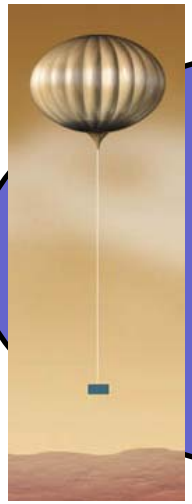
SUBORBITAL AND SPECIAL ORBITAL PROJECTS DIRECTORATE

Balloon Working Group

Balloon Program Technology Developments

Debbie Fairbrother

June 30, 2003



Balloons

Aerobots
&
Airships

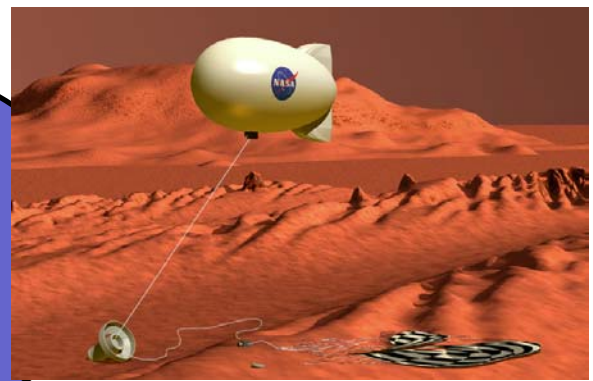
Application Specific R&D

Application Specific R&D

Common Enabling Technologies & Tools

Application Specific R&D

Tethered Vehicles

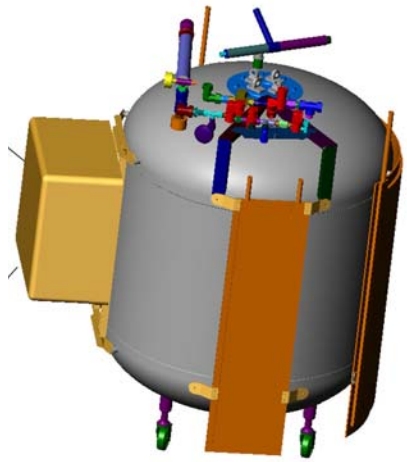


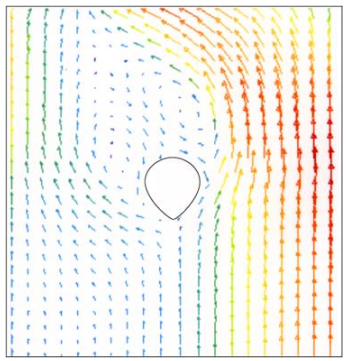
Technology Resources

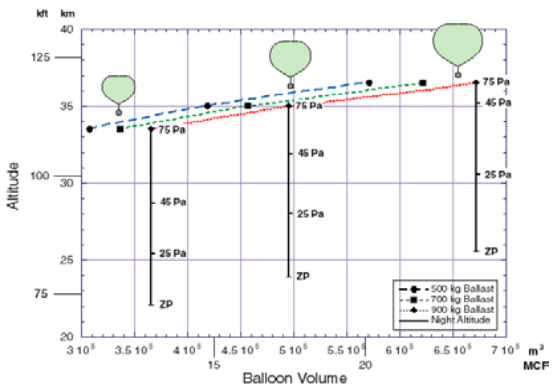
- Balloon Program Office
  - 3 Technology Mangers with 4th starting mid-July
  - Maintain WFF Balloon Research and Development Laboratory
  - Numerous development projects being conducted by PSL and NASA
  - University Grants
    - University of North Texas – Materials
    - George Washington University – 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

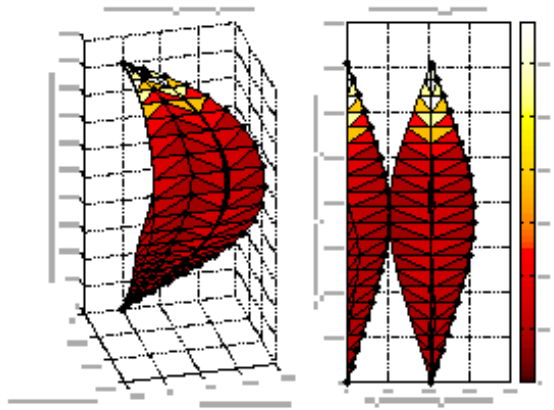
Technology Focus Areas

- Materials
- Vehicle Design & Development
- Structural Analysis
- Operations & Support Systems
- Performance Modeling
- Planetary Balloons





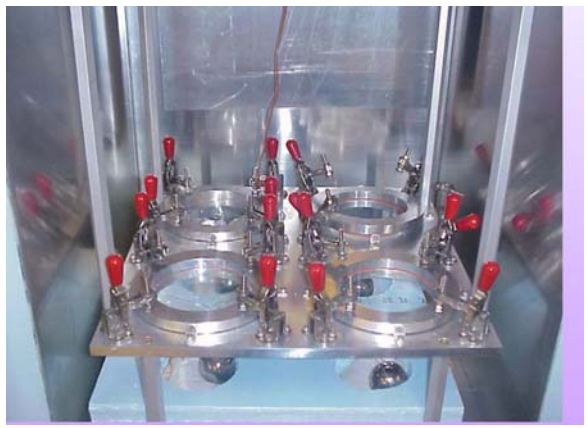




Balloon Research & Development Laboratory

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

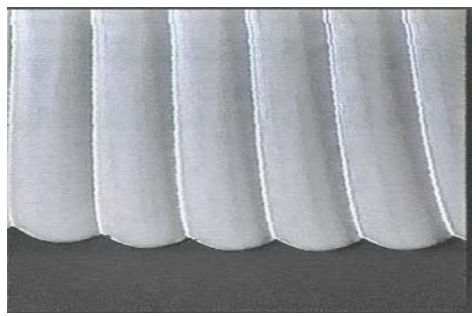


Cold Brittleness Test Chamber

Toughness Tester

The ULDB Technology Developments

- New Balloon Design
- New Construction Techniques
- New Coextruded Balloon Film
- New PBO Load Tendons



The “Big 60” – A New NASA Balloon

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 μm	(0.4 mil)
Cap:	13 μm 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.

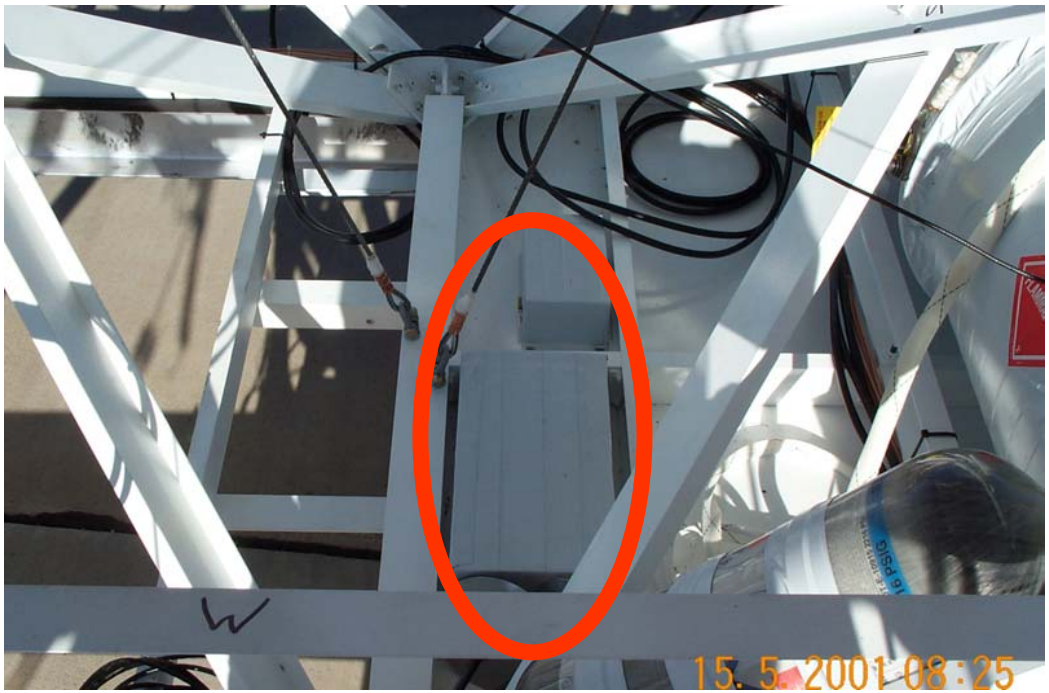
90 kg to 30-33.5 km

Advantages:

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

Remote Autonomous Instrument Data Acquisition System (RAIDAS)

The Remote Autonomous Instrument Data Acquisition System is an independent "add-on" box for any LDB or ULDB mission to collect data from a specific sensor.

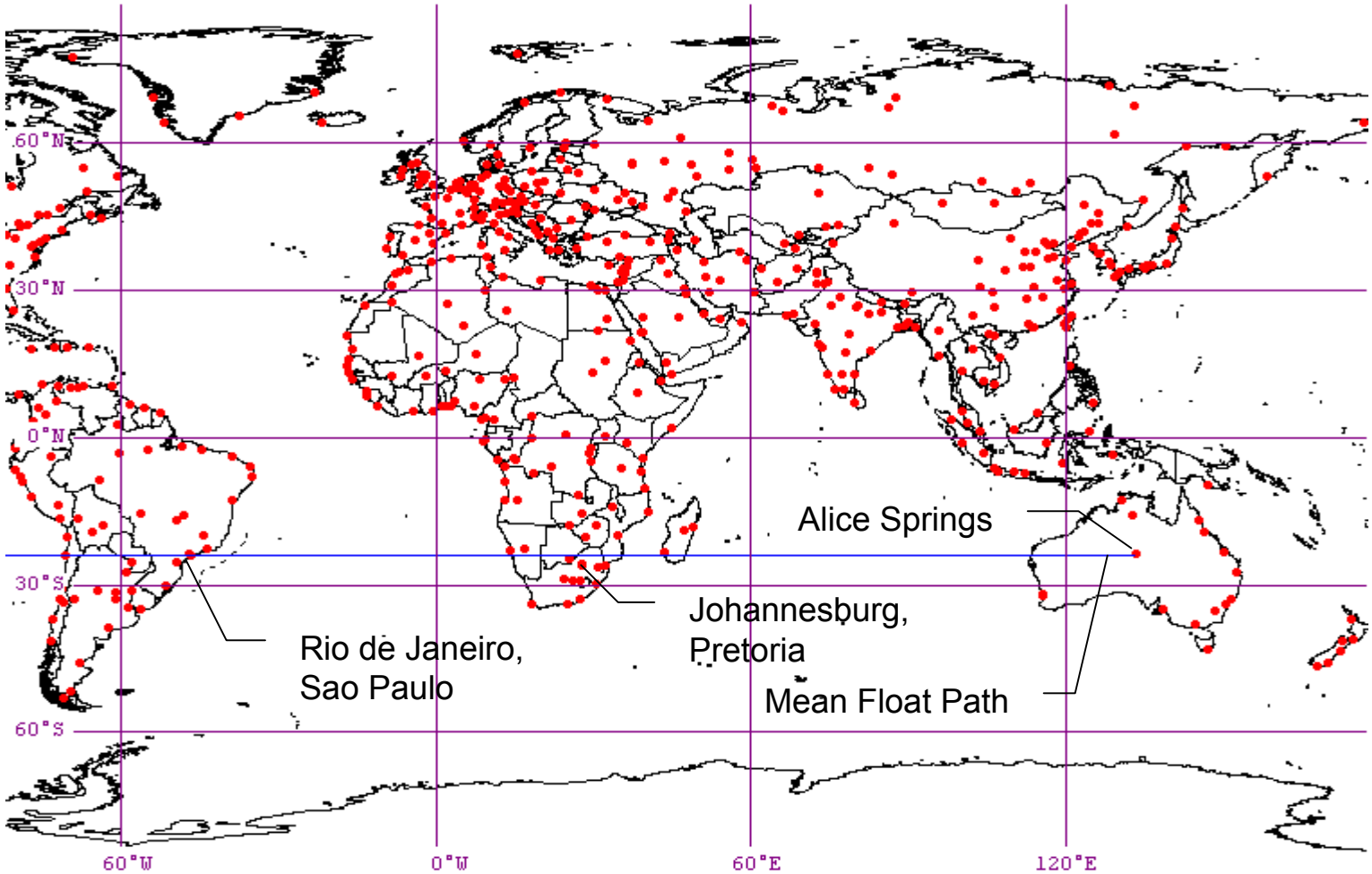


Flight 498N – May 26, 2001

RAIDAS Spec's

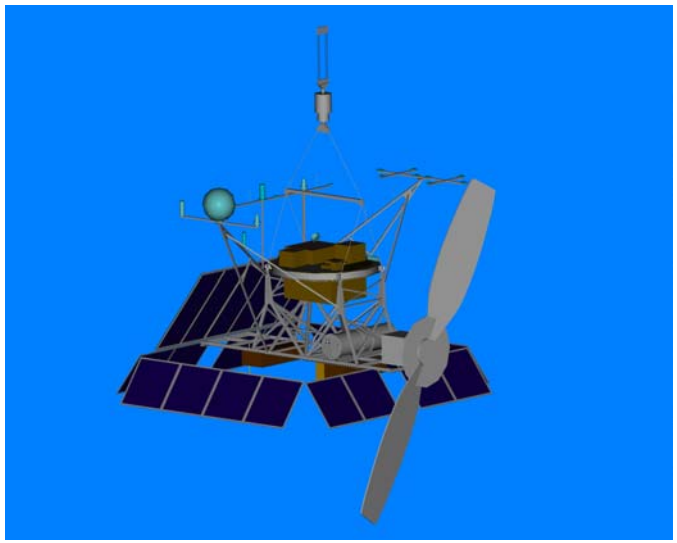
- Eppley's Precision Infrared Radiometer (PIR) Pyrgeometer
- Thermistors
- Power
- Data Acquisition & Storage
- GPS *Integration in process*

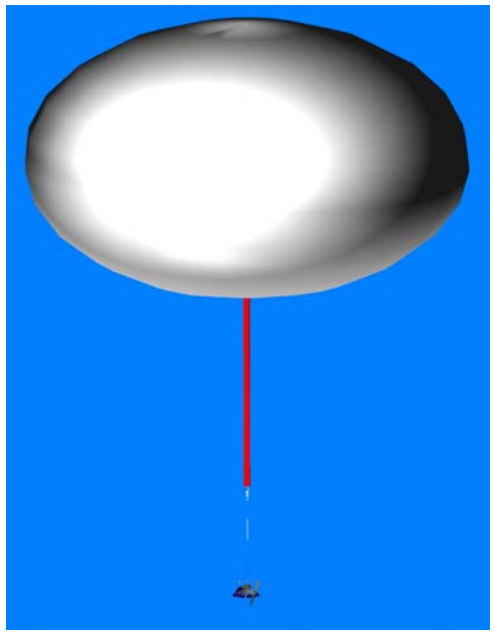
Balloon Trajectory



Mean Float Path for Alice Springs Launch

Trajectory Control System



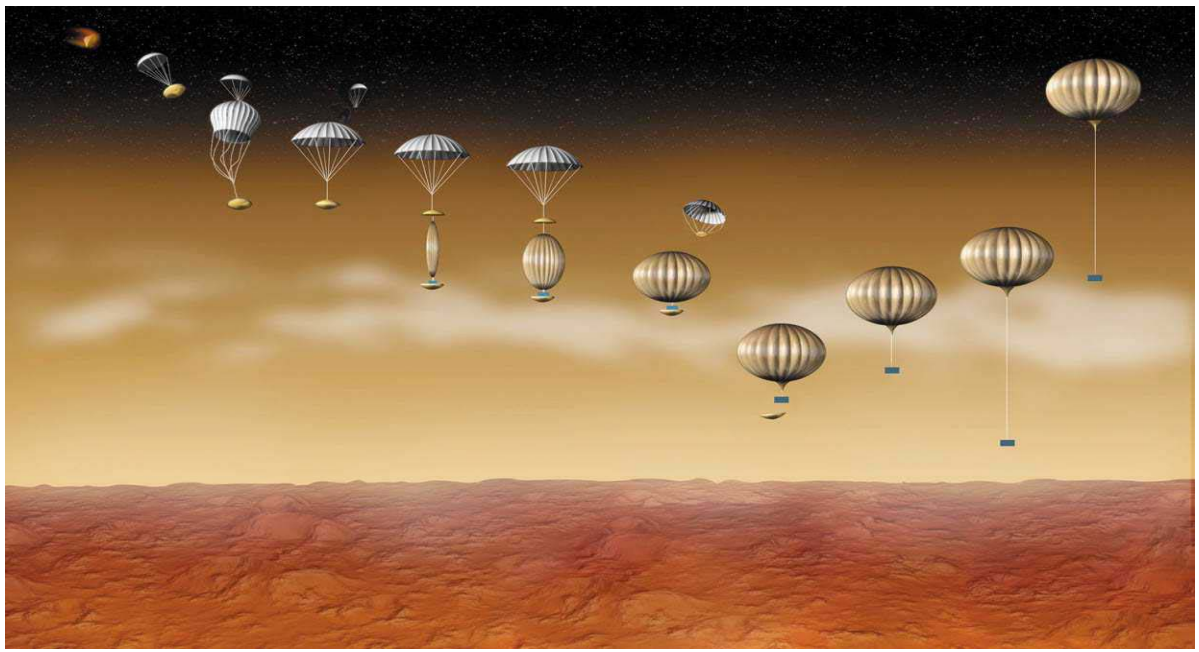


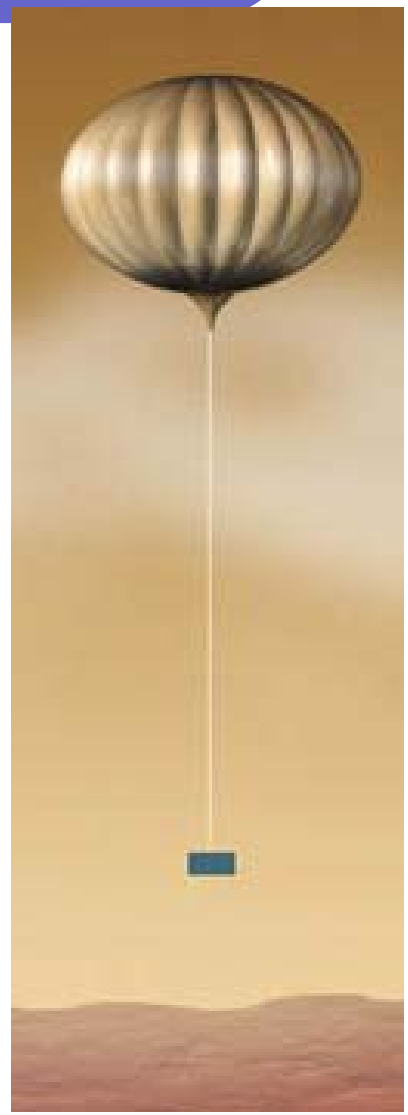
TCS Mounted on Representative Gondola (TIGER) Beneath 20 MCF Balloon

Global Aerospace Stratosail TCS

Ballooning at Mars

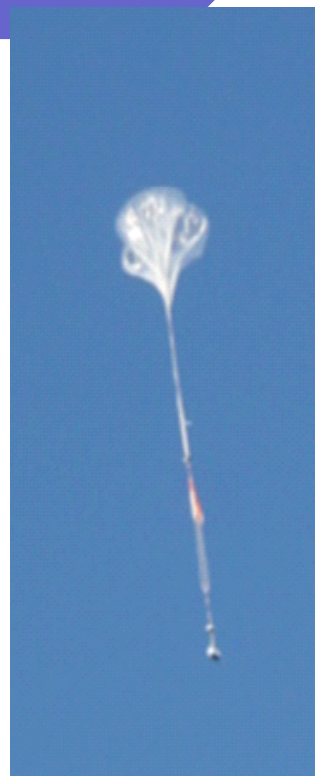
A superpressure pumpkin balloon is being developed to satisfy the science need for an aerial platform at Mars. The aerial deployment and inflation of the balloon while descending on a parachute imposes some unique challenges to the development effort.



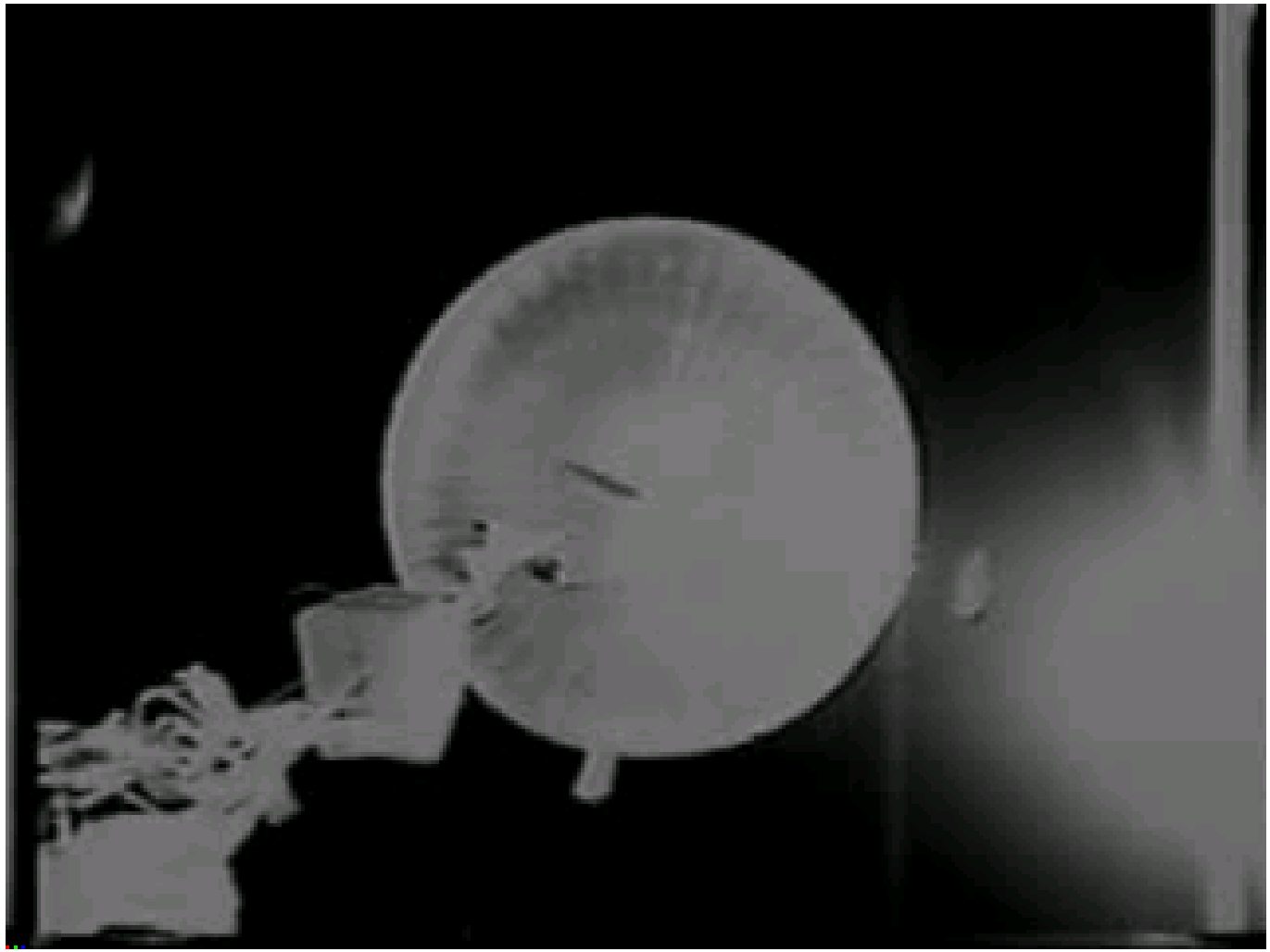


Balloon Technology, NASA Balloon Working Group

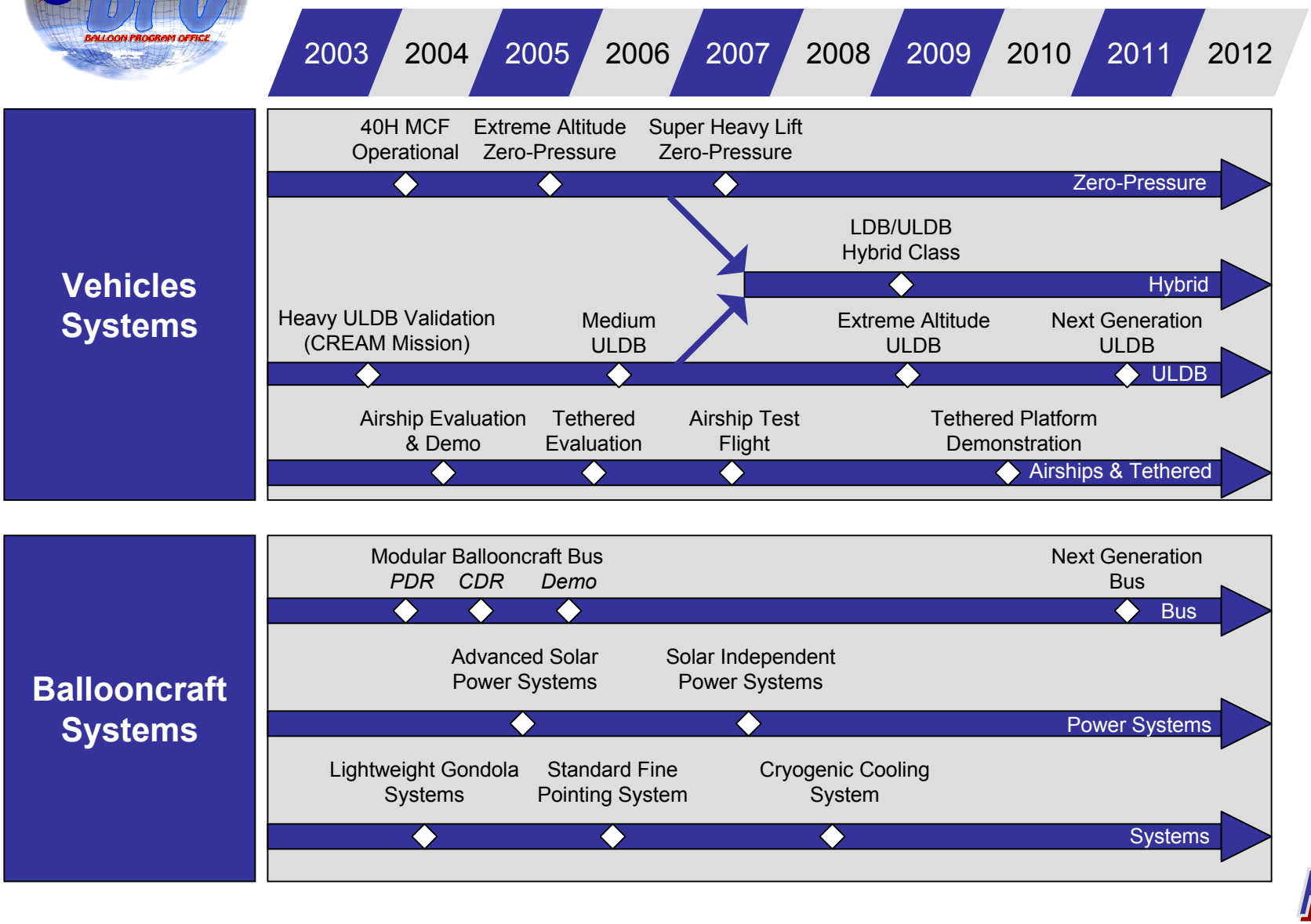
Flight Testing from Hawaii



Aerial Deployment Video



Balloon Technology Roadmap



Balloon Technology Roadmap