General Program Briefing

Revised March 22, 2019

National Center for Earth and Space Science Education
and the Arthur C. Clarke Institute for Space Education

Inspire...then Educate
Summary: What is the Student Spaceflight Experiments Program

Breaking new ground in commercial space, SSEP is the first pre-college STEM education program that is both – a U.S. national initiative and implemented as an on-orbit commercial space venture. SSEP immerses hundreds of students across a community in an authentic research proposal competition as part of the real Space Program.

In each community-

- one student team designed experiment is selected to fly to ISS to be conducted by the astronauts

- a Local Team of educators delivers a microgravity curriculum to typically 300+ students (Grade 5-12)

- over 9 weeks, teams of 3-5 students each design a microgravity experiment and write a formal research proposal vying for the flight slot

- a formal proposal review culminates with a National Review Board selecting the community's flight experiment

Student Researchers from Southside High School, San Antonio, TX.
The **Student Spaceflight Experiments Program (SSEP)** is a program of the National Center for Earth and Space Science Education in the U.S., and the Arthur C. Clarke Institute for Space Education internationally. It is enabled through a strategic partnership with DreamUp, PBC and NanoRacks, LLC working with NASA under a Space Act Agreement as part of the utilization of the International Space Station as a National Laboratory.
Deep Investment in Partnership

National Partners – USA
Smithsonian National Air and Space Museum
Center for the Advancement of Science in Space (CASIS), and
Subaru of America, Inc.

National Partners - Canada
Magellan Aerospace

Local Partners
Over 1000 Local Partners to date, including: school districts, private schools, 28 NASA Space Grant colleges and universities, businesses, foundations, private philanthropists, and local research institutions providing science advisors

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Created to Address U.S. Strategic Need, **SSEP** is:

- a high caliber STEM education program for grades 5-16 tuned to Next Generation Science Standards (NGSS);
- designed to be a national model for inspiring and engaging the next generation of scientists and engineers, and to address science literacy.

Students from Stockton University, Galloway, NJ set up a preliminary experiment with flax seeds in a FME.

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The Basics

• SSEP was launched in June 2010 by NCESSE in partnership with NanoRacks, LLC. It is now just 8 years old.

• A U.S. national Science, Technology, Engineering, and Mathematics (STEM) education initiative that gives typically 300+ students across a community the ability to design and propose real microgravity experiments to fly in low Earth orbit, first aboard the Space Shuttle and now aboard the ISS.

• SSEP immerses and engages students and their teachers in real science—on the high frontier—so that students, as early as 5th grade, are given the chance to be researchers—and experience science firsthand.

Student Researchers from Dillard Elementary School, Elk Grove, CA analyzing the first in a series of trials testing the hatch rate and growth of fairy shrimp.
Since inception in June 2010, there have been 16 SSEP flight opportunities: SSEP on STS-134 and STS-135 — the final flights of Space Shuttles Endeavour and Atlantis; and SSEP Missions 1 through 14 to the ISS. SSEP Mission 14 was announced in early Spring 2019, with program operations in participating communities beginning September 3, 2019.
Community Network: Data Available through the first 15 Flight Opportunities (does not include Mission 14 to the ISS)
Track Record: Data Available through the first 15 Flight Opportunities (does not include Mission 14 to the ISS)

- 178 communities have participated from 41 states, the District of Columbia, 4 Provinces in Canada, and a community in Brazil.
- 271 community programs undertaken; 52 communities have participated in at least 2 and as many as 9 flight opportunities, reflecting the sustainable nature of the program.
- 1,100+ Local Partners

5th grade students from Setters Way Elementary in Fort Bend, TX work on a trial version of their project, “Growing Solanum Tuberosum in microgravity.”

Students from Winfield Middle School, Winfield City, AL removing kudzu seeds from seed pods and scarifying them.
Track Record continued: Data Available through the first 15 Flight Opportunities (does not include Mission 14 to the ISS)

- **109,950** grade 5-16 students across **2,190** schools fully immersed in microgravity experiment design and proposal writing;
- **Over 22,400** flight experiment proposals received from student teams;
- **240** experiments flown through Mission 12:
  
  STS-134  
  STS-135  
  M1: SpaceX-D1  
  M2: Space X-1  
  M3a: Orb-D1  
  M3b/M4: Orb-1  
  M5: Orb-2  
  M6: Orb-3 (lost), SpaceX-5 (re-flight)  
  M7: SpaceX-7 (lost), SpaceX-8 (re-flight)  
  M8: SpaceX-9  
  M9: SpaceX-10  
  M10: SpaceX-11  
  M11: SpaceX-12  
  M12: SpaceX-15  
  **M13: SpaceX-18, 41 more experiments expected to launch Summer 2019**

- **8 SSEP National Conferences at the Smithsonian National Air and Space Museum**
Flight Hardware: Fluid Mixing Enclosure (FME) Mini-Lab

Student flight experiment teams receive real flight certified hardware fabricated by NanoRacks. Students assemble, fill, seal, and ship the FME Mini-lab to NanoRacks in Houston in preparation for launch.

Above: loaded and assembled Type 3 FME Mini-lab
Right: graphic labeling components of a Type 3 FME Mini-lab

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Fluid Mixing Enclosure (FME) Mini-Lab: Heat Sealed Containment

- Each SSEP experiment must pass NASA Flight Safety Review to ensure samples pose no risk to the astronaut crew, ferry vehicles, or ISS.
- More levels of containment = less restrictions on samples.
- The current FME Mini-lab has 3 containment levels: the main silicone tube together with two polyethylene bags heat sealed around the tube.
Mission Highlight:
SSEP Mission 12 to ISS

Launch Date:
June 29, 2018 at 5:42 am EDT, SpaceX-15

Return to Earth:
August 3, 2018, SpaceX-15

Payload Designation:
SSEP14 –Mercury
Named for NASA’s Project Mercury

Number of Student Flight Experiments: 34
One for each of the 31 M12 communities and a second for 3 of the 31 communities

Student Researchers from both Winnipeg, Manitoba, Canada flight experiment teams for SSEP Mission 12.
Mission 12 to the ISS: Scope

- **Number of Participating Communities:** 31, with 3 communities flying 2 mini-labs
- **Total Number of Students Fully Engaged in Experiment Design:** 12,150 from grades 5-16
- **Number of Student Team Proposals Submitted:** 2,498
- **Total Number of Proposals Submitted for Step 2 Review:** 98
- **Number of Students Engaged in Mission Patch Art and Design Competition:** 24,831
- **Total Number of Mission Patches Submitted:** 22,320
- **Total Number of Mission Patches Selected to Fly:** 55

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Mission 12 to the ISS: **Communities and Experiment Summary**

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<td>Nanao, British Columbia</td>
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<td>Williamsburg</td>
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<td>Following carrots on the International Space Station in Microgravity</td>
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<td>University of Maryland</td>
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<td>WNY STEM - Buffalo/Niagara</td>
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<td>Unrins Size and Distribution Analysis of Gallium in Microgravity</td>
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Mission 12 to the ISS: Launch Experience

M12 Student Researchers conduct poster presentations for the visitorship at the Kennedy Space Center Visitor’s Complex the day before launch of their SSEP experiments.

SSEP Student Researchers, their families, teachers, and other community delegates watch live from the Smithsonian National Air and Space Museum, the launch of SpaceX-15 carrying the SSEP Mission 12 experiments payload.
Group photos of SSEP Student Researchers that attended and presented at the 2018 SSEP National Conference.
All those that work on the frontiers of human exploration were children once that dared to dream.