

# NASA Range Safety Program 2006 Annual Report

## STATUS REPORTS WALLOPS FLIGHT FACILITY (WFF)

Wallops Flight Facility has had yet another successful year. The Sounding Rockets Program supported 20 missions including the first flight test of the autonomous flight safety system. The Balloon Program Office supported 13 successful missions while uninhabited aerial vehicle operations grew significantly. The TacSat missions demonstrated the Facility's ability to provide responsive range services. New range technologies continue to be developed and the Wallops Mission Planning Laboratory was brought on line this year.

### ***Sounding Rockets Program***

The Sounding Rockets Program had a successful year, supporting 20 missions from Wallops, White Sands Missile Range, and Hawaii. These missions supported NASA Space Science, technology development, and educational outreach experiments, and a variety of Department of Defense projects. The Program experienced a 100 percent mission success rate for the period. The Wallops Safety Office provided operational support and analysis for all these missions.

**Autonomous Flight Safety System.** Wallops conducted the first flight test of the autonomous flight safety system this year on a sounding rocket mission from White Sands Missile Range. The autonomous flight safety system is an on-board sensor and computer suite designed to assess a launch vehicle's performance against pre-programmed range safety mission rules. When rules are violated, the system sends commands to the vehicle's flight safety system to terminate flight. The White Sands Missile Range flight successfully demonstrated the autonomous flight safety system's ability to correctly determine appropriate on-board decision making. The autonomous flight safety system and Low-Cost TDRSS Transceiver have been packaged and are scheduled to fly as experiments in an upcoming SpaceX Falcon 1 flight from Kwajalein Atoll.

**Other New Technologies.** Additionally, the Sounding Rocket Program has been demonstrating other new technologies, including a computer-guided hazard avoidance landing system for use on planetary missions, a new fine pointing celestial attitude control system, and a new velocity vector tracking attitude control system for use on suborbital sciences missions. Many of these efforts are collaborative with partners at the Jet Propulsion Laboratory, Langley Research Center, and Kennedy Space Center. The Wallops Safety Office has played a key role in ensuring successful implementation of these missions.

### ***Balloon Program Office***

The Balloon Program Office at Wallops Flight Facility conducted 13 missions during 2006. Flight operations were conducted from Fort Sumner, New Mexico;

# NASA Range Safety Program 2006 Annual Report

## STATUS REPORTS WALLOPS FLIGHT FACILITY (WFF)

Palestine, Texas; Kiruna, Sweden, and McMurdo, Antarctica. The Wallops Safety Office supported the 2006 balloon flight program by providing flight safety analysis reports for operational implementation for both continental United States and foreign operations. Flights were conducted in support of Space and Earth science payloads as well as developmental test flights for new balloon design and balloon film qualification. Flight durations ranged from 6 hours to 28 days with the longest flight occurring over Antarctica. The northern hemisphere flight capability was used from Sweden-to-Canada for the second year, with science payload recovery in northern Canada.

The Balloon Program Office continued the ultra long duration balloon development with the test flight of a 6 million cubic foot test article from Kiruna, Sweden in May 2006. (See the picture at the right.)

While the flight did not result in a satisfactory inflation of the balloon, considerable data were collected for use in engineering models that will be used to develop necessary design changes.

Further flight testing of the ultra long duration balloon is planned for 2007. The ultra long duration balloon is being developed to provide extended duration flight, upwards of 60-100 days, at constant float altitudes.

### ***Uninhabited Aerial Vehicle***

Uninhabited aerial vehicle operations grew significantly during 2006. Wallops Flight Facility continued a heavy workload with the AAI Aerosonde in support of NASA science missions, including a deployment to Key West, Florida to collect data on early formation of hurricanes.

Additionally, Langley Research Center began frequent operations on the Wallops Island uninhabited aerial vehicle runway with its Global Transport Model operations.

### ***New Range Technologies***

Wallops technologists continued development and testing of numerous new range technologies that promise to improve the responsiveness and cost of launch operations. The Low-Cost TDRSS Transceiver development progressed with a successful operational flight of a 20 watt transmitter-only unit on the Air Force Minotaur I COSMIC mission in January 2006. The Low-Cost TDRSS Transceiver enables the relay of flight data to the ground without requiring line-of-sight, through use of NASA's TDRSS satellites at a small fraction of the cost of

# NASA Range Safety Program 2006 Annual Report

## STATUS REPORTS WALLOPS FLIGHT FACILITY (WFF)

existing systems. Progress continues on developing a 40 watt transmitter as well as with the development of the receiver subsystem.

Prototype hardware has also been developed for a new low-cost flight S-Band telemetry phased array antenna and beamformer. Once operational, this system promises significantly increased data rates. Testing of the initial unit is underway, and a flight test is anticipated for mid-2007. Planning is also underway for Ka and Ku-Band systems as well.

### ***TacSat***

On 16 December 2006, a Minotaur I rocket carrying the Air Force Research Laboratory's TacSat-2 satellite and NASA's GeneSat-1 microsatellite was successfully launched from Wallops Flight Facility. (See picture at right.) The TacSat-2 mission demonstrated Wallops' ability to provide responsive range service, by providing spacecraft and launch vehicle integration and launch operations within six months of the Air Force's request.

Two Minotaur 1 rockets are scheduled for launch in 2007 from Wallops carrying the near-field infrared experiment satellite in April and the TacSat-3 satellite in October. In anticipation of these missions, range and range safety personnel spent much of 2006 modernizing facilities, performing pre-mission analyses, and testing.

### ***Demonstration Missions***

Wallops personnel are also preparing for the demonstration mission of a new commercial high-performance suborbital rocket, ALV-X1 built by Alliant Techsystems. A launch site pathfinder test of the ALV-X1 verified that vehicle processing procedures and equipment were ready for live motors and flight hardware. The demonstration mission, scheduled for mid 2007, will carry two NASA hypersonics experiments sponsored by NASA's Aeronautics Research Mission Directorate. The first, HyBoLT, is a boundary layer transition experiment developed by Langley Research Center. The second, SOAREX, is an aerodynamic re-entry experiment developed by Ames Research Center. The mission has been designated HSA (HyBoLT, SOAREX, ALV-X1).

**NASA Range Safety Program  
2006 Annual Report**

**STSTUS REPORTS  
WALLOPS FLIGHT FACILITY (WFF)**

***Wallops Mission Planning Laboratory***

The Wallops Mission Planning Laboratory was brought on line this year. The Mission Planning Laboratory serves as a high fidelity range mission simulator that can be used to assess trajectories, instrumentation coverage, hazard areas, and other critical parameters in the preparation of upcoming missions. Ultimately, the Mission Planning Laboratory will work with launch vehicle hardware systems as a test bed for new technologies.