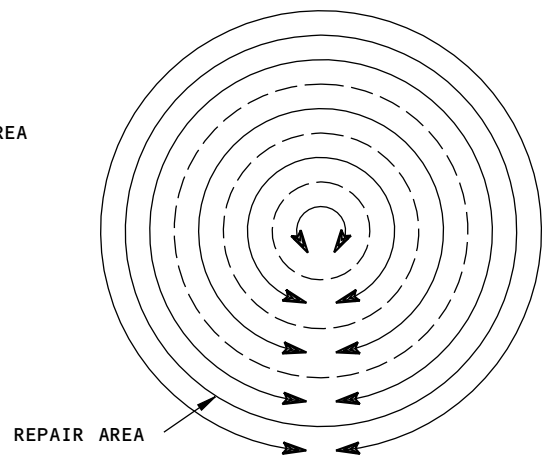
D6-37239

Page 18
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



SCAN PATTERN 1



SCAN PATTERN 2

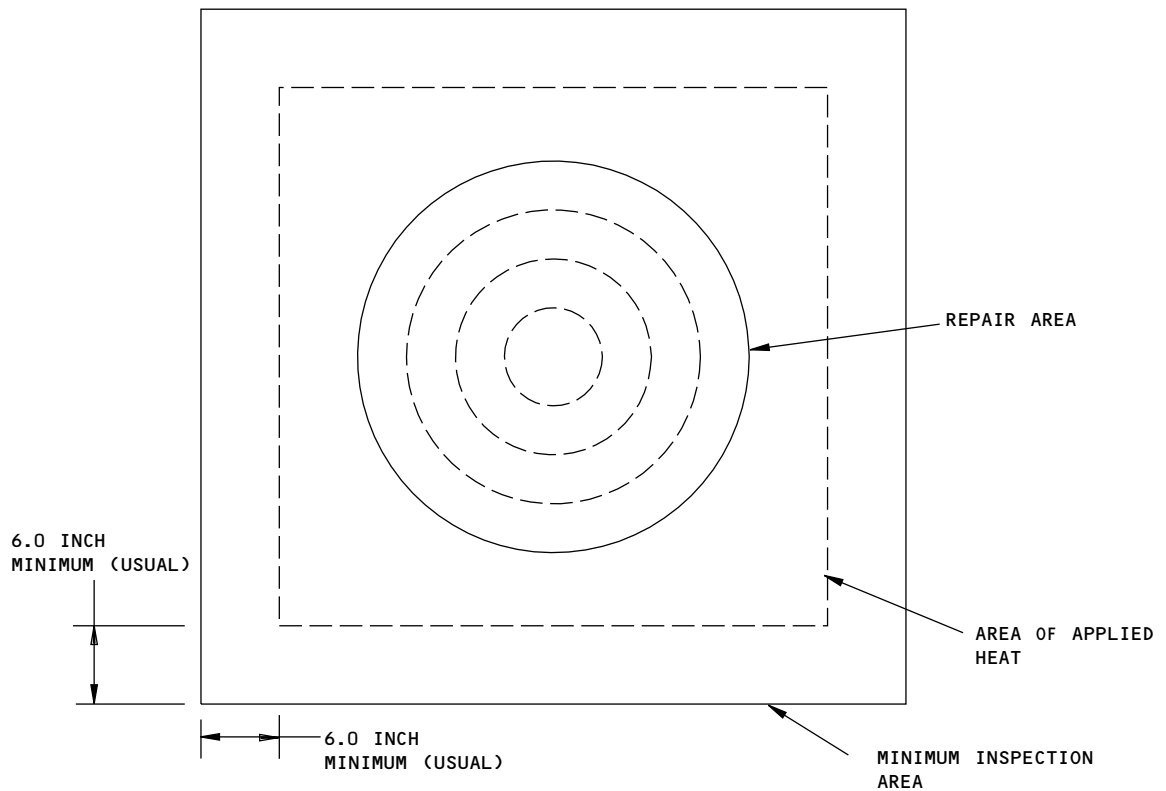
Scan Patterns
Figure 11

2124317 S0000457964_V1

ALL	EFFECTIVITY
	D6-37239

PART 1 51-01-01

737 NON-DESTRUCTIVE TEST MANUAL



2124319 S0000457965_V1

**Inspection Area
Figure 12**

ALL EFFECTIVITY

PART 1 51-01-01

D6-37239

Page 20
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL
PART 1 - GENERAL

NDT EXAMINATION OF COMPOSITE STRUCTURE FOR IMPACT DAMAGE

1. Purpose

- A. This procedure identifies the general NDT procedures that can be used to find and identify the quantity of impact damage to composite structures.
- B. There are four procedures that can be used to find and identify the quantity of damage to composite structures:
 - (1) Visual - Areas are visually examined for signs of physical damage.
 - (2) Pulse-Echo Ultrasonics - Laminate and skin-to-core areas are examined for delaminations that occur between the plies by pulse-echo ultrasonics.
 - (3) Bondtest Ultrasonics -- Bondtesters are used to examine the condition of skin-to-core bonds.
 - (4) Radiography -- X-ray is used to identify damage to the internal structure.

2. Prepare for the Inspection

- A. Identify the areas damaged by impact as follows:
 - (1) Visually examine the surface area of the part for defects. A complete visual examination will identify the surface damage that occurs because of impact damage (see Figure 1). The types of defects to look for are specified below:
 - (a) Cracked, crazed and chipped paint
 - (b) Dents in the surface of the structure
 - (c) Cracked or fractured plies
 - (d) Damage that results in a decrease in the ply thickness
 - (e) Damage that results in total ply removal in areas such that you can see the internal damage to the honeycomb core structure.
 - (2) Make a mark on the part to identify the damaged areas found during the visual inspection.
- B. Refer back to the procedures that referenced the use of this procedure for additional preparation instructions applicable to your inspection.

3. Inspection Procedure

- A. Pulse-Echo Ultrasonics
 - (1) Pulse-echo ultrasonics can be used to find interply delaminations in laminates and skin-to-core structures when there is access to only one side of a part.
 - (2) See Part 4, 51-00-01, "Inspection of Laminated Structures" for a general inspection procedure for solid laminates and skin-to-core structures that are as much as 0.250 inch thick.
 - (3) During a pulse-echo inspection, examine at least 5.0 inches of good structure around each defect area identified in Paragraph 2. Examine these areas as follows:
 - (a) Move the transducer from a good area into the defect area.
 - (b) If the defect area is found to be larger than identified before, make a mark on the part to identify the new defect area.
 - (c) Continue to examine the area until a 5.0 inch good area is identified around the defect area.
- B. Bondtest Ultrasonics

ALL

EFFECTIVITY

PART 1 51-01-02

D6-37239

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Page 1
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

- (1) Bondtesters can identify skin-to-core disbonds when there is access to only one side of a part.
- (2) See Part 4, 51-00-05, "Bondline Delamination Inspection in Honeycomb Structure", for a general inspection procedure of honeycomb structure.
- (3) During a bondtest inspection, examine at least 5.0 inches of good structure around each defect area identified in Paragraph 2. Examine these areas as follows:
 - (a) Move the probe along the surface of the part from the good area into the defect area. Do not examine areas found to have interply delaminations.
 - (b) If the defect area is found to be larger than identified before, make a mark on the part to identify the new defect area.
 - (c) Continue to examine the area until a 5.0 inch good area is identified around the defect area.

C. Radiography

- (1) X-rays of a composite structure can identify:
 - (a) Broken structure when movement or separation of the internal components occurs.
 - (b) Water contamination in honeycomb.
 - (c) Crushed or damaged cores.
- (2) See Part 2, 51-00-02, "Subsurface Fracture in Composite Structure", Part 2, 51-00-01, "Water Detection in Honeycomb Structure", and Part 2, 51-00-03, "Inspection of Honeycomb Structure", for general X-ray inspection procedures.
- (3) Make sure that an X-ray inspection examines at least 5.0 inches of good structure around each defect area identified in Paragraph 2.
 - (a) If the defect area is found to be larger than identified before, make a mark on the part to identify the new defect area.
 - (b) Continue to X-ray the area until a 5.0 inch good area is identified around the defect area.

ALL

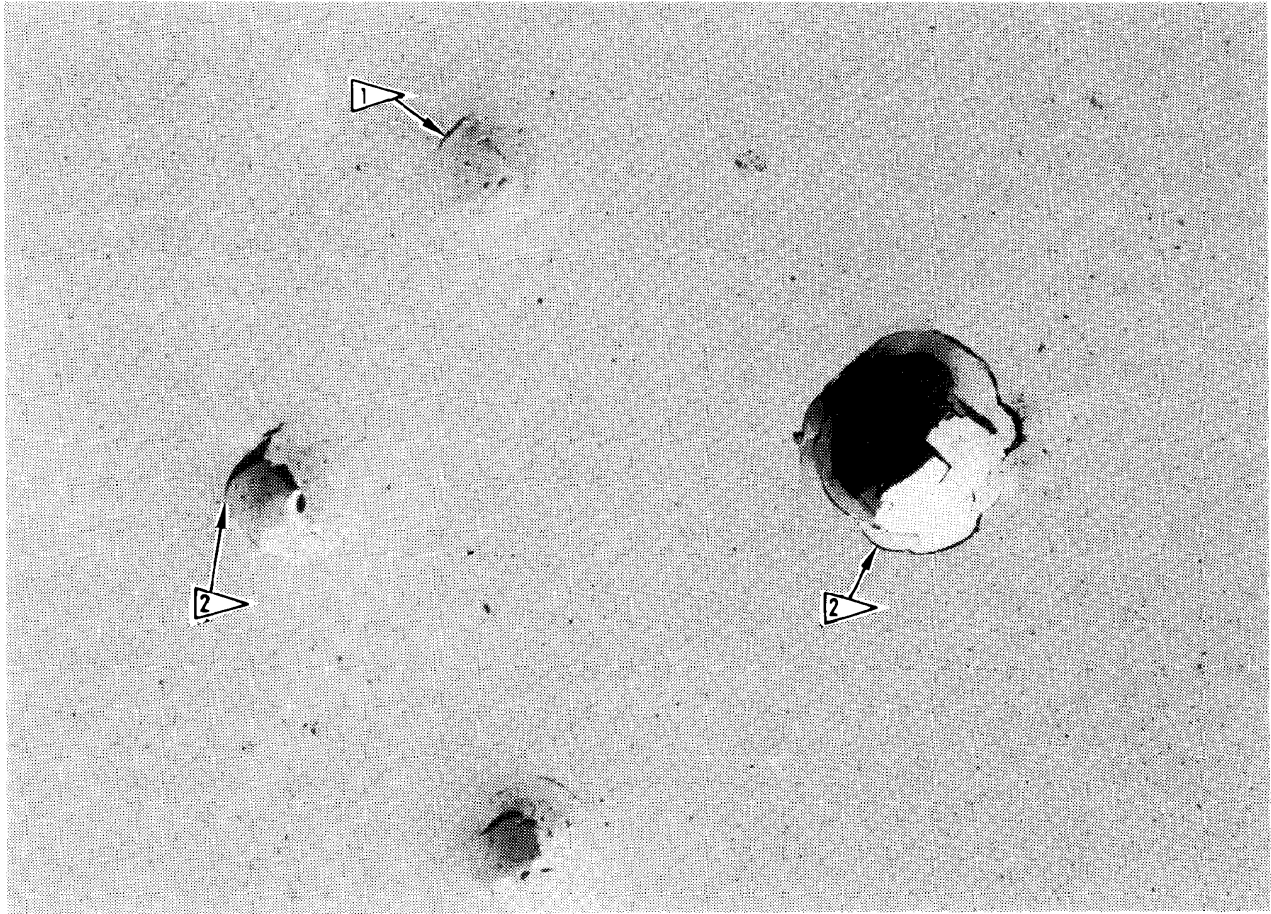
EFFECTIVITY

PART 1 51-01-02

D6-37239

Page 2
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



NOTES

- 1 CRACKED, CRAZED AND CHIPPED PAINT.
- 2 DENTS ON THE SURFACE OF THE STRUCTURE.

2125116 S0000457967_V1

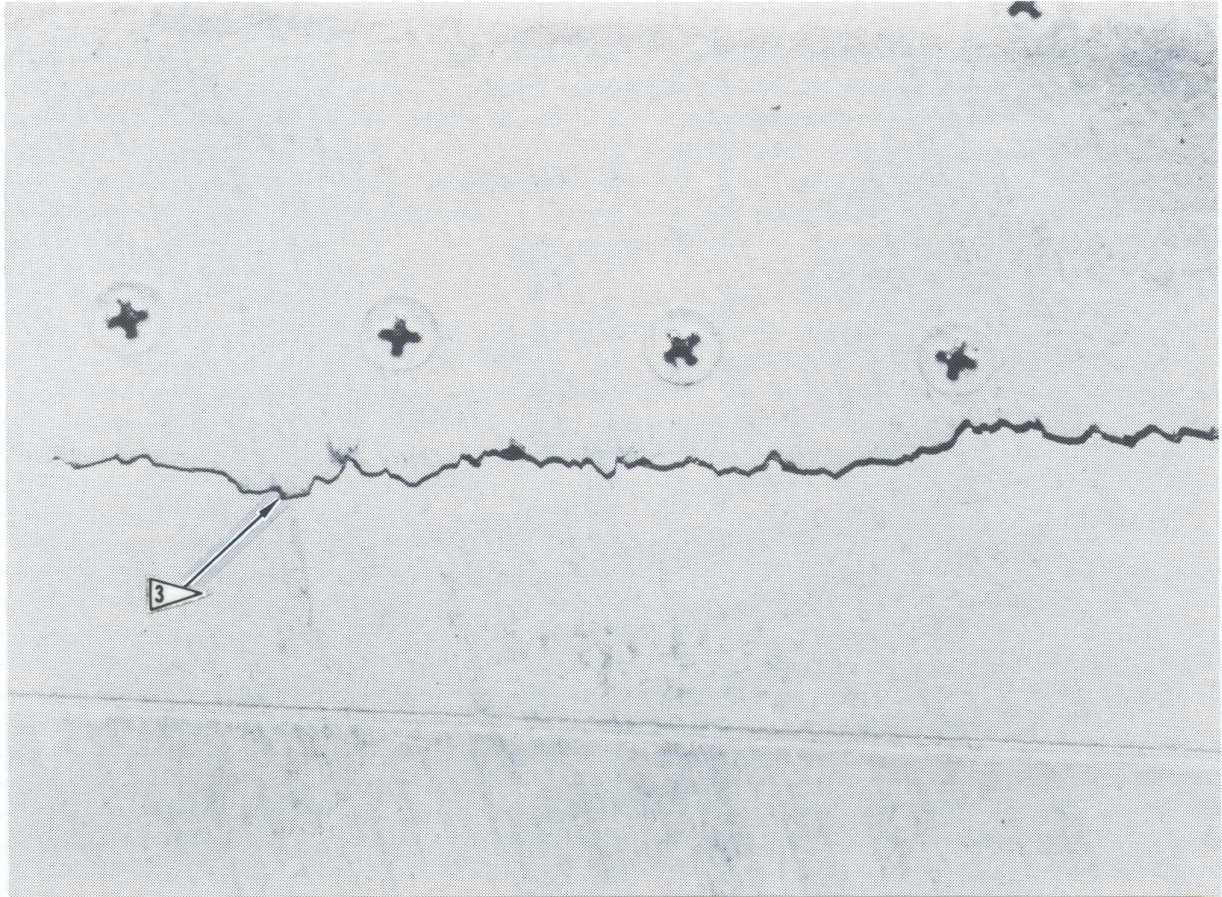
Typical Impact Damage
Figure 1 (Sheet 1 of 3)

ALL EFFECTIVITY

PART 1 51-01-02

D6-37239

737
NON-DESTRUCTIVE TEST MANUAL



NOTES

 **CRACKED OR FRACTURED PLIES.**

2125127 S0000457968_V1

Typical Impact Damage
Figure 1 (Sheet 2 of 3)

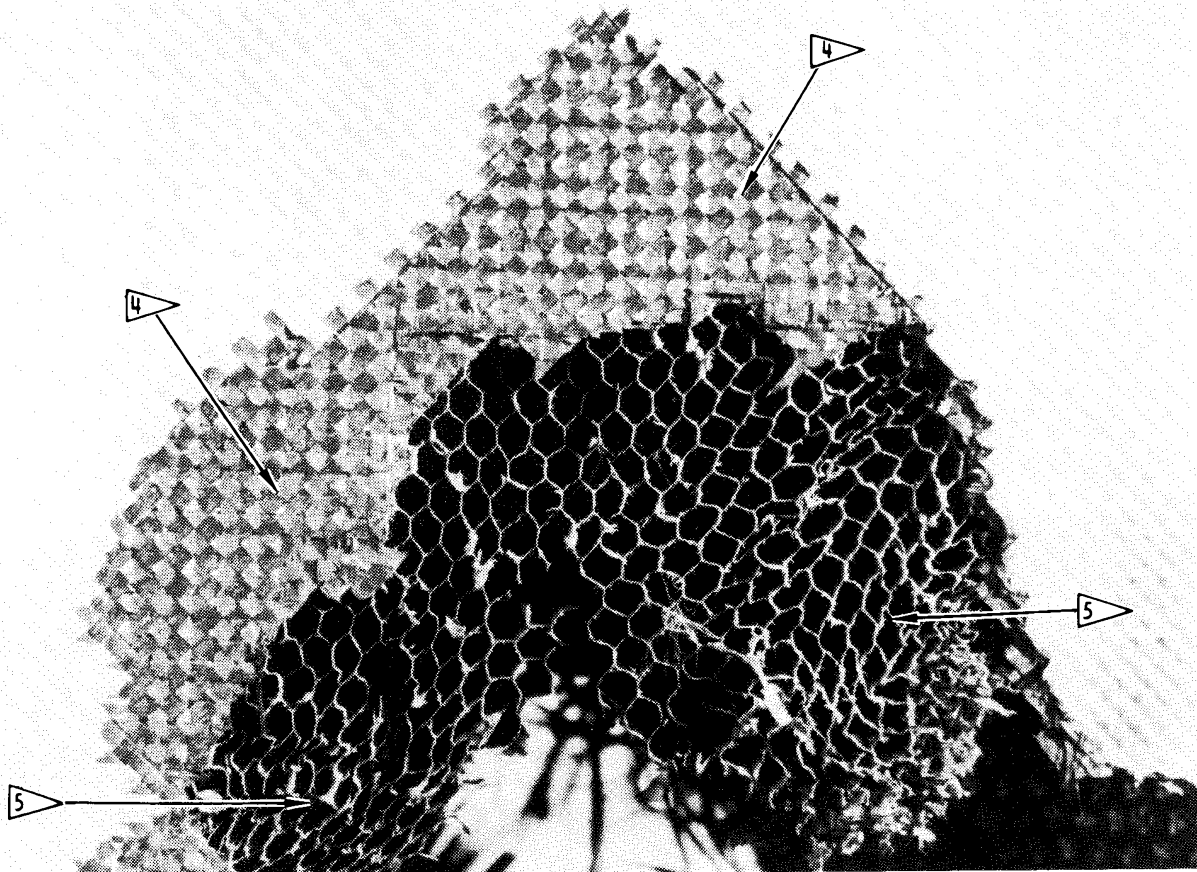
ALL EFFECTIVITY

PART 1 51-01-02

D6-37239

Page 4
Nov 15/2015

**737
NON-DESTRUCTIVE TEST MANUAL**



NOTES

- 4** SOME OF THE PLIES ARE MISSING.
- 5** ALL THE PLIES ARE GONE IN AN AREA SUCH THAT YOU CAN SEE THE HONEYCOMB STRUCTURE.

2125170 S0000457969_V1

**Typical Impact Damage
Figure 1 (Sheet 3 of 3)**

ALL EFFECTIVITY

PART 1 51-01-02

D6-37239



737
NON-DESTRUCTIVE TEST MANUAL
PART 1 - GENERAL

NDT ASSESSMENT OF LIGHTNING STRIKE DAMAGE TO GRAPHITE/EPOXY COMPOSITE STRUCTURE

1. Purpose

- A. This procedure provides general NDT procedures to determine the presence and extent of lightning strike damage.
- B. There are four methods used to detect the degree of damage to graphite/epoxy structures.
 - (1) Visual -- The areas are visually inspected for obvious physical damage.
 - (2) Pulse-Echo Ultrasonics -- The laminate and skin-over-core are inspected by pulse-echo ultrasonics for delaminations occurring between the plies.
 - (3) Bondtest Ultrasonics -- Skin-to-core bond integrity is inspected by the use of bondtesters.
 - (4) Radiography -- X-ray is used to detect damage to internal structure.

2. Prepare for the Inspection

- A. Identify lightning strike damaged areas.
 - (1) A thorough visual examination will find the obvious surface damage which occurs during lightning strike (see Figure 1). This damage can be defined as:
 - (a) Blistered, chipped, scorched and discolored paint.
 - (b) Frayed fibers, particularly around metal attachments and fasteners. Damaged fasteners may show pull-through.
 - (c) Noticeable delaminations where plies are pulled away from surface of part.
 - (d) Partial loss of ply build-up.
 - (e) Total ply loss showing internal damage to honeycomb core structure.
 - (2) Examine surface area of part for discrepant conditions as defined in Paragraph 2.A.(1).
NOTE: Note lightning strike entry and exit points. Pay particular attention to composite structure around metal fittings, attachments and fasteners in general path between lightning entry and exit points.
 - (3) Mark areas noted in Paragraph 2.A.(2) on part.
- B. Part preparation instructions are given in specific procedures used in the investigative process.

3. Inspection Procedure

- A. Pulse-Echo Ultrasonics
 - (1) Pulse-echo ultrasonics will detect interply delaminations in laminates and skin-over-core where access conditions for inspection are limited to a single side.
 - (2) See Part 4, 51-00-01, "Inspection of Laminated Structures" for a general inspection procedure of solid laminates and skin-over-core up to 0.250-inch thick.
 - (3) Include in pulse-echo inspection coverage, 5.0 inches of assumed good structure around each discrepant area noted in Paragraph 2.A.(3) and around all metal fittings and attachments on part. Inspect by sliding the transducer from good area into discrepant area.
 - (4) If discrepant area is found to be larger than previously noted, determine new boundary and mark part. Re-inspect until a 5.0-inch good area is encountered around discrepant area.

ALL

EFFECTIVITY

PART 1 51-01-03

D6-37239

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Page 1
Nov 15/2015



737

NON-DESTRUCTIVE TEST MANUAL

B. Bondtest Ultrasonics

- (1) Bondtesters can detect skin-to-core disbonds where access conditions for inspection are limited to a single side.
- (2) See Part 4, 51-00-04 "Bondline Delamination Inspection in Composite Honeycomb Structure", for a general inspection procedure of honeycomb structure.
- (3) Include in bondtest inspection coverage, 5.0 inches of assumed good structure around each discrepant area noted in Paragraph 3.A.(3). Inspect by sliding the probe from good area into discrepant area excluding any area found to have interply delaminations.
- (4) If discrepant area is found to be larger than previously noted, determine new boundary and mark part. Re-inspect until a 5.0-inch good area is encountered around discrepant area.

C. Radiography

- (1) X-ray of composite structure can detect broken structure when there is a displacement of internal members, the presence of water in honeycomb, and crushed or damaged core.
- (2) See Part 2, 51-00-02, "Subsurface Fractures in Advanced Composite Structure", Part 2, 51-00-01, "Water Detection in Honeycomb Structure", and Part 2, 51-00-03, "Inspection of Nonmetallic Honeycomb", for general X-ray inspection procedures.
- (3) Include in X-ray inspection coverage, 5.0 inches of assumed good structure around each discrepant area noted in Paragraph 3.B.(3).
- (4) If discrepant area is found to be larger than previously noted, determine new boundary and mark part. Re-inspect until a 5.0-inch good area is encountered around discrepant area.

ALL

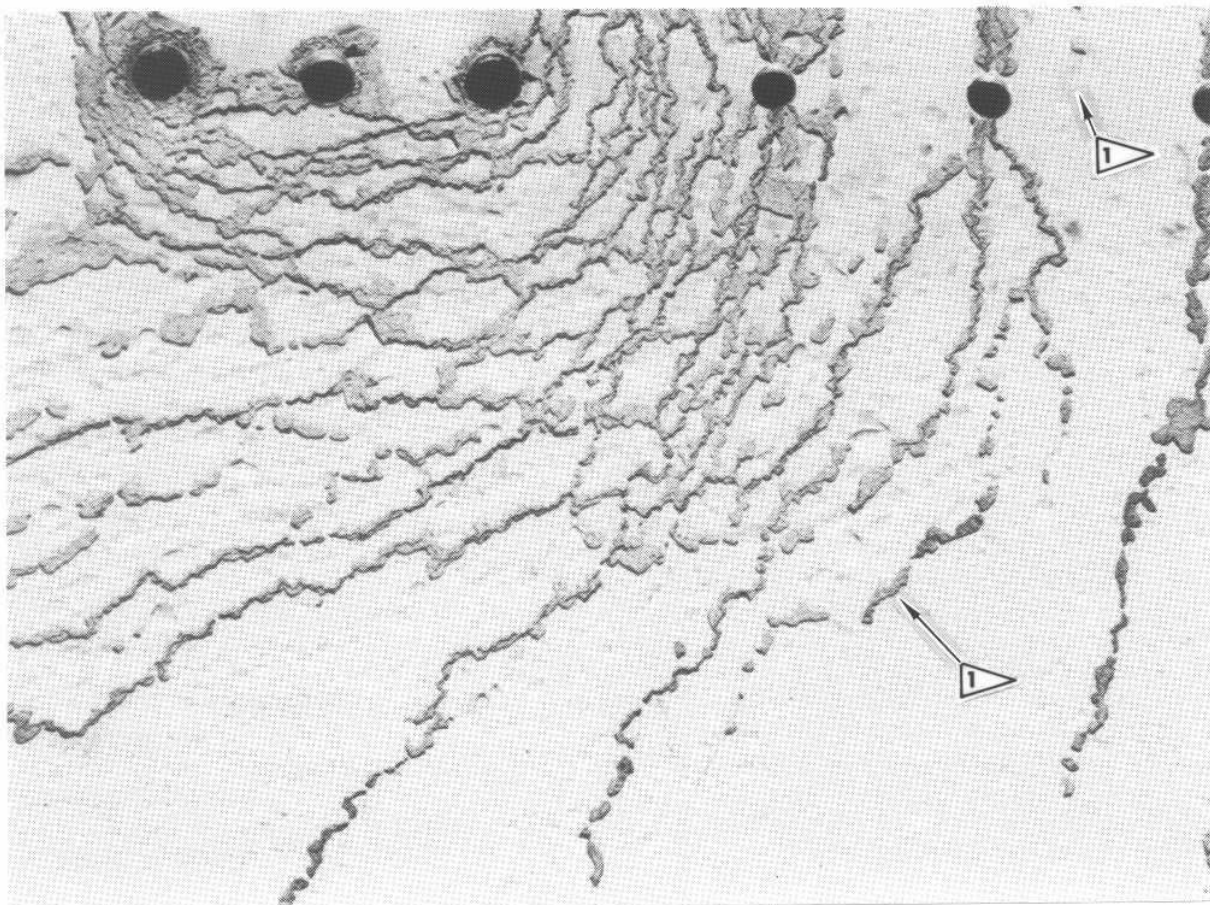
EFFECTIVITY

PART 1 51-01-03

D6-37239

Page 2
Nov 15/2015

**737
NON-DESTRUCTIVE TEST MANUAL**



NOTES:

- 1 BLISTERED, CHIPPED, SCORCHED AND DISCOLORED PAINT

2158983 S0000470898_V1

**Typical Lightning Strike Damage
Figure 1 (Sheet 1 of 4)**

ALL EFFECTIVITY

PART 1 51-01-03

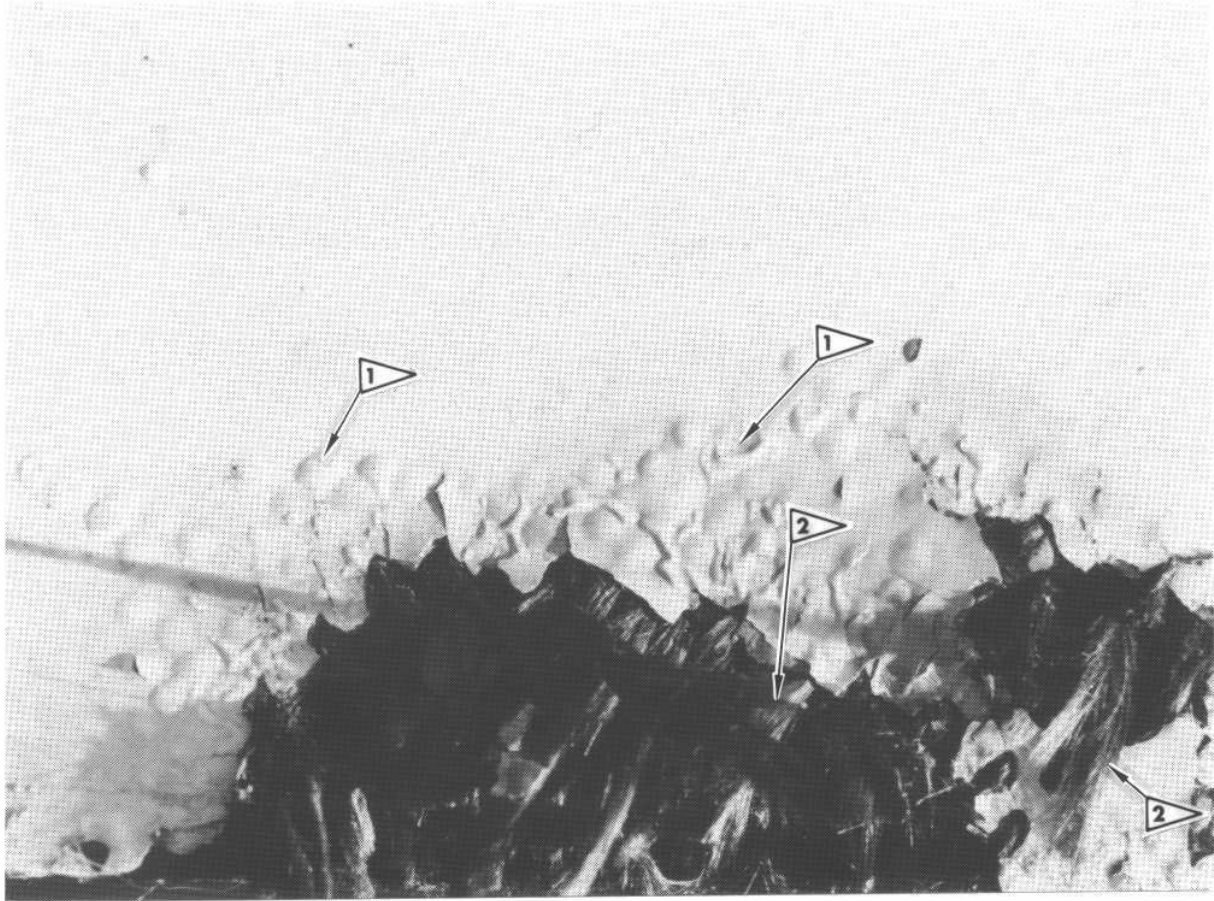
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Page 3
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL



NOTES:

2 FRAYED FIBERS

2159013 S0000470899_V1

Typical Lightning Strike Damage
Figure 1 (Sheet 2 of 4)

ALL EFFECTIVITY

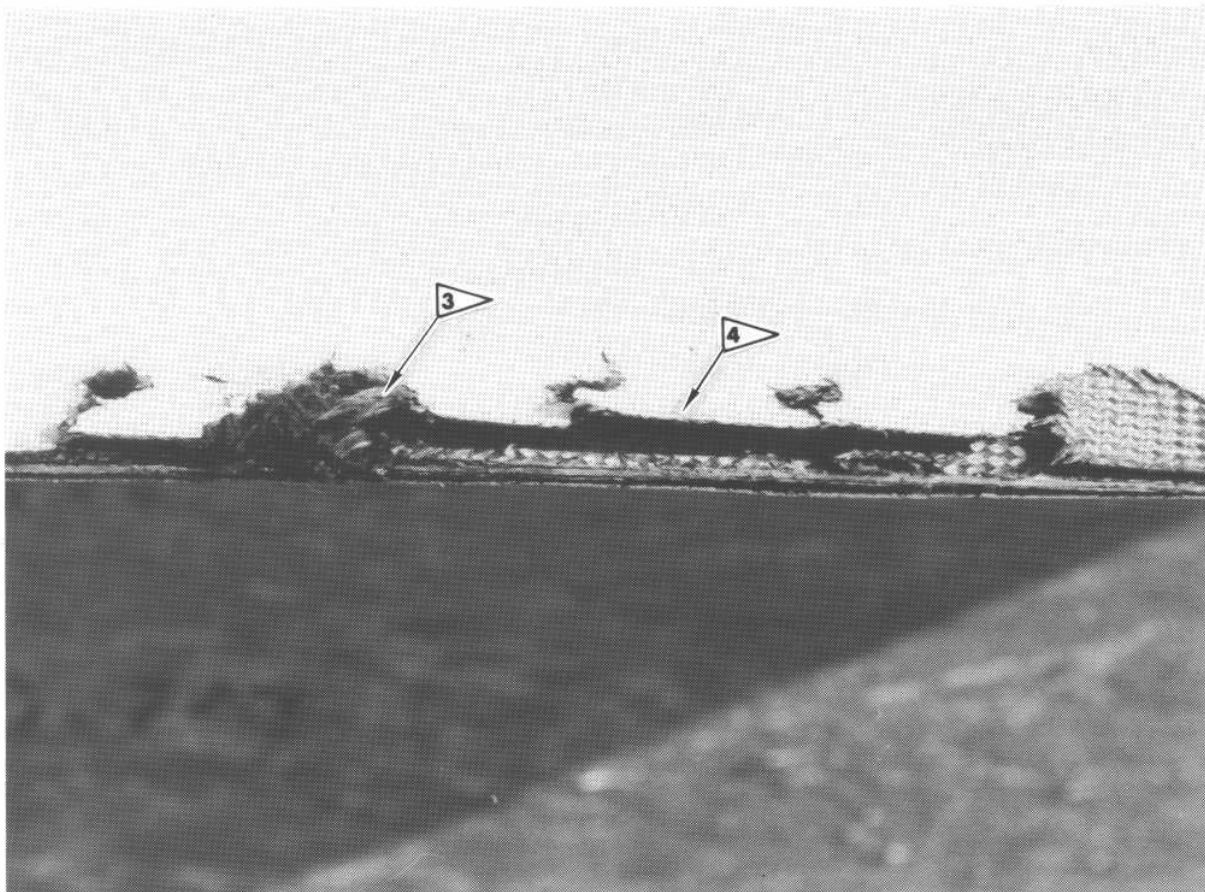
PART 1 51-01-03

D6-37239

Page 4
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL



NOTES:

- 3 FRAYED FIBERS AROUND METAL FASTENERS
- 4 NOTICEABLE DELAMINATIONS WHERE PLIES ARE PULLED AWAY FROM SURFACE OF PART

2159124 S0000470900_V1

Typical Lightning Strike Damage
Figure 1 (Sheet 3 of 4)

ALL EFFECTIVITY

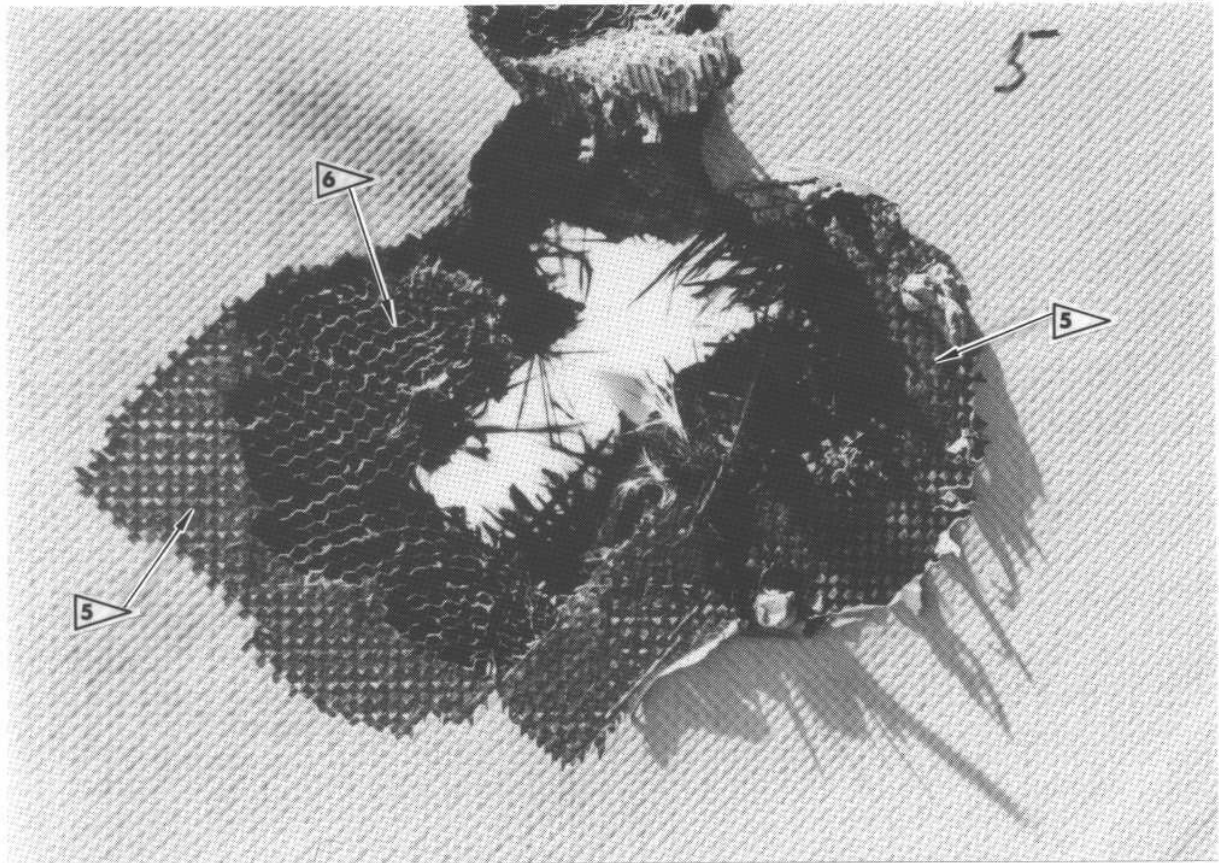
PART 1 51-01-03

D6-37239

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Page 5
Nov 15/2015

737
NON-DESTRUCTIVE TEST MANUAL



NOTES:

- 5 PARTIAL LOSS OF PLY BUILD-UP
- 6 TOTAL PLY LOSS SHOWING INTERNAL DAMAGE TO HONEYCOMB STRUCTURE

2159128 S0000470901_V1

Typical Lightning Strike Damage
Figure 1 (Sheet 4 of 4)

ALL EFFECTIVITY

PART 1 51-01-03

D6-37239

Page 6
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL
PART 1 - GENERAL

INSTALLATION OF RIVETS INTO REFERENCE STANDARDS

1. Purpose

- A. Use this procedure to install rivets into the reference standards.
- B. This procedure was taken from Boeing Specification BAC5004-1 and the applicable model Structural Repair Manual section on rivet installation. Refer to these documents for more data.

2. Installation of Solid Rivets

- A. Use Figure 1 to identify the correct rivet length. To make a selection of the rivet length, use the rivet diameter and the grip length (reference standard stack-up thickness).
- B. Solid rivets can be installed with an applicable squeeze-riveting tool or a rivet gun and bucking bar. Some rivets (for example, the BACR15FT rivet) are installed with tools that can be different than tools for most rivets. Make sure that you have the correct tools for each type of rivet that you install.
 - (1) Do not over-drive the rivets as this can cause cracks.
 - (2) If a rivet gun and a bucking bar are used, they must be large enough to drive the rivets quickly. Three to four seconds of drive time is best. Seven seconds is the maximum. It is recommended that bucking bars be very smooth when you install all types of rivets.

3. Inspection of Installed Rivets

- A. Do the inspections that follow after you install the rivets.
 - (1) Measure the button dimensions as shown in Figure 2.
 - (a) Out-of-round and tipped rivet buttons are permitted if the button dimensions meet those identified in Figure 2, Table I. For out-of-round buttons, measure the minimum diameter.
 - (b) Clinched or bent-over buttons are not permitted if the hole is visible. See Figure 2, Detail 1 for an example of a clinched rivet.
 - (c) Bell-shaped buttons are caused by incomplete driving and are not permitted. See Figure 2, Detail 2 for an example of a bell-shaped button.
 - (2) Examine the rivet heads and buttons to make sure there are no cracks.
 - (a) A deformed manufactured head caused by the die is permitted if there are no sharp discontinuities in the deformed surface.
 - (3) Look for gaps under the rivet heads as shown in Figure 3.
- B. Remove rivets that do not meet the conditions specified in Paragraph 3.A. and install new rivets.

ALL

EFFECTIVITY

PART 1 51-01-04

D6-37239

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Page 1
Nov 15/2015



737 NON-DESTRUCTIVE TEST MANUAL

GRIP (T) RANGES FOR RIVET LENGTHS AND DIAMETERS							RIVET LENGTH L	
5/32 OR 5 DIA	3/16 OR 6 DIA	7/32 OR 7 DIA	1/4 OR 8 DIA	9/32 OR 9 DIA	5/16 OR 10 DIA	3/8 OR 12 DIA	SIZE	DASH NO.
0.035							3/16	-3
0.036 0.093	0.068						1/4	-4
0.094 0.152	0.069 0.127	0.107	0.078	0.058			5/16	-5
0.153 0.211	0.128 0.185	0.108 0.166	0.079 0.136	0.059 0.117	0.087	0.038	3/8	-6
0.212 0.270	0.186 0.244	0.167 0.225	0.137 0.195	0.118 0.176	0.088 0.146	0.039 0.097	7/16	-7
0.271 0.327	0.245 0.303	0.226 0.283	0.196 0.254	0.177 0.234	0.146 0.205	0.098 0.156	1/2	-8
0.328 0.387	0.304 0.362	0.284 0.342	0.255 0.313	0.235 0.293	0.206 0.264	0.157 0.215	9/16	-9
0.388 0.446	0.363 0.420	0.343 0.401	0.314 0.371	0.294 0.352	0.265 0.322	0.216 0.273	5/8	-10
0.447 0.505	0.421 0.479	0.402 0.460	0.372 0.430	0.353 0.411	0.323 0.381	0.274 0.332	11/16	-11
0.506 0.563	0.480 0.538	0.461 0.518	0.431 0.489	0.412 0.469	0.382 0.440	0.333 0.391	3/4	-12
0.564 0.622	0.539 0.597	0.519 0.577	0.490 0.548	0.470 0.528	0.441 0.499	0.392 0.450	13/16	-13
0.623 0.681	0.598 0.655	0.578 0.636	0.549 0.606	0.529 0.587	0.500 0.557	0.451 0.508	7/8	-14

GRIP RANGES AND RECOMMENDED RIVET LENGTHS FOR STANDARD ALUMINUM SOLID RIVETS

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Selection of Rivet Lengths
Figure 1

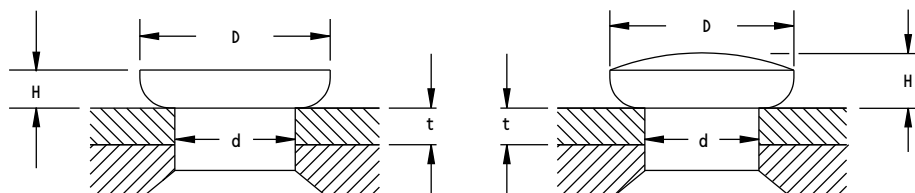
ALL EFFECTIVITY

PART 1 51-01-04

D6-37239

Page 2
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL

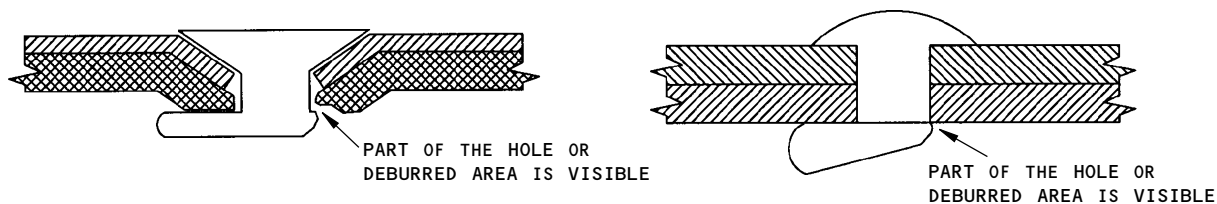


STANDARD FLAT DRIVEN HEAD

UNIVERSAL DRIVEN HEAD

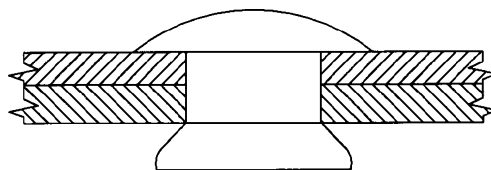
NOMINAL RIVET DIAMETER	D MINIMUM DRIVEN RIVET BUTTON DIAMETER		H DRIVEN RIVET BUTTON THICKNESS OR HEIGHT		
	ALL RIVETS EXCEPT AS NOTED	BACR15GF AND 7050 ALUMINUM ALLOY RIVETS	BACR15GF BACR15CE BACR15DS NAS1097	ALL OTHER RIVETS	ALL RIVETS
	1.3d	1.4d	MINIMUM	MINIMUM	MAXIMUM RECOMMENDED
1/16	0.081	0.088	0.025	0.025	0.040
3/32	0.122	0.131	0.038	0.038	0.060
1/8	0.165	0.175	0.050	0.050	0.080
5/32	0.203	0.219	0.050	0.062	0.100
3/16	0.245	0.264	0.060	0.075	0.120
7/32	0.285	0.311	0.070	0.085	0.140
1/4	0.325	0.350	0.080	0.100	0.160
9/32	0.365	0.397	0.090	0.110	0.180
5/16	0.406	0.438	0.125	0.125	0.200
11/32	0.450	0.481	0.135	0.135	0.210
3/8	0.488	0.525	0.150	0.150	0.210
13/32	0.530	0.569	0.165	0.165	0.215

TABLE I



CLINCHED RIVETS ARE NOT PERMITTED

DETAIL I



BELL-SHAPED RIVETS ARE NOT PERMITTED

DETAIL II

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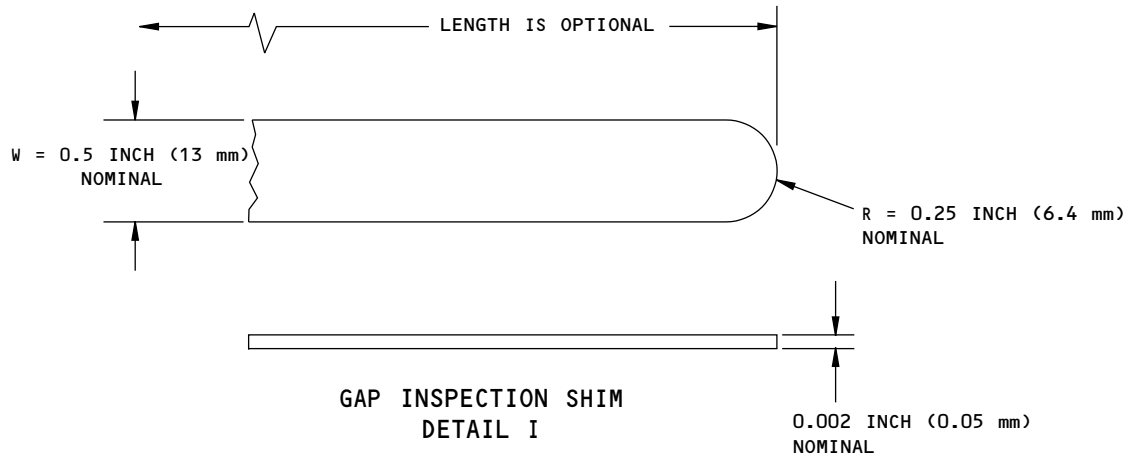
Dimensions for Driving Solid Shank Rivets

Figure 2

ALL EFFECTIVITY

PART 1 51-01-04

737 NON-DESTRUCTIVE TEST MANUAL



INSPECTION	GAP ANALYSIS
PROTRUDING HEADS	<ul style="list-style-type: none"> • SEE DETAIL II
FLUSH HEADS	<ul style="list-style-type: none"> • SEE DETAIL III
FLUSH DRIVEN BUTTONS (ALL RIVETS)	<ul style="list-style-type: none"> • SEE DETAIL IV

TABLE I

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Gap Analysis for Rivet Heads and Buttons Figure 3 (Sheet 1 of 3)

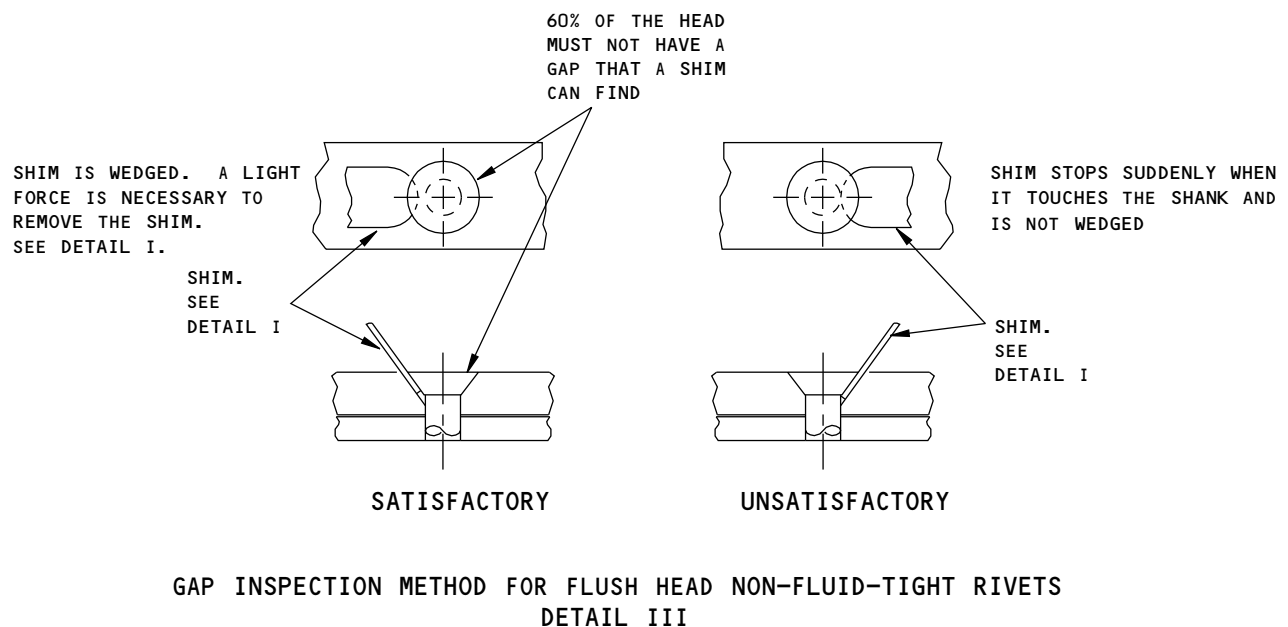
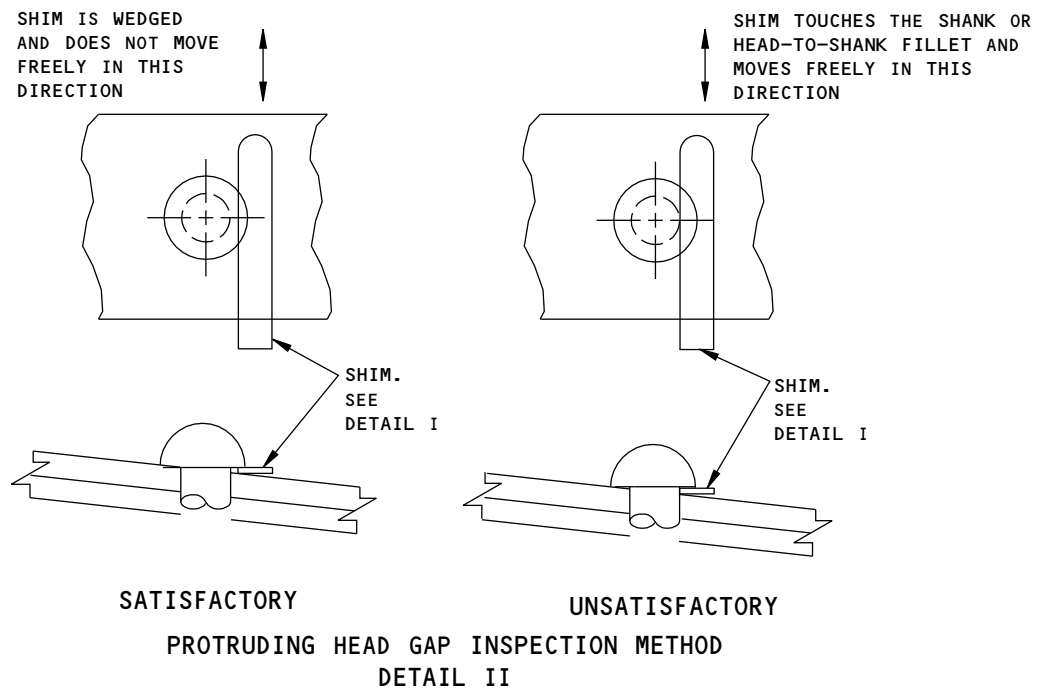
ALL EFFECTIVITY

PART 1 51-01-04

D6-37239

Page 4
Nov 15/2015

737 NON-DESTRUCTIVE TEST MANUAL



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Gap Analysis for Rivet Heads and Buttons Figure 3 (Sheet 2 of 3)

EFFECTIVITY
ALL

PART 1 51-01-04

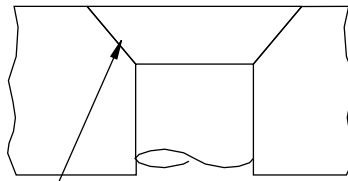
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Page 5
Nov 15/2015



737
NON-DESTRUCTIVE TEST MANUAL



NO MEASURABLE
GAP IS ALLOWED

GAP INSPECTION METHOD FOR
FLUSH DRIVEN BUTTONS (ALL RIVETS)
DETAIL IV

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Gap Analysis for Rivet Heads and Buttons
Figure 3 (Sheet 3 of 3)

ALL

EFFECTIVITY

PART 1 51-01-04

D6-37239

Page 6
Nov 15/2015