

COMMENT DRAFT

NOT FOR RELEASE

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

Date ----- Doc. No. -----

ASTRONAUTICS AND AERONAUTICS

DECEMBER 1968

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

(HHR-23)

Text Drafted by Science and Technology Division  
Library of Congress

ASTP

NASA Historical Division (EH)  
Office of Policy  
National Aeronautics and Space Administration  
Washington, D.C. 20546

(PLEASE RETURN COMMENTS AND SURPLUS COPIES TO EH)

A CH

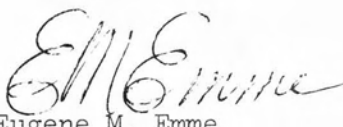
DECEMBER 1968

ASTRONAUTICS AND AERONAUTICS, 1968

A Chronology on Science, Technology, and Policy

F O R E W O R D

The preliminary draft chronologies issued monthly during the year 1968 are now being prepared for publication in the annual volume. Are these drafts complete and correct? Your comments, criticisms, and additions should be directed to the NASA Historical Division (EH) by April 1, 1969, to validate the 1968 published edition.

  
Eugene M. Emme  
NASA Historian (EH)

1 9 6 8

December 1: Walter P. Reuther Chair for study of peaceful use of atomic energy was established at Weizmann Institute of Science near Tel Aviv, Israel, through efforts of United Auto Workers of America. Chair honored labor union's president, Walter P. Reuther. (Feron, NYT, 12/2/68, 8)

December 2: H. Julian Allen, who had announced on Oct. 25 his retirement as Director of Ames Research Center, would defer retirement, NASA announced. Allen would be Special Assistant to Associate Director, Office of Advanced Research and Technology, and would serve as Acting Director of ARC for indefinite period. ARC Associate Director James F. Parsons, named to be Acting Director after Allen's retirement, had become seriously ill with prospect of extended convalescence. (NASA Ann, 12/2/68)

- . U.K., West Germany, and the Netherlands had decided to pool secrets and build centrifuge separation plant to produce cheap enriched-uranium reactor fuel, Don Cook reported in Washington Post. If successful, venture would break U.S. monopoly on enriched uranium, currently produced by gaseous-diffusion separation. In 1962 agreement with U.S., the countries had contracted to keep experimentation in centrifuge secret from each other. In addition to U.S., U.S.S.R. and Communist China produced enriched uranium by gaseous-diffusion process. (W Post, 12/2/68, A3)
- . U.S.S.R. published Zond VI photo of 70-mi-wide lunar crater carrying name honoring geneticist Nikolay I. Vavilov, who had been sent to Siberia in 1939 for opposing ideas of Trofim D. Lysenko, and his brother Sergei I. Vavilov, who had later become president of Soviet Academy of Sciences. Nikolay Vavilov died in Siberia in 1943; his brother died in 1951. Soviet name for crater, Brothers Vavilov, had not yet been accredited by International Astronomical Union. (NYT, 12/3/68, 36)
- . DOD announced issuance of \$4,400,000 initial increment to \$31,132,689 cost-plus-incentive-fee USAF contract with Lockheed Missiles and Space Co. for launch support services at WTR. (DOD Release 1060-68)
- . President Johnson presented 1968 Enrico Fermi Award in White House ceremony to Dr. John Archibald Wheeler, Princeton Univ. physicist, for "pioneering contributions to understanding nuclear fission and to developing the technology of plutonium production reactors and his continuing broad contributions to nuclear science." Award carried gold medal, citation, and \$25,000. (PD, 12/9/68, 1656; W Post, 12/3/68, A2; W Star, 12/3/68, A6)

December 3: U.S.S.R. launched Cosmos CCLVII into orbit with 438-km (272.2-mi) apogee, 269-km (167.2-mi) perigee, 91.6-min period, and 70.9° inclination. (AP, B Sun, 12/4/68; Reuters, C Trib, 12/4/68; GSFC SSR, 12/15/68)

- . President Johnson proclaimed Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Space Objects in effect with deposit in three capitals of instruments of ratification by U.S., U.S.S.R., and U.K. Ireland and Nepal had previously ratified treaty. It had been signed by 75 countries. (PD, 12/9/68, 1658; AP, NYT, 12/5/68, 13; NASA Office of General Counsel)
- . XB-70A experimental supersonic bomber, piloted by NASA test pilots Fitzhugh Fulton and Donald L. Mallick, reached mach 1.64 and 39,400-ft altitude during 1-hr 58-min flight from Edwards AFB to test exiter vane integrated loads and frequency, as well as handling qualities performance. All primary objectives were accomplished, although cabin pressure problem necessitated manual operation of system. (XB-70 Proj Off)
- . President-elect Richard M. Nixon named Dr. Lee A. DuBridge, retiring President of Cal Tech, as his Science Adviser and announced formation of task force under Dr. H. Guyford Stever, President of Carnegie-Mellon Univ., to make recommendations in general science field and task force headed by Dr. Charles Townes, Nobel Prize winning physics professor at Univ. of California at Berkely, to recommend in space field. Dr. DuBridge described as a "very critical matter" loss of momentum in U.S. space program resulting from appropriations cuts and said reducing activities in basic and applied research damaged nation's future. Later, National Science Board Chairman, Dr. Phillip Handler of Duke Univ., said of Dr. DuBridge, "He has one rare attribute...wisdom, an unusual commodity. He is knowledgeable about the role of technology in our society and has a deep belief in the importance of fundamental research to the health and welfare of the country. And he is usually understanding of the problems of the private universities." (Horner, W Star, 12/3/68; Cohn, W Post, 12/3/68, A7; SBD, 12/4/68, 141; W Star, 12/4/68, A13)
- . President Johnson presented Harmon International Aviation Trophy to Maj. William J. Knight (USAF) for piloting X-15 rocket research aircraft to unofficial record speed of 4,520 mph (mach 6.70) Oct. 3, 1967. During White House ceremony President said, "What we learn from the X-15 program will enable us to improve on all our aircraft. The information gained from Major Knight's 'flying laboratory' will make the airplanes of the future safer, faster, and more efficient." (NASA PAO; W Post, 12/4/68, A3; SBD, 12/5/68, 151; PD, 12/9/68, 1660)

December 3: Gen. Jacob E. Smart (USAF, Ret), NASA Assistant Administrator for DOD and Interagency Affairs, addressed Armed Forces Management Assn. on NASA Interagency Coordination: "...I believe it would be appropriate for the President or the Congress to charge NASA with exercising the lead in a national R&D program that is designed to learn how and to what degree science, engineering, and technology can be applied to help the Departments of Interior, Agriculture, Commerce, Navy, and others to fulfill their responsibilities for development and management of natural resources.... National decision on whether we undertake development of operational space systems must await outcome of R&D. Issues will be more clearly identified and understood if the President and the Congress lend their interest and public support to a first class R&D program."

(Text)

- . FAA adopted rule proposed in Sept. 4 announcement to limit number and type of aircraft operations at five "high-density" airports in New York, Washington, and Chicago and included supplemental carriers in same category as scheduled carriers. Final rule, effective April 27, 1969, dropped proposed requirement that all aircraft operating instrument flight rule (IFR) at high-density airports have minimum two-pilot crew and be able to maintain 150-knot minimum airspeed. (FAA Release 68-76; W Star, 12/3/68, A1; Eisen, W Post, 12/3/68, A1; Witkin, NYT, 12/4/68, 1)
- . Cal Tech said Mt. Wilson and Mt. Palomar observatories were keeping close watch for developing sunspots that might threaten Apollo 8 astronauts with dangerous x-ray radiation. (Reuters, W Post, 12/5/68, H9)

December 4: Eugen Sanger Medal of German Society of Aeronautics and Astronautics was awarded to U.S. X-15 research aircraft team in Bonn, West Germany, for X-15 program's contribution to advancement of space flight. Medal honored German rocketry leader, Dr. Eugen Sanger, first to define potential of hypersonic rocket aircraft, who died in 1964. John V. Becker of LaRC accepted award on behalf of NASA-USN-USAF team. (NASA Release 68-206)

- . In New York Times interview, Dr. Donald F. Hornig, Science Adviser to President Johnson, said chief problem facing his successor, Dr. Lee A. DuBridg, was finding funds for science and technology. "The central problem is preserving the vitality, the creativity and the entrepreneurial surge of the establishment. The problem becomes 10 times as acute when money is tight." Next science adviser would have to orient new administration to give science proper place in overall scheme, Dr. Hornig said. One of America's great strengths was

December 4 (continued)

recognition that science, like economics, was part of everything. New administration would have to set course for space program after manned lunar landing. It would have to decide how to improve nation's health care, deal with environmental pollution, and face technological problems of keeping world free of nuclear war. Next administration ought to face question of what science and technology could contribute to solving manifold problems of cities, including urban housing and urban transport. Particularly important task would be protecting and advancing vitality of basic science enterprise--research devoted to quest for knowledge with no immediate applications in mind. Most scientists agreed health and future of all science and technology rested on this basic investigative area. (Schmeck, NYT, 12/5/68, 28)

- . Dr. Abe Silverstein, NASA Lewis Research Center Director, received one of six \$10,000 1968 Rockefeller Public Service Awards--highest privately-sustained honor for Federal career service--in Washington, D.C., ceremonies. (Langley Researcher, 11/29/68, 1; Causey, W Post, 12/5/68, A22)
- . In letter to National Council on Marine Resources and Development, President-elect Richard M. Nixon said his administration would "consider an integrated program in oceanology a first priority." (AP, NYT, 12/8/68, 74)

December 5: NASA successfully launched European Space Research Organization's 240-lb HEOS-A Highly Eccentric Orbiting Satellite from ETR by Thrust-Augmented Thor-Delta booster. Drum-shaped satellite entered orbit with 139,452.8-mi (224,428-km) apogee, 272.8-mi (439-km) perigee, 113-hr 12-min period, and 28.2° inclination.

Primary NASA objective was to place HEOS-A into earth orbit which would permit successful achievement of ESRO scientific objectives and to provide spacecraft tracking and telemetry support. Eight onboard experiments designed by nine scientific groups in Belgium, France, West Germany, Italy, and U.K. would investigate interplanetary magnetic fields and study solar and cosmic-ray particles outside magnetosphere during period of maximum solar activity. By Dec. 30 seven experiments had been turned on and operated satisfactorily. Eighth experiment would be activated two months after liftoff. Spacecraft control had shifted to ESRO Operations Center, Darmstadt, Germany.

HEOS-A was third ESRO mission orbited by NASA, first ESRO mission on Delta launch vehicle, and first NASA-ESRO reimbursable mission, in which ESRO would pay U.S. for launch vehicle hardware and certain launch costs. (NASA Proj Off; NASA Release 68-204; Wilford, NYT, 12/6/68; GSFC SSR, 12/15/68)

December 5: NASA Deputy Administrator for Space Sciences and Applications Oran W. Nicks described applications of Surveyor and Lunar Orbiter techniques to Mars exploration before AIAA meeting in Washington, D.C. Two 1971 Mariner Orbiter missions would provide new tools for survey of dynamic Mars, arriving when most striking seasonal changes were evident in Southern Hemisphere. Their combined orbits and life expectancies would allow observations of dynamic changes in clouds and surface features over several months. In 1973, two additional orbiters would survey Mars from different orbits during different seasons, with support of landing mission as prime requirement. Also planned for 1973 was survivable landing spacecraft to make local measurements of environment, photograph surface and topography, and analyze soil.

"Burning question of immediate concern to you and me will be addressed by use of our new tools," Nicks said: "'Is there life elsewhere? Has life existed on nearby planets and disappeared for any reason? Can nearby planets be made suitable for life?' Together, orbiters and landers form a powerful team for the study of Mars and for seeking answers to these questions. Together, they will continue to extend our capabilities in what is probably the most challenging, open-ended arena for expansion of science and technology in the decade ahead." (Text)

- . NASA announced plans to use Titan III-D/Centaur in dual launches of 6,000-lb spacecraft consisting of Surveyor-type soft landers mated to Mariner 1971 class Mars orbiters in mid-1973, in Project Viking, to obtain scientific information on life on Mars. Launched 10 days apart, spacecraft would arrive about seven months later, when orbiter propulsion systems would place orbiters and landers in Mars orbit. After reconnaissance, landers would be detached and softland on Mars. (NASA Release 68-207; Pasadena Independent, 12/6/68)
- . Wall Street Journal editorial said major task of new Presidential Science Adviser, Dr. Lee A. DuBridge, would be "to try to help instill some semblance of order in the Government's massive involvement in science." While DOD and NASA had been biggest science spenders, other agencies were extensively involved. "Because there was such a limited effort to set priorities in the first place, it's hard for anyone to know for sure which programs the nation now can best afford to slow down or abandon.... [Dr.] DuBridge now must try to plan the future course of Federal science, somehow reconciling all the competing pressures from scientists, universities, industry, Congress, maybe even taxpayers." (WSJ, 12/5/68)



- December 5: Lewis Research Center announced NASA-developed artificial heart control system delivered to Cleveland Clinic, Cleveland, Ohio, would assist research into ways man-made ventricle could assist damaged natural heart. Later system could be modified to control artificial replacement heart. Electronic R-wave detector sorted heart beat from background noise in electrocardiogram to synchronize beat in artificial heart with natural heart and gave synchronization signal to programmer, which could adjust pumping of artificial ventricle to needs of body. (LeRC Release 68-80)
- . ComSatCorp announced it had placed in fulltime commercial operation two new earth station facilities at Jamesburg, Calif., and Paumalu, Hawaii, to handle U.S.-Pacific area communications via INTELSAT-II F-4 (INTELSAT II-D) satellite. (ComSatCorp Release 68-66)
  - . Scientists at Univ. of California at Los Angeles, testing to determine if life could exist in hostile environment of Venus, said they had grown algae in atmosphere of 100% carbon dioxide. They said Venus had more than 90%. More complex plants had not survived, reported Dr. Willard F. Libby, Nobel prize winner in chemistry, Dr. Joseph Seckbach of Israel, and Dr. Irene Aegerter of Switzerland. (AP, NYT, 12/8/68, 35)
  - . Washington Post editorial commented on FAA's limitation of operations at five major airports [see Dec. 3]: "It is unfortunate, of course, that the capacity of airports at New York, Chicago and Washington have not kept up with the growth of the Nation's air fleet. But airports do have limits, and it is growing increasingly clear that the only solution to congestion problems is to separate commercial and non-commercial traffic. It would make far more sense for those who feel they have been unfairly treated by the FAA's action to campaign for more reliever airports around large cities (and the taxes on airport users to pay for them) than to attempt...to overturn the FAA decision." (W Post, 12/5/68, A20)
  - . DOD announced USAF scientists, in study conducted by Air Force Cambridge Research Laboratories, would fly KC-135 flying ionospheric laboratory around auroral oval in Arctic during seven-day series of first flights attempted along this route. Purpose was to obtain data on spatial extent and intensity of optical and radio auroras in mid-winter and define relationships between them. USAF was interested in influence of auroras on radio communication and navigation and on radar surveillance. AFCRL scientists hoped, eventually, to predict occurrence and severity of auroral activity. (DOD Release 1065-68)

December 5: USN announced authorization of \$22 million to Electric Boat Div. of General Dynamics Corp. for planning and procurement of materials and equipment for "quiet" nuclear-powered submarine. Award brought total allocation thus far to \$30.5 million. Initial \$8.5 million was for design. (UPI, W Post, 12/5/68, H7)

- . USAF launched three Athena missiles from Green River, Utah, carrying research payloads to obtain ballistic missile reentry data under ABRES program. Vehicles reentered atmosphere over ASMR. (SBD, 12/13/68, 196)

December 6: Aerobee 150 MI sounding rocket launched by NASA from WSMR carried American Science and Engineering, Inc., payload to 92.6-mi (149-km) altitude to collect data on celestial x-ray sources in 1- to 20-kev range. Rocket and instruments performed satisfactorily. (NASA Rpt SRL)

- . In major organizational changes at MSFC, Dr. W. R. Lucas, Director of Propulsion and Vehicle Engineering Laboratory was named Director for Program Development, effective Dec. 16; Dave Newby was named Director of Center Operations; and Dr. Ernst Stuhlinger, Director of Space Sciences Laboratory, was named Associate Director for Science--all new positions. MSFC Research and Development Operations would become Science and Engineering, with Hermann K. Weidner remaining Director; Industrial Operations would become Program Management under same director, E. F. O'Connor.

Dr. Wernher von Braun, MSFC Director, said major function of new Program Development organization would be to "harden" complete package plans for new programs, such as space station. Director for Program Development would "help chart the course for this Center in the post-Apollo period, keeping in mind our Apollo program requirements and AAP obligations." (MSFC Release 68-276; Marshall Star, 12/11/68, 1)

- . NASA announced first successful orbital operation of two low-thrust space engines during five separate tests in two-month lifetime of ATS IV spacecraft. Ion, or electrical engines, producing thrust of less than 20 micropounds, had been fired for total 23 hr and performed perfectly. Ion engines for future spacecraft were ideal systems for countering gravitational attraction between spacecraft, moon and sun, and elliptical equatorial section--to keep satellite stationary for conducting communications, meteorological, and navigational experiments. They had controllable thrust level and direction, higher fuel efficiency, and longer fuel life than chemically propelled engines. Reservoir of 1/10 lb cesium could

December 6 (continued)

keep synchronous satellite stationary for more than three years. Before test, propulsion experts had expected ion engine firings might create radio frequency interference. Test showed no interference. Two more ion engines were planned for testing aboard ATS-E, scheduled for August 1969 launch. (NASA Release 68-205)

- . Apollo 7 Astronaut Walter M. Schirra, Jr., received Kitty Hawk Memorial Trophy for distinguished achievement in aeronautics at annual Wright Brothers memorial banquet in Beverly Hills, Calif. Banquet commemorated 65th anniversary of flight of Kitty Hawk. (UPI, W Star, 12/7/68, A2)
- . ComSatCorp filed application for authority to construct earth station for satellite communications in Alaska, 90 mi north of Anchorage near Talkeetna Village. (ComSatCorp Release 68-68)
- . In Washington Post, Thomas O'Toole said Howard Hughes organization's holding company, Hughes Nevada Operations, had requested public disclosure of alledged DOD study by Harvard Univ.'s Dr. George Kistiakowsky and MIT's Dr. Jerome Wiesner and James Killian, Special Report on Underground Testing, which it claimed concluded there was no reason for continued underground atomic tests. Study was said to have been made for former Defense Secretary Robert S. McNamara at cost of \$250,000. DOD spokesman denied existance of study, while Science Adviser to President Johnson, Dr. Donald F. Hornig, said only that he had met with top physicists in November to discuss safety of underground testing. "We may make a public report on it. The subject seems to be of enough importance to warrant a public airing," Dr. Hornig said. (W Post, 12/6/68, 87)

December 7: NASA's QAO II (QAO-A2) Orbiting Astronomical Observatory was successfully launched from ETR by two-stage Atlas-Centaur booster. Orbital parameters: apogee, 485.7 mi (781.6 km); perigee, 479.2 mi (771.2 km); period, 100.4 min; and inclination, 35°. Heaviest and most complex automated spacecraft ever developed by U.S., QAO II was 7 ft wide and 10 ft high, weighed 4,400 lb, carried 11 telescopes, and contained 238,000 separate parts.

Primary mission objective was to demonstrate flight operation to support two experiments provided by Smithsonian Astrophysical Observatory and Univ. of Wisconsin for at least 30 days. Secondary objective was to obtain scientific data over a range of star magnitudes and wavelengths for at least 50 hr. Experiments would observe interstellar dust and extremely young hot stars in UV portion of spectrum not visible to human eye or earth-based observatories. Satellite would be able to

1 9 6 8

December 7 (continued)

collect six hours of UV data per day--twice as much as had been obtained in 15 yr from 40 sounding rocket launches. Through its complex ground-command spacecraft-attitude system QAO II would be aimed at individual objects in space with precision never before attained by an orbiting satellite. Information from experiments would be radioed to earth as digital data for analysis by experimenters.

By Dec. 10 all spacecraft equipment had been turned on and operated satisfactorily: satellite had been placed in its sunbathing mode with its solar panels oriented toward sun; its six star trackers had been activated; three of the trackers had been locked on to preplanned guide stars; and satellite had established three-axis stabilization. Smithsonian experiment initial power had been turned on. Wisconsin Experiment Package would be turned on Dec. 11.

QAO II was second in series of four spacecraft in NASA's QAO program to obtain precise astronomical observations of celestial objects above earth's atmosphere. QAO I had been launched into almost perfect orbit April 6, 1966, but had failed because of power supply system malfunction and probable high voltage arcing in star tracker. QAO program was managed by GSFC under OSSA direction. (NASA Proj Off; NASA Release 68-186K; KSC Release KSC-511-68; UPI, W Star, 12/8/68, A5; O'Toole, W Post, 12/8/68, AP, W Star, 12/9/68, A6; SBD, 12/10/68, 172; Sehlstedt, B Sun, 12/12/68, A5)

December 8: MSC said Chief Test Pilot Joseph S. Algranti successfully ejected from LLTV about four minutes into planned six-minute flight, when large lateral-control oscillation developed as he descended from maximum altitude of 550 ft. He ejected at 200 ft and landed by parachute while \$1.8-million vehicle crashed and burned several hundred feet away. Flight was 14th for this LLTV. Astronaut Walter M. Schirra, Jr., was named chairman of board to investigate accident. (MSC Special Release; W Post, 12/9/68, 1; SBD, 12/10/68, 172)

- In New York Times, Walter Sullivan said President-elect Richard M. Nixon's entourage had discussed creation of Cabinet post for science and technology. "The science adviser, in the view of the Nixon entourage, has been unable to streamline the machinery for making science policy. Science, and the problems relating to it, has outgrown its old boundaries. The big problems are interdisciplinary. Their solution requires expertise in many fields, and the cooperation of many departments of government. This has led to a proliferation of interdepartmental committees." However, "because the creation of a Cabinet post would have major repercussions within the scientific establishment, it is unlikely that such a step will be taken until there has been an extensive study, lasting perhaps a year or more." (NYT, 12/8/68, 3E)

December 9: NASA's HL-10 lifting body vehicle, piloted by Maj. Jerauld R. Gentry (USAF), successfully completed second rocket-powered flight from Edwards AFB reaching mach 0.8 (550 mph) at altitude approaching 50,000 ft. (NASA Proj Off; AP, B Sun, 12/10/68, 5)

- At White House dinner, President Johnson presented retired NASA Administrator James E. Webb highest civilian award, Presidential Medal of Freedom, and honored 23 Apollo astronauts, Charles A. Lindbergh, and heads of rocket-building firms. Award was made to Webb as "a most distinguished public administrator...a farsighted and forceful leader of this Nation in the pioneer exploration of outer space, opening new frontiers of discovery and progress for the American people."

In predinner ceremony, document for White House Treaty Room was signed by Apollo 7 astronauts Walter M. Schirra, Jr., R. Walter Cunningham, and Donn F. Eisele; Apollo 8 Astronauts William A. Anders, Frank Borman, and James A. Lovell, Jr.; and Lindbergh. Also in Treaty Room were commemorations of May 21, 1963, visit to White House by Astronaut L. Gordon Cooper following 22-orbit mission in Faith VII May 15-16 and June 17, 1965, award of Exceptional Service Medal to late Astronaut Edward H. White, II, and Astronaut James A. McDivitt following first U.S. space walk during June 3-7 Gemini IV mission.

In exchange of dinner toasts President Johnson said that "in the hundreds of laws on which I have answered the rollcall, the bills that I have sponsored or cosponsored or amended or defeated, there is not a single one that gives more pride than the Space Act." Responding, Webb cited three generations of spacecraft in 10 yr, "put to use...in every major field," and said he had "strongly held view that in the kind of world we live in, our Nation needs this kind of success in this kind of endeavor." (PD, 12/16/68, 1689-91; McCardle, W Post, 12/10/68, D1; Shelton, W Star, 12/10/68, B6; NYT, 12/10/68, 86)

- World Meteorological Organization, U.N. agency managing World Weather Watch project, said work was well advanced, according to UPI. System would be fully operational in 1971 and save world economy estimated \$17 billion annually in losses caused by unexpected weather changes. System called for 29,000 observations daily, of which 24,000 were already being made. Additional 2,500 by 1971 would bring implementation level to 91%. World centers had been established at Melbourne, Moscow, and Washington and would be computerized by 1969, increasing daily output of 134 charts to 223 by 1971. Additionally, 21 regional centers issuing 1,191 charts daily would increase output to 1,830 charts by 1971 and, eventually, would be linked to global communications system. Observations would be made by land surface stations 300 mi apart throughout world with exception of desert areas. Further data

December 9 (continued)

would be passed on by weather ships, upper-air sea stations, aircraft, and meteorological satellites. (W Star, 12/9/68, A8)

December 9-12: New York Times and Washington Evening Star published contents of unreleased draft report by Presidential task force appointed in 1967 to formulate national communications policy dealing with rapid technological changes and providing for adequate Government supervision. Report would recommend reorganization of U.S. communications industry to include Government-sponsored monopoly to transmit all international communications--including ComSatCorp satellites and ground stations; AT&T underseas cables; and terminals and switching stations of "record" carriers ITT World Communications, Inc., RCA Communications, Inc., and Western Union International, Inc. If ComSatCorp became single international "entity," committee's recommendations would preclude it from becoming owner and manager of domestic satellite communications system for which the report would propose pilot program.

Committee claimed single entity could make more balanced investment choice on whether to lay more cables or launch satellites and would eliminate need for duplicate transmission facilities. Conclusions were challenged in dissenting footnote to report by Dr. Edward C. Welsh, Executive Secretary of NASC, who said merger would inhibit development of satellite technology and reduce technological competition between cables and satellites that could result in lower rates.

Report also would recommend informal merger of postal and telegraph services, with Western Union Telegraph Co. permitted to operate in post offices; relaxation of FCC restrictions on cable TV to protect broadcasters; and Government sponsorship of experimental program to test TV's usefulness in assisting minority groups. Report said major finding was "the need to strengthen Government capabilities, both in FCC and the Executive Branch and private industry to develop and implement policies" which would enable Government and industry to realize full potential of communications. (Finney, NYT, 12/9/68, 1; 12/10/68, 1; Aug, W Star, 12/12/68, A13)

December 10: Cosmos CCLVIII was successfully launched by U.S.S.R. into orbit with 302-km (187.6-mi) apogee, 206-km (128-mi) perigee, 89.5-min period, and 64.9° inclination. Satellite reentered Dec. 18. (UPI, W Star, 12/10/68, A6; AP, NYT, 12/11/68, 6; GSFC SSR, 12/15/68; 12/31/68)

1 9 6 8

December 10: NASA announced award of \$1,046,123 contract to Thiokol Chemical Corp.'s Elkton, Md., Div. for development of more powerful solid rocket for automated missions, including possible use as 3rd stage for Centaur and Delta. New 3rd stage was expected to be ready for use in 1971. (NASA Release 68-210)

- . NASA announced joint 1969 project with German Federal Ministry for Scientific Research (BMwF) to photograph earth's magnetic lines of force high in space would involve release of barium vapor by NASA Scout rocket at 20,000-mi altitude. Scientists would use special optical equipment to view resultant glowing ionized cloud along magnetic field line and visually map electromagnetic forces acting in barium area. Barium release technique, pioneered by Prof. Reimar Luest of Max Planck Institute, required ejection of barium copper oxide mixture that vaporized on release; ultraviolet radiation from sun would ionize portion of barium. Agreement on project called for BMwF to provide payload, two ground observer stations, and data analysis. NASA would furnish rocket, conduct launch from NASA Wallops Station, and provide tracking and communications services. (NASA Release 68-211)
- . MSC had awarded \$16.4 million, one-year extension to cost-plus-award-fee contract with Lockheed Electronics Co. Div. of Lockheed Aircraft Corp., NASA announced. Award was for general electronic, instrumentation, and engineering support services, bringing total contract value to \$46.4 million. (NASA Release 68-209)
- . Washington Daily News editorial commented on statement by physicist Dr. Ralph E. Lapp warning of possible dangers in Apollo 8 mission [see Dec. 14]: "There are perhaps sound reasons involving national prestige for trying to be the first nation to send men into a moon orbit. But surely no such reasons are compelling enough to cut corners on safety. The technical arguments advanced by Dr. Lapp are far too complex to be resolved by laymen. But after the tragic fire that took the lives of three of our Apollo spacemen two years ago it should not be necessary to urge that the National Aeronautics and Space Administration exercise all due prudence--even at the risk of losing the race around the moon." (W News, 12/10/68, 24)
- . Secretary of Defense Clark Clifford announced DOD had completed Project 693, \$3-billion cutback in FY 1969 expenditures required by Revenue and Expenditure Control Act of 1968, including \$85-million reduction in MOL program. (DOD Release 1083-68; SBD, 12/11/68, 176)

1 9 6 8

December 10: Soviet Finance Minister Vasily Garbuzov told semiannual budget meeting of Supreme Soviet in Moscow that nominal U.S.S.R. defense spending in 1969 would increase 6%, from 16.7 billion to 17.7 billion rubles. Institute of Strategic Studies in London had estimated before Aug. 20 invasion of Czechoslovakia that real Soviet military spending for 1968 would be approximately equivalent to \$50 billion. Thus, announced increases would bring total 1969 budget to some \$53 billion, as against \$80 billion for U.S., which had allocated \$30 billion for costs of Vietnam War. However, Soviet figure did not include military R&D and investment in defense industries.

Budget also disclosed continued expansion of government support for scientific research. (Shabad, NYT, 12/11/68, 1; Shub, W Post, 12/11/68, A1)

December 11: President-elect Richard M. Nixon introduced his Cabinet on nationwide TV from Washington, D.C. Among appointments, William P. Rogers, Washington attorney and Eisenhower Administration Attorney General, would serve as Secretary of State; Rep. Melvin R. Laird (R-Wis.), as Secretary of Defense; and Massachusetts Gov. John A. Volpe, as Secretary of Transportation. (Herbers, NYT, 12/12/68)

- . Apollo 8 crew, wearing their spacesuits, participated in final 2 hr 45 min of countdown rehearsal for Dec. 21 launch. Spacecraft had completed four-day rehearsal fully fueled Dec. 10. (AP, B Sun, 12/11/68, A9; UPI, W Star, 12/11/68, C4)
- . NASA was unsuccessful in second Project SHAPE (Supersonic High Altitude Parachute Experiments) attempt at WSMR when parachute was ejected prematurely from five-foot-long canister after three-stage rocket had successfully propelled payload to 33-mi altitude. First test Oct. 23 had been successful. (NASA Release 68-216)
- . Fédération Aéronautique Internationale (FAI) had established Yuri Gagarin gold medal honoring cosmonaut who became first man in space April 12, 1961, during Soviet Vostok I mission, Space Business Daily reported. Medal would be awarded annually to pilot contributing best performance of year in peaceful exploration of space. (SBD, 12/11/68, 178)
- . Cal Tech's Dr. Maarten Schmidt received Rumford Premium, nation's oldest science award for "the most important discovery or useful improvement...on heat and on light" at American Academy of Arts and Sciences dinner in Boston, Mass. Award, established in 1796 by Benjamin Thompson, Count Rumford, consisted of medal and



1 9 6 8

December 11 (continued)

\$5,000. Dr. Schmidt had determined intense radio emission of quasars indicated they were moving away from earth at speeds up to 149,000 mps, or about 80% of speed of light. (AP, W Star, 12/12/68, A2)

December 13: Explorer XXXIX (Air Density Explorer C) and Explorer XL (Injun V), launched as dual payload Aug. 8, were adjudged successful by NASA. Explorer XXXIX balloon had been ejected and fully inflated. Explorer XL had despun, extended booms, and turned on experiments satisfactorily. Malfunction in spacecraft's power subsystem had caused loss of 1/3 of power generated by solar panels, reducing quantity but not affecting quality of data. Satellite would enter full sunlight Sept. 18, 1969, permitting originally planned data acquisition rate. (NASA Proj Off)

- NASA announced agency and DOD had agreed jointly to make computer programs available to industry, educational institutions, scientific and technical organizations, and others through Computer Software Management and Information Center (COSMIC). Established in 1966 under NASA contract at Univ. of Georgia, COSMIC listed some 350 computer programs for sale at fraction of cost. More than 100 DOD programs, with additional NASA programs, would be added during 1969.

Part of NASA Office of Technology Utilization effort to encourage secondary use of aerospace R&D results, COSMIC offered design information for electronic printed-circuit boards and programs for such jobs as inventory control, accounting, data control, stress analysis, equipment checkout, and structural testing. (NASA Release 68-212)

- Cal Tech trustees announced choice of Air Force Secretary, Dr. Harold Brown, to replace Dr. Lee DuBridge, who resigned effective Jan. 20 to become Science Adviser to President-elect Richard M. Nixon. (UPI, W Star, 12/14/68, A3; W Post, 12/15/68, A6)
- Naval Ship Command System had awarded \$13.5-million contract to Todd Shipyards Corp. for first of nine oceanographic ships of radically new design. Prototype would provide USN with its first catamaran-style hull. Diesel-propelled, 246-ft-long ship would be designated GOR-16 (for general ocean research). (NYT, 12/13/68, 86)

1 9 6 8

December 14: NASA's OA0 II, launched Dec. 7, photographed three unnamed stars in Draco Constellation 2,000 light years from earth, near Vega between Big and Little Dippers--to make first ultraviolet photographs of stars. Photos were taken by telescopes of Smithsonian Astrophysical Observatory experiments aboard satellite and used UV radiation which did not penetrate earth's atmosphere. They gave GSFC astronomers enough information to reconstruct fairly detailed images of stars, GSFC spokesman said. (OSSA; UPI, NYT, 12/15/68; SBD, 12/17/68, 208)

- U.S.S.R. launched Cosmos CCLIX from Kapustin Yar into orbit with 1,331-km (827-mi) apogee, 213-km (132.4-mi) perigee, 100.3-min period, and 48.4° inclination. Equipment was functioning normally. (GSFC SSR, 12/15/68, 210; SBD, 12/17/68, 210)
- In Washington Evening Star, John Lanman said deep sea drilling between U.S. and Africa by scientists of Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) had confirmed that sea floor was spreading and pushing Europe and America farther apart. Evidence, brought to surface in samples, or cores, extracted from earth's bottom, showed fluid internal mass of molten rock under ocean was still welling up along mid-Atlantic Ridge. Cores indicated "this newly formed crust must spread slowly aside, like a giant conveyor belt, continuously accumulating sediment...throughout millions of years as it moves," scientists said. (W Star, 12/14/68, A1)
- In New Republic interview, Dr. Ralph E. Lapp, physicist and assistant laboratory director of World War II Manhattan Project, said: "We are pushing our luck, gambling that everything will work perfectly" on Apollo 8 mission. He advised delay in program so that Apollo 9, configured to have relief-capability, would be on pad ready for launch should Apollo 8 "run into trouble." Asked if U.S. could afford to delay Apollo 8, Dr. Lapp said, "The basic factor is not really technical. We are racing the Russians to the moon. A lot of people in NASA and in industry are hoping that a successful Apollo-8 orbiting of the moon--or even circumnavigation--will build up public support for an invigorated manned space program. It's just one of the weighty techno-decisions facing Mr. Nixon. He is committed to funding out the Apollo program--but post-Apollo programs await his decision." (AP, W Star, 12/9/68; W Post, 12/9/68, 3; New Republic, 12/14/68, 16-9)

December 15: NASA successfully launched ESSA VIII (TOS-F), eighth meteorological satellite in ESSA's Tiros Operational Satellite (TOS) system, from WTR by two-stage, Thrust-Augmented, Long-Tank Thor-Delta booster. Primary NASA mission objective was to provide global cloud coverage

December 15 (continued)

on regular, daily basis with six-month nominal and three-month minimum lifetime. Satellite achieved nearly polar, sun-synchronous circular orbit with 902.8-mi (1,493.8-km) apogee, 87.4-mi (1,406.5-km) perigee, 114.6-min period, and 101.9° inclination.

An advanced version of cartwheel configuration, 300-lb ESSA VIII carried two Automatic Picture Transmission (APT) cameras which would photograph earth's cloud cover and immediately transmit pictures to local APT stations in 52 nations. During first 22 orbits spacecraft underwent orientation maneuver to place it in wheel mode and spin rate was adjusted by 0.2 rpm. By Dec. 19 all spacecraft systems had been successfully programmed and excellent pictures had been read out.

ESSA financed and managed TOS system and would operate spacecraft after NASA completed checkout later in month. GSFC was responsible for procurement, launch, and initial checkout of spacecraft in orbit. ESSA VIII was 18th Tiros satellite launched successfully since Tiros I, first weather satellite, April 1, 1960. All from Tiros III on had equaled or exceeded designed operation lifetimes. Most recent ESSA satellite launched was ESSA VII, launched Nov. 10. (NASA Proj Off; ESSA Release ES 68-67; SBD, 12/17/68, 210)

- . Apollo 8 launch crew began lengthy countdown on time at KSC at 7:00 pm EST, for launch scheduled for 7:51 am EST Dec. 21. (W Post, 12/16/68, A12; W Star, 12/16/68, A5; W News, 12/16/68, 3)
- . NASA announced millions of home TV viewers in U.S., Europe, and Japan would see live pictures taken by Apollo 8 crew with cigar-box-size camera similar to that carried on Apollo 7 mission. They would be beamed to earth from spacecraft six times during Apollo 8 mission, including twice while spacecraft was in moon orbit. Manned Space Flight Network stations near Madrid, Spain, and Goldstone, Calif., would convert slow-scan signal into TV picture. Still photos would be taken of TV monitor during live transmission and pictures released in Los Angeles, Madrid, and Canberra. (NASA Release 68-214)
- . Scientific team headed by Nobel Prize winning physicist, Dr. Charles H. Townes, announced discovery of ammonia molecules in direction of Sagittarius toward Milky Way center 30,000 light years away from earth. Finding, made through spectographs at radioastronomy observatory of Univ. of California at Berkeley during studies supported by NASA, Office of Naval Research, and NSF, was significant, team said, because ammonia was considered a "chemical ancestor" of organic compounds and necessary step towards origin of life. Team said discovery "marks the first time that a relatively complex molecular compound has been definitely identified in the vast regions between

December 15 (continued)

the stars." It would spur intensified search for additional combinations of life-essential elements detected in space.

Former MIT provost and inventor of maser, which led to development of laser, Dr. Townes had been named Dec. 3 to head President-elect Richard M. Nixon's task force to make recommendations on space program. Report would be published in Physical Review Letters of American Institute of Physics. (UPI, NYT, 12/16/68, 93; AP, W Post, 12/16/68, A1)

- . In Washington Sunday Star William Hines said NASA announcement of plans for 1974 Mars landing marked revival "of a project that was sacrificed last year on the altar of the great God Apollo whose manned moon program was gobbling up all the funds at NASA's disposal. It also marked the first positive action by NASA in two years directed to starting rather than terminating activities." Its timing, one month after presidential election, seemed "to provide a tantalizing clue to the Nixonian philosophy about space." Hines said it was likely new administration would heed post-Apollo views of National Academy of Sciences, which had recommended more attention to scientific exploration of space with instruments. (W Star, 12/15/68, F4)
- . In Washington Post Thomas O'Toole said poisoning from overexposure to beryllium powder had resulted in 800 known deaths in U.S. during past 15 yr. Beryllium disease expert, Dr. Harriet L. Hardy of Massachusetts General Hospital, estimated total beryllium cases at 2,500, "about three times as many as we've heard about." New uses for lightweight, heat-resistant metal had pushed production to 150,000 lb per year. Battelle Memorial Institute estimated output would grow at 20% rate per year for next five years; NAS estimated 1979 production at six times 1969's. Beryllium was being used by Lockheed for wheel brakes in C-5A transport and heat shields for Poseidon missile. Boeing used it for new Minuteman missile shield. In past three years estimated \$25 million had been spent on beryllium rocket research. O'Toole said at least one scientist claimed test firing in California had so contaminated site that electrician working there developed beryllium poisoning. Neither NASA or USAF planned to abandon testing beryllium rockets, however, and beryllium use had "kicked off a lively debate inside the Federal Government." (W Post, 12/15/68, A1)

December 16: U.S.S.R. launched Cosmos CCLX into orbit with 39,576-km (24,591.3-mi) apogee, 511-km (317.5-mi) perigee, 712.3-min period, and 64.9° inclination. (AP, B Sun, 12/18/68, 10; SBD, 12/18/68, 211; GSFC SSR, 12/31/68)

1 9 6 8

December 16: NASA announced decision to terminate work on two Biosatellites scheduled for 21-day missions beginning in 1971. Contract with General Electric Co. Reentry Systems Div. would be revised to retain only work on two 30-day primate experiment Biosatellites scheduled to begin in 1969. Funding for later missions had been reduced and efficient planning made more difficult. Possibilities for experiments with greater flexibility in early 1970s had been indicated by success of smaller satellites and by studies. (NASA Release 68-215)

- . FRC said two reports--one by Dr. Eldon E. Kordes, NASA Senior Staff Scientist, to American Society of Mechanical Engineers and one by Chief XB-70 Pilot for FRC, Fitzhugh L. Fulton, Jr., to Flight Safety Foundation--indicated XB-70 test program was providing valuable information for operation of large supersonic commercial and military aircraft. Results from XB-70's participation in national sonic boom research program had shown methods used to predict overpressure and extent of boom were generally adequate for aircraft of this size and speed under "standard day" conditions but indicated unusual weather conditions and other factors could affect these predictions. XB-70 program was attempting to define intensity of turbulence at higher altitudes. System to improve stability, lessen turbulence-induced accelerations, and improve passenger riding qualities while lengthening aircraft's fatigue life was being tested.

New methods of presenting flight and engine information to pilot had evolved from XB-70 program, including digital form for more precise readout. Special warning systems prevented exceeding operating limits and attitude indicator with changeable sensitivity for smoother flight control had been evaluated. XB-70 flight had demonstrated need for further research in basic stability and control characteristics of its class of aircraft. Actual cross-country flight experience had been gained with trip from Edwards AFB, Calif., to Carswell AFB, Tex., and return. Both reports emphasized that, although XB-70 was not passenger aircraft, it was similar in size and performance characteristics to proposed SSTs and was only operational aircraft approaching SST size and speed. (FRC Release 28-68)

- . Apollo 8 astronauts were pronounced in perfect health by NASA Director of Medical Operations, Dr. Charles A. Berry, after three-hour physical examination as countdown proceeded toward Dec. 21 launch for moon flight. "The crew is in real fine spirits," he added. (AP, B Sun, 12/17/68; AP, W Star, 12/17/68)

December 16: National Trendex Poll reported public support for space program was 17% higher than in 1967. Tenth poll, sponsored by Thiokol Chemical Corp., was taken Oct. 21-23 after successful Apollo 7 mission and showed 68% of U.S. public favored Apollo program to land man on moon by 1970, 21% did not, and 11% was undecided (in September 1967 poll, Apollo had 51% support, with 33% opposed and 14% undecided). Public desire for increased Government spending on space was at its highest point in five years, with 18% in favor, as against 7% in 1967. Support for program was highest among college-educated, those under 35, and men; 49% favored manned space exploration, versus 25% instrumented program; 60% backed planetary exploration, with 30% opposed. Favored programs after Apollo were: (1) reusable space system, (2) lunar exploration, (3) manned space stations, (4) manned Mars exploration. (SBD, 12/16/68, 197-8)

- . President Johnson proclaimed Dec. 17 Wright Brothers Day, commemorating aircraft flights made by Orville and Wilbur Wright 65 yr earlier: "Their first journey was shorter than the floor of the giant C-5 cargo ship that was test flown earlier this year. But those brief flights... on December 17, 1903, launched the air age. They changed mankind's way of life." (PD, 12/23/68, 1718-9; NYT, 12/17/68, 16)

December 17: In interview Dr. Lee A. DuBridge, science adviser-designate to President-elect Richard M. Nixon, said problem facing Government was not "Shall Government support and use science and technology, but how shall it do it. What are the priorities...." Fundamental to use of science was knowledge; therefore, "one must have in any modern society a very important and extensive free basic research enterprise establishment, largely in universities, so that new areas of knowledge will be explored." Basic research budget of country should increase at least 10% annually for next few years. When it came to using this knowledge, "the Government can, and somebody must, direct, set up the goals."

On space program, Dr. DuBridge said that "the astonishing discoveries" made by launching instruments into space justified further exploration from scientific point of view. When man entered picture as "another piece of the instrumentation that is needed for the exploration," first effect "is that the costs get large.... Apollo landing of a man on the moon is vastly more expensive... than the Surveyor landing.... By the same token, the information returned will be much greater, too. However, as the technology of the spacecraft improves, and our instruments need to get more complex, heavier, or longer lasting, there may very well be a time when putting a man up will actually be cheaper than trying to use automated instruments." (Sullivan, NYT, 12/17/68, 1)

December 17: National Science Board Chairman, Dr. Philip Handler, only nominee to succeed Dr. Frederick Seitz as NAS president in July 1969, said in interview he would urge Federal program of "bloc grants" to U.S. universities in 1969 to support science. Legislation would be introduced in new Congress, with "something like" \$500-million price tag in first year, "just for starters." Universities, "completely dependent upon science project grants," had had funds for individual projects cut off leaving "numerous employees for whom they have no salaries." He advocated "Federal cushion" in form of bloc or institutional grants to supplement individual project support. "I would even support bloc grants for all graduate education, not just in science. (Cohn, W Post, 12/18/68, A32)

- . Arms Control and Disarmament Agency Director William C. Foster had submitted resignation to President Johnson effective Dec. 31, ACDA aides said. (Gwertzman, NYT, 12/18/68, 5; W Post, 12/19/68, A21)
- . At Washington, D.C., ceremony, Adm. Thomas H. Moorer, Chief of Naval Operation, USN., presented Distinguished Service Medal to Astronaut Walter M. Schirra, Jr., for space deeds "exceeded by no one afloat or airborne." (AP, W Star, 12/18/68, B2; W Post, 12/18/68, A3)
- . DOD announced USN had selected Grumman Aircraft Engineering Corp. and McDonnell Douglas Corp. to continue in contract definition phase for F-14A aircraft, formerly called VFX-1. Selection of contractor was scheduled for January 1969. (DOD Release 1109-68; WSJ, 12/18/68; UPI, W Star, 12/18/68, A6)

December 18: NASA announced appointment of William C. Schneider, Apollo Mission Director, as Director of Apollo Applications, succeeding late Harold T. Luskin, who died Nov. 25. George H. Hage, Deputy Director of Apollo Program, would be Acting Apollo Mission Director in addition to his present duties. (NASA Release 68-217)

- . Apollo 8 astronauts heading for moon would be "in far less hazardous position" than they would have been as crew for Columbus, NASA Director of Manned Space Flight Safety Jerome F. Lederer said in speech before Wings Club in New York. "Columbus did not know where he was going, how far it was, nor where he had been after his return. With Apollo, there is no such lack of information." Nevertheless, mission would "involve risks of great magnitude and probably risks that have not been foreseen.

"Apollo 8 has 5,600,000 parts and one and a half million systems, subsystems and assemblies. Even if all functioned with 99.9 per cent

December 18 (continued)

reliability, we could expect 5,600 defects. Hence, the striving for perfection and the use of redundancy." (Text; NYT, 12/19/68, 56)

- . Aerospace sales reached record high of \$30.1 billion in 1968, an increase of almost \$3 billion over 1967, Aerospace Industries Assn. President Karl G. Harr, Jr., told Washington, D.C., meeting of Aviation/Space Writers Assn. Commercial aerospace sales increased 39%, to record \$6.4 billion; aerospace exports rose 32%, to \$3 billion.

Military space programs in 1968 rose 3%, from \$1.088 billion in 1967 to \$1.121 billion, reported AIA's "1968 Aerospace Industry Review and Forecast," which Harr also released. Nonmilitary space sales declined 3.7%, from \$4.202 billion in 1967 to \$4.047 billion in 1968. Sales of products and services for use of aerospace technology in nonaerospace areas--such as marine science, water desalination, crime control, and rapid transit--increased from \$2.579 billion to \$2.726 billion.

Harr predicted slight decline in total aerospace sales to about \$29.6 billion during 1969 because of 25% drop in jet transport sales before deliveries of new high-capacity aircraft; continuing increase in helicopter, executive, and utility aircraft sales; modest increase in defense and nonaerospace sales; and decline in civil space sales. He noted that in third quarter of 1968 backlog of U.S. Government aerospace orders was less than that of other customers for first time since before World War II. (Text; AIA Release 68-60; W Star, 12/19/68, A19)

- . USAF permitted 11 newspapermen to fly simulated combat missions in F-111A from Nellis AFB, Nev., to demonstrate aircraft's systems. In Washington Post, George C. Wilson said decision to allow newsmen in cockpits of controversial plane for first time evidenced USAF's conviction "that the F-111 program is at a crucial juncture as the Nixon Administration gets ready to take office." (W Post, 12/19/68, A8)
- . Dr. Anatoli A. Logunov, Director of Institute of High Energy Physics near Serpukhov, 60 mi south of Moscow, said in Izvestia that Institute's 1,000-yd-dia, 70-bev, proton accelerator had joined scientists elsewhere in search for quark. Quark was hypothetical particle thought to be elementary building block of all matter and to carry electrical charge one third to two thirds that of electron charge. (NYT, 12/20/68, 3)



December 18: American Institute of Aeronautics and Astronautics announced Dr. Charles P. Sonnett, Chief of Ames Research Center's Space Science Div., would receive Space Science Award, including \$500 honorarium, "for his personal contribution as planner, leader and individual experimenter in major space science vehicle programs which have contributed to the field of space physics." He had worked in magnetospheric physics and nuclear physics and was currently concentrating on interplanetary physics. He had been principal investigator on several NASA experiments and ALSEP. Award would be presented at AIAA 7th Aerospace Science Meeting in New York Jan. 20-22, 1969.

Dr. Stanley G. Hooker, Technical Director of Bristol Engine Div., Rolls-Royce Ltd., and Perry W. Pratt, Vice President and Chief Scientist of United Aircraft Corp. had been selected to share \$10,000 Goddard Award for their separate work in developing gas turbine engines. Goddard Award, named for late rocket pioneer Robert H. Goddard, was awarded annually to "a person who has made a brilliant discovery or a series of outstanding contributions over a period of time, in the engineering science of propulsion or energy conversion."

Prof. Rene H. Miller, head of MIT Dept. of Aeronautics and Astronautics, would be given Sylvanus Albert Reed Award for "outstanding contributions" to rotary-wing aircraft. Dr. Robert D. Fletcher, USAF Air Weather Service's Deputy Chief of Staff for Aerospace Sciences, would receive Robert M. Losey Award for "outstanding and dedicated leadership and service" for 30 yr to aeronautical meteorology. (AIAA Release; NASA Biog, 11/29/68; NYT, 12/31/68, 52)

December 18-20: INTELSAT-III F-2 was successfully launched by NASA for ComSatCorp on behalf of International Communications Satellite Consortium. Launch was from ETR by three-stage, Thrust-Augmented, Long-Tank Delta booster. The 632-lb cylindrical satellite entered elliptical transfer orbit with 22,580-mi (36,355.1-km) apogee, 161.9-mi (260.5-km) perigee, 642.9-min period, and 28.8° inclination. All systems were functioning normally. On Dec. 20 apogee motor was fired to kick satellite into planned near-synchronous orbit over Atlantic at 51° west longitude with 22,328.2-mi (35,933.8-km) apogee, 21,833.4-mi (33,137.5-km) perigee, 0.79° inclination, and 3.25° per day eastward orbital drift.

INTELSAT-III F-2, first successful launch in INTELSAT III series, was backup to INTELSAT-III F-1 (INTELSAT III-A) which had been destroyed minutes after launch Sept. 18 when launch vehicle began to break up. Satellite was scheduled to begin commercial service Jan. 2, 1969 [see Dec. 28], handling up to 1,200 voice circuits or four TV channels. By Jan. 29, 1969, all Atlantic area service except NASA Apollo traffic would be transferred to INTELSAT-III F-2 from other Atlantic comsats,

December 18-20 (continued)

INTELSAT I (Early Bird) and INTELSAT-II F-3 (Atlantic II). Etam, W. Va., earth station would become prime East Coast terminal and Andover, Me., station would be removed from service preparatory to its use as prime terminal for INTELSAT-III F-4. NASA Apollo communications would be maintained through INTELSAT-II F-3 with 42-ft terminal antenna at Andover. (NASA Proj Off; ComSatCorp Release 68-69; Stevens, NYT, 12/19/68, 1; AP, W Post, 12/19/68, A3)

December 19: Cosmos CCLXI was launched by U.S.S.R. into orbit with 637-km (396.8-mi) apogee, 206-km (128-mi) perigee, 92.9-min period, and 71° inclination. (GSFC SSR, 12/31/68)

- . NASA issued Management Instruction establishing Committee on Extra-Vehicular Activities (EVA), activities performed in space by astronaut outside space vehicle. Seven-member committee, serving for two-year period, would provide Deputy Associate Administrator for Manned Space Flight with recommendations on overall NASA EVA planning and development by: identifying EVA capabilities which must be defined and developed to support manned space flight activities; identifying ground-based, orbital, and lunar surface experiments to establish required EVA capabilities; providing recommendations on short- and long-term EVA program plans; reviewing proposed EVA flight experiments and making recommendations; and maintaining awareness of EVA-related activities of organizations other than NASA. (NMI 1152.36)
- . NASA announced renewal through August 1970 of 10-yr contract with NAS which provided one-year appointments for post-doctoral and senior post-doctoral scientists and engineers specializing in space-related work to conduct research at NASA field centers. NASA would pay NAS \$2,390,500 to carry out program. (NASA Release 68-218)
- . AEC announced it had conducted underground nuclear test of about one-megaton yield at Nevada Test Site. It was similar to April 26 test. Tests had been described in press as largest continental explosions announced by AEC. Newsmen were permitted to witness test for first time in 10 yr. Among factions protesting underground testing was Howard Hughes spokesman who said Hughes would continue to sponsor independent studies on advisability of continuation of testing [see Dec. 6]. (AEC PIO; AEC Release L-288; Wilson, W Post, 12/20/68, A3; Hill, NYT, 12/20/68, 1; 12/25/68; AP, NYT, 12/18/68, 35)

December 19: U.N. General Assembly, by vote of 96-0, approved plans for permanent body of 42 members to study means of reserving seabed for peaceful purposes and of exploring resources beyond national jurisdiction. Members would serve six-year terms, with one-third of membership changing every two years. (Estabrook, W Post, 12/20/68, A12)

December 20: NASA announced completion of X-15 flight research program. On final flight Oct. 24--199th in series which began June 8, 1969-- NASA test pilot William H. Dana flew rocket-powered aircraft to 255,000-ft altitude. Attempt at 200th flight Dec. 20 was canceled because of adverse weather conditions.

In NASA-USAF-USN program initiated in 1954, flights by three X-15 aircraft manufactured by North American Rockwell Corp. had included more than 82 min of flight at speeds exceeding mach 5 and total flight time of more than 30 hr. Peak altitude reached was 354,200 ft (67.04 mi) and top speed was 4,520 mph (mach 6.7)--speeds and altitudes never before attained by any vehicle fully controlled by pilot from launch to landing. It had set two official world altitude records of 246,740 ft and 314,750 ft previously. X-15 flight program provided knowledge applicable to design and development of future spacecraft and commercial supersonic aircraft and data on aerodynamic heating in high-speed flight, which could cause deterioration of aircraft structural integrity. X-15 remained only aircraft capable of studying phenomena at hypersonic speeds, space-equivalent flight, and reentry flight.

It also had served as test bed for new components and subsystems, subjecting them to hypersonic flight environment. In 1962 four X-15 pilots received Robert J. Collier Trophy from President Kennedy for "the greatest achievement in aeronautics or astronautics in America, with respect to improving the performance, safety, or efficiency of air and space vehicles." (NASA Release 68-221; NASA SP-60; NASA EP-9; AP, NYT, 12/21/68, 73; SBD, 12/23/68, 236)

- . Workmen loading super-cold oxygen into Apollo 8 service module discovered gas had been contaminated, apparently by nitrogen used to flush tanks. Oxygen would be changed and tanks reflushed and launch was expected to take place on schedule. (Lannan, W Star, 12/20/68, A5)
- . National Science Foundation announced it had provided support permitting more than 5,800 secondary school students to receive special training in science and mathematics in summer 1969 or in 1969-70 academic year through 112 training projects. Grants totaled \$1,815,874. (NSF Release 68-180)

1 9 6 8

December 20: Dr. Robert H. Guest, professor of organizational behavior in Amos Tuck School of Business Administration, Dartmouth College, was sworn in as consultant by Dr. Thomas O. Paine, Acting NASA Administrator. Dr. Guest would serve on Management Advisory Panel. (NASA Release 68-220)

December 21: President Johnson sent congratulatory message to Apollo 8 astronauts: "I am confident that the world's finest equipment will strive to match the courage of our astronauts. If it does that, a successful mission is assured." (PD, 12/30/68, 1738)

December 21-27: NASA's Apollo 8 (AS-503), second manned mission in Apollo lunar landing program and first manned mission to orbit moon, was successfully launched from KSC Launch Complex 39 at 7:51 am EST by Saturn V booster. Primary objectives were to demonstrate crew, space vehicle, and mission support performance during manned Saturn V mission with command and service module (CSM) and to demonstrate performance of nominal and selected backup lunar orbit rendezvous (LOR) mission activities--including translunar injection; CSM navigation, communications, and midcourse corrections; and CSM consumables assessment and passive thermal control. All launch events occurred as planned and spacecraft, carrying Astronauts Frank Borman (commander), James A. Lovell, Jr. (CM pilot), and William A. Anders (LM pilot), entered initial orbit with 118.4-mi (190.6-km) apogee, 113.8-mi (183.2-km) perigee, 32.51° inclination, and 88.2-min period.

At 10:42 am EST 3rd stage burned for second time, injecting spacecraft into lunar trajectory, and astronauts began journey to become first men to leave earth's gravitational field. Stage and instrument unit separated as planned and service module propulsion system was fired to increase separation distance from 3rd stage, which was trailing 500-1,000 ft behind spacecraft, spewing unused propellants. Crew fired service propulsion system (SPS) engine for 2.4 sec, correcting trajectory and increasing velocity by 25 fps.

Second midcourse maneuver, scheduled for second day, was canceled because trajectory was already so accurate that burn would have required velocity change of only 0.7 fps. Borman reported illness, apparently from 24-hr intestinal virus or from reaction to sleeping pills being used during space flight for first time, and Lovell and Anders reported nausea. Crew took navigation sightings and conducted first TV transmission, showing spacecraft interior and earth from 138,690-mi altitude and demonstrating food preparation and movements in weightlessness. Signals were received at ground stations and transmitted to NASA

December 21-27 (continued)

Mission Control Center in Houston before release live to commercial networks.

Second TV transmission, on third day, showed excellent pictures of earth from 201,365-mi altitude, including view of western hemisphere in sunlight. Crew pointed out North Pole, South America, Cape Horn, and Baja, Calif., and noted that U.S. East Coast was very cloudy. Earth, they said, was beautiful; water looked royal blue, land areas brown, and clouds bright white. Reflection off earth was much greater than off moon. SM reaction control system's four rockets were fired for 12 sec to reduce velocity by 2 fps and to make approach to moon closer to 60 mi at nearest point.

On fourth day, Christmas Eve, communications were interrupted as Apollo 8 passed behind moon and astronauts became first men to see moon's far side. SPS engine was fired for 4 min 2 sec, reducing speed by 2,994 fps and placing spacecraft in lunar orbit with 193.6-mi (310.6-km) apolune and 69.1-mi (111.2-km) perilune. In third TV telecast Anders described lunar surface as "whitish gray, like dirty beach sand with lots of footprints on it. Some of these craters look like pick-axes striking concrete, creating a lot of fine dust." After spacecraft passed behind moon at end of second revolution, SPS engine burned for 10 sec to reduce speed by 135 fps and to circularize orbit with 70.0-mi (112.6-km) apolune and 69.6-mi (112.0-km) perilune. Lovell said astronauts had "a grand view" of the lunar surface and confirmed that prospective landing sites were satisfactory. He reported that at about two minutes before sunrise a fan-shaped white haze appeared just behind moon's limb. Crew continued landmark sightings and named numerous unnamed lunar features after other astronauts, NASA officials, and friends. They conducted communications experiment which showed that radio signal from earth to Apollo 8 and back to earth took three seconds to make 460,000-mi round trip. Third TV transmission during ninth revolution showed heavily impacted mountains described by Anders as "a vastness of black and white, absolutely no color. The sky up here is also rather forbidding, forboding extents of blackness with no stars visible when we're flying over the moon in daylight. You can see by the numerous craters that this planet has been bombarded through the eons with numerous small asteroids and meteoroids, pock-marking the surface of every square inch. And one of the amazing features of the surface is...that most of the craters...have a round mound type of appearance instead of sharp jagged rocks. All, only the newest of features have any sharp definitions to them, and eventually they get eroded down by the constant bombardment of small meteoroids." The moon is "a very dark and unappetizing place...." Crew read verses from first chapter of Genesis and wished viewers a Merry Christmas.

1 9 6 8

December 21-27 (continued)

On fifth day, while spacecraft was behind moon completing its 10th revolution, SPS engine was fired for 3 min 23 sec, increasing spacecraft velocity by 3,523 fps and propelling Apollo 8 back toward earth. Spacecraft left lunar gravity at 201,807 mi above earth. At 10<sup>4</sup> hours mission elapsed time 14-sec reaction-control-system burn increased velocity by 5 fps. Fifth TV transmission showed spacecraft interior, controls, and food preparation. Data analysis revealed sixth midcourse correction would not be necessary because of accuracy of course. Astronauts reported they had slept well and were in "very good shape." Sixth TV transmission showed earth from 112,125-mi altitude.

On sixth day crew prepared for reentry and SM separated from CM on schedule. Parachute deployment and other reentry events were nominal and Apollo 8 splashed, apex down, in Pacific about 5,100 yd from recovery ship U.S.S. Yorktown at 10:51 am EST Dec. 27, 147 hr after launch and precisely on time. According to prior planning, helicopters and aircraft hovered over spacecraft and pararescue personnel were not deployed until local sunrise, 50 min after splashdown. Crew was then picked up and reached recovery ship at 12:20 pm EST.

All primary Apollo 8 mission objectives and detailed test objectives were achieved and, in addition, five not originally planned. All launch vehicle and spacecraft systems performed according to plan. Engineering accomplishments included use of ground network with on-board navigational techniques to sharpen accuracy of lunar orbit determination and successful use of Apollo high-gain antenna, four-dish unified S-band antenna that deployed from SM after separation from 3rd stage. Mission proved capability of Apollo CSM and crew, as well as ground support and control systems, to operate out to lunar distances and return through the earth's atmosphere at lunar velocity.

Apollo 8 was fifth Apollo mission to date, second manned Apollo mission, first manned mission on Saturn V launch vehicle, and first manned operation of Apollo system under conditions for which it was designed. Earlier unmanned Apollo flights had yielded all spacecraft information possible without crew on board. Apollo 4 (launched Nov. 9, 1967) and Apollo 5 (launched Jan. 22, 1968) had both been highly successful, completing inflight tests of all major pieces of Apollo hardware. Apollo 6 (launched April 4), despite launch vehicle problems, had attained four of five primary objectives with the spacecraft recovered in excellent condition. First manned Apollo mission, Apollo 7 Oct. 11-22, had achieved all primary objectives and had verified operation of spacecraft for lunar-mission duration. Apollo program was directed by NASA Office of Manned Space Flight; MSC was responsible for Apollo spacecraft development, MSFC for Saturn V launch vehicle, and KSC for launch operations. Tracking and data

December 21-27 (continued)

acquisition was managed by GSFC under overall direction of NASA Office of Tracking and Data Acquisition. (NASA Proj Off; NASA Release 68-208; NASA Special Releases; Lannan, W Star, 12/21/68, A1; 12/22/68, A1; 12/24/68, A1; 12/25/68, A1; 12/27/68, A1; Cohn, W Post, 12/23/68, A1; O'Toole, W Post, 12/22/68, A1; 12/28/68, A1; Stevens, NYT, 12/23/68, 27; Lyons, NYT, 12/23/68, 26; 12/25/68, 36; 12/28/68, 1; Wilford, NYT, 12/23/68, 1; 12/25/68, 1; 12/26/68, 1; 12/27/68, 1; 12/28/68, 1; Sehlstedt, B Sun, 12/23/68, A1; 12/24/68, A1; 12/26/68, A1; 12/28/68, A1; SBD, 12/26/68, 239; 12/27/68, 245; MSC Roundup, 1/10/69, 3)

December 21-28: Apollo 8 editorial comment:

New York Times: "Space contains more than enough opportunity for fruitful application of the energies that all mankind can devote to its exploration, development and eventual settlement. There is no need here for wasteful rivalry deriving from earthbound nationalistic and political ambitions. In the face of the most breathtaking challenge humanity has ever faced, the only rational response is cooperation to make space an arena of unity and international brotherhood. Man's hopes and prayers ride with the pre-Christmas voyagers. After them must come ships bearing the United Nations flag, each carrying men of different citizenship, language, political and religious convictions and color." (NYT, 12/22/68, E10)

New York Times: "...the drama and interest of yesterday's view of earth from space transcended any prosaic considerations of practical utility. Rather the excitement these pictures aroused among millions of stay-at-homes flowed from the visual evidence they provided of man's successful entrance into a completely new realm, one which poses challenges, opportunities and dangers such as the human species has never before faced. And yesterday's pictures provided a sobering perspective on man's puny earthly works and rivalries, reminding all humanity that nature is the basic antagonist, not other men." (NYT, 12/24/68, 22)

New York Times: "The space age, no doubt, will produce many future heroes and many other historic accomplishments, but even now it is plain that yesterday Astronauts Borman, Lovell and Anders assured themselves of immortality as the first men literally to break the shackles of earth and travel successfully to another destination in this suddenly shrunken solar system." (NYT, 12/25/68, 30)

December 21-28 (continued)

Washington Post: "Above all, perhaps, this Christmas Eve at the moon and Christmas Day on the way home have told us more about our earth than about the moon. One of the astronauts had wondered on his way to the moon whether, if he were a traveller from another planet, he would think that intelligent life existed on Earth. The answer, from Captain Lovell at least, is that our planet is 'a grand oasis in the great vastness of space.' That is an awing insight and it reminds us that man has far to go here at home to fulfill the Christmas promise of Peace on Earth, Good Will toward Men." (W Post, 12/26/68, A20)

Washington Sunday Star: "The essential thing that man has gained as a result of Apollo 8 is a new vision of himself. There is no revelation, it is true, in the knowledge that the earth is a small planet, a speck of dust in the vastness of space. That is an intellectual concept that man has accepted, or tried to accept, since Galileo glimpsed infinity more than 300 years ago. But never before has the earth seemed so fragile--or so precious--as it looked from the edge of that boundless night." (W Star, 12/29/68, C1)

. International comment on Apollo 8 mission:

In statement distributed by Soviet Embassy in Washington, D.C., Boris Petrov, Chairman of Council for International Cooperation in Investigation and Utilization of Outer Space, U.S.S.R. Academy of Sciences, hailed "hardware" and "courage" of Apollo 8 astronauts but called attention to "considerable accent" placed on "automatic devices" in Soviet space program. He said, "The Soviet Union is engaged in a large-scale program of planned studies and exploration of outer space, which provides for the investigation of the earth's upper atmosphere and of near-earth outer space and studies of sun-earth relationships and of our closest space neighbors--the moon, venus and mars, and later, on more remote planets."

Cuban National radio: called mission "a total success."

Tass: "Due tribute should be paid to the courage and mastery of Frank Borman, William Anders and James Lovell who have accomplished this outstanding scientific and technical experiment. The successful flight of Apollo 8 ushers in a new stage in the history of space exploration." Ten Soviet cosmonauts telegraphed Apollo crew congratulations for "another milestone in scientific and technical progress."

Pope Paul VI, in message to President Johnson: "Giving thanks to God for the successful completion of the magnificent enterprise of the Apollo 8 mission, we congratulate you and the people of the United States of America and particularly the intrepid space travelers, and invoke divine blessing upon all contributing to this noble achievement."



1 9 6 8

December 21-28 (continued)

U.N. Secretary General U Thant: "The powerful thrust of the rocket engines, the awesome speeds attained in flight, the vast distances traveled, the precision of navigation and the fidelity of communications, aural and visual, all stagger the imagination and defy the comprehension of man."

Emperor Haile Selassie of Ethiopia: "a great milestone in man's continued search of the unknown."

Gov. Gen. Roland Michener of Canada, in message to President Johnson: Canadians had followed astronauts' flight with "admiration for their courage and the technical skill of all who have a part in the enterprise."

Prime Minister Eisaku Sato of Japan to President Johnson: feat showed America's "courage and the high level of scientific technology."

The Economist: "What did they think, those three men of Apollo 8 who risked their lives and their sanity to fly to the moon only to report that it looked like grey plaster of paris? What should we earthbound ones think? In New York City, there are at least 2,000 people who would rather have watched a football game and were sufficiently incensed to telephone the television networks and tell them so. The blame is not the astronauts'. A whole series of photographs, some taken from instruments actually on the moon's surface, some in black-and-white, some in colour, had already warned them what to expect. The buck lies on the desks of the men who for the past 13 years have directed the United States' \$32 billion space programme, and spent 70% of it on getting men into space without planning anything constructive for them to do when they got there.... The cost of a manned moonshot is put at around \$1 billion, and for that sum you could get a whole programme of unmanned moon launches.... But man does not live by science alone. ...the greatest achievements of men in space have so far been in the realm of the human spirit.... Apollo 8 is part of the unceasing restlessness, invention and ambition of our kind. Have we really any reason to believe that man's evolution has come to a stop after a bare half million years on earth?... It requires arrogance, a closed mind and absolutely no sense of history...to say that sending men into space is an utter waste of time."

Neither Peking Radio nor New China News Agency covered Apollo 8 mission. (UPI, C Trib, 12/26/68, 4; B Sun, 12/28/68, A1; Economist, 12/28/68, 11-12; UPI, N Va Sun, 12/28/68, 1)

1 9 6 8

December 22: New York Academy of Science investigative committee of 22 members directed "preliminary report" to President Johnson, President-elect Richard M. Nixon, and Congress on intensifying crisis in U.S. science and education which they said stemmed from cuts in Federal Government support. Investigation covering 84 academic institutions and work of 193 research scientists had shown "potential solutions of such problems as poverty, racial discrimination, population control, air and water pollution, cancer and cardiovascular disease, mental illness, mass transportation, housing and education are not being pursued because of lack of continuing support." Committee recommended diverting Federal science funds earmarked for buildings and other capital equipment to use on research programs and in training scientific manpower to "preclude a serious shortage in the near future, a crippling one within five years." (UPI, W Post, 12/23/68, A20)

December 24: INTELSAT-III F-2 began carrying segment of coverage of Apollo 8 to Europe. It transmitted moon pictures from capsule and relayed TV coverage of Pacific splashdown to Europe and Puerto Rico. INTELSAT II satellites over Atlantic and Pacific each reserved about 100 voice circuits for NASA support communications with Apollo 8. ATS II and III augmented commercial communications coverage and transmitted limited number of weather photos. (OSSA; NASA Release 69-6)

- . FAA announced report, Friction Effects of Runway Grooves, Runway 18-36 Washington National Airport [AD 678 645 (DS 68-21)], result of nine-month test series at Washington National Airport, indicated runway grooving, designed to prevent hydroplaning by increasing drainage of water, might also enhance braking effectiveness of aircraft on wet runways [see Nov. 17]. (FAA Release T 68-48)
- . Soviet Union announced through Tass successful completion of experiment in which three researchers spent from Nov. 5, 1967, to Nov. 5, 1968, in isolated chamber consisting of living compartment and greenhouse linked to outside world by videotelephone. Purpose of experiment was to test man's ability to live in isolation for year, using water and oxygen regenerated from waste products and dehydrated food supplemented by greenhouse-grown vegetables; study effects of various factors on human organism and establish optimum conditions for long isolation; and evaluate effectiveness of self-contained life-support systems based on regeneration of waste products. Daily requirements of astronauts on long voyage included 700 g of food, 2.4 kg of drinking water plus 5.5 kg of water for other

December 24 (continued)

purposes, and 800 g of oxygen, amounting to 11 tons of supplies for one-year space voyage. Report said there were no significant changes in body weight and temperature of experimenters except one lost eight to nine pounds before his weight stabilized in five to six months. Electrocardiogram remained unchanged and no dehydration was observed. Pulse and respiration rates had fluctuated before assuming lower level than at start of experiment. Researchers Gherman A. Manovtsev, Andrey N. Bozhko, and Boris N. Ulybshev were reported in good health at conclusion of experiment. (Shabad, NYT, 12/25/68, 38)

December 26: U.S.S.R. launched Cosmos CCLXII from Kapustin Yar into orbit with 791-km (491.5-mi) apogee, 264-km (164-mi) perigee, 95.2-min period, and 48.4° inclination. Equipment was functioning normally. (SBD, 12/30/68, 257; GSFC SSR, 12/31/68)

- President Johnson appointed four new members to President's Committee on the National Medal of Science: Dr. Ernest R. Hilgard, Stanford Univ.; Dr. Edwin Land, president of Polaroid Corp.; Dr. Charles P. Slichter, Univ. of Illinois; and Dr. Richard B. Turner, Rice Univ. Terms would expire Dec. 31, 1971. Dr. Max Stone Peters of Univ. of Colorado was named Committee chairman for 1969, succeeding Dr. Bryce Crawford of Univ. of Minnesota. (PD, 12/30/68, 1742; NYT, 12/27/68, 4)
- In Washington Post columnist Joseph Kraft said post-Apollo programs had been sharply cut in Congress and space spending had been compared unfavorably with money for pressing internal needs. "In this situation, it makes sense for this country to disengage while it is ahead. There is no need for the United States to race Russia to every new milestone in space. On the contrary, what the United States wants is a program closely connected to explicit American requirements--a program of exploration for its own sake, not for the sake of beating the Russians. In that way, this country can continue to develop a capability in space, without having to respond in a panic to the ups and downs that are necessary part of the space business." (W Post, 12/26/68)
- Apollo 8 lunar flight was voted top news story of 1968 in Dec. 24 repolling of editors of Associated Press member newspapers, radio, and TV stations. Previous poll, completed before Dec. 21-27 mission, had selected assassinations of Sen. Robert F. Kennedy and Rev. Martin Luther King as No. 1 and No. 2 stories of year. (W Star, 12/26/68, A8)

1 9 6 8

December 26-31: At 135th meeting of American Assn. for the Advancement of Science in Dallas, Tex., John M. Logsdon, assistant professor of international relations at Catholic Univ. of America, said former President Dwight D. Eisenhower had planned to scrap manned space flights after Project Mercury but his successor, President John F. Kennedy, had decided to try to send men to the moon because of "America's competitive and expansive spirit."

Outgoing Presidential Science Adviser, Dr. Donald F. Hornig recommended reexamination of concept of Federal Department of Science since science "has now assumed such importance to the nation that its position would be stronger if it had a voice in the Cabinet." He advocated annual report on state of science similar to annual economic report and said Office of Science and Technology "could eventually evolve in an office of planning and analysis, looking broadly at national problems with some scientific or technological component, but extending well beyond the purely technical areas." Under questioning, Dr. Hornig said he agreed with Dr. J. Herbert Hollomon, President of Univ. of Oklahoma and former Assistant Secretary of Commerce, that Federal Dept. of Science, with National Science Foundation as its core, might encompass oceanographic agencies, high energy physics research currently funded by AEC, ESSA, Bureau of Census and Labor Statistics, geophysics branches of Geological Survey, and some NIH programs. Dr. Hollomon also suggested NASA be added when it could be included "without having it become the tail that wags the dog." Dr. Hornig insisted no massive "science agency" should be created to usurp supervision of Nation's science effort.

Cornell Univ. map expert, Prof. Arthur J. McNair, said sophisticated photographic mapping by satellites at 140-mi altitude would provide faster, cheaper, broader, and more detailed coverage than now possible by airplane mapping. Single map-making satellite photo, he said, would be equivalent to 1,000 photos taken by aircraft. U.S. could be fully and adequately mapped in one year from photos from satellite in near-polar orbit for four weeks. Another 11 mo would be needed for data processing. U.S. had already spent 125 yr in inadequate mapping.

Dr. Robert H. Hardie of Vanderbilt Univ. said planet Pluto had appeared to be dimming for past 10 yr. It was moving around in 248-yr orbital period to point where it reflected little sunlight. Its surface temperature had dropped two degrees as result. He speculated that planet froze into mass of stone and solid nitrogen as temperatures reached  $-250^{\circ}$  C when facing away from sun. When bathed in sunlight, planet warmed to  $-200^{\circ}$  C and formed reflecting puddles which astronomers saw as variations in light intensity. (Text; UPI, W Post, 12/28/68, A9; Lannan, W Star, 12/30/68, A3; AP, W Post, 12/30/68, A6; W Star, 12/30/68, A3)

1 9 6 8

December 27: At White House press conference President Johnson discussed Apollo 8's effect on U.S. position in space race: "We are very pleased with the progress we have made.... Each side has different examples of its achievements. But in the 10 to 11 years since Sputnik I...when we didn't even have a space committee in the Congress, when we were talking about the basketball up there in the air, when we have weathered the storms that have brewed--everyone who wanted to cut anything, the first thing they wanted to cut was the space program--when we have seen the editorial professors inform us that there was really no value in doing all of this anyway, it gives me great pleasure now to see the thrill that even they are getting out of it."

President described anxiety about such a complex mission and said he had repeatedly asked himself whether U.S. was ready, whether date selected was best one, whether every possible precaution had been taken, and whether every man had performed his requirements. "About all you can do...is to pick men that you have confidence in, that you trust, give them the support they need, and then hold on." Remembering he had "recommended this goal for this decade" to President Kennedy, he said: "There have been many pitfalls every step of the way. I don't know how many folks have just wanted to abandon it, clip it, cut it, take the money for the cities or the war or just anything else. Space has been a whipping boy.

"So when you see the day approaching when visions, and dreams, and what we said to the Congress when we created the Space Administration back in 1958 are becoming reality, you naturally are hopeful."

Later, in telephone message to Apollo 8 astronauts President congratulated crew and said: "You have made us very proud to be alive at this particular moment in history. You have made us feel akin to those Europeans nearly five centuries ago who heard stories of the New World for the first time. There is just no other comparison that we can make that is equal to what you have done or to what we feel.... My thoughts this morning went back to more than 10 years ago...when we saw Sputnik racing through the skies, and we realized that America had a big job ahead of it.

"It gave me so much pleasure to know that you men have done a large part of that job." (PD, 12/30/69, 1744-50)

- Apollo 7 mission (Oct. 11-22) was adjudged successful by NASA. All launch vehicle systems performed satisfactorily throughout expected lifetime and spacecraft systems functioned with few minor anomalies, which were countered, preventing loss of systems support. Splashdown occurred within one mile of guidance system target point and recovery of flight crew and CM was successful. All test objectives had been successfully accomplished. (NASA Proj Off)

1 9 6 8

December 27: Apollo 6 (launched April 4) was adjudged unsuccessful by NASA. Although three of five primary mission objectives had been fully accomplished and two partially accomplished, overall mission was not a success. Apollo 6 had entered elliptical parking orbit instead of planned circular orbit when 2nd stage engines shut down prematurely and 3rd stage failed to reignite on command. (NASA Proj Off)

- . NASA announced it would convert to civil service operation during next 18 mo work performed in 810 contractor positions at GSFC, to bring Center's operations into accord with Civil Service Commission guidelines prohibiting Government supervision of contractor employees. Many incumbent contractor employees would be offered Government positions and only small portion of contractors' activities would be affected in many cases. Conversion would be completed by June 1970 and NASA would continue to rely on industry to considerable extent for support services. (NASA Release 68-223)
- . MSFC announced it had issued Boeing Co. \$8,429,047 supplemental agreement extending from October 1968 to March 1970 maintenance and operation of Saturn V development facility at MSFC and providing for mechanical ground support equipment and logistics work. (MSFC Release 68-283)
- . NASA announced award by LeRC of \$3,448,762 cost-plus-award-fee contract to Honeywell, Inc., for Centaur launch vehicle guidance system including management, engineering, repair, and modification support during 1969. (NASA Release 68-222)
- . In Science Dr. J. C. G. Walker, Yale Univ. geologist and geophysicist, and N. W. Spencer, Chief of GSFC's Laboratory for Atmospheric and Biological Sciences, said thermosphere probe experiments had provided largest body of rocket mass-spectrometer data obtained. Tests had been conducted jointly by scientists at GSFC and Space Physics Research Lab. at Univ. of Michigan to determine temperatures of earth's upper atmosphere. Since 1962, concentration and temperature of molecular nitrogen in upper atmosphere had been measured in 22 successful flights under varying conditions of solar activity, from launch sites at Fort Churchill, Manitoba, Wallops Island, Va., and Vega Baja, Puerto Rico. Scientists had concluded that upper atmosphere consisted of mixture of gases--electrons, ions, and neutral particles--each of which had distinct temperature. Multiplicity of temperatures could be expected in upper atmosphere of planets, though differences between planetary atmospheres must be more striking than similarities

December 27 (continued)

- because of differences in atmospheric composition and in distance from sun. It was likely that absence of permanent magnetic field on either Mars or Venus caused further substantial differences between upper atmospheres of these planets and the upper atmosphere of earth. (Science, 12/27/68, 1437-41)
- . Washington Post said Harvard Univ. scientist Dr. George B. Kistiakowsky, who in 1959 was chief science adviser to President Eisenhower, had said in taped interview for broadcast on CBS radio network Dec. 29 that putting man on moon would not compare to great scientific achievements such as breaking genetic code. "This [moon flight] is an adventure. ...it's different from Darwin's travels," which led to his discovery of genetic evolution. (Aarons, W Post, 12/28/68, A8)
  - . Associated Press quoted Mrs. Madalyn Murray O'Hair, who was instrumental in having prayer removed from U.S. public schools, as saying she would register complaints with NASA against reading by Apollo 8 astronauts of portions of Genesis during lunar orbit and would organize mail campaign to bar prayer from space. (AP, W Post, 12/28/68, A9)
  - . National Science Foundation announced median annual salary of U.S. scientists in 1968 was \$13,000, up \$1,200 (10%) from 1966. Self-employed scientists earned highest median, \$18,000, in 1968, with those employed by industry, business, and nonprofit organizations second at \$14,700. Federal Government scientists reported same median salary--\$13,500--as those employed on yearly basis by educational institutions. Single largest users of scientific talent were educational institutions (40%). Industry and business employed 32%, and 10% were civilians in Federal Government. Information was based on responses by 298,000 U.S. scientists to NSF's biennial National Register survey. (NSF Release 68-181)
  - . New York Times said article in December issue of Australian Quarterly by Australian National Univ. lecturer Robery Cooksey had suggested U.S. "space research facility" at Pine Gap near geographical center of Australia might be station designed to guide orbital missiles fired from U.S. to targets in Communist China. If so, he said, Australia would then be potential target for retaliation with nuclear weapons. Article had caused flurry of questions about base in Australian press. Later New York Times story said U.S. officials in Washington had denied suggestion and said Pine Gap installation was joint U.S.-Australian space research facility established by agreement in 1966. (Trumbull, NYT, 12/29/68, 30)

December 27: DOD announced appointment to Defense Science Board of Dr. Arthur T. Biehl, Associate Director for Advanced Study, Lawrence Radiation Laboratory; Dr. Lewis M. Branscomb, Chairman of Joint Institute for Laboratory Astrophysics, Univ. of Colorado; Daniel J. Fink, General Manager for Space Systems, General Electric Corp.; and Dr. Charles M. Herzfeld, Technical Director of Defense Space Group (R&D), International Telephone and Telegraph Corp. (DOD Release 1139-68)

- . AEC announced detection of Chinese Communist atmospheric nuclear test at Lop Nor area. It was eighth Chinese Communist nuclear test detected and had yield of about three megatons. Peking government later confirmed successful explosion of hydrogen bomb, particles of which, said Associated Press, had been found in rain water collected at Nigata, Japan. Peking Radio also said Communist China would never sign U.N. treaty to end spread of nuclear weapons. (AEC Release L-294; AP, W Star, 12/26/69, A10; UPI, W Star, 12/29/69, A10; Kumpa, B Sun, 12/29/68, 1)

December 28: INTELSAT-III F-2 (launched Dec. 19) was used between Etam, W. Va, and Raisting, Germany, under emergency authorization to back up interruption of service on TAT-4 cable. (NASA Proj Off)

- . Finnish professor Arrno Niini said photos of earth brought back by Apollo 8 astronauts might show tiny ring of small dust particles 200 to 350 mi above earth. It would be discernible only in pictures taken with sun behind camera and with sufficiently sensitive film. (UPI, NYT, 12/30/68, 2)
- . President Johnson announced promotion of Apollo 8 Astronaut William A. Anders (Maj., USAF) to Lieutenant Colonel under his policy of granting one-grade promotion to military astronaut after his first successful space mission. (Maynard, W Post, 12/29/68, A4; PD, 1/6/69, 5)
- . In Moscow interview with Turin, Italy, newspaper La Stampa, Soviet space scientist Prof. Leonid I. Sedov said U.S.S.R. was concentrating on perfecting unmanned spaceships for exploration of celestial bodies deeper in space than moon. "There does not exist at present a similar project [to Apollo 8] in our program. In the near future we will not send a man around the moon. We start from the principle that certain problems can be resolved with the use of automatic soundings." Sedov hailed Apollo 8 mission as "a great scientific conquest." (UPI, W Post, 12/29/68, A4)



December 29: In Washington Sunday Star, William Hines reported results of query of eight eminent scientists on most important single decision related to science and technology which faced President-elect Richard M. Nixon early in his administration. Consensus was: shaping of long-term science policy. Also cited were need for reexamination of priorities and goals, with firm decision on extent to which science and higher education should receive Government support; creation of Dept. of Science in cabinet or stronger science-Government communication lines; reassessment of space funding and other "big science" projects, including proton accelerators; greater emphasis on social goals; vigorous antipollution efforts; and more imaginative use of science and technology as instruments of national policy. None of eight scientists advocated abandonment of space program after culmination of Apollo project. Physicist Alvin M. Weinberg, Director of Oak Ridge National Lab., said of space program, "This thing takes so very much money that it's hard to get excited about any other decision in science until this one has been made. What should be its level in the 1970s? We have become accustomed to something like four or five billion dollars a year, but I doubt very much that this is a level the new President is likely to concur in." (W Star, 12/29/68, C3)

- . Noting what he called "curious conspiracy of silence on Russia's capabilities and intention" for almost eight years, William Hines in Washington Sunday Star said: "One of the many small acts of positive statesmanship which Richard M. Nixon could profitably perform early in his administration would be to tell the American people fully and frankly just what the United States government knows about the Soviet space program.... It would lend credence to Mr. Nixon's professed policy of openness. It would compromise no significant secrets. And it would enable the American public to make judgments about the future of the U.S. space program at a time when vital decisions along this line would be coming due." (W Star, 12/29/68, C4)

December 30: Defense Secretary designate, Rep. Melvin R. Laird (R-Wis.) named David Packard, chairman of Hewlett-Packard Co., California electronics firm, to be Deputy Secretary of Defense in Nixon Administration. (Beecher, NYT, 12/31/68, 1; WSJ, 12/31/68; Aero Daily, 12/31/68)

- . Cost-plus-fixed-fee contract for Cal Tech's operation of JPL as a major NASA installation was renewed by NASA and Cal Tech through Dec. 31, 1971. Cal Tech staffed and operated JPL; property, facilities, and equipment were owned by Government. (NASA Procurement Off; NASA Release 69-2)

December 30: In Pravda, Prof. Boris Petrov, Soviet guidance mechanisms specialist, said U.S.S.R. preferred not to send men to moon at this point though unmanned Zond V and Zond VI "were adapted for piloted flight." (Reuters, W Post, 12/31/68, A3)

- . Cleveland Plain Dealer editorial said, "Those who argue that the country should be spending more money on important domestic programs are correct. But these increases should not have to come at the expense of American space exploration and newly-won world prestige. NASA's needs deserve high priority. There should be no lost opportunities. When the first American sets foot on the moon next year, his accomplishment should symbolize a beginning, not an ending." (C Plain Dealer, 12/30/68)
- . In Washington Evening Star, David Lawrence asked, "What was really the big 'miracle' in the voyage of the American astronauts to the moon and back?" It could have happened, "and the rest of the world would not have witnessed the dramatic arrival of the astronauts aboard an aircraft carrier in the middle of the Pacific Ocean or the pictures sent from outer space for several days if it has not been for another great feat of science--transmission of television and radio from artificial satellites direct to every continent of the world." (W Star, 12/30/68, A9)

December 31: White House announced from Johnson City, Tex., that President Johnson would present NASA Distinguished Service Medals to Apollo 8 Astronauts Frank Borman, James A. Lovell, Jr., and William A. Anders during "Astronaut Day" ceremonies in Washington, D.C., Jan. 9, 1969. (AP, W Star, 12/31/68, A5; UPI, NYT, 1/1/69, 10C; W Post, 1/1/69, 2)

- . Soviet test pilot Eudard V. Yelyan test-flew Tu-144 U.S.S.R.'s delta-wing supersonic transport, on successful 38-min maiden flight from airport near Moscow. Tass reported "the equipment on board the airliner operated normally." Aircraft was designed to carry 120-135 passengers at speeds to 1,600 mph over 4,000-mi range. It was equipped with four Kuznetsov N.K.-144 turbofan engines. Tass said sonic boom "is almost not felt" on earth because Tu-144 reached maximum speed at high altitudes.  
 Later, New York Times editorial commented: "The long international debate about supersonic airliners is sure to be stepped up in the wake of the news that the Soviet entry, the TU-144, has made its first flight. Since it has not been claimed that this initial trial reached supersonic speeds, the likelihood is

December 31 (continued)

that the TU-144 was kept subsonic on its first outing. But Soviet airplane designers and builders have manufactured enough supersonic military planes to suggest that on a subsequent flight the TU-144 will fly faster than the speed of sound.... In this country, the Soviet first will undoubtedly spur those who want to pour still more Government funds into the Boeing project to build an advanced supersonic plane that is faster and larger than the TU-144. Fortunately, this country's technological prestige is now higher than ever in the wake of the Apollo 8 moon journey. That fact should help the incoming Nixon Administration to see that there are better uses for the nation's scarce resources than to engage in a supersonic plane race whose economics are dubious and whose product's contribution to noise pollution is all too loud." (Shabad, NYT, 1/1/69, 1; UPI, W Star, 1/1/69, A7; Winters, B Sun, 1/1/69, 1; NYT, 1/2/69, 30)

- National Science Foundation released Federal Funds for Research, Development, and Other Scientific Activities: Fiscal Years 1967, 1968, and 1969. Federal obligations for basic research, applied research, and development (plant excluded) totaled \$16.5 billion in FY 1967 and were expected to total \$16.2 billion in FY 1968, first drop since 1955. Obligations had been expected to total \$17.3 billion in FY 1969, but, because of appropriations and apportionment actions, probably would be even less than in 1968.

Basic research obligations totaled \$2.0 billion in FY 1967 and were expected to be \$2.1 billion in 1968. Applied research obligations totaled \$3.3 billion in FY 1967, with \$3.3 billion estimated for 1968. Originally expected increases in FY 1969 obligations, to \$2.4 billion for basic research and \$3.6 billion for applied research, probably would not occur because of cutbacks in FY 1969 budget. Development obligations were \$11.3 billion in 1967, highest ever reported, but were expected to drop to \$10.8 billion in 1968. Originally expected rise to \$11.3 billion in 1969 probably would not be achieved. In FY 1967, obligations for R&D plant totaled \$620 million, with estimated \$517 million for 1968 and \$777 million for 1969. DOD, NASA, and AEC provided bulk of R&D funds, with 90% average share during 1960-66 and 85% during 1967-69. DOD, NASA, and AEC together supported 60% of Federal research total and more than 95% of development total in 1968.

During 1967-69, 80% of Federal R&D funds were scheduled for extramural performers, chiefly U.S. industrial firms. In 1968 they received 60%, with colleges and universities receiving 9%,

1 9 6 8

December 31 (continued)

Federally funded R&D centers, 4%, and remaining 20% to intramural performers. In basic research colleges and universities were 1968's major performing group, with 37% of total. Federal sector was scheduled to perform 37% of 1968 total applied research. Industrial firms were to perform 77% of total 1968 development. During three years, 1967-69, life sciences received 29% of Federal support; engineering sciences 28%; physical sciences 21%; and environmental sciences 12%. Since 1959, however, psychological and social sciences had shown faster relative gains than all others. (Text)

- . New York Gov. Nelson B. Rockefeller announced Apollo 8 astronauts had accepted invitation to come to New York for special day of observance Jan. 10. (Fox, NYT, 1/1/69, 1)
- . Senator-elect Barry Goldwater (R-Ariz.) test-rode F-111A and took controls during part of 90-min flight to and from Nellis AFB, Nev. Later he said aircraft had been victim of politics, not by party, but by "bungling in the Defense Department." Goldwater said he had not opposed aircraft but objected to way DOD had awarded contract to General Dynamics Corp. He said USAF had done good job in "taking the bugs out of this airplane." (AP, W Post, 1/1/69, A9)
- . USAF awarded contracts totaling \$28.8 million to Fairchild Hiller Corp., McDonnell Douglas Corp., and North American Rockwell Corp. for contract definition for ZF-15A advanced air superiority fighter aircraft. (DOD Release 1147-68)

During December: NASA issued Objectives and Goals in Space Science and Applications-1968. NASA Office of Space Science and Applications had participated in 1968 agency-wide planning to detail program objectives and options from which program could be built. Many tools required for future space program had already been developed and many future ventures would require only modest improvements. Spacecraft pointing accuracies and stability would improve, and their lifetimes would increase. More powerful transmitters would communicate data across ever-widening expanses. Spacecraft weight would increase and man would have increasing capability to work and navigate in space. Advances in chemical propulsion, and introduction of nuclear and electric propulsion, and new combinations of existing stages, would permit growth of launch vehicle capability to meet mission demands. FY 1969 support of program recognized need for austerity and provided

During December (continued)

for continuance of existing programs at economical level and initiation of only "projects of great merit, including those where a unique opportunity might be lost." Future emphasis would be on expanding applications of space and space technology for benefit of man: improving capability for surveying earth's resources, providing TV broadcast from space, and improving weather forecasting. Knowledge of Mars, Venus, Mercury, Jupiter, and other outer planets would be expanded. Introduction of larger, more accurate telescopes would provide man perhaps with "his greatest step in understanding the nature of his universe." (Text)

- Senate Committee on Aeronautical and Space Sciences issued Tenth Anniversary, 1958-1968 to meet requests for information concerning its historical background, activities, jurisdiction and procedures, legislative record, membership, and staff assistance. Report contained National Aeronautics and Space Act of 1958, as amended, related legislation--including NASA's funding history--and Communications Satellite Act of 1962. (Text)

During 1968: In 1968 U.S. orbited 64 spacecraft and U.S.S.R., 74. U.S. total included 43 launched by DOD. NASA's 21 included satellite orbited as secondary payload.

Highlight of NASA's 10th anniversary year was success in carefully planned series of Apollo missions--including first two manned flights in Apollo lunar landing program. Unmanned Apollo 5 and Apollo 6 completed inflight tests of all major pieces of Apollo hardware. First manned mission, Apollo 7, carried three astronauts around earth for 11 days, verifying spacecraft operation before splashing down precisely on target. Mission included live TV transmission from space, largest number of inflight restarts of SPS to date, and new record of 781 man-hours in space. Apollo program climaxed Dec. 21-27 with highly successful six-day Apollo 8 mission on which three-man crew demonstrated operation of spacecraft systems in lunar environment. Spacecraft orbited moon 10 times, providing man with his first trip out of earth's gravitational field and first look at moon's far side and proving capability of crew, spacecraft, and support and control systems to operate out to lunar distances and return through earth's atmosphere at lunar-return velocity.

Unmanned Surveyor VII, NASA's first launch in 1968 and last spacecraft in Surveyor series, softlanded on moon, conducted on-site analyses of lunar soil, and took part in laser-detection

During 1968 (continued)

communications experiment. Applications satellites launched included INTELSAT-III F-2 comsat for ComSatCorp and ESSA VII and VIII meteorological satellites for ESSA. Scientific achievements included orbiting of NASA's OGO V, OA0 II, Explorer XXXVI, XXXVIII, XXXIX, and XL satellites and Naval Research Laboratory's Explorer XXXVII. OA0 II--heaviest and most complicated U.S. automated spacecraft ever launched--took first UV photos of stars, returning previously unobtainable data. Explorer XXXVI was successfully used by GSFC as target in first daylight operational laser tracking. Pioneer IX, launched into solar orbit, carried TETR II pickaback and ejected it into earth orbit where it served as tracking target for NASA's Manned Space Flight Network.

Some 157 meteorological sounding rockets and 100 scientific sounding rockets were launched, and RAM C-II spacecraft was launched on suborbital mission to obtain data on radio attenuation during reentry.

X-15 rocket research aircraft made 13 flights, ending its flight program with 199 missions, including 154 at mach 4 or greater, 109 at mach 5 or above, and 4 at greater than mach 6. NASA-USAF flight research continued with 13 flights of XB-70 supersonic aircraft. USAF's C-5A, world's largest military cargo aircraft, made its maiden flight and three of the aircraft completed 31 flights for 88-hr total flying time. Design of SST was reevaluated and program was delayed until new fixed-wing design was selected, with prototype construction expected to begin in 1969. NASA's HL-10 lifting-body vehicle completed 12 successful glide flights and first powered flight.

DOD space program included orbiting of 8 IDCSP comsats, 1 Lincoln Experimental Satellite, 5 Orbiting Vehicle research satellites, and 2 environmental research satellites; static test-firings of Titan IIIM 1st stage; and near completion of MOL launch complex at Vandenberg AFB.

In joint NASA-AEC effort, propulsion technology highlights included power tests of Phoebus 2A nuclear reactor, first tests of cold-flow test engine in flight configuration in new test stand, and first test-firings of Pewee 1 fuel element test-bed reactor.

U.S.S.R. launched 74 payloads, including 64 Cosmos satellites, 1 Luna, 1 Proton, 3 Zond, and 2 Soyuz spacecraft, and 3 Molniya I comsats. Manned Soyuz 2 rendezvoused but did not dock with unmanned Soyuz 3 launched one day earlier. Unmanned Zond 5 and 6 completed circumlunar flights and were recovered. Zond 4 circled moon and apparently crashlanded. U.S.S.R.'s Tu-144 delta-wing supersonic transport successfully made 38-min maiden flight. (Pres Rpt 68; NASA Release 68-219; B Sun, 1/18/69, 28; Shabad, NYT, 1/1/69, 1; UPI, W Star, 1/1/69, A7)

During 1968: Major administrative events affecting NASA and its role in space were resignation of Administrator James E. Webb in October, after nearly 8½ yr as NASA's head, and budget cuts necessitating program and personnel reductions.

Press marked Webb retirement with praise for many accomplishments of U.S. space program during his leadership. Webb, planning to devote time to interests in education and urban and foreign affairs, continued to serve as consultant to Acting Administrator Dr. Thomas O. Paine.

NASA FY 1969 budget request of \$4.37 billion, already smallest since 1963 and \$700 million below FY 1968 request, was further trimmed by Congress because of urgent national needs in other areas, particularly Vietnam war and urban problems. Authorization of \$4.013 billion was lowered to appropriation of \$3.995 billion--\$375.12 million below original request. Revenue and Expenditure Control Act of 1968 again reduced NASA funds, as well as funds for DOD and other agencies.

Dr. Paine in October announced NASA interim operating plan limited to \$3.85 billion for FY 1969. Cutbacks included "sharply limited and deferred" Apollo Applications program, end to Saturn IB and V booster production, 50% cut in advanced mission studies, reduced lunar and planetary exploration program, one-year delay in NERVA development, slips in Biosatellite program, and reductions in astronomy, physics, and basic research. In November Dr. Paine said that below \$4-billion level NASA could no longer "hold together our hard-won capabilities and utilize them effectively in critical programs; some of them would have to be dropped entirely." (EH)

- . In its international cooperation program, NASA successfully launched three satellites for European Space Research Organization: International Radiation Investigation Satellite IRIS I (ESRO II-B), Aurorae (ESRO I) to study aurora borealis and related polar ionosphere phenomena, and Highly Eccentric Orbiting Satellite HEOS A for interplanetary physics research. From eight nations, 35 investigators were selected to carry out experiments with the first lunar surface material to be retrieved by NASA. Four nations contributed experiments flown on NASA spacecraft and 122 sounding rockets were launched in scientific programs with eight countries. Geodetic satellite observations were carried out with 34 countries; aeronautical research was conducted with 4 countries; and 52 countries had APT facilities to receive cloud cover pictures from U.S. satellites. (NASA Releases 68-219, 68-204; Pres Rpt 68)

PROVISIONAL INDEX--DECEMBER 1968

AA. See Apollo Applications program.  
Accident, 393, 396  
Accelerator, 405  
Advanced Ballistic Reentry System (ABRES), 391  
AEC. See Atomic Energy Commission.  
Aegerter, Dr. Irene, 390  
Aerobee 150 MI (sounding rocket), 391  
Aeronautics, 386, 387, 392, 402, 408, 428  
Aerospace Industries Assn., 405  
Aerospace industry, 405  
Africa, 399  
Agreement, 385, 386, 420  
Agriculture, Dept. of, 387  
AIAA. See American Institute of Aeronautics and Astronautics.  
Air Force Cambridge Research Laboratories (AFCRL), 390  
Aircraft, 386, 387, 390, 401, 402, 404, 405, 423-425, 427  
Airports, 387, 390  
Alaska, 392  
Algranti, Joseph S., 393  
Allen, H. Julian, 385  
American Academy of Arts and Sciences, 397  
American Assn. for the Advancement of Science, 417  
American Institute of Aeronautics and Astronautics (AIAA), 389  
    Space Science Award, 406  
American Institute of Physics, 400  
American Science and Engineering, Inc., 391  
American Society of Mechanical Engineers, 402  
American Telephone & Telegraph Co. (AT&T), 395  
Ames Research Center (ARC), 385  
    Space Science Div., 406  
Ammonia, 400  
Anchorage, Alaska, 392  
Anders, L/C William A. (USAF), 394, 409, 421, 423  
Andover, Me., 407  
Anniversary, 403, 426  
Apollo (program), 391, 396, 399, 403, 404, 426  
Apollo 4 (flight), 411  
Apollo 5 (flight), 411, 426  
Apollo 6 (flight), 411, 419, 426  
Apollo 7 (flight), 400, 411, 418, 426  
Apollo 8 (flight), 396, 399, 400, 402, 409-414, 416, 418, 420, 421, 426  
Apollo 8 (spacecraft), 404-405, 408  
Apollo 9 (flight), 399  
Apollo Applications (AA) program, 391, 399, 404, 416, 428  
Apollo Lunar Surface Experiment Package (ALSEP), 406



ARC. See Ames Research Center.  
Arctic, 390  
Armed Forces Management Assn., 387  
Arms Control and Disarmament Agency, 404  
Astronaut, 386, 387, 392-394, 396, 397, 400, 402, 404, 407, 409-414,  
418, 421, 423, 425, 426  
Astronomy, 387, 388, 392-393, 399-401, 417, 426, 428  
Athena (missile), 391  
Atlantic Ocean, 406, 415  
Atlas-Centaur (booster), 392  
Atmosphere, 419-420  
Atomic Energy Commission (AEC), 407, 417, 421, 427  
ATS II (Applications Technology Satellite), 415  
ATS III, 415  
ATS IV, 391  
ATS-E, 392  
Aurora borealis, 390, 428  
Aurorae (ESRO I) (satellite), 428  
Australian National Univ., 420  
Automatic Picture Transmission (APT), 400, 428  
Aviation/Space Writers Assn., 405  
Award, 385, 387, 388, 392, 397, 404, 406  
Baja, Calif., 410  
Balloon, 398  
Barium, 396  
Battelle Memorial Institute, 401  
Becker, John V., 387  
Belgium, 388  
Berry, Dr. Charles A., 402  
Beryllium, 401  
Beverly Hills, Calif., 392  
Biehl, Dr. Arthur T., 421  
Big Dipper (constellation), 399  
Biosatellite (program), 402, 428  
Boeing Co., 401, 419, 423  
Bonn, West Germany, 387  
Borman, Col. Frank (USAF), 394, 409, 423  
Boshko, Andrei N., 416  
Boston, Mass., 397  
Branscomb, Dr. Lewis M., 421  
Brown, Dr. Harold, 398  
Bureau of Labor Statistics, 417  
Bureau of the Census, 417  
C-5A (cargo transport), 401, 427  
California Institute of Technology (Cal Tech), 386, 397, 398, 422

California, Univ. of  
    Berkely, 386, 400  
    Los Angeles, 390  
Camera, 400  
Canberra, Australia, 400  
Cape Horn, 410  
Carbon dioxide, 390  
Carnegie-Mellon Univ., 386  
Carswell AFB, Texas, 402  
Catholic Univ. of America, 417  
Centaur (booster), 419  
Chicago, Ill., 387, 390  
China, Communist, 385, 420, 421  
Civil Service Commission, 419  
Cleveland Clinic, 390  
Clifford, Secretary of Defense Clark, 396  
Cloud, 428  
Collier, Robert K., Trophy, 408  
Colorado, Univ. of, 416  
    Joint Institute for Laboratory Astrophysics, 421  
Commerce, Dept. of, 387  
Communications satellite, 390, 392, 395, 406-407, 427  
Communications Satellite Act, 426  
Communications Satellite Corp. (ComSatCorp), 390, 393, 395, 406-407, 427  
Computer Software  
    Management and Information Center (COSMIC), 398  
Congress, 387, 415, 416, 418, 428  
Congress, Senate  
    Committee on Aeronautical and Space Sciences, 426  
Cook, Don, 385  
Cooksey, Robert, 420  
Cooper, L/C L. Gordon (USAF), 394  
Cornell Univ., 417  
Cosmic rays, 388  
Cosmonaut, 386, 397  
Cosmos CCLVII (U.S.S.R. satellite), 386  
Cosmos CCLVIII, 395  
Cosmos CCLIX, 399  
Cosmos CCLX, 401  
Cosmos CCLXI, 407  
Cosmos CCLXII, 416  
Crawford, Dr. Bryce, 416  
Cunningham, R. Walter, 394  
Czechoslovakia, 397  
Dallas, Texas, 417

Dana, William H., 408  
Darmstadt, Germany, 388  
Dartmouth College  
    Amos Tuck School of Business Administration, 409  
Defense, Dept. of (DOD), 385, 389, 390, 392, 398, 421, 422, 425, 426, 428  
Defense Science Board (DOD), 421  
Delta (booster), 388  
Distinguished Service Medal, 404  
Distinguished Service Medal (NASA), 423  
DuBridge, Dr. Lee A., 386, 389, 398, 403  
Draco (constellation), 399  
Duke Univ., 386  
Earth, 396, 410, 412, 413, 421, 426  
Eastern Test Range (ETR), 388, 392, 406  
Education, 404, 415, 422  
Edwards AFB, Calif., 386, 394, 402  
Eisele, Donn F., 394  
Eisenhower, President Dwight D., 417, 420  
Environmental Science Services Administration (ESSA), 399, 417, 427  
ERS XXI (Environmental Research Satellite), 427  
ERS XXVIII, 427  
ESSA VII (meteorological satellite), 400, 427  
ESSA VIII (TOS-F), 399-400, 427  
Etam, W. Va., 407, 421  
ETR. See Eastern Test Range.  
Europe, 400  
European Space Research Organization (ESRO), 388, 428  
Explorer XXXVI (satellite), 427  
Explorer XXXVII, 427  
Explorer XXXVIII, 427  
Explorer XXXIX (Air Density Explorer C), 398, 427  
Explorer XL (Injun V), 398, 427  
Extraterrestrial life, 389, 390  
Extravehicular activity (EVA), 407  
F-14A (supersonic fighter), 404  
F-111A (supersonic fighter), 405, 425  
Fairchild Hiller Corp., 425  
Federal Aviation Administration (FAA), 387, 390, 415  
Federal Communications Commission (FCC), 395  
Federal Department of Science (proposed), 417  
Fédération Aéronautique Internationale (FAI), 397  
Fermi, Enrico, Award, 385  
Fink, Daniel J., 421  
Fletcher, Dr. Robert D., 406  
Flight Research Center (FRC), 402  
Flight Safety Foundation, 402

Fort Churchill, Manitoba, 419  
Foster, William C., 404  
France, 388  
Friction Effects of Runway Grooves, Runway 18-36, Washington National  
Airport, 415  
Fulton, Fitzhugh L., Jr., 386, 402  
Gagarin, Col. Yuri A. (U.S.S.R.), 397  
Garbuzov, Finance Minister Vasily (U.S.S.R.), 397  
Gas turbine, 406  
General Dynamics Corp., 425  
    Electric Boat Div., 391  
General Electric Co., 421  
Gentry, Maj. Jerauld R. (USAF), 394  
Geodetic satellite, 428  
Georgia, Univ. of, 398  
German Federal Ministry for Scientific Research (BMWF), 396  
Germany, West, 385, 388  
Goddard, Dr. Robert H., 406  
Goddard, Robert H., Award, 406  
Goddard Space Flight Center (GSFC), 393, 399, 400, 412, 419, 427  
    Laboratory for Atmospheric and Biological Sciences, 419  
Goldstone, Calif., 400  
Goldwater, Barry, 425  
GOR-16 (general ocean research ship), 398  
Grants, 404, 408  
Green River, Utah, 391  
Grumman Aircraft Engineering Corp., 404  
GSFC. See Goddard Space Flight Center.  
Guest, Dr. Robert H., 409  
Hage, George H., 404  
Haile Selassie, Emperor of Ethiopia, 414  
Handler, Dr. Phillip, 386, 404  
Hardie, Dr. Robert H., 417  
Hardy, Dr. Harriet L., 400  
Harmon International Aviation Trophy, 386  
Harr, Karl G., Jr., 405  
Harvard Univ., 392, 420  
Heart, artificial, 390  
HEOS-A (Highly Eccentric Orbiting Satellite), 388, 428  
Herzfeld, Dr. Charles M., 421  
Hewlett-Packard Co., 422  
Hilgard, Dr. Ernest R., 416  
Hines, William, 401, 422  
HL-10 (lifting-body vehicle), 394, 427  
Hollomon, Dr. J. Herbert, 417

Honeywell, Inc., 419  
 Hooker, Dr. Stanley G., 406  
 Hornig, Dr. Donald F., 387, 392, 417  
 Hughes, Howard, 392, 407  
 Hughes Nevada Operations, 392  
 Illinois, Univ. of, 416  
 Initial Defense Communications Satellite (IDCSP), 427  
 Institute of High Energy Physics, 405  
 Institute of Strategic Studies, 397  
INTELSAT I (Early Bird) (communications satellite), 407  
INTELSAT-II F-4 (INTELSAT II-D), 390,  
INTELSAT-II F-3 (Atlantic II), 407  
INTELSAT-III F-1, 406  
INTELSAT-III F-2, 406-407, 415, 421, 427  
 Interior, Dept. of, 387  
 International Astronomical Union, 385  
 International cooperation, space, 388, 396, 428  
 International Telecommunications Satellite Consortium (INTELSAT), 406  
 International Telephone and Telegraph Corp., 421  
 Ion propulsion, 391-392  
 Ionosphere, 428  
 Ireland, 386  
IRIS I (ESRO II-B) (International Radiation Investigation Satellite), 428  
 Isolation experiment, 415-416  
 Italy, 388  
 ITT World Communications, Inc., 395  
 Jamesburg, Calif., 390  
 Japan, 400  
 Jet Propulsion Laboratory (JPL) (Cal Tech), 422  
 Johnson City, Texas, 423  
 Johnson, President Lyndon B., 385, 386, 392, 403, 404, 409, 415, 418, 421  
 Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), 399  
 Jupiter (planet), 426  
 Kapustin Yar, U.S.S.R., 399, 416  
 KC-135 (flying ionospheric laboratory), 390  
 Kennedy, President John F., 408, 417  
 Kennedy, Sen. Robert F., 416  
 Kennedy Space Center (KSC), 409, 411  
 Killian, Dr. James R., 392  
 King, Rev. Martin Luther, 416  
 Kistiakowsky, Dr. George B., 392, 420  
 Kitty Hawk Memorial Trophy, 392  
 Knight, Maj. William J. (USAF), 386  
 Kordes, Dr. Eldon E., 402  
 Kraft, Joseph, 416

KSC. See Kennedy Space Center.  
 Kuznetsov N.K.-144 (U.S.S.R. turbofan engine), 423  
 Laird, Rep. Melvin R., 397, 422  
 Land, Dr. Edwin, 416  
 Langley Research Center (LaRC), 387  
 Lannan, John, 399  
 Lapp, Dr. Ralph E., 396, 399  
 Laser, 400, 427  
 Launch Complex 39, 409  
 Lawrence, David, 423  
 Lawrence Radiation Laboratory, 421  
 Lederer, Jerome, 404  
LES VI (Lincoln Laboratory Experimental Satellite), 427  
 Lewis Research Center (LeRC) (NASA), 388, 390, 419  
 Libby, Dr. Willard F., 390  
 Lifting-body vehicle, 394  
 Lindbergh, Charles A., 394  
 Little Dipper (constellation), 399  
 Lockheed Aircraft Corp., 396, 401  
 Lockheed Electronics Co., 396  
 Lockheed Missiles and Space Co., 385  
 Logsdon, Prof. John M., 417  
 Logunov, Dr. Anatoli A., 405  
 Lop Nor, Communist China, 421  
 Los Angeles, Calif., 400  
 Losey, Robert M., Award, 406  
 Lovell, Capt. James A., Jr. (USN), 394, 409, 423  
 Lucas, Dr. W. R., 391  
 Luest, Prof. Reimar, 396  
Luna XIV (U.S.S.R. lunar probe), 427  
 Lunar Landing Test Vehicle (LLTV), 393  
 Lunar orbit rendezvous (LOR), 409  
 Lunar Orbiter (program), 389  
 Luskin, Harold T., 404  
 Lysenko, Trofim D., 385  
 McDivitt, Lt/C James A. (USAF), 394  
 McDonnell Douglas Corp., 404, 425  
 McNair, Prof. Arthur J., 417  
 Madrid, Spain, 400  
 Magnetic field, 388, 420  
 Mallick, Donald L., 386  
 Manhattan Project, 399  
 Manned Orbiting Laboratory (MOL), 396, 427  
 Manned space flight, 399, 400, 403, 414, 417, 418, 426  
 Manned Space Flight Network, 400, 427  
 Manned Spacecraft Center (MSC), 393, 411

Manovtsev, Gherman A., 416  
 Mariner (program), 389  
 Mars (planet), 389, 403, 413, 420, 426  
 Marshall Space Flight Center (MSFC), 391, 411, 419  
 Maser, 400  
 Massachusetts General Hospital, 400  
 Massachusetts Institute of Technology (MIT), 392  
     Dept. of Aeronautics and Astronautics, 406  
 Max Planck Institute, 396  
 Melbourne, Australia, 394  
 Mercury (planet), 426  
 Meteorological satellite, 395, 399-400, 427  
 Meteorology, 394, 406, 426  
 Michener, Gov. Gen. Roland, 414  
 Michigan Univ. of  
     Space Physics Research Laboratory, 419  
 Miller, Dr. Rene H., 406  
 Minnesota, Univ. of, 416  
 Minuteman (missile), 401  
 Missile, 391, 401, 420  
 MOL. See Manned Orbiting Laboratory.  
Molniya I (U.S.S.R. communications satellite), 427  
 Moon  
     crater, 385, 410  
     exploration of, 396, 399, 403, 413, 421  
     landing  
         manned, 401, 403, 420, 423  
         soft, 426  
         unmanned, 414  
     landing site, 410  
     photographs, 385, 414, 415  
     surface, 407, 410, 414, 426, 428  
 Moorer, Adm. Thomas H. (USN), 404  
 Moscow, U.S.S.R., 394, 405, 423  
 Mt. Palomar Observatory, 387  
 Mt. Wilson Observatory, 387  
 MSC. See Manned Spacecraft Center.  
 MSFN. See Manned Space Flight Network.  
 MSFC. See Marshall Space Flight Center.  
 NASA Committee on Extra-Vehicular Activities, 407  
 NASA Office of Manned Space Flight (OMSF), 411  
 NASA Office of Space Science and Applications (OSSA), 393, 425  
 NASA Office of Technology Utilization, 398  
 NASA Office of Tracking and Data Acquisition, 412  
 National Academy of Sciences, 400, 401, 407

National Aeronautics and Space Act, 394, 426  
National Aeronautics and Space Administration (NASA)  
    anniversary, 426  
    award, 387, 388, 392, 394, 406, 423  
    budget, 426, 428  
    contract, 396, 407, 419, 422  
    cooperation, 387, 398, 427  
    cooperation, international, 388, 396, 428  
    employees, 419, 428  
    launch, 426  
        Apollo 8 (AS-503), 409-415  
        satellite, 388, 392-393, 399-400, 406-407, 428  
        sounding rocket, 391  
    organization, 391, 407  
    personnel, 385, 391, 404, 409, 419, 428  
    program  
        aeronautics, 386, 387, 402, 408, 428  
        Apollo, 391, 396, 399, 403, 404, 426  
        Apollo Applications, 391, 399, 416, 428  
        Biosatellite, 402, 428  
        Explorer, 398  
        Lunar Orbiter, 389  
        Mariner, 389, 401  
        NERVA, 428  
        planetary, 428  
        sounding rocket, 391, 419, 427, 428  
        space biology, 390, 402, 428  
        Surveyor, 389  
        Viking, 389  
    test, 391-394, 397, 400  
National Aeronautics and Space Council (NASC), 395  
National Council on Marine Resources and Development, 388  
National Institutes of Health (NIH), 417  
National Science Foundation (NSF), 400, 408, 417, 420  
Nellis AFB, Nev., 405  
Naval Research Laboratory, 427  
Nepal, 386  
Nellis AFB, Nev., 425  
NERVA. See Nuclear Engine for Rocket Vehicle Application.  
Netherlands, 385  
Nevada Test Site, 407  
New York, N.Y., 387, 390, 404  
New York Academy of Science, 415  
Newby, Dave, 391  
Nicks, Oran W., 389



Nigata, Japan, 421  
Niini, Arrno, 421  
Nixon, President-elect Richard M., 386, 388, 393, 397, 398, 400, 403, 415,  
421, 422  
North American Rockwell Corp., 408, 425  
North Pole, 410  
NSF. See National Science Foundation.  
Nuclear Engine for Rocket Vehicle Application (NERVA), 428  
Nuclear fission, 385  
Nuclear nonproliferation treaty, 421  
Nuclear reactor, 385, 427  
Nuclear submarine, 391  
Nuclear test, 421  
Oak Ridge National Laboratory, 422  
OAO I (Orbiting Astronomical Observatory), 393  
OAO II (OAO-A2), 392-393, 399, 427  
Oceanography, 388, 398, 399, 408, 417  
O'Connor, E. F., 391  
Office of Naval Research, 400  
OGO V (Orbiting Geophysical Observatory), 427  
O'Hair, Mrs. Madalyn Murray, 420  
Oklahoma, Univ. of, 417  
Orbiting Vehicle (research satellite), 427  
O'Toole, Thomas, 392, 401  
Oxygen, 408  
Pacific Ocean, 415  
Packard, David, 422  
Paine, Dr. Thomas O., 409, 428  
Parachute, 397  
Parsons, James F., 385  
Paul VI, Pope, 413  
Paumalu, Calif., 390  
Peters, Dr. Max Stone, 416  
Petrov, Prof. Boris, 413, 423  
Pewee 1 (nuclear reactor), 427  
Phoebus 2A (nuclear reactor), 427  
Pine Gap, Australia, 420  
Pioneer IX (interplanetary probe), 427  
Pluto (planet), 417  
Polaroid Corp., 416  
Poseidon (missile), 401  
Pratt, Perry W., 406  
Presidential Medal of Freedom, 394  
Press comment  
airports, 390

Press comment (continued)

Apollo 8 flight, 396, 412-414  
science, 389  
space program, 423  
Press conference, 387-388, 403, 404, 418, 421  
Princeton Univ., 385  
Proton IV (U.S.S.R. space station), 427  
Proton accelerator, 405  
Puerto Rico, 415  
Quark (matter theory), 405  
Quasar, 398  
Radiation, 387  
Radio signal, 410  
Radioastronomy, 400-401  
Raisting, W. Germany, 421  
RAM C-II (spacecraft), 427  
R.C.A. Communications, Inc., 395  
Record  
aircraft, 386, 408  
Reed, Sylvanus Albert, Award, 406  
Reentry, 391, 427  
Rendezvous, 427  
Research and development, 387, 397, 424-425  
Reuther, Walter P., 385  
Revenue and Expenditure Control Act of 1968, 428  
Rice Univ., 416  
Rockefeller, Gov. Nelson B., 425  
Rockefeller Public Service Award, 388  
Rogers, William P., 397  
Rolls-Royce, Ltd.  
Bristol Engine Div., 406  
Rumford, Sir Benjamin Thompson, Count, 397  
Rumford Premium, 397-398  
Sänger, Dr. Eugen, 387  
Sato, Prime Minister Eisaku, 414  
Saturn IB (Up-rated Saturn I) (booster), 428  
Saturn V, 409, 411, 419, 428  
Schirra, Capt. Walter M., Jr. (USN), 392-394, 404  
Schmidt, Dr. Maarten, 397-398  
Schneider, William C., 404  
Science, 386-389, 393, 403, 415, 422  
Scientists, 420  
Scout (sounding rocket), 396  
Seckbach, Dr. Joseph, 390  
Sedov, Prof. Leonid I., 421

SHAPE (Supersonic High Altitude Parachute Experiment) Project, 397  
Silverstein, Dr. Abe, 388  
Slichter, Dr. Charles P., 416  
Smart, Gen. Jacob E. (USAF, Ret.), 387  
Smithsonian Astrophysical Observatory, 392-393  
Sonic boom, 402  
Sonnett, Dr. Charles P., 406  
Sounding rocket, 391, 419, 427, 428  
South America, 410  
Soviet Academy of Sciences, 385  
    Council for International Cooperation in Investigation and Utilization  
    of Outer Space, 413  
Soyuz 2 (U.S.S.R. spacecraft), 427  
Soyuz 3, 427  
Space biology, 390, 402  
Space, peaceful use of, 397, 426  
Space program, national, 386-389, 391, 394, 396, 399, 403, 414, 416-418,  
    422, 423, 425-426, 428  
Space race, 396, 399, 416, 418  
Space rescue treaty, 386  
Space results, 390, 398, 426  
Space station, 391, 403  
Special Report on Underground Testing, 392  
Spencer, N. W., 419  
Stanford Univ., 416  
Star, 392-393, 399, 427  
Stever, Dr. H. Guyford, 386  
Stuhlinger, Dr. Ernst, 391  
Supersonic High Altitude Parachute Experiment. See SHAPE Project.  
Supersonic transport (SST), 423-424, 427  
Surveyor (program), 389, 403, 426  
Surveyor VII (lunar probe), 426-427  
Technology, 386-388, 403, 422  
Tel Aviv, Israel, 385  
Telescope, 426  
Television, 395, 400, 412, 414, 426  
TETR II (Test and Training Satellite), 427  
Thant, U.N. Secretary General U, 414  
Thrust-Augmented Long-Tank Delta (booster), 406  
Thiokol Chemical Corp.  
    Elkton, Md. Div., 396  
Thrust-Augmented Long-Tank Thor-Delta (booster), 399  
Thrust-Augmented Thor-Delta (booster), 388  
Tiros I (meteorological satellite), 400  
Tiros III, 400  
Tiros Operational Satellite (TOS) system, 399-400

Titan III-D/Centaur (booster), 389  
Titan III-M, 427  
Todd Shipyards Corp., 398  
Townes, Dr. Charles H., 386, 400  
Tracking, 427  
Trendex Poll, 403  
Tu-144 (U.S.S.R. supersonic transport), 423-424, 427  
Turner, Dr. Richard B., 416  
Ulybshev, Boris N., 416  
Underground nuclear test, 392, 407  
United Aircraft Corp., 406  
United Auto Workers of America, 385  
United Kingdom (U.K.), 385, 386, 388  
United Nations (U.N.), 394, 412, 421  
    General Assembly, 408  
Universities, 389, 404, 425  
Uranium, 385  
U.S. Air Force (USAF), 386, 398  
    aircraft, 386, 387, 390, 402, 405, 408, 425, 427  
    award, 387  
    contract, 385, 407, 425  
    cooperation, 387, 408, 427  
    launch  
        missile, 391  
        reentry vehicle, 391  
MOL, 396  
    research, 390, 401  
U.S. Geological Survey, 417  
U.S. Navy (USN), 387, 398, 404  
U.S.S.R. (Union of Soviet Socialist Republics)  
    aircraft, 423-424  
    budget, 397  
    launch, 426, 427  
        satellite, 427  
            Cosmos, 386, 395, 399, 401, 407, 416, 427  
    science and technology, 385, 397, 405, 415-416  
    space program, 385, 399, 413, 421-423  
    space rescue treaty, 386  
    weapons, 397  
U.S.S. Yorktown, 411  
Vandenberg AFB, Calif., 427  
Vanderbilt Univ., 417  
Vavilov, Nikolay I., 385  
Vavilov, Sergei I., 385  
Vega (star), 399

Vega Baja, Puerto Rico, 419  
Venus (planet), 390, 413, 420, 426  
VFX-1. See F-14A.  
Vietnam War, 397, 428  
Viking, Project, 389  
Volpe, Gov. John A., 397  
Von Braun, Dr. Wernher, 391  
Vostok I (flight), 397  
Walker, Dr. J. C. G., 419  
Wallops Station (NASA), 396, 419  
Washington, D.C., 388, 389, 404, 405, 423  
Washington National Airport, 387, 415  
Webb, James E., 394, 428  
Weidner, Hermann K., 391  
Weinberg, Alvin M., 422  
Weizmann Institute of Science  
    Reuther, Walter P., Chair for Study of Peaceful Use of Atomic  
    Energy, 385  
Welsh, Dr. Edward C., 395  
Western Test Range (WTR), 385  
Western Union International, Inc., 395  
Wheeler, Dr. John Archibald, 385  
White, L/C Edward H., II (USAF), 394  
White House, 385, 386, 394, 418, 423  
White Sands Missile Range (WSMR), 391, 397  
Wiesner, Dr. Jerome, 392  
Wilson, George C., 405  
Wings Club, 404  
Wisconsin, Univ. of, 392-393  
World Meteorological Organization, 394  
World Weather Watch, 394  
Wright Brothers Day, 403  
Wright, Orville, 403  
Wright, Wilbur, 403  
WSMR. See White Sands Missile Range.  
WTR. See Western Test Range.  
X-15 (rocket research aircraft), 386, 387, 408, 427  
XB-70 (supersonic aircraft), 402, 427  
XB-70A, 386  
X-ray, 389, 391  
Yale Univ., 419  
Yelyan, Eudlard V., 423  
ZF-15A (fighter aircraft), 425  
Zond V (U.S.S.R. space probe), 423  
Zond VI, 385, 423

COMMENT DRAFT

NOT FOR RELEASE

III.02X

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

Date ----- Doc. No. -----

A S T R O N A U T I C S   A N D   A E R O N A U T I C S

DECEMBER 1968

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

(HHR-23)

Text Drafted by Science and Technology Division  
Library of Congress

NASA Historical Division (EH)  
Office of Policy  
National Aeronautics and Space Administration  
Washington, D.C. 20546

(PLEASE RETURN COMMENTS AND SURPLUS COPIES TO EH)