THE SLR TIMES

The Early Days of Satellite Laser Ranging

Making History at NASA Goddard Space Flight Center

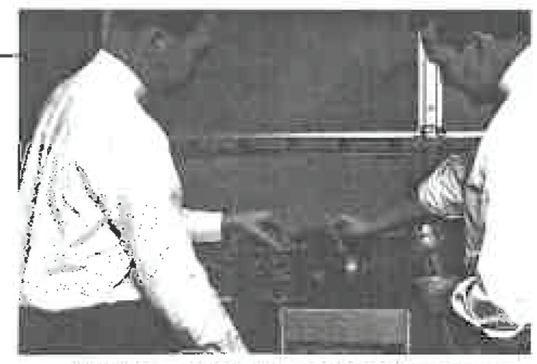
s S. Johnson (left) and Don A. Premo are at the Antenna-n Programmer Control Console, which points the antenna predicated path of the satellite.

Goddard News—November 30, 1964

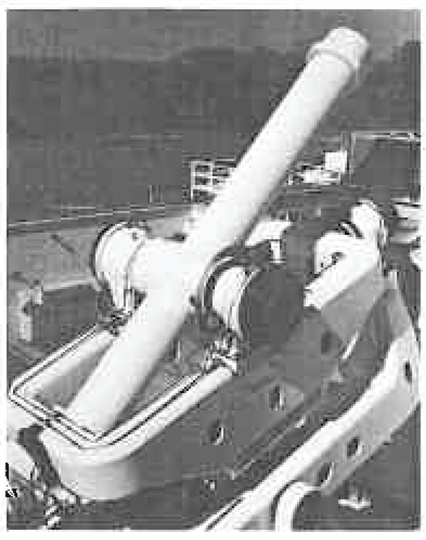
GODDARD'S OPTICAL SYSTEMS BRANCH:

HOME OF THE LASER EXPERIMENTS AND NEW RADOT,

(Real-time Automatic Digital Optical Tracker) now being developed to track the satellite with the narrow laser beam for a full 24 hours.



Edward Hayes (left) and Louis O. Caudill, section head, insert Image-Orthicon sensor into the tracking head of system, which automatically reads-out a satellite's position stars' positions in real-time.



t" telescope with a 2500" focal length will go onto lig Mount" at GORF and be operational sometime 5. At present it has a dummy load. The multi-mode is shown in equatorial position.

Howard Genatt, Station Manager, Goddard Optical Research Facility, at the finder—scope of the Branch's 16-inch equatorial telescope, used for research on image orthicons and other astronomical sensors.

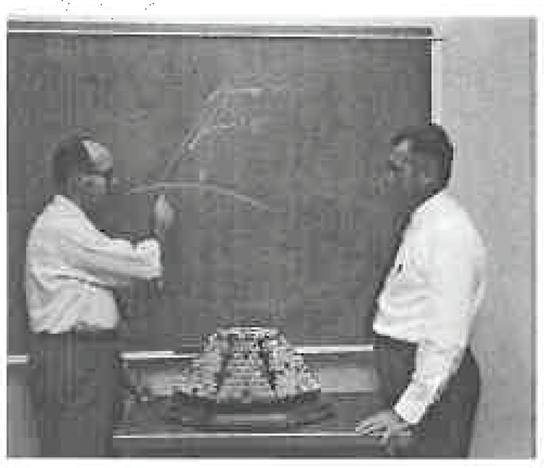
Charles Peruso is assembling a 50-joule ruby laser (used in the S-66 Project), which illuminates the satellite's optical reflectors in the laser tracking experiments.

Jack Degnan, co-op student, at the spectrophotometer, is mounting a gas cell to measure absorption and fluorescence spectra of gaseous samples.

John Moye makes evaluation of a photo-multiplier to determine the one best used as laser receiving device. A Polaroid camera photographs the dark-current pulses to get statistical average of number and/or height (amplitude).

Paul Spudin tests the sensitivity of p pliers at the Helium-Neon laser wav study the effects of atmospheric pertur the laser beam.

nry H. Plotkin (left), Head, Optical Systems Branch, and J. Carrion, Associate Head, discuss use of Beacon Explorer-C reflectors (on table) in laser tracking experiments. A simi-kage has already been orbited on Explorer XXII.



LATEST NEWS ON LASER

Goddard scientists are expressing satisfaction with results obtained thus far through the use of LASER devices in the precision tracking of the Beacon-Explorer satellite, launched October 9 from Vandenberg AFB.

The LASER used by Goddard is a recently developed device in which light from a powerful flash lamp is focused into a synthetic ruby rod. This excites chromium atoms in the ruby to a state from which they tend to radiate their characteristic red light. In the LASER, the exact time and direction is controlled, to produce a very short powerful burst of light in a narrow pencil beam.

Dr. Henry H. Plotkin, Project Scientist, Optical Systems Branch, and his team of physicists-engineers have been directing their powerful LASER devices at special reflectors mounted atop the Beacon-Explorer as it travels through space. Although their techniques and equipment for aiming the light beam and receiving the reflected radiation are presently very new, experiments within the past month have shown a number of successful tracks.

Beginning October 11, 1964, 10 passes of the Beacon-Explorer have been tracked through spacecraft reflected radiation. Detection of the radiation returns was accomplished by an electronic photo-detector after completion of a 1200 mile round trip by the LASER generated light pulse. Once detected, the optical "signals" were displayed and photographed on the face of an oscilloscope.

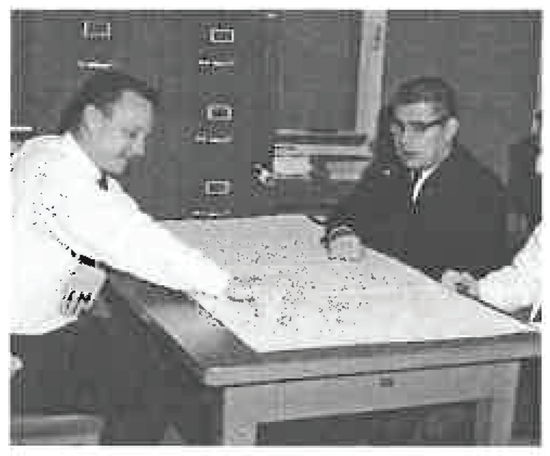
As is the case with many original investigations, many questions remain to be resolved. One perplexing Dr. Plotkin and his Goddard team at the moment is just why the LASER generated signal is smaller than was expected; not received consistently each time the satellite is illuminated.

Many more questions must be answered and techniques perfected before the Goddard LASER data can be used to refine Beacon-Explorer's orbit through purely optical means.

In making the announcement, Dr. Plotkin emphasized that Goddard's success was only a "beginning."

"Techniques being developed in these experiments must be perfected before LASER beams can be used to obtain refined satellite orbits, give us information about the shape of the earth, or for communicating between earth and space vehicles. In reaching these goals Goddard has embarked upon a program of systematic development in which the Beacon Explorer is an important tool," concluded Dr. Plotkin.

Herbert L. Richards (left to right), Don Premo and Pete going over the PERT diagram being used for development of Infrared Tracker System, which will acquire and generate ang information on the Apollo spacecraft as it re-enters earth's a upon return from a lunar mission.



Meet Our People

This is another in a series of articles on Goddard personalities

Walter J. Carrion

Walter J. Carrion, Associate Head, Optical Systems Branch, came to Goddard, May 1, 1961, from the Ballistic Research Laboratories (BRL), U.S. Army Ordnance Department, where he was Chief, Telescopic Instrumentation Section and member of the Scientific Staff.

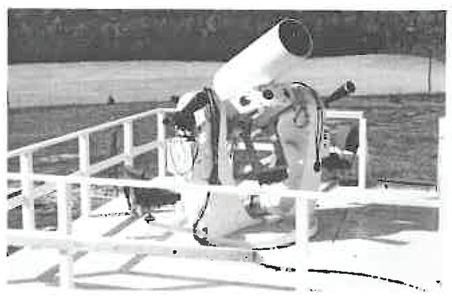
While there in 1958 he was nominated by the Ballistic Measurement Laboratory (BML) for the coveted Kent Award, and came in second in the final judging for the honor which BRL presents annually to top engineers and scientists whose accomplishments are judged the most outstanding of the year. This was the year that BML made the first precision measurements of the Russian Sputnik.

He has worked on Echo, the optical alignment of large radio antennas, Real-time Automatic Digital Optical Tracker (RADOT), and the S-66 laser tracking experiments. His current assignments include the development of new types of precision tracking instrumentation, and the planning of new facilities, such as the Goddard Optical Research Facility. He is also assigned as optical instrumentation consultant on the RT-2 telescope for Wallops Island Station, and on the Echo Project.

Mr. Carrion received his BAE degree from Catholic University, where also he was a graduate student as well as at Johns Hopkins University. While in Naval Aviation he held the rank of Lieutenant Commander.

He likes hunting, fishing, and is especially fond of training retrievers. Much of his spare time is spent working with his dogs.

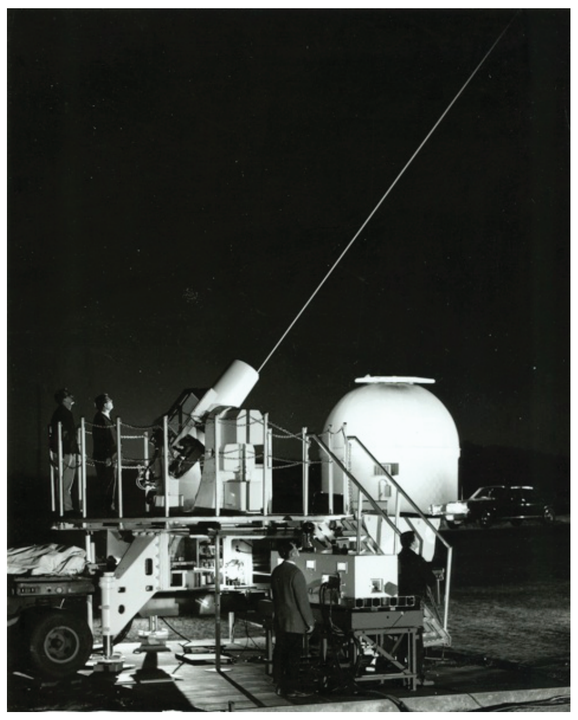
Mr. Carrion lives at 16 Amherst Avenue, Ellicott City, Md., with his wife, Helen and three sons: Michael, 13, Timothy, 11, and Patrick, 9.



A converted Nike-Ajax tracking mount positions this 16" telescope to receive the reflected laser beam at the Goddard Optical Research Facility. It has a 290" focal length.

NASA astronomer Sol Howard Genatt and physics co-op student, John Degnan.

Henry Plotkin at the JHU Applied Physics Laboratories in 1964 with the Beacon Explorer A retroreflector array before integration onto the spacecraft.



Walter Carrion, Louis Caudill, Peter Minott, and Donald Premo.

NASA astronomer, Sol Howard Genatt, and physics co-op student, John Degnan, point and focus the Mobile Optical Telescope System (MOTS) camera along the Beacon Explorer satellite track in order to record the laser returns against the star field on photographic film.

SATELLITE TRACKED WITH A LASER BEAM

WASHINGTON, Nov. 13 (AP) —The National Aeronautics and Space Administration announced today the first successful tracking of a satellite by a laser beam—a concentrated ray of light.

Scientists have hit the satellite, Explorer 22, with laser beams at least 10 times in the last month and are optimistic about possible use of light beams in space work.

Laser guns mounted on telescopes at the Goddard Space Flight Center in Greenbelt, Md., and at a General Electric Company station at Phoenix, Ariz., have bounced light beams from the satellite several times since their first success Oct. 11.

The time required for the laser beam to reach the satellite and return can be used to measure distance. The space agency said that at the 600-mile distance to Explorer 22, such measurements are accurate to within 10 feet.

Dr. Henry H. Plotkin, chief of Goddard's optical systems branch, said that when laser techniques are perfected the beams can be used "to obtain refined orbits, furnish information about the shape of the earth, or enable communication between earth and deep space vehicles."

The New York Times
Published: November 14, 1964