Balloon Working Group

Balloon Program Technology Developments
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Aerobots & Airships

Balloons

Application Specific R&D

Common Enabling Technologies & Tools

Application Specific R&D

Tethered Vehicles
Technology Resources

- Balloon Program Office
  - 3 Technology Managers with 4th starting mid-July
  - Maintain WFF Balloon Research and Development Laboratory
  - Numerous development projects being conducted by PSL and NASA
  - University Grants
    - University of North Texas – Materials
    - George Washington University – Structural Analysis
    - North Carolina State University – Fiber Protection
- Small Business Innovative Research (SBIR)
  - 1 Phase I, 2 Phase II’s, negotiating on 2 Phase III’s
- Internal GSFC
  - IR&D and B&P
Technology Focus Areas

- Materials
- Vehicle Design & Development
- Structural Analysis
- Operations & Support Systems
- Performance Modeling
- Planetary Balloons
The Balloon Research & Development Laboratory has evolved into a specialized facility for the testing of thin films. The flight environment of scientific balloon imposes some unique testing considerations.

- Permeability Testing
- Cold Brittleness Test Chamber
- Toughness Tester
The ULDB Technology Developments

- New Balloon Design
- New Construction Techniques
- New Coextruded Balloon Film
- New PBO Load Tendons
The “Big 60”, a 60 million cubic foot balloon, was designed and built in response to a science need to reach a higher altitude than obtainable with current NASA standard balloons. The thin co-extruded film used was a spin-off from the ULDB development.

**Flight Specifications**
- Launch Site: Lynn Lake, CAN
- Launch Date: 8-26-02
- Float Altitude: 160.3 kft (GPS)
- Flight Time: 22 hrs, 22 minutes
- Suspended Wt: 1546 lbs
- Science Wt: 452 lbs

**Balloon Specifications**
- Volume: 1.69 MCM (59.84 MCF)
- Gore Length: 228.6 m (750.14 ft)
- # of Gores: 202
- Shell: 10 $\mu$m (0.4 mil)
- Cap: 13 $\mu$m x 2 (0.52 mil x 2)
- Balloon Wt: 1248.3 kg (2752 lbs)
Iridium Electronics Package

The Iridium Electronic Package was developed to enable global communications to and from a balloon platform through the Iridium constellation of satellites.

**Advantages:**
- Global Coverage
- Low Cost
- Compact and Light Weight
- Reliable

ULDB Pathfinder Project

90 kg to 30-33.5 km
The Remote Autonomous Instrument Data Acquisition System (RAIDAS) is an independent “add-on” box for any LDB or ULDB mission to collect data from a specific sensor.

**RAIDAS Spec’s**
- Eppley’s Precision Infrared Radiometer (PIR) Pyrgeometer
- Thermistors
- Power
- Data Acquisition & Storage
- GPS Integration in process

Flight 498N – May 26, 2001
Balloon Trajectory

Mean Float Path for Alice Springs Launch

Alice Springs
Rio de Janeiro, Sao Paulo
Johannesburg, Pretoria
Mean Float Path
Trajectory Control System

TCS Mounted on Representative Gondola (TIGER) Beneath 20 MCF Balloon

Global Aerospace Stratosail TCS
Ballooning at Mars

A superpressure pumpkin balloon is being developed to satisfy the science need for an aerial platform at Mars. The aerial deployment and inflation of the balloon while descending on a parachute imposes some unique challenges to the development effort.
Flight Testing from Hawaii
Aerial Deployment Video
Balloon Technology Roadmap

Operational and Safety Support Systems

- Demonstration Test Bed
- Operational Workstation
- Propeller Demo
- Stratosail Demo
- Operational System Flight
- Shock Reduction
- Dispersion Reduction
- Guided Parafoil
- Mechanical Systems Enhancements

Planetary Vehicles

- Pumpkin Inflations
- End-to-End Test Flight
- Mars Scout 2011 AO
- First Possible Mars Balloon Mission
- Cassini-Huygens Probe Released
- Model Atmosphere
- Airship Evaluation
- Materials Development
- Titan
- Model Atmosphere
- Materials Development
- Venus