



HEO NASA Advisory Council Meeting

Ken Bowersox
Committee Chair



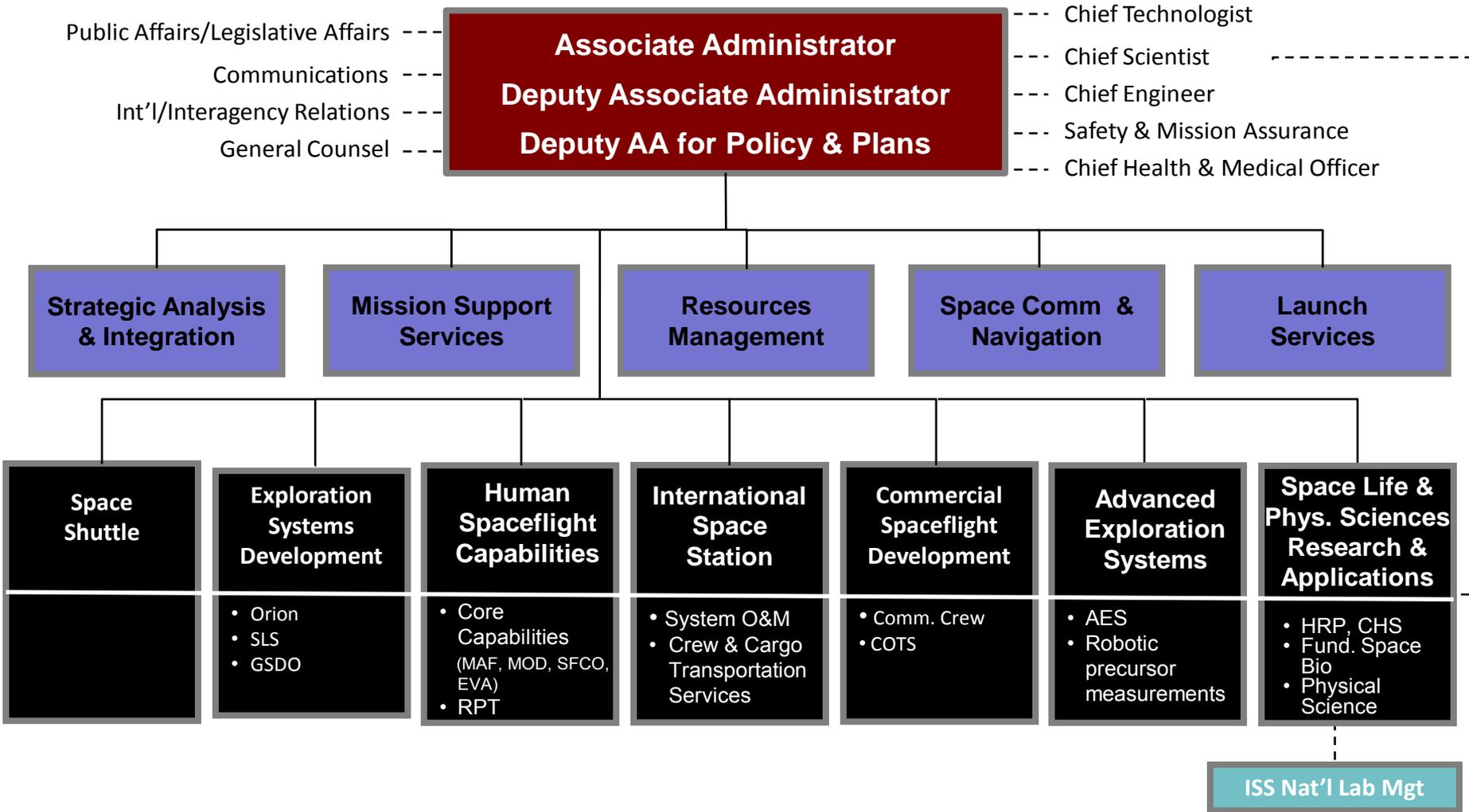
NAC HEO Committee Members



- Ms. Bartell, Shannon
- Mr. Bejmuk, Bohdan, **Co-Chair**
- Mr. Bowersox, Ken, **Chair**
- Ms. Budden, Nancy Ann
- Dr. Chiao, Leroy
- Dr Condon, Stephen "Pat"
- Mr. Cuzzupoli, Joseph W.
- Mr. Holloway, Tommy – did not attend.
- Mr. Kohrs, Richard
- Dr. Longenecker, David E.
- Mr. Lopez-Alegria, Michael (New Member)
- Mr. Malow, Richard N.
- Mr. Odom, Jim (James) – did not attend
- Mr. Sieck, Robert
- Mr. Voss, James (New Member)

Human Exploration & Operations Mission Directorate

Organizational Structure





NAC HEO Committee Meeting

Monday, December 9, 2013

Opening Remarks

Mr. Ken Bowersox, NAC HEO Chair &
Dr. Bette Siegel, Chair & Executive
Secretary NAC HEO Committee

Status of Human Exploration and Operations

Mr. William Gerstenmaier
Associate Administrator
HEOMD, NASA HQ

Status of Commercial Spaceflight

Mr. Phil McAlister
Director, Commercial Spaceflight
Development Division, HEOMD
NASA HQ

Status of Exploration Systems Development

Mr. Daniel Dumbacher
Deputy Associate Administrator
for Exploration Systems &
Development, HEOMD, NASA HQ

ADJOURN



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December 10, 2013

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Update on the Capability Driven Framework
& Status of Advanced Exploration Systems

Mr. Jason Crusan
Director, Advanced Exploration
Systems Division, HEOMD, NASA HQ

Status of International Space Station

Mr. Sam Scimemi
Director, International Space Station,
HEOMD, NASA HQ

Public comments and input

Committee Discussion and Deliberation

ADJOURN

Areas of Discussion



- Ways to develop understanding, support, and excitement for NASA's human exploration mission
- Integration of HEO programs – across directorates, missions, vehicles and systems
- Management of programs with constantly uncertain funding
- Importance of setting an official target date for ending NASA's support of ISS, and planning for what comes after.
- Topics for future discussion and recommendations for the council.



Chart from Advanced Exploration Systems
Presented by Jason Crusan
December 10, 2013

Capability Driven Framework



Incremental steps to steadily build, test, refine, and qualify capabilities that lead to affordable flight elements and a deep space capability.

Mars: Ultimate human destination in the next decades

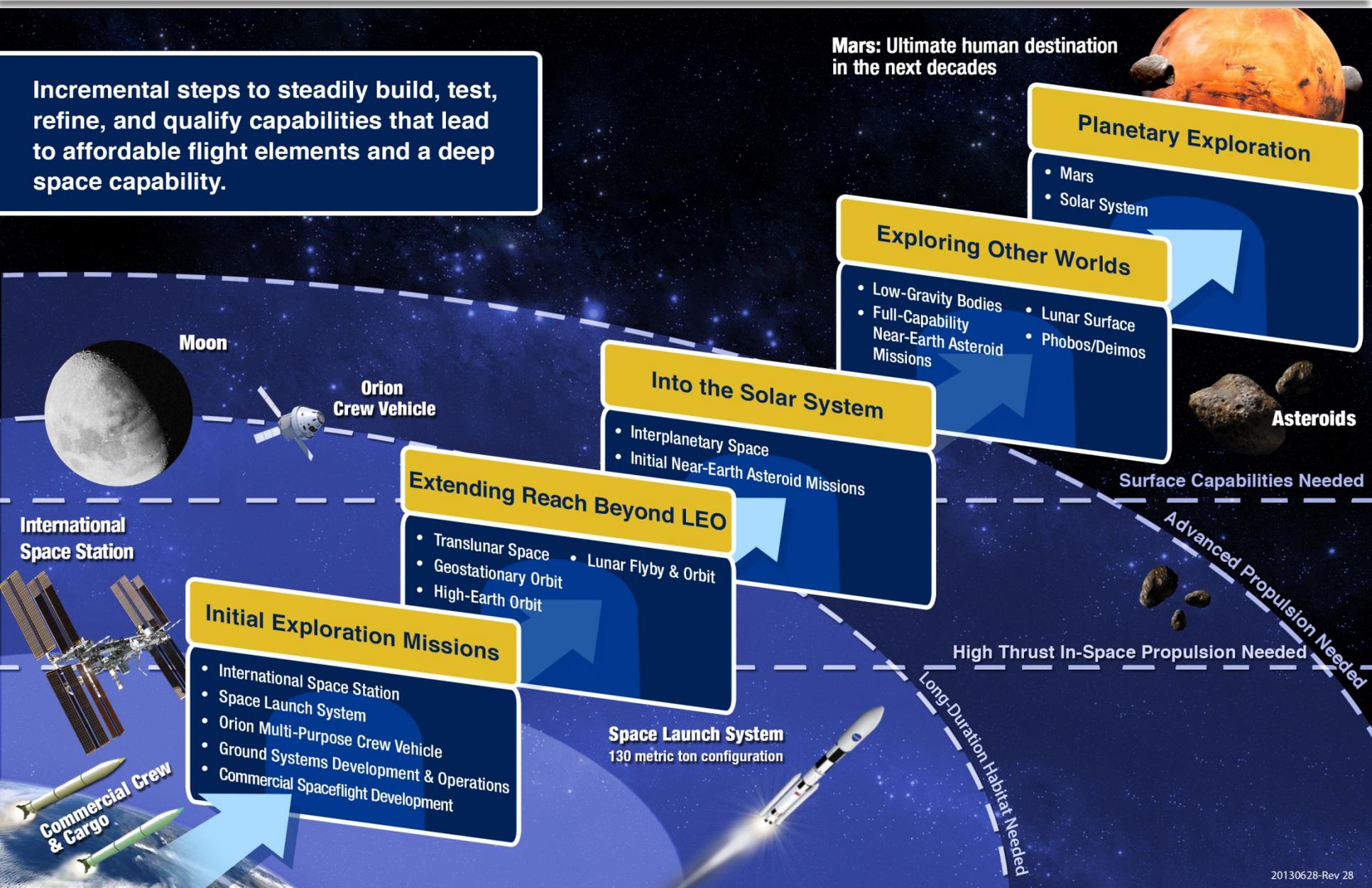




Chart from Human Exploration and Operations Mission Directorate
Presented by William Gerstenmaier
December 9, 2013

Alignment Strategy for a Mission

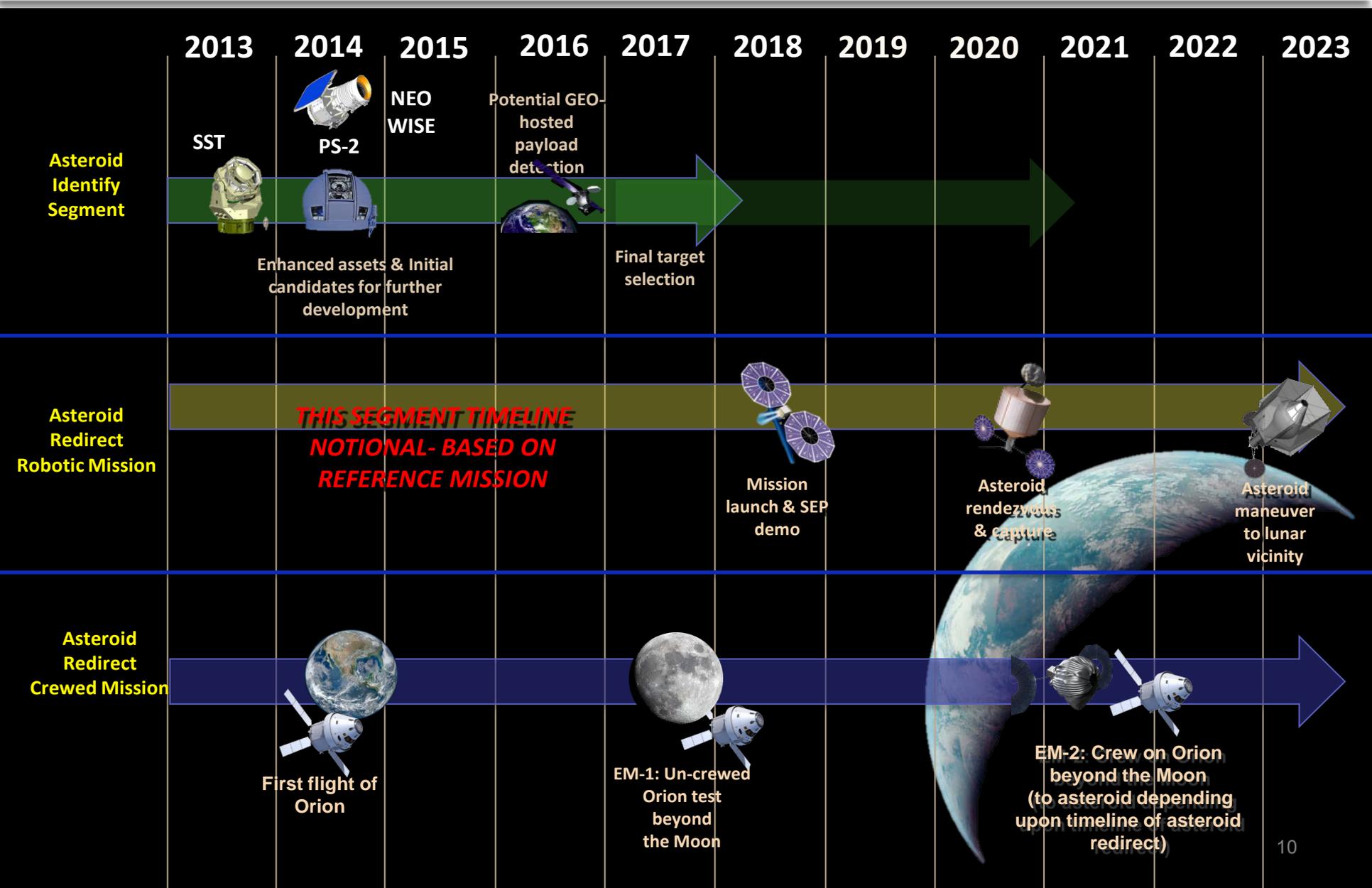


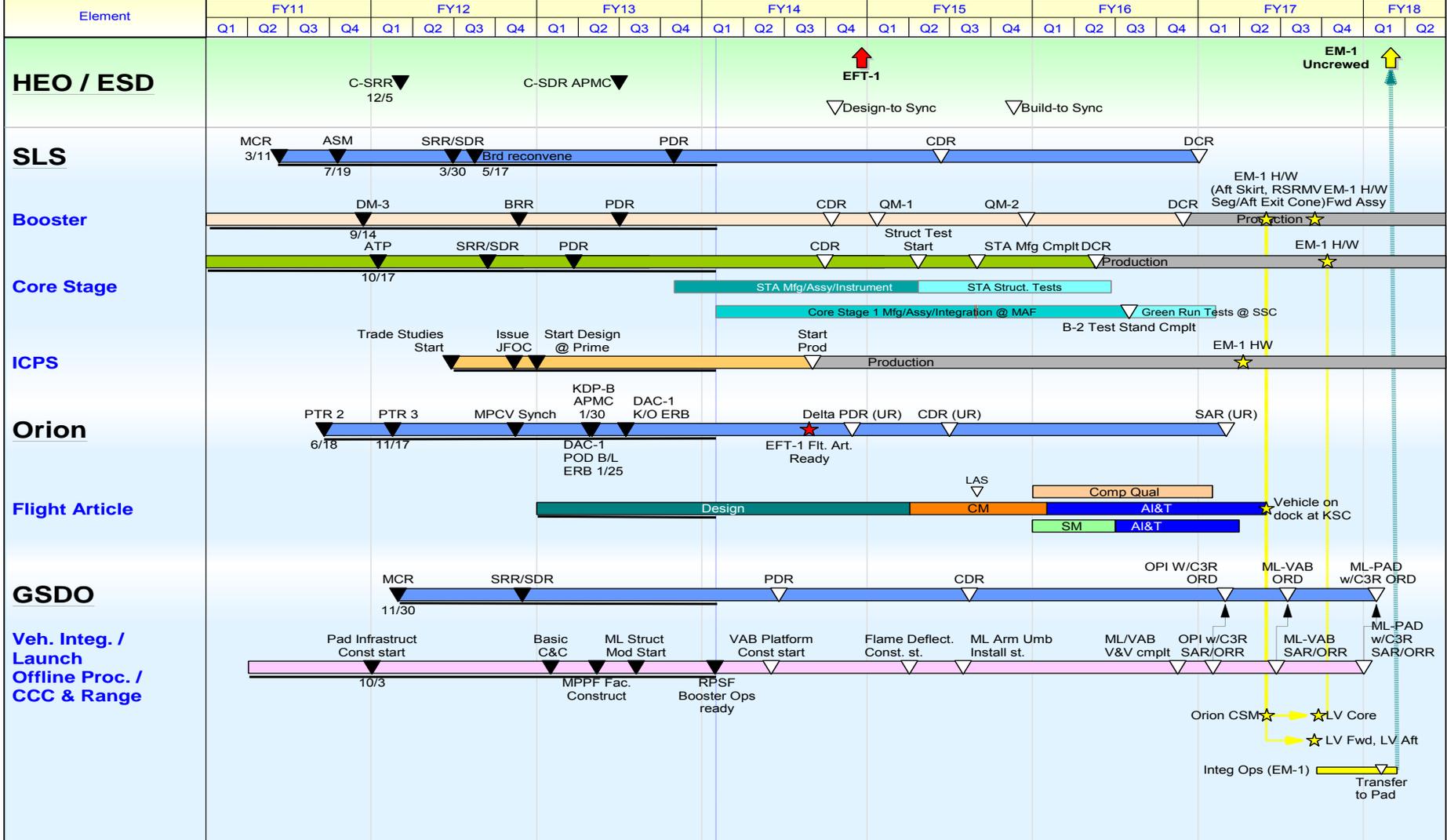


Chart from Exploration Systems Division
Presented by Dan Dumbacher
December 9, 2013



ESD Summary Schedule

Version: 2013-10-31





Charts from Advanced Exploration Systems
Presented by Jason Crusan
December 10, 2013

Principles for Incrementally Building Capabilities



Six key strategic principles to provide a sustainable program:

1. Executable with current *budget with modest increases*
2. Application of *high Technology Readiness Level (TRL)* technologies for near term, while focusing research on technologies to address challenges of future missions
3. *Near-term mission* opportunities with a defined cadence of compelling missions providing for an incremental buildup of capabilities for more complex missions over time
4. Opportunities for *US commercial business* to further enhance the experience and business base learned from the ISS logistics and crew market
5. *Multi-use* space infrastructure
6. Significant *international and commercial participation*, leveraging current International Space Station partnerships and commercial companies

HEO Time Phased Capability Prioritization



Mission Classes and Design Reference Missions



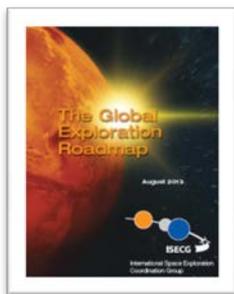
Near Term Strategy



HEO MD Objectives and Strategic Knowledge Gaps



Capabilities



Partnerships (Commercial, International via GER)

Information Captured for Sensitivity Analysis

Investment Priorities to HEOMD Divisions and Programs

Allows:

- Sensitivity analysis on objective satisfaction (asteroid mission, ISS testing, etc.)
- Make / buy / partner options
- Strategic considerations
- Portfolio recommendation
- Data required PPBE for programmatic decision /implementation processes



Charts from International Space Station
Presented by Sam Scimemi
December 10, 2013



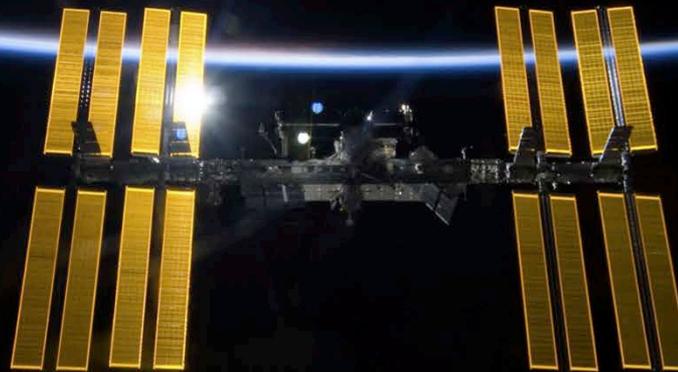
International Space Station is essential to meeting the Nation's goals in space

Returning benefits to humanity through research

Enabling a self-sustaining commercial LEO market

Laying the foundation for long-duration spaceflight beyond LEO

Leading the world in an exploration partnership



2013

2020

2030

International Space Station

General Research and Exploration
Preparatory Activities

Note: ISS partner agencies have agreed to use the ISS until at least 2020.

Commercial or Government Low-Earth Orbit Platforms and Missions

Robotic Missions to Discover and Prepare

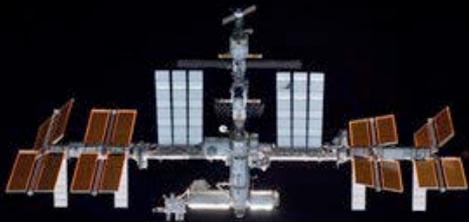


Human Missions Beyond Low-Earth Orbit





Station is on the critical path to getting humans to Mars



In-space segment

- *Life support*
- *Spacecraft reliability, supportability and maintainability*
- *Human performance for long durations in deep space*
- *Transportation system performance*

Access to the surface: landing on, operating on, and then ascending from Mars



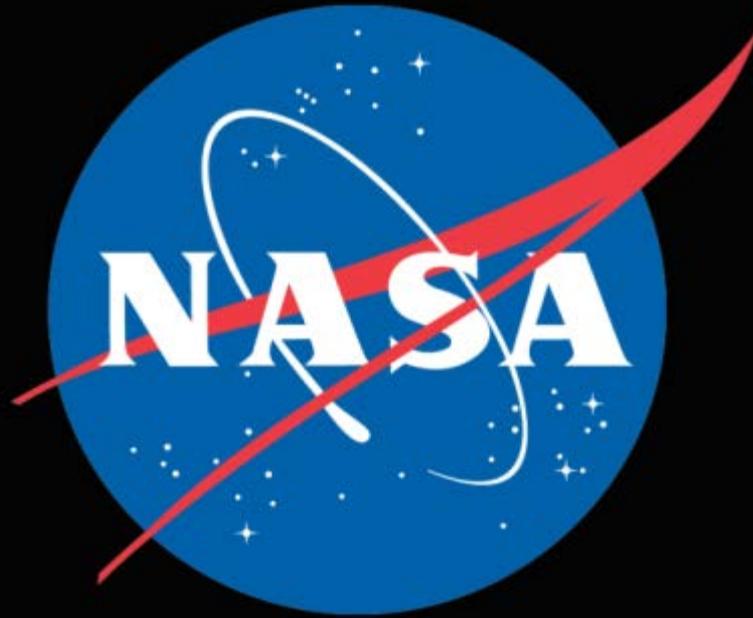
Recommendation: NAC endorses immediate action to officially extend NASA ISS support beyond 2020.

MAJOR REASONS FOR PROPOSING THE RECOMMENDATION:

We recommend an extension of NASA support for the ISS past 2020. Current analysis shows that ISS operations and utilization beyond 2020 is feasible.

- Returning benefits to humanity through research:
 - medical technologies and medicine, earth and space sciences, physical and biomedical research, National Laboratory/CASIS;
- Facilitating National Security:
 - Remote sensing, orbital intelligence and situational awareness;
- Enabling a self-sustaining commercial market in LEO:
 - pharmaceutical, materials, crew and cargo transportation industries
- Laying the foundation for long-duration spaceflight beyond LEO:
 - human health and performance, spacecraft technologies and systems, life support, operations;
- Leading the world in an international exploration partnership and cooperation:
 - national security, foreign policy instrument, national leadership objectives.

CONSEQUENCES OF NO ACTION ON THE PROPOSED RECOMMENDATION: Permanent loss of U.S. leadership position in spaceflight, medical and pharmaceutical research, cost effective research and technology development in basic research and earth and space science; inability to expand long duration human spaceflight beyond LEO and onto Mars; crippling the development of commercial LEO market.



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