

NOTICE OF CHANGE

METRIC

MIL-STD-1757A
NOTICE 2
31 January 1993

MILITARY STANDARD

LIGHTNING QUALIFICATION TEST TECHNIQUES
FOR AEROSPACE VEHICLES AND HARDWARE

TO ALL HOLDERS OF MIL-STD-1757A:

1. THE FOLLOWING PAGES OF MIL-STD-1757A HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
1	31 January 1993	1	15 April 1991
2	31 January 1993	2	15 April 1991

2. MAKE THE FOLLOWING PEN AND INK CHANGES:

a. Cover page, delete Distribution Statement D and insert Distribution Statement A:

"Distribution Statement A. Approved for public release; distribution is unlimited."

b. Cover page, delete in their entirety, "Warning" and "Destruction Notice" paragraphs.

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-1757A will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or cancelled.

Custodians:

Army - AV
Navy - AS
Air Force - 11

Preparing activity:

Air Force - 11

Project number EMCS-O148

AMSC: N/A

AREA: EMCS

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

1. SCOPE

1.1 Scope. This document presents a set of standard test waveforms and techniques for lightning qualification testing of aerospace vehicles and hardware. The test waveforms presented in this document are intended to reproduce the significant effects of the natural environment and are therefore independent of vehicle type or configuration. The tests include high voltage and high current physical damage tests of fuel, structural and electrical hardware, as well as indirect effects associated with lightning strikes to externally mounted electrical hardware.

1.1.1 This document does not include design criteria nor does it specify which items should or should not be tested. The document is written so that test environments can be tailored for each specific program as dictated by the vehicle design, performance, and mission constraints. Acceptable levels of damage and pass-fail criteria for the tests described herein shall be established and agreed upon by the acquisition activity, regulatory authority, and aerospace vehicle manufacturer.

1.1.2 This document does not yet include specific test techniques or procedures that deal with indirect, or induced, effects of lightning on internal electrical or electronic equipment. As these test techniques are developed and verified, they will be added to the document.

1.2 Application. The test requirements described in this document are applicable to aerospace vehicles and parts or assemblies thereof. (Note: The term "aerospace vehicles" includes fixed/variable wing aircraft, helicopters, missiles, and spacecraft.)

1.3 Method of reference. When applicable, test methods contained herein shall be referenced in the individual specification by specifying this standard and the method number.

1.4 Units. The International System of Units, designated SI, is used throughout this document.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards and handbooks. The following standard forms a part of this document to the extent specified herein. Unless otherwise specified, the issue of this document is the one listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement(s) thereto, cited in the solicitation.

STANDARDS

Military

MIL-STD-45662

Calibration Systems Requirements

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from DoDSSP, Standardization Document Order Desk, 700 Robbins Avenue, Bldg 4D, Philadelphia PA 19111-5094.)

2.2 Non-Government publications. The following document forms a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

IEEE 4

Standard Techniques for Dielectric Tests

(Application for copies should be addressed to the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York NY 10017.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

DEFINITIONS

3.1 Direct and indirect lightning effects. The lightning effects which aerospace vehicles experience and the effects which are reproduced through laboratory testing with simulated lightning waveforms are divided into direct effects and indirect effects. The direct effects of lightning are the burning, eroding, blasting, and structural deformation caused by lightning arc attachment, as well as the high pressure shock waves and magnetic forces produced by the associated high currents. The indirect effects are predominantly those resulting from the interaction of the electromagnetic fields accompanying lightning with electrical apparatus in the vehicle. Hazardous indirect effects, in principle, could be produced by a lightning flash that did not directly contact the vehicle and hence was not capable of producing the direct effects of burning and blasting. However, it is currently believed that most indirect effects of importance will be associated with a direct lightning flash. In some cases, both direct and indirect effects may occur to the same component of the vehicle. An example would be a lightning flash to an antenna which physically damages the antenna and also sends damaging voltages into the transmitter or receiver connected to that antenna. In this document, the physical damage to the antenna will be discussed as a direct effect and the voltages or current coupled from the antenna into the communications equipment will be treated as an indirect effect.

3.2 Lightning attachment zones

3.2.1 Surface zones. Aerospace vehicle surfaces are divided into three zones, with each zone having different lightning attachment or transfer characteristics. These are defined as follows:

- a. Zone 1: Surfaces of the vehicles for which there is a high probability of initial lightning flash attachment (entry or exit).
- b. Zone 2: Surfaces of the vehicle across which there is a high probability of a lightning flash being swept by the airflow from a Zone 1 point of initial flash attachment.