Research Range Services

2010
Annual Report

National Aeronautics and Space Administration
Goddard Space Flight Center

Wallops Flight Facility

This Research Range Services Annual Report is dedicated to Dr. John Campbell who retired as the sixth director of NASA Wallops Flight Facility Dec. 31, 2009. Taking the helm in January 2002 leading Wallops and the Goddard Space Flight Center's Sub-Orbital and Special Orbital Directorate, Dr. Campbell led the facility through a period of unprecedented growth and recognition of its capabilities. In his eight years at Wallops, Dr. Campbell led the growth of the testing of unmanned vehicle systems; an upgrade of the facilities infrastructure; a resurgence of its sub-orbital sounding rocket and scientific balloon programs; a return of Wallops as the agency's premiere site for sub-orbital technology development and testing; a resurgence in orbital missions from the Wallops Launch Range; and the development of the Wallops Research Park.

Dr. Campbell began his career with NASA in 1987 at the Goddard Space Flight Center, Greenbelt, MD, as a systems engineering manager. During his career at Goddard he held several leadership positions including key roles in the first three servicing missions for the Hubble Space Telescope.

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Wallops Research Range Services
…Cornerstone of Excellence for Services Critical to the Success of Range Operations

Wallops Island, Virginia, is where many Research Range Services assets are located.

Executive Summary

Personal commitment to excellence upholds a rich tradition at NASA's Wallops Flight Facility (WFF) that started in 1945 with the firing of the first rocket from the Virginia shoreline. Whether it's the skies above WFF or locations around the globe to include Alaska, Norway, and many other stops, the Research Range Services (RRS) team of professionals routinely lights up the sky with magnificent launches of a vast array of spacecraft. This past year, RRS Program personnel worked countless hours to ensure mission success for scores of operations and to build a Range infrastructure capable of launching a new class of rocket that will take critical supplies to the International Space Station.

It is important to point out that while WFF is involved in creating future space range architectures for the nation, it is currently a first rate, state-of-the-art facility known for its adaptability, flexibility and responsiveness to meet a variety of customer launch requirements and varied schedules. Our moniker is "We'll Get You There" to "Enable Worldwide Research" — whether the platform is an unmanned aerial vehicle, sounding rocket, expendable vehicle, or other type of vehicle. For any type of launch, RRS provides exceptional support systems and services to include: radar and optical tracking, telemetry, command, meteorological data, post-launch data processing, program management, and a host of other services to enable scientific research.

Defining how the Research Range works is simple. A lot of interrelated, highly complex activities have to happen in a specific order and in a short period of time. Fortunately, due to the extraordinary experience, knowledge and dedication of our entire launch team, we are ready today and will continue to be ready, willing and able to rapidly and positively respond to changing customer requirements or deviations in launch schedule with a "can do" attitude and a total commitment to safety and mission success.

Demonstrating remarkable skills, unsurpassed professionalism, and customer friendly flexibility, the Research Range's team of civil servants, contract employees and interns provide an atmosphere where our customers can get responsive, low-cost access to space whether it's within the earth's atmosphere or beyond. The Range's ability to maximize asset utilization while accommodating diverse customer launch requirements demonstrates exemplary resiliency and unique skills mimicked by few and envied by many.

In summary, RRS continues to enable worldwide research through our premiere Range engineering and operations services team and looks forward to continuing our world-class support to all of our customers in 2011.

Thomas J. "Jay" Pittman
Goddard Space Flight Center
Commander, Wallops Research Range

Range Instrumentation Radar 706 is a precision tracking radar which provides time, space and position information during rocket launches and other missions at Wallops Research Range.

A New Year with a New Partner

This year, a monumental change took place within the Research Range Services (RRS) program. For more than 15 years, services that supported RRS requirements were provided under a large contract primarily focused on NASA's Space Network and Ground Network functions. Due to the large size of the past contract, it was difficult for RRS to focus on range improvements and maintain responsiveness to its customers. Therefore, in 2009, with the approval of the RRS Program's Heliophysics Division leadership, the Range Operations Contract (ROC) procurement process started. The process involved meetings at NASA Headquarters to develop a procurement strategy and at Goddard Space Flight Center for legal and acquisition strategy meetings. The full and open competition solicitation was released in early 2009 and in mid-2009 nine acceptable proposals were received.

A team of operations, engineering, procurement, and management experts made up the Source Evaluation Board (SEB). After an intense period of evaluating more than 15,000 pages of material covering nine offeror's technical approach, cost and past performance, the SEB was ready to present their findings to the ROC Source Selection Official at Goddard Space Flight Center in Maryland.

On June 22, 2010, the Range Operations Contract was awarded to LJT and Associates, Inc., a small business headquartered in Columbia, Maryland. A 60-day phase-in period started June 27, 2010, for the newly-selected ROC contractor in conjunction with the RRS team. During this period, LJT personnel worked side-by-side with the RRS team to start implementation of new business and management processes, hire a staff of more than 100 uniquely qualified employees, and prepare themselves for contract start on August 27, 2010.

Since that date, the RRS/ROC team has performed flawlessly in meeting the demands of the RRS Program's challenging mission and is on the precipice of perhaps the most challenging 12 months of range services requirements ever experienced at Wallops Flight Facility. In this short time period, ROC personnel will deploy to locations such as Antarctica, Alaska, and Norway to support existing RRS Program customer requirements. While they are supporting this worldwide need, the Wallops Launch Range will transform itself into the nation's newest medium-class expendable launch vehicle spaceport. In addition, they will conduct numerous tests as a precursor to the early 2012 launch of Orbital Sciences Corporation's Taurus II launch vehicle destined to perform resupply missions to the International Space Station after the Space Shuttle is retired.

Looking back at the accomplishments of 2009 and 2010, it is evident the team assembled to tackle the most challenging twelve months in Wallops Flight Facility history is up to the challenge. We are well positioned to tackle the challenges that will follow in 2011 and beyond.

Wallops Flight Facility's fully operational airport contains two 8,000-foot runways, an air traffic control tower and is also the location of the Range Control Center.

Introduction

This year, Research Range Services (RRS) professionals continued their long-standing tradition of delivering consistently superior support. RRS supports a variety of customers ranging from NASA's mission directorates, to other United States Government agencies, colleges and universities, civilian corporations and the worldwide scientific community by providing tracking, telemetry, meteorological, optical, command and control and range operations services for Wallops Flight Facility (WFF), Poker Flat Research Range near Fairbanks, Alaska, and other remote locations around the globe. The RRS program's dedicated, experienced, and highly skilled engineers and technicians assured error free, safe Range operations for real-time capture and display of mission-specific flight, payload and science data for a myriad of flight vehicles including orbital and sub-orbital rockets, manned and unmanned aircraft, satellites, the Space Shuttle and research balloons.

Systems and capabilities under the auspices of the RRS Program include:

- A fully equipped, state-of-the-art Range Control Center with a full compliment of command and control equipment as well as an extensive bank of monitors to provide real-time display of all flight events
- An aeronautical research airport
- Fixed and mobile radar systems for tracking launch vehicles, satellites and aircraft
- Fixed and mobile telemetry systems to collect state-of-health and science experiment data
- Fixed and mobile optical and television systems
- Ground–based and aerial video and photography, professional archiving and printing, and post-production services
- Fixed and mobile Range Safety systems to facilitate and ensure flight safety
- A comprehensive suite of meteorological instrumentation, radars and weather balloons used in collecting atmospheric measurements to provide real-time weather forecasts
- Radio Frequency spectrum allocation management and coordination
- Master station time equipment to synchronize Range activities and data

The RRS program also offers world class sustaining engineering and project management services to underwrite WFF's widely recognized status as a flexible, full service, customer friendly Range. RRS engineers and technicians routinely establish and verify instrumentation metrics, adapt Range instrumentation and optics to unique customer requirements, assist in performing root cause analyses, implement minor to moderate system upgrades, and perform link analysis calculations to ensure adequate radar, telemetry, and command support for a myriad of challenging missions. RRS engineers are also involved in Range technology development to support advanced mission planning systems and space-based Range architectures.

This Fiscal Year 2010 Annual Report highlights and spotlights the projects that continued our long track record of successfully, safely, efficiently, and professionally enabling research worldwide and of which we, the RRS team, are most proud.

Range Instrumentation Radar 716 is a mobile system often deployed to Poker Flat Research Range near Fairbanks, Alaska, to support sounding rocket campaigns.

A Team of Teams

- Program Management
- Range Control
- Risk Management
- Systems Engineering
- Hardware Engineering
- Software Engineering
- Technology Development
- Configuration Management
- Financial Management
- Radar
- Telecommunications
- Command and Control
- Optical
- Meteorological
- Logistics

Sending multi-million dollar space vehicles screaming into the Earth's atmosphere at hypersonic speeds, conducting data gathering missions with unmanned aerial vehicles, and providing world class test support to other government and civilian agencies are all core competencies of Wallops Flight Facility (WFF). Each operation requires a total commitment to excellence.

Program Management Overview

Directorate: Science Mission Directorate
Division: Heliophysics
Program Executive: Ms. Cheryl Yuhas
Program Manager: Mr. Thomas J. "Jay" Pittman
Lead Center: Goddard Space Flight Center
Performing Facility: Wallops Flight Facility
Program Type: Research Range Services

The Research Range Services (RRS) program has a deep bench of highly experienced Range Service Managers at the ready to build, coordinate, and manage cohesive teams to tap the minds of engineers and involve the expertise of technicians, the know-how of scientists, and the watchful eye of safety to create a user-friendly environment to facilitate collecting and processing scientific information to enhance our understanding of the Universe.

At Wallops, effective management and integration of all aspects of mission support are where the rubber meets the road. In 2010, RRS Range Service Managers were responsible for Range instrumentation support such as radar tracking, telemetry, command, optical, meteorological, and data processing for NASA orbital and sub-orbital programs, and programs for other government and civilian agencies. Range Service Managers assured 100% success for a multitude of programs executed at WFF while simultaneously managing remote campaigns in Alaska and Norway and downrange tracking/command sites. Highly skilled RRS Range Service Managers leave no stone unturned to:

- Ensure total success in meeting our customer's requirements through risk assessment and mitigation, comprehensive operator certification, configuration management, pre-mission testing, proven operating procedures, and post-mission support.
- Assure a "green range" for all missions through effective corrective and preventive maintenance for all WFF facilities and equipment.
- Creatively use state-of-the-art engineering expertise and technology advancements to meet new mission requirements, improve Range safety, reduce operational costs and replace obsolete equipment.
- Provide expertise and management skills to oversee the technical performance of contract services including setting mission priorities, ensuring sufficient staffing levels, identifying and prioritizing engineering upgrades and overseeing efforts between NASA engineering and contractor personnel.

From the initial dreams of a principal investigator through the completion of data analysis, the RRS project manager is the glue that bonds the talents and efforts of the extended team of professionals needed to ensure successful completion of every mission. RRS project managers take a back seat to no one; their vision, technical expertise and management skills are truly world class.

Research Range Services Assets: $231.7 million

Telemetry Systems	Per Unit	Quantity	Total ($M)
7.3-Meter Fixed Antenna	$1.5	2	$3.0
7-Meter Mobile Antenna	$1.5	2	$3.0
Mobile Telemetry Van	$1.5	1	$1.5
20-Foot Mobile System	$2.0	1	$2.0
Mobile Super Van	$2.5	1	$2.5
10-Foot Mobile Antenna	$0.5	1	$0.5
8-Foot System	$0.4	2	$0.8
8-Foot Mobile Antenna	$0.4	1	$0.4
8-Meter Antenna	$2.5	2	$5.0
16-Foot System	$0.5	1	$0.5
9-Meter Redstone	$6.0	1	$6.0
9-Meter System	$4.0	1	$4.0

Atmospheric Radars	Per Unit	Quantity	Total
Space Range Radar	$20.0	1	$20.0
Ultra High Frequency (UHF)	$18.0	1	$18.0
S-band Weather (Tropical Ocean Global Atmosphere)	$5.0	1	$5.0
NASA Polarimetric (NPOL)	$5.0	1	$5.0

Tracking Radars	Per Unit	Quantity	Total
Range Instrumentation Radar — 778C	$6.0	4	$24.0
Range Instrumentation Radar — 716	$7.0	2	$14.0
Range Instrumentation Radar — 706	$70.0	1	$70.0

Surveillance Radars	Per Unit	Quantity	Total
Airport Surveillance Radar	$10.0	1	$10.0
Sea Surveillance	$1.0	1	$1.0
Pathfinder	$0.7	2	$1.4
Active Protective System	$2.5	1	$2.5

Command & Support Systems	Per Unit	Quantity	Total
Fixed UHF Command System	$4.0	1	$4.0
Mobile Command System	$1.4	1	$1.4
Mobile Range Control System	$2.1	1	$2.1
Radio Frequency Communication	$3.0	1	$3.0
Timing System	$0.8	1	$0.8
Video and Optical Systems	$10.0	1	$10.0
Mobile Power Systems	$0.3	4	$1.2

Range Control	Per Unit	Quantity	Total
Range Control Center	$10.0	1	$10.0

The Research Range Services (RRS) program's customer base spans all four of NASA's mission directorates: Science, Space Operations, Aeronautics Research and Exploration Systems. The RRS program continues a long tradition of providing world-class support to NASA's Sounding Rocket, Space Shuttle and Unmanned Aircraft Systems programs using fixed and mobile range assets at Wallops Flight Facility (WFF) and remote locations worldwide.

The RRS program also supports DoD and civil agency missions by working with a diverse group of customers including, but not limited to, the U.S. Navy, the U.S. Air Force, the Missile Defense Agency, the National Weather Service, and the National Oceanic and Atmospheric Administration.

This year, RRS supported missions spanning a multitude of objectives that included four Shuttle launches, unmanned aerial vehicle flights, and multiple sounding rocket missions around the globe. One particular operation showcased the Range's flexibility when Gulfstream Corporation selected WFF to conduct water ingestion testing on their new G650 aircraft. Data captured using the RRS program's unique capabilities provided Gulfstream critically important information necessary to analyze their new aircraft's ability to land and take off in wet runway conditions. The successful application of WFF's capabilities and the RRS program's adaptability to a wide variety of data capture challenges to support a customer's unique requirements is a prime example of the resources offered by WFF and the RRS program to the civilian community.

Since 2009, the RRS program, under the auspices of the Range and Mission Management Office, has been a key member of the Range Commander's Council (RCC). The RCC provides a framework wherein common needs are identified and common solutions are sought. The Council is dedicated to serving the technical and operational needs of 23 U.S. test, training and operational ranges by ensuring that technical standards are established and disseminated, joint procurement opportunities are explored, technical and equipment exchanges are facilitated, and advanced concepts and technical innovations are assessed.

For more information on Wallops Flight Facility's Research Range Services Program, contact Steve Kremer at (757) 824-1114 or at Steven.Kremer@nasa.gov.

Research Range Missions

Mission	Launches	Date
Ares I-X Test Flight	1	Oct. 28, 2009
STS 129 Shuttle	1	Nov. 16, 2009
Mesquito Sounding Rocket	1	Dec. 16, 2009
STS 130 Shuttle	1	Feb. 8, 2010
TMA Ampoules Sounding Rocket	1	Feb. 9, 2010
CHARM 2 Sounding Rocket	1	Feb. 15, 2010
Terrier MK70-Improved Malemute Sounding Rocket	1	Mar. 27, 2010
STS 131 Shuttle	1	Apr. 5, 2010
STS 132 Shuttle	1	May 14, 2010
RockOn! III Sounding Rocket	1	Jun. 24, 2010
Viking 300 NASA UAV Tech Flights	6	Aug. 3 to Sept. 10, 2010
Nikha MOD II Sounding Rocket Test Flight	1	Aug. 4, 2010
SubTEC III Sounding Rocket	1	Sept. 21, 2010
Water Ingestion	1	Oct. 2, 2010

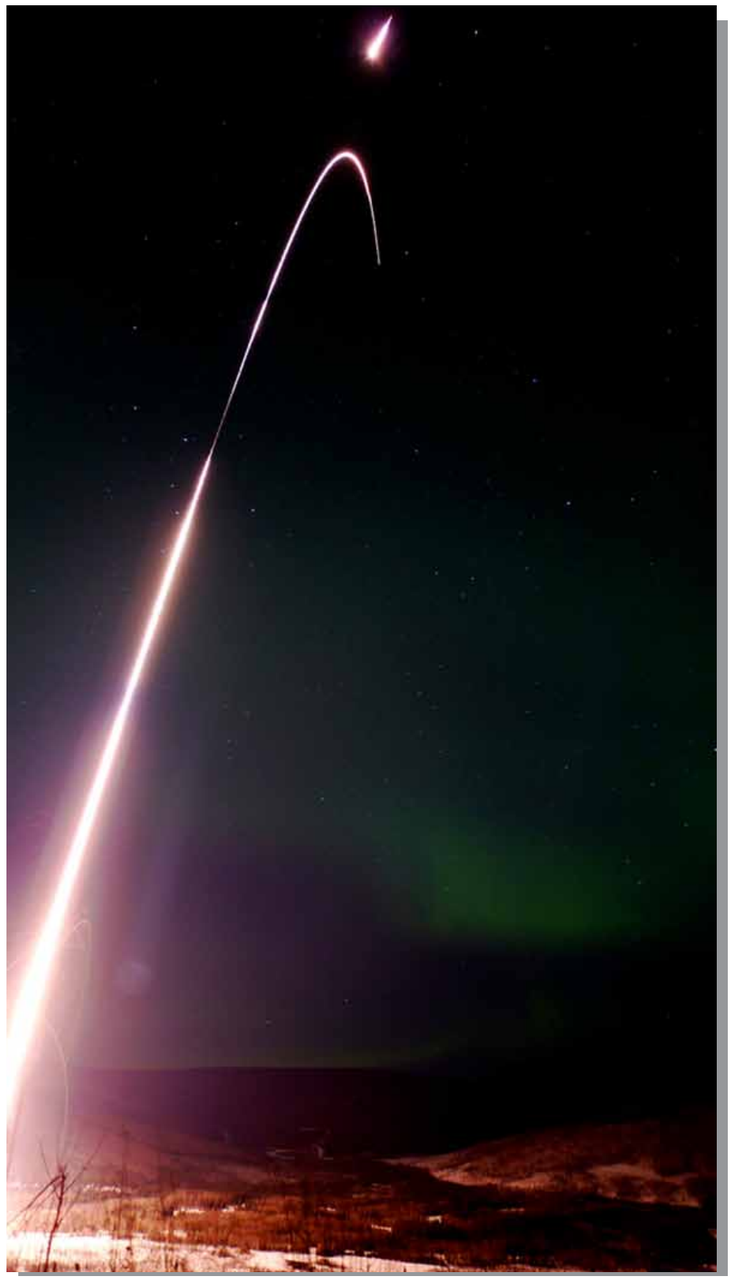
The Range Control Center is the heartbeat of all operations conducted at the Launch Range. From this location, Research Range Services personnel direct all support duties for the operation that includes project management, surveillance, meteorological, and other support duties.

2010 Poker Flat Research Range Sounding Rocket Campaign

Research Range Services (RRS) played a key role in two Science Mission Directorate missions by deploying Range systems and personnel to the University of Alaska Geophysical Institute's Poker Flat Research Range near Fairbanks, Alaska, for launch of the CHARM II and TMA payloads in February 2010. RRS personnel deployed in advance to prepare for the mission and were faced with the cold Alaska winter with temperatures reaching -50° F. The RRS team travelled daily an hour north from Fairbanks to the Range over snow-packed roads and across mountain ranges to prepare for the launch by continuously testing and monitoring Range systems while awaiting acceptable science conditions. If acceptable science conditions didn't materialize, the RRS team shut down for the evening and travelled back to Fairbanks.

The RRS team was deployed for eight weeks awaiting conditions meeting specific scientific criteria. In the end, both missions were successfully launched, meeting all scientific and mission objectives despite the considerable challenges presented by the environment.

RRS engineers implemented a new Range slaving system at Poker Flat to operate in parallel as part of a continuous program of modernization for these missions. This new system utilizes an network infrastructure to distribute vehicle position data to tracking radar and telemetry antennas. An X-band telemetry demonstration was also implemented in parallel for the CHARM II mission.



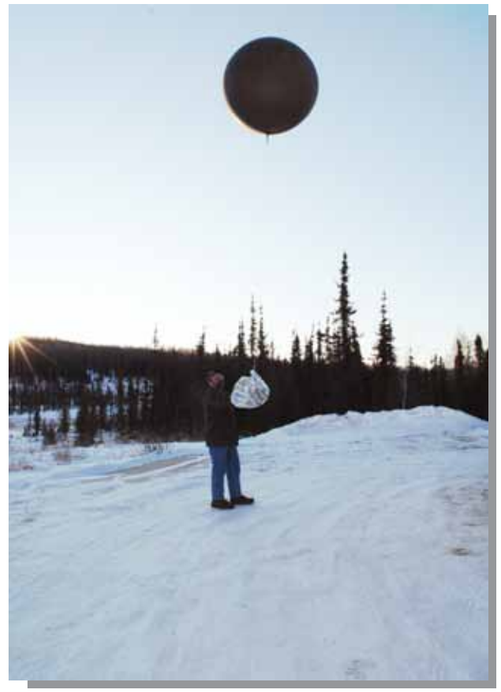
The second stage of the CHARM II sounding rocket ignites as the first stage burns out and starts to fall back to earth during a sounding rocket mission in Poker Flat Research Range.

We're Working On...

Research Range Services (RRS) continues to implement new technologies to meet the ever increasing demand for higher data rates from sub-orbital missions. In February 2010, the CHARM II (Correlations of High Frequencies and Auroral Roar Measurements) payload was launched from Poker Flat Research Range in Alaska with a demonstration X-band telemetry system on board. RRS, in partnership with NASA's Sounding Rocket Program and NASA's Applied Engineering Technology Directorate, developed, integrated, and tested the X-band flight hardware system and ground systems to receive a high data rate telemetry signal. This X-band link increased data rates by 10 times over current S-band link capabilities. The mission was a success and the data collected on X-band proved invaluable for future high data rate missions. The next mission that will demonstrate progression to high data rata telemetry is a Sub-Orbital Technology (SubTEC IV) flight scheduled for 2011 at Wallops Flight Facility (WFF). An X-band upgrade to the WFF eight-meter antenna is being evaluated to support the SubTEC IV mission. This flight will increase the date rate again and utilize a new encoding scheme to improve the quality of the data.

"The X-band telemetry system functioned impressively well for a first flight... (researchers are) enthusiastic about this new high bandwidth telemetry and will be interested in having it on future flights for which science warrants it."

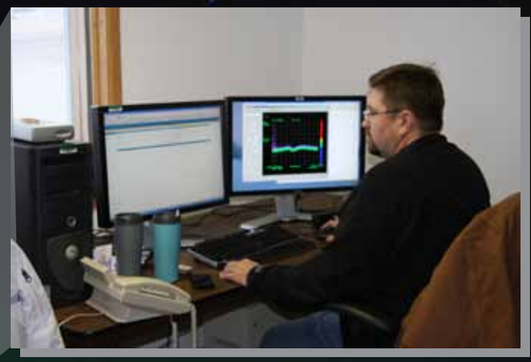
— Dr. Jim LaBelle
Department of Physics and Astronomy,
Dartmouth College
Principal Investigator, CHARM II Mission



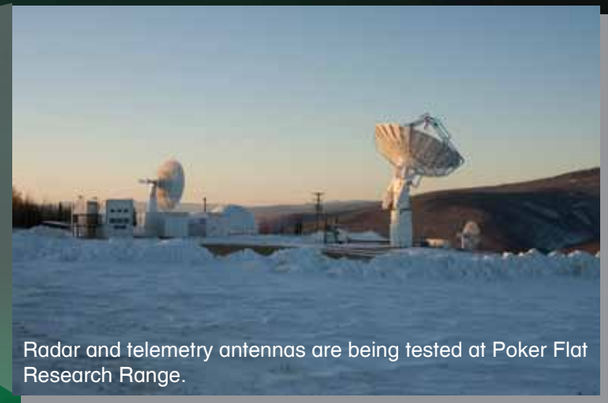
Brian Cunningham, Research Range Services meteorological technician, releases a weather balloon before launch of the missions from Poker Flat Research Range near Fairbanks Alaska.

Ron Perry, Research Range Services telemetry technician, records data as it's being transmitted from a sounding rocket mission at Poker Flat Research Range.

Bob Ross, Research Range Services telemetry technician, conducts patch updates to correctly configure telemetry recorders during a sounding rocket mission at Poker Flat Research Range.



Don Penney, Research Range Services telecommunications supervisor, analyzes his team's telemetry configuration just before launch operations at Poker Flat Research Range.



Radar and telemetry antennas are being tested at Poker Flat Research Range.

A 20-foot telemetry dish is tested at Poker Flat Research Range near Fairbanks, Alaska.

We're Working On...

The Poker Flat Research Range (PFRR) added a Mission Operations Voice Enhancement (MOVE) subsystem to benefit Research Range Services, the Sounding Rocket Program and the University of Alaska. NASA is providing a state-of-the-art system complete with parts, maintenance, systems spares, test, and transition equipment and a voice recorder. The Range is procuring 41 MOVE keysets that will interface to MOVE via Voice Over Internet Protocol (VoIP). In order to integrate VoIP keysets, fiber-optic cabling has been extended to required buildings; and an IP network infrastructure will be deployed to accommodate operational radar, wind-weighting, and telemetry data as well as keyset connections. The MOVE switch will integrate with air-to-ground radios, campus telephones, the paging system, and public radio, to provide all existing capabilities, but with a more robust and reliable system that will benefit the University of Alaska as well as the Sounding Rocket Program.

SubTEC III

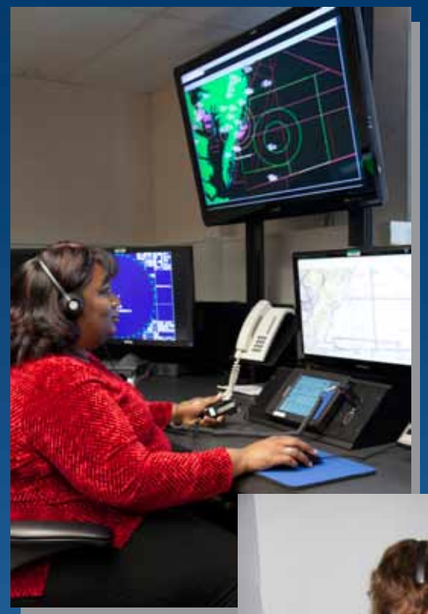
The SubTEC III sounding rocket carried the Autonomous Flight Safety System (AFSS), two secondary payloads operated by the Federal Aviation Administration, and a combination of seven Sounding Rocket Program experiments.

NASA's AFSS experiment consisted of an Inertial Measurement Unit, a GPS antenna/receiver, redundant flight processors, battery power, ordnance simulator, and a Low-Cost Telemetry Transceiver. In the event of a mission rule violation during the flight, the AFSS would autonomously generate a Flight Termination System destruct command. The AFSS performance in flight is monitored on the ground by having the AFSS transmit telemetry of its navigation data and mission rule evaluation status from launch to apogee. The telemetry paths included a direct telemetry path to Research Range Services (RRS) ground antennas and a separate telemetry path back to Wallops Flight Facility through the Tracking and Data Relay Satellite System.

The RRS program provided project management, scheduling, telemetry, timing, communications, frequency monitoring, command uplink, radar tracking, surveillance, data processing, webcasting, air traffic control, weather forecasting, optical tracking, photo/video, and post-production services. Range instrumentation provided critical flight performance data for the AFSS and validated system functionality when faced with pre-planned flight termination decision points.

We're Working On...

The backbone of Research Range Services (RRS) weather forecasting support remains the Leading Environmental and Display System (LEADS). This system provides computer model data, satellite, weather radar data, as well as forecast and observations throughout the U.S. Wallops National Weather Service (NWS) data is incorporated into LEADS and is part of the national data base. On-going upgrades to the system have kept RRS on the cutting edge of weather technology, and the latest software build that is scheduled in the next six months will be able to handle the new NWS high resolution level 3 radar data that will soon be available. Other LEADS upgrades being worked prior to Taurus II include integration of portable weather station data, meteorological tower data and lightning detection data into LEADs for display on a composite, "one-stop-shopping" weather chart that will be extremely valuable in the go/no-go decision making process.



Many different Research Range Services talents are required to conduct operations at the Launch Range. Sharone Corbin (left) provides optical support and serves as the Range's archivist while Carla Cunningham (right) serves as a systems engineer responsible for designing solutions to supply the Range Control Center with scores of video sources. In the background, the SubTEC III vehicle soars above the Launch Range.

Mesquito

One of the main elements that makes rocketry so fascinating is pure speed. Rockets can leave a launch pad and reach thousands of miles per hour very quickly leaving a beautiful contrail which becomes the only visible evidence that a launch just occurred. This two-stage sounding rocket known as the Mesquito put Research Range Services (RRS) personnel in a challenging position due to its excessive speed. This relatively small sounding rocket took flight December 16, 2009, and came off the rail at such a pace that RRS technicians had to reevaluate normal tracking configurations to ensure proper data collection.

Mesquito's extreme speed made photography a challenge during the December 2009 launch. However, RRS optical technicians were able to capture the early morning launch.

Radar, telemetry and optical teams analyzed their systems and made adjustments to successfully track this challenging vehicle. The Mesquito vehicle was designed to determine the feasibility of using modified military M-26 motors as launch vehicles for mesospheric research, develop sub-systems to support scientific research instrumentation, and promote the infrastructure required to support high launch rates required for temporal studies of the mesosphere.

Other RRS provided services were meteorological, frequency monitoring, project management and communications support.

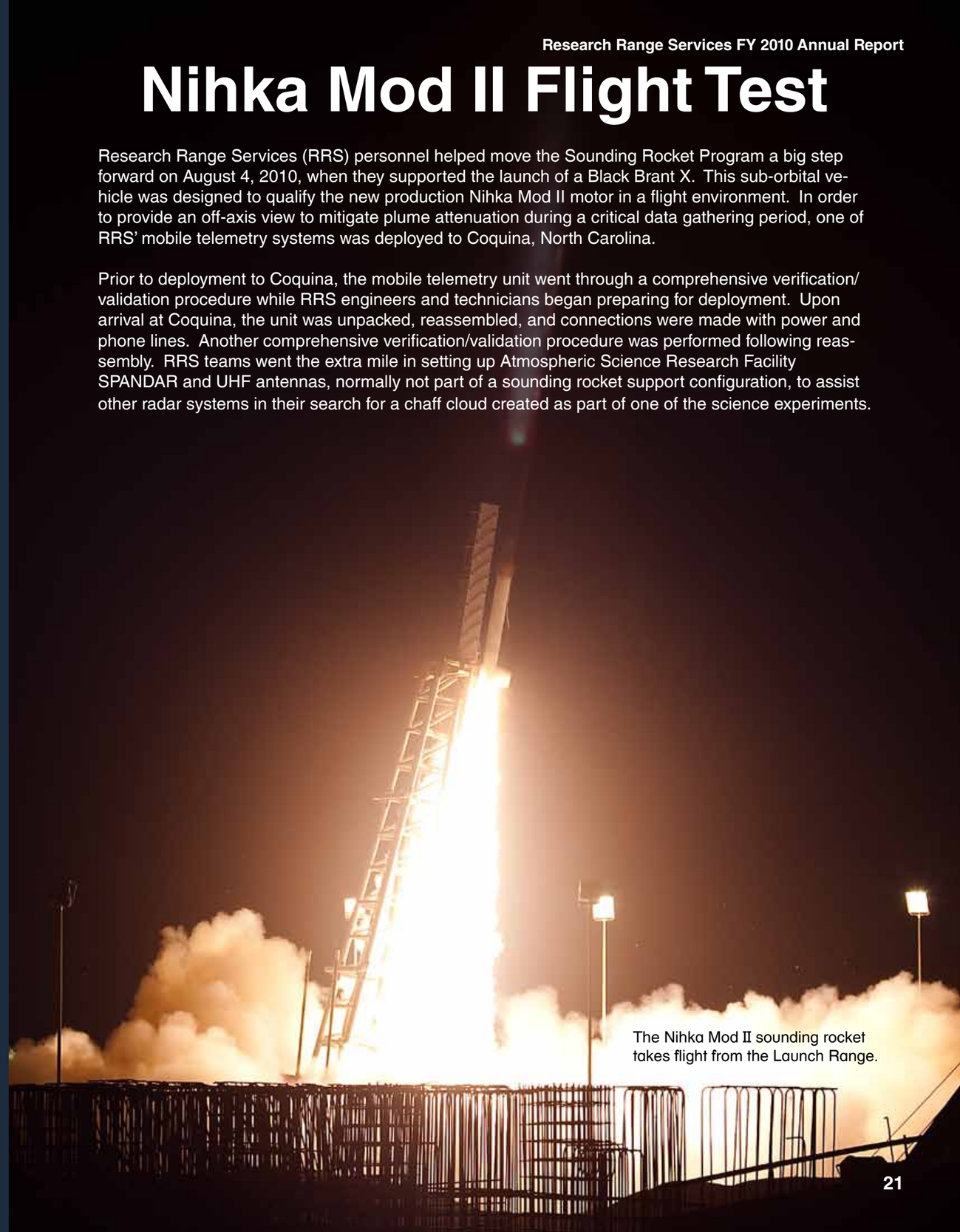
We're Working On...

This year, the Instrumentation Radar Support Program serviced C- and X-band radars managed by the Research Range Services (RRS) program at Wallops Flight Facility. In particular, a depot-level maintenance team performed multiple upgrades on Mobile Radar 11 which will ensure the system will be fully mission capable with minimal downtime for future launch campaigns.

Nihka Mod II Flight Test

Research Range Services (RRS) personnel helped move the Sounding Rocket Program a big step forward on August 4, 2010, when they supported the launch of a Black Brant X. This sub-orbital vehicle was designed to qualify the new production Nihka Mod II motor in a flight environment. In order to provide an off-axis view to mitigate plume attenuation during a critical data gathering period, one of RRS' mobile telemetry systems was deployed to Coquina, North Carolina.

Prior to deployment to Coquina, the mobile telemetry unit went through a comprehensive verification/validation procedure while RRS engineers and technicians began preparing for deployment. Upon arrival at Coquina, the unit was unpacked, reassembled, and connections were made with power and phone lines. Another comprehensive verification/validation procedure was performed following reassembly. RRS teams went the extra mile in setting up Atmospheric Science Research Facility SPANDAR and UHF antennas, normally not part of a sounding rocket support configuration, to assist other radar systems in their search for a chaff cloud created as part of one of the science experiments.



The Nihka Mod II sounding rocket takes flight from the Launch Range.

RockOn!

As part of NASA's support of university research and education programs, the Wallops Research Range Services (RRS) supported the third hands-on, university level rocket flight workshop known as "RockOn!". The mission included five RockOn! workshop experiments and RockSat-C experiments from the University of Northern Colorado, Colorado State University College of Engineering, Temple University, the University of Louisiana at Lafayette, University of Colorado at Boulder, University of Minnesota, West Virginia University, University of Puerto Rico, University of Wyoming, Virginia Tech, and College of Menominee Nation.

The primary objective of the RockOn! workshop is to provide university undergraduate level students and instructors a space flight opportunity that involves minimal cost, minimal amount of time invested, and a relative low level of complexity. The RockOn! workshop is intended to be an introductory flight opportunity to provide exposure to and spark interest in space-based science missions. The long-term goal of this program is to provide a low-cost, subsidized, self-sustaining, annual training program for the university community. The first-time participants fly the simpler kit experiments known as the RockSat-W experiments; as they gain more experience, they progress toward developing their own unique experiments know as the RockSat-C class experiments.

RRS supplied Range Control Center support, Weather Office forecasting, tracking radars, high-speed cameras, Range timing, and surveillance to ensure a safe launch, and payload recovery coordination. The RRS team used this launch opportunity to test various camera systems including a new camera-based dynamic range extension to correct normally overexposed areas of the image caused by the rocket booster flame at lift-off, a new tracking camera being tested in an engineering test mode, and cinema cameras used for a sounding rocket launch for the first time.

RRS instrumentation supplied the precise location of the splash point of the payload and the RRS Recovery Director vectored the recovery vessel to the payload's location.

This Terrier MK12-Improved Orion sounding rocket is fixed to Pad 2's MRL launcher during horizontal checks at the Launch Range.

We're Working On...

As Wallops Flight Facility continues to grow in stature as one of the nation's leading launch ranges, the RRS program executes an ongoing evaluation of all areas of Range services to determine where upgrades may be required to maintain its current state-of-the-art capabilities. For example, with the upcoming Taurus II missions — and future missions destined to reach the Moon's surface — imaging, distribution and storage of video data is becoming even more critical to overall mission success. Currently, the capability of the Range to collect, distribute, record and archive video data is under evaluation with several key areas already identified for upgrade.

Terrier MK70-Improved Malemute

Research Range Services (RRS) personnel played a key role in ushering in a new era in fast, inexpensive access to space for small payloads when on March 27, 2010, two small spacecraft known as CUBESATs were launched aboard a Terrier MK70-Improved Malemute sounding rocket. The CUBESATs were designed and built by university students in Kentucky and California and "hitched a ride" on a NASA flight test of a new class of sub-orbital sounding rocket. In the short float time in space, the CUBESATs gathered important data that will be applied to future small earth-orbiting space vehicles.

At mid-morning on launch day, the NASA Terrier MK70-Improved Malemute sounding rocket lifted off from the Launch Range leaving a fiery trail in the clear skies. Right on schedule, the two CUBESATs were ejected during the sub-orbital flight at approximately 77 miles altitude, 72 seconds into the flight. James Lumpp, Director of Space Systems Laboratory at the University of Kentucky and faculty advisor for the project, said, "This is the first time CUBESATs were ejected in space on a sub-orbital trajectory. This capability of leveraging the CUBESAT satellite standard on a NASA sounding rocket could open a whole new chapter in fast, inexpensive access to space for small payloads."

RRS professionals staffed the tracking radar, telemetry and optical instrumentation systems and provided meteorological services, frequency monitoring, communications support, and project management services critical to successful mission completion. The NASA Terrier MK70-Improved Malemute mission is just one more example of the successful partnership between Wallops Flight Facility and university students and professors.

"This is the first time CUBESATs were ejected in space on a sub-orbital trajectory. This capability of leveraging the CUBESAT satellite standard on a NASA sounding rocket could open a whole new chapter in fast, inexpensive access to space for small payloads."

— James Lumpp
Director of Space Systems Laboratory
University of Kentucky

We're Working On...

Surveillance is an essential safety element of mission operations at the Launch Range. Research Range Services (RRS) personnel are currently working with NASA engineers in an effort to provide a new surveillance capability, called the Consolidated Sea and Air Surveillance (CSAS) System, located in the Range Control Center. This new, state-of-the-art processing and display system is being built upon a software product called SureTrak, which was originally developed by the U.S. Navy at the Patuxent River Naval Air Station for air and sea surveillance. RRS and NASA are collaborating with the Navy to make enhancements and modifications that will enable SureTrak to interface with Range assets and provide Range Safety officers a pre-launch risk assessment capability. The new system will substantially improve the surveillance capability at the Launch Range.

The Terrier MK70-Improved Malemute sounding rocket takes flight from Pad I at the Launch Range.

Ares 1-X

NASA's Ares 1-X was launched from Kennedy Space Center (KSC) in Florida on October 28, 2009, in anticipation of bringing the agency one step closer to its future exploration goals and journeys to destinations beyond low earth orbit. Research Range Services (RRS) personnel were instrumental to pre-launch support testing and to flight operations during the launch.

RRS provided project engineering support to design, integrate, and install telemetry ground systems at the Eastern Range Central Telemetry Facility (TEL-4) and the Jonathan Dickinson Missile Tracking Annex necessary to receive and record telemetry links providing the mission control team with real time data from more than 700 sensors on the rocket as well as data for post mission flight analysis. Prior to the launch, RRS personnel supported radio frequency compatibility testing of the Ares 1-X avionics section at the United Launch Alliance System Integration Laboratory (ULA SIL) in Denver, Colorado, and the RF final compatibility testing in the Vehicle Assembly Building at KSC. RRS Engineering/Operations also provided final close out open loop RF data flow testing at TEL-4 validating the fully integrated system was "go" for launch.

The 327-foot tall Ares 1-X test vehicle produced 2.6 million pounds of thrust to accelerate the rocket to Mach 4.76, just below hypersonic speed. The Ares 1-X capped its easterly flight at a sub-orbital altitude of 150,000 feet after the separation of its first stage, a four-segment solid rocket booster. The test flight lasted about six minutes from its launch from the newly-modified Launch Complex 39B at KSC until splash down of the rocket's booster stage nearly 150 miles down range.

Thanks to the unequalled expertise and total dedication to the mission of the entire RRS Team, reception and processing of vehicle telemetry links and delivery of real-time telemetry data to KSC Launch Control and Range Safety was 100 percent successful. Following the test launch, RRS personnel delivered data for post mission analysis to NASA supporting centers and to the ULA vehicle support team.

The Ares 1-X test flight provided NASA with important data that will be used to improve the design and safety of the next generation of American spaceflight vehicles which could again take humans beyond low earth orbit.

Matt Schneider and Ron Taylor, Research Range Services (RRS) telemetry engineers, configure the telemetry ground station in preparation of the Ares 1-X launch at the Kennedy Space Center in Florida. **Lower Left:** Ron Taylor, RRS telemetry engineer, stands near the Ares 1-X rocket as it sits on the launch pad. **Center:** The Ares 1-X rocket flies through the atmosphere moments after liftoff. **Background:** The Ares 1-X rocket is in position for liftoff from Kennedy Space Center.

We're Working On...

To ensure secure communications of flight termination signals (FTS) to a launch vehicle to prevent unintended termination and to comply with NASA information technology security policies, Research Range Services (RRS) engineers are implementing a new tri-mode flight termination ground system. Tri-mode includes standard IRIG, secure command and enhanced FTS modulation schemes. This effort implements new hardware and software in the Range Control Center Transmitter Site on Wallops Mainland and in Mobile Command Systems. Once operational, RRS personnel will be capable of supporting any of the FTS modes currently employed on launch vehicles and will comply with NASA IT requirements. To date, systems have been procured that will provide the dual-redundant link between the RCC and the transmitter site. These systems will be delivered, installed, and tested in the coming year.

NASA UAV Technology Project

The NASA Unmanned Aerial Vehicle (UAV) Technology Project is one of the most exciting missions supported by Research Range Services (RRS) personnel. The UAV project conducted three test flights and one demonstration during Fiscal Year 2010. The objective of this project is to develop a weather observation platform utilizing the Tracking and Data Relay Satellite System (TDRSS) for the communications link.

The mission on August 29, 2010, was particularly challenging as supporting personnel were in a transition period from the Near Earth Networks Services contract to the new Range Operations Contract. RRS personnel provided project management, frequency monitoring, air traffic control, weather forecasting, and project camera surveillance to ensure that all objectives of the mission were successfully met. Resource coordination with NASA project management, RRS engineering personnel, RRS operations personnel, and others was fast paced and came off without a hitch.

Throughout the year, RRS engineers and technicians, in conjunction with the NASA UAV Technology Project designed, tested and demonstrated a common payload interface package for use on a small-to-medium class UAV in the following areas:

- Flight computer with networking
- Over-The-Horizon (OTH) communications (using TDRSS at nominal throughput)
- Common, standard science interfaces to support a variety of science instruments
- Common, standard aircraft interfaces to support a variety of UAVs (use of a pod)

As FY 2010 came to an end, RRS was transitioning into the second phase of the initiative that will continue to enhance and advance UAS technical capabilities and fold in newly designed science instrumentation to support and advance core science capabilities.

The NASA Unmanned Aerial Vehicle Technology Project conducts flight operations from the Launch Range's 1,500-foot UAV runway on the shores of the Atlantic Ocean. **Lower Left:** The NASA unmanned aerial vehicle taxis just before takeoff.

We're Working On...

In January 2010, AirTEC, Inc., in partnership with Research Range Services (RRS) successfully designed, integrated, tested and operationally deployed a second radar surveillance aircraft. Since 1998, AirTEC, Inc., has provided range support for WFF in the form of airborne radar surveillance, visual range surveillance and payload recovery, and airborne telemetry services. This NASA/AirTEC partnership continues to successfully deploy a reliable and effective platform utilizing NASA's APS-143 b(v)3 surveillance radar with AirTEC's proprietary satellite downlink system. This second surveillance platform utilizes a similar sensor package including an X-band marine surveillance radar integrated with an Automatic Identification System, a satellite data link, and the AirTEC mission computer and mapping system. The confluence of these two aircraft systems and a single ground station operator has allowed Wallops Flight Facility to conduct missions requiring the clearance and monitoring of marine traffic over areas covering the Atlantic Ocean and coastal areas. This dual aircraft capability was first successfully deployed this year on March 27, 2010, to support the launch of the Terrier MK70-Improved Malemute rocket supporting the CUBESAT spacecraft project.

Space Shuttle Support

During Fiscal Year 2010, Research Range Services (RRS) personnel supported four Space Shuttle missions to help complete the assembly of the International Space Station (ISS). Overall, nearly 500 passes were tracked with valuable data transmitted to the Eastern Range controllers and Johnson Space Center (JSC) navigators as part of pre-launch, launch and on-orbit mission activities. The Research Range's two main radars shared the workload of simultaneously tracking the Orbiter and the ISS during the rendezvous and separation phases of the mission. Without this tracking, the mission control team would not have had an independent tracking source during those final critical minutes to make performance assessments and, if necessary, an abort determination. Prior to each launch, Range tracking radars, telemetry, and command systems personnel worked with the Eastern Range controllers, Goddard Space Flight Center (GSFC) network managers and JSC navigators to ensure RRS system readiness. Voice circuits were thoroughly tested with GSFC and JSC prior to launch to ensure critical backup communications with the Orbiter in the event of an emergency.

Orbiter: Atlantis
Mission: STS-129
Launch: November 16, 2009
Landing: November 27, 2009
Site: Shuttle Landing Facility, KSC

Orbiter: Endeavour
Mission: STS-130
Launch: February 8, 2010
Landing: February 21, 2010
Site: Shuttle Landing Facility, KSC

Orbiter: Discovery
Mission: STS-131
Launch: April 5, 2010
Landing: April 20, 2010
Site: Shuttle Landing Facility, KSC

Orbiter: Atlantis
Mission: STS-132
Launch: May 14, 2010
Landing: May 26, 2010
Site: Shuttle Landing Facility, KSC

The Space Shuttle Discovery take flight during the early morning hours of April 5, 2010, from Kennedy Space Center in Florida.

James Parks, right, Research Range Services communications technician, stands with his wife Debbie Parks and the NASA Administrator Charles Bolden shortly after receiving the Space Flight Awareness Award.

The Space Flight Awareness Award (SFAA) was presented to James Parks and Ken Griffin. The Space Flight Awareness Award Program recognizes the outstanding job performance of employees, who, by substantial contributions, have personally displayed strong dedication to quality work and flight safety.

Mr. Parks is a NASA Communications (NASCOM) senior technician for the Research Range Services (RRS) program. In this role, he provides critical onsite data connectivity for all missions supported by the Range. He has been a key player for all Space Shuttle launch operations including Space Shuttle pre-launch, launch, on-orbit, and return to earth flight segments. James has truly earned his SFAA while performing as a senior NASCOM technician for more than 20 years.

Mr. Griffin, Contract Program Manager for the Research Range Services Program, received the SFAA for leadership in the area of telemetry, tracking and command support at various NASA tracking stations throughout the world. Mr. Griffin has performed an active role on nearly every NASA astronaut mission including the final Apollo flights and every Space Shuttle mission, and has tracked the ISS and Mir as part of docking evolutions. When not occupied with manned missions, Mr. Griffin has been involved in numerous robotic flight missions and has traveled the globe to further the agency's and country's space initiatives. Ken received his SFAA In recognition of 40 years of exceptional technical and management service to numerous NASA human and robotic space flight missions.

Water Ingestion Study

Research Range Services (RRS) conducts literally hundreds of operations each year; however, few operations present the unique challenges of taxiing a multi-ton aircraft through thousands of gallons of water to analyze the effects of water ingestion into the aircraft's engines. Data captured using RRS' unique capabilities provided Gulfstream Corporation critically important information necessary to evaluate the aircraft's ability to safely land and take off in wet runway conditions. Wallops Flight Facility is one of only a few places capable of conducting such experiments.

In early October 2010, Gulfstream chose the Research Range to bring a new Gulfstream G650 to conduct water ingestion testing. This comprehensive test scenario required many weeks of developing challenging optical configurations to accurately capture a large volume of data, conducting extensive safety analyses, and test planning and preparation.

The Optical Systems Group outfitted the airfield with an Intermediate Optical Focal Length Tracker configured with mid-range lenses and high definition video cameras. In addition, remote unmanned surveillance cameras were strategically placed around the airfield to give the customer a wide variety of angles to analyze their aircraft.

After the Wallops Airfield Manager and the Wallops Fire Department fabricated a 200-foot long water trough that held just less than an inch of water, the airfield was ready for action. As engine start time approached, weather data provided by the RRS Weather Office showed that poor conditions were rapidly moving into the area. Range personnel and Gulfstream engineers and technicians worked together to safely conduct 15 runs within a 12-hour period, a feat never before accomplished.

The Gulfstream water ingestion tests are a sterling example of a highly efficient integration of RRS capabilities with the needs of the civil community.

The Gulfstream G650 aircraft is positioned at the entrance of the water trough in preparation for water ingestion testing at the Launch Range's fully functional airport. **Lower Left:** The Gulfstream G650 aircraft taxis through the water trough so engineers can collect data to determine how the aircraft's engines perform. **Lower Right:** Wallops Flight Facility Firemen Jeff Bell, Hank Bodley, and Willie Kirkpatrick (wearing blue shirts) fill the water trough to an acceptable level. The firemen not only maintained the trough during operations but were instrumental in the trough's construction.

In FY 2010, Research Range Services Again Set the Standard for Supporting NASA's Education Programs

In Fiscal Year 2010, Research Range Services (RRS) hosted many students from high schools and universities supporting NASA's Education Programs, and the number increases every year.

RRS continued inspiring and motivating students to pursue careers in science, technology, engineering, and mathematics through internships in a variety of careers to help young adults gain practical work experience. The underlying map on this and the following page displays schools represented in the Wallops Flight Facility Internship Program. Our headline programs include:

Cooperative (Co-Op) Education Program

College students receive valuable work experience through positions with Wallops-based organizations, including RRS, related to their major field of study. This experience helps create and sustain the scientific and engineering workforce of the future. The Co-Op Program is the principal source of new permanent employees at Wallops.

STEP UP

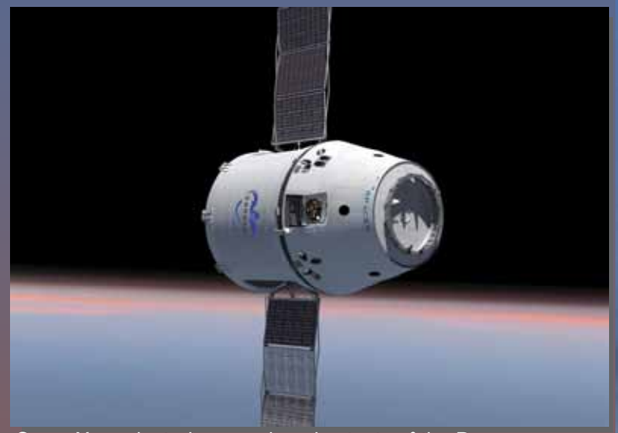
RRS supports the partnership between NASA; Worcester County, Maryland; and the Lower Shore Workforce Alliance in conducting the Science, Technology, Engineering Pipeline for Underserved Populations (STEP UP) internship program targeted for students of Worcester County, Maryland, high schools; WorWic Community College; Salisbury University; and the University of Maryland Eastern Shore. Students participate in an 8-week summer internship at the NASA Wallops Flight Facility or the Maryland Institute for Space Technology.

RRS Support Extends To Many Other Programs:

- National Space Club Scholars Program
- Undergraduate Student Research Program
- Graduate Research Studies
- Wallops Contractors Student Job Opportunities

RRS has hired numerous graduating students who were former participants in education programs.

SpaceX



SpaceX conducted comprehensive tests of the Dragon spacecraft as it orbited the earth.

Research Range Services (RRS) personnel continue to be at the cutting edge of addressing tomorrow's space transportation needs as they joined forces with NASA's Johnson Space Center to support SpaceX's Commercial Orbital Transportation Services (COTS) Demonstration Flight 1, SpaceX's first launch under NASA's COTS Program. The two-stage Falcon 9 expendable launch vehicle took flight from Cape Canaveral, Florida, Dec. 8, 2010, to deploy the Dragon spacecraft. The Dragon's role on future launches will be to resupply the International Space Station (ISS) with supplies and eventually carry crew members to the ISS. NASA is partnering with commercial companies like SpaceX in a symbiotic and highly productive relationship to develop and demonstrate space transportation capabilities.

The Dragon spacecraft separated from the second stage and demonstrated operational communications, navigation, maneuvering, and reentry capabilities. For this demonstration flight, Dragon orbited the Earth as SpaceX tested all of its systems and subsequently initiated thruster firing to begin reentry, returning the Dragon capsule to Earth for a Pacific Ocean splashdown off the coast of California.

Research Range Services provided command uplink, telemetry, and radar support throughout the mission. Powerful RRS antennas provided tracking, receiving, and processing of telemetry data and video from Dragon during the launch and subsequent orbit as it passed over the Launch Range. RRS played a pivotal role in mission success by providing back-up S-band Command Uplink support for the Dragon capsule to SpaceX and radar tracking during the launch and ascent phase and the first orbit to the U.S. Air Force's Eastern Range.

Research Range Services personnel provided command uplink, telemetry, and radar support throughout the mission for this Falcon 9 expendable launch vehicle.

SNOWMAGEDDON

2010 brought a new challenge in the form of an unusually heavy snowfall, sometimes requiring Research Range Services (RRS) personnel to spend the night “on console” to make sure not a single mission went unsupported.

Wallops Flight Facility (WFF) and its surrounding areas typically receive an average of 8.4 inches of snow from December through March. However, this past year was extremely atypical as the RRS Weather Office recorded over 27.9 inches of total snowfall, more than 19 inches more than the average amount. At times, driving conditions were seemingly as awful as those experienced in the Arctic Circle. More than once, road conditions deteriorated to the point where they were closed by local authorities requiring RRS personnel to remain on the facility, leading to long, exhausting days. RRS personnel were up to the challenge, and earned many accolades for their hard work, dedication, and commitment to mission success.

Many stories of “above and beyond” dedication to mission accomplishment came out of one of the most challenging winter seasons on record. One such story evolved during the second of three major storms in February 2010 which coincided with the Space Transportation System (STS) 130 Shuttle mission.

Blizzard conditions made coming to work for RRS personnel treacherous as WFF was closed and the Eastern Shore was in a state of emergency causing local officials to restrict travel. Roads were all but impassable due to high snow drifts and more than 20 inches of snow in many locations. RRS personnel remained “on console” to ensure the mission was fully supported.

Another example occurred when missile precision radar technicians for RRS’s most powerful tracking radar known locally as Radar 5, despite extreme difficulty getting through the snow drifts, successfully fought the forces of nature to provide critical tracking during Space Shuttle and International Space Station rendezvous and separation. At one point, ice and snow that had built up on the radar dish needed clearing to prevent possible tracking anomalies and a second RRS radar crew was called in. After successfully making it to the operating location with the assistance of WFF Security and their four wheel drive vehicles, the crew cleaned the dish enough so full operation could continue until the sun came up and melted the remaining ice.

It is particularly noteworthy that during our bout of uniquely harsh weather, the Meteorological Operations team did not miss a scheduled balloon release critical to gathering meteorological data. STS 119 Discovery Astronaut Richard Arnold visited the Launch Range to personally thank them for their hard work and dedication to further space exploration during these fierce conditions.

Two atmospheric research radars, SPANDAR and UHF, are stowed during poor weather conditions at Wallops Flight Facility.

Range Commander's Council

Lee Wingfield, Research Range Services optical technician, assists in the configuration of an intermediate focal length optical tracker during operations on the airfield. **Background:** Range Instrumentation Radar 778C is a mobile radar unit often deployed to Coquina North Carolina to support downrange tracking requirements.

The Range Commander's Council (RCC) is a community of practice among Range Commanders that provides a framework wherein common needs are identified and common solutions are sought. In Fiscal Year 2010, Range Research Services (RRS) officially participated in the RCC, marking its second year as a formal member. Mr. Jay Pittman, Chief of the Range and Mission Management Office and Commander of Wallops Launch Range, served as NASA's technical representative to the council and was later named NASA's executive committee member. Replacing Mr. Pittman as the NASA technical representative is Mr. Barton Bull, the Range Chief Engineer. Notable from the past year's activities are the selection of Mr. Mike Patterson as the Chair of the RCC Range Safety Group and an initiative, led by Mr. Bull, to canvas all NASA Centers in order to increase Agency participation in the working groups. Wallops will host the summer 2011 Range Commanders Conference. This will represent the first gathering of the RCC at NASA's Wallops Flight Facility.

The RCC is dedicated to serving the technical and operational needs of U.S. test, training and operational ranges by ensuring that technical standards are established and disseminated, joint procurement opportunities are explored, technical and equipment exchanges are facilitated, advanced concepts and technical innovations are assessed and potential applications are identified.

The RCC, founded in 1951, was organized to preserve and enhance the efficiency and effectiveness of member ranges, thereby increasing their research capabilities, operational test and evaluation expertise and training and readiness resources. The mission of the RCC is to:

- Identify and resolve common problems
- Discuss common range matters in an organized forum
- Exchange information to minimize duplication
- Conduct joint investigations pertaining to research, design, development, procurement and testing
- Coordinate major or special procurement actions to realize procurement efficiencies where possible
- Develop operational test procedures and standards for present and future range use
- Encourage the interchange of excess technical systems and equipment

Taurus II

The current construction of a launch complex capable of sending medium-class expendable launch vehicles (ELVs) into space illuminates the Launch Range's growth and aggressive move into the future as a national resource for enabling low-cost access to space to further enable science and technology research. Since the Range's inception in 1945, and more than 16,000 launches and six decades later, the Research Range Services (RRS) team is poised to support operations to launch its largest vehicle ever – a 130-foot tall, 13-foot diameter Taurus II ELV. This Orbital Sciences Corporation rocket is part of NASA's Commercial Orbital Transportation Services (COTS) contract to resupply the International Space Station and is estimated to launch in early 2012.

The Taurus II is designed to provide versatile, flexible, and cost-effective access to space for medium-class payloads.

In preparation for the 2012 launch, the RRS Team needed to upgrade payload processing, fueling, and integration facilities as well as build a new launch complex. Wallops broke ground on NASA's Horizontal Integration Facility (HIF) December 19, 2009. At the time of publication, the HIF's main structure is complete and will be fully functional in January 2011. In partnership with the Mid-Atlantic Regional Spaceport, shovels started moving dirt to mark the beginning of the new launch complex, Pad 0-A, March 1, 2010, which is scheduled to be completed by spring 2011.

Normally, medium-class vehicles, such as the U.S. Air Force's Minotaur I, are configured in separate stages and each stacked individually on the launch pad with a large crane slowly moving each stage into position. The Taurus II vehicle and payload will be completely integrated in the HIF and subsequently transported to Pad 0-A and erected to launch position as an integrated launch system.

RRS has initiated several instrumentation upgrades that will enable mission success. Upgrades include the video networks, downrange tracking locations, Range communications, and numerous other upgrades. These upgrades and newly constructed infrastructure will allow RRS to continue living by its moniker "We'll Get You There."

We're Working On...

The legacy voice conferencing system, consisting of a core switch with 40 keysets in the RCC (installed 1993), and 12 Transistor Operated Phone System (TOPS) intercoms (installed 1960), is being replaced with an all-new, state-of-the art conferencing system. MOVE provides a more reliable system with improved voice conferencing features, and replaces the current 12-channel analog system with a fully digital system that supports 240 channels. The MOVE system has been integrated with all circuits required for launch support, enabling support of the Sub-TEC III launch in September 2010 using MOVE keysets in the Range Control Center. Approximately one third of the 368 MOVE keysets have been installed to date, and the system will be fully integrated prior to the Track-Ex launch in January 2011. The MOVE system is scaled for 50% growth to accommodate significant expansion for upcoming projects.

Pad 0-A undergoes construction on Wallops Island. The site consists of liquid fueling tanks, a 300-foot water tower and the launch pad for the new Taurus II medium-class launch vehicle.

The Horizontal Integration Facility will be Wallops Flight Facility's premier launch vehicle processing facility capable of processing two Taurus II first stage core's at the same time. The building measures 98 feet wide and 248 feet long and will be used to integrate and encapsulate the Cygnus Spacecraft to Taurus II.

Poker Flat 2011

Research Range Services (RRS) personnel will again be busy in Fiscal Year 2011 supporting NASA's Sounding Rocket Program with two launches scheduled from Poker Flat Research Range (PFRR) outside Fairbanks, Alaska. In fact, the preparation started when RRS crews performed a maintenance trip in September 2010 to ensure that range instrumentation systems are operating nominally and are ready to swing into action.

The science missions to be carried into space include:

Polar Night Nitric Oxide to measure the concentration of nitric oxide in the mesosphere and lower thermosphere in the nighttime polar region.

Far-ultraviolet Imaging Rocket Experiment to help determine the number of hot, young O stars in the Andromeda Galaxy. This type of star has the highest temperatures, the most luminosity, and the most mass and shortest life.

RRS personnel will staff two PFRR telemetry antennas that will provide telemetry tracking and data reception, recording, processing and displays throughout the launch and will use a mobile command system for the Far-ultraviolet Imaging Rocket Experiment to align sensors with the proper stars. RRS personnel will also operate surveillance and precision tracking radar systems to provide tracking data on the sounding rockets during flight, collect wind and weather measurements during the pre-launch preparations and provide timing and voice communications systems to ensure that telemetry and radar assets are communicating properly.

ORS-1 Satellite Mission

In early 2011, the Research Range Services (RRS) program will meet another exciting challenge by supporting Department of Defense's Operationally Responsive Space (ORS) office at Kirtland Air Force Base, New Mexico, via participation in its fourth Minotaur I orbital spacecraft launch at Wallops Flight Facility (WFF) under the auspices of the USAF Space and Missile Systems Center's Space and Development Test Wing. The mission, designated ORS-I, will demonstrate the militarily important capability to provide real-time data collected from space to combatant commanders with minimal preparation time. Such a time sensitive mission requires rapid design, construction, integration and test of a launch-ready space vehicle to conduct launch operations to support an urgent operational need.

Minotaur I, the launch vehicle to the ORS-I mission, is a four-stage rocket developed for the U.S. Air Force by Orbital Sciences Corporation. It consists of two government supplied surplus stages plus two commercial stages. RRS personnel will provide tracking and telemetry data collection from lift off to mission completion and will coordinate the use of area airspace for the ascent to orbit. RRS support for this mission will also include ground instrumentation at WFF plus two downrange sites and the coordination of flight vehicle and payload operations during the countdown, launch and orbit insertion.

RRS support to the Air Force Space and Missile Systems Center for this and the prior three Minotaur I launches from WFF is an important step in preparing to support future orbital launches such as the upcoming Taurus II/COTS resupply missions to the International Space Station and the Minotaur IV Lunar Atmospheric and Dust Experiment Explorer (LADEE) in 2013.

Telemetry antenna systems sit on top of a ridge at Poker Flat Research Range near Fairbanks Alaska. These systems are used to transmit science data during sounding rocket missions.

Research Range Services

…cornerstone of excellence for services critical to the success of Range operations

The Research Range Services (RRS) Program is critical to providing tracking, telemetry, meteorological, optical and command and control services for Wallops Flight Facility, Poker Flat Research Range, and remote locations around the world. The RRS Program's dedicated, experienced, and highly skilled engineers and technicians assure error free real-time display and capture of mission-specific flight, payload and science data for a myriad of flight vehicles including orbital and suborbital rockets, aircraft, satellites, the Space Shuttle, balloons, and Unmanned Aircraft System (UAS) vehicles.

National Aeronautics and Space Administration

Goddard Space Flight Facility
Wallops Flight Facility
34200 Fulton Street
Wallops Island, VA 23337
http://sites.wff.nasa.gov/code840/

www.nasa.gov