2017 S4: Small Satellites for Secondary Students

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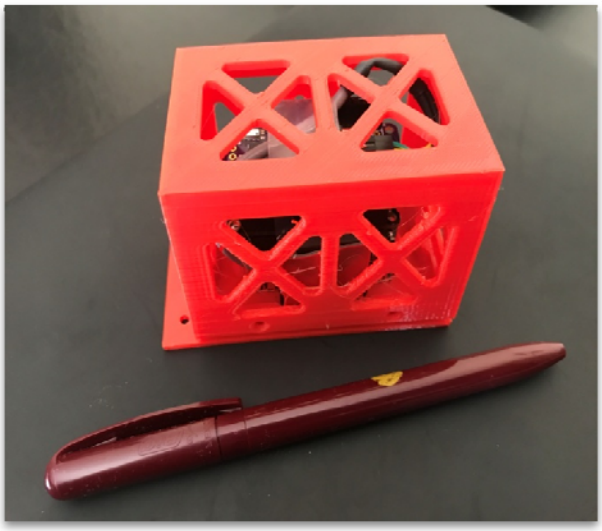
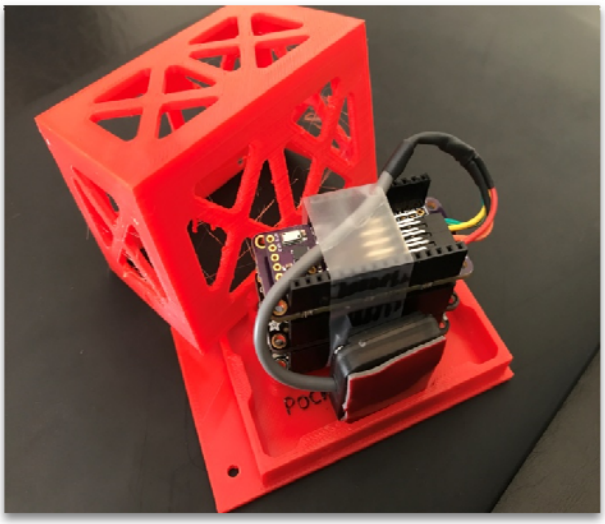
Congratulations 2017 TARC National Finalists!

This is your opportunity to explore the science of the stratosphere



The S4 (Small Satellites for Secondary Students) student satellite system is an opportunity to do ARLISS[1] program of university student payloads that invented CanSats. Each S4Arduino payload is based on the new standard 1.5p PocketQube[2] picosatellite format (5 x 5 x 7.5 cm). Each S4Arduino PocketQube contains an array of sensors and is programmed as an advanced Arduino compatible computer. Each S4Arduino uses modern spread spectrum long range radio communications to communicate to the ground and download telemetry from the flight. The system is extensible and new sensors can be added to each S4 for new and different missions. Students can make use of the baseline sensors and programming or add new sensors or programming.

S4 satellites are designed to be flown on 3" (and above) diameter rockets on G motors to 1000' all the way up to sounding rockets reaching the top of the stratosphere. S4 satellites can be configured for either captive flights or to be deployed at apogee on a recovery device for independent descent.



Baseline S4Arduino sensors include: flight capable GPS, 3D accelerometer, 3D gyro, 3D magnetometer, temperature, atmospheric pressure, and battery status. Additional available sensors include light (IR, visible, UV), CO2 gas, volatile organic compound pollutants, gamma ray radiation, dust concentration, humidity and IR imaging. Standard interfaces are available to add even more sensors. S4Arduino samples data from the baseline sensors at about 50 Hz, stores data locally at about 10 Hz and transmits telemetry at about 1 Hz. The package has enough room for a small video camera. A microSD card provides for local recording of sensor data and a wireless telemetry connection provides for real-time data collection.

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[1] A Rocket Launch for International Student Satellites is an international high school and university competition for autonomous robotic student satellites held for the last 17 years by the AeroPac rocketry club at Black Rock Nevada. www.arliss.org

[2] PocketQubes are the successor to CubeSats designed by Professor Bob Twiggs, co-inventor of CubeSats and CanSats. CubeSats are now the standard for small satellites - educational, commercial and government. PocketQubes are the successor - recognizing the increase in electronics capability at small size. A number are now in orbit with more on the way. https://en.wikipedia.org/wiki/PocketQube

2017 S4Arduino Program

The top 50 2017 TARC teams have the opportunity to submit a proposal for a science or engineering experiment using the S4Arduino satellite. Teams can add sensors for their particular experiment. A maximum of 6 teams will be selected based on the quality of their proposal and provided an S4Arduino satellite kit with the baseline sensor suite. Teams will then construct their experiment and fly at their local facilities to conduct the experiment. It is expected that each team will partner with an experienced local rocket flier to fly their payload in the manner and altitude they need for their experiment to work. Each team will prepare a final report on their experiment and their findings. The S4Arduino satellite fits in a standard 3" airframe coupler.

The top team selected by their results and documentation will be rewarded with a rocket flight of their payload to near space at over 100,000 ft. with a maximum velocity exceeding 3.5 Mach using an ARLISS Extreme[3] sounding rocket at Black Rock, Nevada. The second place teams will receive a flight of their payload to 35,000 ft. The third place team would receive a flight to 10,000 ft. All the award flights would have video and data streamed back to the team's classroom from the Black Rock playa during the ARLISS launch in mid-September.

2017 proposals for award flights in September 2018 must be submitted by November 1st 2017, proposal selection will be completed by December 1st 2017. Notification of selection will occur prior to December 15th and satellite kits delivered to the team lead before January 15th 2018. The selected top 6 teams would then program their satellite to collect experimental data described in their proposal and fly it at a local launch site collecting data. The teams will then analyze their data and submit a report of their results and findings for evaluation and award selection *no later than March 15th, 2018.*

Teams can contact Ken Biba (kenbiba@icloud.com) at AeroPac for more information.

[3] ARLISS Extreme is based on the Carmack Prize winning design to fly small payloads to the edge of space economically. It flies standard CanSats or PocketQubes to over 100k'. https://www.youtube.com/watch?v=hQDLykL45Xk