

Student-Built Texas Twin Satellites Aim for Space

<http://fastrac.ae.utexas.edu>



Figure 1: The FASTRAC Satellites, built by University of Texas students, have won a ride into space.

When aerospace students actually get to see their designs fly in orbit, what new ideas are inspired? That question is answered by the FASTRAC team at The University of Texas at Austin, as their hands-on engineering project takes flight. The FASTRAC team is turning their designs and ideas into real satellites that will soon be orbiting in space over the skies near you.

The Formation Autonomy Spacecraft with Thrust, Relnav, Attitude, and Crosslink (FASTRAC) team consists of approximately 25 students from Aerospace Engineering, Electrical Engineering, Mechanical Engineering, and Information Systems Departments of the University of Texas at Austin. Program Manager Jamin Greenbaum, a Masters student in Aerospace Engineering, leads the team under the supervision of faculty member Dr. E. Glenn Lightsey.

The FASTRAC mission allows students the unique opportunity to see their design actually fly in orbit. Invaluable experience is also gained from the hands-on engineering work that goes into the construction of a satellite. The mission incorporates the use of twin satellites to demonstrate technologies for orbital formation flying. Each twin is roughly the size of an automobile tire and weighs 28 pounds. Global Positioning System (GPS) units will allow the twins to navigate relative to each other, while a miniature thruster rocket developed at the UT Department of Aerospace Engineering provides maneuverability.

In addition to providing much needed hands-on experience for undergraduate and graduate students, the FASTRAC program seeks to include students in K-12 classes throughout the Austin area through student involvement in satellite fabrication, and presentations to classes.



Figure 2: The FASTRAC team assembles the satellite in the Satellite Design Laboratory at the University of Texas at Austin, Aerospace Engineering Department.

The exploration of space is an endeavor normally reserved for large government and corporate researchers. The opportunity for undergraduate and graduate students to do the same is indeed very rare. They gain hands-on experience with satellites that will fly in space, solving real-world problems and working with a wide variety of industry partners. This new generation of engineers and scientists in the space industry is one of the greatest benefits derived from the FASTRAC mission.

The FASTRAC Program is funded through a grant from the United States Air Force Office of Scientific Research as part of the University Nanosatellite Competition. This program provides a total of \$100,000 for two years of design, development, and fabrication of a NASA-qualified satellite system. This is a unique departure from government and commercial projects with multi-million dollar budgets and decade-long design periods.

On January 9, 2005, the FASTRAC team was announced as winners of the University Nanosatellite 2004 Competition. The FASTRAC team was selected from among 12 other universities for the opportunity to fly their satellites in space. As winners of the competition, the FASTRAC satellites will be launched into space by the Air Force. The satellites, entirely student designed, built, and tested, will fly in space as soon as 2006.



Figure 3: The FASTRAC Team wins the University Nanosatellite 2004 Competition

The FASTRAC team built the nanosatellites in Austin on the University of Texas campus. The students have outfitted the Department of Aerospace Engineering building with a Satellite Design Laboratory, including a cleanroom in which the satellites were constructed. In addition, they have designed and installed a satellite tracking station and mission control center in the lab.

While in orbit, the FASTRAC satellites will conduct GPS relative navigation and microthruster experiments. Using a radio communications link between the two satellites, GPS information will be transferred between the two satellites to be used in determining the position of one satellite relative to the other satellite's position.

A miniature rocket called a Microdischarge Plasma Thruster will give the satellites maneuverability. The microthruster is a small thruster that uses superheated gas, called plasma, to propel the spacecraft in space. The microthruster used on the FASTRAC satellites was designed and developed at the University of Texas Aerospace Engineering Department. FASTRAC will show the effectiveness of this small, safe, low-power unit.

The FASTRAC satellites communicate with stations on Earth using amateur radio frequencies, giving amateur radio operators the capability of communicating with the satellites. These operators will serve as "remote groundstations" for the FASTRAC program, downloading information from the satellites and sending the information to the FASTRAC team via their website (<http://fastrac.ae.utexas.edu>). With the help of

amateur radio operators throughout the world, much more FASTRAC satellite information will be gathered.



Figure 4: The FASTRAC satellites just after separation.

The FASTRAC program began with design of the mission plan and initial concepts of the spacecraft structure in early 2002. Since that time, the FASTRAC team has grown and the project has evolved into a full satellite construction project. Today, the FASTRAC team has built two satellites that will actually fly in space and conduct research on orbital formation flying. The construction phase finishes in September 2005, with launch anticipated in 2006.

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