National Aeronautics and Space Administration

Science & Technology Utilization Office Overview

HEO Systems Engineering and Integration
Science & Technology Utilization Office (S&TU)
and Utilization Coordination and Integration Group (UCIG)

Julie Robinson, Ph.D.
Human Exploration and Operations Mission Directorate
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HEO SE&I Functional Descriptions

Systems Engineering & Integration Deputy Associate Administrator

Responsible for ensuring the overall HEO strategy is reflected in program requirements; leads architecture, formulation mission planning and provides technical direction for HEO activities (Moon, Mars and other human missions)

Strategy and Architecture

Translates Agency vision into an integrated HEO portfolio that supports national exploration goals through development of campaigns and architectures and performing formulation activities

Capability Integration

Articulates capability needs for lunar and Mars missions, identifies integration and overlap between mission needs, and develops strategies for advancing key capabilities that support those needs

Science and Technology Utilization

Integrates science and technology goals from mission directorates and international partners to develop HEO utilization goals, objectives and requirements for Artemis missions, and the cross-platform research strategy to prepare for human missions to Mars

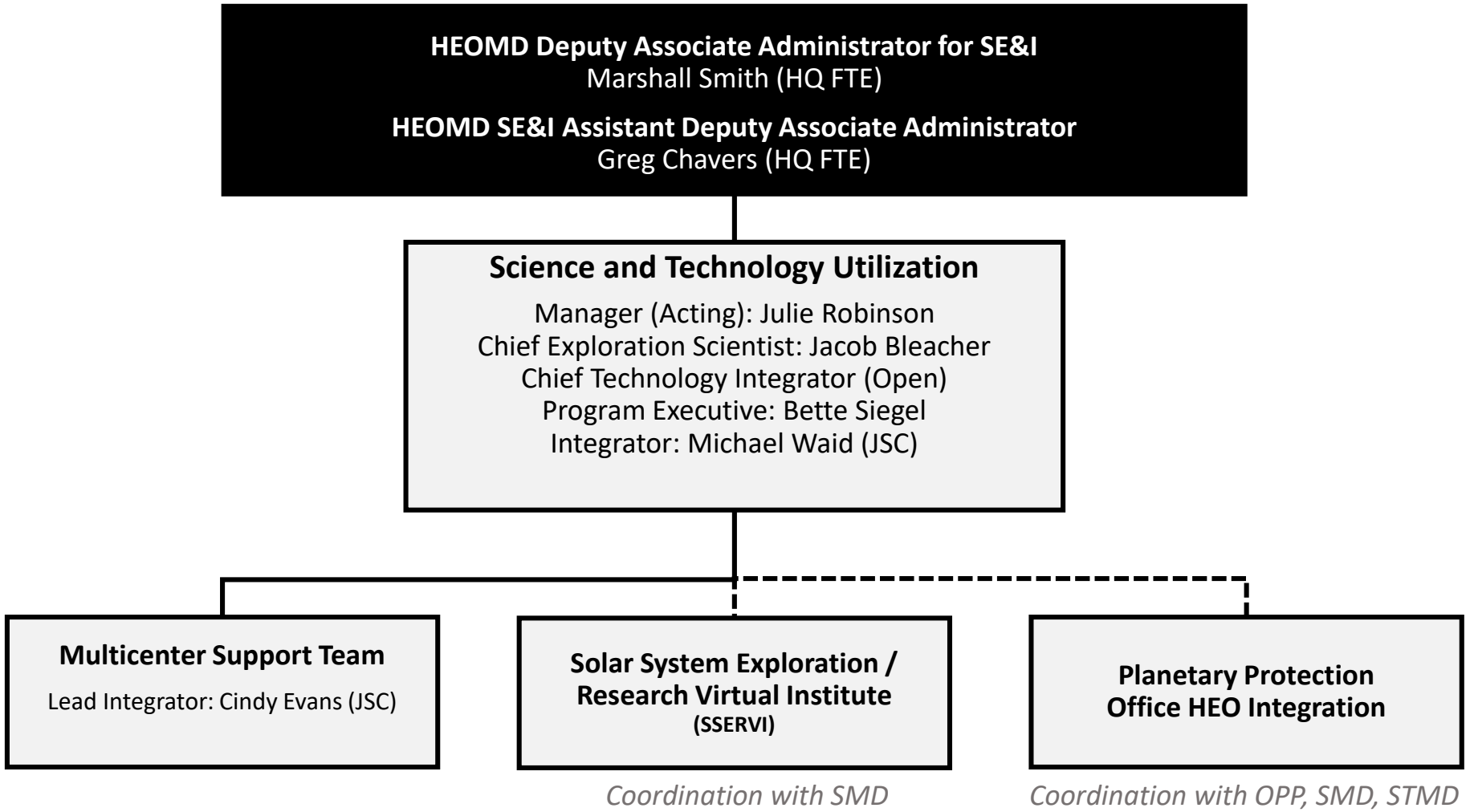
Technical Integration

Focused on ensuring agency strategies are achieved through HEO systems and programs, establishes and maintains HEO top-level requirements, and allocates to the various campaign elements and initiatives

Portfolio Integration

Provides cross-cutting support to HEO systems and programs coordinating activities, boards, schedules and driving issue resolution

HEO Science & Technology Utilization



Last revision: Apr. 2, 2021

Science & Technology Utilization
Major Functions

Science and Technology Utilization

Integrates science and technology goals from mission directorates and international partners to develop HEO utilization goals, objectives and requirements for Artemis missions, and the cross-platform research strategy to prepare for human missions to Mars

Integrates the objectives of NASA mission directorates and international partners to define human spaceflight utilization strategy, objectives and requirements.

Documents HEO requirements to guide implementation of Artemis programs and missions and to insure optimum use of human spaceflight missions across all spaceflight platforms in preparation for human missions to Mars.

Provides a strategic view of competing priorities to optimize the advancement of knowledge from human spaceflight missions and reduce the risk of future missions.

Facilitate the communication of objectives and accomplishments within HEO and to stakeholders and the public.

Advocate for all utilization, including science, technology maturation and infusion, international partnerships, commercialization, and outreach.

Utilization Coordination and Integration Group (UCIG)*

Mission Directorate "Level 0"

- Three Mission Directorate co-chairs
- SMD, STMD and HEOMD evaluate, define and own their own utilization objectives and selections
- HEO integrates and determine what utilization objectives can be accommodated in mission capabilities
- Documentation in HEO-006 Utilization Plan

Mission Directorate Representatives that fund utilization

- SMD/ESSIO
- SMD/BPSD
- SMD/DAA Programs
- STMD
- HEOMD/HRP
- HEOMD/AES Enabling Capabilities
- Office of Planetary Protection

HEO Representatives

- **Science & Technology Utilization (SE&I)**
- Other SE&I Orgs

Implementing Divisions

- ESD
- AES
- HSFCD
- ISS
- CSDD
- SCaN

Observers

- Office of the Chief Scientist
- Office of the Chief Technologist
- Office of International and Interagency Relations
- Technical Authorities

Implementing Programs

- Gateway
- HLS
- LTV
- ISS

Requirements Flow

Science and Technology Utilization – Processes

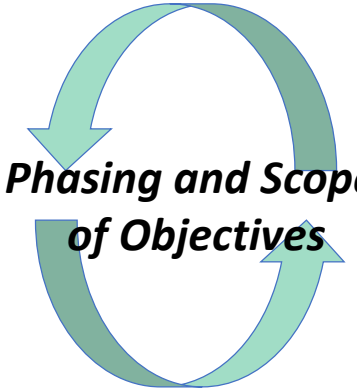
Transition from Strategy to Execution

HEO Level

HEO Science & Technology Utilization Office

Jointly With SMD and STMD

- Works with users and AES to integrate high-level Goals, Objectives, Cornerstone Utilization Capabilities and strategic plans
- "Utilization Coordination and Integration Group (UCIG)" co-chaired with SMD (ESSIO) and STMD
- Integrates HEO-006 Utilization Plan
- Mission Phased Objectives as a realistic subset (**Level 0 Utilization Requirements**)



Artemis Division Level

Advanced Exploration Systems,

with Exploration Systems Development

- Works with users, programs and HEO S&TU on detailed mission objectives, approach to implementation, and payload manifest
- "Artemis Utilization Coordination Panel (AUCP)' for AES, "Payload ITT" for ESD
- Tactical research plans with increased level of detail (**Level 1 Utilization Requirements**)

Draft approach, subject to final Mission Directorate Approvals

Science & Technology Utilization Products

HEO-006 Utilization Plan

Main Body

1.0 INTRODUCTION
2.0 APPLICABLE AND REFERENCE DOCUMENTS
3.0 Utilization Goals and Objectives (ISS, Commercial LEO, Artemis)
- 3.1 SMD
- 3.2 STMD
- 3.3 HEOMD

4.0 Introduction to Annexes

Appendices – Acronyms, Definitions, Open Work, Forward Work

Annexes

Annex 1 – Cornerstone Utilization Capabilities that Enable Multiple Objectives (Use Cases)

Annex 2 – Ten-year Utilization Phasing Plan

Annex 3 – Integrated LEO Utilization Objectives

Annex 4 – Integrated Artemis Mission Utilization Objectives
- 4.1 Artemis First Crewed Landing
- 4.2 etc.

First priority items being developed concurrently
Document baseline in FY21

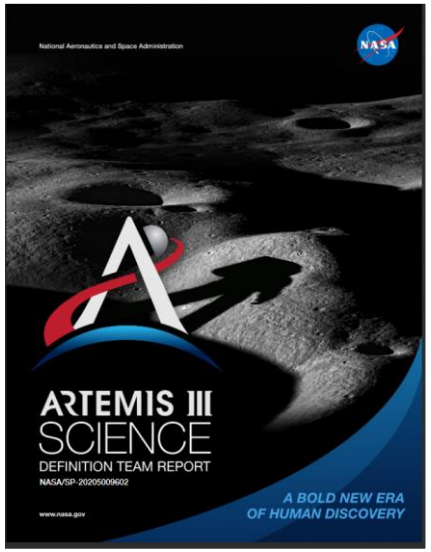
Draft approach, subject to final Mission Directorate Approvals

HEO 006 Annex 1 Cornerstone Utilization Capabilities
(Use Cases, First Priority for Baselining. Others to Follow as Needed)

1.1 Model Traverse Approaches: Access to and operations in new terrain including traverse use cases to inform crew and rover mobility, communications.
1.2 End-to-End Sampling Strategy: Sampling, curation, and transport strategy including core tube samples, stratigraphy, identification and collection of rocks, biological samples, cold sample curation, documentation tools both geological and biological sample.
1.3 Integrated Planetary Protection Strategy: Planetary protection strategy and microbial monitoring across PPO, PSD, BPSD, and HRP, and ECLSS SCLT research.
1.4 Extended Missions: Extended duration orbit/surface missions for experiments and technology development (applies to both ISS and Artemis)
1.5 Integrated Crew Research: Integrating/coordinating access to human test subjects pre- and post-flight
1.6 Robotic Utilization for HEO Assets: Uncrewed/robotic operations for utilization of HEO assets (use cases, characterization of local environment, instrument deployment)
1.7 Integrated Instrumentation Strategy: In situ instrumentation and measurements (external instruments, real time EVA and shirtsleeve measurements)
1.8 PSR Operations: Complex operations in permanently shadowed regions/cold regions (sampling, measurements, ISRU)
1.9 Science Team Coordination: Science team and backroom operations and coordination with FOD
1.10 Utilization Interoperability: Systems needs and ability to exchange data, information, materials, consumables, or physically interact.

Draft approach, subject to final Mission Directorate Approvals

HEO-006 Annex 4: Mission Specific Utilization Objectives/Requirements



Science Definition Team Report (December 2020)

- **Released December 2020, Will inform the selection of mission priorities by SMD and used to integrate and document HEO-006 Annex 4**
- SDT traces from science Goals (areas of research) to Investigations (specific activities undertaken to address Goals).
- Constructed a candidate program that captures the highest-priority science for the first landed crew mission and provides the greatest feed-forward to follow-on missions and the build-up to the Artemis Base Camp
- A cohesive program that contains a mix of activities encompassing field geology and sample return, *in situ* measurements and long-lived experiments

Edited from R. Weber: Artemis III SDT Report Briefing

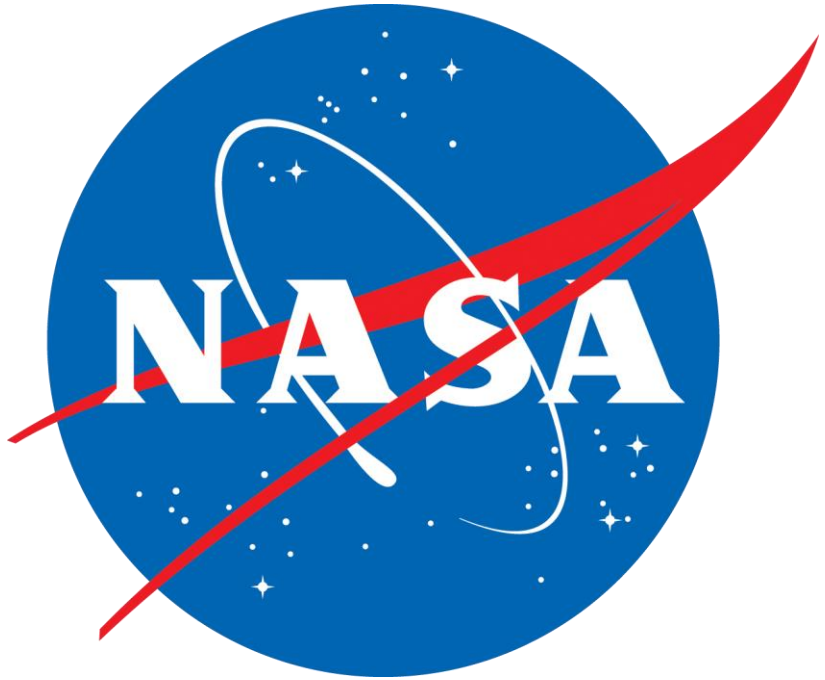
Community Strategy Documents
Decadal Surveys

Science Definition Team Reports

User-Solicited Investigations
(e.g. SMD)

Main Volume: All Utilization Goals/Objectives (disciplines, human spaceflight platforms)	Annex 4: Mission-Specific Objectives & Requirements	AES Level 1 Research Plans

HEOMD-SMD-STMD Joint Approach to HEO-006 Utilization Plan, Draft, Subject to final Mission Directorate Approvals



QUESTIONS

Acronyms

- AES- Advanced Exploration Systems (HEOMD)
- AUCP - Artemis Utilization Coordination Panel
- BPSD – Biological and Physical Sciences Division (SMD)
- CSDD – Commercial Spaceflight Development Division (HEOMD)
- DAA Deputy Associate Administrator
- ESD – Exploration Systems Division (HEOMD)
- ESSIO – Exploration Science Strategy and Integration Office (SMD)
- HEO - Human Exploration and Operations (Mission Directorate)
- HRP – Human Research Program (HEOMD)
- HSFCD – Human Spaceflight Capabilities Division (HEOMD)
- HLS – Human Landing System
- ISS – International Space Station (HEOMD)
- ITT – Integration Task Team
- LTV – Lunar Terrain Vehicle
- SCaN – Space Communications and Navigation (HEOMD)
- SE&I - Systems Engineering and Integration (HEOMD)
- SMD – Science Mission Directorate
- STMD – Space Technology Mission Directorate
- UCIG – Utilization Coordination Integration Group