H. Wallops Flight Facility (WFF)

WFF is NASA's principal facility for the management and implementation of suborbital science research programs. The research and responsibilities of Wallops 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 2012.

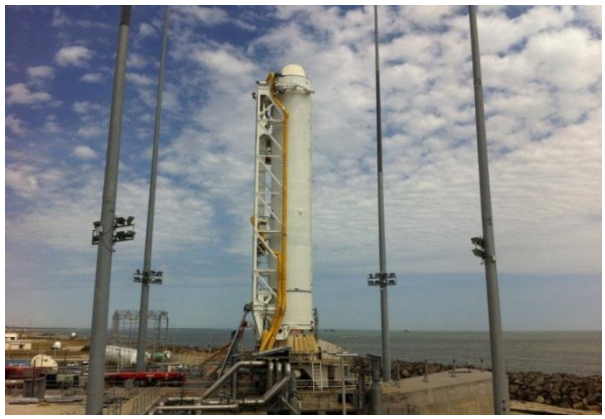

FIGURE 51: ANTARES LAUNCH VEHICLE

1. Expendable Launch Vehicle Support

WFF Safety Office continues to support the Antares Launch Vehicle (Figure 51), which involves facility construction, testing of Ground Support Equipment, and testing in support of NASA's Commercial Resupply to Station (CRS) activities. Multiple Antares pathfinders have been conducted in preparation for cold flow testing of liquid oxygen (LOX)/kerosene for first stage fueling, followed by a static hot fire from Pad 0A before eventual first launch by year's end.

2. Sounding Rocket Program Office (SRPO)

NASA/WFF Range Safety personnel supported 21 missions conducted by the WFF SRPO in 2012. The launch manifest consisted of 2 technology development/demonstration missions, 2 undergraduate student outreach missions (Rock-Sat X and Rock-On), 14 science missions, and 2 reimbursable missions for the DoD. Additionally, 1 highly visible reimbursable NASA mission was conducted for LaRC (IRVE 3 described below). Launch sites included Wallops Island (12 launches), Poker Flat Research Range (1 launch), and White Sands Missile Range (8 launches). Two of the more significant launches from WFF are discussed below.

a. Anomalous Transport Rocket Experiment (ATREX)

The ATREX missions 41.097, 41.098, 45.004, 46.002, and 46.003 (Figure 52) were launched from WFF on March 27, 2012. ATREX involved launching 5 rockets in approximately 5 minutes to obtain measurements of the turbulent fluctuations over an extended horizontal range of 550km. The purpose of the experiment was to gather information needed to better understand the process responsible for the high-altitude jet stream located between 95km and 105km (60 and 65 miles) above the surface of the earth. The winds found in that region typically have speeds of 225 to 335 miles per hour and create rapid transport from mid-latitudes

FIGURE 52: ATREX MISSION PRELAUNCH TESTING

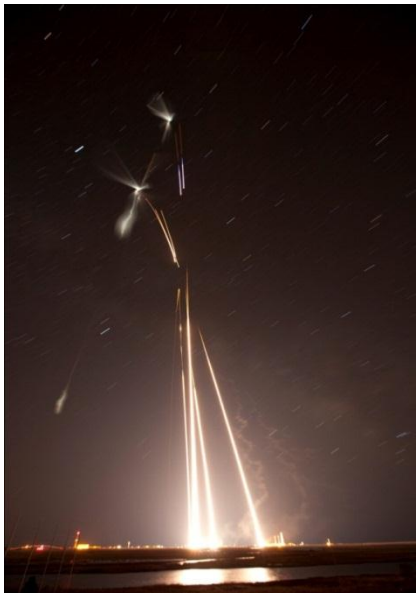

FIGURE 53: ATREX TIME-LAPSE

to polar regions. The winds were discovered in the last 10 years and are still very poorly understood although it is known that they have a significant impact on the formation and severity of so called “space storms” which disrupt the normally stable ionosphere. ATREX was a challenging mission to execute in terms of the operational planning; the resources required both in terms of hardware and personnel, and the complexity of the Safety operational support.

b. Inflatable Re-entry Vehicle Experiment (IRVE 3)

The third launch in the series of IRVE 3 was launched on July 23, 2012 from WFF aboard a Talos, Terrier, Black Brant three-stage Sounding Rocket (mission 39.011). LaRC was the lead NASA Center for designing and testing the IRVE 3 payload. IRVE 3 is the study and test of inflatable (as opposed to the more familiar rigid) aeroshell technology for deceleration purposes. Current rigid aeroshell capabilities limit landing options and complicate packaging of payloads, especially for some proposed payloads which are larger in size and mass. Inflatable aeroshells provide advantages in both the stowed and inflated configuration, including allowing access to payload after launch vehicle integration, minimizing volume requirement during launch, beginning deceleration at higher altitudes, lower heat flux during reentry, and delivery of more mass to the surface.

3. Balloon Program Office (BPO)

NASA/WFF Range Safety personnel supported nine missions conducted by the BPO during 2012. Flight operations were conducted from Fort Sumner, New Mexico; McMurdo, Antarctica; and Kiruna, Sweden in support of Space Science payloads as well as a test flight for a new balloon design. The Stratospheric Terahertz Observatory (STO) experiment, launched on December 25, 2011, is investigating the life cycle of the galactic interstellar gas and the parameters that affect star formation in the galaxy (Figure 54).

The BPO also conducted a deployment test flight of an 18.8-million-cubic-foot balloon, the largest single-cell, fully-sealed, super-pressure structure ever flown from Kiruna, Sweden.

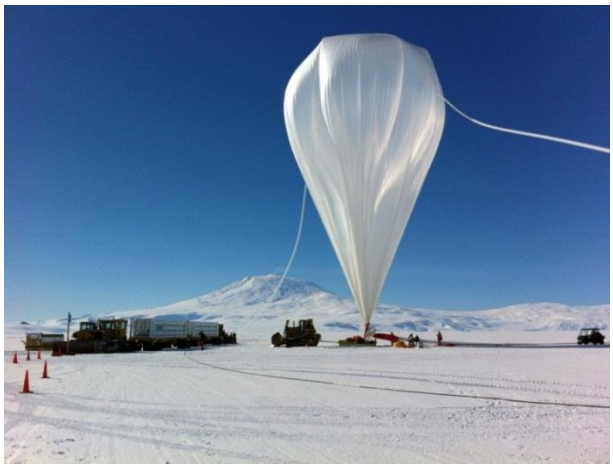

FIGURE 54: STRATOSPHERIC TERAHERTZ OBSERVATORY (STO) LAUNCH

This super pressure balloon (Figure 55) is a larger scale version of a similar balloon flown over Antarctica for 22 days from January to February 2010. The next developmental step will be additional flights of the 18.8-million-cubic-foot balloon to qualify this balloon for science flights. Further plans include a larger ~26-million cubic-foot super-pressure balloon, nearly the

size of a football stadium, that will fly at a slightly higher altitude. NASA's goal is to provide circum-global science flights at mid-latitudes for over 100 days.

FIGURE 55: SUPER PRESSURE BALLOON