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SPACE EXPLORATION HIGHLIGHTS NASA ACTIVITIES IN 1964

Photographs of the Moon's surface 1,000 times clearer than Earth telescopes produce and a Mariner satellite headed for Mars highlighted the accomplishments of the National Aeronautics and Space Administration in 1964.

At 25 minutes and 49 seconds after 9 a.m. (EDT), July 31, -- precisely the predetermined time -- the Ranger VII crashed into the Moon.

For the last 17 minutes of 68½-hour, 240,000-mile voyage, Ranger VII clicked off 4,316 extraordinary TV pictures of the lunar surface. Scientists were jubilant over the pictures showing details of the Moon with 1,000 times the clarity of Earth telescopes.

This flawless, textbook flight topped the nation's space exploits in the year 1964. It also underscored the fact that 1964 was a great year for unmanned, scientific exploration of space.

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This fact is further emphasized by Mariner IV, NASA's spacecraft now speeding on its 325-million-mile voyage to Mars on a photographic mission.

With the launching of Mariner IV on Nov. 28, the United States undertook its most difficult mission to date. Mariner will make its closest approach to Mars -- about 5,900 miles -- on July 14, 1965.

During the year the space agency continued its intensive preparations for the Apollo Moon landing. Giant Saturn boosters were coming off assembly lines and massive launch facilities neared completion at Cape Kennedy. The Manned Spacecraft Center at Houston, with its Mission Control Center, also neared completion.

Project Gemini suffered a setback on Dec. 9 when a malfunction in the launch vehicle, with an unmanned spacecraft aboard, failed on the pad. An earlier test, on April 8, was successful.

The full effect of the December failure on the Gemini program was not clear at year's end.

But during the year NASA selected its astronauts to fly the first two-man Gemini mission in 1965. They are Virgil I. Grissom and John W. Young, with Walter M. Shirra and Thomas P. Stafford as alternates.

A nationwide search was launched for some 10 to 20 scientist-astronauts for advanced Apollo and post-Apollo missions.

It was also a year in which significant gains were made in nuclear rocket propulsion, and a year in which satellites further demonstrated their practical value.

NASA's Nimbus weather satellite photographed cloud conditions over every square mile of Earth, and Syncom III televised the Olympic Games from Tokyo to the western world.

On Jan. 29, 1964, NASA flight-tested its powerful Saturn I booster with the launching of SA-5, the fifth in a series of ten. SA-6 and SA-7 were also launched in '64 giving NASA a perfect record -- seven successes in seven tries with the big Saturns.

Neither SA-5, SA-6 nor SA-7 launched later in the year, had any of the breath-taking drama of the Ranger epic or of a man-in-orbit, but they were crucial launches in that they boosted into orbit payloads of around 39,000 pounds, the heaviest ever lifted off Earth.

And they confirmed what earlier Centaur rocket launches established --that liquid hydrogen is a highly efficent fuel, with greater thrust than other chemical fuels, for upper stages of heavy launch vehicles.

NASA took Centaur to the launch pads twice in '64 -- on June 30 and Dec. 11, making a total of four engineering performance flight tests for the Centaur/liquid hydrogen combination.

Gains in nuclear rocket propulsion came in the fall of '64 when NASA and the Atomic Energy Commission tested two Kiwi reactors and one Nuclear Engine for Rocket Vehicle Apllication (NERVA) reactor at full power conditions in the short space of one month.

The results were hailed as the greatest advance in rocket propulsion since Dr. Robert Goddard experimented with rockets in the 1920s and '30s.

NASA achieved still another milestone when it flew the SERT I (Space Electric Rocket Test) on July 20. It was the first successful operation in space of an electric rocket engine and verified that electrostatic (ion) engines -- which run longer on far less fuel than present rocket engines -- could efficiently produce thrust in space.

A major scientific first was scored by NASA when its communications satellite Syncom III was launched on Aug. 19 and then was jockeyed into "stationary," synchronous orbit with Earth. It transmitted television pictures of the Olympic Games in Tokyo.

On Aug. 28, NASA launched weather satellite Nimbus I and the world had the first night-time photos of its cloud cover from space.

In its lifetime of about a month, Nimbus I transmitted 27,000 remarkably clear day-and-night weather pictures including shots of hurricanes Cleo, Dora, Ethel and Gladys in the Atlantic and typhoons Ruby and Sally in the Pacific. What its infrared eyes saw in complete darkness emerged as photos of startling clarity.

The biggest scientific satellite ever launched in this country -- OGO I (Orbiting Geophysical Observatory) -- began working in space on Sept. 4. Weighing more than 1,000 pounds, OGO I carried 20 different experiments -- a record number -- submitted by scientists from seven government laboratories and nine universities.

NASA researchers also harnessed the laser (light amplification by stimulated emission of radiation) beam and used it successfully in 1964 for tracking a satellite in orbit.

During the year NASA continued aeronautical research on the supersonic transport and V/STOL (vertical short takeoff and landing) aircraft. The X-15 research airplane entered a new area of research and made its 121st successful flight to the edge of space. On Sept. 17 the black rocket airplane completed five years of powered flight.

NASA also stepped up the transfer to industry of knowledge and techniques it gained in the fabrication of spacecraft and space materials.

It participated in a broad program of international space research highlighted by an agreement, announced on Jan. 20, between this country and the U.S.S.R. A month later, joint tests with the Soviets began, using NASA's Echo II satellite, launched Jan. 25.

In all, space activity was pursued with 69 countries.

On Dec. 15 the San Marco satellite, designed and built in Italy, was launched from NASA's Wallops Island, Va. Station by Italian personnel. It was the first time in the NASA international co-operative program that a satellite launch operation was conducted by a team of foreign nationals.

Italy became the third nation in history to launch its own satellite. The others were the Soviet Union and the United States.

In addition, NASA also launched the Relay II and Echo II, communications satellites; Project Fire, launched to test heating of a spacecraft returning to the Earth's atmosphere from outer space, and Radio Attenuation Measurement (RAM) a suborbital experiment to study radio black-out in spacecraft.

The Explorer family of diversified small scientific satellites increased more than 25 per cent in 1964, capped with the double launching of Explorers XXIV and XXV by a single Scout vehicle on Nov. 21. Explorer XXVI was successfully launched Dec. 21.

The Scout had its greatest year, placing seven satellites in orbit.

Sounding rockets were used to launch about 150 experiments for university, industrial, governmental and foreign scientists.

Explorer XXVI, launched Dec. 21, completed NASA's 1964 launch and mission schedules. Of the 33 missions attempted, 28 were successful for an average of 85 per cent. Of the launch pad the attempts numbered 32 with 28 successes for an 87.5 percentage. Thus NASA's 1964 mission-launch boxscore showed better than 85 per cent successes.

(Chart Follows)

National Aeronautics and Space Administration

1964 Launches

Project Name	Launch Date	Launch Site	Results** Vehicle	Spacecraft
Relay II	1/21	Kennedy	success	success
Echo II	1/25	Kennedy	success	success
Saturn (SA-5)	1/29	Kennedy	success	orbit
Ranger VI	1/30	Kennedy	success	failure(impact, no pictures)
Beacon Explorer A	3/19	Kennedy	Failure	--------
Ariel II	3/27	Kennedy	success	success
Gemini (GT-1)	4/8	Kennedy	success	success
Ram	4/10	Wallops	success	success
Fire	4/14	Kennedy	success	success
Little Joe II/Apollo	5/13	White Sands	success	success
Saturn (SA-6)	5/28	Kennedy	success	success
Centaur (AC-3)	6/30	Kennedy	success	success
Sert-I	7/7	Wallops	success	success
Ranger VII Impact Moon	7/28 7/31	Kennedy ———	success ———	success ———
Scout Re-entry	8/18	Wallops	success	success
Syncom III	8/19	Kennedy	success	success
Explorer XX (IE-A)	8/25	W.T.R.*	success	success
Nimbus-I	8/28	W.T.R.*	failure***	success
OGO-I	9/4	Kennedy	success	success
Saturn (SA-7)	9/18	Kennedy	success	success
Explorer XXI (IMP-B)	10/3	Kennedy	failure***	failure***
Scout (RFD-2)	10/9	Wallops	success	success

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Explorer XXII (BE-B)	10/9	Kennedy	success	success
Mariner III	11/5	Kennedy	success	failure
Explorer XXIII	11/6	Wallops	success	success
Explorer XXIV Explorer XXV	11/21	W.T.R.*	success	success
Mariner IV	11/28	Kennedy	success	success
Apollo High Q Abort	12/8	White Sands	success	success
Gemini (GT-2)	12/9	Kennedy	aborted	_____
Centaur (AC-4)	12/11	Kennedy	success	success
San Marco I	12/14	Wallops	success	success
Explorer XXVI	12/21	Kennedy	success	success

footnotes-

* Western Test Range, Pacific Launch Operations, Lompoc, Calif., (formerly Pacific Missile Range).

** Launch vehicle performance -- Spacecraft performance

*** Vehicle failure due to a short burn placed spacecraft into lower orbit than planned.

Explorers 24 and 25, were launched on one vehicle.

Vehicle attempts 32; successes 28; 87.5 per cent successes

Mission attempts 33; successes 28; 85 per cent successes

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