NASA AgencyReport to the CCSDS Management Council

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Agenda

✦ News from NASA

✦ Report on CCSDS activities

✦ Report on infusion of CCSDS standards in NASA:

◆ Implementations planned by projects and in infrastructures

◆ Technology effort

✦ Issues and proposals

✦ Backup Slides (optional):

◆ NASA org chart

◆ CMC template

News from NASA

Optical Payload for Lasercomm Science

The Optical Payload for Lasercomm Science (OPALS) investigation, is preparing for a March 16 launch to the International Space Station aboard a SpaceX Falcon 9 rocket. The lasercomm will demonstrate up to 50 megabits per second and future deep space optical communication systems will provide over one gigabits per second from Mars. OPALS will be positioned on the station's exterior by a robotic arm and then will conduct transmission tests for a period of nearly three months, with the possibility of a longer mission.

Uses CCSDS Space Packets as defined in CCSDS 131.0-B-1 for command and data; the AOS space link protocol, CCSDS 701.0-B-2 for forward and return communications; the time code formats, CCSDS 301.0-B-2, to time tag the data; CCSDS Enhanced Forward CLTU specification, CCSDS 912.1-O-1 for the forward AOS service; SLE RAF and RCF services provide the AOS return services.

TDRS L Launch

NASA's Tracking and Data Relay Satellite L (TDRS-L) successfully launched on Jan 23 aboard an Atlas V rocket. TDRS-L is the 12th spacecraft in the agency's TDRS Project. The satellite is in good health and the manufacturer, Boeing, will conduct a three month checkout. NASA will then conduct a series of additional tests before putting TDRS-L into service.
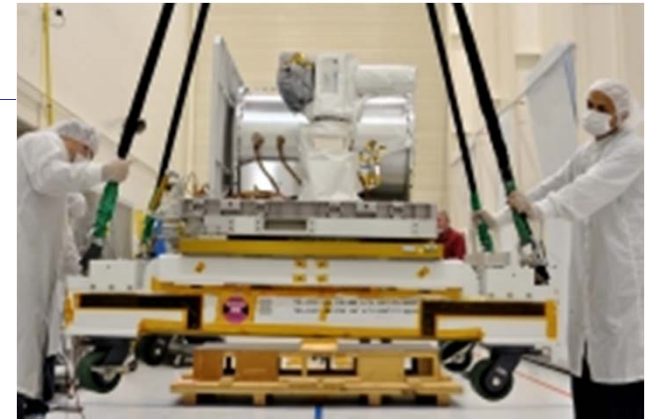
News from NASA

Space Communication and Navigation Testbed demonstrates GPS-GNSS receiver capability

NASA's Space Communications and Navigation (SCaN) Testbed aboard the International Space Station successfully recorded a navigation signal from the European Galileo satellite constellation and the U.S. GPS constellation at the same time. The world's first flight-validated, in-space U.S. GPS-European Galileo Global Navigation Satellite System (GNSS) receiver enhances GNSS interoperability while enabling more precise and robust orbital predictions, more diverse multi-frequency GNSS capabilities and improved applications such as on-board autonomous spacecraft operations and scientific measurements. The Testbed now is helping to pave the way for greater use of international GNSS signals, to validate the new modernized GPS signals and to support future public and private sector users around the world and beyond Earth.

The New Generation of Antennas for the Deep Space Network

The construction of the first two of several 34 meter (111 foot) antennas, Deep Space Station (DSS) – 35 and 36, continues at the Canberra Deep Space Communications Complex in Australia. The 34 meter antennas will replace the aging 70 meter (230 foot) antennas at the three Deep Space Network complexes which are over 40 years old. The 34 meter (111 foot) antennas are easier to maintain and when four antennas are arrayed, they equal the performance of the 70 meter antenna.

The DSN receivers support all of the standard deep space modulation, coding, and link layer protocols. Data will be sent to the 34M from the user MOCs using SLE F-CLTU. Data will be returned to the MOCs using SLE R-AF and R-CF. The DSN is being upgraded in the next couple of years to support the CCSDS Enhanced Forward CLTU specification and Low Density Partity Check codes.
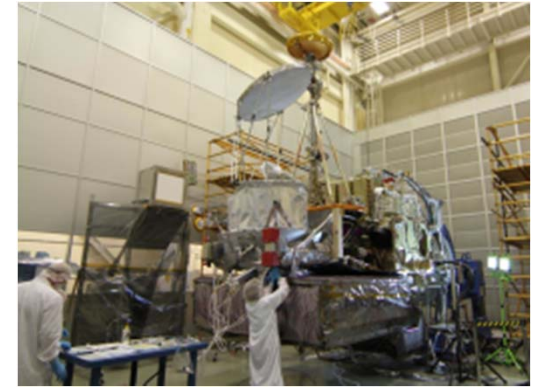
News from NASA

NASA and JAXA launch GPM

The Global Precipitation Measurement (GPM) Core Observatory, a joint Earth-observing mission between NASA and JAXA, was successfully launched on Feb. 28 from Japan. The GPM Core Observatory will map global snow and rain every three hours. The two science instruments aboard have been activated and are going through instrument checkout. The GPM Microwave Imager, provided by NASA, will estimate precipitation intensities from heavy to light rain, and snowfall. The Dual-frequency Precipitation Radar (DPR), developed by JAXA with the National Institute of Information and Communication Technology, Tokyo, will make detailed measurements of three-dimensional rainfall structure and intensity, allowing scientists to improve estimates of how much water the precipitation holds.

CCSDS 131.0 TM Synchronization and Channel Coding; CCSDS 133.0 Space Packet Protocol; CCSDS 231.0 TC Synchronization and Channel Coding; CCSDS 232.0 TC Space Data Link Protocol; CCSDS 232.1 Communication Operation Procedure-1;CCSDS 727.0 CCSDS File Delivery Protocol (CFDP); CCSDS 732.0 AOS Space Data Link Protocol

Facilitating Commercial Transportation To Space

The Future of Human Space Exploration
NASA's Building Blocks to Mars

U.S. companies provide affordable access to low Earth orbit

Expanding capabilities at an asteroid redirected to lunar orbit

Exploring Mars and other deep space destinations

Learning the fundamentals aboard the International Space Station

Traveling beyond low Earth orbit with the Space Launch System rocket and Orion crew capsule

Missions: 6 to 12 months
Return: hours

Missions: 1 month up to 12 months
Return: days

Missions: 2 to 3 years
Return: months

Earth Reliant

Proving Ground

Earth Independent

News from NASA

SLS is the rocket and launch system capable of transporting humans, habitats and support systems directly to deep space.

Powerful – High-Capacity – Flexible – Manufacturable

Three Successful Ground Tests of Booster Developmental Motors
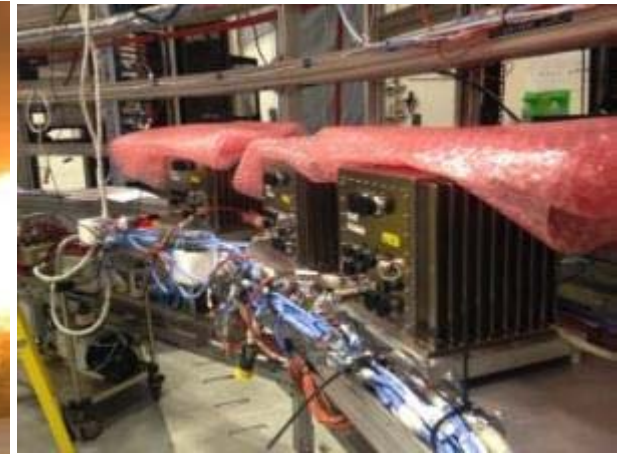
Core Stage Flight Computers
Installed and almost ready for testing

Barrel Section Complete at MAF

Wind Tunnel Test

Barrel Weld Center

News from NASA

Orion is the first spacecraft in history capable of taking humans to multiple destinations in deep space.
Long Duration – Adaptable – Life Sustaining

Orion Propulsion and Life Support System Assembly

Parachute Drop Tests

Orion Post Landing Recovery Test

Orion Heat Shield
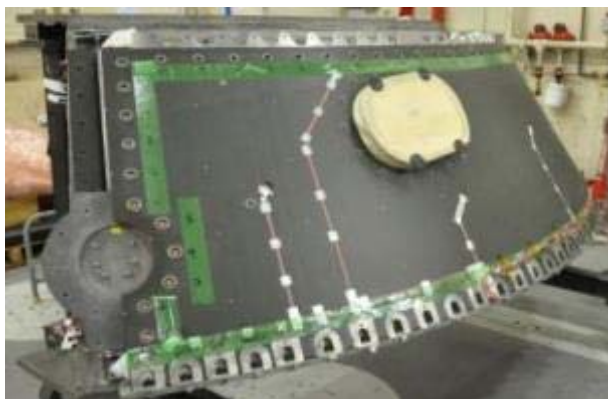
Thermal Protection System Thermal and Backshell

Successful Fairing Separation Test

Consultative Committee
CCSDS
for Space Data Systems

News from NASA

Orion Fully Powered at KSC

News from NASA

Coming This Fall…

News from NASA

Exploration Mission One (EM–1)
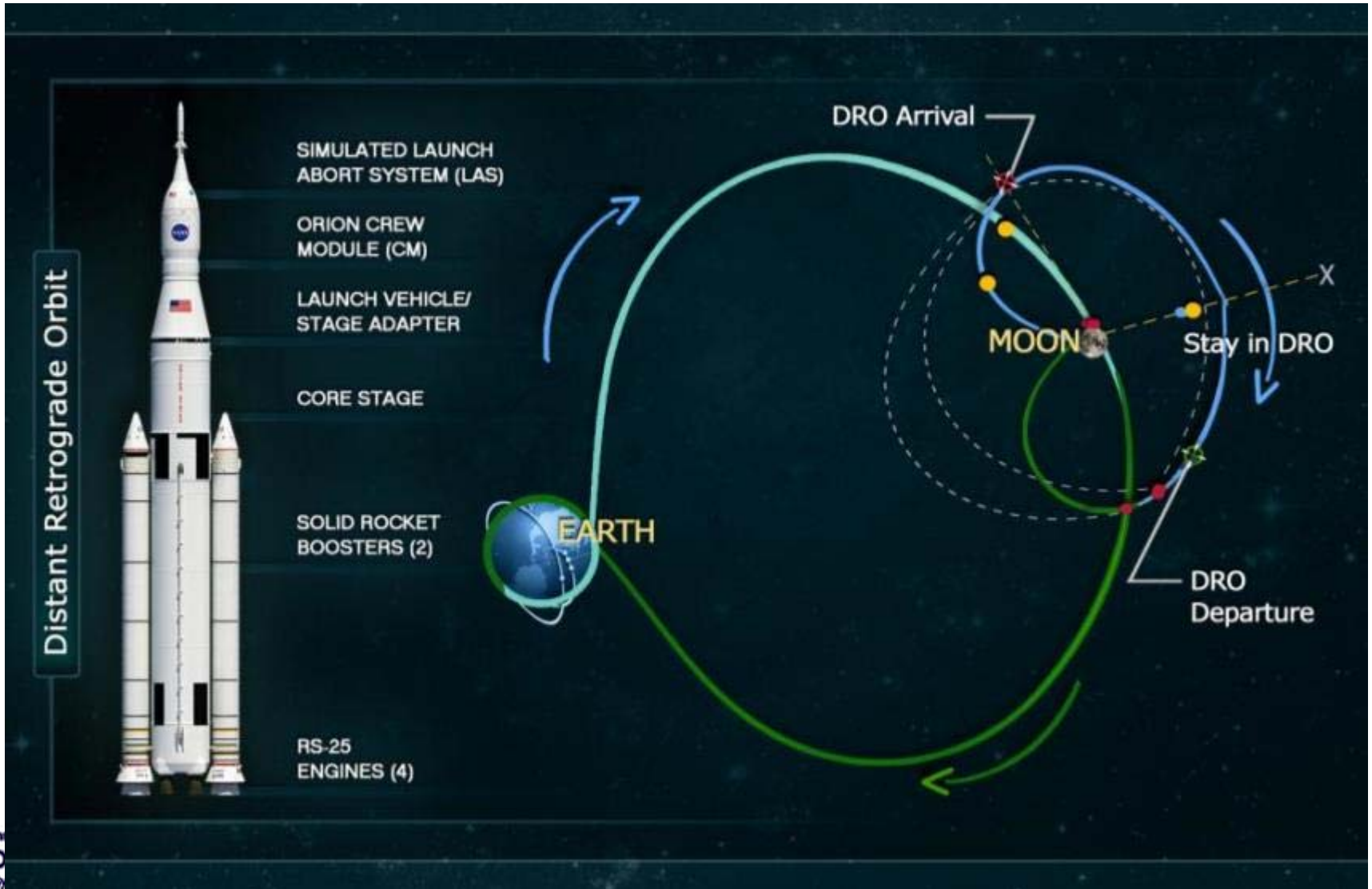
News from NASA

Asteroid Redirect Mission Provides Capabilities For Deep Space/Mars Missions

NASA support to CCSDS WGs

✦ 105 Document Projects in the Framework

✦ 89 have NASA participation in some way (Green areas)

✦ Most without NASA participation are simply in the formulation stage.
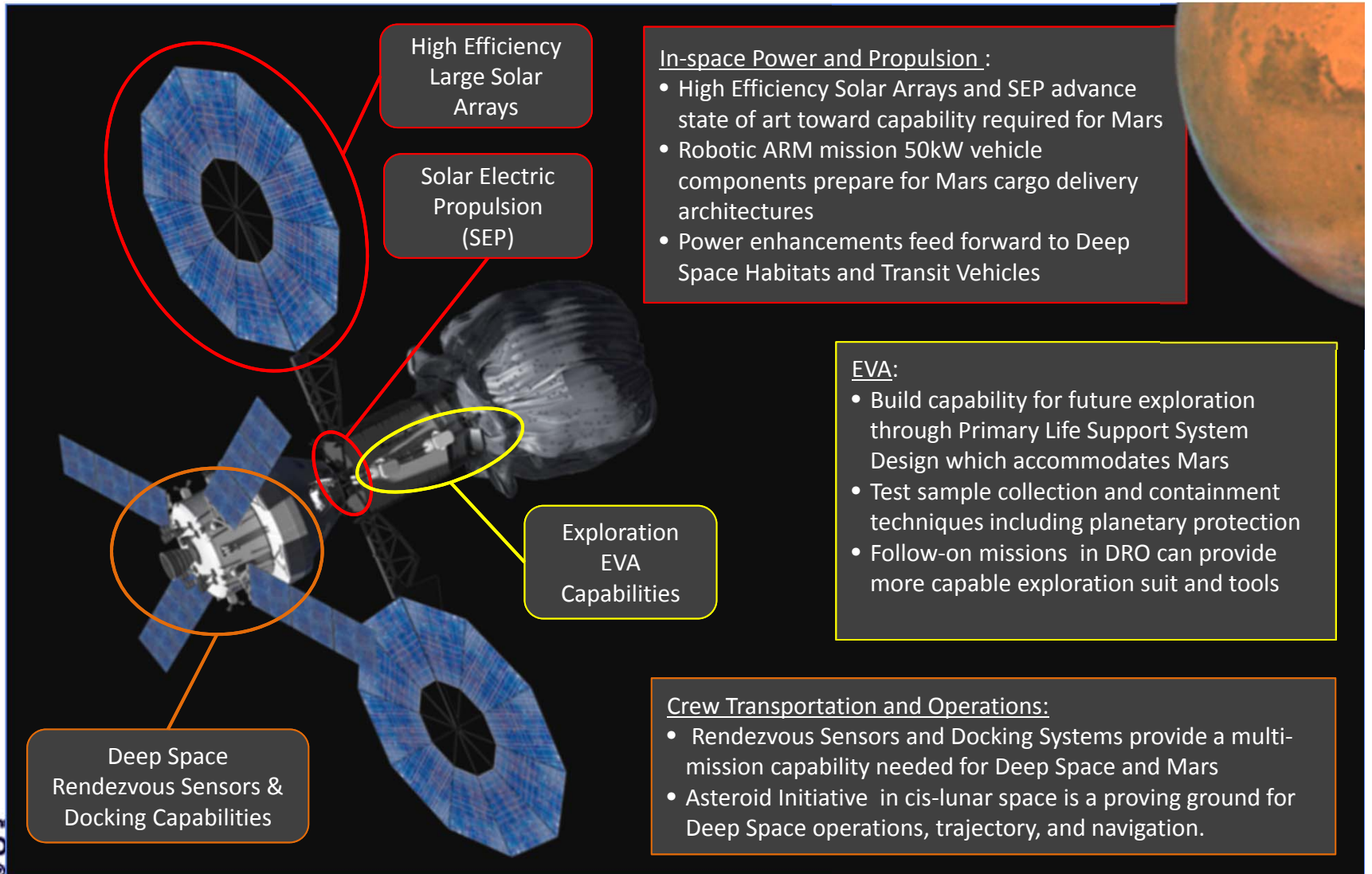
Report on infusion of CCSDS standards
DTN Technology efforts

✦ Work is proceeding to implement the DTN-for-ISS change request. The plan is to allocate laptops to serve as 'border DTN routers' for ISS.

✦ Three projects from the crowdsourcing approach are completed / underway:

◆ LTP Authentication – TopCoder implemented the LTP authentication mechanisms from the LTP Red Book for the ION Open Source BP implementation. The code produced will be part of the interoperability test for the LTP Blue Book.

◆ Delay-Tolerant Payload Conditioning for DTN2 – TopCoder teams, starting with the MSFC DTPC implementation, will do some modifications, integration and testing in support of the interoperability testing for the BP-for-CCSDS Blue Book.

◆ Security Key Management – TopCoder is investigating ways to perform key management in Delayed / Disrupted environments.

✦ NASA MSFC is working with DLR's Col-CC team to pursue a ground DTN prototype to deliver science and support data to Col-CC users.

✦ NASA is working to integrate DTN capabilities into its Core Flight Software (CFS) suite of avionics software. This will make DTN services available for spacecraft avionics to missions that choose to use CFS.

Items of concern to NASA

✦ Next Gen Space Link Protocols, while not broadly accepted by SLS teams, is critical to future human spaceflight programs. NASA strongly promotes further work in this area.

✦ Participation of commercial spaceflight providers needs to be increased.
   ◆ Text in the Procedures manual should reflect this, but that is not the critical question.
   ◆ The critical question is what do we *do* to recruit interest from SpaceX, Sierra Nevada, Virgin Galactic, etc.
   ◆ No quick answers for this.

✦ In general, because of reductions to NASA's budget for the Secretariat (in 2010), outreach for CCSDS has suffered. More effort and projects by other agencies is encouraged.
   ◆ Can some other agency take on the role of "outreach lead", and organize/produce things like press reports, conference booths,
   ◆ Suggestion: When a CCSDS Agency is hosting the next SpaceOps or IAC conference, they should produce/execute a CCSDS booth with giveaways, brochures, etc.

Ontologies – New area to consider or not?

- Ontologies (data dictionaries with relationships to build an ontological system).
  - Important to automation; e.g. management of autonomous planetary surface rovers, etc.
- NASA has a NASA-internal proposed standard on ontologies.
  - It seems to have a scope larger than spaceflight… physics and scientific dictionary and relationships, etc.
- OMG also has work in this area, not exactly compatible with the NASA approach.
- ISO may be the most appropriate forum for the broadest standard including scope outside of spaceflight. (spaceflight terms are a subset)
- Options are:
  1. CCSDS does nothing.
  2. CCSDS develops a proposal for a CCSDS standard.
  3. CCSDS develops a proposal for an ISO standard.
  4. CCSDS develops a proposal for an OMG standard (cover-sheets it?).
- NASA thoughts:
  - NASA suggests anything but #1.
  - If CCSD ever expects to need this, it's better to start early.
  - Resources are always a problem. We should decide what's best and then address resources.

BACKUP MATERIAL

NASA Org Chart

National Aeronautics and Space Administration

Administrator
Deputy Administrator
Associate Administrator

- Chief of Staff
- Associate Deputy Administrator
- Associate Deputy Administrator for Strategy and Policy
- Assistant Associate Administrator

Advisory Groups NAC and ASAP

Chief Financial Officer*

Inspector General

Chief Information Officer*

Chief Scientist

Chief Technologist

Diversity and Equal Opportunity

Legislative and Intergovernmental Affairs*

Education

Communications*

International and Interagency Relations

Small Business Programs

General Counsel

Chief Engineer

Chief, Safety and Mission Assurance

Chief Health and Medical Officer

Mission Support Directorate
- Human Capital Management
- Strategic Infrastructure
- Headquarters Operations
- NASA Shared Services Center
- Internal Controls and Management Systems
- Procurement
- Protective Services
- NASA Management Office

Aeronautics Research Mission Directorate

Human Exploration and Operations Mission Directorate

Science Mission Directorate

Space Technology Mission Directorate

Ames Research Center

Johnson Space Center

Dryden Flight Research Center

Kennedy Space Center

Glenn Research Center

Langley Research Center

Goddard Space Flight Center

Marshall Space Flight Center

Jet Propulsion Laboratory

Stennis Space Center

Reporting Structure

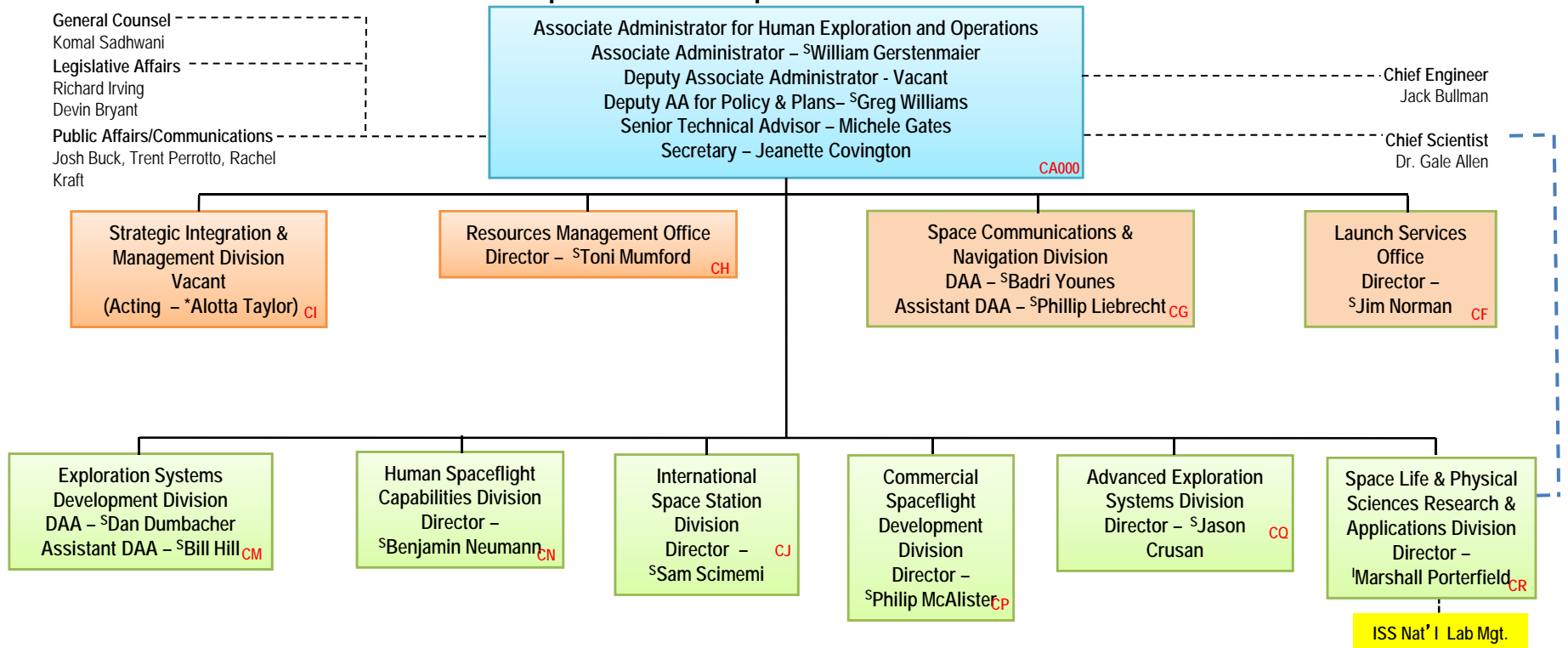|	
	Administrator
	Deputy Administrator
	Associate Administrator

Note:
* Center functional office directors report to Agency functional AA. Deputy and below report to Center leadership.

www.nasa.gov

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HEOMD Organization

Human Exploration and Operations Mission Directorate

General Counsel
Komal Sadhwani
Legislative Affairs
Richard Irving
Devin Bryant
Public Affairs/Communications
Josh Buck, Trent Perrotto, Rachel Kraft

Associate Administrator for Human Exploration and Operations
Associate Administrator – ^{S}William Gerstenmaier
Deputy Associate Administrator - Vacant
Deputy AA for Policy & Plans– ^{S}Greg Williams
Senior Technical Advisor – Michele Gates
Secretary – Jeanette Covington
CA000

Chief Engineer
Jack Bullman

Chief Scientist
Dr. Gale Allen

Strategic Integration & Management Division
Vacant
(Acting – *Alotta Taylor) CI

Resources Management Office
Director – ^{S}Toni Mumford CH

Space Communications & Navigation Division
DAA – ^{S}Badri Younes
Assistant DAA – ^{S}Phillip Liebrecht CG

Launch Services Office
Director – ^{S}Jim Norman CF

Exploration Systems Development Division
DAA – ^{S}Dan Dumbacher
Assistant DAA – ^{S}Bill Hill CM

Human Spaceflight Capabilities Division
Director – ^{S}Benjamin Neumann CN

International Space Station Division
Director – CJ
^{S}Sam Scimemi

Commercial Spaceflight Development Division
Director – ^{S}Philip McAlister CP

Advanced Exploration Systems Division
Director – ^{S}Jason Crusan CQ

Space Life & Physical Sciences Research & Applications Division
Director – ^{I}Marshall Porterfield CR

ISS Nat'l Lab Mgt.

Eracenia Kennedy (Sec)

HEOMD ORG –CS -140126

CMC Template Outline (as agreed in CMC Spring 2010)

✦ News from the Agency (brief): Organization changes, next launches…

✦ Report on CCSDS activities:
  ◆ Areas of interest and manpower / personnel involved
  ◆ Statements on the activities conducted in the areas of interest

✦ Report on infusion of CCSDS standards in Agencies :
  ◆ Implementations planned by projects and in infrastructures
  ◆ Technology effort

✦ Issues and proposals

✦ Spare Slides : Agency references
  ◆ Organization
  ◆ Mission model
  ◆ In-flight missions