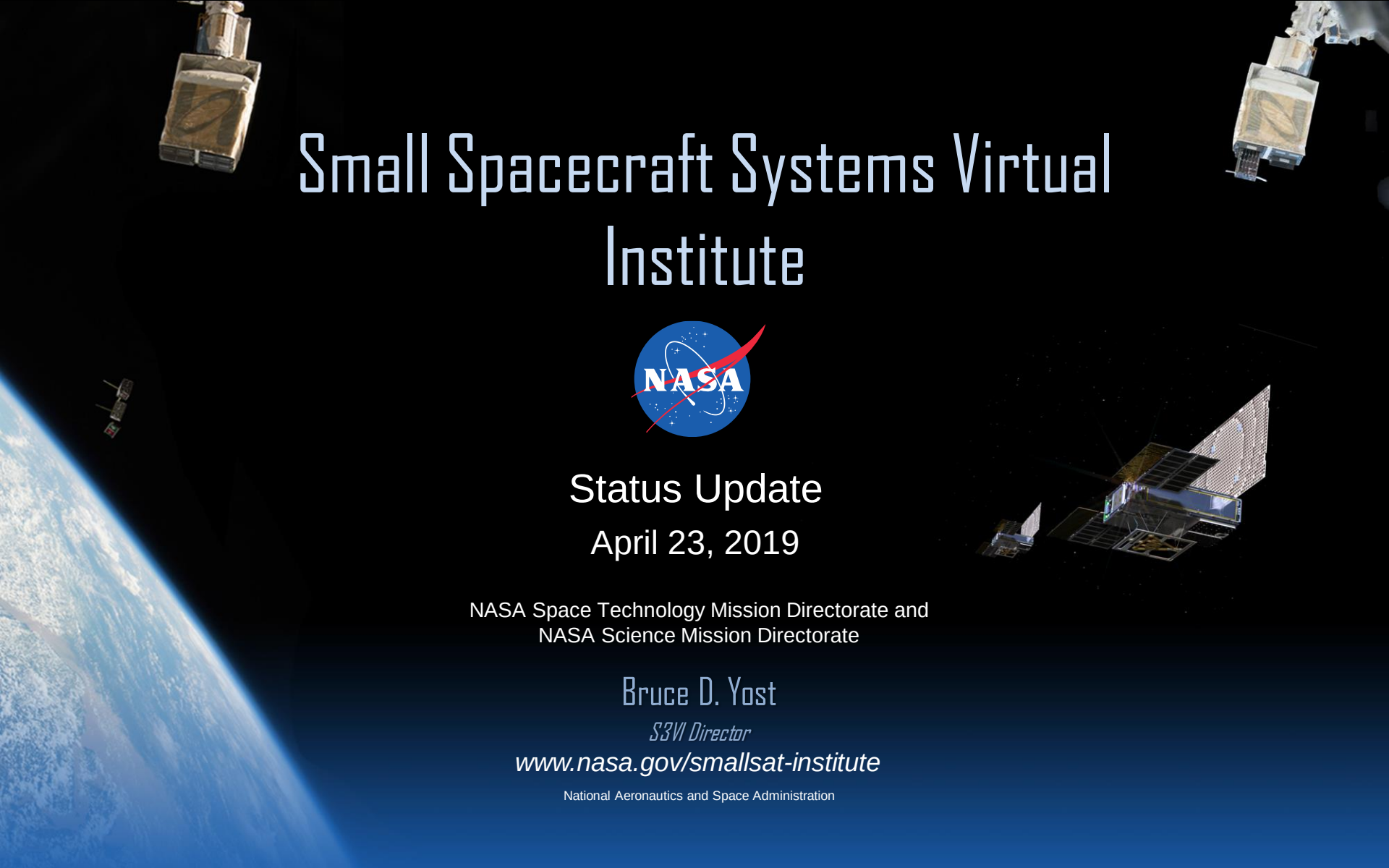
Small Spacecraft Systems Virtual Institute



Status Update

April 23, 2019

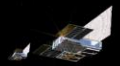
NASA Space Technology Mission Directorate and
NASA Science Mission Directorate

Bruce D. Yost

S3VI Director

www.nasa.gov/smallsat-institute

National Aeronautics and Space Administration



S3VI Mission Statement

- Advance clear communications, coordination, and consistent guidance regarding small spacecraft activities across NASA.
- Provide the US smallsat research community with access to mission enabling information.
- Maintain engagement with small spacecraft stakeholders in industry and academia. Support the overall small spacecraft community.

S3VI is a NASA-wide institute managed at NASA Ames Research Center, with participation from LaRC, GSFC, JPL, MSFC, and GRC.

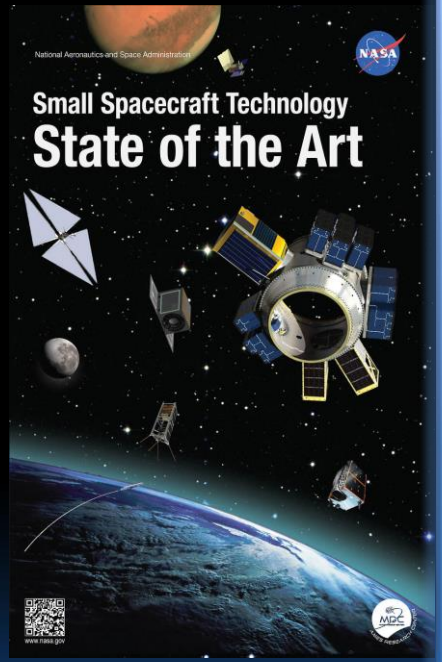
S3VI is jointly sponsored by NASA's Space Technology Mission Directorate (STMD) and the Science Mission Directorate (SMD).

2018 Major Accomplishments

Accomplishments	Status
Small Spacecraft State of the Art Report 2018	Released December 2018 https://sst-soa.arc.nasa.gov
Small Spacecraft Community of Practice	Webinar Series Initiated https://www.nasa.gov/smallsat-institute/small-spacecraft-community-of-practice/
Web Portal	Expanded to accommodate new content https://www.nasa.gov/smallsat-institute
Federated Database Set	Expanded to include NEPP, Aerospace, https://s3vi.ndc.nasa.gov

State of the Art

Select 2018 state of the art technologies targeted for small spacecraft



Subsystem	Technology	Product	FOM*	TRL*	Comments
Comms	Deep Space Transponder	IRIS V2.1	X Band Frequency 62.5 PM/PSK/NRZ	9	First version (V2) flew on MarCO, launched May, 2018; last transmission January, 2019.
Electric Propulsion Systems	Ion Engine	BIT-3 and IFM Nano Thruster	Thrust: 10 µN - 200 mN Isp: 1,000 - 6,000 s	Xenon7, Iodine 5, Indium 7	In July, 2017 Busek BIT-3 completed two critical design reviews for upcoming small spacecraft missions IceCube and LunaH-Map, which are scheduled to be launched in 2020. (IFM) Nano Thruster from Enpulsion fits a 1U volume, producing 220 mN of thrust with 4,000 s Isp. It has flown on a 3U nanosatellite. deployed January, 2018.
	Hall Effect Thruster	BHT-200 and HT100	Thrust: 5 - 15mN Isp: <1,350 - 1,390 s	Xenon 6-8, Iodine 4	The BHT-200 is suitable for high mass and power small spacecraft. Flight heritage on >150 kg spacecraft. The HT100 has been selected for an in-orbit validation program by the European and Italian space agencies where it will be tested to both maintain the orbit and accelerated reentry.
	Electrospray	I mN and 100 µN Busek thruster	Thrust: 0.7 mN Isp: 800 s	7	The 1mN system uses 15 W of power and provides 675 N-s with 50 mL of propellant and has a mass of 1.15 kg. The 100 µN can deliver 85 ms-1 to a 4 kg CubeSat with a wet mass of 0.320 kg, using 10 mL of an ionic liquid propellant that has been fully characterized during the ST-7 flight program.
GNC	Reaction Wheels	BCT RWA	Up to 1 Nm-s momentum storage	9	BCT Zero momentum RWA = 100 mNm-s and 15 mNm-s (x3) BCT wheels to be used on NEA Scout

Current Small Spacecraft Technology State of the Art Report is available at https://sst-soa.arc.nasa.gov

Small Spacecraft Community of Practice
Co-Sponsor with NEN

NEN NASA ENGINEERING NETWORK

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SMALL SPACECRAFT

The Small Spacecraft CoP will provide information resources, access to peer expertise, and opportunities for knowledge sharing and collaboration in sound management, engineering, manufacturing, and verification practices for development of small spacecraft projects including but not limited to, scientific research, aerospace research, and technology development for space activities as outlined in NPR 7120.8, "NASA Research and Technology Program and Project Management Requirements." The CoP will serve as a forum for representatives from Flight Projects, Engineering, Safety and Mission Assurance, Science, Space Technology, and Human Exploration and Operations to share challenges, approaches, and lessons learned for development of small spacecraft projects, including the implementation of safety, mission assurance, design, and test guidelines such as those in Appendix C of NPR 8705.4, Risk Classification for NASA Payloads.

Join and Subscribe

Bruce Yost
Leads

Sarah Mccrea
Facilitator

explore

National Aeronautics and Space Administration

2019 Webinars

- **Wednesday, May 15, 2019,** 10:00AM-11:00AM Pacific Daylight Time
  Computing Space Mission Geometry Using NASA's SPICE System
  Speaker: Charles Acton, *Jet Propulsion Laboratory, California Institute of Technology*

- **Wednesday, July 17, 2019,** 10:00AM-11:00AM Pacific Daylight Time
  Software: The Overlooked Glue that Holds CubeSats Together
  Speaker: John Bellardo, *California Polytechnic State University (Cal Poly)*

- **Wednesday, September 11, 2019,** 10:00AM-11:00AM Pacific Daylight Time
  Small Satellites Demand Innovation in Reliability
  Speaker: Harald Schone, *Jet Propulsion Laboratory, California Institute of Technology*

Archived 2019 Webinars

- **Wednesday, March 13, 2019,** *Available Online*
  Small Satellite Industrial Base Study: An Overview and Interim Update
  Speaker: Allyson Yarbrough, *The Aerospace Corporation*

https://www.nasa.gov/smallsat-institute/small-spacecraft-community-of-practice

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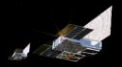
Common Search for Federated Database Set

ABOUT

Search small satellite parts...

- [x] ALL
- [x] SPOON
- [x] TECHPORT
- [x] NEPP Radiation Parts
- [x] NEPP Radiation Publications
- [x] EEE Parts

NASA's Small Spacecraft Systems Virtual Institute (S3VI) uses web technologies, databases, and virtual collaboration tools to collect, organize, and disseminate small spacecraft knowledge for the benefit of NASA and the community. S3VI has established this federated search capability that serves as an entry point to the SmallSat Parts On Orbit Now (SPOON) database and other NASA-internal and external databases to allow the public to search multiple databases for small spacecraft parts and technologies. Currently, S3VI's federated databases consist of: the NASA Technology Portfolio System (TechPort), NASA Electronic Parts and Packaging (NEPP) database and the Automotive Grade Parts database.



Plans for 2019-2020

National Aeronautics and Space Administration

Activity / Product	Status / Detail
Small Spacecraft State of the Art 2019	Redefining survey/review process
Community of Practice Virtual Webinar Series	Scheduling speakers for late 2019, early 2020
S3VI Web Portal	Newsletter, Journal and Invited Paper Sections
Federated Database Set / Common Search	Continued Expansion in 2019: ESA Parts, SBIR/STTR, Launch Portal, Missions Database
Studies, Workshops, Working Groups	Small Spacecraft Reliability Initiative Science Mission Directorate Workshops Small Spacecraft Trending Studies