

2011

**NASA Range Safety
Annual Report**

G. Wallops Flight Facility (WFF)

Wallops Flight Facility (WFF) is NASA's principal facility for the management and implementation of suborbital science research programs. The research and responsibilities of WFF are centered on the philosophy of providing a fast, low cost, highly flexible, and safe response to meet the need of aerospace technology interests and science research. Listed below are various project/programs that the Safety Office supported in 2011.

1. Expendable Launch Vehicle Support

a. Minotaur 1 ORS-1

The U.S. Air Force Minotaur 1 rocket carrying the Department of Defense's Operationally Responsive Space office's ORS-1 satellite successfully launched from NASA's Launch Range at the Wallops Flight Facility and the Mid-Atlantic Regional Spaceport on June 29, 2011 (Figure 27). A video of the launch is available at: http://www.nasa.gov/multimedia/videogallery/index.html?collection_id=13587&media_id=98860351.

WFF Ground Safety personnel supported all ground processing of the vehicle and payload while at WFF and supported certification of the Flight Termination System (FTS). WFF Flight Safety supported on pad testing with Orbital Sciences Corporation (OSC) for validation and verification of vehicle systems, including the FTS final certification for launch. WFF provided the Range Safety Officer (RSO) along with other safety team members for the launch countdown and in-flight termination if needed.



FIGURE 27: ORS-1 LAUNCH

b. Minotaur IV TacSat-4

WFF Range Safety personnel supported the launch of a Minotaur IV rocket on September 27, 2011, from Kodiak Alaska (Figure 28). The Minotaur IV carried the TacSat-4, an experimental communications satellite for the United States Navy and Operationally Responsive Space Office. In addition to flight safety risk analysis and certification of the Flight Termination System, WFF provided on-console launch support, including the RSO for pre-launch Go/No Go decisions and in-flight termination, if needed. This mission is the second of two missions for WFF where no radar tracking sources were used by the Safety team. Instead, WFF utilized two independent GPS-based data sources from the launch vehicle. This solution was certified jointly by WFF and Vandenberg Flight Safety to meet the requirements of the NASA Range Flight Safety Program.



Taurus II (Artist Rendition)

FIGURE 30: TAURUS II

The Mid Atlantic Regional Spaceport (MARS) also continued construction of the renovated Pad 0A. Construction of the new medium-class ELV pad has been completed, along with associated liquid fueling facilities. NASA certification of the new MARS facilities is underway and initial operations from Pad 0A are expected to begin in early CY2012.

Orbital Sciences' first International Space Station (ISS) cargo carrier vehicle (Cygnus) arrived at WFF in the Fall 2011 and is being prepared for initial flights in 2012 aboard Taurus II as part of NASA's Commercial Resupply of Station (CRS) program. NASA personnel have provided both technical development support and safety certification of the Taurus II launch program, including both facility and flight hardware systems.

The Ground Safety Group has been working closely with the construction activities to ensure the operational safety of these new systems, including a new launch pad (Pad 0A), the transporter/erector/launcher (TEL) system used to transport the launch vehicle from the HIF to the pad and the liquid fueling farm, used to fuel the vehicle once erected on the Pad. Many of these systems are new to WFF, so significant effort has been put into ensuring adequate safety factors are in place, hazardous procedures and test plans are being approved and operational oversight provided during hazardous operations. These efforts will continue until all the new systems have been proven safe for operational use.

NASA Flight Safety personnel are conducting risk assessments of the test flight and first flight of the Cygnus, both planned for 2012. WFF is working closely with the FAA in meeting the needs of the commercial licensing and ensuring both WFF and FAA criteria are met.

3. Sounding Rocket Program

NASA/WFF Range Safety personnel supported 12 missions conducted by the WFF Sounding Rockets Program (SRP) in 2011. The launch manifest consisted of three technology development/demonstration missions (including the GSFC/ORS Small Rocket / Spacecraft Technology Platform (SMART) payload, two undergraduate student outreach missions, six science missions (including space physics investigations and satellite under-flight calibrations, among others), and one reimbursable mission for the DoD. Launch sites included Wallops

Island (five launches), Poker Flat Research Range (three launches), White Sands Missile Range (two launches), Andoya, Norway (one launch), and San Nicholas Island (one launch).

The Daytime DYNAMO missions 21.141 and 41.091 UE Black Brant and Terrier-Improved Orion (Figure 31) were launched from Wallops Island, VA on July 10, 2011. The purpose of this mission was to explore, for the first time, the ion-neutral coupling, wind shears, and electrodynamics of the mid-latitude lower ionosphere during the daytime. Specifically, the mission hopes to determine the cause of intense daytime irregularities that are consistently observed in the mid-latitude ionosphere during the summer.



FIGURE 31: DAYTIME DYNAMO MISSION

The Ground Safety Group provided risk assessments and safety plan documentation for all launches and supported ground processing for the launches at WFF, Poker, and Norway. Ground Safety Data Packages are provided to other US Ranges.

The Flight Safety Group provided risk assessments and safety plan documentation for the missions at WFF, Poker, and Norway. On console launch support (RSO) was provided for WFF and Poker. A WFF Range Safety Officer supported the launches at Norway to audit the Flight Safety Program at the Andoya Rocket Range, a Norwegian-owned and operated range.

4. Balloon Program Office

NASA/WFF Range Safety personnel support 16 missions conducted by the Balloon Program Office (BPO) during 2011. Flight operations were conducted from Palestine, Texas; Fort Sumner, New Mexico; McMurdo, Antarctica; Kiruna, Sweden; and Alice Springs, Australia in support of Space Science payloads as well as a test flight for a new balloon design. The Cosmic Ray Energetics and Mass (CREAM VI) experiment, launched on December 20, 2010, is investigating high-energy cosmic-ray particles that originated from distant supernovae explosions in the Milky Way (Figure 32).



FIGURE 32: CREAM VI

The BPO also conducted a test flight of a 14-million-cubic-foot balloon, the largest single-cell, fully-sealed, super-pressure structure ever flown. The Super Pressure Balloon (Figure 33) is twice the size of a similar balloon flown over Antarctica for 54 days from December 2008 to February 2009. NASA's goal is to eventually develop a 26-million cubic-foot super-pressure balloon, nearly the size of a football stadium.



FIGURE 33: SUPER PRESSURE BALLOON

The Ground Safety Group provided risk assessments, safety plan documentation, and supported ground processing at all sites. For the final campaign of the year (Antarctica 2011), the duties of overseeing ground processing was turned over to Columbia Scientific Balloon Facility (CSBF) personnel, per the WFF Operational Safety Supervisor training requirements.

The Flight Safety Group provided risk assessments and safety plan documentation for all missions. On console launch support (RSO) was provided for all missions, with the exception of Sweden. A waiver was granted for the Swedish Safety Office, which was provided training at WFF, to serve in the RSO role.

5. WFF Aircraft Office

The WFF Aircraft Office supported multiple manned airborne science missions aboard the NASA P-3 aircraft during 2011 including the Deriving Information on Surface Conditions from COlumn and VERTically Resolved Observations Relevant to Air Quality (DiscoverAQ), Operation IceBridge, ECHO 3D, and Carve. Also supported were Viking 300 UAS flights conducted on the WFF UAS runway on Wallops Island in support of the NASA UAV Technology Project.

The Ground Safety Group provided risk assessments and safety plan documentation for all missions, including any airborne hazards such as lasers. On site ground processing support was provided for the Viking 300 flights from the WFF Island runway.

The Flight Safety Group provided risk assessments, safety plan documentation and on-console support (RSO) of flight operations for the Viking 300 mission. The WFF Aviation Safety Officer (ASO) provided flight safety for manned missions.



FIGURE 34: P-3 AIRCRAFT

Wallops Flight Facility Missions 2011				
DATE	VEHICLE	ACRONYM	LOCATION	RESULT
12/6/2010	41.087 NT Terrier Improved Orion	TRaiNED (Terrain Relative Navigation and Employee Development)	White Sands Missile Range, NM	Success
12/12/2010	40.026 UE Black Brant XII	RENU (Rocket Experiment for Neutral Upwelling)	Norway	Failure*
1/22/2011	Terrier Oriole - Track-Ex		Wallops Island, VA	Success
1/28/2011	36.257 UG Black Brant IX	FIRE (Far-ultraviolet Imaging Rocket Experiment)	Poker Flat Research Range, AK	Partial**
2/5/2011	36.256 UE Black Brant IX	Polar NOx (Polar Night Nitric Oxide)	Poker Flat Research Range, AK	Partial***
3/23/2011	36.275 UE Black Brant IX	EVE (EUV Variability Experiment)	White Sands Missile Range, NM	Success
4/27/2011	36.278 GT Black Brant IX	N/A	Poker Flat Research Range, AK	Success
5/9/2011	Viking 300 UAV		Wallops Island, VA	Success
6/10/2011	41.096 GP Terrier Orion	SubTEC 5	Wallops Island, VA	Success
6/23/2011	41.095 UO Terrier Orion	RockSat/RockOn	Wallops Island, VA	Success
6/28/2011	ORS-1		Wallops Island, VA	Success
7/9/2011	21.141 GE Black Brant VB	Daytime DYNAMO	Wallops Island, VA	Success
7/9/2011	41.091 GE Terrier Orion	Daytime DYNAMO	Wallops Island, VA	Success
7/21/2011	41.092 UO Terrier Orion	RockSat-X	Wallops Island, VA	Success
9/8/2011	12.075 GT Test Rocket	N/A	Wallops Island, VA	Success
9/11/2011	Viking 300 UAV		Wallops Island, VA	Success
10/11/2011	36.225 UG Terrier Black Brant	PICTURE (Planet Imaging Concept Test bed Using a Rocket Experiment)	White Sands Missile Range, NM	
*Vehicle Failure **Experiment Failure ***Experiment Failure				

FIGURE 35: WALLOPS FLIGHT FACILITY MISSIONS 2011

Wallops Flight Facility Balloon Launches 2011			
DATE	VEHICLE	LOCATION	RESULT
12/13/2010	612N MILLAN/Dartmouth Unv	Antarctica	Success
12/17/2010	613N MILLAN/Dartmouth Unv	Antarctica	Success
12/21/2010	614N SEO/UMD	Antarctica	Partial*
12/27/2010	615N DEVLIN/Unv PENN	Antarctica	Success
1/9/2011	616NT PIERCE/WFF	Antarctica	Success
4/1/11	1596P ROBERTS/ULL	Palestine, TX	Success
4/18/11	617N RAMSEY/MSFC	Alice Springs, Australia	Success
5/27/11	618N CLEM/Univ DE	Kiruna, Sweden	Success
6/10/11	619BN CLEM/Univ DE	Kiruna, Sweden	Success
6/13/11	620N WU/NCAR	Kiruna, Sweden	Success
8/31/11	621N GUZIK/LSU	Fort Sumner, NM	Success
9/8/11	622NGUZIK/LSU	Fort Sumner, NM	Success
9/17/11	623N LUBIN/UCSB	Fort Sumner, NM	Success
9/23/11	624N McCONNELL-RYAN /UNH	Fort Sumner, NM	Success
9/23/11	625N MARGITAN/JPL	Fort Sumner, NM	Success
9/28/11	626NT FAIRBROTHER/WFF	Fort Sumner, NM	Success
*Balloon Failure / Mission Success			

FIGURE 36: WALLOPS FLIGHT FACILITY BALLOON LAUNCHES 2011