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# FASTRAC Early Flight Results

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## Abstract

The Formation Autonomy Spacecraft with Thrust, Relnav, Attitude, and Crosslink (FASTRAC) satellites was launched on November 19, 2010 from Kodiak, AK as part of the Space Test Program STP-S26 launch, aboard a Minotaur IV rocket. Throughout the first six months of operations, the satellites underwent an extensive check-out period, ensuring that all subsystems were working nominally. During the first year of operations, enough data has been gathered to show that all mission objectives satisfied the minimum success criteria. The data collected during the first six months of operation are presented and analyzed, showing the status of the spacecraft health and the primary GPS experiment. The data received thus far demonstrates that the GPS receivers of both satellites have been capable of fixes regularly, and have performed to the level of accuracy expected from ground simulations. From the GPS messages received, several types of measurements, such as position fixes and pseudo-ranges, have been post-processed, using a batch estimation algorithm to determine daily nominal satellite trajectories. When the GPS receivers were position-fixing, they were also able to obtain on-orbit single GPS antenna attitude solutions that matched predicted accuracies from ground simulations.

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## 1. Introduction

The Formation Autonomy Spacecraft with Thrust, Relnav, Attitude, and Crosslink (FASTRAC) student satellite program started in 2003 as part of the third installment of the University Nanosatellite Competition (NS-3), which is sponsored by the Air Force Office of Scientific Research (AFOSR) and managed by the Air Force Research Labs (AFRL). In early 2005, the project was chosen as the winner of the competition, at which

point the team started working closely with personnel at AFRL to transform the FASTRAC Engineering Design Unit (EDU) into two flight-ready satellites to ensure they would survive the launch and space environments. This required some of the components, such as the enclosure boxes for Electromagnetic Interference (EMI) protection, to be redesigned or modified (Greenbaum, 2006). The satellites were first delivered to AFRL to undergo a series of qualification and environmental tests in summer 2006, which led to additional hardware modifications, a process which lasted until February 2010. This final development time took

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