Project PoSSUM: Citizen-Science Astronautics and Immersive Education

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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 yielding publications in aeronomy, bioastronautics, human factors, and educational methods mostly through private funding. Concurrently, PoSSUM administers 36-credits of related educational content that have drawn students from 43 different countries to two hosting institutions: the Embry-Riddle Aeronautical University in Daytona Beach, FL and Florida Tech in Melbourne, FL. PoSSUM also maintains three outreach program serving under-represented minorities in STEM.

PoSSUM's Aeronomy Program 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. The program seeks to characterize the roles of gravity wave and instability dynamics in the mixing and transport processes of the upper atmosphere through coordinated ground, airborne, balloon, and space-borne imagery and in-situ observation of noctilucent cloud (NLC) structures. PoSSUM airborne research campaigns employ custom instrumentation and are conducted in collaboration with the Royal Canadian Air Force to produce imagery data concurrent with NASA's PMC-Turbo balloon mission, led by PoSSUM's Chief Scientist. PoSSUM also maintains a citizen-scientist network of NLC observers.

PoSSUM's Bioastronautics Program evaluates Final Frontier Design IVA and EVA space suit and Canadian Space Agency (CSA) biomonitoring technologies. EVA space suits are currently being evaluated using PoSSUM's gravity offset laboratory recently established at the CSA headquarters in Montreal, Qc.

PoSSUM's Operational Sciences Program studies human performance in various simulated and analog environments including contingency post-landing environments in partnership with Survival Systems USA, hypoxic environments, and microgravity environments wherein PoSSUM members have integrated and/or flown over 40 microgravity experiments, including human-tended space suits, with the National Research Council of Canada.

The human component of the PoSSUM experiment provides a powerful means to inspire and excite general audiences while communicating science. PoSSUM maintains three targeted outreach programs to serve under-represented communities in STEM, including 'PoSSUM 13' for girls and young women, 'Out Astronaut' for the LGBTQ community, and the 'PoSSUM Emerging Space Nations Project' for individuals from nations where space research is not well represented.