National Aeronautics and Space Administration

SPLICE

Safe and Precise Landing – Integrated Capabilities Evolution

The SPLICE project is developing, maturing, demonstrating, and infusing precision landing and hazard avoidance (PL&HA) technologies for NASA and potential commercial spaceflight missions. Near-term development includes high precision and accuracy velocimetry with ranging (via the NDL), high-resolution real-time mapping and hazard detection with ranging (via the HDL), lunar terrain relative navigation (TRN), and the requisite high performance computing capability. These technologies are initially intended to provide PL&HA for the moon, but are extensible to any planetary body. Long-term, the goal is to make these capabilities available to government and commercial entities and to license technology to commercial entities for production.

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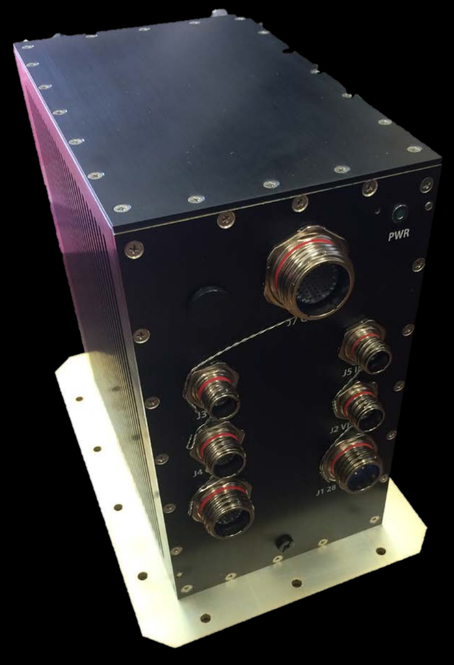
Descent and Landing Computer (DLC)

Compute element employing a surrogate High Performance Space Computing SoC. Current maturity is a path-to-spaceflight engineering development unit (EDU).

Performance
- Quad core A53, FPGA
- 4GB RAM
- 960GB storage

Chassis
- 22x25x17cm, 6kg
- 28VDC, 60W peak



Navigation Doppler LiDAR (NDL)

Highly accurate velocimetry and ranging spaceflight-capable engineering test unit (ETU) with manifested lunar flight in 2021.

Performance
- 4km+ range
- 0.2 cm/s accuracy
- 25 cm range accuracy

Chassis
- 25x18x32cm, 11kg
- 28VDC, 80W peak

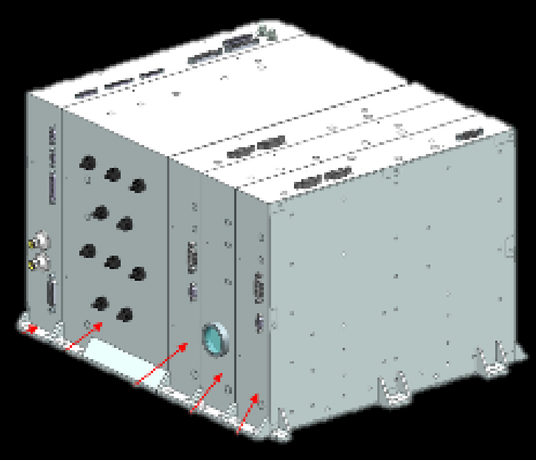
Optical head (3x telescopes)
- 15cmx7cm diameter, 2.5kg, power supplied by chassis

Hazard Detection LiDAR (HDL)

High speed sensor capable of generating a detailed 3-D map of the landing area in real time. Currently a terrestrial prototype with EDU airborne demo planned in 2020.

Performance
- 4Mpixel Digital Elevation Map (DEM)
- 2sec DEM generation
- 5cm ground sample distance at 500m range across 100m diameter
- Altimeter: 10cm range accuracy at 10km

Chassis
- 25x25x25cm, 10kg
- 28VDC, 280W peak



Optical head
- 17cmx14cm diameter, 4kg, power supplied by chassis

Algorithms

SPLICE is developing a variety of algorithms by blending new advances with state of the art GN&C capabilities

- Anonymous feature tracking and other TRN approaches
- Hazard relative navigation
- Dual-quaternion guidance