National Aeronautics and Space Administration
Office of the Administrator
Washington, DC 20546-0001

August 12, 2009

Vice Admiral Joseph W. Dyer, USN (Ret.)
Chairman
Aerospace Safety Advisory Panel
National Aeronautics and Space Administration
Washington, DC 20546

Dear Admiral Dyer:

Enclosed are NASA's responses to two recommendations from the 2009 First Quarterly Meeting of the Aerospace Safety Advisory panel (ASAP). Please do not hesitate to contact me if the Panel would like further background on the information provided in the enclosures.

I look forward to receiving continued advice from the ASAP that results from your important fact-finding and quarterly meetings.

Sincerely,

Charles F. Bolden, Jr.
Administrator

Enclosures

Tracking Number 2009-01-01a
Human-Rating Requirements (HRR) and Data Mining

Recommendation

2009-01-01a. Human-Rating Requirements (HRR) and Data Mining. The ASAP recommends that NASA rigorously research, compare, and contrast the different human-rating approaches used during the Apollo, Shuttle, International Space Station, and other programs. NASA should take advantage of this significant history and body of knowledge not only to assess the validity of the assumptions used in the new hazard analysis (HA) and in failure mode and effects analyses (FMEAs), but also to evaluate the benefits that the various approaches yield in terms of safety and mission assurance, which enhance future HRR modifications.

NASA Response

NASA concurs. The teams that developed the various revisions to the NASA HRR (NPR 8705.2) performed exhaustive research into the activities analogous to human rating that were applied to the Apollo, Space Shuttle, ISS, Orbital Space Plane (OSP), as well as other programs. More importantly, the Apollo, Space Shuttle, ISS, and OSP engineers and managers that applied these analogous requirements provided their opinions on the strengths and weaknesses of their respective requirements. NASA incorporated the knowledge gleaned from that research into the various versions of the NASA HRR, culminating in the current NPR 8705.2B. NASA agrees to perform additional research to support development of the HRR implementation handbook (described in NASA's response to ASAP recommendation 2008-04-03) that will include examples from previous programs to assist in effective and consistent application of the HRR. In addition, NASA will factor in the results of the independent assessment (conducted in response to ASAP recommendation 2008-04-02) to augment the implementation handbook. As appropriate, NASA will also make changes to the HRR based on this research.

Tracking Number 2009-01-01b
Human-Rating Requirements (HRR) and Engineering Standards

Recommendation

2009-01-01b. Human-Rating Requirements (HRR) and Engineering Standards. The recently revised HRR standard focuses principally on the process used to reach a human-rating certification. Although it does specify some design requirements (such as fault tolerance and some human factors design standards), it does not include a requirement to implement, tailor, or obtain approval to waive NASA's other engineering design requirements for critical systems. These requirements embody the experience of NASA's best designers and the lessons learned throughout the Agency's vast experience in human spaceflight. These lessons might not be properly applied without such a requirement.

To clearly articulate the consistent and comprehensive integration of human safety considerations and mission assurance needs into the integrated design analysis (as required by the HRR), the ASAP recommends that NASA formally establish and stipulate the direct link between the HRR and the applicable NASA standards, such as the NASA-STD-5000 series of engineering directives, as well as relevant technical standards.

NASA Response

NASA concurs. Although the first section of the HRR document states that human rating involves many more requirements and standards than are listed in the document itself, it does not specify (other than four direct references to human system unique standards) what those other requirements are. NASA will address this issue with a change to the first section of the HRR document that makes it clear that human rating consists of tailoring all NASA requirements contained in Agency directives that are categorized as mandatory for all high-priority space systems. The change will also make it clear that human rating includes tailoring of all "mandatory standards" managed by the Office of the Chief Engineer, the Office of Safety and Mission Assurance, and the Office of the Chief Health and Medical Officer. The current list is attached for reference. Finally, NASA will ensure that the language in the first section of the HRR document makes it clear that the Technical Authority may suggest other NASA, military, voluntary consensus, or industry standards or requirements (beyond the mandatory list) as appropriate to the design concept and mission on a case-by-case basis.

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
AFSPCMAN 91-710	Range Safety User Requirements Manual	NPR 8715.5, Range Safety Program
AFSPCMAN 91-710	Range Safety User Requirements Manual	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
AIA/NAS NAS410	National Aerospace Standard Certification and Qualification of Nondestructive Test Personnel	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
AIAA S-080-1998	Space Systems, Metallic Pressure Vessels, Pressurized Structures, and Pressure Components	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
ANSI/AIAA S-080	Space Systems Metallic Pressure Vessels, Pressurized Structures, and Pressure Components	NASA Policy Directive 8710.5D, Policy for Pressure Vessels and Pressurized Systems
AIAA S-081A-2006	Standard for Space Systems - Composite Overwrapped Pressure Vessels (COPVs)	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
ANSI/AIAA S-081A	Space Systems Composite Overwrapped Pressure Vessels (COPV)	NASA Policy Directive 8710.5D, Policy for Pressure Vessels and Pressurized Systems
AIAA S-111-2005	Qualification and Quality Requirements for Space Solar Cells	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
AIAA S-112-2005	Qualification and Quality Requirements for Space Solar Panels	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
Air Force AFOSH Standard 48-12	Health Hazard Control for Laser Operations	NPR 8715.3, NASA General Safety Program Requirements
ANSI 358.1	Emergency Eyewash and Shower Equipment	NPR 8715.3, NASA General Safety Program Requirements
ANSI D6.1	Manual on Uniform Traffic Control Devices for Streets and Highways	NPR 8715.3, NASA General Safety Program Requirements
ANSI Z117.1	Safety Requirements for Confined Space	NPR 8715.3, NASA General Safety Program Requirements
ANSI Z136.1	American National Standard for Safe Use of Laser	NPR 8715.3, NASA General Safety Program Requirements
ANSI Z136.1	American National Standard for Safe Use of Laser	NPR 8715.5, Range Safety Program
ANSI Z136.6-2000	American National Standard for the Safe Use of Lasers Outdoors	NPR 8715.5, Range Safety Program
ANSI/DWS D14.1	Specifications for Welding Industrial and Mill Cranes	NASA-STD-8719.9, Standard for Lifting Devices and Equipment

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)	NPD 8730.5, NASA Quality Assurance Program Policy
ANSI/ISO/IEC 17025:2000	General Requirements for the Competence of Testing and Calibration Laboratories	NPD 8730.1B, Metrology and Calibration
ANSI/NCSL Z540.1-1994 (R2002)	General Requirements for Calibration Laboratories and Measuring and Test Equipment	NPD 8730.1B, Metrology and Calibration
ANSI/SIA A92.2	Vehicle-Mounted Elevating and Rotating Aerial Devices	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ANSI/SIA A92.5	Boom Supported Elevating Work Platforms	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
AS9003	Inspection and Test Quality System	NPD 8730.5, NASA Quality Assurance Program Policy
AS9100	Quality Management Systems - Aerospace - Requirements	NPD 8730.5, NASA Quality Assurance Program Policy
AS9100	Quality Management Systems - Aerospace - Requirements	NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts
AS9101	Quality Management Systems Assessment	NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts
ASME B30.1	Jacks	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ASME B30.10	Hooks	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ASME B30.2	Overhead and Gantry Cranes	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ASME B30.23	Personnel Lifting Systems	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ASME B30.5	Mobile and Locomotive Cranes	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ASME B30.9	Slings	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
ASME B56.1	Safety Standard for Low-Lift and High-Lift Trucks	NASA-STD-8719.9, Standard for Lifting Devices and Equipment

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
EM 385-1-1	U.S. Army Corps of Engineers, Safety and Health Requirements	NPR 8715.3, NASA General Safety Program Requirements
EWR 127-1	Range Safety Requirements	NPR 8715.3, NASA General Safety Program Requirements
Federal Aviation Administration Human Factors Design Standard	Federal Aviation Administration Human Factors Design Standard	NPR 8705.2, Human-Rating Requirements for Space Systems
Federal Standard 313	Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities	NPR 8715.3, NASA General Safety Program Requirements
GIDEP S0300-BT-PRO-010	GIDEP Operations Manual	NPR 8735.1, Procedures for Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories
GIDEP S0300-BU-GYD-010	GIDEP Requirements Guide	NPR 8735.1, Procedures for Exchanging Parts, Materials, and Safety Problem Data Utilizing the Government-Industry Data Exchange Program and NASA Advisories
IEEE 730-2002	IEEE Standard for Software Quality Assurance Plans	NASA-STD-8739.8, Software Assurance Standard
IEEE C95.1-1991	American National Standard Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 30 KHz to 100GHz	NPR 8715.5, Range Safety Program
ISO 9001	Quality Management Systems - Requirements	NPD 8730.5, NASA Quality Assurance Program Policy
ISO 9001	Quality Management Systems - Requirements	NPR 8735.2, Management of Government Quality Assurance Functions for NASA Contracts
MIL-STD-1472	Department of Defense Design Criteria Standard - Human Engineering	NPR 8705.2, Human-Rating Requirements for Space Systems
MIL-STD-454	Standard General Requirements for Electronic Equipment	NPR 8715.3, NASA General Safety Program Requirements
MIL-STD-461	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
NASA-GB-8719.13	NASA Software Safety Guidebook	NASA-STD-8719.13, Software Safety Standard
NASA-STD-3000 Volume I and II	Man-Systems Integration Standards	NPR 8705.2, Human-Rating Requirements for Space Systems
NASA-STD-3000 Volume I	Man-Systems Integration Standards	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-3000 Volume II	Man-Systems Integration Standards	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-3001, Volume 1	Spaceflight Human Systems: Crew Health	NPR 8705.2, Human-Rating Requirements for Space Systems
NASA-STD-4003	Electrical Bonding for NASA Launch Vehicles, Spacecraft, Payloads, and Flight Equipment	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-4005	Low-Earth Orbit Spacecraft Charging Design Standard	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-5001	Structural Design and Test Factors of Safety for Spaceflight Hardware	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-5002	Load Analyses of Spacecraft and Payloads	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-5006	General Fusion Welding Requirements for Aerospace Materials Used in Flight Hardware	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-5017	Design and Development Requirements for Mechanisms	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-6001	Flammability, Odor, Offgassing, and Compatability Requirements and Test Procedures for Materials in Environments that Support Combustion	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-6002	Applying Data Matrix Identification Symbols on Aerospace Parts	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-7001	Payload Vibroacoustic Test Criteria	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-7002	Payload Test Requirements	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards
NASA-STD-7003	Pyroshock Test Criteria	September 6, 2007, Chief Engineer Memorandum, Subj: Mandatory Standards

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
NASA-STD-8719.11	Safety Standard for Fire Protection	NPR 8715.3, NASA General Safety Program Requirements
NASA-STD-8719.13	Software Safety Standard	NPR 8715.3, NASA General Safety Program Requirements
NASA-STD-8719.13	Software Safety Standard	NPR 8715.5, Range Safety Program
NASA-STD-8719.13	Software Safety Standard	NASA-STD-8739.8, Software Assurance Standard
NASA-STD-8719.14	Process for Limiting Orbital Debris	NPR 8715.6, NASA Procedural Requirements for Limiting Orbital Debris
NASA-STD-8719.17	NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems	NASA Policy Directive 8710.5D, Policy for Pressure Vessels and Pressurized Systems
NASA-STD-8719.7	Facility System Safety Guidebook	NPR 8715.3, NASA General Safety Program Requirements
NASA-STD-8719.8	Expendable Launch Vehicle Payload Safety Review Process Standard	NPR 8715.5, Range Safety Program
NASA-STD-8719.9	Standard for Lifting Devices and Equipment	NPR 8715.3, NASA General Safety Program Requirements
NASA-STD-8739.1	Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies	NPD 8730.5, NASA Quality Assurance Program Policy
NASA-STD-8739.2	Workmanship Standard for Surface Mount Technology	NPD 8730.5, NASA Quality Assurance Program Policy
NASA-STD-8739.3	Soldered Electrical Connections	NPD 8730.5, NASA Quality Assurance Program Policy
NASA-STD-8739.4	Crimping, Interconnecting Cables, Harnesses, and Wiring	NPD 8730.5, NASA Quality Assurance Program Policy
NASA-STD-8739.5	Fiber Optics Terminations, Cable Assemblies, and Installation	NPD 8730.5, NASA Quality Assurance Program Policy
NASA-STD-8739.8	Software Assurance Standard	NPR 8715.3, NASA General Safety Program Requirements
NASA-STD-8739.8	Software Assurance Standard	NASA-STD-8719.13, Software Safety Standard
NFPA 1	Uniform Fire Code	NPR 8715.3, NASA General Safety Program Requirements

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
NFPA 101	Life Safety Code	NPR 8715.3, NASA General Safety Program Requirements
NFPA 1561	Standard on Emergency Services Incident Management System	NPR 8715.3, NASA General Safety Program Requirements
NFPA 45	Standard on Fire Protection for Laboratories Using Chemicals	NPR 8715.3, NASA General Safety Program Requirements
NFPA 70	National Electrical Code	NPR 8715.3, NASA General Safety Program Requirements
NFPA 70E	Standard for Electrical Safety in the Workplace	NPR 8715.3, NASA General Safety Program Requirements
NFPA 921	Guide for Fire and Explosive Investigations	NPR 8715.3, NASA General Safety Program Requirements
NIOSH Publication 87-113	A Guide to Safety in Confined Spaces	NPR 8715.3, NASA General Safety Program Requirements
NSS 1740.12	Safety Standard for Explosives, Propellants, and Pyrotechnics	NPR 8715.5, Range Safety Program
NSS/WS-1740.10	NASA Safety Standard for Underwater Facility and Non-Open Water Operations	NPR 8715.3, NASA General Safety Program Requirements
NSS-1740.12	Safety Standard for Explosives, Propellants, and Pyrotechnics	NPR 8715.3, NASA General Safety Program Requirements
PCSA Standards No. 4	PCSA	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
PCSA Standards No. 5	PCSA	NASA-STD-8719.9, Standard for Lifting Devices and Equipment
RCC 313	Range Commanders Council Test Standards for Flight Termination Receiver/Decoders	NPR 8715.5, Range Safety Program
RCC 319	Range Commanders Council Flight Termination Systems-Commonality Standard	NPR 8715.5, Range Safety Program
RCC 321	Range Commanders Council Common Risk Criteria for National Test Ranges: Inert Debris	NPR 8715.5, Range Safety Program
RCC 323	Range Commanders Council Range Safety Criteria for Unmanned Air Vehicles	NPR 8715.5, Range Safety Program

STANDARD NUMBER	STANDARD TITLE	SOURCE OF MANDATORY DESIGNATION*
RCC Document 316-91	Laser Range Safety	NPR 8715.3, NASA General Safety Program Requirements
Standard Number	Standard Name	Document(s) Designating the Standard as Mandatory
	American Industrial Hygiene Association Emergency Response Planning Guidelines	NPR 8715.5, Range Safety Program

*Always Check the Mandatory Citation for Specific Applicability

Tracking Number 2009-01-04
Safety, Reliability, and Mission Assurance (SR&MA) Technical Fellows

Recommendation
To raise the level of technical expertise available to the Agency to solve challenging SR&MA technical and programmatic issues, NASA has worked diligently to establish Technical Fellow positions for the primary SR&MA technical disciplines. The Panel is pleased that NASA allocated appropriate grades to these positions to attract highly qualified candidates, demonstrating the Agency's level of commitment to the SR&MA effort. The Panel was disappointed to learn at this review that NASA currently is not filling these positions because of budgetary constraints.

The ASAP recommends that funding be provided to complete this important step in the process of raising the capability and credibility of the SR&MA discipline at NASA.

NASA Response
NASA concurs with this recommendation. The Agency has approved four Safety and Mission Assurance Technical Discipline Fellows positions: Systems Safety, Reliability and Maintainability, Quality Engineering, and Software Assurance. The NASA Safety Center will advertise for, screen applicants (along with the Office of Safety and Mission Assurance Safety and Assurance Requirements Division Director), and recommend candidates for approval to the Chief, Safety and Mission Assurance. The initial term of the temporary promotion will be for three years, with two additional one-year options. The successful candidates will be allowed to serve as Technical Discipline Fellows from their host Centers and will not be required to relocate. The NASA Safety Center has developed a split funding arrangement with the Centers to cover these Scientific and Technical positions, has polled the Safety and Mission Assurance Directors for their concurrence, and is working with Human Resources to fill the four Safety and Mission Assurance Technical Fellow positions.

We are hopeful that we can have the Safety and Mission Assurance Technical Discipline Fellow positions filled by August 1, 2009.