OSIRIS-REx Project Planning and Control Process for Communication and Collaboration in Mission Development and Operations. H. L. Enos[1], D. S. Lauretta[1], [1]Lunar and Planetary Laboratory, University of Arizona (1415 N. 6th Ave, Tucson, AZ, Email:heather@orex.lpl.arizona.edu)

Introduction: NASA's Origins, Spectral Interpretation, Resource Identification, and Security–Regolith Explorer (OSIRIS-REx) spacecraft launched on September 8th, 2016. During its rendezvous with near-Earth asteroid (101955) Bennu beginning in 2018, OSIRIS-REx will characterize the asteroid's physical, mineralogical, and chemical properties at the global and regional scale, and the Principal Investigator (PI) will use this information to choose a sampling location. [1]

The distinctive requirements of a sample return mission, the integrated nature of the science payloads, the intrinsic science operations, the Earth-return phase, and the ground requirements for sample curation and analysis require a distinctive management approach and a combination of cost-estimating methods to ensure the highest level of confidence.

The Goal: The OSIRIS-REx project philosophy is to produce accurate and credible cost estimates that will ensure that we can maximize the scientific results while minimizing risk.

Approach: The OSIRIS-REx PI established a unique management approach (Figure 1) to reduce risk of scope and requirements creep and to increase visibility across all mission partners. Complex missions such as OSIRIS-REx include partners from multiple types of institutions (government, industry, academia, and foreign entities), which often have different cultures and competing goals.

To provide adequate insight and oversight, the PI appointed a Planning and Control Officer (PPCO), a first for a PI-led mission. This position played an integral role in the development of resource plans, oversight of mission resources, and risk management, and served as a liaison to the NASA GSFC Project Management Office and all other major partners. The PPCO provided a mechanism for aligning institutional cultures, procedures, and reporting processes.

Historically, mission teams have excluded their science and technical members from participating in the project-wide requirements development, technical readiness assessments, and detailed basis of estimate. The OSIRIS-REx management team, in contrast, takes an integrated approach. Creating a culture of transparency across all work breakdown structure (WBS) elements fosters trust and the ability to achieve buy-in from the team as a whole.

The OSIRIS-REx management team established Project Cost Guiding Principles that serve as the foundation for credible life-cycle cost estimates, including Phases E and F. The key principles established include:

a) Well-defined and stable requirements
b) A tightly coupled WBS
c) An integrated master schedule (IMS)
d) A transparent and open process

After establishing our guiding principles, we created a "toolbox" to facilitate consistent and high-fidelity inputs across all WBS elements and partners. The toolbox consisted of detailed guidelines and assumptions, clear and concise guidance for technical readiness assessments, basis of estimate templates, and a detailed IMS. Providing this toolbox allowed the team to communicate their assumptions and basis of estimates in an open-forum cost summit. This allowed us to identify overlap in costs and/or gaps that needed to be filled.

The OSIRIS-REx management philosophy encourages open communication among all team members. To foster this philosophy and ensure that it led to credible cost and schedule estimates, we created many forums to allow for clear and continuous communications. Communication in multiple settings subtantially increases the fidelity of estimates, promotes transparency, and creates ownership by the team as a whole. In gathering the basis of estimates and each subsequent update, we hold discussions with element leads and subject expert working groups, review heritage assumptions, and hold inclusive cost summits.

Using a multi-pronged approach increased the confidence, credibility, and accuracy of the OSIRIS-REx life-cycle cost estimate. In addition to performing comprehensive grass roots estimates—using an integrated process and close communication—we validated cost estimates against analogs and performed an independent cost estimate validation. The results demonstrated that our grass roots estimating process had produced an accurate, credible cost estimate.

The integrated and continuous OSIRIS-REx cost estimating and control methods have enabled us to stay within the PI-managed cost budget while meeting our requirements and reducing risk.

References: [1] Lauretta, D. S. et al.(2017) Space Science Reviews 212: 925

Acknowledgments: This material is based upon work supported by NASA under Contracts NNM10AA11C, NNG12FD66C, and NNG13FC02C issued through the New Frontiers Program.

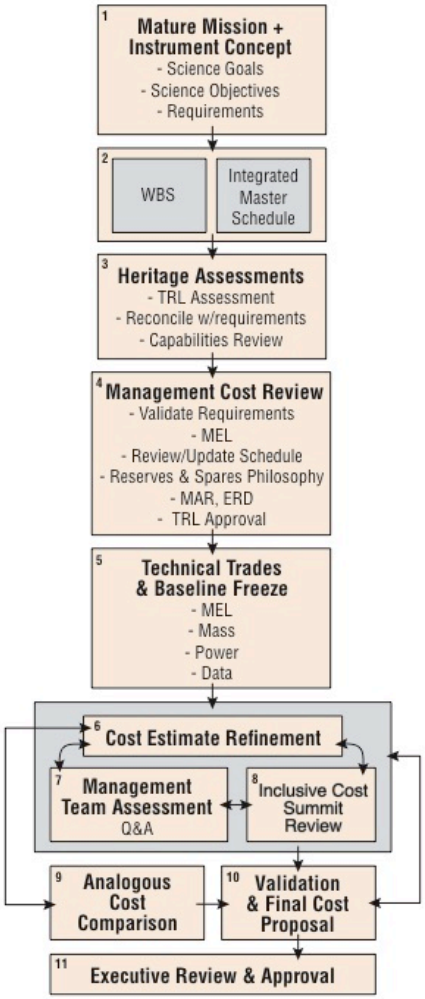

Figure 1. OSIRIS-REx project management approach.