

NEWS BUREAU

**GENERAL ELECTRIC**

1010 Barclay Bldg., Bala Cynwyd, Pa. 19004

Area Code 215 TE 9-3093

P. H. Scott

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July 1969

SATURN HISTORY DOCUMENT  
University of Alabama Research Institute  
History of Science & Technology Group

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HIGHLIGHTS OF GENERAL ELECTRIC'S PARTICIPATION

IN THE U.S. MISSILE AND SPACE PROGRAM

FOR IMMEDIATE RELEASE

The General Electric Company was given the first industrial contract for liquid-fuel rocket engine work in the history of the United States. The Army Ordinance contract called for research and development in all phases of guided missiles. The project was named Hermes.

A year later General Electric also was asked to focus its technical talent on the work that had been done by the Germans, and sent four members of the team to Europe to gather what they could of German missile technology and equipment.

Hermes highlights included:

First missile operations at White Sands Proving Grounds and the area that is now Cape Kennedy.

First launch of a missile from shipboard at sea.

Project Bumper, the first launch of a two-stage rocket.

Construction and flight test of first inertially-guided missile.

An altitude record of 252 miles, set by Bumper Five, stood for 7 years.

A total of 103 missiles were built, or rebuilt, and fired during the 10 years of the Hermes program.

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Subsequent General Electric Space Highlights:

- 1955      The Company is selected by the Air Force to develop the reentry vehicle for the Atlas intercontinental ballistic missile.
- 1958      General Electric rocket engine launches Vanguard space satellite as part of International Geophysical Year.
- 1959      The Department of Defense awards General Electric the development contract for a complete unmanned spacecraft.
- 1960      The Company secures contract for construction of the space vehicle and integration of the subsystems for Project Nimbus, first weather study satellite.
- Recovery of the Discoverer space capsule whose reentry and recovery system was designed and built by General Electric marks the first successful recovery of an object that had been orbited around the Earth.
- 1961      The Company's Atlas radio-command guidance system is used to guide the Mercury spacecraft carrying the chimpanzee Enos into a predetermined orbit in preparation for manned orbital flight. The system is also being applied to the guidance of Atlas boosters for the Advent communication satellite launching and the Ranger Moon probe vehicles.
- 1962      General Electric's radio-command guidance system is part of all three of the US's manned orbital launches, as well as on the Mariner II spacecraft on its journey to observe the planet Venus. The system has been chosen to provide the precise control required to put the two-man Gemini spacecraft into orbit, a new step in space scheduled for 1964.
- General Electric is awarded a major supporting role in Project Apollo. General Electric will provide supplies and services to assist NASA in the performance of checkout, reliability assessment and integration support for the program.
- 1963      General Electric is awarded an additional responsibility in the lunar program: operation of NASA's Mississippi Test Facility, a static test area for Saturn boosters.

Major new contracts include one for the development of the Mark 12 reentry system for the Air Force's advanced Minuteman missile, as well as one for the development of NASA's Biosatellite - a recoverable space vehicle which will study the combined effects of radiation and weightlessness on biological specimens during extended orbital flight.

1964 GE assembles and tests NASA's Nimbus weather satellite.

General Electric delivers the first of a series of complex electronic checkout systems as part of the reliability and checkout support being supplied to NASA.

1965 The first GE-635 computer is installed at Kennedy Space Center. Primary function: monitor some 3,000 different parts on the early Saturn.

NASA's Geodetic Earth Orbiting Satellite (GEOS) is launched. General Electric's gravity gradient test system is the satellite's stabilizer.

1966 The highly successful Gemini manned flights, which used General Electric's radio guidance system and fuel cells, are completed.

1967 The Nimbus II weather satellite, originally slated for a six-month orbit, continues its outstanding performance after functioning in orbit for 20 months as of the end of this year.

The second GE-635 computer -- with such applications as pre-launch checkout, post-test reduction and multi-programming requirements -- is installed at Cape Kennedy.

Successful launch and recovery of Biosatellite II, developed and manufactured for NASA by GE.

1968 NASA's Orbiting Astronomical Observatory II, for which General Electric designed and built a stabilization and control subsystem, is successfully launched. OAO's objective is to provide for the first time a detailed survey of the stars.

General Electric's TRANSATEL (Transportable Satellite Telecommunications) provides live color TV coverage of the Apollo 7 splashdown and recovery.

1969 General Electric's portable nuclear generator, SNAP-27, is readied for the Apollo 12 Moon Landing, when it will be left to provide power for the equipment package which will monitor and transmit data on the Moon's environment for a year after the astronauts return to Earth.

Nimbus III, most sophisticated of the experimental meteorological observatories built for NASA by General Electric, is launched successfully.

GE is prime contractor for TEKTITE I, a program sponsored by NASA, the Navy and the Department of the Interior to determine man's capability to perform a scientific research mission while living on the ocean floor. TEKTITE will also access the correlation between long duration missions under the sea and in outer space. General Electric is furnishing the undersea habitat and assisting in the program planning and scientific coordination.

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CAPE KENNEDY, FLA. -- As many as 20,000 separate contractors have been involved in the Apollo program. One of the largest and most diverse of these contractors is the General Electric Company.

Over 6,000 General Electric employees in 26 locations provide support ranging from checkout of the spacecraft, booster and launch facilities to illumination of the instrument panels in the command and lunar modules and color TV transmission of the splashdown of Apollo.

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Pre-launch checkout systems, built by GE's Apollo Systems Organization in Daytona Beach, Fla., have already conducted thousands of tests on the Apollo 11 spacecraft, its Saturn launch vehicle and on the launch facilities themselves.

"Fourteen Apollo Systems ACE (Acceptance checkout Equipment) stations have tested the Apollo 11 spacecraft from factory to launch," G. T. Smiley, General Manager of Apollo Systems, said. "Each three-room ACE station comprises racks of equipment which conduct critical tests, acquire data, analyze findings and report on those findings. They are capable of checking all of the spacecraft's more than 3,000 test points automatically, receiving data at the rate of 200,000 bits per second."

Similar GE Apollo Systems equipment inspects all of the thousands of checkpoints on Saturn V's three stages; conducts all switching operations in the final three minutes of count-down; checks fueling of the Saturn stages; and controls communications, telemetry, water control and launch complex operations.

Another General Electric component, the Mississippi Test Support Department, operates and maintains the 25 square-mile NASA Mississippi Test Facility (MTF) near Bay St. Louis. According to J. R. Picard, General Manager of this GE Department, services provided NASA at MTF, proving ground for the first and second stages of the Apollo/Saturn V space vehicles, include range maintenance, systems modifications, central control and the transport, storage and transfer of cryogenic propellants and high-pressure gases.

The department also operates high-pressure water systems on the test stands, performs test and range data acquisition and processing, and operates the laboratories which provide electronics, instrumentation, materials, calibration, photographic, acoustic, and video services.

The Company's Information Systems Equipment Division in Phoenix, Arizona, provided two high-speed GE-635 multi-programming and multi-processing computers to conduct pre-launch checkout of the Saturn V launch vehicles on all Apollo missions and are key components in the post-flight reduction of data. During the final hours of countdown, the GE computers continuously monitor some 3,000 different valves and gauges on Saturn, checking them 12 times each second and flashing selective bits of data to any one or all of 30 display terminals--all in real time.

The Valley Forge, Pa., based GE Space Systems Organization has made two principal contributions to the Apollo program. Lee Farnham, General Manager of Space Systems said that a color TV transmission system, built and operated by GE for Western Union International, Inc., provides live color television coverage of all Apollo recoveries via satellite from the recovery carrier. And an isotope thermoelectric power system called SNAP-27 will provide electricity to power a package of experiments to be left on the surface of the Moon on the Apollo 12 mission this fall.

Neutrography service, a non-destructive testing technique similar to X-Ray but which reveals details which can not be seen

in X-Rays, is being used by contractors who supply components to the Apollo Project and is provided by the General Electric Irradiation Processing Operation in Pleasanton, Calif. Neutrography is used principally to inspect pyrotechnic devices such as the tension tie cutters which must separate the command module from the command service module prior to re-entry. The service is especially useful for inspecting explosive devices which contain high quantities of hydrogen but which appear transparent when X-Rayed.

Instrument panels aboard NASA's Apollo 11 command module and its piggyback Moon-exploring Lunar Module will glow with "moonlight" lamps manufactured by the General Electric Miniature Lamp Department in Cleveland, Ohio. The low-brightness electroluminescent (EL) light sources are wafer thin and produce a brightness approximating moonglow. They were chosen for the job because they provide more visual comfort for the astronauts and because of their extreme ruggedness.



CONTRIBUTIONS OF OTHER GE COMPONENTS

Other General Electric components, their locations and contributions were:

<u>Component</u>	<u>Location</u>	<u>Contribution</u>
Aerospace Electrical Equipment Department	Syracuse, N.Y.	Electrical control assemblies for IM
	Erie, Pa.	Hydraulic pump motor on Saturn II first stage
Aircraft Engine Group	Lynn, Mass.	Engines for Apollo re- covery helicopters; and engines for Lunar Landing Training Vehicles.
	Evendale, Ohio	Ullage rocket motor cases for second stage of Saturn
Apparatus Service Shops Department	Chamblee, Ga.	Instrumentation repair
Capacitor Department	Irmo, S.C.	Capacitors used in Lunar and Command modules
Distribution Assemblies Department	Plainville, Conn.	Switchboards and panel- boards used in ground support equipment

<u>Component</u>	<u>Location</u>	<u>Contribution</u>
Distribution Protective Equipment Dept.	Pittsfield, Mass.	Emergency substation at Cape Kennedy
Distribution Transformer Department	Oakland, Calif.	Transformers aboard Essex provided power for TV coverage of Apollo 8 recovery.
Electronics Laboratory	Syracuse, N.Y.	Computed Display developed for NASA simulates space docking.
Industry Control Dept.	Salem, Va.	Controls for hoist systems at Redstone Arsenal, KSC Complex 39 and MTF.
Industry Sales and Engineering Operation	Schenectady, N.Y.	Engineered hoist systems at Redstone, KSC and MTF.
Insulating Materials Department	Schenectady, N.Y.	Insulating materials used in variety of applications at Kennedy Space Center.
Lamp Glass Dept.	Cleveland, Ohio	Meteor shield built for first Apollo mission.
Lamp Metals and Components	Cleveland, Ohio	Raw tungsten supplied for Apollo control jets.
Large DC Motor Business Section	Schenectady, N.Y.	Traction drives in crawler transporters at Cape Kennedy.
Lighting Systems Dept.	Hendersonville, N.C.	Interior lighting of Vertical Assembly Building (VAB) at Cape Kennedy.
Magnetic Materials Business Section	Edmore, Mich.	Thermistors for use in automatic exposure controls.

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<u>Component</u>	<u>Location</u>	<u>Contribution</u>
Marine Turbine and Gear Dept.	West Lynn, Mass.	Marine steam turbines and gears for Apollo 7 recovery ship, USS Essex.
Mechanical Drive Turbine Dept.	Fitchburg, Mass.	Generators for power on all Apollo instrumentation ships.
Medium AC Motor Dept.	Schenectady, N.Y.	Motor used in derrick at Redstone.
Mobile Radio Dept.	Lynchburg, Va.	Radios used by security and maintenance personnel at Kennedy Space Center.
Plastics Dept.	Pittsfield, Mass.	Lexan polycarbonate used in helmets worn by Apollo astronauts.
Power Transformer Dept.	Pittsfield, Mass.	Lightning protection studies at Cape Kennedy.
Semiconductor Products Dept.	Syracuse, N.Y.	Semiconductors used in Apollo spacecraft.
Small AC Motor Dept.	Schenectady, N.Y.	Motors in use at Redstone, Cape Kennedy and Miss. Test.
Speciality Control Dept.	Waynesboro, Va.	About 500 relays for use in Apollo spacecraft.
Speed Variator Dept.	Erfe, Pa.	56 Max speed drive systems for derricks and cranes at Redstone, KSC and Miss. Test.

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<u>Component</u>	<u>Location</u>	<u>Contribution</u>
Tempo	Santa Barbara, Calif.	Twelve Apollo related studies. Former Tempo manager, Dr. Thomas O. Paine, now NASA Administrator.
Tube Department	Owensboro, Ky.	Video display devices in use at Houston Manned Space Flight Center Bethpage, N.Y. and Downey, Calif.
Visual Communication Products Dept.	Syracuse, N.Y.	Color TV cameras used by network crews on Apollo 8.
Wire and Cable Dept.	Bridgeport, Conn.	Electronic and power cable in three launch towers and VAB at Cape Kennedy

GENERAL ELECTRIC/APOLLO COMMUNICATORS

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ACE -- Checkout of Apollo Spacecraft  
ESE -- Checkout of Saturn Vehicle  
LCCE -- Checkout of Launch Facilities

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Operation and Maintenance  
of test facilities for Saturn launch  
vehicle.

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SNAP-27 thermonuclear power system.  
Color TV transmission system aboard  
recovery aircraft carrier.

INFORMATION SYSTEMS

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Computer evaluation and checkout  
of Saturn launch vehicle and  
post-flight reduction of data.

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Computed display

MINATURE LAMP DEPARTMENT

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Lamps used in instrument panels  
aboard the command and lunar modules

For information regarding any other aspect of General Electric's role in  
Apollo please contact:

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