

Standardizing Standards Access (Summary)

- ✦ **Problem Statement**: SIF attempts to “harvest” standards descriptions annually from AIAA, ISO and CCSDS *manually*; It’s very time intensive (over a week of effort)
 - ◆ SIF’s application is to compile a spreadsheet (our Mission Applicability Guide – MAG) that evaluates standards for mission types.
 - ◆ Sample on next chart.
 - ◆ Other standards users (NASA, ESA, etc.) need to do the same to integrate their standards evaluations.
- ✦ **Recommend** that major Standardization organization come to agreement on the way metadata about their standards are presented on the web.
- ✦ **Minimum**: Standard layout page that can use simple manual cut-and-paste
- ✦ **Better**: Restful machine-readable interface that applications can “harvest” for user organizations to build an integrated library/description.
- ✦ **May be** as simple as other SDOs adopting ISO’s RSS Feed approach (to be confirmed)
- ✦ **Next Step**: Recommend AIAA, ISO and CCSDS (and others interested) have telecon to discuss this IT initiative to improve usability and “integrate-ability” of their websites.



SIF's MAG product

- Other user orgs may vary, but all need some level of integration.
- Notice ***inconsistent data*** in “topic” and “book type” and others, as harvested from websites.
- Other fields are collected, but not shown here. It's a complex task.
- Far right (blue) columns are SIF evaluations of applicability to mission types

Document Data (Updated August 2018)										Mission Applicability By Mission Type		
SDD name	Document Number	Title	Link	Topic (ICS for ISO)	Status Published or in Development	ISO Stage	Book Type	Date Published (or Estimated date)	Earth Observing	Other LEO missions	RESEARCH	
ISO	ISO/TS 18667:2018	Space systems -- Capability-based Safety, Dependability, and Quality Assurance	ISO/TS 18667:2018	49.14	Pub	60.6			3	3		
ISO	ISO/TS 20991:2018	Space systems -- Calibration requirements for satellite-based passive microwave	ISO/TS 20991:2018	49.14	Pub	60.6						
ISO	ISO/TS 21979	Space environment (natural and artificial) -- Procedure for obtaining worst case	ISO/TS 21979	49.14	Dev	60						
ISO	ISO 10795:2011	Space systems -- Programme management and quality -- Vocabulary	ISO 10795:2011	01.040.49	Pub	90.92						
ISO	ISO 20188:2018	Space systems -- Spacecraft and launch vehicle combined operation plan (COP)	ISO 20188:2018	03.120.20	Pub	60.6						
ISO	ISO 14624-3:2005	Space systems -- Safety and compatibility of materials -- Part 3: Determination of	ISO 14624-3:2005	13.220.40	Pub	90.93			3	3		
ISO	ISO 14624-4:2003	Space systems -- Safety and compatibility of materials -- Part 4: Determination of	ISO 14624-4:2003	13.220.40	Pub	90.92			3	3		
ISO	ISO 14624-6:2006	Space systems -- Safety and compatibility of materials -- Part 6: Determination of	ISO 14624-6:2006	13.220.40	Pub	90.92			3	3		
ISO	ISO 16781:2013	Space systems -- Simulation requirements for control system	ISO 16781:2013	13.220.40	Pub	60.6			3	3		
ISO	ISO 14619:2003	Space systems -- Space experiments -- General requirements	ISO 14619:2003	33.100.01	Pub	90.93						
AIAA	AIAA G-003C-2010(2016)	Guide: Reference and Standard Atmosphere Models	Link	Atmospheric, Orbital and Space Environment Models			Guide					
AIAA	AIAA G-065-1999	Guide: Global Aerosol Models (GAM)	Link	Atmospheric, Orbital and Space Environment Models			Guide					
AIAA	AIAA G-083-1999	Guide: Modeling Earth's Trapped Radiation Environment	Link	Atmospheric, Orbital and Space Environment Models			Guide					
AIAA	AIAA G-140-2015	Guide: Terrestrial Environment Guidelines for Use in Aerospace Vehicle Development	Link	Atmospheric, Orbital and Space Environment Models			Guide					
AIAA	AIAA SP-016-1992	Special Project: Orbital Debris Mitigation: Technical, Legal, and Economic Aspects	Link	Atmospheric, Orbital and Space Environment Models			Special Project					
AIAA	AIAA SP-016-2-1999	Special Project: MECLEO Constellations: U.S. Laws, Policies, and Regulations of	Link	Atmospheric, Orbital and Space Environment Models			Special Project					
AIAA	AIAA SP-069-1994	Special Project: Contemporary Models of the Orbital Environment	Link	Atmospheric, Orbital and Space Environment Models			Special Project					
AIAA	AIAA SP-137-2012	Special Project: Status of Inflight Icing Forecasting Products and Plans for Future	Link	Atmospheric, Orbital and Space Environment Models			Special Project					
AIAA	ANSI/AIAA_G-034A-201	Guide: Reference and Standard Ionosphere Models	Link	Atmospheric, Orbital and Space Environment Models			Guide					
AIAA	ANSI/AIAA S-123-2007(2)	Adaptations and Conversions of CCSDS Space Link Extension Forward Communi	Link	CCSDS Space Link Extensions			Standard					
AIAA	ANSI/AIAA S-124-2007(2)	Adaptations and Conversions of CCSDS Space Link Extension Return All Frames	Link	CCSDS Space Link Extensions			Standard					
AIAA	AIAA G-077-1998(2002)	Guide: Verification and Validation of Computational Fluid Dynamics Simulations	Link	Computational Fluid Dynamics			Guide					
AIAA	AIAA R-101A-2005	Recommended Practice: The CFD General Notation System - Standard Interface	Link	Computational Fluid Dynamics			Recommended Practice					
AIAA	ANSI/AIAA S-119-2011(2)	Standard: Flight Dynamics Model Exchange Standard	Link	Computational Fluid Dynamics			Standard					
CCSDS	902.12	Cross Support Service Management -- Common Data Entities	Link	Cross Support (Ground Station)	Dev		Magenta	Est-8/12/2019	5	5		
CCSDS	902.13	Abstract Event Definition -- Data Format for Specifying Events	Link	Cross Support (Ground Station)	Dev		Magenta	Est-8/12/2019	5	5		
CCSDS	902.2	Cross Support Service Management: Planning Information Formats	Link	Cross Support (Ground Station)	Dev		Blue	Est-8/30/2019	5	5		
CCSDS	902.4	Cross Support Service Management: Service Package Data Formats	Link	Cross Support (Ground Station)	Dev		Blue	Est-1/15/2020	5	5		
CCSDS	902.9	Cross Support Service Management: Service Management Utilization Request Fo	Link	Cross Support (Ground Station)	Dev		Blue	Est-10/10/2019	5	5		
CCSDS	920	Cross-Support-Transfer Services Specification Framework Concept	Link	Cross Support (Ground Station)	Dev		Green	Est-8/30/2018	5	5		
CCSDS	921.2	Guidelines for Specification of Cross Support Transfer Services	Link	Cross Support (Ground Station)	Dev		Magenta	Est-7/26/2018	5	5		
CCSDS	922.2	Tracking Data Cross support Transfer Service	Link	Cross Support (Ground Station)	Dev		Blue	Est-5/10/2018	5	5		
CCSDS	922.4	Cross Support Transfer Services: Forward Frame CSTS	Link	Cross Support (Ground Station)	Dev		Blue	Est-2/7/2020	5	5		
CCSDS	927.1	Cross Support Service Management: File Transfer, Ground Segment, Recommen	Link	Cross Support (Ground Station)	Dev		Blue	Est-11/1/2019	5	5		
CCSDS	901.0-G-1	Space Communications Cross Support--Architecture Description Document	901:0g1.pdf	Cross Support (Ground Station)	Pub		Green	11/1/2013	5	5		
CCSDS	901.1-M-1	Space Communications Cross Support--Architecture Requirements Document	901:1m1.pdf	Cross Support (Ground Station)	Pub		Magenta	5/1/2015	5	5		
CCSDS	902.0-G-1	Extensible Space Communication Cross Support--Service Management--Conce	902:0g1.pdf	Cross Support (Ground Station)	Pub		Green	9/1/2014	5	5		
CCSDS	902.1-B-1	Cross Support Service Management--Simple Schedule	902:1b1.pdf	Cross Support (Ground Station)	Pub		Blue	5/31/2018	5	5		
CCSDS	910.0-G-2	Space Link Extension Services--Executive Summary	910:0g2.pdf	Cross Support (Ground Station)	Pub		Green	3/1/2006	5	5		

Basic Concept



CCSDS

ISO

The screenshot shows the CCSDS Management Framework interface. At the top, it displays 'CCSDS Collaborative Work Environment (CWE)'. Below this, there are sections for 'All Open Projects (Approved & Pending)', 'Projects not Approved (Draft)', and 'Projects Approved, Pending, and Closed (Open Charters Only)'. A table lists various projects with columns for Project Title, Document Type, Document Number, Approval, and Start Date. Two charters are highlighted: '1.02 Security Working Group (Projects = 4)' and '1.05 Delta-DOR Working Group (Projects = 5)'.

The screenshot shows the ISO Standards catalogue. It features a navigation menu with 'Standards', 'About us', 'Standards Development', 'News', and 'Store'. Below the menu, there are filters for 'Browse by ICS' and 'Browse by TC'. The main content area is titled 'ISO/TC 20/SC 14 - Space systems and operations' and lists 'Standards and projects under the direct responsibility of ISO/TC 20/SC 14 Secretariat'. A table lists standards with columns for 'Standard and/or project', 'Stage', and 'ICS'.

The screenshot shows the AIAA ARC Aerospace Research Central website. It features a search bar at the top with options for 'Advanced Search' and 'Find'. Below the search bar, there are navigation tabs for 'Home', 'Journals', 'Books', 'Meeting Papers', 'Standards', and 'Other Publications'. The main content area is titled 'PUBLICATIONS' and lists various documents with titles like 'AIAA Special Report: Orbital Debris Mitigation - Technical, Legal, and Economic Aspects (SP-1992-2)' and 'AIAA Standard - Space Plug-and-Play Architecture - Package Set'.

Query
Response

Integration Website

Document Data			Mission Applicability		
Org.	Document Number	Title	Earth Observing	Other LEO missions	Deep Space Missions
AIAA		Guide to Human Performance Measurements (AIAA G-035A-2000)			
AIAA		Guide to Modeling Earth's Trapped Radiation Environment (AIAA G-083-1999)			
AIAA		Guide to Reference and Standard Atmosphere Models (AIAA G-003C-2010)			
AIAA		Guide to Reference and Standard Ionosphere Models (ANSI/AIAA_G-034A-2010)			
AIAA		Guide to Safety of Hydrogen and Hydrogen Systems (AIAA G-095-2004)			
AIAA		Guide to the Preparation of Operational Concept Documents (ANSI/AIAA G-043)			
CCSDS	CCSDS 3212	Guidelines for Specification of Cross Support Transfer Services			
ISO	ISO/CD 16157	Human-Life Activity Support Systems and Equipment Integration in Space Flight --			
ISO	ISO/CD 16726	Human-Life Activity Support Systems and Equipment Integration in Space Flight --			
CCSDS	CCSDS 120.1-G-1-S	Image Data Compression	5	5	4
CCSDS	CCSDS 120.1-G-2	Image Data Compression	5	5	4
CCSDS	CCSDS 122.0-B-1	Image Data Compression	5	5	4
CCSDS	CCSDS 122	Image Data Compression, Issue 2	5	5	4
CCSDS	CCSDS 653	Information Curation Process	3	3	3
CCSDS	CCSDS 350.8-G-1	Information Security Glossary of Terms	5	5	5
CCSDS	CCSDS 702.1-B-1	IP over CCSDS Space Links	4	4	4
CCSDS	CCSDS 734.1-B-1	Licklider Transmission Protocol (LTP) for CCSDS	4	4	4
CCSDS	CCSDS 120.0-G-3	Lossless Data Compression	5	5	5
CCSDS	CCSDS 121.0-B-2	Lossless Data Compression	5	5	5
CCSDS	CCSDS 120.2	Lossless Multispectral & Hyperspectral Image Compression	5	5	4
CCSDS	CCSDS 123.0-B-1	Lossless Multispectral & Hyperspectral Image Compression	5	5	4
AIAA		Low Earth Orbit Spacecraft Charging Design Standard Requirement and Associated			
AIAA		Managing the Use of Commercial Off the Shelf (COTS) Software Components for			
CCSDS	CCSDS 740.0-G-1	Mars Mission Protocol Profiles--Purpose and Rationale	2	2	5
AIAA		Mass Properties Control for Space Systems (AIAA S-120-2006)			
AIAA		MED/LEO Constellations: U.S. Laws, Policies, and Regulations on Orbital Debris			
CCSDS	CCSDS 522	Mission Operations - Common Services	4	4	4

Query
Response

Query
Response



Full Proposal to SDOs “Standardized” Standards Access

January 31, 2020

Space Infrastructure Foundation



In a nutshell...

- ✦ SIF had a need to “harvest” some data about standards documents from the ISO, AIAA and CCSDS websites.
 - ◆ In support of developing a class on Space Standards
- ✦ It was not easy. Different formats, different tables of data, different definitions for terms, etc.
- ✦ Result: This is a proposal for “standardized” access to “metadata” about your standards documents.
- ✦ Example data:
 - ◆ PUBLISHED: Title, Number, Date published, keywords...
 - ◆ IN DEVELOPMENT: Title, Draft number, stage, scheduled pub date
- ✦ Example usage:
 - ◆ Companies’/Missions’ access dates for their development schedules
 - ◆ Missions have integrated view across the “Space Standards Framework”
 - ◆ Educational entities like SIF developing a class
- ✦ Example *possible* implementations
 - ◆ Standard table format for easy cut-and-paste of lists of documents
 - ◆ An API for programmatic access (RESTful, HTML5, etc?)
 - ◆ May work hand-in-hand with XML formatted standards documents
 - ✦ (That’s a subject for another time)



Proposal for “Standardized” Standards Access

- ✦ Currently Space Standards are developed and published by ISO, CCSDS and AIAA.
- ✦ Each organization presents a different human-readable interface to the external world, with different “metadata” in different formats. Examples:
 - ◆ ISO’s ICS classification
 - ◆ CCSDS’s Blue/Green/Magenta book classification
 - ◆ Publication dates in different formats
- ✦ None of the SDO’s online access allows programmatic interfaces (yet).
- ✦ Programmatic interfaces would allow external organizations to develop applications that integrate standards listings and access for a technical domain (like “space standards”), adding value and capability for the industry.



SIF Background; Efforts Towards Integration

- ✦ Space Infrastructure Foundation (SIF) develops class and online materials to help spaceflight missions and projects to understand and utilize space-related standards from major SDOs.
- ✦ We have executed this exercise several times.
 - ◆ Used cut-and-paste from website into spreadsheet
 - ◆ Totals 500+ standards documents
 - ◆ Extremely labor intensive process, quickly out-of-date
- ✦ In doing this, SIF adds value to SDO-published metadata
 - ◆ Assessment of applicability to certain mission types (LEO, GEO, Exploration, etc.) and domains (onboard, ground, etc.)
 - ◆ Assessment of priority and value based on future needs of missions.



Benefits

- ✦ Programmatic, “standardized” metadata presentation of standards documents would be valuable to:
 - ◆ External organizations (like SIF) that can add value to users, increasing user adoption.
 - ✦ Encourages advocacy of standardization by non-profit or commercial organizations with external resources
 - ◆ Agencies that need to develop their own integration tools
 - ✦ e.g. ECSS drawing from ISO, CCSDS and potentially other websites).
 - ✦ e.g. NASA-internal NESP Technical Standards Website
 - ◆ Could be adopted by other standards organizations eventually (IEEE, OMG, etc.?) and become a “viral” approach allowing broad standards integration capabilities.
 - ◆ Increase adoption of standards worldwide.



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Standard and/or project	Stage	ICS
ISO 10784-1:2011 Space systems – Early operations – Part 1: Spacecraft initialization and commissioning	60:60	49:140
ISO 10784-2:2011 Space systems – Early operations – Part 2: Initialization plan	60:60	49:140
ISO 10784-3:2011 Space systems – Early operations – Part 3: Commissioning report	60:60	49:140
ISO 10785:2011 Space systems – Bellows – Design and operation	60:60	49:140
ISO 10786:2011 Space systems – Structural components and assemblies	60:60	49:140
ISO 10786:2014	60:60	49:140

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Query
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AIAA		Managing the Use of Commercial Off the Shelf (COTS) Software Components for			
CCSDS	CCSDS 740.0-G-1	Mars Mission Protocol Profiles--Purpose and Rationale	2	2	5
AIAA		Mass Properties Control for Space Systems (AIAA S-120-2006)			
AIAA		MED/LEO Constellations: U.S. Laws, Policies, and Regulations on Orbital Debris			
CCSDS	CCSDS 522	Mission Operations - Common Services	4	4	4

Query
Response

Query
Response

Organizational Approach

- ✦ A “lead” organizes some telecons with SDOs and SIF
 - ◆ SIF represents a non-SDO invested external customer
 - ◆ Others, also, if SDO’s know of other interested parties
- ✦ Agenda for the telecon:
 - ◆ Walk through this proposal to answer questions
 - ◆ Discussion of technical options for programmatic interfaces
 - ◆ Discussion about feasibility from each SDO
 - ◆ If agreement to explore this is reached, develop forward plan for follow-on telecons.
- ✦ Organizational working group should address what subset of metadata needs to be shared (doc title, doc name, pub date, etc.)



Proposed Technical Approach

- ✦ The general technical approach should be for the SDO websites to allow programmatic access via a **RESTful** interface.
 - ◆ Widely accepted across the WWW
 - ◆ CCSDS SharePoint system easily adapted to it.
 - ◆ Perhaps AIAA SharePoint as well (?)
- ✦ Visual layout should also accommodate cut-and-paste.
- ✦ Technical working group will need to confer by telecon to discuss this... details of REST (REpresentational State Transfer) approach need to be specified (version, etc.?)
- ✦ Probably will need to document these technical details in an Interface Control Document that can be published by the SDOs, so externals can access the public data programmatically.
- ✦ Name? Space Standards Integration Team?



Action for now

- ✦ Simply need agreement to organize a telecon discussion, with one of the SDOs as the telecon organizer.
- ✦ This effort needs both organizational folks (content owners, deciding what metadata to share) and technical folks (web developers) at the outset.
 - ◆ They can possibly branch off to separate telecons or direct one-on-one coordination later
- ✦ SIF volunteers to start the conversation by walking through this presentation.
 - ◆ Or an updated version, or something completely different if the SDOs (ISO/CCSDS/AIAA) have new suggestions on how to proceed.



Space Infrastructure Foundation



Contact Information:

Executive Director

Fred Slane freds@spacestandards.org 719-229-4252

Members of the Technical Staff

Mike Kearney mikek@spacestandards.org

Ray Krosley ramonk@spacestandards.org

