



Bronco Ember: Autonomous Nascent Wildfire Detection and Prevention System

Technology Need

- *Accurate geolocation will enable faster and more accurate aerial detection of fires or other terrestrial phenomena, and can currently be quantified by the root-mean-squared error (RSME) of current instruments*
- *Google Earth control points has a RSME of 39.7 meters and LandSat RSME <50 meters, which enables a need for a sensing capability of RSME <39.7 meters for nascent wildfire detection*

Technology Concept

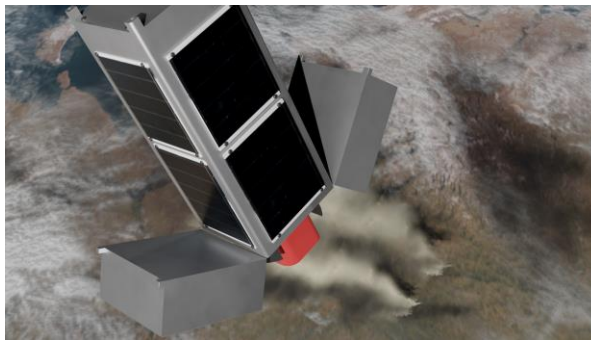
- *Autonomous POI detection and tracking in a CubeSat form factor*
- *Tracking of nascent wildfires to prevent widespread devastation to the environment*
- *Use case for planetary science observations, such as methane plumes on Enceladus or ejecta from lunar impacts*

Technology Development Team

- *Bronco Space Club at Cal Poly Pomona*
- *PI: Cristian Rodriguez, Master's Student in Mechanical Engineering*

Test Apparatus

- **Size:** 3U CubeSat form factor (100 mm x 100 mm x 340.5 mm)
- **Mass:** 6.0 kg
- *Bronco Ember shall combine the use of a SWIR camera with AI and ML to monitor and pinpoint the location of a wildfire or natural disaster. Pointing shall be done using a 2DOF gimbal system. Ground testing of nascent wildfire detection shall use an artificial IR signature. Flight test shall involve a controlled burn to test payload's POI detection and tracking.*



Flight Requirements/Objectives

- **Flight Profile:** *Target altitude shall be 30 km maintained for a minimum of 2 hours*
- **Desired flight vehicle:** *World View High Altitude Balloon. Alternative - Raven Aerostar Balloon*
- **Flight Objectives:** *Reach target altitude and begin target acquisition routine. Maintain target within the camera's frame and record its location with respect to Earth center-Earth-fixed coordinates*
- **Expected Flight:** June 2022

Technology Advancement

- *Bronco Ember shall demonstrate a TRL of 6 by the time of launch*
- *The gimbal mechanism shall demonstrate full mobility and provide continuous tracking of target within a 180° FOV*
- *The Geolocation algorithm shall enable a higher precision location determination for future missions*

Technology End Users

- *Government forest management and wildfire prevention agencies*
- *Earth Science and Planetary researchers*

Technology Applicability: Event and Anomaly Detection 10.1.5-10.1.6, Operational Assurance for Autonomous Systems 10.4.3, Software Operational Assurance 11.1.4