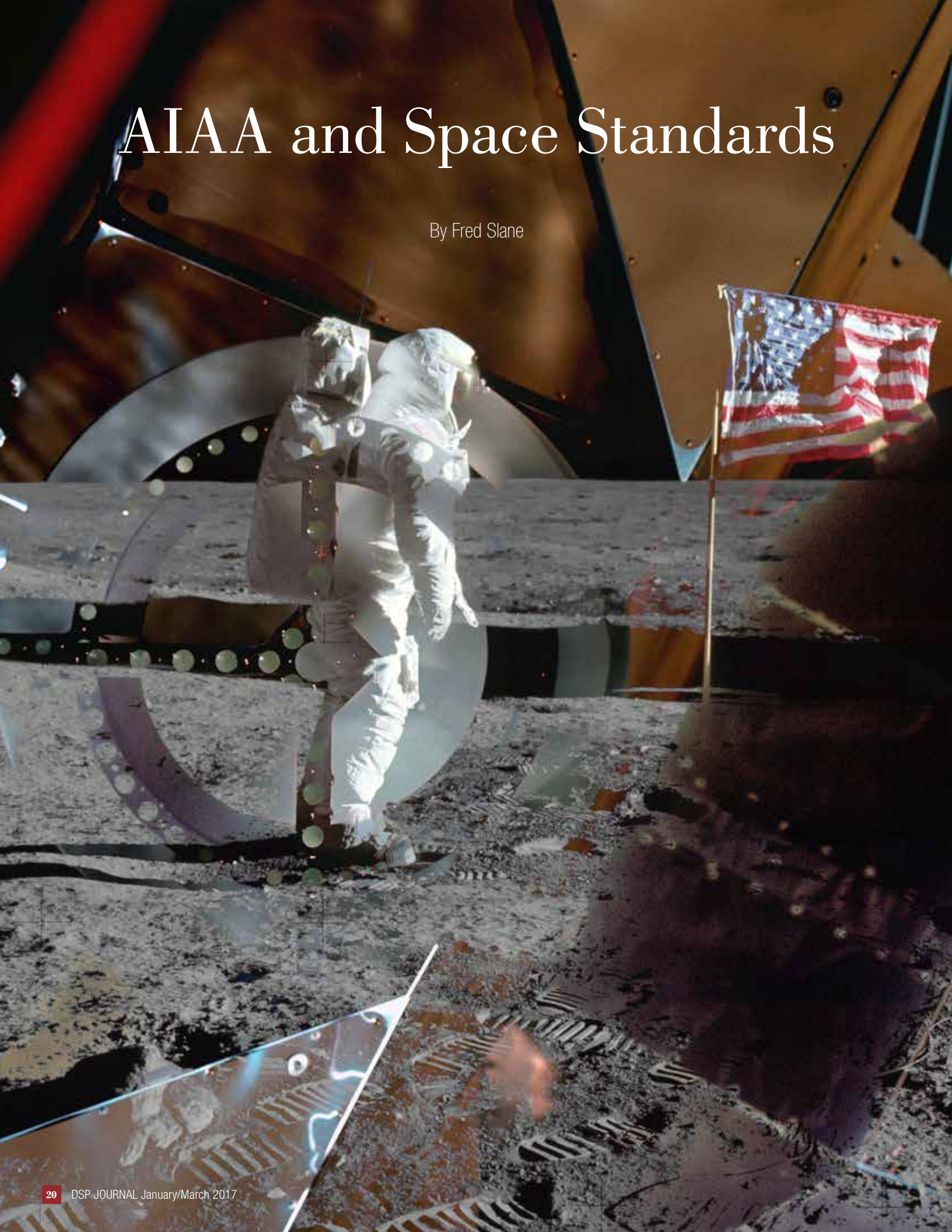
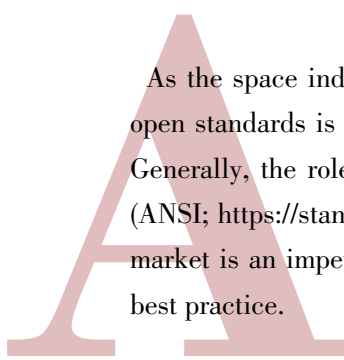


# AIAA and Space Standards

By Fred Slane





As the space industry approaches the 60th anniversary of spaceflight, a reflection on the role of open standards is an appropriate measure of the maturity of the industry, its actors, and markets. Generally, the role of open standards is described by the American National Standards Institute (ANSI; <https://standardsboostbusiness.org>). The advent of a strong international, commercial space market is an impetus for the U.S. defense and civil sectors to leverage open space standards as a best practice.

The American Institute for Aeronautics and Astronautics (AIAA) has been producing space standards since 1990, with the publication of ANSI/AIAA G-003-1990, “Guide to Reference and Standards Atmospheric Models.” Under the administrative control of the AIAA Standards Executive Council (SEC), committees on standards are established for the specific purpose of writing one or more designated standards. Unlike most other AIAA bodies, membership in standards committees is not restricted to AIAA members only but is open to any qualified subject matter experts (SMEs). This is necessary for AIAA standards to qualify as “open” standards.

In the late 1990s, the AIAA, working with the National Aeronautics and Space Administration (NASA), the Department of Defense (DoD), and the major space companies, attempted to provide a general guide to open space standards, the Collection of Preferred Space Related Standards (CPSRS). Standard topic areas catalogued more than 2,000 space-related documents into 10 topic areas: Documentation and Configuration Management, Program Management; Systems Engineering and Integration, Aerospace Environments, Celestial Mechanics, Mass Properties; Computer Systems, Software, Networking; Human Rating, Factors, and Health; Electrical Systems, Electronics, Avionics/Control Systems, Optics; Structures/Mechanical Systems, Fluid, Thermal, Propulsion, Aerodynamics; Materials and Processes, Parts; System Test, Analysis, Modeling, Evaluation; Safety, Quality, Reliability, Maintainability; and Operations, Command, Control, Telemetry/Data Systems, Communications. After about 2 years of work, this effort was abandoned when DoD and Hughes withdrew support following changes in International Traffic in Arms Regulations implementation procedures.

## Past Production of Standards

A complete view of AIAA standards is online (<http://arc.aiaa.org/page/standards>). The following is a limited sample:

- Standard Atmosphere, including a 2016 update of the original 1990 AIAA G-003 document.
- Pressure Vessels, with project leadership from the Aerospace Corporation. These standards were migrated to international standards in the International Organization for Standardization (ISO) through the Subcommittee for Space Systems and Operations (SC14).
- Space Plug-and-Play Architecture, sponsored by the Air Force Research Laboratory in Albuquerque. Standards in this set on ontology and electronic data sheets were strategically migrated to CCSDS in the SOIS group.

■ Mission Assurance, a set of 39 standards in three categories: management, engineering, and testing. Under the label of Safety, Dependability, and Produce Assurance, the principles of the AIAA Mission Assurance standards are now present in international standards in SC14.

Another significant contribution the AIAA has made to standards development is administrative support to the international space standards committees. The largest international standards organization is the ISO, and the U.S. member body to ISO is the American National Standards Institute. ANSI has designated the AIAA as administrative lead for the space standards (as related to ISO). Historically, the AIAA has been the only place in the United States where a comprehensive view of voluntary consensus standards is possible.

## Working to Establish a Better Forward Vision

In the 2010 time frame, about a decade after the demise of the CPSRS effort, AIAA leadership on the SEC again looked at approaches for advancement of open standards development. Looking primarily inward with a view to both aviation and space, efforts were made for the following:

■ **To increase the engagement of the AIAA technical committees (TCs) in standards development.** While there were existing pockets of standards work in the TC community, an effort was made to expand the role of the TCs to directly sponsor new standards development activities and to foster closer technical ties with existing committees on standards. This was seen as a way to bring not only fresh ideas to the standards efforts, but also more resources and expertise as the TCs enjoy both a larger membership pool and greater support from the institute.

■ **To establish domains for standards development rather than simply waiting for standard topics to be suggested in the hitherto rather haphazard manner.** The establishment of domains was intended to target standards development strategically.

## Results of That Engagement and Other Things

In the past 2 or 3 years, the SEC strategic leadership has shown promising results, including the following examples:

■ ANSI/AIAA S-119-2011(2016), “Flight Dynamics Model Exchange Standard.” This effort was sponsored by the Guidance, Navigation, and Control Technical Committee. This standard deals with aviation systems and is one of the first standards produced by a committee on standards spawned from a technical committee.

■ AIAA S-117A-2016, “Space Systems Verification Program and Management Process.” The committee on standards membership for this effort is from the Systems Engineering Technical Committee. This standard provides a broader definition of space systems verification methods than the limited test methods employed for conventional spacecraft.

■ The International Standards Advisory Board. This was established to develop and recommend to the AIAA Board of Directors related policies and procedures and to provide oversight of the administration of international standards secretariats and ISO U.S. technical advisory groups assigned by the American National Standards Institute to the institute.

Almost predictably, foresight of the opportunities for a standards development organization (SDO) in the space industry has not been unique to the AIAA. The Aerospace Industries Association has assumed support for the Consultative Committee for Space Data Systems (CCSDS) from the AIAA (the AIAA retains support for the U.S. advisory committee here). The American Society for Testing and Materials acts as the primary SDO supporting the Federal Aviation Administration and U.S. industry in their collaborative efforts in the United States for commercial manned spaceflight. For space systems standards to advance in some coherent fashion, it has become necessary for these SDOs to establish some means of strategic collaboration.

## **AIAA Constitutional Change Impacts (2016–17)**

AIAA Standards Executive Council restructuring of the AIAA standards work has been in discussion for several years. Institute membership approval of constitutional changes in 2016 has created a needed degree of flexibility and strategic thinking to the institute governance model that should also positively affect AIAA standards, including open standards efforts. Undertaking a more aggressive leadership role is one objective of the SEC within the institute and may extend to related NASA, CCSDS, and SC14 standards work. The use of domains (consistent with CPSRS and 2010 visions) may be extended.

## **Conclusions**

What we see looking forward for the AIAA standards program, based on the history and position today of AIAA standards work, are engagement and interaction. SMEs need to be engaged from within the institute membership and outside. Effective interaction and planning with other U.S.-based SDOs is necessary for U.S. industry to prevail in the global space marketplace.

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### **OTHER RESOURCES**

The non-profit Space Infrastructure Foundation provides a Standards and Architecture class that expands on much of the material in this article. The class is held at various space industry conferences, or it can be arranged at any location.

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### **About the Author**

Fred Slane is a founder and executive director of the Space Infrastructure Foundation, a 501(c)(3) non-profit organization. Working almost entirely in space systems for over 30 years, he retired from the U.S. Air Force in 2001 after a 20-year career and completed another 8 years in the Air Force Reserve. Serving with the AIAA Standards Executive Council and ISO's Technical Committee 20 Subcommittee 14 since 1999, Mr. Slane is the current chair of the TC20/SC14 U.S. Technical Advisory Group and is based in Colorado Springs, CO.