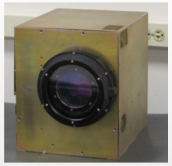
Prioritized Technology: Pinpoint Landing and Hazard Avoidance
Europa Lander

Capability Description

- Sensor suite to enable pinpoint landing on Europa and detect and avoid landing hazards.
  - Terrain-Relative Navigation (TRN) camera to determine map-relative position and velocity
  - Laser Imaging, Detection and Ranging (Lidar) sensor to map hazardous features below map resolution and provide altimetry
- TRN camera must determine position <50m and touchdown velocity <0.1 m/s with 1200 krad TID
- Lidar must generate 100m x 100m map with 5 cm ground sampling from 430m at 0.5 Hz with 1200 krad TID

Capability Status

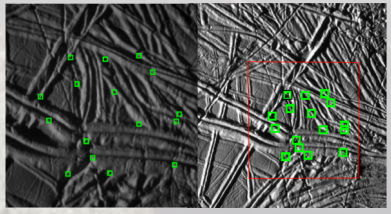
- TRN
  - Capability being implemented on Mars 2020 project
  - Evaluating suppliers for radiation hardened cameras
- Lidar
  - Design analyses and radiation tests (FY16 study contracts) provided existence proofs for lidar that can meet performance
  - Evaluating three Lidar suppliers for adapting commercial hardware to space
    - Also, developing 4th, alternate rad-hard detector option



Sigma Space
Mini-ATM

Mission Applications

- TRN can be used for any mission requiring pinpoint landing (ocean worlds, small bodies, etc)
  - For landing on bodies with atmospheres, need to evaluate atmospheric and dust effects (e.g. Venus)
- Lidar can be used for any landing on body with changing small-scale topography (e.g. icy or tectonic bodies) or for which high-resolution surface imaging not available (e.g. Enceladus)



Simulated Europa
Descent Image and Map

Development Cost and Schedule