NASA Report to the CCSDS Management Council

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Consultative Committee for Space Data Systems

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

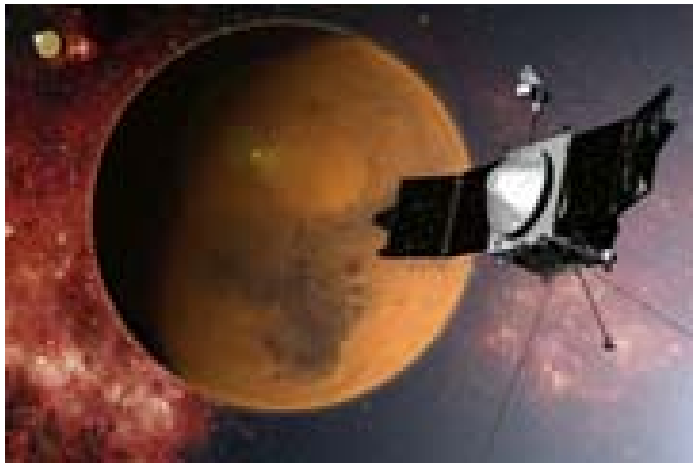
News from NASA

Launch of NASA Ocean Winds Sensor to ISS

The NASA ISS-RapidScat instrument was launched on 21 Sept 2014 on a SpaceX Commercial Resupply Services flight and will be the first Earth-observing sensor to be mounted on the exterior of ISS. ISS-RapidScat will monitor ocean winds for climate research, weather predictions and hurricane monitoring. The data provided by ISS-RapidScat will support weather and marine forecasting, including tracking storms and hurricanes. The station's orbit will allow the instrument to make repeated, regular observations over the same locations at different times of the day, providing the first near-global measurements of how winds change throughout the day. ISS-RapidScat will be the first science payload to be robotically assembled in space since the space station itself.

The Mars Atmosphere and Volatile EvolutioN (MAVEN) enters Mars Orbit

The MAVEN spacecraft entered Mars' orbit on Sept. 21 and has begun the six week commissioning phase before studying the Mars upper atmosphere. Scientists will use MAVEN data to determine the role that loss of volatile Mars atmosphere to space has played through time, giving insight into the history of Mars' atmosphere and climate, liquid water, and planetary habitability.



CCSDS SLE Forward CLTU, SLE RAF/RCF, TDM, Delta-DOR Data Exchange, RFM for X-band, CCSDS Turbo code at ½,1/3,1/5, Reed-Solomon, Prox-1

News from NASA

Optical Payload for Lasercomm Science (OPALS)

The Optical Payload for Lasercomm Science (OPALS) sent the first high-definition video from the ISS to ground on 5 June using a 2.5-watt, 1550 nanometer laser. The 175-megabit video transmission was the first for OPALS and achieved a maximum data rate of 50 megabits per second downlink. The OPALS instrument was built at JPL as part of the Phaeton hands-on training program.

OPALS 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.

NASA's Newest Near Earth Network (NEN) Antenna Is Operational

A new NASA Near Earth Network (NEN) antenna began operation recently within the Alaska Satellite Facility (ASF). Operation of the NASA-owned communication equipment, consisting of three antennas, is the responsibility of the University of Alaska, Fairbanks (UAF). The ASF is a prime polar location for the NEN's globally distributed, ground-based communication network. NEN services provide downlink, uplink and coherent tracking to support launches, early orbits and routine on-orbit operations.

News from NASA

Exploration Flight Test-1 Orion Crew Module Completed

NASA’s Orion crew module has been completed and is mounted atop its service module at Kennedy Space Center. The crew and service modules will be transferred to another facility for fueling, before moving again for the installation of the launch abort system. At that point, the spacecraft will be complete and ready to stack on top of the Delta IV Heavy rocket that will carry it into space on its first flight in December. For that flight, Exploration Flight Test-1, Orion will travel 3,600 miles above the Earth – farther than any spacecraft built to carry people has traveled in more than 40 years – and return home at speeds of 20,000 miles per hour, while enduring temperatures near 4,000 degrees Fahrenheit.

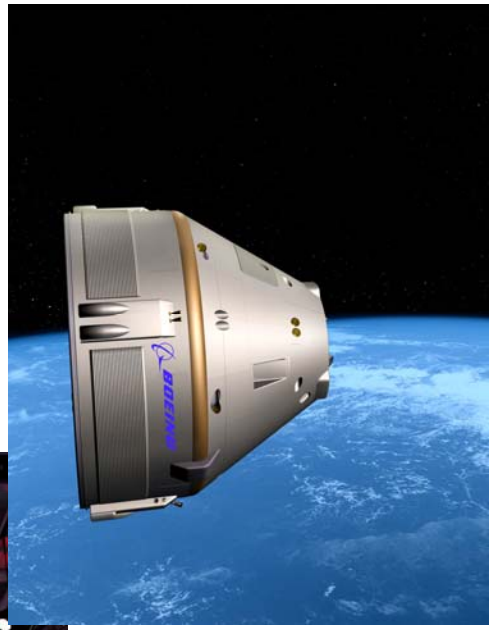
NASA's Space Launch System Boosters Office Completes CDR

As progress continues on NASA's new rocket, the Space Launch System (SLS), the solid rocket boosters team successfully completed its critical design review (CDR) Aug. 6. This is an important milestone for the program, as it verifies the boosters are ready to move forward with qualification testing. The two five-segment solid rocket boosters will provide the majority of the liftoff thrust for the SLS vehicle. As the SLS evolves, it will be used for deep space missions to destinations such as an asteroid and ultimately Mars.

News from NASA

NASA Selects Boeing and SpaceX for ISS Crew Vehicle

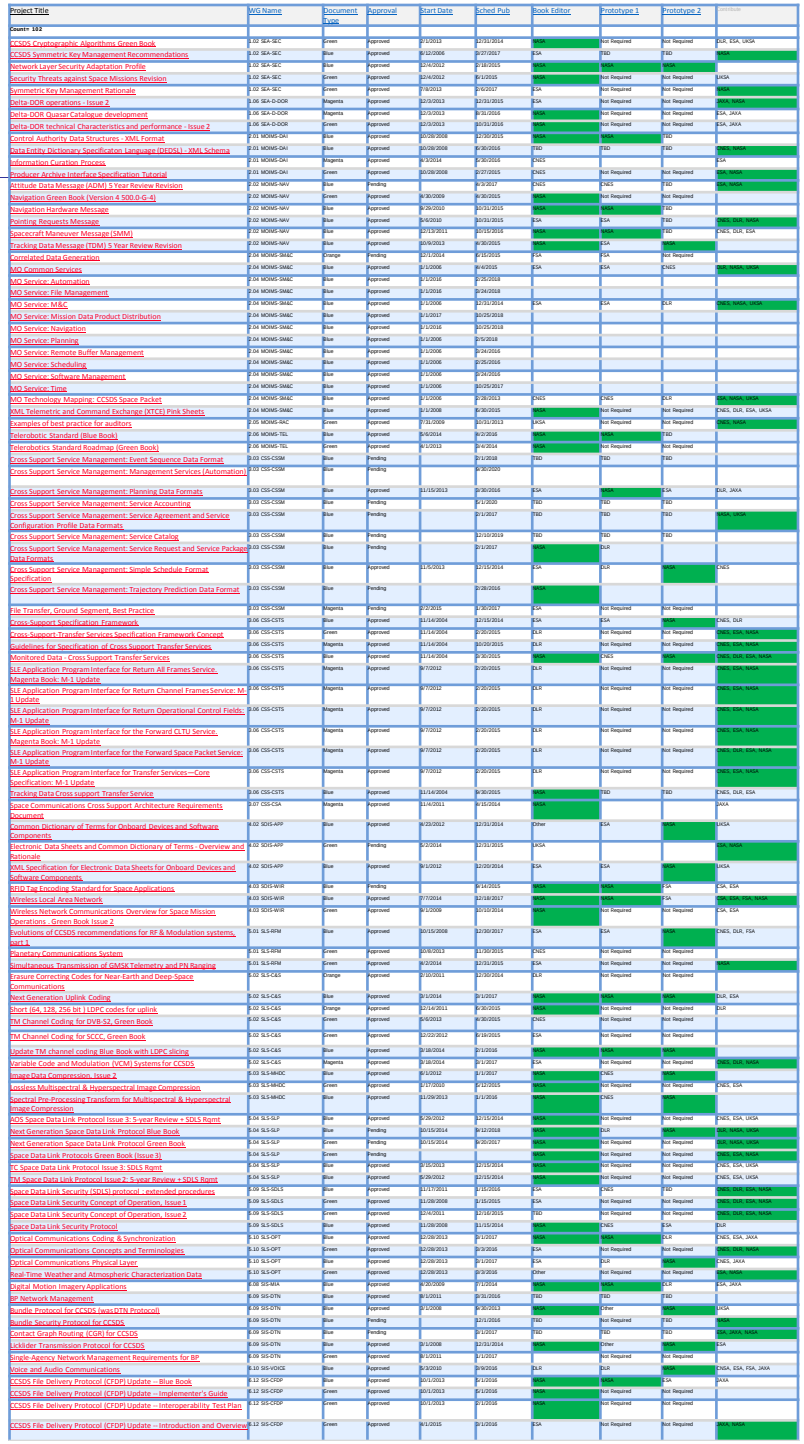
On 16 Sept NASA announced that Boeing's *CST-100* and SpaceX's *Dragon* vehicle designs were selected to ferry crew to the International Space Station (ISS) and back by 2017. The vehicles are designed to carry up to seven astronauts or a mix of crew and cargo and must meet the rigorous safety standards used for the Space Shuttle Program. The low-Earth orbit spacecraft will launch from Kennedy Space Center – Cape Canaveral complex.



NASA support to CCSDS WGs

- 102 Document Projects in the Framework
- 71 have NASA participation in some way other than “monitor”
  - (Green areas)
- Most without NASA participation are simply in the formulation stage.
- Interesting data:

	Book Editor	Prototype 1	Prototype 2	Contribute	Sum of BE&P
NASA	41	13	17	36	71
ESA	20	8	3	38	31
DLR	10	5	4	21	19
CNES	6	7	1	31	14
FSA	1	1	2	3	4
UKSA	2	0	0	15	2
JAXA	0	0	0	12	0
CSA	0	0	0	3	0
CNSA	0	0	0	1	0
ASI	0	0	0	0	0
INPE	0	0	0	0	0



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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

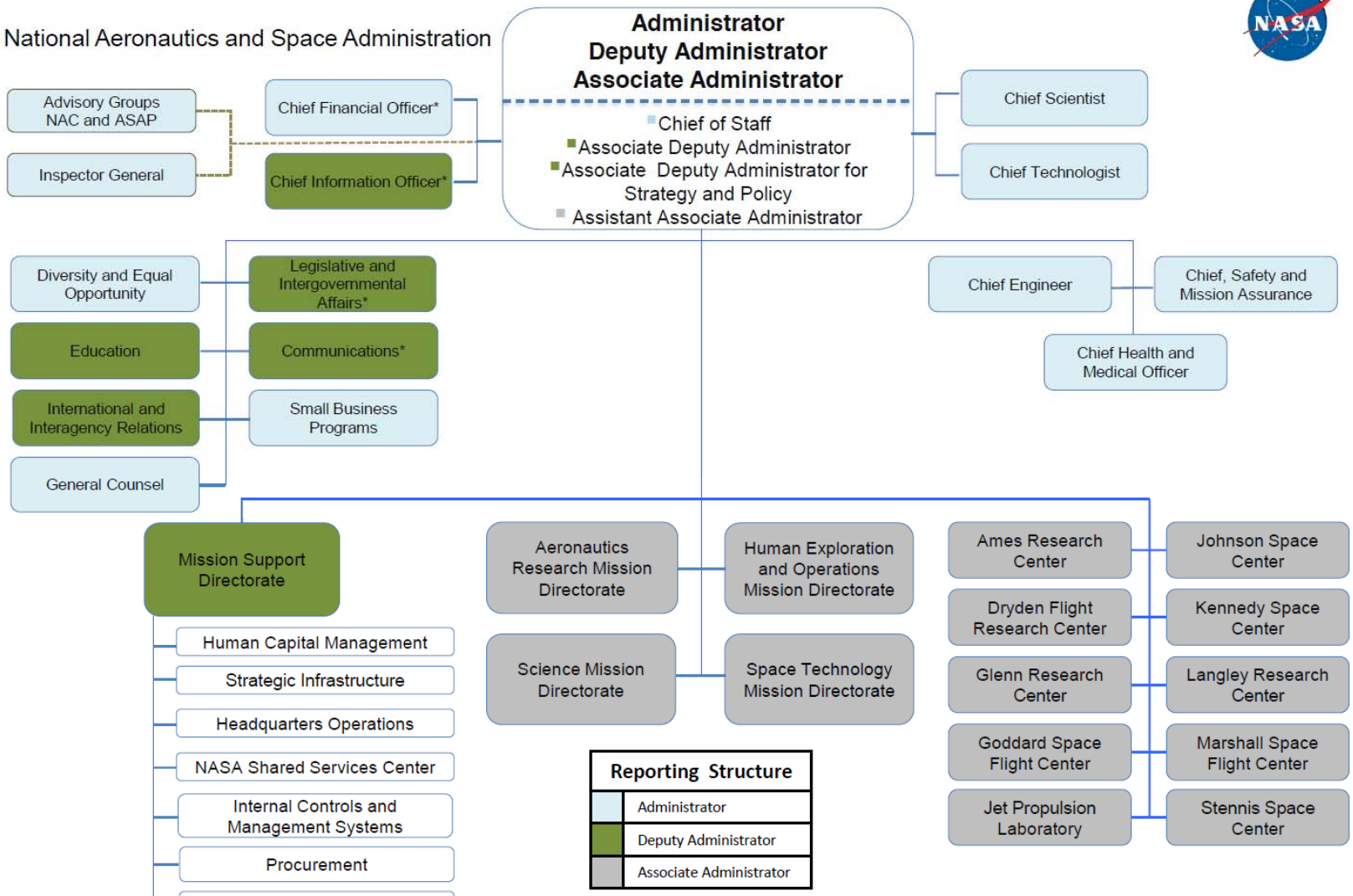
- Next Gen Space Link Protocols, while not broadly accepted by SLS teams, is critical to future human spaceflight programs. NASA strongly promotes further work in this area.
- Participation of commercial spaceflight providers needs to be increased.
  - Text in the Procedures manual should reflect this, but that is not the critical question.
  - The critical question is *how* can we 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

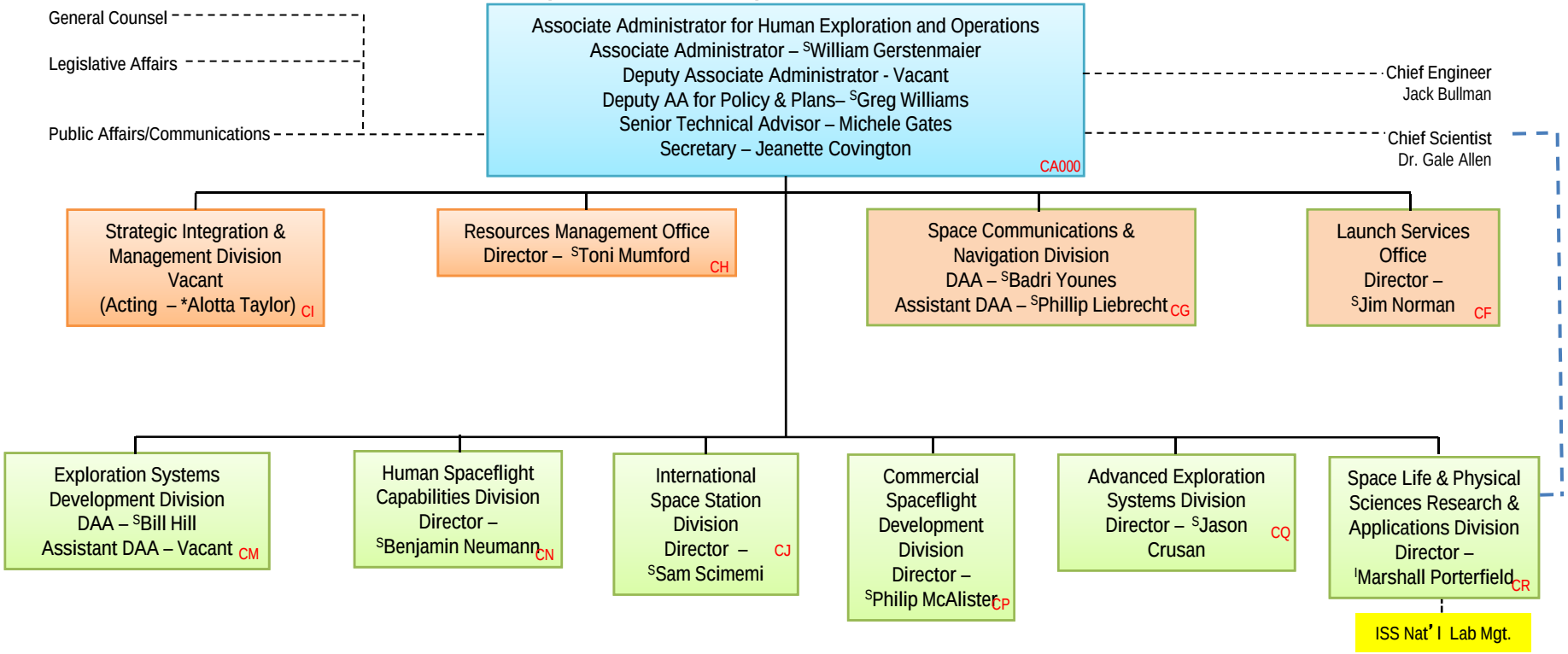
NASA Org Chart



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

HEOMD Organization

Human Exploration and Operations Mission Directorate



Eracenia Kennedy (Sec)

Reference: 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

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