2017 Scientific Ballooning Technologies Workshop

NASA Super Pressure Balloon

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Two Types of Balloons

Super Pressure Balloon maintains nearly constant volume – under development
- Allows Ultra Long Duration Balloon (ULDB) Flights
- Provides stable altitude Long Duration Balloon (LDB) flights at mid-latitudes

Zero-Pressure (ZP) Balloon changes volume due to radiative input
- Used for Conventional Flights and Polar LDB Flights
Altitude Stability Comparison

Flights from Antarctica

Super Pressure

Zero Pressure

Days at Float

GPS Altitude Variation from Average Float Altitude (m)

615N BLAST, +1429 m -1910 m

61GNT Super Pressure Balloon, +212 m -182 m
Several science groups are requesting a suspended weight of 5,500 pounds on the 18.8 MCF; therefore, some future test flights will have higher suspended weights when appropriate.
Mid-Latitude Location for SPB
Wanaka, New Zealand

- Far Enough North
- Far Enough South
- Airport Location
- Geography
- Low Populations
- Stratospheric Trajectories
- Infrastructure
- Accommodations
Stratospheric Winds
• WFF Completed a Biological Evaluation and Environmental Assessment for SPB (ULDB) Program Southern Hemisphere Flight Operations covering Antarctica and New Zealand-launched SPBs.

• The Program received a Finding Of No Significant Impact and has received approval from NASA and concurrence from NOAA and NSF to proceed with Operations.

• The stratospheric anticyclone over Antarctica provides a stable balloon trajectory, once the anticyclone breaks down trajectories are highly variable.

• Increased operational area (more northern latitudes) for 2017 mission.

• In the event of ocean termination, the entire balloon system will be valve downed to the water surface and submerged.
Safety Considerations

• Trajectory Analysis Pre-Launch
• Airport Closed During Launch Operations
• Roadblocks
• Go-No Go prior to Land Mass
• Go-No Go ~ every 24 hour when over land
• Wanaka team will monitor and support flight from launch pre-ops to end of LOS
• Palestine Operations Control Center will be online at launch and take over after leaving LOS capabilities in Wanaka
• SPB team will monitor the entire flight remotely
• Palestine Operations Control Center will be manned 24 hours from launch until termination
• Science typically monitors from home institution
Launch Site: Wanaka, New Zealand
Volume: ~532,152 m$^3$ (~18,793,000 ft$^3$)
Launch Date: May 16, 2016 @ 23:35 Z
Suspended Load: 2,268 kg (5,000 lbs.)
Flight Time – 46 Days, 20 hours, 19 minutes
669 NT SPB-COSI
Launched: 16 May 2016 / 23:35:00Z
Impact: 2 July 2016 / 19:54:00 Z
Total Flight Time: 46 days, 20 hours, 19 minutes

West Altitude During Flight ~ 22 km Due to Loss of Gas During Flight.
2016 - 18.8 MCF SPB

669 NT SPB-COSI
Launched: 16 May 2016 / 23:35:00 Z
Impact: 2 July 2016 / 19:54:00 Z
Total Flight Time: 46 days, 20 hours, 19 minutes
The Balloon Performed as a Hybrid – SPB During Day – ZP at Night Later in the Mission.
Launch Site: Wanaka, New Zealand
Volume: ~532,152 m³ (~18,793,000 ft³)
Launch Date: April 24, 2017 @ 22:50 Z
Suspended Load: 2,495 kg (5,500 lbs.)
Flight Time – 12 days, 4 hours, 34 mins
Flying the Extreme Universe Space Observatory (EUSO) as a Mission of Opportunity
Note: Initially, 1200 pounds of ballast – dropped over 1100 pounds of it in drops on 4/29, 4/30, 5/1, 5/3, and 5/6
• Inflated volume = 18.8 million cubic feet
• Number of Gores = 280
• Number of Gore Width Measurements = 6,440 (23 per gore)
• Amount of Load Tape Tendon in Balloon=137,760 feet (26 miles)
• Amount of film visually inspected, re-rolled and dispensed for this balloon > 1.3 million square feet - over 30 acres of film
• Minimum amount of walking just to seal balloon = 55 miles
• Balloon shipping box 16 ft. x 6 ft. x 5.3 ft.
• Gross Weight of Balloon in Box = 8,832 pounds