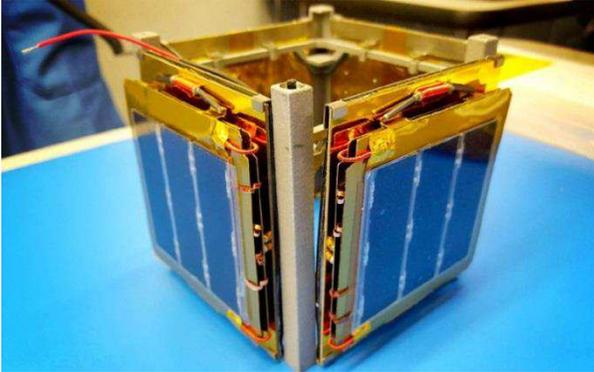


Irvine CubeSat STEM Program

Irvine01 2017 Update



As the Irvine01 team prepares for launch, we reflect on the incredible accomplishments that our high school students have made over the past several months.

2017 began with the exciting announcement that Irvine02, the next mission of the Irvine CubeSat STEM Program, was selected as one of 34 small satellites nationwide to participate in NASA's CubeSat Launch Initiative and fly on an upcoming NASA sponsored mission. Irvine CubeSat is one of only two high school groups chosen by NASA to participate in this

prestigious program, alongside world class universities and research centers.

In February, the team visited Cal Poly SLO to conduct Communications testing and passed on the first attempt, a feat rare even among university and commercial CubeSat projects. This was an exciting milestone, energizing the students and surpassing the expectations of teachers and mentors.

The CubeSat underwent its most significant test to date in March, the Vibration & Thermal Vacuum (VTV) test at National Technical Systems (NTS). Also referred to as "Shake and Bake", the test simulates the extreme environments that the CubeSat will encounter in space. Irvine01 passed each stage on its first attempt, another huge win for the team.

Irvine 01 is now moving into its final exciting phase: launch integration. On May 31, the team packed up the completed CubeSat and transported it the launch integrator, Tyvak Nanosatellite Systems, a worldwide leader in nanosatellite services located right here in Irvine. During the integration on July 26, the Irvine01 CubeSat will be positioned into an orbital deployer (POD) which will eject the satellite into orbit after launch. Once the integration is complete, the CubeSat will be ready for launch from India in late August.



IPSF is proud to sponsor this afterschool program providing over \$150,000 in funding annually with the support of our corporate partners: FivePoint, Ingersoll-Rand/Trane, Google.org, Cisco, Resilient, Microsemi, and the Arnold and Mabel Beckman Foundation. In addition to the funding, IPSF provides oversight, consultation, event management, and administrative support of the program.

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Team Updates

Team Avionics (Beckman High School) oversees the electronics and sensor suite for controlling each flight. This includes the main computer and GPS navigation sub-system. The team assembles and tests the entire stack of onboard electronics, often with student-coded software. The C-card design is nearly complete, they are waiting on LED circuit finalization before PCB order. The team is currently assisting with all software tests on IRVINE01 and prep code for IRVINE02.



Team Communications (Woodbridge High School) controls all radio and optical-data flow to and from orbit. Their hardware includes a UHF radio card from Tyvak that is supported by Cal Poly SLO's ground station staff, an antenna from EXA, and a visible-violet LED based optical communications system mentored by Brown University's CubeSat (EQUISat), Harvard optics researchers and the Fukuoka Institute of Technology CubeSat (FITSat-1) team in Japan. Many of the students have become licensed amateur radio operators, practicing communicating with older CubeSats already in orbit, and programming their "Comms" hardware for launch. They also oversee the government paperwork concerned with FCC and international licensing of the frequencies they use, as well as communication with other satellite operators. The team is currently finalizing radio setup for IRVINE01 with CalPoly and running last DITL test steps. They also ran LED prototype circuit test at Beckman High School on May 31.



Team Power (Northwood High School) is responsible for all solar panel and lithium battery array functions. This includes the wiring to power all systems on the CubeSat and the extensive ground testing of this hardware to characterize its performance prior to launch. The panels for battery and solar arrays are made by the Ecuadorian Space Agency (EXA) and directly supported by Astronaut Ronnie Nader. During flight, the team is responsible for battery charging management (which sets the limit on CubeSat operations), thermal/radiation effects with support from Montana State University, and handling the power budget for experiments or choreographed maneuvers. The team has conducted five Solar Lamp Tests since passing VTV thermal test on March 31.

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Team Propulsion (Irvine High School) handles the electric thruster and magnetorquers for moving and pointing the CubeSat, respectively. They plan these maneuvers using orbital simulation codes like the General Mission Analysis Code (GMAC) from NASA, compensating for subtle effects including stratospheric drag, lunar gravity, and sunlight pressure. The propulsion hardware is supplied by EXA and Accion Systems, with

technical support from MIT. This team also prepares the de-orbit analysis for our launch permit paperwork and the end-of-flight process for safely disposing of the CubeSat, remotely monitoring its re-entry/burn-up over the Pacific. They oversaw all final prep tests before integration at Tyvak on July 26.

Team Prime (University High School) is responsible for the primary scientific instrument for each flight. This includes the frame to support the instrument (connecting it to the rest of the CubeSat) and the government paperwork required to launch it. Team Prime ran final Orbital Operations (CONOPS) tests. They have also received the IRVINE02 frame and have started filing the permit application for IRVINE02's flight camera with NOAA.

Team BioTech (Portola High School) is in the early stages of formation, but has ambitious plans to use NASA Ames experts in Biology-based space missions to study microscopy and genetics. This team will be responsible for the life-support system for sustaining bacteria and other micro-organism experiments in orbit, slated for a future flight concept payload. The team received a sample of sulfur bacteria from Cal State Long Beach, and is planning on sequencing its DNA at Zymo Research in Irvine. They are currently working on early study and prep work for culturing/sterilizing bacteria, and are exploring a fall project to have Irvine High create 3D print structures for cell growth at the high school.



Irvine CubeSat STEM Program



Irvine01 Students

- 150 Students from 6 Irvine High Schools
- 40 graduating seniors in 2017
- Attending colleges and universities including UC Berkeley, UCSB, UCSD, and CalPoly SLO
- Declared majors include Electrical and Mechanical Engineering, Computer Science, Engineering Physics, and other STEM fields of critical importance to California industry
- Irvine CubeSat STEM Program is poised to become the first high school team on the West Coast to launch a CubeSat nanosatellite.

Student Demographics

Gender

Male	65%
Female	35%

Ethnicity

Chinese	24%
Asian Indian	21%
Korean	6%
Taiwanese	3%
Hispanic	3%
Middle Eastern	2%
Vietnamese	3%
Caucasian	21%
Black	0.7%
Asian (Not specified)	10%
Persian	1%
Mixed Race	0.6%

