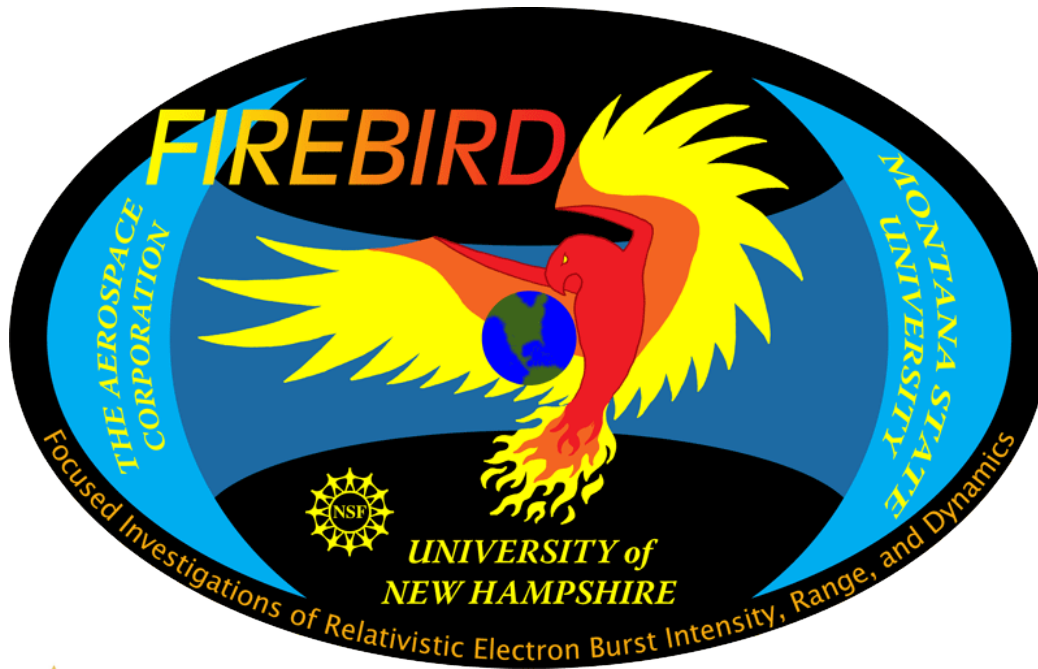




Focused Investigations of Relativistic Electron Burst Intensity, Range, and Dynamics (FIREBIRD)

Overview



Alex Crew
May 23-24 2011



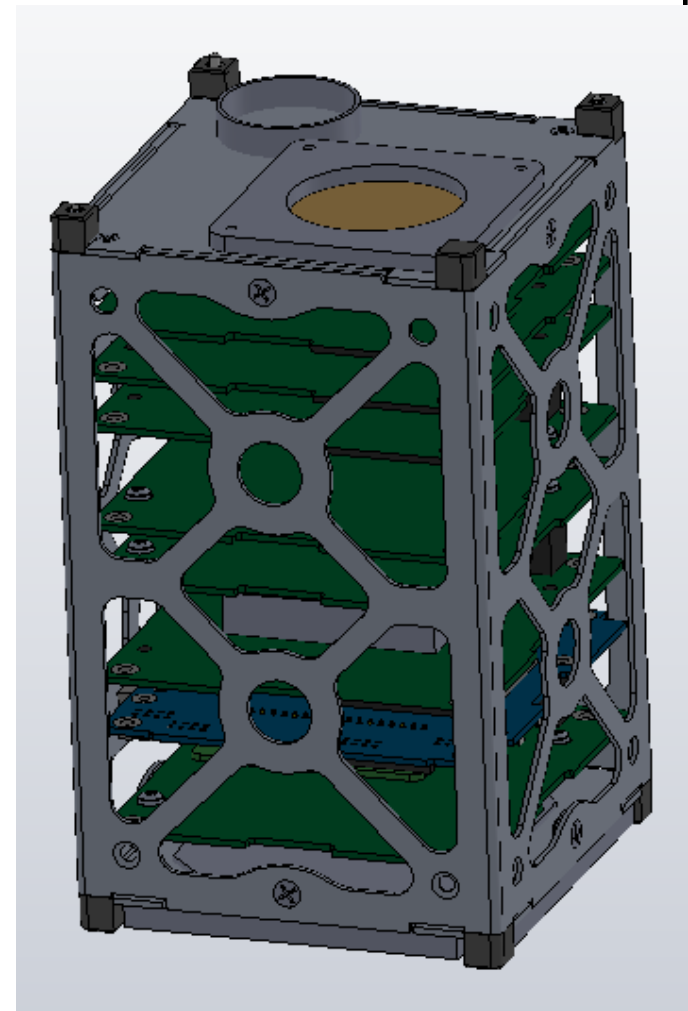
Mission concept

- Fly two 1.5kg (1.5U) cubesat spacecraft to assess the spatial scale and spatial/temporal ambiguity of magnetospheric relativistic electron microbursts
- Mission Science Questions:
 - 1) What is the spatial scale size of an individual burst?
 - 2) What is the energy dependence of an individual burst?
 - 3) How much total electron loss do bursts produce globally?



FIREBIRD concept

- 2 identical 10x10x15cm CubeSats
- Passive magnetic attitude control
- Large GF omni solid state detector (SSD) – one per s/c
- Small GF SSD– one per s/c
- Gradual separation over 120 day prime mission allows sampling across many spatial scales





FIREBIRD Data Products

- Event Data (High Resolution)
 - 6 Energy Channels from 200keV to 1050keV
 - 18.75ms time resolution
 - Limited availability (telemetry restrictions)
- Microburst Parameter Data (MBP)
 - Calculated proxy for microburst activity
 - 100ms time resolution
 - Based on 2 energy channels
- Context Data
 - 6s averages for 2 energy channels



Science Operations Plan

- Mission philosophy--“Capture fewer events in greater detail”
- Telemetry is primary limitation on data
- Instrument power limited to 50% duty cycle
- On ground utilize MBP and context data to select intervals of interest for high resolution event data
- Current estimate is 140* 10 second events downloadable per day
- On board data storage of last 2 weeks data

*# subject to change



Orbit/Timeline

- Looking for a high-inclination low earth orbit
- Targeted for launch end of 2012
- Payloads will slowly drift apart over time
- Prime mission focus is first few weeks for small-scale sampling of microburst spatial scales
- Later in the mission expect to operate as two independent payloads



Data Availability

- Plan to make FIREBIRD data available through the RBSP-ECT SOC at LANL
- Total data set expected to be ~600MB
- However high resolution data only limited to times that we identified as of interest and downloaded



FIREBIRD and RBSP

- Opportunity to measure the loss cone from below if RBSP and FIREBIRD are on the same field line
- Wave data from RBSP combined with particle information from FIREBIRD



FIREBIRD and BARREL

- Goal of trying to assess loss on global scale
- FIREBIRD provides 1-2 points of complementary measurements
- Able to directly measure electron population over energy range



Burst Mode/Campaigns

- FIREBIRD will only be taking data 50% of the time (power considerations)
 - We *may* be able to run it continuously for a few orbits if planned in advance (Telemetry will still be an issue)
- If other assets see times of interest we may be able to download high resolution data for that time period
 - Need to know within a week in order to avoid overwriting data