

The Wallops Flight Facility Model for an Integrated Federal/Commercial Test Range

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Abstract. Historically, the U.S. federal government has been the predominant user of space within this country. In support of this need, it established a number of federal launch facilities to support government projects. Among these sites was NASA's Wallops Flight Facility. While Wallops' historical responsibilities have been principally in support of NASA science and technology missions, the emerging growth of commercial space is changing the fundamental philosophies of the roles of the government. The Virginia Commercial Space Flight Authority and NASA have formed a partnership that leverages the capabilities of the established NASA/Wallops Test Range with the resources offered by a commercial space flight center. This innovative relationship allows for growth of commercial space activities while preserving the ability to support NASA and Department of Defense needs. Wallops Flight Facility has developed a cooperative federal/commercial relationship that can serve as a model for other potential public/private partnerships to follow. Today's federal launch sites are challenged to meet the emerging needs of commercial industry under an increasingly difficult financial climate. The current range studies and the actions taken within the next several years will be critical to the future of this country's space launch infrastructure.

Background

Since the earliest days of the Space Age, the federal government has dominated the use of space within the United States. The government has maintained a constant emphasis in space, split between national security interests led by the Department of Defense (DoD), and scientific exploration led by the National Aeronautics and Space Administration (NASA).

As part of these efforts, the federal government has funded, managed, and conducted the vast majority of efforts necessary to gain access to space. These efforts have covered the full extent of enabling tasks including the development of spacecraft, launch vehicles, and supporting launch infrastructure.

During the mid-1940's through the early 1960's, the U.S. government established a number of test ranges to support the array of missions to be carried out by the DoD and NASA. These ranges were typically established by individual

government organizations to meet their own particular needs.

Establishment of the Wallops Test Range

In the early 1940's, NASA's predecessor, the National Advisory Committee on Aeronautics developed requirements for a site suitable for subscale tests of aircraft designs. The facility now known as the NASA Langley Research Center was heavily involved in the study of the aerodynamics of conceptual aircraft. With supersonic wind tunnels years away from reality, measurements were made through the use of aircraft models carried aboard rockets.

Wallops Island, Virginia was chosen as the site for supporting Langley testing due to its remote barrier island location. In 1945, a Tiamat rocket was launched, marking the first of more than fifteen thousand launches from Wallops. In 1959, NASA added a large portion of land now known as the Main Base to the Wallops Island site

creating over 6000 acres of NASA-owned real estate.

As the space race took off in the 1960's, the Wallops focus moved toward support of the flight test programs necessary to put man on the moon. Wallops served as the site for many of the early animal flight tests, flights of the Mercury capsule aboard the Little Joe rocket, and flights measuring the ionization blackout phenomena during spacecraft reentry.

A mainstay of Wallops during the 1960's, 1970's, and early 1980's was the Scout expendable launch vehicle. During this period, Wallops conducted more than 40 launches of the Scout launch vehicle, including 21 orbital missions. This represented Wallops' entry into the ranks of orbital launch ranges.

NASA Current Activities at Wallops

The Wallops focus has evolved in recent decades and now predominantly supports scientific research and technology development missions. In addition to its historical function as a test range, Wallops is also responsible for implementation of NASA's suborbital flight projects including sounding rockets, balloons, and scientific aircraft. Wallops also implements some of NASA's low cost orbital projects. As a result of these programmatic responsibilities, Wallops' own flight projects are the largest customers of the Wallops Test Range. The Test Range continues to support a large array of both Wallops and other NASA programs, ranging from small, meteorological-class rockets and balloons, to lower-end expendable launch vehicle missions. Inclusive are a wide array of carriers which support science and technology missions including drop models, unpiloted aerial vehicles (UAVs), and next-generation rocket designs.

Wallops Test Range Description

The Wallops Test Range consists of an integrated launch range and research airport. The two elements are located approximately five miles apart, with the inland airport and the coastal

launch range contained within restricted airspace R-6604. The restricted area adjoins the offshore Warning Areas, allowing for continuous controlled airspace for runway or launcher-borne vehicles such as the Orbital Sciences Corp. Pegasus, UAVs, and future reusable launch vehicles, as well as conventional rocket designs.



Figure 1: Wallops Island Launch Sites



Figure 2: Wallops Flight Facility Main Base (including Research Airport)

The Test Range consists of a variety of facilities including a Range Control Center, an Aeronautical Control Center, aircraft hangars, blockhouses, spacecraft processing, and hazardous processing facilities. NASA maintains approximately a dozen suborbital launchers.

The range manages a large array of instrumentation equipment including tracking and surveillance radars, telemetry, UHF command systems, high-speed tracking photography, and a variety of communications capabilities. The Wallops Weather Office has a full suite of resources necessary to support range and project forecasting requirements.

Wallops maintains a full cadre of personnel necessary to support launch operations including project managers, safety officials, and instrumentation operators. It also has a staff of discipline engineers who provide technology improvements and other specialized services. The Test Range shares other Wallops capabilities, such as a fabrication facility, an environmental test laboratory, a chemical analysis laboratory, and a calibration laboratory with other programs. Wallops also provides a full slate of institutional services such as security and fire protection. Wallops shares personnel among its flight projects and Test Range wherever possible to make the most effective use of the available resources.

Several of the Wallops flight programs require the ability to conduct operations worldwide in order to study scientific phenomena unique to a particular location. In support of this need, the Wallops Test Range maintains a transportable set of resources necessary to satisfy user needs and safety requirements. These transportable systems, which include launchers, radar, telemetry, command transmitters, and a mobile Range Control Center, are an integral part of Wallops' Test Range resources and are regularly used to support both suborbital and orbital flight projects.

Support to Non-NASA Projects

Wallops' numerous unique features and capabilities have made it a desirable site for many

non-NASA organizations. Various DoD organizations regularly use Wallops for technology research and development missions, target launches, aircraft and UAV testing, and sensor development operations. Three separate Navy organizations reside at Wallops, partially as a result of their regular need for Wallops range capabilities.

Wallops also supports commercial launch vehicle and aircraft operations. In addition to government Pegasus missions, five commercial missions have been conducted by Wallops, including one mobile mission conducted from the Canary Islands. Wallops also provided range support for the launch of the EER Systems Conestoga launch vehicle.

This support for external customers is welcomed by Wallops, as it increases the facility's relevance to other organizations, and provides reimbursable revenue that is used to help maintain the range. Today, nearly half of the range's efforts are in support of non-NASA projects for a large number of different customers.

In July 1997, Wallops support of these external customers, in addition to its core NASA customers, was formally recognized by NASA Administrator Daniel Goldin when he endorsed the Wallops Mission 2000 strategic plan. This plan defines the Wallops Flight Facility as "a national resource for providing low-cost integration, launch, and operation of suborbital and small orbital payloads." It also defined the Wallops mission to include "enabling frequent flight opportunities for a diverse customer base." Key strategies of the plan include the formation of partnerships with industry, academia, and resident Navy organizations to foster education, commercial development of space, and use of Wallops capabilities by other potential customers.

The Virginia Commercial Space Flight Authority

In the early 1990's, NASA, local and state government, university, and industry representatives began discussing the opportunities available to the Wallops area as a result of the expected growth in commercial space. A strong

coalition was established that advocated the need for an organization to pursue these opportunities. In 1995, the Commonwealth of Virginia agreed, and established the Virginia Commercial Space Flight Authority (VCSFA). The charter of VCSFA is to develop the resources necessary and pursue commercial aerospace opportunities leading to economic development and to foster education and technology development in the region.

The Virginia approach is to take advantage of the capabilities of the federal launch range and augment those resources where necessary to meet expected commercial needs. While NASA maintains most of the necessary facility, instrumentation, and safety capabilities in support of its own projects, increased launch and processing facilities are necessary to meet potential commercial requirements.

VCSFA has recently completed construction of a new universal launch complex, capable of supporting small-to-medium class expendable launch vehicles. In the near future, VCSFA intends to build a gantry for the new complex and to construct a new processing facility with a high-bay clean room. For many of its other needs, VCSFA shares the utilization and cost of existing NASA facilities.

In December of 1997, VCSFA was granted a Launch Site Operator's License by the U.S. DoT/FAA. One of four such licenses granted to ground based launch sites in the U.S., it permits the conduct of commercially licensed launches from the Virginia Space Flight Center (VSFC).

VCSFA maintains strong ties to the state government, having two cabinet members holding positions on its Board of Directors. Its educational mandates are supported via its close relationship with Old Dominion University, which also holds permanent Board membership.

VCSFA recently entered into a venture partnership with DynSpace, a subsidiary of DynCorp. These entities have formed a Limited Liability Corporation that will manage the VSFC, a subordinate entity of VCSFA. Under this arrangement DynSpace will provide at-risk capital

for further infrastructure development, will become a principal in the management of the commercial facilities, will share revenue generated, will assist in marketing the facility, and will provide many of the services required by launch customers.

While the governmental relationship remains between NASA and VCSFA, the involvement of an industry entity further increases the opportunities and resources available for attracting new business.



Figure 3: VSFC Launch Site (Pad 0B)

The NASA/VCSFA Relationship

The Commercial Space Launch Act requires government agencies to support commercial space entities, with excess capacity of services, to the extent that the support does not interfere with government activities.

NASA policy, however, endorses a much stronger commercial space concept. NASA considers encouraging the commercial development of space to be a key element of the agency mission. This philosophy creates a close alignment of the NASA/Wallops and VCSFA charters. The VCSFA responsibility for furthering educational opportunities also fits well with NASA/Wallops strategies and initiatives.

In March of 1997, a Reimbursable Space Act Agreement established a formal relationship between NASA and VCSFA. Subsequently, subagreements were finalized which defined the

working relationships, responsibilities of the parties, and allowed VCSFA to access NASA services, as well as to construct necessary infrastructure on government property. VCSFA became a resident of Wallops, joining three Navy organizations, the National Oceanographic and Atmospheric Administration, and the U.S. Coast Guard.

Also in 1998, these same Wallops resident organizations joined with NASA to form the Wallops Board of Directors. The intent of this organization is to cooperatively address issues of joint concern, such as frequency coordination, environmental management, institutional services, emergency preparedness, and employee morale initiatives. Standing subcommittees have been formed to address individual topics. While NASA, as landlord, retains ultimate authority for most of these responsibilities, the Board serves as a forum for discussion and attempts to resolve all issues through consensus. The Board also seeks out opportunities where the organizations can cooperate to improve services or reduce cost. Through this process, the relationship among the organizations has improved significantly, and the support by these organizations for the facility's welfare has increased, as they now feel a greater ownership and responsibility for its future.

Benefits of the NASA/VCSFA Partnership

As discussed earlier, there are financial benefits as a result of the common NASA and VCSFA interests. NASA receives revenue through the services provided to VCSFA and their commercial or government customers. The fixed costs of the Test Range are spread across a larger customer base, reducing the individual mission cost to other customers. VCSFA benefits through "renting" existing resources, rather than establishing their own capabilities. By minimizing their investment, VCSFA avoids a large capital burden, and can offer lower mission costs.

Beyond these obvious financial considerations, the NASA/VCSFA partnership has created numerous other advantages. One feature is the availability of multiple options for access to Wallops services. NASA can support government

customers through simple agreements and interagency fund transfers. This tends to be the preferred path for most government organizations. Some government programs, however, in support of commercial development, are required to procure services from commercial providers. VCSFA serves as the commercial mechanism for meeting this requirement. While NASA regularly provides direct support to commercial launch service providers, the legal and administrative processes involved with establishing necessary agreements can be intensive. NASA's existing agreements with VCSFA allow the customer to contract with VCSFA and avoid establishing direct arrangements with NASA. This dual-path approach assures that Wallops support is available to the full spectrum of potential customers.

The services offered by VCSFA provide an opportunity for NASA to back away from functions previously required by Wallops customers. These tasks include a variety of logistical services that are not inherently governmental such as use of cranes, providing of gasses, and coordination of shipments. Increased opportunities now exist for greater commercial involvement in these activities. These relatively routine functions have become increasingly difficult for NASA to provide during recent years due to declining budgets and manpower.

The NASA/VCSFA relationship also offers opportunities to jointly develop business opportunities. Federal agencies such as NASA have limited ability to promote themselves, whereas VCSFA markets Wallops capabilities as part of its business plan to develop commercial business opportunities. VCSFA and NASA regularly collaborate on trade show exhibits, promotional materials, and project proposals.

VCSFA and the Commonwealth of Virginia, in the interest of regional economic development also offer a variety of financial incentives to their customers including tax incentives, financial support, employee development assistance, and a pending Foreign Trade Zone. These incentives ultimately make Wallops a more attractive site for prospective users.

With the commitment by Virginia to the VCSFA mission, the interest in Wallops activities by federal, state, and local government officials has grown considerably. Due to its proximity to Maryland (approximately four miles south of the state line), the impact of Wallops activity has great impact on the local Maryland economy as well. This commercial potential, as well as cooperative discussions with Virginia officials is leading toward an alliance, which could include additional states, and creates a formidable advocate in support of the facility. The growing commitment by various government and industry organizations is producing an increased focus on Wallops that will improve its opportunities to capture projects, such as transportation improvements, financial incentives, and improvements in services within the local community.

NASA/Wallops Contract Changes

The contract structure supporting NASA activities at Wallops changed significantly beginning in early 1999. As part of Agency policy, new contracts are performance-based, where the government defines the tasks and metrics, and the implementing contractor determines the most effective means for satisfying the requirements. This strategy most directly impacts the Test Range through the agency-wide Consolidated Space Operations Contract (CSOC) which provides tracking and data services for the range and orbital tracking projects. Prior to the new contract award, services had been provided through an integrated civil service and support service contractor team. The new contract, however, required the contract team, led by Lockheed Martin, to fully provide these services, and the government to remove civil servants from these functional areas. These civil servants are being retrained and reassigned to support other Wallops flight projects. As a result of this new contract and several other similar changes, the contractor and government roles/responsibilities have become much more clearly defined. Government employees manage the range and range projects, provide range safety, and develop new technologies, while the contract workforce provides the routine operational services.

NASA recently awarded a precedent-setting mission implementation contract, the NASA Sounding Rocket Operations Contract (NSROC), to PRC/Litton. While this program is a user of the Test Range rather than a service provider, the contract contains incentives to help NASA and VCSFA develop new business opportunities. The addition of NSROC to the Wallops team provides flight hardware fabrication, testing, and suborbital launch vehicles as part of the end-to-end services available to customers. The addition of these services should broaden the opportunities for new customers, such as university researchers, to conduct space missions in an inexpensive manner.

Challenges Facing the Wallops Test Range

The future of the federal launch ranges is currently a topic of great discussion within the government and aerospace community. The White House and Congress have both chartered studies to consider the future management, funding, modernization, safety practices, and capacity to support the expected commercial growth in launch activities. Various other studies also are underway within the agencies that manage the ranges. These studies have been initiated primarily in response to concerns raised by industry about the ranges' abilities to meet the expected growth.

Wallops is actively participating in each of these efforts. These studies have raised the level of awareness of key government parties and industry to the critical issues faced by the ranges. It is hoped that these studies will lead to proposed solutions to many of these issues. These studies also are creating a forum for debate concerning best practices and innovative concepts for making launch operations safer, cheaper, and more effective.

A key issue currently facing the Wallops Test Range is the preservation of adequate core funding. Although the range is a national resource, the full responsibility for funding lies with NASA. Wallops does charge non-NASA users for services provided, but these charges generally only cover the actual expenses incurred with support to these projects, and do not fund

modernization or development of new systems and capabilities.

NASA also plans to implement a financial management system soon, known as Full-Cost Accounting (FCA). This process is expected to reallocate all range funding to NASA projects that would then pay for range services as they are provided. This pay-as-you-go approach is of great concern, as reallocated range funds could be spent for purposes other than Wallops range services and likely will not provide adequate revenue for maintaining the full spectrum of services presently available. Under FCA, the range would need a heavy, steady, and reliable customer base. This is not typical, as range usage tends to fluctuate greatly. These changes could also ultimately lead to increased range charges for non-NASA customers.

Response-time, capacity to support a large volume of customers, and overall cost of services are concerns presently being voiced by commercial organizations. The emergence of global satellite networks in particular, and the need for rapid replenishment, has raised concerns about the abilities of the federal ranges to provide quick-response capability. In response to these and other related issues, Wallops has initiated the Advance Range Technology Initiative (ARTI). The purpose of ARTI is to pursue innovative, sometimes non-conventional technologies and processes, leading to lower costs, increased project responsiveness, higher capacity, improved reliability, and more effective safety. The intent of these individual projects is to establish a capability of providing orbital mission support on less than forty-eight hours notice, for less than 100 thousand dollars, through highly automated, systematic processes. ARTI is currently being implemented through existing resources, but Wallops is actively pursuing alternative fund sources that would allow for increased emphasis.

Summary

The historical dominance of the NASA Wallops Test Range by NASA and other government users has changed during the last several years. Wallops Flight Facility has embarked on a model

partnership with the Commonwealth of Virginia. This relationship allows for the strong growth in the commercial use of Wallops, while preserving the ability for NASA and other government agencies to accomplish their missions. This relationship leverages the resources and strengths of each of the parties. As commercial launch services continue to grow for both and government use, this partnership will continue to evolve to meet the changing needs of the aerospace sector.

The roles and responsibilities of various entities in carrying out range functions are changing. While this transition has not been painless, the final result should be a more effective Test Range with increased opportunities to assist government, academic, and commercial parties needing access to space.

The federal launch sites will be challenged to meet increasingly difficult goals during the next several years. The federal government, state governments, and industry must work together and must be innovative to assure that U. S. launch sites continue to meet the needs of launch service providers in this global marketplace.

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Bruce Underwood currently works in the NASA/Wallops Flight Facility, Policy and Business Relations Office, responsible for business development, program planning, and policy issues. He received a B. S. in Aerospace Engineering from North Carolina State University in 1985. He has 18 years experience working for NASA at Wallops in support of the Sounding

Rocket Program, Range Safety, and Range Operations, prior to his current assignment. During these assignments, he supported numerous suborbital and orbital flight projects, and worldwide field campaigns. He has also served as Head of the Operations Management Section, and as Range Test Director.