NASA ARC /MSFC Nanosail-D and NASA ARC PRESat (PharmaSat Prototype)

CAMPAIGN MISSION OVERVIEW

Mission Information

Launch Date: June 10, 2008
Launch Vehicle: Spacex Falcon 1
Launch site: Omelek Island, RTS (Kwaj)
Orbit: 685 X 330 km, 9^{o} inclination
Mission Operation Period: 60 days +

Mission Overview and Objectives

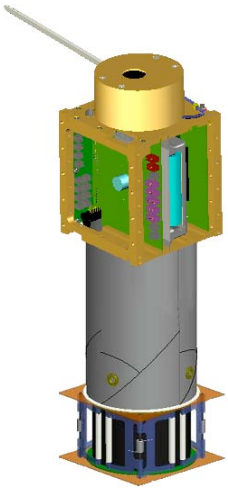
The PreSat nano-satellite and NanoSail-D (NSD) campaign mission system was comprised of four major functional physical segments. They were the Space Segment (Satellite and Deployer), Ground System and Flight Operations Segment, System Safety and Mission Assurance Segment, and Launch.

Mission Objectives

The overall goal of the PreSat Project was to utilize autonomous, in-situ bioanalytical and sample management technologies for investigations in support of the Advanced Capabilities Division non-exploration and exploration objectives. Experiment requirements are described in ARC PharmaSat Project Science Requirements A240-0702-XR004.

PreSat Hardware

Minimum success criteria for PreSat focused on demonstrating that the satellite can provide the necessary environment for executing the biological experiment planned for the later PharmaSat mission. Extended success for PreSat includes detection of actual biology growth during orbit.



Spacecraft Bus (Ames Research Center)

Solar Sail Spool (MSFC/Mantech-SRS)

Boom Spool (MSFC/UAH)

NanoSail-D
(Aluminum Closeout Panels Not Shown)

Minimum success criterion for NanoSail-D (NSD) was to demonstrate that the ARC Nanosatellite bus and MSFC NanoSail-D payload can be integrate and delivered for launch. Extended success for NSD includes validation of the sail deployment mechanism and demonstration of de-orbit performance by use of a solar-sail device.

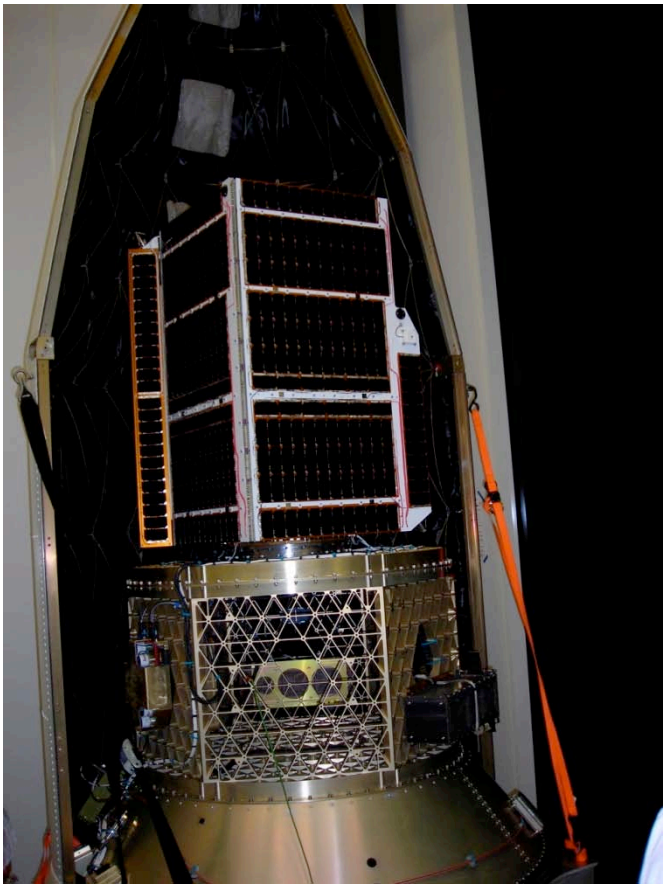
In addition, both the PreSat and Nanosail-D missions were to demonstrate the ability to launch on the Falcon-1 vehicle and operate portable ground stations for near-equatorial orbits.

Nanosail Objectives:	**PRESat Objectives:**
–Primary •*Establish ARC-MSFC collaborative relationship for future small satellite initiative* •*Deploy first solar sail leveraging work by MSFC approved under the SMD In-Space Propulsion Program* **–Secondary/Opportunity** •*Demo Orbital Debris Mitigation technology – drag sail* •*Ground Imaging to reduce spacecraft instrumentation* •*Add to flight experience - ARC Bus "light" experience* •*Relevance* –*Planetary & Heliophysics Science missions Most smallsats orbiting above 450 km struggle to meet <25 year life MOD requirement*	**-Primary [Pharmasat Risk Reduction/Technology Demonstration)** •*Demonstrate/validatepPerformance of NASA-Ames 2nd Generation Modular Triple CubeSat Nanosatellite Platform* •*Spaceflight performance evaluation of generic biofluidic sample management and optical detection system* •*Evaluation of payload environmental management system* **-Secondary (Opportunity/Benefits)** •*First NASA NanoSat Mission on SpaceX Falcon Launch Vehicle* •*Establishment of South Pacific Ground Comm System* •*Demonstrates 6-month, low-cost mission implementation* •*Establishes collab mechanisms w AFRL, MSFC, Entrepreneur* •*Relevance to ISS Non-Exploration and SMD/Astrobiol Science Missions, etc*
Specific Tasks •*GeneSat heritage Bus* • *10 m^2 , 3 micron CP-1 Sail* • *2.2 m Tape Spring Booms* • *UHF & S-Band comm* • *Closeout Panels* • *Magnetic Passive Stabilization* •*E/PO outreach*	***Specific Tasks (uses Prototype HW leveraged from PharmaSat Program (ESMD provided)*** •*Configure Triple-Cube Satellite* •*Flight System Engineering, Environmental Testing* •*Integrate PPOD LV Interface w SAT Rideshare Adapte* •*Configure Comm System, install at Ground Ops Site* •*Support Spacecraft / LV Integration @ Launch Site* •*Conduct Mission Ops* *Evaluate Results, Transfer to Formal Science Missions*

SpaceX Falcon Flight-003: Secondary Payload Flight Integration

PreSat Integration

NanoSail-D Integration



Integrated Payload Stack

Mission Status:

The NASA ARC Nanosatellite Missions Office team successfully assembled, tested, delivered and integrated both the NanoSail and PreSat spacecrafts. The SpaceX Falcon-1 Flight 003 launched on 8/2/2008, but failed to reach orbit.