WALLOPS RANGE USER'S HANDBOOK

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Goddard Space Flight Center | Wallops Flight Facility | Wallops Island, Virginia 23337

Change History Log

Revision	Effective Date	Description of Changes
1	11/1996	Rewrite of all sections in handbook.
2	04/2000	Rewrite of all sections in handbook.
C	03/10/2003	Rewrite of all sections in handbook; added Appendix B. Replaces previous Range Users Handbook, 840-RUH-1996, Revision 2.
D	04/21/2003	Corrected beam widths in Table 3-3 for Radar 2, 8, 10, and 11
E	05/23/2003	Corrected beam widths in Table 3-3 for Radar for Radar 2 and 8
F	06/23/2003	Corrected paragraph 2.2.2
G	12/01/2003	Rewrite of all sections in handbook
H	10/01/2007	Revised all sections in handbook
I	03/17/2008	Revised all sections in handbook
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4	4/1/2024	Rewrite of all sections in handbook

PREFACE

The NASA/Goddard Space Flight Center (GSFC) operates the Wallops Flight Facility (WFF) located on the Eastern Shore of Virginia. NASA supports space and Earth science, technology and aeronautical research. WFF operates a research range consisting of a rocket range and research airport. WFF also maintains capabilities to conduct mobile launch activities due to unique scientific requirements.

Wallops users represent NASA, other United States Government agencies, and foreign and commercial organizations. The *Wallops Range User's Handbook* summarizes Wallops' policies and procedures for facility use and provides a description of general capabilities.

All documents referenced in this handbook can be provided by the Range Project Manager. Neither the United States Government nor any person acting on behalf of the United States Government assumes any liability resulting from the use of information contained in this document, or warrants that such use will be free from privately owned rights. Use of a company product name does not imply approval or recommendation of the product to the exclusion of others that may also be suitable.

This version of the Wallops Range User's Handbook replaces all previous versions of this document.

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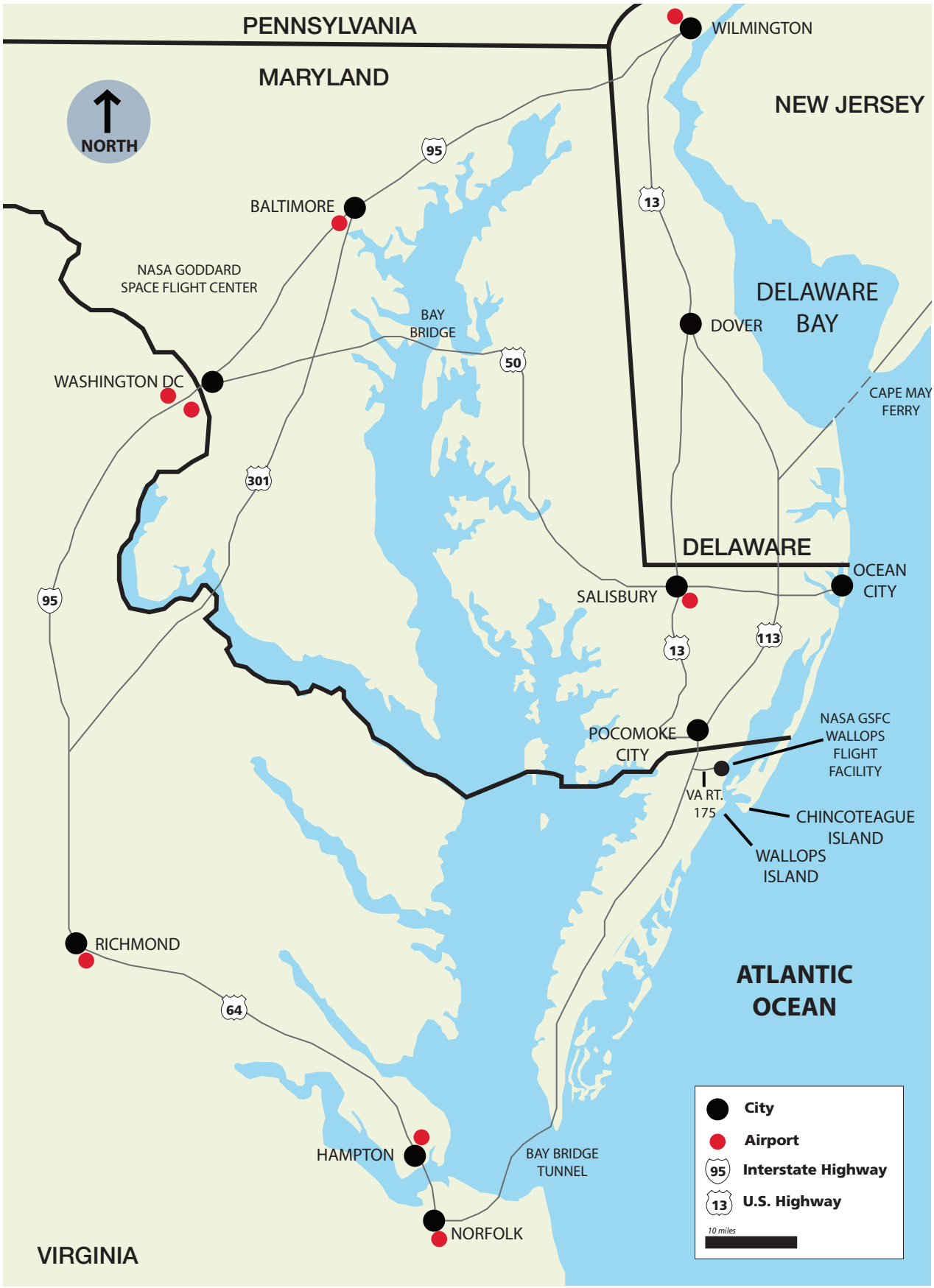
Abbreviations and Acronyms

AMS	Administrative Message Service
APCR	Aeronautical Projects Control Room
ARC	Atlantic Research Corporation
ASRF	Atmospheric Sciences Research Facility
AZ	Azimuth
CAD/CAM	Computer Aided Design/Computer Aided Manufacture
CD-ROM	Compact Disk – Read Only Memory
CNC	Computer Numerically Controlled
CSLA	Commercial Space Launch Act, Public Law 98-575
dB	decibel
dBi	decibels isotropic
D.C.	District of Columbia
DC	Direct current
DoD	Department of Defense
DQCA	Data Quality Computer A
DQCB	Data Quality Computer B
EDARS	Environmental Data Acquisition and Recording System
EFM	Electric Field Measurement
EL	Elevation
ELV	Expendable launch vehicle
ESD	Electrostatic Discharge
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
Fax	Facsimile transmission
FM	Frequency modulation
ft	Foot or feet
FTS	Flight Termination System
G/T	Gain/System Noise Temperature or Figure of Merit
GHz	Gigahertz
GPG	Goddard Procedures and Guidelines
GPS	Global Positioning System
GSFC	Goddard Space Flight Center
H	Height
HF	High frequency
HH	Hook height
IFLOT	Intermediate Focal Length Optical Tracker

in	Inch(es)
INS	Inertial Navigation System
IRIG	Inter-Range Instrumentation Group (U.S. Government Agency)
ISA	Individual Support Annex
ISO	In support of
kg	Kilogram
kW	Kilowatt
LAN	Local area network
lb	Pound or pounds
LFF	Liquid Fueling Facility
LGTAS	Low Gain Telemetry Antenna System
LHC	Left Hand Circular
LTAS	Launch Trajectory Acquisition System
M	Meter
mm	Millimeter
MARS	Mid-Atlantic Regional Spaceport
MCR	Mission Control Room
MDDF	Minimum Delay Data Format
MEC	Management Education Center
MHz	Megahertz
MOA	Memorandum of Agreement
MPPF	MARS Payload Processing Facility
MPPF	Multi-Payload Processing Facility
MSC	Marine Science Consortium
MTS	Master Timing System
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
NASCOM	NASA Communications Room
NEPA	National Environmental Policy Act
NIST	National Institute of Standards and Testing
NLDN	National Lightning Detection Network
nmi	Nautical mile
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense Command
NPG	NASA Procedures and Guidelines
NSROC	NASA Sounding Rocket Operations Contract
NWS	National Weather Service
OSD	Operations and Safety Directive
OSS	Operations Safety Supervisor

PAO	Public Affairs Office
PFRR	Poker Flat Research Range
PPF	Payload Processing Facility
PPR	Prior Permission Request
PRD	Program Requirements Document
R&D	Research and development
RADAC	Range Data Acquisition and Computation
RCC	Range Control Center
RF	Radio frequency
RFI	Radio-frequency interference
RHC	Right Hand Circular
ROCC	Range Operations Control Center
RSM	Range Safety Manual
RSO	Range Safety Officer
SCAMA	Switching, Conferencing and Monitoring Arrangement
SDS	Safety Data Sheet
sec	Second
sq	Square
TOY	Time-of-Year
TM	Telemetry
TV	Television
UAS	Unmanned Aircraft System
UDS	Universal Documentation System
UHF	Ultra high frequency
UPS	Uninterruptible Power System
U.S.	United States
USA	United States of America
USCG	United States Coast Guard
USN	United States Navy
VA	Virginia
VCSFA	Virginia Commercial Space Flight Authority
VFR	Visual Flight Rules
VHF	Very high frequency
VIP	Very important person or people
VSFC	Virginia Space Flight Center
W	Wide
WEMA	Wallops Employee and Morale Association
WFF	Wallops Flight Facility
WGO	Wallops Geophysical Observatory



Regional road map on how to get to Wallops Flight Facility in Virginia

1.1 PURPOSE

The *Wallops Range User's Handbook* is a guide for planning operations at the Wallops Range. It provides a summary of the policies, procedures, and capabilities of the range. Included are procedures for obtaining authorization for range use and for efficient project coordination between the range user and Wallops Flight Facility (WFF) personnel.

This handbook describes the information to be provided by the range user that will enable the Range to effectively plan for and support the range user's project. In addition, this handbook describes the facilities and systems available at WFF for supporting aeronautical research, balloons and suborbital and orbital research projects.

Visit the WFF homepage at **http://www.nasa.gov/wallops** for more information.

1.2 GEOGRAPHY

The WFF Main Base is located on Virginia's Eastern Shore 5 miles west of Chincoteague, Va., approximately 90 miles north of Norfolk, Va., and 40 miles southeast of Salisbury, Md. See previous page for a road map to WFF.

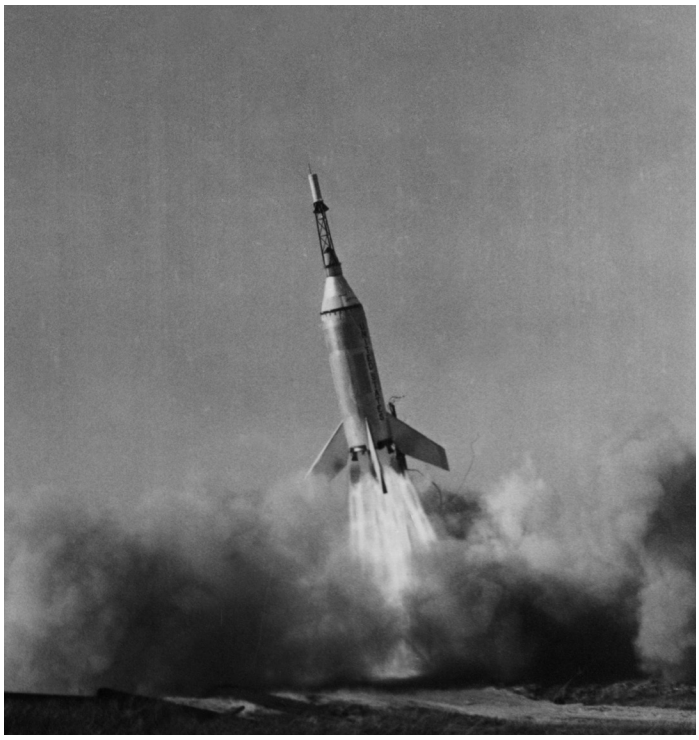
WFF consists of three separate parcels of real property: the Main Base, the Mainland, and the Wallops Island Launch Site. The Mainland and the Wallops Island Launch Site are approximately 7 miles southeast of the Main Base.

Area map showing Wallops Flight Facility Main Base and Island locations.

1.3 WALLOPS RANGE

The Wallops Range is part of WFF and is managed by GSFC's Suborbital and Special Orbital Projects Directorate. The range consists of launch facilities, an aeronautical research airport, an Unmanned Aircraft Systems (UAS) airfield, and associated tracking, data acquisition, and control instrumentation systems. The range includes authorized operating space, primarily over the Atlantic Ocean, and authorized frequency spectrum. Scientists and engineers from NASA, other U.S. Government agencies, colleges and universities, commercial organizations, and the world-wide scientific community have conducted experiments at the range.

1.4 OPERATIONAL HISTORY



A rocket launches from Wallops Island in the 1950s.

In 1945, NASA's predecessor agency, the National Advisory Committee for Aeronautics (NACA), established a launch site on Wallops Island under the direction of the Langley Research Center. This site was designated The Pilotless Aircraft Research Station and conducted high-speed aerodynamic research to supplement wind tunnel and laboratory investigations into the problems of flight.

In 1958, Congress established the National Aeronautics and Space Administration (NASA), which absorbed Langley Research Center and other NACA field centers and research facilities. At that time, the Pilotless Aircraft Research Station became a separate facility — Wallops Station — operating directly under NASA Headquarters in Washington, D.C.

In 1959, NASA acquired the former Chincoteague Naval Air Station, and engineering and administrative activities were moved to this location. In 1974, the Wallops Station was named Wallops Flight Center. The name was changed to WFF in 1981, when it became part of Goddard Space Flight Center in Greenbelt, Maryland.

In the early years, research at Wallops was concentrated on obtaining aerodynamic data at transonic and low supersonic speeds. Between 1959 and 1961, Project Mercury capsules were tested at Wallops in support of NASA's manned space flight program before the astronauts were launched from Cape Canaveral, Florida. Some of these tests using the Little Joe Booster were designed to flight-qualify components of the Mercury spacecraft, including the escape and recovery systems and some of the life support systems. Two rhesus monkeys, Sam and Miss Sam, were sent aloft, acting as pioneers for the astronauts; both were recovered safely.

Since 1945, the Wallops Range has launched thousands of research vehicles in the quest for information on the flight characteristics of airplanes, launch vehicles and spacecraft, and to increase the knowledge of the Earth's upper atmosphere and the near space environment. The launch vehicles vary in size and power from small meteorological rockets to orbital class vehicles.

WFF continues to be a small, fast response, matrix organization that can execute both orbital and suborbital rocket missions, balloon projects, manned and unmanned aircraft operations, and instrument fabrication in support of science and aeronautical research.

1.5 GSFC/WFF MISSIONS

Wallops' key mission elements support all NASA Centers with a science and technology focus.

SUBORBITAL FLIGHT PROJECTS — Wallops manages and implements NASA's sounding rocket, balloon, and airborne science programs.

SMALL- AND MEDIUM-CLASS ORBITAL MISSIONS — Wallops manages and provides technical support for small and medium class spacecraft carriers.

HYPERSONIC MISSIONS — Wallops provides a unique location to test hypersonic flight regimes on the East Coast of the United States. The Range continues to support hypersonic testing and development with test and integration facilities, launch pads, tracking and telemetry capabilities, and technical in-house experts. Opportunities exist for partnering with local wind tunnel experts at NASA Langley Research Center, and DOD partners nationwide.

RANGE OPERATIONS — Wallops provides fixed and mobile launch ranges and a research airport. The range provides the services necessary for a wide variety of research, development and operational missions, including rocket, balloon and aerial vehicle flights. The Range supports NASA, Department of Defense (DoD), commercial and academic organizations.

SCIENCE AND TECHNOLOGY — Wallops researchers study various fields of Earth science. Wallops engineers develop new technologies that improve capabilities of flight projects or lower the cost of access to space.

EDUCATIONAL OUTREACH — Partnerships formed with industry and academia foster educational outreach programs that support the development of future engineers and scientists.

REMOTE RANGE CAPABILITY — WFF supports missions/campaigns in multiple locations with mobile or fixed range assets. These locations include the Poker Flat Research Range (PFRR), Ronald Reagan Ballistic Missile Defense Test Site (RTS), Equatorial Launch Alliance (ELA) Australia and Southern Launch Alliance (SLA), Andøya Space Center (ASC), Columbia Scientific Balloon Facility (CSBF), Sweden, Coquina, Bermuda, and Antarctica. Each location is supported with contract management, instrumentation, and range support as required.

PFRR is maintained and operated by the Geophysical Institute at the University of Alaska in Fairbanks under a contract managed by the Sounding Rockets Program Office (SRPO).

RTS is maintained and operated by the US Army on the Kwajalein Atoll. Its unique instrumentation, including high fidelity metric and signature radars, as well as optical and telemetry sensors, play a vital role in the research, development, test and evaluation required to support America's defense and space programs.

ELA will build and operate Australia's first commercial spaceport in Nhulunboy, Northern Territory, Australia. The complex will serve effectively as a backbone to Australia's burgeoning aerospace industry.

SLA has built a Orbital Rocket Launch Complex situated at the southern tip of the Eyre Peninsula, South Australia, at Whalers Way, approximately 40km south of Port Lincoln.

ASC was established in 1962 and is a solution provider for sounding rocket-, balloon- and remotely piloted aircraft operations from Norway. ASC is also involved with remote sensing and owns and operates the Alomar LIDAR observatory.

CSBF and Antarctica are maintained and operated under a contract managed by the Balloon Program.

1.6 GSFC AT WFF

There are seven GSFC directorates located wholly or in part at WFF. These organizational elements combine to form the Wallops Flight Facility and perform all the functions for the operation of the facility.

SUBORBITAL AND SPECIAL ORBITAL PROJECTS DIRECTORATE (CODE 800) — NASA's WFF provides agile, low-cost flight and launch range services to meet government and commercial sector needs for accessing flight regimes worldwide from the Earth's surface to the moon. Wallops' flight assets ranging from research aircraft, unmanned aerial systems and high-altitude balloons to suborbital and orbital rockets provide a full-range of capability while operational launch range and airfield capabilities meet ongoing and emerging needs in the science, aerospace, defense, and commercial industries. In addition, Wallops is a multi-user/multi-tenant facility in a geographic location ideal for supporting satellite tracking and commanding, military operations and training, scientific investigations, technology development and testing, as well as commercial aerospace. The facility's diverse mission sets and on-site partners, including the United States Navy (USN), National Oceanic and Atmospheric Administration (NOAA), The Federal Aviation Administration (FAA), Virginia Spaceport Authority (VSA), is a model for leveraging and optimizing multi-organizational capabilities and support services.

Code 800 elements supporting the Range include:

• **Range and Mission Management Office (Code 840) –** The RMMO is a team of highly-skilled project management professionals who are charged with the responsibility of marrying the skill of scientists, engineers, technicians, and other personnel into one cohesive team whose objective is to conduct operations for data collections from many different flight platforms around the globe. Working as a team and implementing sound project management strategies, they narrow their focus, reach desired goals, and achieve those goals within specific time and cost parameters.

• **Advanced Projects Office (Code 802) –** The APO is the primary interface for prospective organizations interested in conducting projects or using the products and services provided by NASA/Wallops Flight Facility. The APO, in direct coordination with any prospective organization, develop initial project requirements and project scope. Additionally, they develop and execute agreements between NASA and outside prospective organizations.

• **Sounding Rocket Program Office (Code 810) –** The SRPO provides suborbital launch vehicles, payload development, and field operations support to NASA and other government agencies. SRPO works closely with the Sounding Rocket User Community to provide launch opportunities facilitating a broad spectrum of science applications. The SRPO supports the NASA Science Mission Directorate's strategic vision and goals for Earth Science, Heliophysics, and Astrophysics. The approximately 20 suborbital missions flown annually by the program provide researchers with unparalleled opportunities to build, test, and fly new instrument and sensor design concepts while simultaneously conducting world-class scientific research.

• **Balloon Program (Code 820) –** The primary objective of the NASA Balloon Program is to provide high altitude scientific balloon platforms for scientific and technological investigations. These investigations include fundamental scientific discoveries that contribute to our understanding of the Earth, the solar system, and the universe. Scientific balloons also provide a platform for the demonstration of promising new instrument and spacecraft technologies that enable or enhance the objectives for the Science Mission Directorate Strategic Plan.

• **Aircraft Office (Code 830) –** The Aircraft Office at the Wallops Flight Facility (WFF) provides for the operation, maintenance, engineering, airworthiness, and mission support of assigned aircraft as well as the planning and conducting of Airborne Science missions. The Aircraft Office explores new areas of aircraft support and plans for capabilities to accommodate them, develop, and implement rules and procedures required to ensure the effective management of aircraft operations, and provide safety and quality assurance oversight of all aircraft functions. The WFF Aircraft Office also supports logistical airlift needs, range surveillance, recovery operations, and a wide array of other aircraft functions.

• **Special Projects Office (Code 850) –** The Special Projects Office provides a bridge between suborbital projects at Wallops and the larger spacecraft missions at NASA's Goddard Space Flight Center. This office includes the SmallSat project office, such as CubeSats and smaller satellite missions. They also manage unique, complex projects implemented at Wallops, that do not fit within the typical program tiers of sounding rockets and balloons.

OFFICE OF THE DIRECTOR (CODE 100) — The Office of the Center Director oversees all of Goddard's activities and missions. The office provides overall leadership responsibility for multiple field locations, works

closely with the Executive and Legislative branches of the government, as well as International and Interagency partners to carry out NASA missions. The directorate includes the Office of Human Capital Management (Code 110), Talent Cultivation Office (Code 114), Equal Opportunity Programs (Code 120), Wallops Office of Public Affairs (Code 130.4), and Wallops Fiscal Operations Section (Code 157).

MANAGEMENT OPERATIONS DIRECTORATE (CODE 200) — Code 200 elements that maintain offices at Wallops include Wallops Procurement Office (Code 210), Wallops Facilities Management Branch (Code 228), Wallops Logistics team (Code 231), Wallops Protective Services Division (Code 240), Wallops Environmental Office (Code 250), Technical Information and Management Services (Code 271).

SAFETY AND MISSION ASSURANCE (CODE 300) — The Safety and Mission Assurance Directorate (SMA) main office is located at the GSFC in Greenbelt, Md. The Assistant Director of SMA is co- located at WFF and serves as senior SMA advisor and a point of contact for mission assurance as it relates to WFF programs, projects and operations. The Assistant Director of SMA ensures the proper level of mission assurance with oversight of ground and flight safety for WFF programs, projects and operations is defined, appropriately documented, and implemented. This office also provides support for institutional safety at WFF to facilitate ongoing communication and collaboration with the institutional safety organization at Greenbelt.

FLIGHT PROJECTS DIRECTORATE (CODE 400) — Exploration and Space Communications (ESC), Code 450 is located at GSFC in Greenbelt, Md. Under Code 450, is NASA's Near Space Network (NSN), Code 457, which provides mission-critical communications and navigation services for missions in the near-space region — out to two million kilometers away. The NSN connects users with either government or commercial service providers. The Advanced Communications Capabilities for Exploration and Science Systems (ACCESS) project, Code 459, serves as the government service provider to the NSN. ACCESS operates, maintains, and sustains NASA's government-owned, contractor-operated ground- and flight-based systems that are part of the Space Communication and Navigation (SCaN) Division of NASA's Human Exploration and Operations Mission Directorate. Wallops specifically monitors ACCESS Direct To Earth (DTE) operations (formerly known as the Near Earth Network).

ENGINEERING AND TECHNOLOGY DIRECTORATE (CODE 500) — Code 500 provides multidisciplinary engineering expertise for the development of cutting-edge Science and Exploration Systems and technologies at the NASA Goddard Space Flight Center, in Greenbelt, Maryland, and the Wallops Flight Facility, in Virginia. They maintain several branches at Wallops: Mechanical Systems Branch (Code 548), Wallops Electrical Engineering Branch (Code 569), Wallops System Software Engineering Branch (Code 589), Guidance, Navigation & Control and Mission Systems Engineering Branch (Code 598).

SCIENCES AND EXPLORATION DIRECTORATE (CODE 600) — The Wallops Field Support Office (Code 610.W) supports the Earth science research activities of Code 600 scientists at the Wallops Flight Facility. The Office also conceives, builds, tests, and operates research sensors and instruments, both at Wallops and at remote sites. Scientists in the Office use aircraft, balloons, and satellite platforms to participate in the full complement of Earth science research activities, including measurements, retrievals, data analysis, model simulations, and calibration/validation. Office personnel collaborate with other scientists and engineers at Goddard Space Flight Center, other NASA centers, and at universities and other government agencies, both nationally and internationally.

INFORMATION TECHNOLOGY AND COMMUNICATIONS DIRECTORATE (CODE 700) — Wallops Regional Information Technology Services and Solutions (Code 780) is responsible for overseeing, planning, and implementing information technology (IT) and communications services at WFF. They provide a full range of quality information technology and telecommunications services to support Wallops Flight Facility's missions, Goddard Institute for Space Studies (GISS) , Independent Verification and Validation Facility, (IV&V), and White Sands Complex (WSC).

1.7 WALLOPS PARTNERSHIPS

To describe the Range and Mission Management Office's core mission and responsibility, is also to describe the partnerships of the Wallops Flight Facility. While NASA's GSFC WFF owns and operates the range, missions are accomplished through a "Team of Teams" and strong partners who contribute to the whole of WFF capabilities.

The Antares rocket takes off from MARS' Pad 0A.

In 1998, resident organizations at Wallops formed the WFF Partnership. The purpose of the partnership was to acknowledge the opportunities and collective capabilities of Wallops as a result of organizations working as a team.

The goals of the partnership are to maximize the opportunities of the facility, assure efficient and optimal services, and pursue common interests without impacting the individual missions of the organizations. The partnership operates through a Wallops Board of Directors consisting of representatives from the major organizations which have long-term interest in the vitality of the facility.

1.7.1 Virginia Commercial Space Flight Authority

The Virginia Commercial Space Flight Authority (VCSFA), also known as Virginia Spaceport Authority (VSA), is a political subdivision of the Commonwealth of Virginia. Virginia Space owns and operates the Mid-Atlantic Regional Spaceport and the Mid-Atlantic Regional Unmanned Aerial Systems (MARS UAS) Airfield. Virginia Space offers full-service launch and drone testing facilities for commercial, government, scientific and academic users. The mission of Virginia Space is to serve as a driver for Virginia's new economy by providing safe, reliable, and responsive space access at competitive prices and secure facilities for testing of unmanned vehicles for integration into National Air Space.

1.7.1.1 Mid-Atlantic Regional Spaceport

MARS is one of only four spaceports currently licensed by the FAA Commercial Space Transportation Office to launch to orbit or interplanetary trajectories, and one of only two East Coast launch sites capable of launching to orbital inclinations that are critical to NASA, government, and other commercial customers. For most vehicles, orbital inclinations between 38 and 60 degrees are achievable. With in-flight maneuvers, sun synchronous orbits are possible.

With two launch pads, MARS competes in the small-to-medium class launch vehicle market. Pad 0A and 0D are Medium Class Launch Facilities (MCLF) comprised of state-of-the-art cryogenic liquid fuel facilities with computer-controlled commodities systems, fortified launch mounts, robust electrical and environmental control systems, and gravity fed fresh water deluge systems. MARS currently provides 50 percent of U.S. launch capacity to support the International Space Station (ISS) through critical cargo deliveries originating from Pad 0A. Pads 0B and 0C are Small Class Launch Facilities (SCLF), solid-fuel pads comprised of launch stools, moveable service structures, and environmental control systems. Pad 0B and Pad 0C have hosted multiple launches including Rocket Lab Electron vehicles as well as Minotaur I to Minotaur V vehicles. These facilities can also be reconfigured to host nearly any existing small-class launch vehicle.

Through an established Space Act Agreement, MARS partners with NASA WFF to provide infrastructure and range support services for payload processing, vehicle and spacecraft integration, launch range instrumentation and control, emergency facilities, telemetry and data services, materiel handling and logistics, safety analysis and mission planning. Additional information on MARS facilities and services can be found at www.vaspace.org.

1.7.1.2 MARS Unmanned Aerial Systems Airfield

The MARS UAS airfield is located remotely on the north end of Wallops Island. The Airfield can support up to Group 3 unmanned aircraft on its 3,000-by-75-foot asphalt runway. The airfield also offers a 130-by-120-foot Vertical Takeoff and Landing (VTOL) pad located at the southeast end of the runway rated to 5,000 PSI. This secure isolated facility lies within R-6604 Alpha and Bravo restricted airspace comprising an operational area of 75-square-nautical miles with vertical limits from surface to space directly adjacent to the Atlantic coastline providing DoD and government customer access to VACAPES warning areas W-386, 387. Through interagency coordination with NASA, VCSFA is also capable of offering National Airspace System (NAS) accessibility to Class D and G airspaces for commercial flight operations.

1.7.1.3 MARS Payload Processing Facility

In 2019, VSA constructed a state- of-the-art payload processing facility as part of its regional spaceport on Wallops Island. The MARS Payload Processing Facility (MPPF), located on the north end of Wallops Island, is a 21,760-square-foot facility which consists of various segregated cargo bays that enables Virginia Space to serve multiple customers concurrently.

MARS Payload Processing Facility

The spacecraft vehicle side of the processing facility has been designed and constructed in accordance with the provisions of ICD- 705 in order to support secure processing for sensitive classified and scientific missions from arrival to encapsulation. Furthermore, a portable tactical Sensitive Compartmented Information Facility (SCIF) has been secured by Virginia Space to support sensitive classified mobile operations at MARS.

The notable height of the primary processing bay in the MPPF allows for vertical stacking of payloads, as well as a 30-ton overhead crane (60' hook height). Two 15-ton cranes in the Upper Stage Build-Up bay (30' hook height) are capable of accepting radio-frequency to travel jointly or may function individually in order to support horizontal

operations. In addition, there is optional space for secondary payloads and equipment, all of which may be processed in areas meeting an ISO 8 (100K) cleanroom standard due to multiple airlocks. Additionally, the MPPF is designed with fueling trenches to allow for various fueling setups, as well as separate fuel and oxidizer rooms enabling both to be onsite simultaneously.

1.7.2 Rocket Lab

Rocket Lab is a private American aerospace manufacturer and SmallSat launch service provider with a wholly owned New Zealand subsidiary. It developed a suborbital sounding rocket named Ātea and currently operates a lightweight orbital rocket known as Electron, which provides dedicated launches for SmallSats and CubeSats. The company was founded in New Zealand in 2006 and established headquarters in California in the United States in 2013. Rocket Lab operates commercial launch sites in Mahia, New Zealand, and Wallops Island. These sites combined can accommodate more than 130 launches per year and reach orbital inclinations from sun-synchronous through 39 degrees. NASA and Virginia Spaceport Authority entered into an agreement with Rocket Lab and have built an additional launch pad (Pad 0C/LC-2) to conduct dedicated flights of Small Spacecraft Missions. The pad includes the 66-ton launch platform and 44 foot, 7.6-ton strongback.

The Rocket Lab Electron rocket will launch from Pad 0C on Wallops Island.

1.7.3 Naval Air Systems Command (NAVAIR)

NAVAIR and WFF have benefited from a close relationship for many years. NAVAIR has regularly requested, and WFF has routinely provided range services for a variety of United States Navy flight test projects that could not be supported solely by NAVAIR. WFF's Research Range Services Program (Launch Range and Research Airport) assets play a crucial role in NAVAIR's ability to carry out its testing and training mission. Further, NAVAIR envisions that the use of WFF will continue indefinitely, and due to the continuous nature of NAVAIR activities at WFF, the assignment of certain facilities, and possible construction of new facilities for NAVAIR use, is necessary. Similarly, on occasion, WFF has a requirement for support services such as access to boats, aircraft, or certain qualified personnel, available to NAVAIR, and necessary for the conduct of key WFF activities. Collaboration between WFF and NAVAIR is also anticipated in the areas of mutual interest such as jointly provided project support, jointly maintained range resources, range safety support services implementation and technology development.

1.7.4 Naval Air Warfare Center Aircraft Division (NAWC-AD) & Atlantic Test Range (ATR)

NAWC-AD from Patuxent River, Maryland, also maintains systems at Wallops. NAWC-AD makes regular use of the Wallops Range for aircraft development testing. Main base facilities include housing for personnel and dependents and a Navy Exchange.

NAWC-AD ATR is a Naval Air Systems Command (NAVAIR) field activity that serves as the principle research, development, acquisition, test and evaluation (RDAT&E) and fleet support activity for manned and unmanned naval aircraft for the Navy and the DoD. This includes air vehicles, propulsion systems, avionics, mission systems, human systems, aircraft launch and recovery equipment, landing systems, air traffic control, communications, ship/shore/air operations, and training systems.

The ATR are fully instrumented and integrated test ranges that provide full service support for cradle-to-grave training and testing. This support includes RDAT&E of aircraft, and training for aircrew and integrated avionics and mission systems. ATR manages more than 2,700 square miles of restricted airspace from the surface up to 85,000 feet in the Chesapeake test range operating areas, which consist of selected targets and airspace covering regions over the Chesapeake Bay, Maryland, Delaware and Virginia. Additional air and sea space is available in the Atlantic Warning Areas, located east of the Delmarva Peninsula over the Atlantic Ocean. Scheduling these offshore warning areas, where support is typically provided, expands that area to more than 50,000 square miles. This includes warning areas W-72, W-105, W-106, W-107, W-386, and W-387. The use of these areas often relies on the range services of NASA WFF to extend the instrumentation coverage.

1.7.5 United States Navy (USN) Surface Combat Systems Center (SCSC)

SCSC is co-located with NASA at Wallops. SCSC is a highly sophisticated facility whose mission is provide live and simulated integrated warfare capabilities in a net-centric, maritime environment to develop, test, evaluate, and conduct fleet operations and training for the warfighter. SCSC is comprised of a team of more than 300 military, civilian and contractor personnel all working together to provide highly technical engineering and training support to the fleet.

1.7.6 United States Coast Guard (USCG)

USCG is represented by Station Chincoteague on Chincoteague Island and execute a vital role during launch operations by providing surveillance and clearing of vessels impacting launch hazard areas. USCG Search and Rescue helicopters and other USCG aircraft use the airport as a base of operations.

The United States Navy Surface Combat Systems Center.

1.7.7 National Oceanic and Atmospheric Administration (NOAA)

NOAA operates a field site of the National Environmental Satellite, Data, and Information Service (NESDIS),
which produces multidimensional imagery from polar orbiting and geostationary satellites operated by NOAA.

1.7.8 Marine Science Consortium (MSC)

MSC is a nonprofit corporation dedicated to promoting teaching and research in the marine sciences. Founded in 1968, the MSC established operations at Wallops Flight Facility in 1971. The MSC is a cooperative educational venture, where 16 member institutions pool resources to offer courses and to provide residential and laboratory facilities to students from all member institutions. For more information, visit the MSC website at **http://www.cbfieldstation.org/.**

Operational support during NG-19 at Wallops Range.

2.1 INTRODUCTION

The National Aeronautics and Space Act of 1958 (Space Act), as amended, charters NASA to plan, direct, and conduct space activities. The Space Act authorizes NASA field installations to establish policies and operational interface procedures for users of NASA resources. Activities under the Space Act are to be conducted to optimize America's scientific and engineering resources. NASA is authorized to enter into contracts, leases, cooperative agreements, and other transactions on such terms as it may deem appropriate with any person, firm, association, or corporation. NASA is also authorized to cooperate with public and private agencies in the use of Government-provided launch support, services, equipment, and facilities.

For policies and procedures specific to Wallops, visit the Range and Mission Management Office at **www.nasa.gov/wallopsrange.**

2.2 KEY RANGE PERSONNEL

All operations at the Wallops Range are conducted under NASA control. The following paragraphs define the functions, responsibilities, and authority of key range personnel.

2.2.1 WFF Test Director

The WFF Test Director has authority over all operations conducted on the Wallops Range. The Test Director is responsible for ensuring that all range policy, criteria, and external agreements are satisfied during the operations. The Test Director is responsible for establishing and maintaining the schedule of range activities. This includes publishing schedules and summaries, resolving scheduling conflicts between project requirements and resources, and acquiring required clearances from external organizations for programs conducted at the range.

2.2.2 Project Manager

The Project Manager is the primary point of contact for the range customer. The designated WFF Project Manager has the authority to plan, coordinate, and direct operational support for assigned projects conducted at the Wallops Range.

2.2.3 Range Safety Officer (RSO)

The WFF RSO is responsible for ensuring the Wallops Range safety policy, criteria, and procedures are not violated during operations and to ensure that risks are understood and are within acceptable limits. The RSO has authority to stop work, hold a launch, or terminate a mission in flight if necessary.

2.2.4 Operations Safety Supervisor (OSS)

The OSS is responsible for supervising all assigned hazardous operations. The OSS is also responsible for the implementation for ground safety plans, operation procedures, and ensuring all lifting devices and equipment are certified. In some instances, the OSS may delegate responsibilities to other qualified personnel for specific operations.

2.3 KEY RANGE SERVICES

2.3.1 Safety and Mission Assurance (SMA)

WFF safety personnel will review all activities conducted on the Wallops Range. All range activities will be conducted in accordance with safety policy and criteria established in *NPR 8715.3D, NASA General Safety Program Requirements, NPR 8715.5B, Range Flight Safety Program* and the *GSFC-STD-8009, Goddard Space Flight Center (GSFC) Wallops Flight Facility Range Safety Manual (RSM)*. The purpose of *GSFC-STD-8009* is to identify WFF range requirements to implement the safety policies and criteria defined in *NPR 8715.5B, Range Flight Safety Program, NASA-STD-8719.25 Range Flight Safety Requirements*, and sections of *NPR 8715.3D, NASA General Safety Program Requirements* applicable to range safety. The standard defines the technical design requirements, restrictions, operations procedures, and other support requirements. It identifies data requirements and general schedule requirements for WFF to perform appropriate safety analysis per *800-PG-8715.5.1, Range Safety Process for Programs and Projects.* Safety participation early in the planning stages of a program will reduce the possibility of costly engineering changes. Additionally, Reliability and Quality Assurance reviews may be required on a case- by-case basis.

2.3.2 Frequency Utilization and Management

The WFF Test Director, along with the WFF Spectrum Manager, are responsible for the operational control of the radio frequency (RF) spectrum at Wallops. Frequency utilization and management policies and procedures applicable to all range user activities at Wallops are detailed in the *Wallops Flight Facility Frequency Utilization Management Handbook.*

2.3.3 Scheduling

The range customer submits project scheduling information to the Project Manager, who relays potential conflicts as they are identified. Every effort is made to resolve conflicts between programs in a manner that permits each program to be successfully completed on an acceptable schedule. As new information becomes available, schedules are updated and maintained on a computer database, which is accessible through remote terminals. The current range operations scheduling system is updated on a daily basis by the range scheduler.

The Range Customer must submit launch/activity dates along with required assets and resources to the WFF PM, whom will work directly with the WFF TD, well in advance of the required time to facilitate approval and scheduling. The WFF Test Director acquires clearances required for airspace and oceanic impact areas from the

Federal Aviation Administration (FAA), North American Aerospace Defense Command (NORAD), Fleet Area Control and Surveillance Facility (FACSFAC), and the U.S. Coast Guard. The standard working day is 8 hours daily, Monday through Friday, excluding federal holidays, 0800-1630. Requests for support outside of normal hours need to be submitted as far in advance as possible.

A sounding rocket takes flight from Wallops Flight Facility in Virginia.

2.3.4 Environmental Requirements

The Wallops Environmental Office serves as the interface for National Environmental Policy Act (NEPA) compliance at Wallops. In most cases, Wallops has approved environmental documentation covering range users' activities at WFF. The Wallops Flight Facility Site-Wide Programmatic Environmental Impact Statement (Site-wide PEIS), dated May 2019, provides the required environmental documentation for all Wallops "in- house" activities and also provides the required documentation for many range users' activities. During project formulation, the Project Manager will discuss the project with the range user and the Wallops Environmental Office to identify potential environmental issues. Wallops Environmental Office personnel will make a determination of any formal analysis and documentation required. Funding for the preparation of additional analysis and documentation will be the responsibility of the customer and must be completed prior to the readiness reviews.

2.3.5 Unmanned Aircraft Systems (UAS)

NASA and the Mid-Atlantic Regional Spaceport (MARS) offer customers access to Unmanned Aircraft Systems (UAS) facilities and runways located on Wallops Island.

MARS offers customers access to their UAS facilities and services, including a newly built North UAS runway constructed in 2017. This 3000-by-75-foot asphalt runway is located within restricted airspace and offers customers immediate ocean access. Other amenities include a 130-by-120-foot concrete pad rated to 5000 psi for Vertical Take Off and Landing (VTOL) operations, ground support services, and 90-by-65 foot hangar space dedicated specifically to Unmanned Aerial Vehicles.

MARS assists commercial customers with navigating the established NASA processes and procedures by providing an efficient technical and management interface between the customer and the range. MARS will ensure the UAS approval process, range scheduling, and ground and flight safety requirements of both NASA

and DOT/FAA are achieved, including documentation development, technical reviews, and oversight of UAS operations.

The UAS Control Center (CC), located in the Aeronautical Control Cab in Building E-106A, is part of WFF's Range Control Center (RCC). The primary role of this area is in supporting UAS design, testing and flight operations as the UAS CC. Project personnel in the UAS CC can access all the resources of the RCC to ensure safe operations while conducting a UAS mission. Another UAS CC facility is located on Wallops Island in Building X-15.

A UAS Test and Integration Facility is located in hangars N-159 and D-1. This facility provides an Electrostatic Discharge (ESD) certified test and integration laboratory accessible directly from the main floor of the hangar. Lab test benches and access to a range of power and communications services are included. Adjacent office space and conference room facilities are also available to UAS project teams.

North UAS Runway on Wallops Island

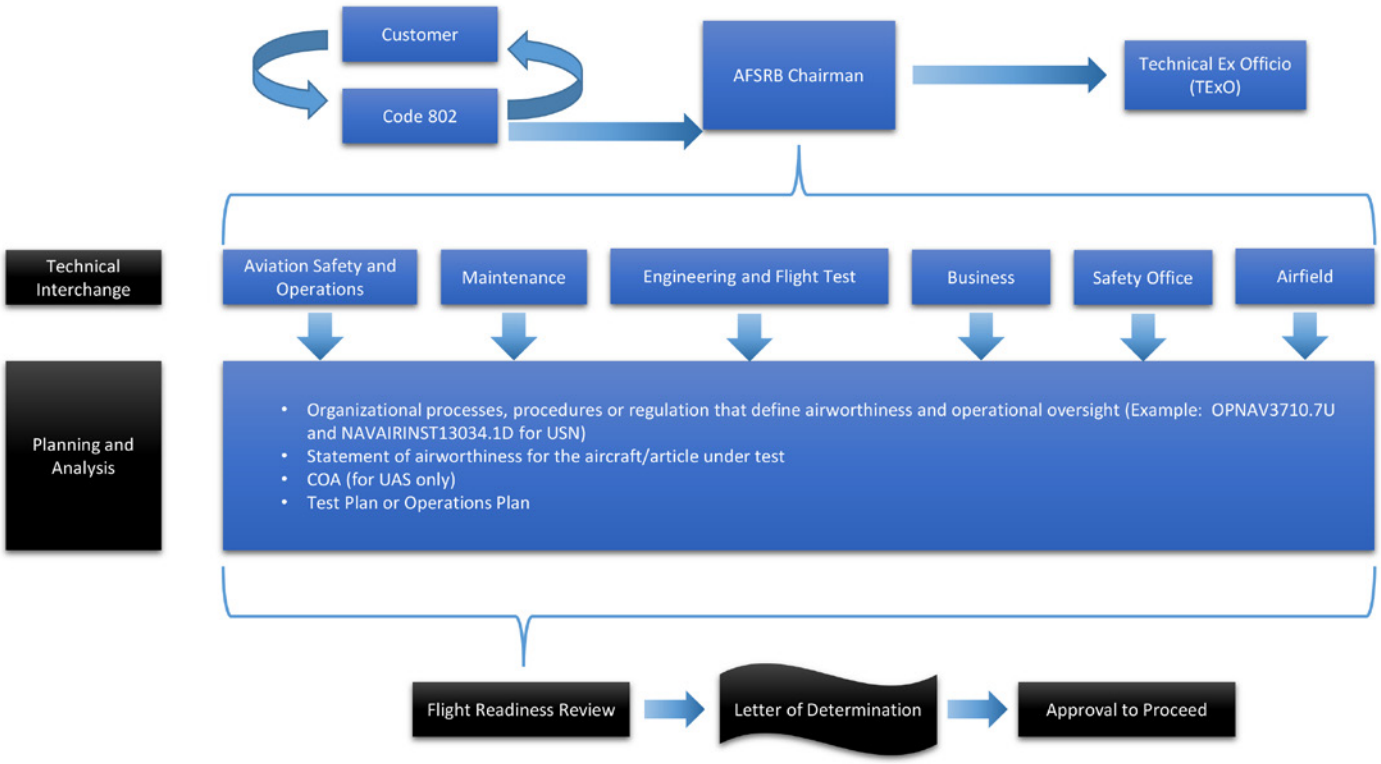
Prior to approval to conduct range operations, the range requestor/user must first submit UAS data for analysis and be granted a statement of airworthiness for flight by NASA.

Upon approval of airworthiness, the Range Safety Office will prepare a ground safety plan and a flight safety plan. These plans will be formulated from data collected in the UAS Access Authorization Questionnaire (AAQ).

The Range Safety Office will also conduct a risk analysis and develop a plan to mitigate any discovered unnecessary risks. Risk mitigation is a joint venture between the range user and the Range Safety Office. Though a formal risk mitigation and analysis is conducted through the safety office prior to the onset of initial operations, it is the responsibility of the UAS Mission Commander to conduct an informal risk assessment prior to each day of flight and include this data in their daily pre-flight brief.

Range use and coordination is initiated through the NASA assigned Project Manager. Upon completion of the AAQ, the Project Manager forwards client data to the system safety analysis team. Upon favorable review the data is further forwarded to the WFF Frequency Utilization Management Working Group (WFUMWG) frequency de-confliction personnel. After the UAS is deemed safe for flight and frequency de-confliction is accomplished, the mission data is forwarded to Range safety and operations planning begins. The ground safety plan delineates procedures to follow to ensure safety prior to flight. The flight safety plan is formulated to reduce air risks and establish expectations while the range user is conducting the UAS flight.

UAS Range Access Workflow



Airspace control:

UAS flight in the National Airspace System (NAS) is only permitted through use of a Certificate of Authorization (COA) or permitted in Special Use Airspace (SUA).

NASA WFF has restricted airspace extending from the main base airfield to Wallops Island. Bordering the eastern boundary of the restricted airspace is the Virginia Capes Operating Area (VACAPES) warning area. The correct and most up to date information about the lateral and vertical confines can be found on the Washington aeronautical sectional published by the FAA.

WFF has developed several procedures to facilitate airspace and ground operations. Some of these procedures include activating temporary airspace coordination areas, Class D airspace, restricted operations zones, or restricted operations areas, including R-6604, for UAS takeoffs and landings and mission areas or flight routes. These are used in the development of air control points, assignment of block altitudes, and non-radar separation in order to facilitate UAS missions.

WFF range operations are conducted in a wraparound approach. Wallops personnel are concerned with mission accomplishment as much as their UAS range users and strive to be an integral part of each mission's success. From mission inception to fruition, support services are an integral part of every user's operation.

For more information on the UAS Program at Wallops, see the *Wallops Flight Facility Uninhabited Aerial Vehicle (UAV) User's Handbook*.

2.4 PROJECT APPROVAL AND INTERFACE PROCEDURES

The Global Hawk sits in front of the N-159 hangar, with the P-3 in the background.

The Range user will confer with Wallops personnel prior to the submission of a formal request to determine the feasibility of conducting the proposed mission/project at the Wallops Range. The first point of contact is the Advanced Projects Office (APO), Code 802. Visit **https://www. nasa.gov/wallopsrange** for more information. WFF and the range user typically hold preliminary discussions via teleconference and/or face-to-face meetings to assess the feasibility of prospective projects. These discussions primarily address the Range's ability to meet technical requirements, potential safety issues, schedule constraints, and estimated costs.

Once complete, assuming both the customer and WFF wish to proceed, formal agreements are established. The details and subsequent procedures of these agreements are dependent upon the range user's organization, as noted in the following subsections.

For all non-NASA customers, the APO will facilitate the establishment of agreements and follow the project through initial formulation, Level 1 requirements development, and cost estimations. Once funding is received by Wallops, several weeks of processing time are required before charge numbers are available which allow the Range to begin project support.

2.4.1 NASA Organizations

Internal to NASA, WFF and the requesting organization can establish agreement through jointly-approved project plans that clearly define the roles and responsibilities of the respective organizations. This can also be accomplished via a Statement of Work (SOW) or other accepted documents outlining the roles and

responsibilities in support of the mission / project. The sponsoring organization is then responsible for providing WFF with funding in support of the NASA Work Breakdown Structure (WBS) established.

2.4.2 Other Federal Organizations

Agreements with federal organizations most often occur through establishment of an Interagency Agreement (IAA). IAA's typically address roles and responsibilities, estimated cost, schedule milestones, and other key provisions. Once approved, the customer agency can then provide funding through an interagency fund transfer (including Military Purchase Request). For relatively simple efforts, the fund transfer can occur without an IAA, but must be accompanied by an approved form (e.g. Form 7600A) provided by WFF that commits both the Range and the customer to certain key responsibilities extracted from the IAA.

2.4.3 Non-Federal Organizations

Agreements with non-federal organizations require the establishment of a Space Act Agreement (SAA). SAA's identify roles and responsibilities of the parties, and address agreement details including the statement of work, estimated cost, schedule milestones, insurance and liability requirements, provisions for data rights, and public affairs. Further information is provided in the *NASA NPD 1050.1I Authority to Enter into Space Act Agreements*. Once the SAA has been approved, the customer will then provide the funding for NASA to begin support.

2.4.4 Commercial Space Launch Act (CSLA) Customers

Agreements with commercial launch service providers require the establishment of a CSLA Agreement. New CSLA agreements are approved by NASA Headquarters and managed by the center (i.e. GSFC / WFF). Once approved, the customer will establish Individual Support Annexes (ISA's) for specific WFF support.

Alternatively, CSLA customers can also contact Virginia Commercial Space Flight Authority (VCSFA) and establish ISA's with Wallops for project support. VCSFA has established Agreements that can be leveraged to sponsor third-party projects if the work requested is within scope.

2.5 TECHNICAL DATA REQUIREMENTS

2.5.1 Program Requirements Document (PRD)

The range user's project description and technical requirements are often conveyed to the Wallops Range through use of a Program Requirements Document (PRD) or equivalent requirements document defined by the Project Manager.

WFF accepts many different PRD formats from the Universal Documentation System (UDS), which is the standardized documentation system accepted and used at ranges operated by the DoD, to any other format that describes the requirements of the project. The primary UDS reference is *RCC 501-12, Universal Documentation System.*

Projects at Wallops Range span a broad spectrum of complexity, and some flexibility in the application of PRD standards is necessary. However, the PRD provides an excellent checklist of information needed for projects conducted at the range. The PRD will normally contain all of the information needed.

2.5.2 Safety Data

The range user must provide a safety data package with ground and flight safety information, specifications, performance and procedures for safety related items. The detailed information that must be included in the safety data package is identified in GSFC-STD-8009.

2.5.3 Operations Directive (OD)

The OD is prepared by the Project Manager and is NASA's response to the range user's requirements. This document provides a description of the project and the detailed support configuration for all Wallops equipment, instrumentation and facilities. The flight safety plan and ground safety plan are referenced and attached to the OD rather than included.

2.5.4 Documentation Schedule

WFF attempts to avoid excessive documentation wherever possible. Range users are required to provide a PRD or comparable document to aid WFF in defining support requirements. Only applicable sections need be provided. Required documentation with generalized publication dates for first-time projects are listed:

Program Requirements Document (PRD)	90 days prior to arrival at WFF
Preliminary Range Safety Data Package	L-120 days
Final Range Safety Data Package	L-90 days
Hazardous Procedures	L-60 days
Trajectory Simulation Data	L-60 days
Operations Directive	L-21 days

Expendable Launch Vehicle (ELV) Missions:

PRD Draft	L - 1 year
Final PRD	90 days from arrival
Preliminary Range Safety Data Package	PDR + 60 days
Final Range Safety Data Package	L - 75 days
Hazardous Procedures	L - 75 days

Timelines may be compressed for small projects or expanded for ELV missions, depending on the Range schedule. Exact data requirements will be determined during the planning process based on schedule and project-unique details. Earlier dates may be required if the range user begins processing at WFF earlier than 30 days prior to launch.

Wallops Range encourages range users to provide documentation as early as possible and incrementally to assure adequate time for review and approval. Failure to do so could require unnecessary redesigns or delays in schedule.

2.5.5 Operational Reviews

WFF conducts pre-mission reviews for all projects in order to ensure that personnel are briefed on requirements and responsibilities and to ensure that all necessary preparations have been satisfactorily completed. A synopsis of WFF reviews is included below:

• **Range Readiness Review (RRR)** – This review assesses the readiness of the range to support missions launched from WFF or from other locations where WFF functions as the lead range. The chair is held by the Chief of the Range or his/her designee and members of the review board will be appointed by the Chair. For orbital missions this review will be conducted approximately 2-weeks before the scheduled launch. RMMO will maintain the appointment memorandum. The action items memo, action items response memo, action items closeout memo, attendance list, and the presentation material from this review will be maintained by the organization conducting the mission.

• **Launch Readiness Review (LRR)** – This review is required by GSFC for NASA Orbital Missions launched from WFF or for missions that WFF will act as the lead range. This review is chaired or co-chaired by the Director of SSOPD. The chairperson will appoint the review board members. This review will assess the readiness for launch of systems and payload hardware, software, safety, and operational support.

It will also assess the readiness of WFF to support the launch. The LRR shall also assure the proper closeout of any action items generated from the Center Director's Mission Readiness Review. The LRR is normally conducted approximately 3-days before the scheduled NASA orbital launch. SSOPD will maintain the appointment memorandum. The records for this review, contained in the project file and maintained by the organization with prime responsibility, will consist of the attendance list, presentations, action items generated, action items closeout, and the statement of launch readiness memorandum from the review chairpersons.

• **Authority To Proceed (ATP)** – Following completion of all required development, documentation, action item closures, and other activities associated with a mission, an approval to proceed request will be generated by the Project Manager for signature by the Director of SSOPD, or his designee, authorizing approval to proceed. The Project Manager will maintain this record.

• **Operation Debriefing** – A post-operation meeting intended to evaluate the operation and identify items requiring action prior to future operations.

Additional reviews may be required for large projects. It is highly recommended that range operations and safety personnel be invited to participate in project design reviews and technical interchange meetings to ensure that concerns are addressed early in the planning process.

2.6 FUNDING INFORMATION

Wallops Range facilities and operational support are available to support NASA projects, other entities such as: U.S. Government agencies, CSLA projects, commercial organizations, academia, and, under certain circumstances, foreign governments. WFF staff will provide a project cost estimate for requested support. The user will be required to pay actual costs. For all non-NASA Projects, work cannot proceed until a formal legal agreement has been established by the Advanced Project Office and funding has been processed. Funding should be received by WFF at least six weeks prior to start of work on the project. Charges are established by means of the full recovery of direct costs incurred for items such as materials, personnel (civil service and contract labor), travel, equipment and facilities utilized. These charges can vary depending upon the work requested.

3 WALLOPS FLIGHT FACILITY & WALLOPS RANGE

3.1 INTRODUCTION

Wallops Flight Facility includes three areas on the Eastern Shore of Virginia. These are the Main Base, the Mainland, and the Wallops Island Launch Site. The Range is located across all three land parcels and is composed of the Wallops Island launch facilities, the Research Airport, supporting instrumentation, authorized space, authorized frequency spectrum and operations and support personnel.

3.1.1 Wallops Main Base

The Main Base is the location of many of the major functions and activities supporting the Range, including the Research Airport, Range Control Center, (RCC), Telecommunications Center, administrative offices, engineering support, technical service support shops, rocket inspection and storage area and telemetry facility.

Aerial View of the Wallops Main Base.

3.1.2 Mainland

The Mainland site is a strip of land located west of Wallops Island and is the location for radar, optical, communications, and command transmitter facilities. The Wallops Geophysical Observatory (WGO), including the Atmospheric Sciences Research Facility (ASRF), is located on the Mainland.

Aerial View of the Mainland.

3.1.3 Wallops Island

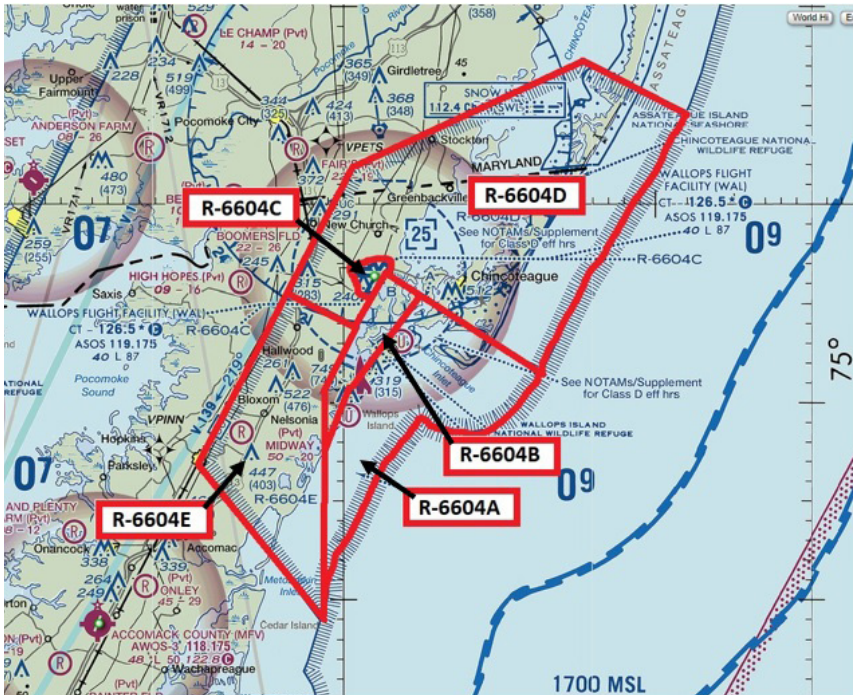
Wallops Island, named for John Wallops, a 17th Century surveyor, is an Atlantic Ocean barrier island off the coast of Virginia approximately 7 miles southeast of the Main Base. The island is roughly 6 miles long and about one-half mile at its widest point. It is separated from the mainland by 2 miles of marsh and water. A causeway and bridge connect the island with the Wallops Mainland. Facilities located on Wallops Island include launch sites, assembly shops, blockhouses, dynamic balance facilities, radar facilities, rocket storage buildings, payload processing facilities and the USN Surface Combat Systems Center.

Aerial View of the Wallops Island.

3.1.4 Authorized Air Space

The authorized space includes the following restricted areas:

Restricted Area R-6604: WFF restricted airspace is divided into five zones A, B, C, D, and E. R-6604-A and -B are surface to unlimited, while RR-6604-C, -D, and -E are available to be activated for use.



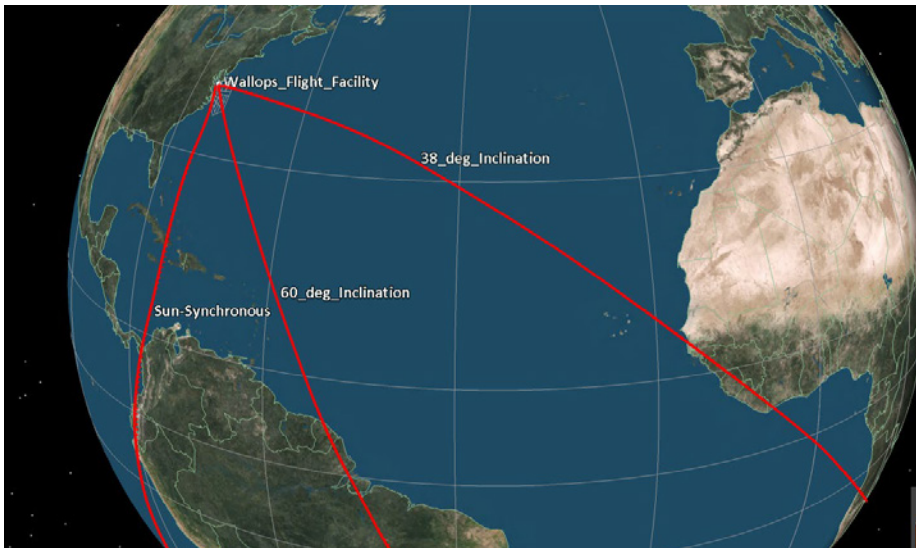
Restricted Airspace R-6604.

The GSFC/WFF Airport Control Zone: Airspace is vertically to 3,500 feet in a 5-statute mile radius of the airport. The Control Zone has an arrival and departure corridor.

VACAPES Warning Areas and International Waters: Mission/project activity requiring surface area and restricted airspace extending outside of R-6604 into the Virginia Capes warning areas and international waters are available 24/7 unconditionally to unlimited altitude with clearance and approval by responsible agencies, e.g., the FAA and USN Fleet Area Control and Surveillance Facility (FACSFAC).

3.1.5 Trajectory Options

Wallops Range offers a wide array of launch vehicle trajectory options. The coastline of Wallops Island is oriented such that a launch azimuth of 135 degrees is perpendicular to the shoreline. In general, launch azimuths between 90 degrees and 160 degrees can be accommodated depending on impact locations. For most orbital vehicles, this translates into orbital inclinations between 38 degrees and approximately 60 degrees.



Trajectory options available from Wallops Range.

Trajectory options outside of these launch azimuths, including polar and sun-synchronous orbits, can be achieved by in-flight azimuth maneuvers. For example, wider northerly options are possible by maneuver around Assateague Island after passing 5 nautical miles (nmi) downrange. The North Carolina Outer Banks are generally the restricting landmass for southern launch azimuths. Specific trajectory options are determined through consultation with the Flight Safety Group.

3.1.6 Wallops Weather

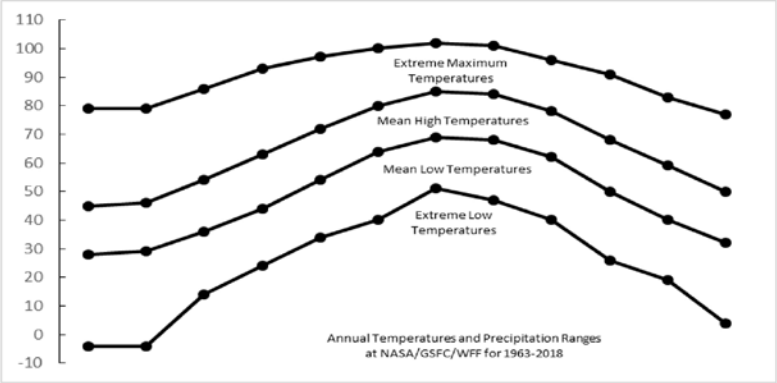
Wallops enjoys a temperate climate and there are only a few months annually when cold weather can be a concern. In winter months, measures are taken to protect launch vehicles. As in most coastal regions, humidity can be relatively high; however, humidity is controlled in work areas and does not significantly affect operations at the Research Range.

The Annual Precipitation and Temperature Plot to the right shows annual temperatures and precipitation at WFF on a month-to-month basis. There are plots for mean high and mean low temperatures and annual variation. Extreme high and extreme low temperatures are noted, as are average precipitation days and precipitation inches per month, including snow averages. The wettest three month period is July through September, with showers and thunderstorms more frequently occurring, however, Wallops' vast array of lightning detection instrumentation minimizes their effect on range operations.

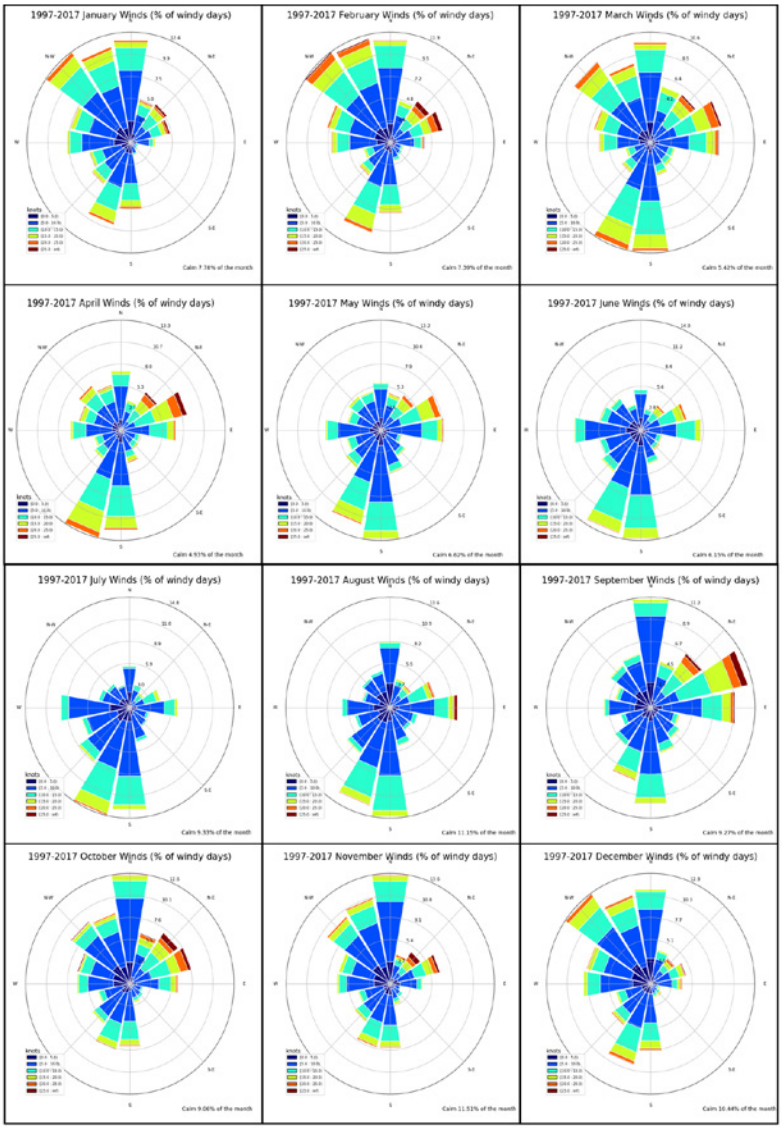
Surface Wind Rose Charts show monthly wind roses depicting the various directions of the surface winds. These wind roses show a predominant northwest wind direction during the winter months and a predominant southerly wind direction during the summer months.

The Range is supported by meteorological data and forecasting capabilities from the Weather Forecast Office, Meteorological Facilities, and the Atmospheric Sciences Research Facility at the Wallops Geophysical Observatory.

Precip Average	DAYS	10.7	9.4	10.3	10.0	10.2	9.2	10.5	8.5	7.7	7.7	8.5	9.8
	INCHES	3.2	2.9	3.7	2.9	3.3	3.4	3.9	4.1	3.8	3.4	2.8	3.4
Snow Average	DAYS	1.8	1.5	0.7	0.1	0	0	0	0	0	0	0.1	0.8
	INCHES	3.42	3.00	0.83	0.10	0	0	0	0	0	0	0.07	1.34
Months		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC



Annual Precipitation and Temperature Plot for Wallops Flight Facility



Surface Wind Rose Charts.

3.2 WALLOPS RANGE FACILITIES

The Wallops Range has a variety of facilities supporting its operations. The major facilities are described in the following paragraphs.

The Launch Pad Manager (LPM) maintains and operates the launch pads. The LPM is available to work through the PM with the range user. The LPM also serves as the point of contact for any shipments coming to the island and arrange for any GSE that might be required.

3.2.1 Launch Facilities

Wallops Range has facilities for the receipt, inspection, assembly, checkout, and storage of rocket motors and other pyrotechnic devices. The Wallops Island Launch Site is comprised of eight active launch pads, three blockhouses for launch control, and assembly buildings to support the preparation and launching of suborbital and orbital launch systems.

Wallops Main Base

Building	Function	Sq.Ft.	Special Features
M-16	Payload Processing	19,290	• two bays 38 ft deep x 35 ft wide x 14 ft high • both are Class 100,000 clean rooms • each has Class 10,000 clean tent 23 ft x 19 ft x 12 ft high • door 12 ft high and 25 ft wide • 2x 1-ton electric chain hoists • manual trolley gantries
M-20	Assembly	11, 585	• single bay • end door 15 ft high and 25 ft wide • side door 13 ft high and 25 ft wide • approved for explosives • 1&1/2 ton manual chain hoist - critical
F-7	Payload Processing	17, 100	• high bay 60 ft long x 30 ft wide x 40 ft high • high bay 60 ft long x 40 ft wide x 30 ft high (100,000 Clean room, and truck Lock with critical lift crane) • other lab and office space
H-100	Payload Processing	14, 400	• high bay 80 ft long x 40 ft wide x 62 ft high • intermediate bay 80 ft long x 40 ft wide x 40 ft high • end door into high bay 60 ft high x 20 ft wide • end door into intermediate bay 42 ft high x 40 ft wide • side door between the two bays 42 ft high x 45 ft wide • laboratory and office space • 20-ton bridge crane - critical

Wallops Island

Assembly and Payload Processing Facilities Wallops Island

Building	Function	Sq.Ft.	Special Features
V-45	Assembly	4,933	• 10-ton bridge crane – critical
V-55	Assembly	2495	• 20-ton bridge crane – critical
W-15	Assembly	5,165	• one 3,936 sq. ft. bay • door 13 ft high x 12 ft wide • 3-ton overhead crane with 10-ft hook height • approved for explosives • 6-ton bridge crane – non-critical
W-40	Assembly	5,255	• 6-ton bridge crane (dual 3-ton trolleys) – non-critical
W-65	Assembly	13,255	• 6 bays • pyrotechnic storage rooms • 6 assembly bays • approved for explosives Bay Doors / HxW / Crane(s) hook height (hh) Bay 1: 7 ft 10 in x 23 ft 11 in — 2x10 ton bridge/20 ft hh Bay 2: 18 ft x 23 ft 11 in; 17 ft 10 in x 23 ft 11 in — 2x7.5 ton monorail/18 ft hh Bay 3: 17 ft 10 in x 18 ft 11 in — 2x3 ton monorail/19 ft hh Bay 4: 14 ft 11 in x 15 ft 11 in Bay 5: 14 ft 11 in x 15 ft 1 in — 2x3 ton monorail/16 ft 5 in hh Bay 6: 14 ft 11 in x 23 ft 11 in; 14 ft 11 in x 23 ft 11 in — 2x3 ton monorail/16 ft hh
X-15	Payload processing	5,740	• door 19 ft 10 in high and 18 ft 10 in wide • 3-ton overhead crane with 19-ft hook height • laboratory and office space • 1-ton stationary electric chain hoist – non-critical • 1-ton electric chain hoist – non-critical • 5-ton bridge crane – non-critical
Y-15	Assembly	8,240	• one high bay (Bay 8) • seven other bays • approved for explosives Bay Doors / HxW / Crane(s) hook height (hh) Bay 1: 9 ft 6 in x 17 ft 6 in Bay 2: 6 ft 10 in x 8 ft Bay 3: 6 ft 10 in x 8 ft Bay 4: 6 ft 10 in x 8 ft — 3-ton monorail/7 ft 10 in hh Bay 5: 6 ft 10 in x 8 ft Bay 6: 6 ft 10 in x 8 ft — 3-ton monorail/7 ft 10 in hh Bay 7: 6 ft 10 in x 8 ft Bay 8: 13 ft 7 in x 10 ft 10 in — 2-ton bridge/15 ft 10 in hh

Launcher Systems

Pad 0A — MARS Launch Complex

Antares liquid fueled launch complex including Liquid Fueling Facility (LFF) for LOX/RP1 and 200,000-gallon elevated tank acoustic suppression system.

Pad 0B — MARS Launch Complex

Designed for small to medium class ELVs up to 200,000 pounds maximum load. Currently supporting Minotaur I, IV and V launches.

Pad 0C — Launch Complex 2

The newly-built Launch Complex 2 at Pad 0C hosts the Electron Vehicle for Rocket Lab.

Pad 2 — 50K Launcher

The 50K launcher is rated as a 50,000 pound maximum design load launcher. It has a movable environmental shelter and a 45-foot, 6-inch overall boom length.

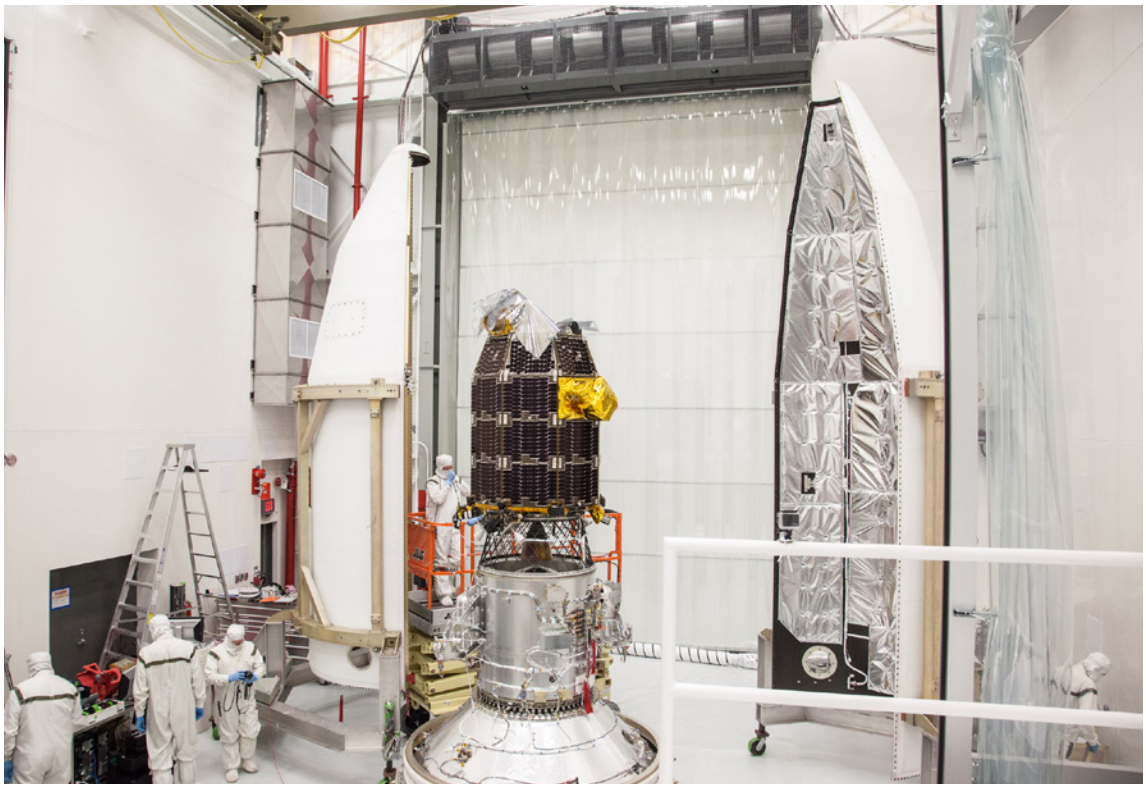
Pad 2 — Atlantic Research Corporation (ARC) and Missouri Research Laboratories (MRL) Launchers

The ARC launcher is rated as a 20,000 pound maximum design load launcher. It has a movable environmental shelter and a 38-foot overall boom length. Pad 2 also has a Missouri Research Laboratories (MRL) which has a 7,000-pound capacity with a 28-foot rail, as well as a removable environmental shelter.

Pad 3 — MK 7 Launcher

The MK 7 launcher located at Pad 3 is currently being used to support Department of Defense U.S. Navy missions in the VACAPES OPAREA for launching GQM-163 Coyote targets.

3.2.2 Spacecraft Fueling Facility (SFF)



Inside Spacecraft Fueling Facility

Wallops Range is capable of supporting spacecraft processing operations including buildup, testing, hypergolic fueling, and integration to the launch vehicle in the newly upgraded SFF, V-55. Self- Contained Atmospheric Protective Ensemble (SCAPE) suits, maintained and certified by Kennedy Space Center, are available for hydrazine fueling operations or the customer may provide their own suits subject to Range Safety approval. The SFF has trained valet and emergency support for SCAPE and a SCAPE van for transport to and from the fueling facility. Wallops will also provide all necessary facility support infrastructure to conduct SCAPE operations including breathing air panels and hoses, wired communications between the SCAPE suits and the fueling control room, nominal and emergency showers, and hypergolic vapor sensors.

The SFF meets all existing NASA requirements for spacecraft fueling operations along with complying with relevant Federal, State, and Industrial standards. The SFF Class 100,000 clean room with fueling island has a trough sized to catch and dilute full 4BW spill and a Hydrazine and oxidizer compatible floor coating. The SFF has building and mobile vapor detectors with intrinsically safe pan tilt zoom and fixed cameras for safety and observation, as well as an infrared camera to allow operations to be observed and coordinated remotely from the fueling control room located nearby in building V-50. This control room can accommodate up to 12 people with eight concurrent video displays visible for the fueling support team and with full camera control by the fueling test conductor. All audio and video is recorded concurrently and redundantly in digital format to hard drives for easy access and playback.

Vapor and liquid collection systems for hypergolic fueling is accomplished via separate vacuum systems for hydrazine and nitrogen tetroxide to above ground tankers for neutralization, an aspirator to collect liquids and vapor as well as nominal and emergency high-rate roof exhaust systems. The SFF has no wind direction restrictions on fueling operations and meets NASA and Virginia air emissions standards. The SFF includes a manually operated deluge system which is controlled remotely from the fueling control room in V50.

The SFF has an extensive flexible support capability by providing a critical lift certified bridge crane, scissor lifts, forklifts, other typical GSE, pressurized commodity systems for clean nitrogen and nominal and shop air. There is also a small conference room and refreshment area to support the fueling teams of up to 24 people.

3.2.3 Horizontal Integration Facility (HIF)

The HIF launch vehicle processing facility, X-79, is a visibly clean high bay area and is sized to accommodate mid-sized launch vehicles. This facility is capable of dual vehicle processing in an open span high bay that is environmentally controlled by radiant floor heat, as well as temperature and humidity controls. The extensive flexible support capability of the HIF includes two critical lift bridge cranes (50 ton and 70 ton), and three mega doors for payload/vehicle ingress/egress, scissor lifts, and forklifts. Pressurized commodity systems for clean nitrogen, helium, and air are available as well as secure access and 24-hour video surveillance. The processing team's support space has a loading dock for ground deliveries, lockable storage area, Electronic Ground Support Equipment (EGSE) lab space, battery charging room, and a kitchen and crew lounge. Currently this building is exclusively used to support Antares and Pegasus vehicle and payload integration.

Inside Horizontal Integration Facility

3.2.4 Payload Processing Facility (PPF)

The PPF, H-100, is located on Wallops Main Base beside the Marine Science Consortium.

There are two 100,000 Class clean rooms, one high bay and one low bay with adjoining work spaces supported by redundant chillers for high reliability. The spacecraft launch control center, located adjacent to the high bay, has pass-throughs for Ground Support Equipment (GSE) cabling and tools, as well as a display for visibility during spacecraft fueling integration and launch. The PPF has an extensive flexible support capability that boasts bridge cranes, scissor and fork lifts, pressurized commodity systems for clean nitrogen, helium, and air, secure access and 24-hour video surveillance, visitor area, staging pad, and other support amenities. Office space for the payload team is available with 24 cubicles, kitchenette, and an adjacent conference room with observation windows overlooking the payload bays.

Inside Payload Processing Facility

3.2.5 The Multi-Payload Processing Facility (MPPF)

The MPPF, F-7, houses multiple areas for scientific balloon and small spacecraft payload processing, as well as offline subsystem and experimenter integration activities. Two high bays at the east and west ends of the building are available for payload processing. The West High Bay has dual trolley cranes and is primarily used for balloon payload integration.

The East High Bay is designed as a Class 100,000 clean room and is equipped with a bridge crane and ESD floor. The building also houses several specialized work areas: a thermal vacuum test area, a materials testing lab, a small prototyping machine shop, hardware storage, small ESD electronics labs, and a "battery lab" equipped with a fume hood and freezer.

Inside Multi-Payload Processing Facility

3.2.6 Research Airport

The WFF Airfield is a NASA facility located approximately 5 miles west of the town of Chincoteague on the Eastern Shore of Virginia. The geographical coordinates of the airfield are 37°56' north latitude, and 75°28' west longitude. The airfield elevation is 41 feet above Mean Sea Level (MSL).

Wallops Airfield

3.2.6.1 Communications

- ATIS: 119.175 Voice line: 757-824-0820 (ASOS)
- GND: VHF127.875, UHF269.325
- PATUXENT APP/DEP: VHF127.95, UHF314.0
- UNICOM IS NOT USED AT WFF
- TWR: VHF126.5, UHF306.975
- CTAF: VHF126.5, UHF306.975
- PATUXENT CLNC DEL: VHF121.7

3.2.6.2 Runway/Taxiway Information

The WFF Airfield has three runways constructed of concrete and asphalt. Runway dimensions are:

- **10-28 – 8,005 feet by 200 feet**
- **04-22 – 8,750 feet by 150 feet**
- **17-35 – 4,810 feet by 150 feet**

Two taxiways Alpha and Echo parallel runways 10/28 and 04/22 and connect at the ends. Taxiways Bravo, Charlie, Delta, Foxtrot, Gulf, Hotel, India and Juliet connect ramps to the parallel taxiways or the parallel taxiways to the runways.

All runways, with the exception of 35, are configured with FAA-approved circling and straight- in approaches. Runway 04-22, the primary research runway, has a test section with a variety of surface textures and materials for runway research projects.

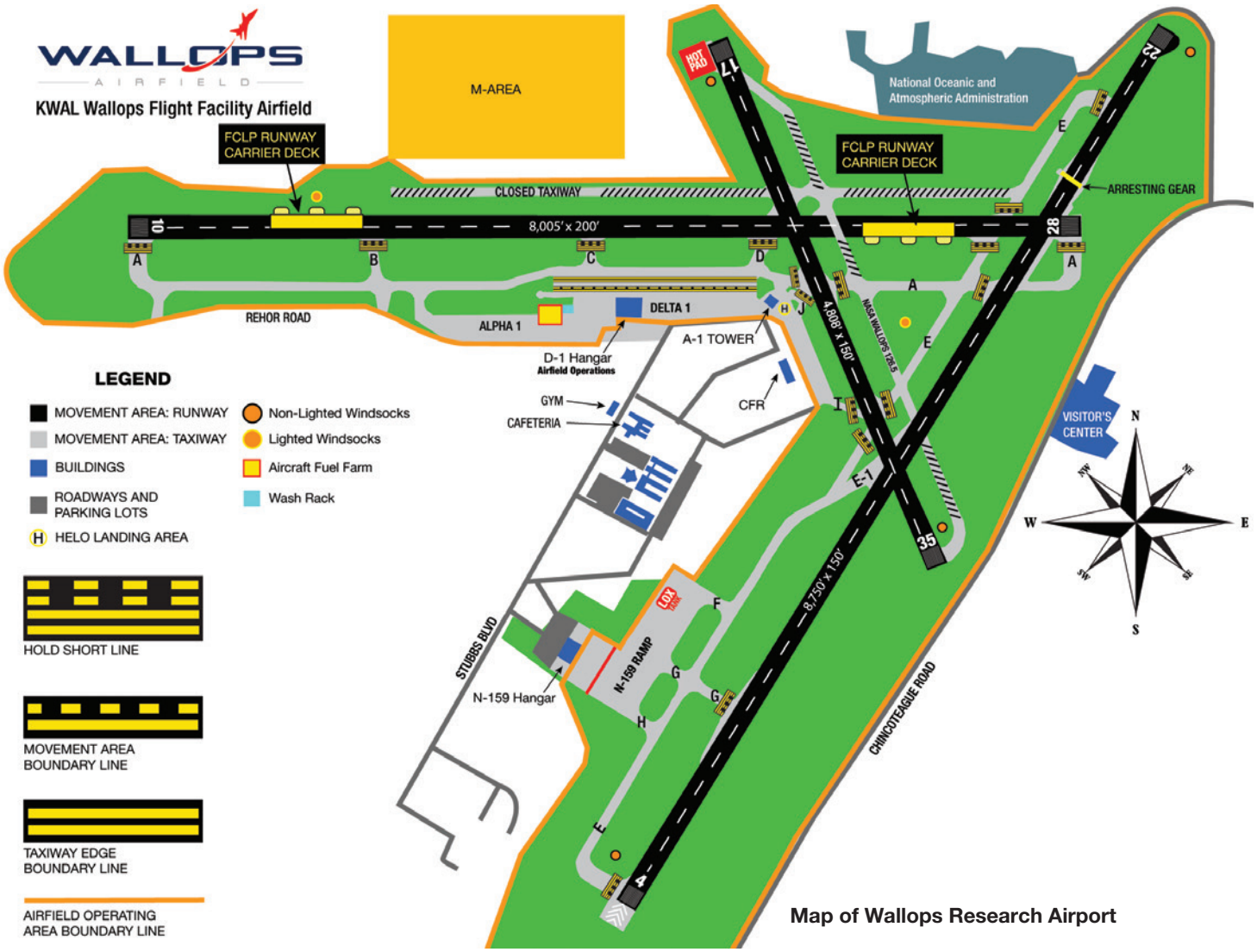
Runway features include the following:

- A grooved section for runway friction research
- A runway-to-taxiway high speed turnoff
- GPS
- A water test section for aircraft water ingestion tests
- E-28 arresting gear

Support and Services

The following support and services can be provided at the Research Airport with prior arrangement:

- Hangar space
- Minor and temporary repairs
- Fuel services for JP-5
- Ground power units
- Aircraft towing
- Rollaway stairs
- Oxygen service, liquid and gaseous
- Local and national meteorological information
- Flight planning support
- First aid and emergency treatment
- Hazardous cargo handling
- Night operations support
- Support for aircraft carrying combat ordnance



Map of Wallops Research Airport

Hangar, office, and shop space are available for approved aircraft projects and vary in size and location. Since Wallops is equipped to affect only minor or limited repairs to transient aircraft, maintenance personnel should accompany project and R&D aircraft when engaged in flight operations at Wallops. Limited assistance may be provided for minor repairs.

Fuel services are available for U.S. Government program aircraft during normal working hours and at other times by prior arrangement. Fuel is dispensed from trucks equipped with single point refueling fittings or over-wing refueling nozzles.

3.2.7 Range Control Center (RCC)

The focal point for all Range operations is the RCC located in building E-106 on the Main Base. Data from the range support instrumentation (e.g., optical, radar and TM data) are acquired, processed, and made available for video display throughout the facility. This data assimilation, in conjunction with communications and command links, facilitates the coordination, control, and safe conduct of WFF missions.

The Range Data Acquisition and Computation (RADAC) System supports the RCC with redundant real-time data support, including impact prediction for range safety, and other Range requirements. The RADAC System provides a quick and flexible selection of data sources and displays. The internet protocol video distribution system (IPVDS) is the primary means of distributing data in the RCC. Critical instrumentation is supported by uninterruptible power supplies (UPS) and a backup power generator.

Range Control Center Mission Control Room

The RCC is composed of co-located rooms devoted to range control functions:

- Mission Control Room (MCR)
- Instrumentation Coordination Room
- Range Safety Room
- Smart Room
- NASA Communications Room (NASCOM)
- MCR Observation Area
- Aeronautical Projects Control Room
- Surveillance Room
- Weather Forecast Office

The Project Manager can provide information on the RCC communications, data systems, and other capabilities available to support a project at the Range.

RCC Mission Control Room (MCR)

The MCR is two stories high and features a 40-feet wide and 8-feet tall video wall, 30 mission consoles, a raised Test Director area, and a VIP area. The video wall provides overall mission situational awareness to the MCR and adjacent mission and viewing areas.

With the development of the Mission Operations Control Center (MOCC), range customers can now support launch operations from this new facility. The RCC MCR is predominately used for Wallops personnel.

The 30 mission consoles are outfitted with Range Client Video Processors (RCVPs) and two monitors at each workstation; additional monitors may be provided at each user workstation, if desired. Software-based IP video decoding allows for users to create a custom video matrix on each monitor. Real-time data displays can be configured as necessary depending on mission requirements.

Data Acquistion and Processing Room

Instrumentation and Coordination Room

The Instrumentation and Coordination Room is adjacent to the MCR. Radar, TM, and other range data are checked for quality and selected for display from this room.
The room is separated from the MCR by a glass wall with sliding glass doors.

These computers provide post-mission data analysis, general data reduction, and range operations support, such as real-time processing, local and remote multi- batch processing, interactive communications, and time-sharing.

The systems are x86/Red Hat Enterprise Linux based. Wallops Range provides libraries and custom applications that process user data and provide real-time flight position data to Range Safety displays.

Range Safety Room

The Range Safety Room is adjacent to the MCR and is the focal point for ground and flight safety operations. The functions performed in the Range Safety Room are wind weighting, monitoring of preflight and flight parameters, and control of the Flight Termination System. The room is separated from the MCR by a glass wall with sliding glass doors.

Surveillance Room

This room is adjacent to the Data Acquisition and Processing Room. Surveillance consoles provide communications, computation and displays for range surveillance and clearance functions. In addition, there are several radar consoles: One for the ASR-8, one for LSTAR, several Aircraft Radar consoles, and one for each of the sea surface surveillance radars Furuno S-band and X-band, which provide radar control and range

surveillance information. There is also an integrated display system that enables a Common Operating Picture with risk calculating capabilities. This room is separated from the MCR by a glass wall and sliding glass door.

Smart Room
This room is adjacent to the Range Safety Room. It can be used for processing, implementation, and testing of new systems.

MCR Observation Areas
There is a glass-enclosed balcony on the third floor between buildings E-106 and E-107, which overlooks the MCR. The balcony will accommodate approximately 30 visitors.

Aeronautical Projects Control Room (APCR)
The APCR on the fourth floor between buildings E-106 and E-107 provides visual observation of the Research Airport, including research runway 04-22 and aeronautical project activities in the surrounding area. The APCR has mission controller consoles identical to those in the MCR, which provide communications and data display for monitoring and control of aeronautical projects.

NASA Communications Room (NASCOM)
The NASCOM Room provides the primary interface with internal and external RCC communications, as well as the control for data distribution within the RCC. The primary support instrumentation based in NASCOM is listed below:

- Frame for twisted pair interface to external points and distribution of RCC data and communications. These pairs support telephone, range intercom, remote radio circuits, command remote, tone keying, timing data, radar data and technical control
- Fiber optic cable system interface, which supports video, high-speed data, and access to the WFF LAN
- Video Switching Network, a two-level computer setup and control
- NTSC: 50-source input by 120 destination output
- RGB: 50-source input by 100 destination output
- Technical Control access, which provides real-time voice and data communications with other locations through the Technical Control network
- Programmable intercom for range communications, which provides patchable radio, telephone, SCAMA (Switching, Conferencing, and Monitoring Arrangement) and range operations channels

Mission Operations Control Center

3.2.8 Mission Operations Control Center (MOCC)

As NASA's only owned and operated launch range, Wallops Flight Facility (WFF) needed to be able to provide the necessary operational environment required to ensure safe and successful flight operations for multiple launch vehicles, aircraft, Unmanned Aerial Systems, and a myriad of missions that only happen at WFF. Even after the renovations to the Range Control Center (RCC) completed in 2017, it was abundantly clear that in order to meet mission requirements for the future that a capability needed to be addressed in the command and control arena.

To that effect, the 11 million dollar, multi-year Mission Operations Control Center (MOCC) project was born and completed in April 2018. The 14,000-square-foot building can support up to 120 on-console operators and will serve as the mission operations hub at WFF for project teams to interface and provide critical command and control missions. This state-of-the-art facility allows for multiple missions to operate simultaneously, increasing the command and control capability threefold. The facility boasts two Launch Control Centers and one Mission Control Center, each with their own conference rooms, data rooms and individual Ground Support Equipment (GSE) rooms that will provide data over the customer network and Range Mission Network. All systems are also fully integrated with the RCC.

State-of-the-art video walls measuring 40-feet wide and 8-feet tall provide mission situational awareness to each control room. Fully customizable IP selectable video and data sources per station give users information at the touch of a screen.

Other amenities include a kitchen, break area for the building occupants and a guard station for security control.

Lastly but most importantly, the MOCC is Leadership in Energy and Environmental Design (LEED) silver certified. This groundbreaking facility will serve the denizens of Wallops and future clients for many years to come.

3.2.9 Wallops Geophysical Observatory (WGO)

The Wallops Geophysical Observatory (WGO) allows scientists, principal investigators and other experimenters to conduct measurements from ground-based test equipment. The WGO is intended to augment and enhance flight vehicle-based test equipment during scientific missions.

Atmospheric Sciences Research Facility (ASRF)
The ASRF houses the atmospheric radar installed on the Wallops Mainland. The facility possesses unique capabilities for atmospheric data acquisition, processing, display and recording. Past studies have contributed to the understanding of atmospheric turbulence, cloud and precipitation development and dynamics, lightning discharge characteristics and distribution patterns, as well as the effects of precipitation on the transmission of electromagnetic radiation. Permanent data acquisition systems available at the ASRF include two high-power radar systems (one S-band and one UHF-band) and an Environmental Data Acquisition and Recording System (EDARS). Both systems are currently inactive, but interested parties should contact the range for more information.

3.2.10 Fabrication Facilities

Wallops has a fully equipped machine shop housed in Building F-10 that can provide electronic, electrical, and mechanical support. The 26,000-square-foot machine shop includes a large selection of Computer Numerically Controlled (CNC) mills and lathes, manual machines, sheet metal fabrication, welding, and heat-treating facilities. Capabilities include full CAD/CAM implementation in developing and fabricating mechanical systems, optical instrumentation, and payload components for flight research. The fabrication area performs functions such as sounding rocket launcher refurbishment, design, and fabrication of mobile telemetry and mobile radar support vans and antenna systems. The machine shop includes mechanical technician laboratories for assembly of scientific sounding rocket payloads. While the facility primarily supports the Sounding Rocket Program, it regularly supports other NASA and reimbursable projects. The facilities are managed through the NASA Sounding Rocket Operations Contract (NSROC). A more comprehensive description of mechanical and electrical fabrication capabilities is available in *810-HB-SRP, Sounding Rocket Program Handbook*.

3.2.11 Environmental Testing Facilities

Specialized facilities for environmental testing of complete payloads, such as subassemblies and components in order to verify flight readiness when exposed to an intended flight environment are available at Wallops and include the following:

- Spin deployment bay
- Static and dynamic balance machines
- Vibration facility
- Thermal-vacuum chambers
- Antenna pattern measurement facility
- RFI/EMI chamber
- Centrifuge Machine
- Spin Balance Facility
- Bend test apparatus
- Magnetic calibration facility
- Vacuum chamber
- Mass properties measurement apparatus
- Thin film testing facility
- Integration laboratories
- Magnetic Test Facility

3.3 WALLOPS RANGE SERVICES

3.3.1 Mobile Range Services

Wallops has mobile radar, telemetry, command/control, and data systems that can be transported to offsite and remote locations. Campaigns have been conducted in the Arctic and Antarctic regions, South America, Africa, Europe, Australia and even at sea. WFF personnel have extensive experience in planning and conducting mobile campaigns and developing equipment and systems to support these operations.

Mobile systems include the following:

- C-band radar
- Launchers
- Surveillance radar
- Meteorology
- Command
- Data acquisition and recording
- Orbital Tracking
- Flight termination system
- Power
- Wind weighing
- Payload processing
- Communications
- Telemetry
- Timing
- Recovery
- High-Speed Video
- Photography
- Optical Tracking
- Facility surveillance
- Video distribution

3.3.2 Mobile Power Services

Mobile Electric Power Services are available at the Wallops Flight Facility, the Poker Flat Research Range (PFRR), and at other ranges worldwide. Mobile electric power services are provided at Wallops Range and simultaneously for missions requiring support at remote locations.

Wallops Range maintains and sustains diesel generators and rotary frequency converters that are part of the electric power generating equipment as well as small diesel generators used for power systems. In addition to providing electric power to the tracking, data acquisition and communications systems at remote locations, utility electric power is provided for assembly buildings, rocket launchers and other remote site users as required. The electric power systems currently in use are single- and three-phase designs. The mobile electric power systems are installed in ISO portable containers and can be transported over the road on flat bed trailers.

Mobile Power Systems

Mobile Power System (MPS)	Input Power	Voltage & Frequency Conversion	Output Power	Redundant Power & Power Conditioning	Standby Power	Assembly Package
MPS-1	208/220VAC, 60Hz, 3PH	-	208/220VAC, 60Hz, 3PH & 110/120VAC, 60Hz, 3PH	30KVA UPS & Bypass Switch 40KVA UPS & Bypass Switch	160KW Diesel Generator & 600A, 208/120VAC, 60Hz Automatic Transfer Switch	40' Enclosure & 53' Trailer
MPS-2	208/220VAC, 60Hz, 3PH	-	208/220VAC, 60Hz, 3PH & 110/120VAC, 60Hz, 3PH	30KVA UPS & Bypass Switch 40KVA UPS & Bypass Switch	160KW Diesel Generator & 600A, 208/120VAC, 60Hz Automatic Transfer Switch	40' Enclosure & 53' Trailer
MPS-3	480VAC, 400A, 50Hz, 3PH	100KVA Rotary Motor Generator	208/220VAC, 60Hz, 3PH & 110/120VAC, 60Hz, 3PH	60KVA UPS & Bypass Switch	175KW Diesel Generator & 600A, 208/120VAC, 60Hz Automatic Transfer Switch	40' Enclosure & 53' Trailer
MPS-4	380/415VAC, 400A, 50Hz, 3PH	75KVA Rotary Motor Generator	208/220VAC, 60Hz, 3PH & 110/120VAC, 60Hz, 3PH	60KVA UPS & Bypass Switch	175KW Diesel Generator & 600A, 208/120VAC, 60Hz Automatic Transfer Switch	40' Enclosure & 53' Trailer

3.3.3 Telemetry Services

Telemetry antennas seen on the main base at Wallops Flight Facility.

Wallops Range provides telemetry services and maintains capabilities enabling telemeter of data in support of mission requirements. The Wallops Range Telemetry equipment supports Consultative Committee for Space Data Systems (CCSDS) as well as RCC IRIG 106 telemetry standards receiving and processing of telemetry data.

Telemetry (TM) instrumentation and trailers are equipped with a trained and certified operations staff to provide services for operational support of a missions. Both fixed and down range telemetry services, simultaneously with a remote mission, utilize deployed mobile telemetry services that require no more than two complete mobile telemetry antennas and associated instrumentation systems.

TM services include receiving, decoding, recording, relay, and display of telemetered data from aircraft, unmanned aerial systems, Sounding Rockets, Expendable Launch Vehicles (ELVs), balloon payloads, ground test articles, and satellites. The Inertial Navigation System (INS) and Global Positioning System (GPS) on-board

Mobile Telemetry Systems

Antenna Diameter/ Type	Frequency Range	G/T (Minimum)	Tracking Modes	Pedestal Type	Trailer	Van	Remarks
Antenna #1 10ft 4 Section Parabolic	1435–1540 MHz 1650–1710 MHz 2200–2300 MHz	5 dB/K@ 1485 MHz 7.5 dB/K @ 2250 MHz	Auto Slave Manual	AZ/EL	n/a	SVAN1 or MITS	Skid-mounted with 20-ft. Conex, can be interfaced to a facility
Antenna #9 6.1M/20 ft 12 Section Mesh Parabolic; Wide band and Narrow band	1435–1540 MHz 2200–2300 MHz 2300-2400 MHz	10.5 dB/K @1485 MHz 17dB/K @ 2250 MHz 17dB/K @2370 MHz	Auto Slave Manual	AZ/EL	12.8M/42 ft flatbed w/ enclosed shelter	n/a	Antenna #9 can be shipped in a C-141 aircraft.
7-meter system 7M/23 ft 12 Section Fiberglass Parabolic	1435–1540 MHz 2200–2300 MHz 2300-2400 MHz	11.0dB/K @1485MHz 18.5dB/K @ 2250 MHz 18.5dB/k @2370 MHz	Auto Slave Manual	AZ/EL	40-ft flatbed	MITS or SVAN	Interfaced to a mobile support van or a facility.
Three 5.4 meter antenna systems, Aluminum parabolic dish. E-Scan feed.	2200-2400 MHz	>16 dB/K @ 2250 MHz	Auto Slave Manual	AZ/EL	Mobile Trailer	MITS or SVAN	Interfaced to a mobile support van or a facility.

flight system data can be received at Wallops by telemetry and can be converted to Launch Trajectory Acquistion

System (LTAS) format for trajectory display and an antenna slave source.

Each fixed or mobile telemetry system (single receiving aperture) is capable of supporting multiple downlinks supporting CCSDS as well as RCC IRIG 106 Telemetry Standards. Wallops Range is able to provide telemetry services to enable receipt of data forwarded by remote downrange telemetry receiving sites supporting missions launching from Wallops Island. Wallops Range provides data recording, telemetry best source selection, de-commutation, decoding and processing, and display of data products at the TM Readout Facility.

Instrumentation components include signal amplifiers and conditioners, bit synchronizers, frame synchronizers, and TM processors, processed/formatted data, and display video is provided by the TM Readout Facility. Implementation and operation of customer provided data processing and display instrumentation systems, including data communications interfaces, is supported in the Telemetry Readout Facility.

The Wallops Range provides a Fixed Telemetry 7M antenna tracking and receiving capability down range in the country of Bermuda. The 7M antenna system has protection from the environment in an enclosed radome. The telemetry tracking and receiving station is located in a secured environmental controlled building. The telemetry station can support up to 5 down links with redundant equipment. The received/processed vehicle PCM data if required is transmitted back to Wallops real-time via TMoIP IRIG-106 standards for delivery to the end customer.

Range Telemetry Systems

Antenna Diameter/Type	Location	Frequency Range	Polarization	G/T* (Minimum)	Gain	Tracking Modes	Pedestal Type
FTM 10 ft Parabolic	WFF Range	1435-1540 MHz 1650-1710 MHz 2200-2400 MHz	RHC/LHC div	5 dB/K @ 1485 MHz 10 dB/K@ 2250 MHz 10 dB/K@ 2370 MHz	34.5 dBi @ 2250 MHz	Auto, Slave, Manual Program	AZ/EL
MGTAS 7.3M/24 ft Parabolic	WFF Range	1400-2400 MHz	RHC/LHC div	10.5 dB/K @ 1485 MHz 14.5/K @ 2250 MHz	39 dBi @ 2250 MHz	Auto, slave, manual program	AZ/EL
7M Parabolic	Bermuda	2200-2400MHz	RHC/LHC div	18.5 dB/K @ 2250 MHz	42 dBi @ 2250 MHz	Auto, Slave, Manual Program	AZ/EL
6M Parabolic	WFF Range	L/S Band 1435-2400 MHZ C-Band 4400-5150MHz	RHC/LHC div	10.5 dB/K @ 1485 MHz 14 dB/K @ 1760 MHz 16.25 dB/K @ 2250 MHz 16.5 dB/K @ 2370 MHZ 20 dB/K @ 4450 MHZ 21.5 dB/K @ 4900 MHz 21 dB/K @ 5120 MHz	40.5 dBi @ 2250 MHz	Auto, slave, Manual Program	AZ/EL
9.3M Parabolic	WFF Range	2200-2290 MHz 2360-2400 MHz 4400-5150 MHz	RHC/LHC div	19.5 dB/K @ 2250 MHz 19.5 dB/K @ 2400 MHz 24 dB/K @ 5000 MHz	44 dBi @ 2250MHz 45.52 dBi @ 2400MHz 52.6 dBi @ 5000MHz	Auto, Slave, Manual Program	AZ/EL
8M at WFF Range	WFF Range	2200-2400 MHz	RHC/LHC div	Tracking >20.5db/K @ 2250 MHz, Data >21 dB/K @ 2250 MHz	42.8 dBi @ 2250MHz	Auto, Slave, Manual Program	AZ/EL
8M (TOTS) at Poker Flat, Alaska	Poker Flat, Alaska	2200-2400 MHz	RHC/LHC div	Tracking >18db/K @ 2250 MHz Data >20.5db/K @ 2250 MHz	42.8 dBi @ 2250MHz	Auto, Slave, Manual Program	AZ/EL
9M1 & 9M2 Redstone at Poker Flat, Alaska	Poker Flat, Alaska	2200-2400 MHz	RHC/LHC div	19 dB/K @ 2250 MHz	41 dBi & 2.25GHz	Auto, Slave, Manual Program	AZ/EL

Mobile Van Summary

Van	Size	Function
Super Van "SVAN"	14.8 meter (48 ft.)	Multipurpose telemetry van equipped to support 2 antenna systems individually and simultaneously configurable to support telemetry links.
20FT Antenna Support Conex	12.2 meter (40 ft.)	53-foot flatbed trailer with hydraulic erected 6.2-meter (20-ft.) tracker and 20-ft. long instrumentation shelter.
40-ft ISO Hauler and MITS Van	12.2 meter (40 ft.)	Equipped to support Down Range Missions, can support two TM antennas and five TM links.

The Roll Away TM Readout System is self-contained deployable system shipped MIL grade rack cases. Roll Away TM Readout System supports Missions globally and provides bit synchronizers and TM de-commutation and data display processing provided to the end customers at the support location.

TM services at the Range include a variety of antennas, receivers, and DECOMM display instrumentation systems. Post-flight telemetry data can be distributed via an IRIG Chapter 10 formatted file.

3.3.4 Range Timing

The Master Timing System (MTS) provides time synchronization and coordination of range activities. The system provides for the distribution of time codes, reference signals, and program time (countdown) information to all required locations. The Time-of-Year (TOY) system is synchronized to the GPS constellation of satellites. The GPS time transfer unit is used to synchronize the MTS and its remote sites. The codes are received and amplified at the various remote user sites for a variety of functions, including use with recorders, camera events, and for driving remote timing displays. Program time provides a visual countdown status and programmable function control (sequencer) for pre-determined events. MTS includes two independently controlled countdown clocks with each selectable as "Online" countdown. Count down/up time has a range of plus and minus 9 hours 59 minutes and 59 seconds. Synchronous generators and translators at remote sites provide for fail-safe operations, propagation delay correction, and translation of received time codes to other codes (e.g., IRIG-A, IRIG-G) and reference signals. The following time codes are available: NASA 28-bit, NASA 36-bit, IRIG-B, IRIG-E, IRIG-H, IRIG-A, IRIG-G, Multiplexed Time Code (ASCII).

The Roll-Away Timing System
The Roll-Away Timing System (RATS) provides time synchronization for remote operations such as sounding rockets campaigns and ELV downrange launches. The TOY system is synchronized to the GNSS that utilizes not only GPS but several global navigation satellite systems including GLONASS and Galileo for synchronization and TOY generation. The system utilizes industry standards and is designed to be integrated into a local mission Ethernet network. A Local Area Network (LAN) provides synchronization between Master and Slave subsystems and time display signal distribution. The system can be configured using point to point cabling if a LAN is not available. A master/slave configuration utilizes a single GPS master that synchronizes to GNSS and provides PTP to synchronize slave devices. Both master and slave devices generate timing signals which include modulated and DC level IRIG codes, 10Mhz reference signals, 1PPS, and a programmable pulse. High stability oscillators in both the master and slave units provide a failsafe if GNSS or network outages occur. A computer-controlled count device synchronized to the PTP standard provides countdown signals in both LAN and serial formats, CS-5 and CS-3 respectively. The count devices includes a manual hold control box. Time Displays are included at both the Master and Slave locations and connected to the LAN to provide configuration and time signals. A graphical time display system provides TOY and count time on standard computer monitors. The system uses a small PC that connects to the mission network.

The Hold System is a dry closure detection and transmission system used to hold the MTS countdown clock, change the state of the range light tree, and provide a signal that is used by range customers to inhibit a launch sequencer. Hold buttons are located in the RCC at designated locations. Detection of a closure or button press in the RCC changes the state of a relay. Relay state changes are transported over redundant fiber optic systems. The system fails in a Hold condition in the event of power or optic failures.

Video Timing Display System
The Video Timing Display System (VTDS) is a LAN based timing distribution and display system. The system generates a network packetized data stream from both the MTS countdown and TOY timecodes. It also detects the dry closure generated by the Hold and Missle Lift Off (MLO) systems. Using a Windows PC and Wallops custom application, the data stream is decoded and a graphical time display generated that includes TOY, Countdown time, MLO time, and a graphical green/red indicator of the Hold system status.

3.3.5 RF Monitoring and RF Communications

Range communications and monitoring services are available for the multi-channel intercom system distributed throughout the Wallops Range for use by both fixed and mobile instrumentation and range data processing and control facilities. WFF provides the voice communications in support of mission operations.

Various radio bands including Very High Frequency (VHF), and Ultra High Frequency (UHF) are utilized by radio equipment at the range transmitting, receiving and airport tower facilities. These radio bands support ground-to-ground, air-to-ground and ship-to-shore voice communications. Various instrumentation elements support voice communications, including digital voice switches, analog patch panels, analog and digital voice recorders, analog line drivers and bridging amplifiers, keysets, headsets and handsets, antennas and associated cabling.

Radio Transmitter Frequency Information

Frequency/Band	Modes	Transmitter	Receiver Location	Numbers of Radios	Power output
Range Radios					
2-30 MHZ HF	AM/LSB/USB	U-55	N-162	1	1KW
2-30 MHZ HF	AM/LSB/USB	U-55	N-162	2	100W
118-136.975 MHZ VHF	AM	U-55	N-162	8	50W
225-399.975 MHZ UHF	AM	U-55	N-162	8	50W
Project Aeronautical Control Cab Radios					
118-136.975 MHZ VHF	AM	RCC CAB	RCC CAB	3	20W
225-399.975 MHZ UHF	AM	RCC CAB	RCC CAB	2	20

WFF provides services and capabilities enabling inter and intra-site interface to communications end equipment in all instrumentation operations sites at the Wallops Range. Services are also available to mobile instrumentation systems and off-site locations as needed.

The Land Mobile Radio (LMR) system provides trunked UHF voice communications between fixed and mobile users utilizing two sets of simulcasting repeaters.

WFF provides frequency monitoring and control services defined by mission requirements documents or requested by the WFF Spectrum manager and/or the WFF Test Director.

Communications are supported by frequency monitoring equipment and frequency spectrum allocation management and coordination capabilities. The Frequency Monitoring System is used to monitor the frequency spectrum and for the detection and location of radio-frequency interference (RFI) sources. The Range is capable of monitoring frequencies up to 22 gigahertz (GHz).

The communications systems at the Range consist of the following components:

- HF/VHF/UHF radios
- Telephone
- Technical Control
- Cable plant
- Data transmission systems
- Administrative Message Service (AMS)
- Local area network (LAN), Internet and email
- Five network terminal
- High-speed data circuits
- Closed-circuit television systems

NASA MOVE

The purpose of the Mission Operations Voice Enhancement (MOVE) units is to meet the mission voice conferencing and voice recording requirements at Wallops Range. The system has a robust architecture managing voice conferences to provide improved mission support. Each voice system is controlled and configured locally via a real-time control subsystem.

HF/VHF/UHF Radio System

The Wallops Range Air to Ground Radio system is comprised of transmitter systems located at U-55 and receiver systems located at N-162. The radio system is integrated into the RCC MOVE intercom panels allowing users to use the radio system from the any assigned intercom panel.

Twelve audio and radio key line circuits connect the RCC with U-55 Transmitter Site to provide uplink audio for RF transmission to range users such as Aircraft or Ships. RF transmissions from range users is received at N-162 Receiver Site, demodulated, and the audio is routed to the RCC intercom panels. The system is typically used to support surveillance operations or any voice communications requirements needed in the bands. A

bank of low-power VHF/UHF transceivers located at the RCC is primarily for use by the Aeronautical Cab. This system is typically used for airfield operations requiring low-power close communications. These radios are also interfaced to the MOVE Intercom system and can be used from any intercom terminal on the range. This radio system also serves as a backup to the range radio system. The table above lists the assets available for control from the RCC and Project Aeronautical Control Cab.

The cable plant supporting communications systems includes extensive telephone, coaxial cable and fiber optic cables interconnecting Wallops facilities. Varied combinations of multimode and single-mode fiber optic cable connect launch pads and blockhouses. Copper twisted pair cable is available for telephone, intercom, timing, and data transfer. All major buildings contain coaxial TV cable for the RF distribution system.

The communications systems are flexible and can be configured to fit user requirements. These systems provide the means for managing operations at the Range and communicating and coordinating with related operations in other geographic areas. Wallops Range will monitor spectrum during times of controlled emissions for protection of sensitive and critical systems, such as experiment payloads and Flight Termination Systems.

3.3.6 Command Operations

FTS Certified Command Systems

Wallops Range provides UHF command instrumentation, as well as trained and certified operations staff for IRIG Flight Termination. The Flight Termination System (FTS) instrumentation supports the Wallops Range Safety function. The Wallops Range Control Center controls up to three transmitter sites by passing command functions via remote control. Transmitter and antenna operation is manually controlled at each site by operators. Each transmitter site is composed of fully redundant transmitter strings and antenna controllers.

Each site has dual strings of FTS control signals equipment, antenna data processing equipment and voice communication needs to support ELV mission requirements.

Fixed and Mobile Command Systems

Transmitters			Antennas		
Fixed Command (Building U-55)					
Type	Frequency	Power	Type/Control	Gain	Polarization
(2) WV Communications 1kW	420-450 MHz FM IRIG Tones	• Commercial AC • 2 generators and UPS for redundant system	(2) Canoga quad helix; radar slaved or manual control	16 dBi	LHC
			(2) Orbit quad-helix; radar slaved or manual control	18 dBi	LHC
			(2) Omni	0 dBi	Vertical
Fixed Command Bermuda					
(2) WV Communications 1 kW	406-450 MHz FM IRIG Tones	UPS	(2) Single-helix, pneumatic mast to 45 feet, Slaved or manual control	13 dBi	LHC
Mobile Range Control System #2					
(2) WV Communications 1 kW	406-450 MHz FM IRIG Tones	UPS	(2) Single-helix, pneumatic mast to 45 feet, radar slaved or manual control	13 dBi	LHC
Roll-Away Command System (RACS)					
(2) WV Communications 1 kW	410-450 MHz FM Modulation (no IRIG Tone capability)	• Commercial AC • Generators	(2) Taco H-085 Single Helix on Tripods TCS ACU antenna controller	13dBi	LHC and RHC

Wallops Range maintains a command site at Wallops, a Mobile Command asset that can be deployed for an off axis location or stand-alone operation, and a fixed command system located at Bermuda servicing as a downrange command asset. All three sites are connected to the Range Control Center RSO panels for remote control of command functions with local transmitter control as a contingency. All three sites are 1 Kilowatt command transmitter system with steerable antennas using pointing data supplied by the range. Pointing data is accepted in two formats: Minimum Delay Data Format (MDDF) and Launch Trajectory Acquisition System (LTAS). The Wallops site also has a set of Omni directional antennas that can be utilized for low gain requirements.

Command Uplink Systems

The transportable Roll Away Command System (RACS) is a 1 Kilowatt Command Uplink transmitter that can be shipped to remote locations. UHF command systems provide control of airborne vehicle (rocket, balloon or aircraft) functions for on-board experimental devices. This system is utilized by up-linking user modulation on a command carrier, but it is not capable of safety related operations. IRIG modulation is not supported by RACS.

RACS is used at Poker Flat Research Range in Alaska with antennas that are permanently installed on site. RACS can also be shipped to any range worldwide with portable, tripod mounted, and steerable antennas to support Sounding Rocket command uplink operations. Both Left Hand and Right Hand Circular polarized helix antennas are available for support with the RACS system. RACS is also capable of providing FTS to 2 vehicles during one mission. This feature utilizes manual high power RF switches that can switch between Left Hand and Right Hand circular polarizations for 2 simultaneous launch vehicles at Poker Flat Research Range.

FTS Receiver Testing

The FTS Receiver certification test lab is located in the Engineering Support Building, Radar Engineering Lab, in building E-109, room 275. The lab conducts pre-flight testing of Flight Termination Receivers to ensure they meet the specifications set forth in Range Commanders Council, Flight Termination Systems Commonality Standard (RCC 319). Test data and associated report are provided to Wallops Safety Office for acceptance of the FTS receivers for flight. In addition to the lab certification testing a transportable test set is used to conduct in-vehicle FTS testing. The test equipment meets NASA ESD requirements as per NASA Standard 8739.7 and all equipment calibration is kept current.

3.3.7 Precision Tracking Radar Services

Wallops Range is capable of providing radar operations services for local missions requiring both fixed and down range mobile radar services, simultaneously with a remote mission utilizing deployed mobile radar services requiring no more than two complete mobile radar antennas and associated instrumentation systems.

Tracking radar systems provide accurate velocity and positional data of launch vehicles, balloons, satellites, and aircraft. The Range has four fixed and three mobile tracking radar systems. The fixed radar systems are the RIR- 716C (Research Airport), RIR-706 (Mainland), RIR-716C (Wallops Island), and RIR-778 (Bermuda).

Precision Tracking Radars

WFF ID No.	Radar	Band	Peak Power Output (Watts)	Pulse Repetition Frequency (pps)	Beamwidth (deg.)	Antenna Size (feet)	Antenna Gain (dB)	1-m2 Skin Track (KM)	Range Precision (Meters) (rms)	Angle Precision (mils rms)	Tracking Velocity (deg/sec) AZ EL
2	RIR-778C (mobile)	C	1M	160, 320, 640	1.5	8	39	251	5	0.24	34 34
3	RIR-716C (Wallops Island)	C	1M	160, 320, 640	1.23	12	43	630	3	0.15	45 28
5	RIR-706 (Mainland)	C	3M	160, 320, 640, 1280	0.39	30	51	1496	3	0.05	20 20
8	RIR-778C (Bermuda)	C	1M	160, 320, 640	1.06	12	43	630	3	0.15	20 20
10	RIR-778C (transportable)	C	1M	160, 320, 640	1.0	12	43	473	3	0.15	34 34
11	RIR-778C (transportable)	C	1M	160, 320, 640	1.0	12	43	473	3	0.15	34 34
18	RIR-716C (Airport)	C	1M	160, 320, 640	0.71	16	46	630	3	0.1	31 28
X-1	MFTR-2100/46 (transportable)	X	1280	CW	9.5x8.4 max 1.0x0.5 min	10x5 Rx 10x5 Tx	46	1150	3	0.15	25 25
X-2	MFTR-2100/46 (mobile)	X	1280	CW	9.5x8.4 max 1.0x0.5 min	10x5 Rx 10x5 Tx	46	1150	3	0.15	25 25

Transponder Test Facilities

The Transponder Test Facility (TTF) is located in the Engineering Support Building, Radar Engineering Lab, in building E-109, room 275. This is an automated test set designed to measure the tolerances to which flight transponders have been set. This is a mobile test setup that allows the equipment to be used at assembly buildings on the island, as well as at E-109 TTF. There are several test procedures which can be run to assure the reliability of the flight transponder. The test equipment meets NASA ESD requirements as per NASA Standard 8739.7 and all equipment calibration is kept current. Approximately 232 man hours per year is spent on flight transponder certification, recertification and equipment calibration dependent upon the number of projects.

Wallops maintains a calibration laboratory equipped to perform repair and calibration of test instruments. Customer-furnished equipment is calibrated and certified at this facility. The equipment in the standards laboratory is traceable to the National Institute of Standards and Testing (NIST). These standards are part of a mandatory recall program for recalibration and certification.

Electrical Performance Test is designed to step the flight transponder through various combinations of performance, such as varying and measuring the interrogate frequency, and at the same time looking at tuning tolerances and the point at which the reply pulse ceases. Other measurements include: transmit frequency, code spacing, delay pulse, power, current, PRF, Receiver Sensitivity and pulse jitter, as well as others.

Electrical Stress Test is identical to the Performance Test with the exception that more data points are stepped through which results in a longer testing period, thus testing the stress (Electrical and Thermal) the flight transponder might experience in flight.

Transponder Set-up is also performed at this facility. Some launches require multiple vehicles to be launched at close intervals. Thus, different codes are used to differentiate between vehicles and sometimes the different stages of vehicles. Generally, we set Interrogate and Reply frequencies, Delay, and Codes. These criteria are set to specifications set by the Range Commander Council. For example the Interrogate frequency is set to 5690 MHz, plus or minus 2 MHz. *Any radar transponder utilized at WFF must be bench-tested at WFF.*

3.3.8 Range Data Processing and Display Services

Range Data Processing and Display Operations includes systems used prior to, during, and after mission operations. Prior to a mission, capabilities are used to determine the effect of winds on the vehicle trajectory. Other capabilities used prior to and during a mission ingest real-time positional data from radars and telemetry sources and convert, process, and display the data in fixed and/or mobile Range Control Centers. Displays are configured (e.g., present position, altitude versus range, etc.) based on project/experimenter needs.

Range Data Acquisition Computer (RADAC)

The RADAC system hardware consists of two nearly identical workstations — DQCA and DQCB — are operated redundantly unless otherwise defined in mission specific requirements documents. Real-time processing includes but is not limited to: determining the best and next best input source and generating instantaneous impact predictions real-time. The data processed and displayed by these systems is used by Range Safety to make flight termination decisions. Slaving data can also be provided. Processed data is archived on the system and can be further reduced per customer specifications.

3.3.9 Surveillance Radar Services

In support of launches at WFF, fixed surveillance radar and Target Display Systems, including air and surface surveillance systems, are operated, maintained, and sustained by Wallops Range. Surveillance radars are able to accurately identify confidence targets as defined by NASA Range Safety and mission specific requirements documents.

Surveillance radars support the detection and tracking of surface and air targets operating on the Wallops Range.

These radar systems provide critical data required to assure the safety of public and non-participating aircraft and surface vessels operating in the vicinity of the Wallops Range. In addition, these radars are necessary to perform safe and efficient control of range aircraft and surface vessels that support Wallops Range operations. Two Furuno surface surveillance radars (one S-band, one X-band), the CSR sea surveillance radar, the PDRS, one LSTAR, and the ASR-8, an FAA-certified air

Surveillance Radars

Radar	Wave Length	Peak Power Output	Pulse Rate Freq.	Beam Width	Antenna Size	Antenna Gain	Max Range	11-m2 Skin Track	Range Precision
ASR-8	S-band	1 MW	1040 Hz	1.4° x 30°	9'x16'	33.54 dB	60 NM	75 NM	1%
APS-143 BV3	X-band	8 kW	395-2491 Hz	1.5 X 17	36" X 12"	31 dB	200 NM	28 NM	0.25 - 1.5%
RDR-1700B	X-band	1 kW	680-2491 Hz	1.5 X 17	36" X 12"	31 dB	120 NM	25 NM	0.4 - 1.5%
Furuno	S-band	30 kW	3000, 1500, 1000, 600 Hz	20°	12'	n/a	96 NM	n/a	n/a
Furuno	X-band	25 kW	3000, 1500, 1000, 600 Hz	20°	8'	n/a	96 NM	n/a	n/a
LSTAR	L-Band	720W	1215-1390 MHz	360° azimuth 30° elevation	40" Diam Circular Phase Array	21 dB	30km	n/a	n/a
CSR	X-Band	300W	3472, 1736, 1040 HZ	25	18'	34.5 dB	n/a (height depen-dant)	n/a	n/a

NOTES: Locally, the Furunos are referred to as WISSRDS-S & WISSRDS-X (Wallops Island Sea Surface Radar Detection System). PRF's change with range settings. The skin track values are estimated based on flight tests and assume relatively low sea states (< 3)

surveillance radar owned by the U.S. Navy and operated in partnership with NASA-Wallops are located on Wallops Island to support these operations. An additional LSTAR is located on Wallops Main Base. The ASR-8 radar system provides a shared air surveillance dataset to the Navy's Chesapeake Test Range at Patuxent River, and the Wallops' RCC, as well as other users on the FAA National Air Space network.

3.3.10 Range Surveillance and Recovery Services

Wallops Range provides planning, management, oversight, implementation and reporting on all range air and sea surveillance and recovery activities. Range personnel arrange and coordinate range surveillance/recovery services, to include a visual spotter helicopter for visual clearance, surface radar equipped surveillance and recovery vessels, crew and operational services, except in cases where other Government agencies, such as the U.S. Coast Guard, are providing services.

Wallops Range will interface with other ranges, organizations, and corporations in identifying and assessing options and range surveillance and tools. The Sure Track in Government (STING) integrates multiple air and surface surveillance radar data and Automatic Information System (AIS) from WFF's 300' and 700' towers into a common user interface. The primary system is commonly used for area monitoring and control. It is the primary surface surveillance system for the United States space launch facilities. It is used in safety operations for maritime and shoreline monitoring. It is also used to monitor air space. The system collects data from a variety of sensors and presents the data to the user/operator in a usable form. The system will merge or "fuse" the data when multiple sensors provide information on a single vessel or aircraft. Fusion ensures the user is presented with the most credible information or "picture" to help with safety critical decision making. Wallops also has an MSCT Air Surveillance Display System (ASDS) which integrates and fuses targets from air surveillance radars and ADS-B data from the Passive Detection and Reporting System (PDRS) into a common display system.

Wallops Range has the capability to provide short- to long-range reconnaissance to patrol land, seas, and skies for all local and worldwide projects, including a FLIR EO/IR camera. This enables Wallops to provide its launch customer with a clear range to limit time spent completing mission essentials. Wallops Range can pull resources from multiple sub-contracts, which offer the range a vast stable of aircraft, watercraft and land-based vehicles and assets.

U.S. Government and contractors provide recovery services for ocean surface, subsurface, and land operations. Visual and electronic search techniques are employed to locate objects impacting on the ocean surface and land areas. Electronic search employs aircraft- or ship-mounted beacon receiving (homing) equipment, in conjunction with homing transmitters attached to the objects to be recovered.

3.3.11 Mission Webcasting Services

WFF can provide public and private (password protected) unclassified near real-time video and audio streaming over the internet in response to needs of customers using appropriate services, technologies and tools. If additional security measures are required, this requirement will be defined in additional task orders or in detailed mission requirements. Streaming video compatible with RealMedia™ and Windows Media™ is supported.

3.3.12 Air Traffic Management Services

The WFF Airport Control Tower controls the movement of air and ground traffic. The tower is staffed Monday through Friday with Control Tower Operators (CTOs) between 0700-1700 local (excluding Federal holidays and weekends) and as required, to support special projects.

The WFF Airport Control Tower complies with FAA regulations at 14 CFR Part 65, Subpart B pertaining to Air Traffic Control Tower Operations; FAA Air Traffic Control Procedures FAA Order 7110.65; and NASA Procedural Requirements (NPR) 7900.3 — Aircraft Operations Management. The CTO's possess an FAA Air Traffic Control Tower Operator's Certificate.

The Airport Manager's office works with NASA Project Managers in the conduct of WFF projects which may require a temporary or partial closure of the airport to accommodate research project requirements. The airport manager or his designee will attend all range reviews requiring WFF Airport services and provide air traffic management subject matter expert services for all mission planning needs that support WFF operations. Air Traffic Management support services include analysis of project requirements, goals, and objectives and are presented in appropriate mission reviews/meetings.

Visiting aircraft on official U.S. Government business are required to obtain a Prior Permission Request (PPR) number from Wallops Airport Operations/ Wallops Tower prior to flying into WFF. The PPR should be obtained at least 24 hours before the scheduled arrival. Upon arrival in Wallops airspace, the visiting aircraft should contact the Control Tower operator, call sign "Wallops Tower." The pilot must provide the assigned PPR to the Control Tower operator before permission is given to land.

During non-tower hours, the visiting aircraft must self announce on WFF Common Traffic Advisory Frequency (CTAF) 126.5. Pilot controlled lighting is available on WFF airfield as well. Traffic Advisory Practices at Airports without Operating Control Towers (FAA AC No. 90-42) is in effect during non-tower operating hours because of safety and security considerations.

During tower and non-tower hours, the visiting aviator must contact "Wallops Tower" or "Wallops CTAF" prior to engine start. All movement on the airfield must be pre-coordinated over the Control Tower frequencies 126.5/306.975 MHz.

3.3.13 Weather Forecasting Office

The Weather Forecast Office provides daily forecasts and other meteorological information in support of all WFF activities, including targeted forecasts upon request. National, regional, and local weather data are available. Data sources include several lightning detection systems; field mills, which measure lightning potential; and a full complement of local surface instruments to measure wind, temperature, pressure, dew point and cloud height.

A daily forecast briefing covering detailed weather conditions expected over the next 3 days is conducted at 8:15 a.m. over the WFF closed circuit television. An additional daily briefing is conducted at 10:00 am and provides a weather forecast for the long-range period.

Short term forecast products are produced twice daily at 8:15 a.m. and 2:00 p.m. and are available upon request. A third daily forecast product is produced by 4:00 p.m. and provides detailed information regarding hazardous weather conditions that are expected over the next 3 days.

Weather forecasts for mission-specific operations can also be requested from Project Managers as needed.

Other weather and video switching network information is available on the WFF closed circuit television network:

- Weather radar display originating from the National Weather Service (NWS) radar.
- Local weather conditions, including upper winds, based on sensors at WFF.
- Lightning detection displays.

The Wallops Range Weather Forecasting Office

3.3.14 Meteorological Operations

WFF provides Meteorological Services at the WFF, PFRR and other ranges and mobile deployments worldwide. Meteorological services are provided at the Wallops Range and simultaneously for missions requiring support at remote locations. Meteorological services include weather forecasting, collection of upper air and surface weather data, collection of ozone data and pre-launch collection of data for blast and toxic dispersion required for orbital launches. Daily local weather forecasts include twice daily, detailed 24-hour forecasts, one detailed 3 day outlook, and one seven day outlook. Briefings are presented in a graphical chart format and live briefings via the local WFF closed circuit television system. Special weather forecasts are provided as required for various project requirements and/or special weather events.

Twice daily balloon soundings of the upper atmosphere and associated surface observations are provided at midnight and noon GMT, seven days per week, in compliance with the FAA LOA for Routine Upper-Air and Associated Surface Observations at Wallops Island and the Department of Transportation. Special balloon soundings are provided as required for various projects and weather events.

Various meteorological facilities support launch operations. At Wallops, 403MHz radiosondes and tracking stations are utilized for obtaining full atmospheric profiles from the surface to ~120Kft. This system is capable of tracking up to 8 radiosondes in the air at the same time. Mobile units are also available for deployment and are capable of tracking up to 4 radiosondes in the air at the same time. The mobile systems consist of both 403 and 1680 MHz

tracking capabilities. Fixed sensors include two surface meteorological stations and three tower locations, with the highest being 730 FT. On the 730FT tower, air temperature, relative humidity, pressure, wind speed, and wind direction are measured in 1 sec intervals at the 12FT, 720FT, and at 50FT increments between 50FT and 700FT. The Range also has the capability to provide two mobile 150FT meteorological towers to obtain wind, temperature, relative humidity, and pressure measurements at the 50FT, 100FT, and 150FT levels. This system is capable of being deployed to any remote area as required. Additional sensors include 25Kft ceilometers, sky cameras, and National Weather Service WSR-88d radars. Current weather data from weather sensors on the Main Base and Wallops Island are continuously displayed on the local WFF closed circuit TV system, and the data can be made available remotely via modem interfaces. An Ionosphere Sounding Station provides detailed data on the ionosphere characteristics.

The following lightning characterization systems also support range operations:

- **Total Lightning Solution (TLS)** is a third-party lightning display system which integrates in- cloud and cloud-to-ground lightning detection network within the continental United States
- **National Lightning Detection Network (NLDN)** is a magnetic direction finder antenna network that displays cloud-to-ground and in-cloud lightning strike locations within the continental United States
- **Electric Field Measurement (EFM)** System aids in determining the potential of local lightning activity

Wallops Range provides input data into the Automated Surface Observation System (ASOS) as needed for proper weather data analysis and collection as well as providing data collection of ozonesonde data at Wallops Range and remote project locations worldwide.

3.3.15 Optical Systems Services

Optical Systems Group
The Wallops Range Optical Systems Group has two functional areas providing video systems (real time surveillance, optical tracking, video distribution including display), high-speed video, photographic, print, and graphic services to the Wallops community.

Video Technical Support
Video and computer graphics are encoded and distributed over ethernet and viewed on special purpose computer systems for operational purposes (i.e situational awareness). Operational video is recorded and archived as a customer deliverable, needs may be mission dependent.

Set up of high-speed and still cameras

The Technical Team also operates and maintains three manned IFLOTs and one unmanned Mobile Optical Tracking System (MOTS), which can be relocated to hazardous areas. All video tracking stations are capable of ingesting and distributing standard-definition and high-definition video formats via fiber while providing the customer range timing on all video sources. Along with the video tracking stations, the Technical Team is responsible for operations and maintenance of the RCC, satellite receiving, cable television support to Code 763, and multiple video surveillance systems.

Fixed and Mobile Optical Support Systems

Camera Station	Fixed/ Mobile	System Type	Tracking Rate	Video Format	Focal Length
X-65	Fixed	Open Site	Manual	HD	Short-Range Optics
X-85	Fixed	Open Site	Manual	HD	Short-Range Optics
U-80	Fixed	IFLOT	32˚/sec	HD	Mid-Range Optics
V-100	Fixed	IFLOT	32˚/sec	HD	Mid-Range Optics
Z-35	Fixed	Non-Tracking	Stationary	HS/Stills	Mission-Specific Optics
Z-1	Fixed	Non-Tracking	Stationary	HS/Stills	Mission-Specific Optics
M3	Mobile	Non-Tracking	Stationary	HS/Stills	Mission-Specific Optics
M5	Mobile	KTM	60˚/sec	HD/IR/HS	Mid- to Long-Range Optics
M6	Mobile	KTM	60˚/sec	HD/IR/HS	Mid- to Long-Range Optics

Production Support

The Optical Systems Group also provides photographic and graphic services to the Wallops community. Photographers are outfitted with the latest digital lens reflex cameras for operations support, portraiture photography, and are on stand-by for any Wallops employee request supporting official NASA activities. The Production Team routinely accepts request to create and print awards, certificates, and other documentation to communicate the Wallops mission.

The Production Team maintains the Wallops Archive, which consists of hundreds of thousands of images dating back to 1945, when Wallops launched its first rocket.

Intermediate Focal Optical Length Tracker

4.1 INTRODUCTION

The Suborbital and Special Orbital Projects Directorate is responsible for implementing safety policies and criteria for the Wallops Range as defined in GSFC-STD-8009 More information regarding the WFF Range Safety Organization can be found at the following website: http://sites.wff.nasa.gov/code803.

4.2 DATA DELIVERY SCHEDULES

Schedules appropriate for delivery of range users' inputs to the Range Safety Office are as follows (*):

- Un-Guided (Sounding Type) Rockets which are designated to be inherently safe by WFF Range Safety Personnel
    - **Hazardous Ground Operations:** Step-by-Step Procedures along with supporting data – provided 30 days prior to operation
    - **Preliminary Range Safety Data Package** – Provided 4-6 months prior to launch
    - **Final Range Safety Data Package** – Provided 1-4 months prior to launch
    - **Unmanned Aircraft Systems (UAS)** Launched from the UAS Runway
    - **Flight Termination System Certification** – Six weeks to 15+ months prior to launch
    - **Hazardous Ground Operations:** Step-by-Step Procedures along with supporting data – Provided 30 days prior to operation
    - **Preliminary Range Safety Data Package** – Provided 2-6 months prior to launch.
    - Technical specifications of the system, the operator's manual, and all procedures provided 30 days prior to launch
    - **Final Range Safety Data Package** – Provided 2-6 weeks prior to flight.
    - Coordinate with the WFF Aircraft Office (Code 830) to work through the Aircraft Flight Safety Review Board (AFSRB) process. This requires providing (in addition to the data above) proof of pilot training and certification on the system. This process must be complete prior to first flight.
- Guided Rockets and larger UAS's launched from the main base
    - **Flight Termination System Certification** – Six weeks to 15+ months prior to launch
    - **Hazardous Ground Operations:** Step-by-Step Procedures along with supporting data – Provided 30 days prior to operation
    - **Preliminary Range Safety Data Package** – Provided 5-12 months prior to launch
    - **Final Range Safety Data Package** – Provided 1-5 months prior to launch

(*) Note: Programs with unique flight characteristics require earlier delivery dates for the Range Safety Data Package as determined by the Safety Office. Please refer to the current RSM for all submittal timelines.

4.3 RANGER USER'S PRE-ARRIVAL REQUIREMENTS

Range users should design vehicle and payload systems to fully implement and conform to the safety policies and criteria established by Wallops Flight Facility.

Range users must identify vehicle or payload systems and/or operational requirements that cannot meet the NASA/GSFC/WFF safety policies and criteria.

Range users must provide a safety data package containing the data defined in RSM, and according to the documentation schedule listed in 2.5.4 of this document.

4.4 GROUND SAFETY

Specific policies and criteria, such as radiation exposure limits, power switching, multiple operations, electro-explosive circuit requirements, electrical storm criteria, RF restrictions, personnel requirements, radioactive sources, lifting operations, and pressure vessels, are provided in RSM. Radiation protection requirements are detailed in GPG 1860.1. All hazardous procedures must certify personnel or approve the certification of range user personnel.

WFF Ground Safety Group will prepare a Ground Safety Plan (GSP) and publish it as part of the OSD before any range user operations are conducted at the Wallops Range.

4.5 FLIGHT SAFETY

Specific flight safety policies and criteria for impacts, land over-flights, and ship and aircraft hazard areas are also defined in GSFC-STD-8009. All flights will be planned to minimize the risks involved while enhancing the probability for attaining mission objectives.

WFF Flight Safety will prepare a Flight Safety Plan (FSP) and publish it prior to launch. operations. The FSP will include the specific flight limits, impact limits, ship and aircraft hazard areas, and mission-unique requirements.

5.1 INTRODUCTION

This section describes applicable administrative and facilities and capabilities.

5.1.1 Access

Wallops Flight Facility maintains 24-hour security for all facilities. Personnel without current security badges will not be allowed access to the Main Base, Wallops Island, or the Mainland complex. All visits to WFF should be coordinated with the Project Manager.

5.1.2 Working Hours

The normal workday for WFF is 0800-1630 Eastern Time Monday through Friday. There are work limitations established for safety purposes. Coordination of the work schedule with the Project Manager is necessary to ensure access to required facilities and the availability of necessary technical personnel.

5.1.3 Cafeteria, Dormitories and Gym

The Wallops Exchange and Morale Association (WEMA) manages the cafeteria and dormitories. The cafeteria serves breakfast and lunch Monday through Friday, except on holidays. Dormitory rooms are rented on a space-available basis. Wallops Flight Facility Fitness Club memberships, for personnel with base security identification, can be purchased from the NASA Exchange Store located adjacent to the NASA Cafeteria.

5.1.4 Communication Services

NASA Integrated Communications Services (NICS) provides all networking services. Several networks are available on premises including:

NASA Center Network Environment (CNE)

Both inbound and outbound connections are permitted on the NASA Center Network Environment (CNE) by following the complete IT security plan and processes with the sponsor vouching for any individuals requiring full access to CNE resources. Both wired and/or wireless connections to the CNE are available upon request.

NASA GUEST Center Network Environment (Guest-CNE)

For visiting projects, NICS provides internet access at no cost through a Guest network service which can be used for short-term, outbound-only access. Both wired and/or wireless connections to the Guest-CNE are available upon request and after successful registration.

Range Mission Network (RMN)

The Range Mission Network (RMN) is an operational closed network that supports mainland and island projects and inter-system communications. It supports mission-specific data through its fixed and mobile launch assets. The RMN enables communication of Ethernet-based Mission Operations Voice Enhancement (MOVE), video, E-LTAS/EMDDF, radar and telemetry tracking/slaving data, RADAC, Stratum 1 NTP time servers, command and control

of GPS Radio Sonde receivers, remote control over RADAR assets, Wind Weighting sensing and data processing, and secure data gateway.

The RMN extends its capability through redundant circuits to and from BDA provided by two commercial vendors.

Additional closed, private networks can also be installed if there is a customer need and if connections to the existing networks prove insufficient or are prohibited due to security concerns or risks.

The cable plant supporting communication systems includes extensive telephone, coaxial cable, and fiber optic cables interconnecting facilities. Varied combinations of multimode and single mode fiber optic cable connect the various buildings, launch pads, and control centers. Copper twisted pair cable is available for telephone, intercom, timing, and data transfer. All major buildings contain coaxial TV cable for the RF distribution system. Move Unit communications, infrastructure installations, and changes or upgrades to existing cable plant infrastructure are also possible if necessary to satisfy project requirements. The move unit systems provide the means for communicating and coordinating with related operations in other geographic areas.

Telephone, Teleconferencing, and video teleconferencing services are available through the customer's sponsor. Unlimited local and long distance services are included with standard phone service. International dialing is available upon request. Analog telephone services are also available upon request for modem and fax applications.

A corporate digital CATV head end and distribution system provides the capability for a multi-channel cable television system to distribute video from many diverse sources to WFF facilities, including the NASA Visitor Center, Management Education Center (MEC), U.S. Navy facilities, and the NOAA Weather Data Acquisition Center. Video sources from satellite, real- time range, or computer displays can be directly linked to the cable system and therefore are instantly available for wide distribution on campus.

Surveillance cameras are positioned in many areas of the main base and island. These cameras are capable of Pan, Tilt, and Zoom (PTZ) functions and can be remotely controlled. Many cameras are used by the Test Director, security personnel, and range customers to safely monitor range activities.

Application development services are also available including: design, development, implementation, maintenance, server hosting, technical support, consulting, and coordination for gathering and analysis of user requirements to help customers achieve their system goals. The application development team incorporates new technologies, system design methodologies, and service delivery strategies to ensure that applications and support remain aligned with industry best practices.

5.1.5 Range Launch Power Capability

The Wallops Range provides redundant, clean, and reliable power to support launch operations (and mission assurance) by employing the use of stationary 3MW generators for Wallops range sites (further supported with UPS) and mobile/down range sites with mobile deployed generators (further supported with UPS).

5.1.6 Smoking

Smoking is prohibited in all WFF buildings, launch pads, aircraft, and aircraft support areas.

5.1.7 Industrial Safety

Industrial safety procedures are typical of those enforced at other U.S. Government facilities. In addition, personnel are expected to obey all control signals and roadblocks on the airfield and launch range.

5.1.8 Fire Protection

There are two fire stations at Wallops—one on the Main Base and one on Wallops Island. Fully trained firefighters and emergency medical technicians man the stations 24 hours a day. Each station is equipped to meet Wallops emergency response requirements.

Wallops Fire Department

5.1.9 Medical Facilities

The Health Unit located on the Main Base is available for limited medical services in the event of an emergency during working hours. Emergency medical technicians from the fire station are available 24 hours a day, as well as ambulance services. The Riverside Shore Memorial Hospital is approximately 22 miles south in Onley, Virginia, and the other local hospitals are the Peninsula Regional Medical Center, located approximately 40 miles north in Salisbury, Maryland, and Atlantic General, located approximately 40 miles northeast in Berlin, Maryland.

5.1.10 Shipping

Various shipping services are available, including United Parcel Service, Federal Express and the U.S. Postal Service. The range user should use the following information when mailing correspondence or shipping equipment for official project business:

Mail Address:	Name/GSFC Code Number
	NASA Goddard Space Flight Center
	Wallops Flight Facility
	34200 Fulton St.
	Wallops Island, VA 23337 USA
Freight Destination Address:	Name/GSFC Code Number
	C/O Receiving Officer
	NASA Goddard Space Flight Center
	Wallops Flight Facility
	34200 Fulton St.
	Wallops Island, VA 23337 USA

5.1.11 Motor Freight Truck Service

Most cargo and freight are received at WFF Main Base, building F-19; however, construction material is delivered to the site, and commercial shipments may be received directly by commercial users.

Inbound shipments of Class "A" and "B" explosives and other designated hazardous materials require advance notice prior to arrival. The delivering carrier's representative should provide advance notice to the explosives handling personnel in building M-15. The explosives handling personnel will furnish onsite escort, unloading, inspection, and shipment acceptance.

Normal receiving hours are 0800-1430 (for truckloads) and 0800-1600 (for partial loads), Monday through Friday, excluding holidays.

5.1.12 Air Cargo

Air cargo deliveries require special consideration and must be discussed with the assigned Project Manager and/or the Airport Manager.

5.1.13 Airfreight Services

The nearest commercial airfreight service is at the Salisbury-Ocean City Wicomico Regional Airport in Salisbury, Maryland.

5.1.14 Hazardous Material

All hazardous material must be packaged to conform to applicable Department of Transportation regulations. A Safety Data Sheet (SDS) must accompany all hazardous materials shipped to WFF.

All hazardous materials shall be disposed of in accordance with the Virginia Department of Environmental Quality Regulations. The range user must provide a "Hazardous Waste Disposal Inventory," NASA Form WI-1550, to the Wallops Environmental Office for disposal of all hazardous material.

Radioactive sources require approval from the Wallops Environmental Office prior to arrival. The range user must provide the proper forms requesting the use of a radioactive material at WFF, including license

information, to the Project Manager at least 90 days prior to the shipment/arrival of the source. *GPR 1860.1D, Ionizing Radiation Protection*, defines procedures and provides the needed forms.

5.1.15 Hazardous Material Storage

There are facilities located on Wallops Island for the temporary storage of hazardous liquids, such as propellants and purging gasses. There are also two rocket motor storage facilities on the Island, one for Class 1.1 rocket motor storage and an above ground facility for storage of all classes of rocket motors.

Wallops Main Base has above ground and earthen-covered storage magazines for storage of Class 1.3 and Class 1.4 explosives. There are also facilities for the non-destructive testing of ordnance and rocket motors.

Wallops airfield maintains a Hot Pad at the approach end of runway 17 which is approved for the loading and unloading of hazardous and pyrotechnic materials.

5.1.16 Material Handling Equipment

A variety of material handling equipment is available. These include forklifts, overhead hoists, and material moving equipment. The range user should provide required information regarding the testing and certification of slings, fixtures, and other user-furnished lifting devices.

5.1.17 Customs

International shipments should clear U.S. Customs before arrival at WFF. Arrangements for shipments directly from overseas into WFF must be coordinated and approved by U.S. Customs prior to shipment.

5.1.18 Post Office

A United States Post Office is located in building E-7 on the Main Base. The address is Wallops Island, VA 23337 USA.

5.2 FOREIGN NATIONALS

Foreign nationals must obtain prior approval from NASA before a visit. The individual must provide a visit request to the Project Manager at least one calendar month in advance for a visit of 30 days or less and two calendar months in advance for an assignment more than 30 days. A list of required information to be provided for the visit can be obtained from the Project Manager.

Material Handling Equipment

Quantity	Material Handling Equipment
1	60-ton hydraulic truck crane with 118-foot main boom
1	28-ton hydraulic truck crane with 70-foot main boom
1	95-foot basket truck
1	65-foot basket truck
1	35-foot man lift
Several	Electric fork lifts
Several	Forklifts under 8,000 pounds
6	8,000-pound forklifts
1	10,000-pound forklift
2	18,000-pound forklift
2	Stakeside truck with 2,000-pound hydraulic lift gate
1	Lowboy trailer with hydraulic tail deck
1	Van Truck
3	Truck tractors
Several	Handtrucks
Several	Pallet jacks

5.3 OFFICE OF COMMUNICATIONS

The Wallops Office of Communications (OCOMM) is available to support range users with media and guest relations operations. OCOMM can set up webcasts of missions and can accommodate groups that want to transmit broadcasts from Wallops using a small local radio station that provides launch commentary for local listeners. Initial requests for OCOMM support can be made through the Project Manager.

5.4 NASA VISITORS CENTER

Wallops Flight Facility Visitor Center and Gift Shop are located on Virginia Route 175 about 1 mile east of the Wallops Main Gate. The Visitor Center, Gift Shop and Teacher Resource Lab are part of the Robert L. Kreiger Education Center. A collection of spacecraft and flight articles, as well as exhibits about the U.S. space flight program are on display. Special movies and video presentations can be viewed, and special events, such as model rocket launches, are scheduled. There is no admission charge. The NASA Visitors Center Auditorium has a 12- foot wide, 8-foot tall video wall that is capable of showing NASA's digital cable television, range video tracking locations, surveillance video, NASA Select Television and a full battery of other video sources to help the NASA community and surrounding public keep abreast of the latest happening at Wallops Flight Facility. The Auditorium can seat up to 126 people and is the location of media events and community outreach programs governed by the Wallops Office of Communications.

National Aeronautics and Space Administration

Goddard Space Flight Center
Wallops Flight Facility
34200 Fulton Street
Wallops Island, VA 23337
www.nasa.gov/wallops