



AEROSPACE STANDARD	AS6870™	REV. A
	Issued	2020-12
	Revised	2023-06
Superseding AS6870		
Nondestructive Inspection Program Requirements for Aerospace Systems		

RATIONALE

AS6870A is the result of a review due to changes in reference document and current industry requirements. The revision aligns part classification with reference documents (4.4.1, 5.1, 5.4, 5.5.7, 5.5.8, 6.5, 7.5), revises removal of discontinuities (5.5.5), and updates sustainment procedures based on changes in the associated reference documents (7.3, 7.3.2).

1. SCOPE

1.1 Purpose

This SAE Aerospace Standard defines the requirements for establishing a nondestructive inspection (NDI) program for aerospace systems to include but not limited to aircraft structure, aircraft stores (external structures such as antennas, pods, fuel tanks, weapons, radomes, etc.) and missile/rocket structural components when an NDI Program Plan is required by contract. NDI Programs are essential to ensuring NDI processes are implemented to support the lifecycle design requirements of the system and its components. NDI Programs are applicable to all phases of the system life cycle, including acquisition, modification, and sustainment. This standard may also be applicable to mechanical equipment, subsystems, and propulsion systems, but the requirements defined by the NDI Program Plan should be tailored by the contracting agency for such use. An NDI Program Plan shall be developed at the beginning of the technology development phase and shall define all NDI requirements to be adhered to throughout the system life cycle.

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2644	Inspection Material, Penetrant
AMS2647	Fluorescent Penetrant Inspection Aircraft Structures and Engine Component Maintenance
AMSI83387	Inspection Process, Magnetic Rubber

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Full document details: SAE AS6870A

For more information on this standard, visit
<https://www.sae.org/standards/content/AS6870A/>

Documents
Document Sharing Hub

AMSSTD2154	Inspection, Ultrasonic, Wrought Metals, Process for
ARP4402	Eddy Current Inspection of Open Fastener Holes in Aluminum Aircraft Structures
ARP4462	Barkhausen Noise Inspection for Detecting Grinding Burns in High Strength Steel Parts
AS4787	Eddy Current Inspection of Circular Holes in Nonferrous Metallic Engine Hardware
AS7766	Terms Used in Aerospace Metals Specifications

2.2 ASNT Publications

2.3 Available from American Society for Nondestructive Testing, 1711 Arlingate Lane, Columbus, OH 43228-0518.

SNT-TC-1A	Recommended Practice, Personnel Qualification and Certification in Nondestructive Testing
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2.4 AIA Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NAS410	Nondestructive Testing Personnel Qualification and Certification
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2.5 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B244	Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments
ASTM E164	Standard Practice for Contact Ultrasonic Testing of Weldments
ASTM E213	Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing
ASTM E215	Standard Practice for Standardizing Equipment and Electromagnetic Examination of Seamless Aluminum-Alloy Tube
ASTM E309	Standard Practice for Eddy Current Examination of Steel Tubular Products Using Magnetic Saturation
ASTM E376	Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Testing Methods
ASTM E426	Standard Practice for Electromagnetic (Eddy Current) Examination of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys
ASTM E498/E498M	Standard Practice for Leaks Using the Mass Spectrometer Leak Detector or Residual Gas Analyzer in the Tracer Probe Mode
ASTM E1004	Standard Test Method for Determining Electrical Conductivity Using the Electromagnetic (Eddy - Current) Method
ASTM E1316	Standard Terminology for Nondestructive Examinations
ASTM E1417/E1417M	Standard Practice for Liquid Penetrant Testing
ASTM E1444/E1444/M	Standard Practice for Magnetic Particle Testing

ASTM E1742/E1742M	Standard Practice for Radiographic Examination
ASTM E2033	Standard Practice for Computed Radiology (Photostimulable Luminescence Method)
ASTM E2375	Standard Practice for Ultrasonic Testing of Wrought Products
ASTM E2339	Standard Practice for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE)
ASTM E2445/E2445M	Standard Practice for Performance Evaluation and Long-Term Stability of Computed Radiography Systems
ASTM E2580	Standard Practice for Ultrasonic Testing of Flat Panel Composites and Sandwich Core Materials Used in Aerospace Applications
ASTM E2581	Standard Practice for Shearography of Polymer Matrix Composites, and Sandwich Core Materials in Aerospace Applications
ASTM E2582	Standard Practice for Infrared Flash Thermography of Composite Panels and Repair Patches Used in Aerospace Applications
ASTM E2662	Standard Practice for Radiologic Examination of Flat Panel Composites and Sandwich Core Materials Used in Aerospace Applications
ASTM E2663	Practice for Digital Imaging and Communication in Nondestructive Evaluation (DICONDE) for Ultrasonic Test Methods
ASTM E2698	Standard Practice for Radiological Examination Using Digital Detector Arrays
ASTM E2736	Standard Guide for Digital Detector Array Radiology
ASTM E2737	Standard Practice for Digital Detector Array Performance Evaluation and Long-Term Stability

2.6 EN Publications

Available from the British Standards Institute, 389 Chiswick High Road, London, W4 4AL, UK, +44 (0)20 8996 9001, www.bsi-global.com.

EN 4179	Qualification and Approval of Personnel for Non-Destructive Testing
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2.7 Government Documents

2.7.1 Department of Defense Specifications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

JSSG-2006	Joint Service Specification Guide Aircraft Structures
MIL-DTL-87929	Manuals, Technical Operation and Maintenance Instructions in Work Package Format

2.7.2 Department of Defense Standards

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-STD-867	Temper Etch Inspection
MIL-STD-1530	Aircraft Structural Integrity Program (ASIP)

MIL-STD-1537	Electrical Conductivity Test for Verification of Heat Treatment of Aluminum Alloys, Eddy Current Method
MIL-STD-1798	Mechanical Equipment and Subsystems Integrity Program
MIL-STD-1907	Inspection, Liquid Penetrant and Magnetic Particle, Soundness Requirements for Materials, Parts, and Weldments
MIL-STD-3024	Propulsion System Integrity Program (PSIP)
MIL-STD-40051-1	Preparation of Digital Technical Information for Interactive Electronic Technical Manuals (IETMs)
MIL-STD-40051-2	Preparation of Digital Technical Information for Page-Based Technical Manuals (TMs)

2.7.3 Department of Defense Handbooks

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-HDBK-516	Airworthiness Certification Criteria
MIL-HDBK-1783	Engine Structural Integrity Program (ENSIP)
MIL-HDBK-1823	Nondestructive Evaluation System Reliability Assessment
MIL-HDBK-6870	Nondestructive Inspection Program Requirements for Aircraft and Missile Materials and Parts

2.7.4 Other Government Documents, Drawings, and Publications

2.7.5 Available online at <https://etims.cce.af.mil/ETIMS/index.jsp>.

Technical Orders

Joint Air Force-Navy-Army Technical Manual

NAVAIR 01-1A-16-2	
TM 1-1500-366-23	
TO 33B-1-2	Nondestructive Inspection General Procedures and Process Controls

2.7.6 Air Force Structures Bulletins

Available from EngineeringStandards@wpafb.af.mil or the Air Force NDI Program Office, AFRL/RXSST, 4750 Staff Dr., Tinker AFB OK 73145, DSN 339-4931 or 405-739-4931.

EN-SB-08-011	Nondestructive Inspection of Safety-of-Flight Structures
EN-SB-08-012	In-Service Inspection Crack Size Assumptions for Metallic Structures
EZ-SB-13-003	Revised Initial Flaw Size Assumptions for Slow Crack Growth (SCG) Metallic Structures
EZ-SB-15-001	Aircraft Structures Teardown Inspection and Evaluation Program Protocols
EZ-SB-15-002	Requirements for NDI Procedure Development, Validation and Verification for Aircraft Inspection During Operations and Support Phase

3. DEFINITIONS

Terms used in AMS are defined in AS7766 and the following. (Refer to ASTM E1316 for definitions of terms related to nondestruction examination that are not listed below.)

3.1 CERTIFICATION - INSPECTOR

A written statement from the certifying agency verifying that an individual inspector has met applicable requirements. The certifying agency may be the employer of the inspection personnel.

3.2 CLASSIFICATION

Classification refers to functional reliability requirements of the part and implies a confidence level requirement for NDI. A high-reliability class (i.e., fracture-critical and fracture-critical traceable) may require NDI capability demonstrations to assure the capability and confidence level of the NDI process; applied to that component to meet the intended design requirement. Complex components may also be divided into zones with separate classifications.

3.3 CONTRACTING AGENCY

A contractor, subcontractor, or government agency procuring product or services.

3.4 CONTRACTOR

An organization having contractual responsibility to the government.

3.5 DURABILITY-CRITICAL PART

A non-safety-of-flight structural component that is judged to require additional controls beyond those for normal-control parts.

3.6 FINAL INSPECTION

The last inspection of a part or component usually just prior to final acceptance. This inspection may occur during manufacturing and also before a component is built into an assembly and will become uninspectable. The final inspection may also be an inspection just after some processing step and is not subject to reinspection by the manufacturer after further processing. Final inspection may also occur in maintenance activities just before the component is built into an assembly where subsequent inspection is not possible.

3.7 FRACTURE-CRITICAL PART

A safety-of-flight, structural component that is not single load path nor judged to require serialization and traceability (refer to MIL-STD-1530, MIL-STD-3024, MIL-HDBK-516, and JSSG-2006).

3.8 FRACTURE-CRITICAL TRACEABLE PART

A safety-of-flight structural that is either single load path or judged to require serialization and traceability (refer to MIL-STD-1530, MIL-STD-3024, MIL-HDBK-516, and JSSG-2006).

3.9 LIFE CYCLE

The entire life of a program or system, including design, development, testing, production, sustainment, modification, and disposal.

3.10 MATERIAL REVIEW BOARD (MRB)

A government approved review of discrepant materials by authorized contractor engineering and quality assurance personnel to determine whether material or component can be returned to an acceptable state.

3.11 NONDESTRUCTIVE INSPECTION (NDI)

The inspection of a structure or component in any manner that will not impair its future usefulness. The purpose of NDI may be to detect flaws at or beneath the external surface of a part, measure geometric characteristics, determine material structure or composition, or it may characterize physical, electrical, or thermal properties without causing changes in the part. The five primary methods of NDI are liquid penetrant, magnetic particle, eddy current, ultrasonic, and radiography. Other methods include but are not limited to computed tomography, shearography, and thermography.

3.11.1 NDI FACILITY

Organizations responsible for providing NDI services in support of the program in any phase of the system life cycle.

3.11.2 NDI PROCEDURE

Step-by-step instructions for performing a particular NDI method on a specific part or family of parts (see 5.3.4).

3.11.2.1 GENERAL NDI PROCEDURE

Non-part-specific, step-by-step NDI instructions applicable to common product forms such as plates, composite laminates and bonded assemblies, bar stock, fasteners and tubular products, etc. General NDI procedures may also include those that describe standardization and inspection processes for common inspection methods.

3.11.2.2 PART-SPECIFIC NDI PROCEDURES

Step-by-step instructions for inspection of a designated part or component, which incorporates all processing criteria. The contractor's or customer's general procedures may be used to form part of specific NDI procedures when supplemented by part-specific information, permitted by contract and approved by the customer. With approval from the contracting agency, part-specific NDI procedures may be used in lieu of company process specifications.

3.11.3 NDI PROCESS SPECIFICATION

NDI process specifications define the requirements for equipment, reference standards, materials, personnel, etc., for a particular NDI method or for the testing of a particular product.

3.11.4 NDI PROGRAM PLAN

Document that defines the approach for implementing NDI processes throughout the system life cycle.

3.11.5 NDI REQUIREMENTS REVIEW BOARD (NDIRRB)

An advisory team (also known as an NDI Advisory Board) comprised of representatives from pertinent disciplines that guides the NDI Program. NDI, durability and damage tolerance, design, materials and processes (M&P) subject matter experts (SMEs) representing the prime, major subcontractors and government/customer. The NDIRRB shall be formed early in the conceptual phase of a weapons system to provide guidance to the prime contractor, major sub-contractors, System Program Office (SPO), and subsequently to the System Program Manager (SPM), on all technical matters necessary to establish, implement, and maintain an effective life cycle NDI Program responsive to the quality assurance, structural integrity and sustainment requirements of the program. The NDIRRB shall review and assess inspection requirements and processes during all phases of the program from initial design through production and in-service operation.

3.12 PROBABILITY OF DETECTION (POD)

A statistical measurement of the likelihood, with a specified confidence level, of finding a flaw of a defined size using a specific inspection process.

3.13 QUALIFICATION

The verified ability of personnel or products to meet the minimum capability, technical or performance requirements for a specified level of capability.