The SpaceTREx Story: Ten Years of Research and Development Advancing the Small Spacecraft Paradigm

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The Space and Terrestrial Robotic Exploration (SpaceTREx) Laboratory started in the state of Arizona back in 2013. The laboratory was founded to utilize engineering-science principles in conceptualizing, designing and developing ground-breaking small spacecraft missions and technologies. The lab as part of its core mission has been training the next generation of aerospace engineers and scientists for Arizona. The laboratory has counted on government agencies and labs as its major sponsors. The lab has witnessed solid growth year after year mirroring the rise of small space and Newspace industries producing more than 270 technical publications and presentations, 10 provisional and full patents and wining over $17 million in research and development contracts. Steady growth also brought challenges including administrative pressures to be on specific space missions that would stretch lab resources beyond technical feasibility, to administering laboratory space to meet specialized needs of a space program.

Ultimately, the laboratory shed administrative pressures and had followed an independent path striving to meet sponsor expectations, with honesty, excellence and long-term vision towards advancing transformative and disruptive potential of small spacecraft. A second major challenge has been dealing with the TRL Valley of Death and the lack of paths to success for many potential/revolutionary space technologies. SpaceTREx has pursued pathways to infuse technologies it has developed through collaboration with government agencies and private industry. The team also faced numerous logistical challenges along the way, some that have inspired new research investigations while others that have resulted in down-scaling certain research thrusts. Propulsion is one such research that faced severe difficulties, primarily because of the challenges of a university environment in supporting and nurturing research that has high-standards of safety, security and inherent challenges.

Growth at the laboratory has been reinforced by ever increasing market demands for aerospace engineering and planetary science students. The laboratory has matriculated more than 150 students, mostly undergraduate, with nearly 16 Master’s students and 3PhDs. Graduates estimated to be about 70% are finding jobs in the aerospace and defense industry, while others are finding positions in robotics, IT and auto industry. The accomplishments made in the SpaceTREx laboratory was used to jump-start ASTEROIDS Laboratory under NASA funding in 2020. ASTEROIDS aims to tackle some of persistent challenges in aerospace, namely lack of gender and ethnic diversity and to strengthen America’s aerospace workforce. The team developed an innovative Undergraduate Research and Education Program to advance opportunities for undergrads through space research and facilitate interest in education.

The program has produced numerous success stories from underrepresented groups going onto to do great things. Importantly, the program has cultivated wide interest in space exploration, space development and space technology and services in Southern Arizona.