

## **Project PoSSUM: Citizen Science Aeronomy and Bioastronautics**

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Project PoSSUM, an acronym for Polar Suborbital Science in the Upper Mesosphere, is a 501(c)(3) aeronomy research and education program that grew from the opportunity created by the Noctilucent Cloud Imagery and Tomography Experiment, selected by the NASA Flight Opportunities Program as Experiment 46-S in March 2012. A custom instrument was developed for this experiment to produce high-resolution noctilucent cloud and OH-layer imagery coincident with in-situ temperature measurements and neutral and charged particle densities in a manner from which tomography may be constructed. This tomography aims to characterize the roles of gravity wave and instability dynamics in the mixing and transport processes of the upper atmosphere.

The human component of the PoSSUM experiment provides opportunities beyond traditional public funding sources for increased funding through private funding sources including participant tuition, commercialization of media products, and sponsorships. In June 2017, PoSSUM conducted a privately-funded airborne research campaign from High Level Airport, Alberta using three camera systems designed and constructed for NASA's 'PMC-Turbo' high-altitude balloon mission. In October 2017, PoSSUM conducted the first pressurized microgravity tests of a commercial spacesuit together with Final Frontier Design and the National Research Council of Canada. These tests follow two years of unpressurized spacesuit tests in microgravity and precede post-landing testing, to be conducted by PoSSUM in April 2018. Other privately-funded PoSSUM citizen-science research yielded publications in bioastronautics, human factors, and educational methods.

The human component of the PoSSUM experiment also provides a means to inspire and excite general audiences while communicating science. PoSSUM manages two educational programs at the Embry-Riddle Aeronautical University in Daytona Beach, FL and one aeronomy education program held at the Space Foundation at Colorado Springs, CO. These programs have drawn students from 24 different countries. In all courses, students learn about aeronomy, remote sensing of the mesosphere, and about noctilucent clouds while they fly simulated suborbital missions using actual instrumentation in fully-pressurized spacesuits.

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