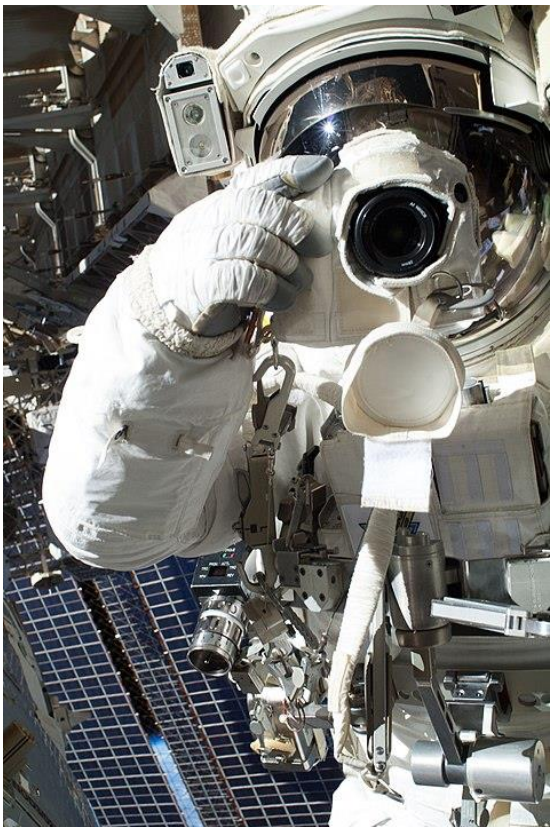
Situational Awareness Vision



Name of Technology:
Imaging Sensors for Situational Awareness

Participating NASA Centers:
JPL (Lead); GSFC, LaRC,

Technological Area:
X1.03 Sensing and Imaging

Vision for the Technology:
New exploratory crews require smart cameras for situational awareness including robotic vision that can provide high-definition imagery. The cameras will need sufficient onboard data compression to minimize bandwidth constraints. Due to long duration missions, the cameras must have sufficient radiation tolerance and reliability.

Challenges:
Commercial off-the-shelf (COTS) sensors are currently being used but have unknown radiation tolerance. Industry development is currently targeting UHD cameras that can support the expected radiation environments, but it is not clear that these developments will fully provide the needed embedded compression capabilities.

Not having adequate imaging sensor will limit situational awareness for the crew with limited frame rate and bandwidth.

NASA Seeks to Meet the Following Specs:
Key performance parameters include:

- Resolution: 2160p UHD
- Frame rate: 60 fps
- Compression: H.265
- Size: 25cm x 25cm x 15cm
- Mass: 1.5 kg
- Power: 10W
- TID radiation tolerance: 100krad(SiO2)
- Destructive Single Event Effects (SEE) immunity:
  - ≥37 MeV-cm2/mg (threshold)
  - ≥60 MeV-cm2/mg (goal)
- Lifetime: 15 years

Overview of Student Project:
NASA seeks innovative image sensor technology solutions for situational awareness on long duration missions. Solutions may include new technologies as well as improving current with radiation protection.

Innovative Areas Student Projects Can Address:

A. New image sensor

B. Improving current technologies to tolerate radiation for long duration missions

Project Phases

I. Analytical critical function and/or characteristics of sensor

II. Component and/or breadboard validation in a laboratory environment.

Research Funded by NASA on this Topic:

Proposal Number: 14-2 A2.01-9452
A Compact, Wide Area Surveillance 3D Imaging LIDAR Providing UAS Sense and Avoid Capabilities

Proposal Number: 11-1 S5.01-8899
Three Dimensional Situational Awareness Sensor to Assist Descent and Landing of the Mars Lander Spacecraft

Proposal Number: 4-1 S20.02-9702
Wide-Field, Deep UV Raman Hyperspectral Imager

References:

X1.03Sensing and Imaging

S1.03Martian Entry, Descent and Landing Sensors

O3.05Advanced Motion Imaging

S1.06In Situ Sensors and Sensor Systems for Lunar and Planetary Science

O2.01Optical Tracking and Image Analysis