

SPACE

Man's Leap Into Space

The Russians leaped forward in the race to the moon in 1964, while Americans moved more slowly in the same direction—Compiled by Jonathan Eberhart

See Front Cover

► THE "CROWDS" of Russian cosmonauts and American astronauts that populated space in previous years were nowhere to be seen in 1964. The only manned shot of the year, however, was a momentous one.

The Soviet Union captured world headlines with a three-man spacecraft called Voskhod, or Sunrise. The diverse crew—astronaut, doctor, and scientist—wore no spacesuits throughout their journey 16 times around the earth.

The Soviet triumph overshadowed, but by no means obscured, perhaps the biggest news story all year to come from this side of the Iron Curtain—4,316 crystal-clear pictures of the moon, taken from as close as a few hundred feet by the Ranger 7 space-going TV camera, which seconds later crashed into its very subject.

Upon the success of the Sunrise shot, the

National Aeronautics and Space Administration hastened to open recruiting for its long-in-the-works "scientists' bootcamp." There, it plans to train physicists, geologists and other specialists not qualified as astronauts for future trips into space.

American plans to put their own teams in space with the two-man Gemini spacecraft succumbed to one delay after another, finally being delayed right into 1965. Meanwhile, other nations were getting on at the bottom of the ladder.

Great Britain, for example, in order to be independent of the demands of ESRO (the European Space Research Organization), revived its four-years-dead Blue Streak rocket and is mating it with a Black Knight missile, looking for a workable, all-British satellite launcher.

France is working on plans to get into the act next year with France-1, the first French satellite, which will be launched aboard a U.S.-made Scout rocket. Later in

the year an all-French launch will take place, using a similar satellite and the French Diamante (Diamond) rocket.

While NASA pursued its projects for the most part in the open, the Air Force carried on in secrecy. With only the barest public knowledge ("An unidentified satellite was launched today . . ."), several series of "sky-spy" satellites, such as Samos, Midas, and Vela Hotel, were created or expanded to keep closer tabs on enemy rocket trails, missile bases and nuclear tests.

Orbiting satellites are everywhere, with almost 500 man-made objects circling the earth. Communications satellites scored several successes, most notably Relay 2, which last January transmitted the first live television pictures between Japan and the U.S., and Syncom 3, which sent two live hours of the Olympic Games from Tokyo to California.

Few observers at the time of Sputnik 1's launching in October of 1957 could have foreseen the great traffic in space that now surrounds our planet. As each taste of the new frontier further whets man's appetite for exploration, it is unlikely that the space race will ever lose momentum, at least for many years to come.

1964 Space Calendar

The following are the principal satellites and probes launched in 1964 up to Dec. 1. When available, orbital distance closest to (perigee) and farthest from (apogee) earth are shown in miles. The times represent the durations of the orbits. Unsuccessful launches in general are not listed.

RELAY 2 (U.S.) Jan. 21, 1964—Communications satellite. Equipped to handle TV, radio and telephone, it carried the first live television pictures between Japan and the United States. 1,298-4,606 miles. 194.7 minutes.

ECHO 2 (U.S.) Jan. 25, 1964—The giant silvery reflector balloon was the first US-USSR cooperative space program. It has been used to send messages around the world. 642-816 miles. 108.8 minutes.

SATURN SA-5 (U.S.) Jan. 29, 1964—The fifth in the series of test flights leading up to the manned Apollo program set a "world payload record" of 20,000 pounds. 164-471 miles. 94.8 minutes.

ELEKTRON 1 and 2 (USSR) Jan. 30, 1964—The first Soviet two-in-one launch was sent to investigate the Van Allen radiation belts. Elektron 1: 252-4,412 miles, 169 minutes. Elektron 2: 286-42,377 miles, 1,360 minutes.

RANGER 6 (U.S.) Jan. 30, 1964—Crashed on the moon after a short circuit in its television cameras prevented it from sending pictures of the lunar surface back to earth. Flight time was 65.6 hours.

ARIEL 2 (US-Eng.) Mar. 27, 1964—NASA launched it, Great Britain provided the three experiments aboard, measuring galactic radio noise, ozone layers, and micrometeoroids. 180-843 miles. 101.3 minutes.

ZOND 1 (USSR) Apr. 2, 1964—Russia launched a rocket, which launched a "platform satellite," which launched the Zond (Russian for Sound, or Probe). It followed an unspecified heliocentric (sun-circling) orbit.

GEMINI-TITAN 1 (U.S.) Apr. 8, 1964—Carried the first "boilerplate" mock-up of the two-man Gemini spacecraft. 100-204 miles. 89.2 minutes.

POLYOT 2 (USSR) Apr. 12, 1964—The radio-controlled object was the second in a series of highly-maneuverable-from-the-ground satellites. 193-311 miles. 92.5 minutes.

PROJECT FIRE (U.S.) Apr. 14, 1964—Designed to measure the terrible heat of reentry into the atmosphere, it was launched upward by an Atlas-D rocket and kicked back down for the test by an Antares II solid-fuel booster.

SATURN 6 (U.S.) May 28, 1964—Carried the first boilerplate mock-ups of the Apollo command and service modules. The shot was also used to check out the first/second-stage separation procedures in space. 124-140 miles. 88.5 minutes.

ATLAS-CENTAUR 3 (U.S.) June 30, 1964—The most troublesome rocket in America's space program, Centaur finally underwent its third test, during which it did everything but go into orbit as it was supposed to. It will be Centaur's job to "soft land" the unmanned Surveyor spacecraft on the moon.

ELEKTRON 3 and 4 (USSR) July 11, 1964—Second Elektron double launch. Elektron 3: 251-4,365 miles, 168.2 minutes. Elektron 4: 285-41,076 miles, 1,313.9 minutes.

NDS 3 and 4 (U.S.) July 17, 1964—The Air Force launched these two Nuclear Detection Satellites, together with a radiation-measuring research probe, from the same Atlas-Agena-D rocket. They were the first "field" tests of a new experimental sensing system. NDS 3: 63,369-65,024 miles, 100.3 hours. NDS 4: 58,766-69,482 miles, 100.1 hours.

RANGER 7 (U.S.) July 28, 1964—America's triumph of '64. Three days after launch, the spacecraft sent back to earth 4,316 crystal-clear pictures of the lunar surface, stirring up new theories on the composition of the moon's top layer. Flight time was 68.6 hours.

SYNCOM 3 (U.S.) Aug. 19, 1964—Sent live TV pictures of the Olympic Games in Tokyo to California. Syncom sits above a fixed point on the earth, ranging from 21,690 miles to 22,509 miles above the surface.

TOPSI (U.S.) Aug. 25, 1964—Actually Explorer 20, it is named for its role as a Topside Sounder. The satellite is providing upper-atmospheric data by the unusual method of bouncing signals off the ionosphere from above, then relaying them back to earth. 540-634 miles. 103.9 minutes.

NIMBUS 1 (U.S.) Aug. 28, 1964—The most remarkable weather satellite yet took the first photographs ever of the earth's nighttime cloud cover, using special, infrared cameras. It missed its intended circular orbit, but the resulting close-ups were an unexpected pleasure. 263-579 miles. 103 minutes.

OGO-1 (U.S.) Sept. 4, 1964—The first Orbiting Geophysical Observatory carried 20 experiments into orbit, with 17 working despite a major mechanical failure. It showed that almost any combination of experiments can be put together in one satellite, despite their need for "special treatment." 175-92,827 miles. 63.59 hours.

SATURN 7 (U.S.) Sep. 18, 1964—Another test of Apollo's ride-to-the-moon, with nothing to speak of different from the previous flight, except for a new guidance system, which worked perfectly, as did everything else. 112-145 miles. 88.6 minutes.

BEACON EXPLORER-B (U.S.) Oct. 9, 1964—22nd in the Explorer series, the satellite carries a honeycomb of tiny mirrors designed to reflect an earth-based laser beam directly to its source. Exact measurements of the time between transmission and reception of the beam give a super-accurate picture of the satellite's orbit. 546-674 miles. 104.7 minutes.

VOSKHOD (USSR) Oct. 12, 1964—The event of the year. Three men—an astronaut, a doctor, and a scientist—went around the world 16 times without spacesuits, the only spacemen of 1964. 112.5-255.6 miles. 90.1 minutes.

MARINER 3 (U.S.) Nov. 5, 1964—Sent on a 325-million-mile journey to fly close to the planet Mars and take photographs, the probe was lost when its shroud failed to eject clear of the spacecraft.

MARINER 4 (U.S.) Nov. 28, 1964—After some early trouble, the 575-pound probe finally locked its electronic "eye" on the star Canopus and sped toward its rendezvous with Mars about July 14, 1965. It is designed to take 22 TV photographs of Mars, make scientific observations and then go in orbit around the sun. On this week's cover the Mariner is shown on the launch pad at Cape Kennedy.

ZOND 2 (USSR) Nov. 30, 1964—Believed to weigh about 2,000 pounds, this Mars probe was reported to have suffered a failure in half of its power supply shortly after launch.

COSMOS (USSR)—The Soviet Union doubled the size of its unmanned, unpublicized, unidentified space probe series, launching numbers 25 through 50 in 1964.

DISCOVERER (U.S.)—Discoverer launches were so secret that even the number is not known. Usually for scientific/military purposes, more than 60 were launched in 1963, probably more than that this year.

• Science News Letter, 86:373 December 12, 1964

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Atlas Missile Has A Variety of Missions

► THE MIGHTY ATLAS missile, used to launch the Mariner Mars probes, has a variety of other assignments in National Aeronautics and Space Administration programs.

These include:

1. RANGER—A lunar research program, with television cameras transmitting close-up pictures of the surface of the moon during the last few minutes of flight as the Ranger spacecraft descends toward a hard landing.

2. OGO (Orbiting Geophysical Observatory)—A standardized spacecraft designed to accommodate a variety of geophysical experiments to be launched into an eccentric orbit.

3. OAO (Orbiting Astronomical Observatory)—A scientific satellite to make telescopic observations of ultraviolet, infrared, and X-ray ranges from a precisely stabilized orbiting platform above the obscuring effects of the earth's atmosphere.

4. CENTAUR — Launching high-energy liquid hydrogen-powered Centaur upper stages (under development by the Astronautics division) for Surveyor and other missions.

Surveyor is designed for soft landings on the moon to provide: lunar data in support of Project Apollo; techniques of control, guidance, communication, and landing for manned expeditions, and to obtain basic scientific data about the moon.

5. FIRE—Testing of vehicles and systems during atmosphere re-entry at high velocities.

6. GEMINI TARGET—The second U.S. manned space flight program to provide experience in rendezvous and docking, perform earth-orbital flights up to 14 days, and



Composite of NASA photos by Fremont Davis

AMERICA'S BIG MOMENT—Biggest space news from the United States this year was the Ranger 7 spacecraft, which took 4,316 razor-sharp pictures of the moon's surface. The pictures started a flurry of nature-of-the-moon theories that is still raging today. Here Ranger 7 is shown before a background of one of its own photographs.

demonstrate controlled re-entry and landings. The Air Force will launch Agena vehicles with Atlas to serve as rendezvous targets for the two-man Gemini spacecraft.

7. LUNAR ORBITER—Launch of spacecraft to orbit the moon, take close up pic-

tures of the lunar surface and transmit them to earth. Lunar orbiter spacecraft will secure topographic data for the selection and confirmation of landing sites for Project Apollo manned lunar landing missions.

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