AIAA
S-110-2005

Standard

Space Systems – Structures, Structural Components, and Structural Assemblies

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Space Systems — Structures, Structural Components, and Structural Assemblies

Sponsored by

American Institute of Aeronautics and Astronautics

Approved

12 July 2005

Abstract

This document establishes a standard for the design, analysis, material selection and characterization, fabrication, test, and inspection of structural items in space systems, including payloads, spacecraft, upper-stages, and expendable and reusable launch vehicles. This standard, when implemented on a particular space system, will assure high confidence in achieving safe, reliable operation in all phases of the mission. This document applies specifically to all structural items including fracture-critical hardware used in space systems during all phases of the mission—with the following exceptions: adaptive structures, engines, solid rocket nozzles, and thermal protection systems.

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Foreword

This standard was prepared by the AIAA Structures Committee of Standards (CoS) based on an Aerospace Technical Operating Report, TOR-2003 (8583)-2894, Space Systems-Structures Design and Test Requirements, 2 August 2004.

The AIAA Structures CoS was formed in 2004 with an emphasis on inclusion of experts in aerospace industry, academia, and interested government agencies. Deliberations focused heavily on adapting this standard to new space systems not only developed for the United States Air Force/Space and Missile Systems Center (USAF/SMC) but also for civil and commercial applications.

At the time of approval, the members of the AIAA Structures CoS were:

Pravin Aggarwal	NASA Marshall Space Flight Center
Basem Alzahabi	Kettering University
Steve Brodeur, Chair	Swales Aerospace
Meredith Cawley, Liaison	AIAA
Jim Chang, Co-Chair	The Aerospace Corporation
Sean Coghlan	Air Force Research Laboratory
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The above consensus body approved this document in June 2005.

The AIAA Standards Executive Council (Mr. Amr ElSawy, Chairman) accepted the document for publication in July 2005.

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In formulating, revising, and approving standards publications, the committees on standards will not consider patents that may apply to the subject matter. Prospective users of the publications are responsible for protecting themselves against liability for infringement of patents or copyright or both.

1 Scope

This document establishes a standard for the design, analysis, material selection and characterization, fabrication, test, and inspection of structural items in space systems, including payloads, spacecraft, upper-stages, and expendable and reusable launch vehicles. This standard, when implemented on a particular space system, will assure high confidence in achieving safe, reliable operation in all phases of the mission. This document applies specifically to all structural items including fracture-critical hardware used in space systems during all phases of the mission—with the following exceptions: adaptive structures, engines, solid rocket nozzles, and thermal protection systems.

2 Tailoring

For a specific program or project, the requirements defined in this Standard may be tailored to match the actual requirements of the particular program or project. Tailoring of requirements shall be undertaken in agreement with the procuring authority where applicable.

Tailoring is a process by which individual requirements or specifications, standards, and related documents are evaluated and made applicable to a specific program or project by selection, and in some exceptional cases, modification and addition of requirements in the standards.

3 Applicable Documents

The following applicable documents contain provisions which, through reference in this text, constitute provisions of this standard.

Aerospace TOR-2003 (8583) - 2886	*Aerospace Technical Operating Report, Independent Structural Loads Analyses of Integrated Spacecraft/Launch Vehicle Systems*
ANSI/AIAA S-080	*Space Systems - Metallic Pressure Vessels, Pressurized Structures, and Pressure Components*
ANSI/AIAA S-081	*Space Systems - Composite Overwrapped Pressure Vessel (COPVs)*
ANSI/AIAA S-096	*Space Systems - Flywheel Rotor Assemblies*
ASTM E-8	*Test Methods for Tension of Metallic Materials*
ASTM E-9	*Test Methods for Compression Testing of Metallic Materials at Room Temperature*
ASTM E-399	*Test Method for Plane Strain Fracture Toughness of Metallic Materials*
ASTM E-647	*Test Method for Measurement of Fatigue Crack Growth Rates*
ASTM E-740	*Practice for Fracture Testing with Surface-Crack Tension Specimens*
DOD/NASA	*Advanced Composites Design Guide, Vols. 1-4*
DOT/FAA/AR-MMPDS-01	*Metallic Materials Properties Development and Standardization*
ISO 21347	*Space Systems-Fracture and Damage Control*
MIL-HDBK-17	*Military Handbook, Polymer Matrix Composites, Vols. 1-5*