SPACE

Space Age: Four Years Old

The Space Age began with the first Sputnik. Since then the U.S. has successfully launched three times as many satellites as the USSR, Tove Neville reports.

➤ THE SPACE AGE is four years old this October.

The USSR has chalked up the most spectacular space scores: big boosters, heavy payloads and the first man to orbit the earth.

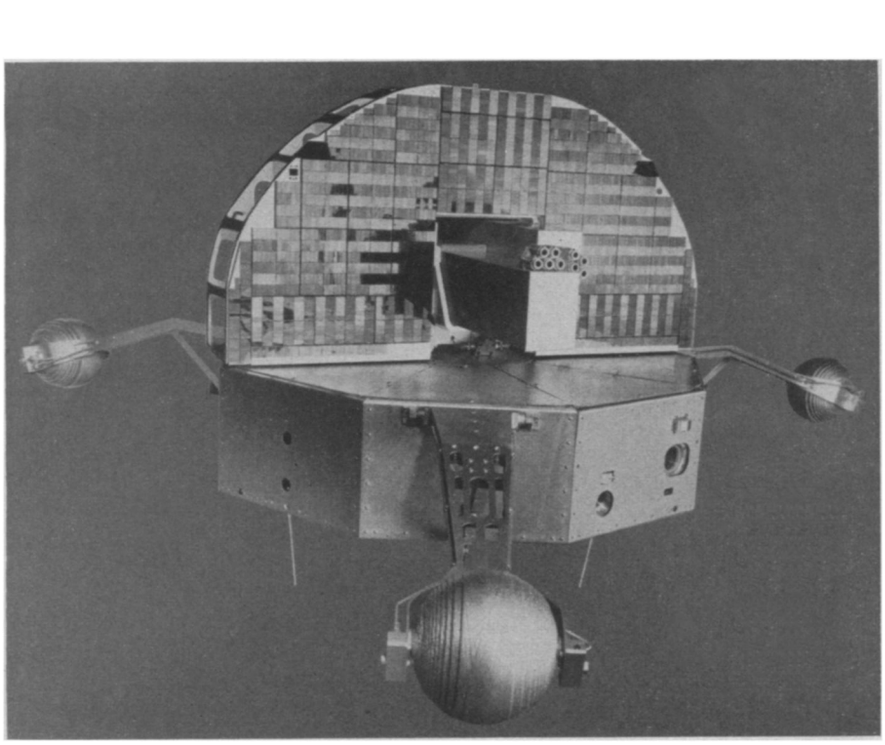
Nevertheless, the U.S. is far ahead where it really counts: in solid scientific achievements from satellite and space probe information.

As of mid-September, the U.S. has launched 54 satellites and space probes, the USSR has launched 16.

Of these, 52 U.S. satellites went into earth orbit. Russia had 13 earth satellites. The U.S. and USSR both have two probes in solar orbit. The USSR has sent one rocket to the moon. One of the 13 Russian earth satellites was Lunik III, which passed once around the moon and then went into earth orbit. Two U.S. space probes, Pioneer I and III, which did not reach the vicinity of the moon, collected important scientific information.

At the present time, the U.S. has 30 satellites in earth orbit, Russia only one. Of the U.S. satellites, 12 are still transmitting scientific information back to earth. None of the USSR satellites are transmitting.

The great scientific program instituted and accomplished by the U.S. in four short years speaks for itself in the calendar of satellites below.



SOLAR EYE—The Orbiting Solar Observatory is now going through the final test phases. It will measure the ultraviolet rays that can be detected only in space.

Calendar of Satellites

This is the complete list of space satellites and probes successfully launched by the U.S. and USSR from the beginning of the space age, Oct. 4, 1957.

The orbital distances when closest to and farthest from earth (moon or sun) are shown in miles. The latest available figures from the National Aeronautics and Space Administration are used for objects still in orbit. Orbital distances of satellites no longer up are the original NASA figures calculated while object was still in orbit. The time it takes a satellite to travel around the earth (moon or sun) is shown in minutes or days. Objects still in the sky are marked with an asterisk. Those still transmitting have two asterisks.

SPUTNIK I (USSR) Oct. 4, 1957-Jan. 4, 1958. Measured atmospheric density, temperatures. 142-558 miles. 96.2 minutes.

SPUTNIK II (USSR) Nov. 3, 1957-April 14, 1958. Biomedical experiments, measured solar influence on upper atmosphere densities, cosmic rays. 140-1,038 miles. 103.7 minutes.

*EXPLORER I (U.S.) Jan. 31, 1958 to 1961-1963. Discovered Van Allen radiation belt (believed most significant find of the International Geophysical Year). 217-1,100 miles. 106.2 minutes.

**VANGUARD I (U.S.) March 17, 1958-2158. Found earth is pear-shaped, tested vehicle and satellite. 404-2,451 miles. 133.9 minutes.

EXPLORER III (U.S.) March 26, 1958-June 27, 1958. Data on radiation belts, micrometeor impacts, temperatures. 117-1,741 miles. 114.7 minutes.

SPUTNIK III (USSR) May 15, 1958-April 6, 1960. For studying atmospheric pressure, composition; concentration of ions; magnetic fields; cosmic rays. 135-1,167 miles. 106 minutes.

EXPLORER IV (U.S.) July 26, 1958-Oct. 23, 1959. Data of radiation belts, spatial relationships, analyzed earth's magnetic field. 157-1,388 miles. 110.1 minutes.

PIONEER I (U.S.) Oct. 11, 1958-Oct. 12, 1958. Determined radiation band, first observation of hydromagnetic oscillations of earth's magnetic field. Space probe.

PIONEER III (U.S.) Dec. 6, 1958-Dec. 7, 1958. Discovered second radiation belt around the earth. Space probe.

PROJECT SCORE (U.S.) Dec. 18, 1958-Jan. 21, 1959. First time human voice beamed from space, relayed messages from U.S. ground stations. 110-920 miles. 101.46 minutes.

*LUNIK I (USSR) Jan. 2, 1959-indefinite. To study interplanetary matter, solar radiation, magnetic fields of earth and moon. Solar orbit: 90.8-122.5 million miles from sun. 450 days.

*VANGUARD II (U.S.) Feb. 17, 1959-1969. For studying cloud cover. 344-2,052 miles. 125.4 minutes.

DISCOVERER I (U.S.) Feb. 28, 1959 to early March, 1959. Tested Discoverer-Thor combination in polar orbit. 176-519 miles. 95.57 minutes.

*PIONEER IV (U.S.) March 3, 1959 in continuing solar orbit. Important data on solar radiation, tested long-range tracking. 91.8-106.2 million miles from sun. 398 days.

DISCOVERER II (U.S.) April 13, 1959-April 26, 1959. For studying propulsion, communication, recovery techniques, cosmic radiation. 156-225 miles. 90.4 minutes.

*EXPLORER VI (U.S.) Aug. 7, 1959-1961. Televised first pictures of earth's cloud cover, detected electrical ring current, mapped Van Allen belt and earth's magnetic field. Position uncertain.

DISCOVERER V (U.S.) Aug. 13, 1959-Feb. 11, 1961 (capsule); Sept. 28, 1959 (satellite). For same purposes as Discoverer II. 120-718 miles. 98.3 minutes.

DISCOVERER VI (U.S.) Aug. 19, 1959-Oct. 20, 1959 For same purposes as Discoverer II. 139-537 miles. 95.3 minutes.

LUNIK II (USSR) Sept. 12, 1959-Sept. 13, 1959. Hit the moon, studied magnetic fields of earth and moon, particles in space, cosmic rays.

*VANGUARD III (U.S.) Sept. 18, 1959 to 1989-1999. Surveyed earth's magnetic field, located edge of Van Allen belt, accurate count of micrometeorite impacts. 317-2,320 miles. 129.8 minutes.

LUNIK III (USSR Oct. 4, 1959 to mid-April, 1960. Photographed moon's far side. Circled moon and earth. 24,840-292,000 miles. 15 days.

**EXPLORER VII (U.S.) Oct. 13, 1959 to 1979-1989. Data on radiation and magnetic storms, first micrometeorite penetration of sensor in flight, detected weather patterns. 344-669 miles. 101.1 minutes.

DISCOVERER VII (U.S.) Nov. 7, 1959-Nov. 26, 1959. For same purposes as Discoverer II. 104-550 miles. 95 minutes.

DISCOVERER VIII (U.S.) Nov. 20, 1959-March 7, 1960. For same purposes as Discoverer II. 120-1,000 miles. 103 minutes.

*PIONEER V (U.S.) March 11, 1960 for 100,000 years. Set long-range communications record (22,500,000 miles), data on solar flare effects, particles and magnetic fields. Solar orbit: 74.9-92.5 million miles from sun. 311.6 days.

**TIROS I (U.S.) April 1, 1960 to 2010-2060. Took more than 22,000 pictures of cloud covers relayed by TV, data for meteorological satellite system. 429-467 miles. 99.1 minutes.

*TRANSIT I-B (U.S.) April 13, 1960-1961. Data for global navigational satellite system. 229-412 miles. 94.9 minutes.

DISCOVERER XI (U.S.) April 15, 1960-April 26, 1960. For same purposes as Discoverer II. 109-380 miles. 92.25 minutes.

*SPUTNIK IV (USSR) May 15, 1960 for brief time. Tested life support systems for manned space flight. 175-305 miles. 92.3 minutes.

*MIDAS II (U.S.) May 24, 1960-1963. Tested infrared scanner system for detection of missile launchings. 297-314 miles. 94.3 minutes.

**TRANSIT II-A—GREB (U.S.) June 22, 1960-2010. Two satellites fired at once, data for navigational satellite system. Transit II-A 389-649 miles. 101.6 minutes. Greb 381-657 miles. 101.6 minutes.

DISCOVERER XIII (U.S.) Aug. 10, 1960-Aug. 11, 1960 (capsule); Nov. 14, 1960 (satellite). Data on propulsion, communication, orbital performance, recovery technique; capsule recovered from sea. 161-436 miles. 94.1 minutes.

*ECHO I (U.S.) Aug. 12, 1960-indefinite. First passive communications satellite, voice and telephone transmission. 823-1,095 miles. 116.9 minutes.

DISCOVERER XIV (U.S.) Aug. 18, 1960-Aug. 19, 1960 (capsule); Sept. 16, 1960 (satellite). Same as Discoverer XIII, capsule recovered in mid-air. 116-502 miles. 94.5 minutes.

SPUTNIK V (USSR) Aug. 19, 1960-Aug. 20, 1960. Tested systems for manned space flight, capsule recovered in 18th orbit. 190-211 miles. 90.72 minutes.

DISCOVERER XV (U.S.) Sept. 13, 1960-Sept. 15, 1960 (capsule); Oct. 18, 1960 (satellite). For same purposes as Discoverer XIII. 130-472 miles. 94.24 minutes.

**COURIER I-B (U.S.) Oct. 4, 1960 for several years. Data for military communications system. 611-743 miles. 106.8 minutes.

*EXPLORER VIII (U.S.) Nov. 3, 1960-1970. Data on ionosphere composition, micrometeorites. 262-1,409 miles. 112.5 minutes.

DISCOVERER XVII (U.S.) Nov. 12, 1960-Nov. 14, 1960 (capsule); Dec. 29, 1960 (satellite). Same as Discoverer XIII, capsule recovered in mid-air. 116-616 miles. 96.45 minutes.

**TIROS II (U.S.) Nov. 23, 1960 to 2010-2060. Data for meteorological satellite system. TV pictures of clouds. 378-461 miles. 98.2 minutes.

SPUTNIK VI (USSR) Dec. 1, 1960-Dec. 2, 1960. Tested equipment for manned space flight. 112-155 miles. 88.6 minutes.

DISCOVERER XVIII (U.S.) Dec. 7, 1960-Dec. 10, 1960 (capsule); April 2, 1961 (satellite). Same as Discoverer XIII, capsule recovered in mid-air after 48 orbits. 154-459 miles. 94.1 minutes.

DISCOVERER XIX (U.S.) Dec. 20, 1960-Jan. 23, 1961. Studied atmospheric phenomena and infrared radiation. 128-323 miles. 92 minutes.

*SAMOS II (U.S.) Jan. 31, 1961 for undisclosed time. Observed space, earth and its atmosphere. 295-341 miles. 94.9 minutes.

SPUTNIK VII (USSR) Feb. 4, 1961-Feb. 26, 1961. Tested heavy satellite in orbit (7.1 tons). 138.75-203.56 miles. 89 8 minutes.

*SPUTNIK VIII—VENUS PROBE (USSR) Feb. 12, 1961-Feb. 25, 1961 (Sputnik). Venus probe for indefinite time that was launched from satellite toward Venus for long-range communication, observation of space. Solar orbit: 66.8-94.7 million miles from sun. 300 days.

*EXPLORER IX (U.S.) Feb. 16, 1961-1962. Tested Scout vehicle, sent balloon into orbit for atmospheric studies. 431-1,562 miles. 118.1 minutes.

*DISCOVERER XX (U.S.) Feb. 17, 1961 to late 1961. Evaluated stabilization system. 176-413 miles. 94.1 minutes.

*DISCOVERER XXI (U.S.) Feb. 18, 1961 for undisclosed time. For engineering, atmospheric and infrared radiation studies. Agena engine restarted in space for the first time. 154-516 miles. 95.5 minutes.

TRANSIT III-B—LOFTI (U.S.) Feb. 21, 1961-March 30, 1961. Two unseparated satellites gathering data for navigational satellite system, geodetic measurements, and radio transmission. 117-511 miles. 94.5 minutes.

SPUTNIK IX (USSR) March 9, 1961-March 9, 1961. Tested system for manned space flight, recovered cabin with live animals. 115-155 miles.

*EXPLORER X (U.S.) March 25, 1961 for uncertain time. Data on interplanetary magnetic fields. Original orbit: 100-145,000 miles.

SPUTNIK X (USSR) March 25, 1961-March 25, 1961. Same as Sputnik IX, recovered live animals at predetermined site. 111-150 miles. 88.4 minutes.

*DISCOVERER XXIII (U.S.) April 8, 1961 for undisclosed time. Testing guidance, and control of orbit. 183-341 miles. 93.1 minutes.

VOSTOK I (USSR) April 12, 1961-April 12, 1961. Manned space ship recovered after one orbit, tested man's reactions in space. 108.76-187.66 miles. 89.1 minutes.

**EXPLORER XI (U.S.) April 27, 1961 to 1962-1964. Orbited a special telescope for mapping gamma rays from cosmic sources. 302-1,113 miles. 107.9 minutes.

DISCOVERER XXV (U.S.) June 16, 1961-June 18, 1961 (capsule); July 12, 1961 (satellite). Tested improvements of orbital period controls, capsule recovered from sea after 33 orbits. 139.1-251.6 miles. 90.87 minutes.

**TRANSIT IV-A—GREB III and INJUN (U.S.) June 29, 1961-1962 (Transit); indefinite (Greb and Injun). Three satellites, two not separated; data for navigational satellite system, on solar X-rays and on cosmic rays. Transit 547-620 miles. Greb and Injun 548-619 miles. 103.8 minutes.

*DISCOVERER XXVI (U.S.) July 7, 1961-July 9, 1961 (capsule); 1962 (satellite). Same as Discoverer XXV, capsule recovered in mid-air after 32 orbits. 142-410 miles. 93.5 minutes.

**TIROS III (U.S.) July 12, 1961-1961. Data for meteorological satellite system, TV pictures of clouds. 457-510 miles. 100.3 minutes.

*MIDAS III (U.S.) July 12, 1961 for indefinite time. Tested system for detection of missile launchings. 2,084-2,197 miles. 161.5 minutes.

VOSTOK II (USSR) Aug. 6, 1961-Aug. 7, 1961. Manned spaceship, studied effects on man of long orbital flight, recovered in 18th orbit. 110.3-115.3 miles. 88.6 minutes.

**EXPLORER XII (U.S.) Aug. 15, 1961-1962. Data on solar wind, interplanetary magnetic fields, particles in space, Van Allen belts. 165-47,858 miles. 26 hours and 24 minutes.

RANGER I (U.S.) Aug. 23, 1961-Aug. 30, 1961. Tested systems for lunar probes, particles in space. 105.3-312.5 miles. 91.1 minutes.

EXPLORER XIII (U.S.) Aug. 25, 1961-Aug. 28, 1961. Tested Scout vehicle, studied micrometeorites. 174.60-606.34 miles. 97.27 minutes.

DISCOVERER XXIX (U.S.) Aug. 30, 1961-Sept. 1, 1961 (capsule); Sept. 10, 1961 (satellite). Same as Discoverer XXV, carried biological experiments, capsule recovered from sea on 33rd orbit. 140-345 miles. 91 minutes.

**DISCOVERER XXX (U.S.) Sept. 12, 1961-Sept. 14, 1961 (capsule); unknown time (satellite). Same as Discoverer XXV, carried biological experiments, capsule recovered in mid-air. 154-345 miles. 92.4 minutes.

MERCURY-ATLAS IV (U.S.) Sept. 13, 1961-Sept. 13, 1961. Tested systems and tracking network for manned space flight, capsule recovered after one orbit. 100-158 miles. 89 minutes.

**DISCOVERER XXXI (U.S.) Sept. 17, 1961—for unknown time. For measuring radiation, Discoverer performance and reliability. 152-255 miles. 91 minutes.

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SPACE

Mercury Capsule Orbited Two Satellites Launched

➤ THE FIRST Mercury capsule has been orbited around the earth and successfully recovered. On Sept. 13, the capsule carrying an astromech, or mechanical man, made the trip in 89 minutes and then descended into the Atlantic Ocean east of Bermuda, the National Aeronautics and Space Administration reported. The next step in the manned space flight program is expected to be an orbital trip of the capsule carrying a chimpanzee.

Two Discoverer satellites, XXX and XXXI, have been launched. On Sept 12, Discoverer XXX went up to test orbital period controls. It also carried biological experiments for studies of radiation effects on living matter. The capsule was recovered Sept. 14 in the Pacific Ocean north of Hawaii. The satellite is still orbiting.

Discoverer XXXI was launched Sept. 17 to measure radiation and Discoverer performance and reliability. However, the goldplated capsule failed to separate from the satellite and no recovery of the capsule is expected. The Air Force satellite Discoverer XXXI was the 21st of its series to orbit successfully.

On Sept. 13 an experiment to measure atmospheric winds, temperatures and density high in the earth's atmosphere was launched by NASA from the launching site at Wallops Island, Va.

A four-stage sounding rocket sent forth a sodium vapor cloud at two altitudes, 120 and 228 miles up. Trails of bright orange clouds at both altitudes were visible for hundreds of miles.

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SPACE

"Talking Ball" to Land, Investigate Moon in 1962

➤ A "TALKING BALL" covered with balsa wood is scheduled to land on the moon in 1962.

MOON BALL ON TOP OF RANGER SPACECRAFT

The ball will contain a seismometer to record moon quakes, and temperature devices and instruments for sending information back to earth about conditions on the moon.

It will travel to the moon on top of the Ranger spacecraft, now under development at Jet Propulsion Laboratory, Pasadena, Calif. After the 240,000-mile trip, the "moon ball" will be detached from the Ranger and hit the moon at less than 150 miles an hour. A retro-rocket will slow it down to this speed.

The separation of the moon ball, made by the Ford Motor Company's Aeronutronic Division, Newport Beach, Calif., will take place 20 to 25 miles above the lunar surface. The Ranger vehicle will continue its flight at 5,000 miles an hour until it crashes into the moon.

Inside the 25-inch sphere a "survival sphere" holding the instruments floats in a liquid, an arrangement planned to ease the impact of the landing after the 60- to 70-hour flight.

The Ranger vehicle will be boosted into space by the Atlas-Agena B rocket. The moon ball will be "hospital clean" before launch to eliminate any earth germs that might contaminate the moon and destroy evidence or clues to the way the solar system was originally formed. Internal instruments in the sphere will be biologically sealed to further insure sterlization.

• Science News Letter, 80:223 September 30, 1961