



National Aeronautics and Space Administration  
Goddard Space Flight Center

Wallops Flight Facility, Wallops Island, Virginia

# Inside Wallops

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## *Goddard Space Flight Center 40th Anniversary* *Proud of the Past.....Prepared for the Future*

### **Robert H. Goddard: American Rocket Pioneer**

*"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."*

The father of modern rocket propulsion is the American, Dr. Robert Hutchings Goddard. Along with Konstantin Eduardovich Tsiolkovsky of Russia and Hermann Oberth of Germany, Goddard envisioned the exploration of space. A physicist of great insight, Goddard also had a unique genius for invention.



*Dr. Robert Goddard in a 1926 picture standing beside the first liquid-propellant rocket.*

By 1926, Goddard had constructed and successfully tested the first rocket using liquid fuel. Indeed, the flight of Goddard's rocket on March 16, 1926, at Auburn, MA., was a feat as epochal in history as that of the Wright brothers at Kitty Hawk. Yet, it was one of Goddard's "firsts" in the now booming significance of rocket propulsion in the fields of military missilery and the scientific exploration of space.

Primitive in their day as the achievement of the Wrights, Goddard's rockets made little impression upon government officials. Only through the modest subsidies of the Smithsonian Institution and the Daniel Guggenheim Foundation, as well as the leaves of absence granted him by Worcester Polytechnic Institute of Clark University, was Goddard able to sustain his lifetime of devoted research and testing. He worked for the U.S. Navy in both World Wars. Eighteen years after his successful demonstration at Auburn, Goddard's pioneering achievements came to life in the German V-2 ballistic missile.

Goddard gained public notice in 1907 in a cloud of smoke from a powder rocket fired in the basement of the physics

building in Worcester Polytechnic Institute. School officials took an immediate interest in the work of student Goddard. They, to their credit, did not expel him. He thus began his lifetime of dedicated work.

In 1914, Goddard received two U.S. patents. One was for a rocket using liquid fuel. The other was for a two or three stage rocket using solid fuel.

At his own expense, he began to make systematic studies about propulsion provided by various types of gunpowder. His classic document was a study that he wrote in 1916 requesting funds of the Smithsonian Institution so he could continue his research. This was later published along with his research and Navy work in Smithsonian Miscellaneous Publication No. 2540 (January 1920). It was entitled "A Method of Reaching Extreme Altitudes." He detailed his search for methods of raising weather recording instruments higher than sounding balloons. In this search he developed the mathematical theories of rocket propulsion.

Towards the end of his 1920 report, Goddard outlined the possibility of a rocket reaching the moon and exploding a load of flash powder to mark its arrival. The bulk of his scientific report to the Smithsonian was a dry explanation of how he used the \$5000 grant in his research.

The press picked up Goddard's scientific proposal about a rocket flight to the moon and began a journalistic controversy concerning the feasibility of such a thing. Much ridicule came Goddard's way, and he reached firm convictions about the virtues of the press corps which he held for the rest of his life.

Several of the 1750 copies of the 1920 Smithsonian report reached Europe. The German Rocket Society was formed in 1927, and the German Army began its rocket program in 1931.

Goddard's greatest engineering contributions were made during his work in the 1920's and 1930's. He received \$10,000 from the Smithsonian by 1927. Through the personal efforts of Charles A. Lindbergh, he received financial support from the Daniel and Florence Guggenheim Foundation.

Goddard's work largely anticipated in technical detail the later German V-2 missiles, including gyroscopic control, steering by means of vanes in the jet stream of the rocket motor, gimbal-

steering, power-driven fuel pumps and other devices. His rocket flight in 1929 carried the first scientific payload, a barometer, and a camera.

Goddard developed and demonstrated the basic idea of the "bazooka" two days before the Armistice in 1918 at the Aberdeen Proving Ground. His launching platform was a music rack. Dr. Clarence N. Hickman, a young Ph.D. from Clark University, worked with Goddard in 1918 and provided continuity to the research that produced the World War II bazooka. In World War II, Goddard again offered his services and was assigned by the U.S. Navy to the development of practical jet assisted takeoff (JATO) and liquid propellant rocket motors capable of variable thrust. In both areas, he was successful. He died on August 10, 1945, four days after the first atomic bomb was dropped on Japan.

Goddard was the first scientist who not only realized the potentialities of missiles and space flight but also contributed directly in bringing them to practical realization. This rare talent in both creative science and practical engineering places Goddard well above the opposite numbers among the European rocket pioneers. The dedicated labors of this modest man went largely unrecognized in the United States until the dawn of what is now called the "space age."

On Sept. 16, 1959, the 86th Congress authorized the issuance of a gold medal in the honor of Professor Robert H. Goddard.

A list of Goddard's historic firsts can be found at: <http://pao.gsfc.nasa.gov/gsfc/welcome/history/history.htm>

*In memory of the brilliant scientist, a major space science laboratory, NASA's Goddard Space Flight Center was established on May 1, 1959.*



**Boat Smart  
From the Start  
Wear Your Life  
Jacket**



As the weather get warmer and the fishing improves, more of us will head to local waters. It is essential that novice and experienced boaters practice safe boating habits, such as wearing a life jacket.

Boating safety begins long before the boat leaves the dock. When you leave for a day of boating, you seldom expect to end up in the water. If you do and are not wearing your life jacket, your chances of becoming a boating statistic increase greatly.

Some other points to remember for a day of safe boating include:

\*Before leaving the dock, advise someone on shore where you will be leaving from, where you will be going and an approximate time you plan to return.

\*If you don't know how, learn to swim.

\*Learn safe boating by taking a Coast Guard Auxiliary course.

\*Learn CPR and first aid skills. Carry a well-stocked first aid kit on the boat.

\*Check the weather forecast and tides before leaving the dock.

\*Keep a good lookout for floating hazards and partially submerged posts or poles.

\*Observe the nautical "rules-of-the-road".

\*Never stand in a small or moving boat.

\*Don't overload the boat.

\*Don't drink alcohol while boating. Being charged with Boating Under the Influence (BUI) could lead to the suspension of an individual's right to operate a boat.

**Ergonomics Seminar**

Sponsor: Industrial Hygiene Office  
Date: May 11  
Time: 1 to 3:30 p.m.  
Place: Bldg. F-3

The practical application of ergonomics calls attention to how the work environment affects people. Improper posture and use of equipment can lead to long-term musculoskeletal effects such as repetitive strain injuries which can cause recurring symptoms of numbness, tingling, or pain in joints, muscles and tendons. These injuries can be debilitating and generally are preventable.

The seminar will focus on correctly setting up individual computer work stations.

Contact the Wallops Health Unit, x1766, for further information or to sign up for the seminar.

**Space Week Water Rocket Contest**

The votes have been counted, the tally is in. The winning entry in the first phase of the Water Rocket Contest, Overall Looks and Aesthetics category is **X-Y2K**, entered by **Team Under Pressure**. A win in this category was worth 15 points.

Pretty is one thing, but will it fly is another. This will be determined on launch day scheduled for May 4. The launch window is from 11:30 a.m. to 1 p.m. The launch pads will be located on the softball field between Bldg. F-10 and the Main Gate. The following entries will be launched:

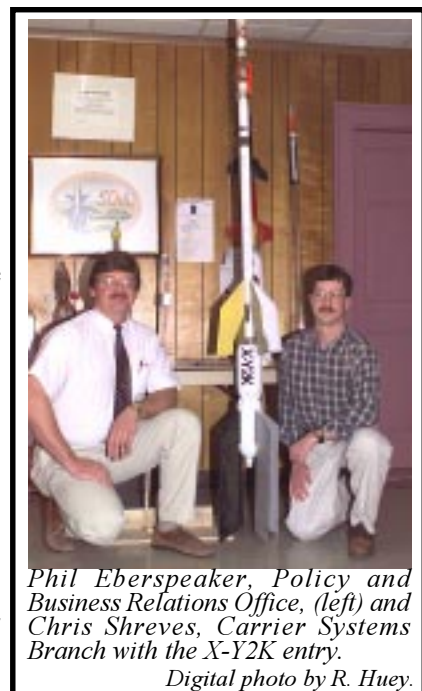
- X-Y2K** - Team Under Pressure
- Spike** - Cogs in the System
- Silver Bullet** - PAO
- Black Brant XII** - F-6
- GUMP** - Code 870 (ISO Compliant)
- H2R** - Wallops Rocket Factory
- OTIOSE** - Sub-Orbit

Judging in the following categories will be based on a total of 50 points.

- \*Overall looks and aesthetics (15 points) —
- \*Stability during flight (15 points)
- \*Actual Altitude (10 points)

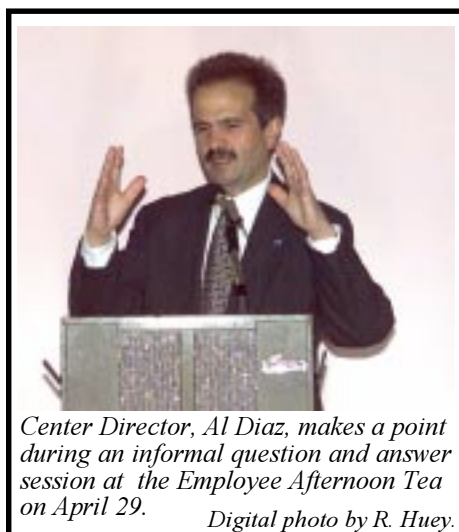
0-25 meters	5 points
26-35 meters	6 points
36-45 meters	7 points
46-55 meters	8 points
56-65 meters	9 points
65+ meters	10 points

- \*Overall Flight (10 points)
- \*Bonus Points for a working parachute/recovery system (5 points)



*Phil Eberspaker, Policy and Business Relations Office, (left) and Chris Shreves, Carrier Systems Branch with the X-Y2K entry.*  
Digital photo by R. Huey.

Spectators are welcome. Come out and see which entry takes home the grand prize, Bragging Rights for One Year!



*Center Director, Al Diaz, makes a point during an informal question and answer session at the Employee Afternoon Tea on April 29.*  
Digital photo by R. Huey.

**Upcoming Training**

An OSHA Voluntary Compliance Course will be taught at Wallops by video instruction. The course will begin June 2 and end Aug. 12, 1999. There will be 11 three-hour sessions. Personnel need to be aware that several classes are scheduled late in the day. This course is offered at no cost to all NASA civil service and contractor employees.

Personnel wishing to attend this course need to respond as soon as possible. For information call Joe Drawdy, x1884.

**Retirement Planning Workshop**

DATE: May 12 - 14, 1999  
TIME: 9 a.m. to 4:30 p.m.  
LOCATION: Wallops Flight Facility  
COST: Center Funded

For further information call Laura Potler, x66-4853. Code 800 Training Requests should be routed through Sherry Kleckner. Training Requests with appropriate signatures may be faxed to x66-1679.

Non-NASA Federal employees may register by submitting a copy of their Training Request and a prepared Purchase Request form to Laura Potler. A complete course description is available on the OHR web site at: <http://ohr.gsfc.nasa.gov/gsfc/training/annualcal/CAREER.HTM>

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