

**Small Satellite Reliability Initiative (SSRI)**  
***A Public-Private Effort Addressing SmallSat Mission Confidence***

Technical Interchange Meeting-4  
7-8 November 2018, Laboratory for Atmospheric and Space Physics (LASP), Boulder, CO

**Context**

Historically, CubeSat/SmallSat components and sub-systems have not generally been appropriate for missions where significant or indeterminate risk of failure are unacceptable. Although improving, this has precluded their use where their attributes could otherwise enable or enhance mission objectives or provide other meaningful benefits—e.g., lower cost, increased coverage (spatial, temporal, spectral), agility, resiliency, etc. Previously, this has not been an issue since it was understood and accepted that "high risk" and "CubeSat" were largely synonymous; expectations were set accordingly. However, as the field matures we anticipate CubeSats or SmallSats—small satellites that deviate from CubeSat form factors but incorporate CubeSat components and subsystems—will be used for Earth-observing missions requiring 1-3 years of reliable operation, and even longer for Planetary, Heliophysics, and Astrophysics missions. This growing potential utility is driving an interagency effort to improve and quantify CubeSat, and more generally, small satellite mission confidence.

The Small Satellite Reliability Initiative has been targeting this challenge. The collaborative team comprised of persons from the public and private sectors has made significant progress towards defining and documenting the full range of best practices and design/development guidelines—from those aligned with "do no harm" missions, to those whose failure would result in loss or delay of key national objectives. The recommendations target a range of SmallSat communities—from system developers to mission architects and persons acquiring SmallSat-based systems and missions and is intently focused on maintaining to the extent practical, cost efficiencies associated with small satellite missions.

**TIM-4 Objective**

TIM discussions will be highly-interactive and build on SSRI working group recommendations. The objective is to mature responses to the following questions-

- Status, and Next Steps- What is the status of SSRI activities and how do we achieve the end objective?
- Lessons Learned- What should we learn from SmallSat missions that have flown and from missions in development to inform the success of future missions? What lessons can we learn from analogs such as the automotive industry?
- Best Practices and Design/Development Guidelines- What is the status of, and what is TIM-4 attendee feedback on the sub-team effort to define design/development guidance and best practices consistent with confidence levels ranging from "do no harm" missions to those whose failure would result in loss or delay of key national objectives?
- What type of software-based framework can allow a range of users to most efficiently and effectively benefit from knowledge captured by this initiative? What are plans for developing it?
- What activities related to SmallSat mission success are being executed by the NASA Electronic Parts and Packaging Program (NEPP)?
- Knowledge Sharing- The pace of SmallSat mission capabilities advancement will be informed by how broadly the community shares knowledge. What is the status of knowledge sharing activities? What information and resources should the SmallSat community exchange to increase mission success and reduce overall development costs? And importantly, what systems and processes can we establish to facilitate knowledge sharing among organizations that may compete against each other?

## TIM-4 AGENDA

SSRI TIM-4 is intended to be a forum where we make progress towards objectives through exchanges of thoughts and experiences. To this end, free and open discussions during and after presentations are a key and essential component of the meeting.

### DAY 1

- **Welcome- Neil White- LASP** [9:00 AM]
- **TIM-4 Objectives, Day 1 and Day 2 Plans, SSRI Status and Next Steps**
  - Michael Johnson/ NASA Goddard Space Flight Center
- **Lessons Learned from SmallSat Missions (30-minute presentations/discussions)- *What should we learn from SmallSat missions that have flown and from missions in development to inform the success of future missions?***
  - John Baker-JPL: MarCO (Mars Cube One) [9:15 – 9:45]
  - Kyle Kemble- AFRL/RVEP: SHARC (Satellite for High Accuracy Radar Calibration) [9:45-10:15]
  - Steve Diamond- Airbus-OneWeb [10:11 -10:45]
  - Will Mast- Goddard Space Flight Center/WFF: IceCube [10:45-11:15]
  - Ken Hyatt- Adcole Maryland Aerospace: Kestrel Eye (KE-IIM) [11:15 – 11:45]
- **Working Lunch- Lessons Learned from SmallSat Missions, cont.**
  - Patrick Phelan- Southwest Research Institute: CYGNSS (Cyclone Global Navigation Satellite System) [12:15-12:45]
  - Amanda Donner-JPL- ASTERIA (Arcsecond Space Telescope Enabling Research in Astrophysics) [12:45 – 1:15]

### Afternoon Session

- **SSRI Best Practices/ Design Development Guidelines Working Group- Status and Plans Presentations and Discussions (5 sections)- *What is the status of, and what is TIM-4 attendee feedback on the sub-team effort to define design/development guidance and best practices consistent with confidence levels ranging from “do no harm” missions to those whose failure would result in loss or delay of key national objectives?***
  - Working Group Section Leads [1:30 – 2:45]
- **Best Practices/ Design Development Guidelines Software Framework- *What type of software-based framework can allow a range of users to most efficiently and effectively benefit from knowledge captured by this initiative? What are plans for developing it?***
  - Harald Schone- JPL [2:45 – 4:45]
- **Open Discussion** [4:45 – 5:15]
- **Day 1 Debrief, Day 2 Plans** [5:15 – 5:30]
- **Adjourn** [5:30]

**7:00- Group Dinner**

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**DAY 2**

- **Day 1 Debrief, Day 2 Plans, Open Discussion** [9-9:15]
- **Other Efforts Relevant to SmallSat Mission Confidence (30-minute presentations, 15-minute discussions)-** *What activities related to SmallSat mission success are being executed by the NASA Electronic Parts and Packaging and the NASA Academy of Aerospace Quality and the NASA Academy of Aerospace Quality? Can we leverage each other's activities?*
  - Michael Campola- Goddard Space Flight Center: NASA Electronic Parts and Packaging (NEPP) [9:15-10:00]
  - Jeanette Plante- NASA HQ: NASA Academy of Aerospace Quality [10:00 – 10:45]

**Break [10:45 – 11:00]**

- **Knowledge Sharing-** *What is the status of knowledge sharing activities? What information and resources should the SmallSat community exchange to increase mission success and reduce overall development costs? And importantly, what systems and processes can we establish to facilitate knowledge sharing among organizations that may compete against each other?* [11:00 -11:30]
  - Craig Burkhard- NASA Ames Research Center
  - Allyson Yarbrough, Craig Langford- The Aerospace Corp: Alternative Parts Database

**LASP Tour, Lunch [11:30 – 1:00]**

- **Knowledge Sharing, cont.** [1:00 – 2:00]
- **Open Discussion, TIM-5 Plans** [2:00 – 3:00]
- **Adjourn (3:00 PM)**

***The organizers convey special thanks to Neil White and his colleagues at LASP for hosting TIM-4. Everyone, thank you for making it a productive event.***

***Safe travels.***