Lunar Precursor Robotics Program

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LPRP Program Overview

LPRP Program Description

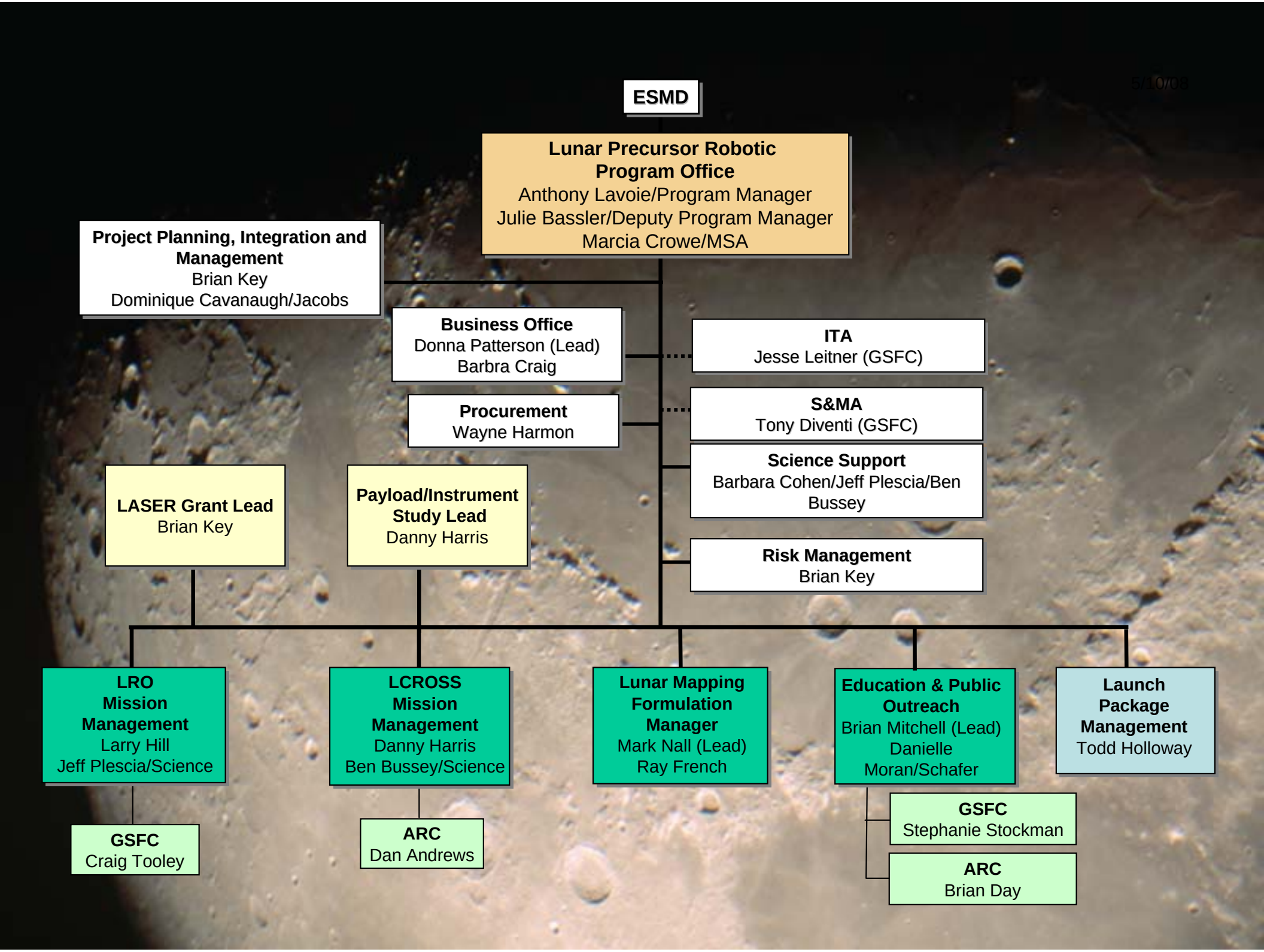
The goal of the LPRP is to undertake robotic lunar exploration missions that will return data to advance our knowledge of the lunar environment and allow United States (US) exploration architecture objectives to be accomplished earlier and with less cost through application of robotic systems. LPRP will also reduce risk to crew and maximize crew efficiency by accomplishing tasks through precursor robotic missions, and by providing assistance to human explorers on the Moon.

Objectives

Starting no later than 2008, initiate robotic missions to the Moon to prepare and support future human exploration activities.

Customer

ESMD Advanced Capabilities Division
Constellation Program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Dominique Cavanaugh/Jacobs
Business Office
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Risk Management
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Payload/Instrument Study Lead
Danny Harris
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Larry Hill
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Craig Tooley
LCROSS Mission Management
Danny Harris
Ben Bussey/Science
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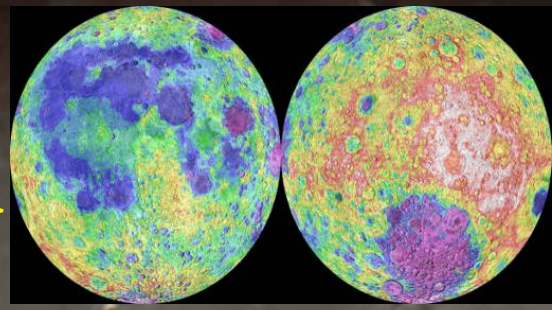
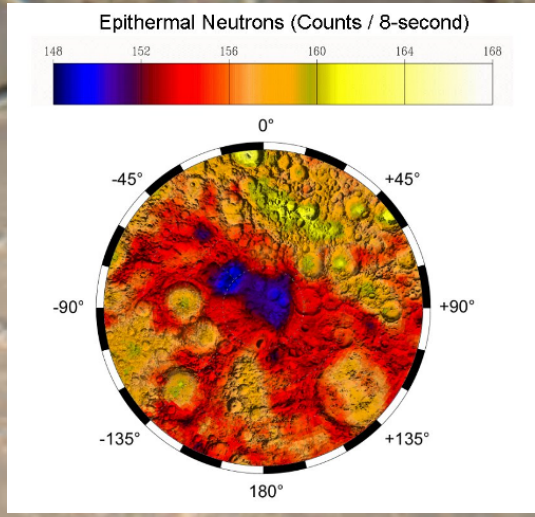
Dan Andrews
Lunar Mapping Formulation Manager
Mark Nall (Lead)
Ray French
Education & Public Outreach
Brian Mitchell (Lead)
Danielle Moran/Schafer
GSFC
Stephanie Stockman
ARC
Brian Day
Launch Package Management
Todd Holloway

LPRP Scope

LPRP Program has the following Objectives/Missions/Responsibilities:

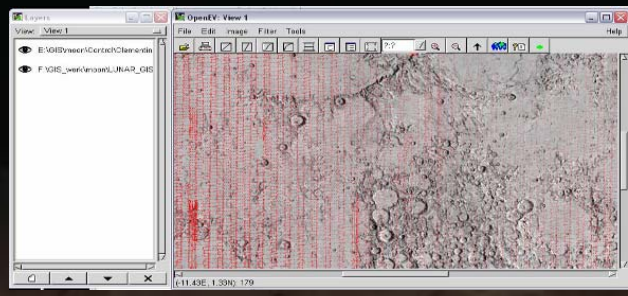


- Execute the LRO (GSFC Project) Mission {WBS 342556}
- Execute the LCROSS (Ames Project) Mission {WBS 342556}
- Execute the new Lunar Mapping (MSFC) Project {WBS 132438}
- Execute the Education & Public Outreach task {WBS 132438}
  - LRO component funded to GSFC
  - LCROSS component funded to Ames
  - Program component funded to MSFC



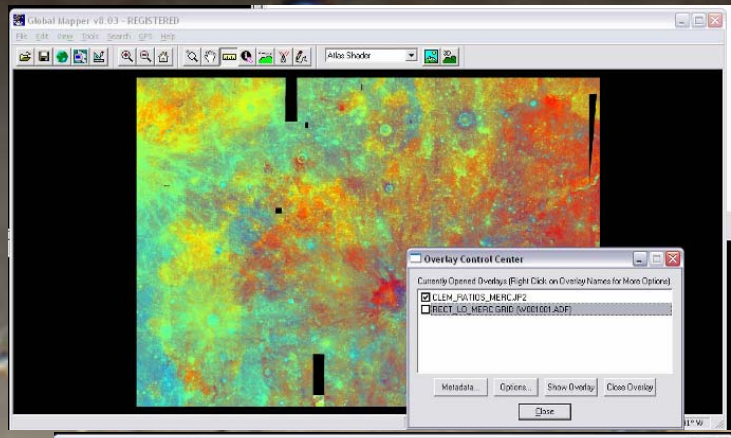
- NEW: Execute the selected LASER grants/contracts that benefit ESMD and Constellation {WBS 132438}
- NEW: Formulate, down-select, and build a payload(s) to fly for ESMD on a Mission Of Opportunity {WBS 132438 and potentially WBS 342556 residuals}

Lunar Mapping Project (New)



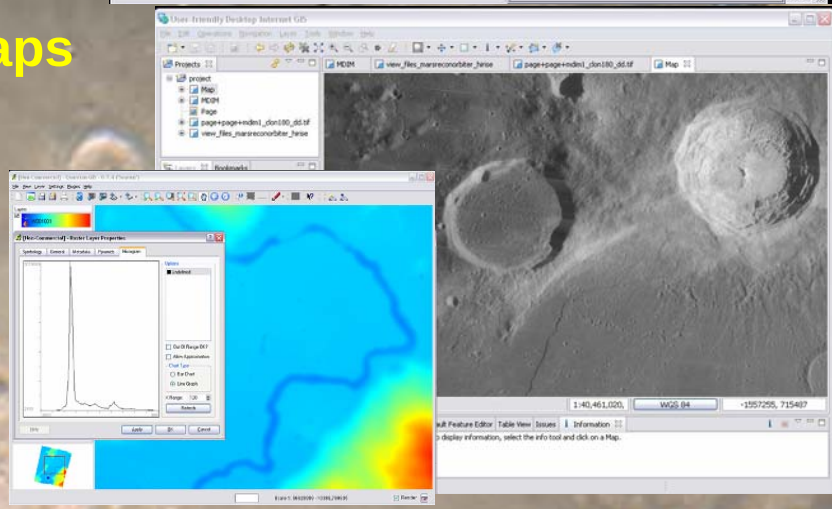
Lead Center: MSFC

Project Description: Produce various lunar maps, tools, models, and displays from LRO and other lunar International Missions to support the Constellation engineers responsible for developing the Lunar elements as part of the VSE



Objectives (tentative):

- Lunar lighting, temperature, maps
- Geo-registered global and local image maps
- Digital Elevation Models
- Rock abundance and surface roughness
- Resource Maps
- Geographical Information System



Formulation Manager: Mark Nall/MSFC

Organizations: ESMD/Constellation Modeling, SMD, Constellation Environments Group, GSFC, Ames, USGS, JPL, CRREL Constellation engineering, Constellation Program Science, EPO, MSFC, APL

LASER Grants

- **NASA/ESMD collaborated with SMD in 2007 to jointly support a LASER call for Research and Analysis**
  - **Call was tailored to define specific topics of interest to ESMD**
  - **SMD would fund selected Fundamental Research proposals**
  - **ESMD would fund selected Applied Science proposals**
  - **ESMD and SMD would jointly fund proposals that touched both**
- **After peer review, ESMD has selected a group of 15 proposals to fund**
  - **7 fully funded by ESMD**
  - **8 jointly funded by ESMD and SMD**
- **Certain topics are of specific interest to Constellation, and so the activities may be tailored to focus more narrowly on specific needs**
  - **Dust, potential and field modeling, and plume predictions for example**
  - **LPRP will periodically review progress with awardees**

LPRP Payload Study

- **NASA/ESMD has authorized LPRP to study the selection and development of a payload(s)**
  - Funding is available in the near term
  - HQ/ESMD will determine the Mission Of Opportunity which defines the payload to use
- **First iteration of study plan has been reviewed with HQ/ESMD**
  - Based upon needs list developed with HQ and others
  - Intent is to have wide review of possibilities
- **Anticipate the study lasting approx 2-3 months with downselect to develop and build a payload to fly on a Mission Of Opportunity**

LPRP Strategic Status

- **(Notional) Lunar Information List (not coordinated w/Constellation)**
  - **Dust characterization & mitigation**
  - **Landing site reconnaissance**
  - **Lunar model validation (tie to ground truth)**
  - **Local radiation measurement**
  - **Spacecraft charging evaluation**
  - **Regolith handling/site preparation**
  - **ISRU characterization and demonstration**
  - **Hydrogen form and location characterization**
  - **Lighting perspective (permanent low incidence at poles)**
  - **Technology Demonstration (next page)**

LPRP Strategic Status

- Technology demonstration
  - Communications (surface mobile comm)
  - Mechanisms (1/6G performance, dust impact on lifetime)
  - Materials (dust compatibility)
  - Thermal (surface influence, radiator dust exposure)
  - Navigation and guidance (Precision Landing)
  - Propulsion (system performance, plume interaction)
  - Mobility (traction, dust impact)
  - Power (Re-charging mobile robotic assets, fuel cell tech)
  - Avionics (Open architecture, Rad hard)
  - Cryo handling & storage (test demo)
  - ECLSS (water loop performance in 1/6g, dust filters)