Wallops: The Management of Rapid Change

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Chief, NASA's Wallops Range
History and Wallops Overview
Wallops Research Range History
A unique national resource, Wallops Flight Facility’s Research Range enables flexible, low-cost space access, in-flight science, and technology research for all of NASA and the nation. It is the only launch range that NASA owns.

Enabling Science from Earth to Orbit and Beyond
- Vehicle Development and Risk Reduction Missions
- Proof of Concept Missions and Technology Testing
- Partnered with Mission Directorates and Centers

Island Facilities
- Southern 1/3 is dominated by Launchers and the UAV Runway
- Middle 1/3 is Mission Integration Facilities and Storage
- Northern 1/3 houses Instrumentation and Payload Processing Facilities as well as Navy Facilities
Wallop Range Usage

Average Annual Range Usage

- NASA Science: 28%
- NASA Aeronautics: 23%
- Non-NASA: 28%
- NASA Human Exploration and Operations: 21%
The Wallops Range Charter

Provide operational access to orbital and suborbital flight regimes for NASA and for the Nation and serve as a “test range for ranges” to improve national range capability

- **Support:**
  - NASA Science & Technology (primary)
  - Department of Defense & other Government Agencies
  - Commercial Industry

- **Full suite of support services:**
  - Launchers
  - Processing Facilities & Logistics
  - Range Safety
  - Tracking & Data Services

- **Specialized focus:**
  - Suborbital & Small Orbital Launch Vehicles
  - Experimental Vehicles & Payloads
  - Responsive & Low-Cost Missions
The Flexible Organization

Sounding Rockets
Expendable Launch Vehicles
Aircraft
Mobile Campaigns
Balloon Program
Sounding Rockets: At Wallops

Suborbital flights are the core mission set
- NASA-sponsored science
- DoD (USN, MDA)
- Commercial

Sounding rockets demand responsiveness
- Short lead times
- Complex tracking and data acquisition requirements
- Transient science conditions
- Payload recovery

Campaigns require great flexibility
- Poker Flat, Alaska
- Norway
- Kwajalein Atoll
Hall Test Flight

• A sounding rocket test to verify fixes following a flight failure
• Necessary to enable science mission to follow one week later
• Project inception to launch in five weeks: Extreme project management approach and activities performed in parallel drove mission success
• Planning and configuration completed for Telemetry, Timing, RF, Precision Radar, Surveillance Radar, Data Processing and Display, Air and Sea Surveillance, Optical, Communications, and Meteorological Operations
• Flexibility and hard work paid off - Two successful launches within one week of each other
Sounding Rockets: Complex Requirements

FTX-19

• Three launch salvo to support MDA and US Navy fleet missile defense exercise

• Three Terrier-Oriole vehicles successfully launched in succession within 20 seconds from Wallops Flight Facility

• Wallops developed complex tracking plan and range support
  • Eight Telemetry assets for independent tracking, receiving, and relaying, recording, and readout capabilities.
  • Five fixed and mobile radars
  • High-speed video systems to capture motor ignition, umbilical release and vehicle egress from the rail as well as optical tracking data through flight
  • Launch System Integration Range surveillance

• Coldest February on record at Wallops
Mobile Campaigns: Norway, Alaska, Bermuda
Mobile: Norway/Alaska

- Wallops typically supports campaigns from Poker Flat Research Range (PFRR) in Alaska or Andoya Space Center (ASC) in Norway
  - PFRR is semi-permanent site; systems shipped to PFRR only when in-place systems are not adequate to meet requirements
  - ASC is a mobile range where all support systems are shipped from WFF
- Deployment planning begins at least six months prior to mission support
- Operations/Engineering personnel analyze the requirements to determine which assets are needed
- Set-up trips conducted in the summer to avoid the poor weather and test they systems well ahead of operations
- One month prior to first required support, a team of operators travel to the site to finish site preparations and perform integration testing with the vehicle
- Launch support is requires two-week deployment depending on type of mission (and cooperation of science conditions)
- Mobile Deployment Challenges:
  - Extreme cold temperatures
  - Minimal crew deployed
  - On-site spares and repair capabilities limited
  - Operating in a foreign country (Customs, ITAR, language, etc)
Orbital won the initial Commercial Resupply Services (CRS) contract in 2008: Wallops chosen as launch site location by Orbital Sciences Corporation (Now Orbital-ATK). First Antares launch from Wallops in 2013!
Quick Development of Range Capabilities

- Significant upgrades to Wallops Ground processing had to be completed in short order to launch a liquid first stage with cargo for the International Space Station

- Ground infrastructure efforts included:
  - Pad 0A and Liquid Fueling Facility (MARS)
  - Horizontal Integration Facility
  - Spacecraft Processing
  - Spacecraft fueling site: Hypergolic fuels
Mobile: Bermuda

- Antares launches require deployment of a tracking site to Bermuda
  - Telemetry
  - Radar
  - Command
  - Power
  - Communications
- Support agreement between NASA/Bermuda developed by Wallops to enable this critical support
- Wallops developed solution to provide real-time data back to the Range Control Center to meet Safety and customer requirements
ELV: Orb-3 Failure and Range Recovery

- After four successful Antares missions, Orb-3 failed shortly after liftoff (28 Oct 14), causing great damage to the launch pad, as well as support facilities across an extensive area of the range.
- The next day Wallops was working with its partners to assess damage to the facility, create a path forward to support future ELV launches from Wallops and repair damaged infrastructure.
- One year after: Wallops is ready to once again support ELV missions with an improved posture:
  - Pad Rebuild Complete 30 Sep 15
  - Performance Testing Complete 6 Nov 15
  - 50K Sounding Rocket launcher relocated further from Pad 0A
- Current Antares schedule:
  - New Antares engine testing scheduled for the end April
  - OA-5 likely to launch in June

Orb-3 Aftermath
Pad-0A Recovered
50K Launcher Relocated and Rebuilt
Wallop's Airfield: Dynamic Use

- Our airfield hosts multiple customers with a diverse mission set during each year
  - Resident NASA aircraft conducting science missions
  - US Navy airframe testing (Patuxent River)
  - US Navy Field Carrier Landing Practice
  - NASA/NOAA Global Hawk hurricane science
  - NASA/DoD/Commercial UAS development
- DoD customer funding has enabled ongoing runway/hanger upgrades
- WFF is designated test site for Mid-Atlantic Aviation Partnership
Balloon Program

- Worldwide mission capabilities
- Low-cost, long-duration flights capable of collecting high-altitude data for extended periods

FY15 Antarctica Payloads
The Backbone of Flexibility

Onsite Capabilities
Mobile Capabilities
Our Backbone: Onsite Capabilities

Wallops Range Control Assets

- Aeronautical Control Center
- Safety
- Breakout Room
- Range Control Center
- Data Acquisition & Processing Room
- Surveillance
- Air Control Tower
Our Backbone: Onsite Capabilities

Wallops Island Fixed Radar Assets

- Not Pictured: WISSRDS-S Sea Surveillance Radar
- Airport Surveillance Radar 8
- WISSRDS-X Sea Surveillance Radar
- Radar 5 C-Band Tracking
- Radar 3 C-Band Tracking
Our Backbone: Onsite Capabilities
Our Backbone: Onsite Capabilities
Our Backbone: Onsite Capabilities

Wallops Optical Tracking Assets

Camera Station X85
Camera Station V100
Camera Station U80
Camera Station M1 Mobile Platform
Camera Station X65
Our Backbone: Mobile Capabilities

Wallops Range Mobile Telemetry Assets

Other Mobile TM Systems:
20 Foot
7 Meter #1
7 Meter #2
10 Foot

Mobile Operations Center (Part of Transportable Command and Telemetry Systems - TCATS)

Directional Command and Tracking Antennas (TCATS Antennas)

Mobile Integrated Telemetry System
Our Backbone: Mobile Capabilities

Wallops Range Radar, Telemetry & Command Assets at Bermuda

- Radar 8
- Radar 8 Control Van
- Mobile Integrated Telemetry System
- 7-Meter #1
- Mobile Power System #1
- Mobile Command System #1A
Our Backbone: Mobile Capabilities

![Image of Wallops Assets at Launch Range in Alaska]

- Redstone #1
- Redstone #2
- Radar 10
  Located Near Launch Pads
- 8 Meter
- 11 Meter
- Telemetry Building & UHF Command
Partnerships at Wallops

Navy: FCLP, PAX, Aegis
MARs/ Orbital
Other NASA centers
NOAA
Navy: SCSC, FCLP, PAX

Wallops’ partnership with the Navy allows for amazing opportunities

- **Field Carrier Landing Practice**: E-2 and C-2 pilots practice landing on a simulated aircraft carrier in order to qualify for carrier operations. We host multiple detachment of 150 personnel multiple times each year to qualify new pilots and refresh qualified pilots with safe daily operations.

- **Surface Combat Systems Center**: Our Navy tenant has based its Aegis training facility on Wallops Island to provide a location close to Norfolk for students to get hands-on experience without the cost of training at sea.

- **Patuxent River Aircraft Support**: Providing Range services for the test and development of Navy aircraft has been an ongoing project at WFF since 1996. Requirements are primarily for Patuxent (PAX) River Navy Test Flights of the F-35 Joint Strike Fighter (JFS) to relay telemetry from the aircraft through Wallops and back to PAX. The Range also supports additional Navy aircraft events for the F-18 Hornet, P-8 Poseidon, MH-60 Romeo helicopters, and MQ-4C Triton as requested.
MARS and Orbital ATK

A beneficial partnership between the state of Virginia, a commercial company and NASA working together for the advancement of scientific discovery
Other NASA centers

Wallops has a strong relationship with other NASA centers and collaborates on projects

• Armstrong: Hurricane Sentinel (HS3)
• Goddard and KSC: ISS CREAM
• JPL: Long-Duration Supersonic Decelerator (LDSD)
NOAA is a long term tenant at Wallops and provides the nation with up-to-date weather information available to the public.

The support NOAA provides the nation and Wallops makes Wallops Flight Facility a stronger operational hub than if the two agencies were not co-located.
Key to Success
Wallops Range has a relatively small staff of civil servant and contracting personnel conducting an diverse and changing mission schedule while also completing engineering project to advance Range capabilities

### A Year in Review 2015

#### 10 Sounding Rocket Missions
- **Poker Alaska 2015**
- **MDA PTK-10**
- **RockSat-X 2014**
- **Black Brant IX Test Flight**
- **RockOn VIII**
- **RockSat-X 2015**
- **Heath**
- **Norway 2015: CARE II**
- **Norway 2015: RENJ2/Isabelle**

#### 3 UAS Missions including a long duration detachment
- **SpaceX CRS Support**
- **SpaceX (Commercial Support)**
- **Navy Aerostar**
- **LbRC AViSTAR**
- **SHOUT**
- **LDSD**
- **NGA Laser Testing**

#### 4 Navy FCLP detachments
- **SMALT Tracking Support**
- **Navy Aircraft (Pax & FCLP)**

#### Vehicle Types:
- **SR**: Sounding Rocket
- **ELV**: Expendable Launch Vehicle
- **UAS**: Unmanned Aerial System
- **BLU**: Balloon
- **AIR**: Aircraft
- **OTH**: Other

*The number inside the diamond signifies multiple launches*
Keys to Our Success: Knowledgeable staff

Program Manager Jack Vieira and Range Services Manager Dawna Marr discuss the MDA Shark launch.

John VanKleef prepares to set the clock for the mission.

Lauren Neely looks over her mission checklist.

Jason Rausch practices his height training.

Bob Swift checks the telemetry read outs before a mission.

Jeff Reddish puts in his donation for the Feds Fed Families Stuff a Rocket event. The event collected 175 pounds of food, which helped surpass the 1,000 pound mark to 1,127 collected for the summer.

Jordan West and John Dickerson have their pre-launch lunch.


From left, Brian Abresch, Eugene Guidry, Center Director Chris Scoles, and Dr. Michael Gazark observe the Low-Density Supersonic Decelerator project.

Mission Operations Lead Joe Jimmerson is on point for the MDA Shark launch.

Lauren Neely looks over her mission checklist.
Keys to Our Success: Selective Upgrading

• Range Control Center
  • Built in 1993 with numerous incremental changes to system
  • Video wall, main room console furniture, and individual video displays at each user workspace have not been upgraded for 15 years

• Complete overhaul objectives:
  1) Replace the existing video wall a new LCD-based video wall to display multiple modern HD formats
  2) Replace the existing eight consoles on the RCC main floor with 32 user workspaces, to allow for increased demand from range customers
  3) Replace the existing monitors at each user workspace with higher resolution monitors in laptop friendly stations
  4) Replace the existing analog video distribution subsystem with digital HD
  5) Remove existing motorized wheelchair lift and build a fixed wheelchair ramp to conform with ADA standards
  6) Improve location of HVAC vents to better balance the airflow for equipment and personnel comfort
Keys to Our Success: Selective Upgrading

- Mobile Optical Tracking Station (MOTS)
  - Go-anywhere, high-definition video tracking
- Mobile Integrated Telemetry System (MITS)
  - Redundant multiple-link mobile system specifically designed for Antares deployment support
- Transportable Command and Telemetry System (TCATS)
  - Two complete integrated self-sufficient mobile systems
Keys to Our Success: Selective Upgrading

• Wallops Range has developed and fielded multiple internet-based tools to provide faster communication at different levels of project management
  • SSOPD: Management staffing and documentation repository
  • ROMS: Range schedule, project management, Action Item tracking, Lessons Learned, maintenance tracking, configuration management, imagery search and storage, discrepancy reporting
  • OTS: Task assignment and tracking system
Due to Wallops’ agility and smaller size we are often capable of providing services at costs significantly lower than other Ranges

- The process for conducting a project at Wallops Flight Facility varies depending on the type of project and the type of customer organization. In general, the process follows the paths described below:
  - Contact is initiated with the Advanced Projects Office to discuss feasibility of a prospective project
  - If NASA/Wallops and the customer agree that the project is feasible, frequently a Technical Interchange Meeting is scheduled (usually at Wallops) to familiarize Wallops personnel and identify key issues and actions
  - Wallops and the customer agree that technical and schedule requirements can be met
  - Wallops and the customer establish necessary terms and agreement
Negotiating Roadblocks
Negotiating Roadblocks: Range Clearance

• Hazard Area Clearance:
  • There are more than 20 fishing tournaments per year that can impact our ability to launch
  • Close communication with local captains and robust planning is required
  • WFF employs commercial aircraft (radar and visual), commercial boats, the USCG and VMRC to clear potential range foulers

• Offshore drilling and windmill encroachment
  • There is a potential of offshore drilling and wind power generation off of the Atlantic coast near Wallops. Currently working with federal agencies to identify the impact to the services Wallops provides the nation as part of the cost/benefit analyses of any new activity.
Negotiating Roadblocks: Bermuda Site Development

• To reduce maintenance and replacement costs for systems deployed to Bermuda, WFF is currently implementing plan to protect our assets utilizing a hardened facility and radomes
  • Challenge to obtain NASA and State Dept approvals for modifications to operations center (unoccupied on-site building owned by Bermuda government)
  • Scheduling upgrades to occur between Antares missions
  • Estimated operating cost savings of $4.6M over five years
Looking Forward
Looking Forward: Small Sats

- Wallops is working with personnel from the Greenbelt campus to develop Cube Stats in-house. This provides a low-cost platform to gather scientific information from space.

- Wallops 45’ UHF antenna is a high-demand asset for small sat communication:
  - Upgrading capability to support ~10 customers simultaneously.
Looking Forward: ISS

• Award of Commercial Resupply Contract (CRS2)

Jan. 14, 2016
RELEASE: 16-007

NASA Awards International Space Station Cargo Transport Contracts

NASA has awarded three cargo contracts to ensure the critical science, research and technology demonstrations that are informing the agency’s journey to Mars are delivered to the International Space Station (ISS) from 2019 through 2024. The agency unveiled its selection of Orbital ATK of Dulles, Virginia; Sierra Nevada Corporation of Sparks, Nevada; and SpaceX of Hawthorne, California to continue building on the initial resupply partnerships with two American companies.

• Award of CRS2 to Orbital ATK ensures continued ISS Resupply operations from Wallops through 2019
Looking Forward: Navy Global Hawk

• US Navy considering Wallops as a site to base their Global Hawk operations

• Entails housing and operations for 6 airframes

• Proposed plan includes additional hangar space to accommodate and maintain the aircraft
Questions?