Students work in roles outside their area of expertise, requiring them to critically think and problem-solve. They are often led by seasoned engineers and NASA Headquarters executives, who feed back the strengths and weaknesses of their proposal and mission design.

### Project Goals

**Indicators of the long-term success of PSSS**

- PSSS experience has a positive influence on career choice and on career progress
- PSSS feeds the employment pipeline for NASA, aerospace, and related academia
- PSSS alumni demonstrate leadership potential, ability, and/or experience in fields related to planetary science exploration

### 2016 PSSS Session Feedback: Value to Participants’ Careers

“Utterly invaluable pairing of intense mission design development with Team X interactions that allow greater exploration of the engineering, science, and related space than we would have been able to do on our own.”

“This experience has provided substantial insight and context for my available career options.”

“...it’s been a fantastic experience for it’s educational aspect but also my career as I am now in a better position to contribute towards future mission proposals.”

### Employment (1999-2016 Cohorts)

- 555 of 599 alumni located through online presence
- PSSS clearly feeds the employment pipeline for NASA, aerospace, and related academia

### Leadership potential and experience

- Alumni hold science and engineering leadership roles on NASA missions, science teams, and research grants
- Prize recipients of awards: Urey Prize (DPS), Macelwane Medal (AGU), Napoli Award (AIP), Biggs Award (OSA)

### Mars Robotic Spacecraft Mission Teams

- 19 alumni in science team roles in currently active Mars exploration missions (Mars Odyssey, MAVEN, MER, MRO, MSL) + Mars 2020
- 12 female, 7 male
- 13 cohorts from 1999 through 2015
- Roles include: Deputy Project Scientist, Instrument PI, Deputy Instrument PI, Instrument Co-I, Science Team Member, Science Definition Team member, Collaborator

### Diversity of Participants

Diversity (% of total) of PhDs Earned at Accredited US Institutions, Compared to Participation in PSSS

- PSSS tracks and, most recently, exceeds male/female gender balance (2016 attendance was 72% female):
  - (1) PhDs earned in related fields (Source: 2000-2015 NSF Survey of Doctoral Degrees Earned)

- PSSS attendance (1999-2016) generally tracks PhDs earned in relevant fields for largest underserved/underrepresented minority groups (Source: 2000-2015 NSF Survey of Doctoral Degrees Earned)

### Participants

- 15-18 slots available per session
- Strong interest and experience in careers in planetary science/planetary exploration
- Science and engineering PhD candidates or postdocs, or last year engineering MS students
- Typical student areas of study/disciplines: planetary science, geoscience, geophysics, environmental science, aerospace engineering, mechanical engineering, materials science
- Participants have come from over 50 different universities
- Selected through competitive review process, based on strength of application and advisor’s recommendation letter

### Planetary Science Summer Seminar (PSSS) Experience

- For 10 weeks prior to JPL session, students select the mission and science goals, and develop a preliminary suite of instrumentation and a science traceability matrix.
- Once at JPL, students participate in a series of Team X project design sessions, during which their mentors aid them in finalizing their mission design and instrument suite, and in making the necessary trade-offs to stay within the cost cap.
- At week’s end, students present their Concept Study to a “proposal review board” of JPL scientists and engineers and NASA Headquarters executives, who feed back the strengths and weaknesses of their proposal and mission design.

### PSSS as Design Thinking and Authentic Learning Experience

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<th>Design Thinking</th>
<th>Authentic Learning</th>
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| Starts from abstract specifications. | Students develop an instrument concept from a general science requirement.
| Provides the opportunity to experiment, create, and prototype models, and gather feedback and conclusions. | The process is iterative, exploratory, and sometimes chaotic. Problems may change in reaction to unexpected problems. Follows cycles of mutual adjustment between ideas and solutions until a final solution is attained. |
| The process is iterative, exploratory, and sometimes chaotic. Problems may change in reaction to unexpected problems. Follows cycles of mutual adjustment between ideas and solutions until a final solution is attained. | Students share their science and engineering roles, which requires teamwork to come to broad and complementary understandings. Each design is a product of the combined, yet distinct, roles.
| “...I love the process, the major change of the mission concept during the week at JPL.” | “...the most important part of the experience was the change during the week.” |