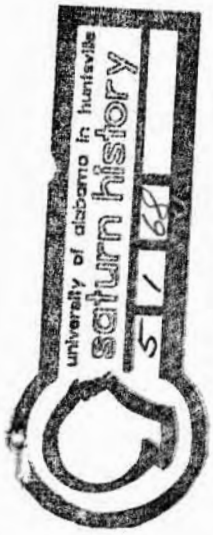

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A S T R O N A U T I C S A N D A E R O N A U T I C S

APRIL 1968

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

(HHR-23)

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A P R I L 1 9 6 8

April 1: Flights of USAF F-111A aircraft had been halted pending results of investigation of March 28 and 30 crashes, Associated Press reported. (AP, W Star, 4/1/68, A3)

. Dr. Robert R. Gilruth, Director of NASA's Manned Spacecraft Center, was elected member of National Academy of Engineering "in recognition and in honor of his important contributions to engineering and of his leadership in the field." He was cited specifically for his work in aircraft design and testing and for development and operation of manned spacecraft. (NAE PIO; MSC Roundup, 4/12/68, 1)

. New York Times editorial in support of F-111A aircraft: "The difficulties that have beset the controversial F-111 swing-wing plane recently provide new evidence of the folly of allowing political factors to veto or dilute technical judgment.

"These additional blows to a plane that still has great potential promise emphasize what most experts have been saying for seven years--the F-111 has been built the wrong way from the beginning. It reflected former Secretary of Defense McNamara's insistence, in the name of 'commonality' and savings, that the Navy and the Air Force buy one plane for two entirely different missions.

"But, though the Navy's version may never--as Congress believes--meet the Navy's needs, the Air Force model has great potential capabilities as a supersonic high- and low-level all-weather fighter-bomber...[and] must be developed, tested and utilized to its fullest capability." (NYT, 5/1/68)

. Atomic Energy Commission-NASA Space Nuclear Propulsion Office awarded Aerojet General Corp. extension of cost-plus-fixed-fee contract for nuclear propulsion work. Extension covered period through Sept. 30, but NASA funding would be restricted to effort through July 31 pending Congressional action on NASA's FY 1969 budget request. Extension brought total estimated cost to $59.4 million for Oct. 1, 1967, through Sept. 30, 1968, including $25.8-million NASA share. (NASA Release 68-57; WSJ, 4/2/68, 12; SBD, 4/2/68, 179)

. Marshall Space Flight Center contract awards: $2.1-million contract modification to RCA for continued support of RCA 110A computers for use in checkout and launch of Saturn IB and Saturn V launch vehicles, bringing total contract value to $12.7 million; and $1.8-million follow-on contract to Sanders Associates, Inc., to provide logistics and engineering support to Saturn V operational display systems at MSFC, bringing total value of contract to $3.9 million. (MSFC Releases 68-57, 68-58)

April 1: USAF awarded RCA $100,000 initial increment to $1.5-million fixed-price contract for study, evaluation, and testing of advanced electro-optical techniques for surveillance of high-altitude space vehicles. (DOD Release 288-68)

April 2: Senate Armed Services Committee, after hearing DOD witnesses in closed session, voted to appropriate $297 million--including $170 million for contract definition of Navy VFX-1 as possible replacement for F-111B--for continuation of USN's fighter-bomber program and procurement of F-4J Phantom jet aircraft. Committee had voted March 28 to deny the funds. Contract definition phase was expected to take 8 to 12 mo. (W Star, 4/3/68, A8)

. NASA and German Federal Ministry for Scientific Research (BMwF) were conducting series of four sounding rocket launches from Thumba Equatorial Rocket Launching Station (TERLS) to study upper atmosphere near Equator. NASA Nike-Apache sounding rockets ejected barium clouds between 90- and 120-mi altitudes to investigate electric fields in upper atmosphere region of intense electric current. Results would be available to world scientific community. BMwF was responsible for chemical payloads, photographic equipment, and cloud observation; Indian National Committee for Space Research provided launch services; and NASA supplied sounding rockets and rocket launcher. (NASA Release 68-58)

. President Johnson, in letter transmitting to Congress Fifth Annual Report on Communications Satellite Act of 1962, said: "[Report] reflects... steady progress toward the ultimate goal of providing mankind with new capabilities for worldwide communication. In the brief span of five years, satellite technology has grown dynamically. The possibilities envisioned in 1962 have been greatly exceeded...." Communications, he said must provide "'network for knowledge' so that all peoples can share the scientific, educational, and cultural advances of this planet....

"Failure to reach these goals can only contribute to apathy, ignorance, poverty and despair in a very large part of the world. Success in our telecommunications policies can be a critical link in our search for the understanding and tolerance from which peace springs. Communication by satellite is a tool--one of the most promising which mankind has had thus far--to attain this end." (Text; AP, W Star, 4/3/68, A7; PD, 4/8/68, 637)

April 2: Dr. John C. Houbolt, Executive Vice President of Aeronautical Research Associates of Princeton, Inc., received American Institute of Aeronautics and Astronautics Structures and Materials Award for his "original, definitive, and continous research leading to the use of random processes in aircraft gust loads design." (SBD, 4/4/68, 199)

April 3: U.S.S.R. successfully launched Cosmos CCX into orbit with 374-km (232.4-mi) apogee, 198-km (123-mi) perigee, 90.2-min period, and 81.3° inclination. Satellite reentered April 11. (SBD, 4/4/68, 197; GSFC SSR, 4/15/68)

. National Academy of Sciences president Dr. Frederick Seitz was elected president of Rockefeller Univ. to succeed Dr. Detlev W. Bronk, who would retire July 1. Dr. Seitz would divide his time between NAS and University until early 1969, when he would assume his full-time educational duties. Member of President's Science Advisory Committee and of DOD's Defense Science Board, which he chaired four years ending in March, Dr. Seitz had succeeded Dr. Bronk as NAS president in 1962. He was re-elected, as first resident, full-time president, in 1965 for six-year term. His principal field of research was theory of solids and nuclear physics. (Farber, NYT, 4/4/68; NAS-NRC-NAE News Report, 4/68)

. Dr. Harold A. Rosen, Assistant Manger of Hughes Aircraft Co.'s Space Systems Div. and Manager of Hughes Satellite Systems Laboratories, was named recipient of American Institute of Aeronautics and Astronautics first Aerospace Communications Award for his "leadership in making synchronous satellite communications a global reality, thereby opening a new challenge for the progress of mankind." Award also honored late Don Williams, former Chief Scientist for Communications Satellite Systems at Hughes, for "his early recognition, technical judgement, inventiveness, and singular dedication in pioneering the development and design of synchronous communications satellites." (AIAA News; AIAA PIO)

. USAF was flight-testing tactical photographic image transmission (TAPIT) subsystem which would enable tactical fighter aircraft to perform as reconnaissance vehicles. TAPIT, self-contained in pod mounted under aircraft wing with small control box in cockpit, took panoramic pictures from low altitudes; developed film in seven seconds; electronically scanned photos; and transmitted resulting signals from higher altitude to ground station within 100-mi radius, permitting military commanders in field to view photos of targets while fighter aircraft was still in target area. (AFSC Release 24.68)

April 3: Marshall Space Flight Center awarded IBM's Space Guidance Center $1.3-million contract for spare parts and logistic support of instrument units that guided Saturn IB and Saturn V launch vehicles. (MSFC Release 68-63)

April 4: NASA's Apollo 6 (AS-502) was successfully launched from Kennedy Space Center's Complex 39A at 7:00 am EST on mission to qualify Saturn V launch vehicle for future manned space flights. Primary objectives were to demonstrate structural and thermal integrity and compatibility of launch vehicle and spacecraft; confirm launch loads and dynamic characteristics; demonstrate S-II/S-IC and S-IVB/S-II stage separations; verify operation of propulsion (including S-IVB restart), guidance and control (optimum injection), and electrical systems; evaluate performance of Emergency Detection System (EDS) in closed-loop configuration; and demonstrate mission support facilities and operations required for launch, mission conduct, and Command Module (CM) recovery.

Launch vehicle 1st-stage performance was near nominal, but two of five 2nd-stage J-2 engines shut down prematurely, causing remaining 2nd-stage engines and 3rd-stage engine to burn longer than planned. As result, spacecraft and 3rd stage entered elliptical parking orbit with 223.1-mi (395.1-km) apogee, 107-mi (172.1-km) perigee, and 89.8-min period instead of planned circular orbit of 115-mi (175-km) altitude. When 3rd stage failed to reignite on command after two orbits as planned, NASA switched to alternate mission, firing Service Propulsion System (SPS) to place spacecraft into trajectory with 13,823-mi (22,225.4-km) apogee. Since insufficient propellant remained after extended burn, second SPS burn was not attempted and CM reentered at 22,376 mph, just under planned 25,000-mph rate. Spacecraft splashed down 50 mi off target in Pacific 9 hr 50 min after launch and was recovered in good condition by U.S.S. Okinawa. Preliminary assessment indicated that four of five primary objectives were attained, even though launch vehicle performance and S-IVB restart and guidance control (optimum injection) were not fully successful [see April 11 and 24].

Apollo 6 was second flight for Saturn V launch vehicle and boilerplate Lunar Module (LM) and fourth for operational Block I Command/Service Module (CSM). Spacecraft had been modified to include Block II heatshield and instrumentation for unmanned configuration; delete crew provisions; incorporate new unified quick-operating hatch and movie camera to record Launch Escape System (LES) jettison and reentry conditions; and relocate sequence camera for earth landmark photography. Apollo 4 (launched Nov. 9, 1967) and Apollo 5 (launched Jan. 22, 1968) had both been highly

April 4 (continued)
successful, completing inflight tests of all major pieces of Apollo hardware. Apollo program was directed by NASA Office of Manned Space Flight; MSC was responsible for Apollo spacecraft development, MSFC for Saturn launch vehicle development, and KSC for launch operations. Tracking and data acquisition was managed by GSFC under overall direction of NASA Office of Tracking and Data Acquisition. (NASA Proj Off; NASA Release 68-54K; W Post, 4/5/68, A18; UPI, W Star, 4/5/68, A3)

. NASA test pilot William H. Dana flew X-15 No. 1 to 185,000-ft altitude and 3,546 mph (mach 5.11) to test spray-on foam insulation, much lighter than previously used insulation, for use on Saturn V 2nd stage. Test, from Edwards AFB, was satisfactory, with X-15 performing in maximum-heating design trajectory close to that of Saturn V and sustaining temperatures of up to 1,500°F. (X-15 Proj Off; MSFC Release 68-69; AP, P Inq, 4/5/68)

. NASA Ames Research Center scientists Dr. William Quaide and Verne R. Oberbeck had developed method of calculating lunar soil depths using measurements based on Lunar Orbiter photos and Surveyor photos and surface analyses. Studies indicated that many of moon's smaller craters and much of soil and fragmental material on lunar surface were result of meteoroid impacts. By simulating impacts in laboratory and comparing results with photos of lunar craters scientists identified four crater types: (1) craters with up to 12-ft dia, round bottoms, and depths 25% of their diameter; (2) craters with 12- to 22-ft dia, flat bottoms, and central mound; (3) craters with 22- to 30-ft dia, flat bottoms, and no mound; and (4) craters with diameter greater than 30 ft with second crater gouged in flat bottom. Thick layer of fragmented material, calculated by new method to be up to 20 yd deep (8-yd maximum was calculated in preliminary surveys), coincided with densely-cratered areas to support impact theory. (NASA Release 68-59; SBD, 4/5/68, 202)

. USAF's Lincoln Experimental Satellite (LES-5) (launched July 1, 1967), first all solid-state UHF band comsat, had been used in first network of tactical terminals to include a comsat, first air-to-air link via satellite relay, and first communications link from high latitudes via satellite as part of USAF program to improve communications between aircraft. LES-5 was testing UHF teletype system which relayed 60-wpm messages over ground distances of up to 8,000 mi. Satellite's 20,000-mi-altitude orbit allowed line of sight stretching

April 4 (continued)
nearly halfway around the world. USAF proposed using system for communications between low-altitude attack aircraft and rear area controllers, for USAF worldwide logistic control and status reporting system, and for strike and reconnaissance reporting. (AFSC Release 23.68)

. Dr. William H. Pickering, Director of Cal Tech's Jet Propulsion Laboratory, spoke at Space Forum sponsored by American Institute of Aeronautics and Astronautics, American Astronautical Society, and Institute of Environmental Sciences in Washington, D.C. Describing first decade in space as "most productive...in history of technology," he forecast manned lunar operations including lunar laboratories before end of second decade and possible tour of Jupiter, Saturn, Uranus, and Neptune by single spacecraft in 1977--as well as dramatic yield from growing applications of near-earth satellites during decade.

Dr. Pickering urged initiation of "orderly planning cycle" to replace major programs being phased out. Emphasis of next phase was likely to be "gleaning more benefits" from space dollar expenditure. National Space Council estimated annual return from space would markedly exceed expenditures in 10 yr. (Text)

. NASA would negotiate $3.5-million, one-year, cost-plus-fixed-fee contract with General Electric Co.'s Apollo Systems Div. for Apollo Applications engineering support. GE, under direction of NASA Hq. Apollo Applications Program Office, would provide engineering support in areas of quality and reliability, configuration and data management, test, and checkout. (NASA Release 68-61)

. Marshall Space Flight Center contract activity: RCA was awarded $1.3-million contract to modify RCA 110 computer module boards, by systematically incorporating improved solder design.

IBM was issued $1.5-million supplemental agreement for adjustment and implementation of configuration management for fabrication, assembly, checkout, and delivery of 27 Apollo/Saturn instrument unit stages and other support equipment.

Air Products and Chemicals, Inc., received $2.3-million contract extension to supply 12 million lb liquid hydrogen by March 31, 1969, to MSFC, purchasing agent for Government agencies and their supporting contractors in eastern U.S.

Three one-year contract renewals, effective through March 31, 1969, were awarded for MSFC support services: $10.5 million to Brown Engineering Co. for services in Propulsion and Vehicle Engineering Laboratory, $4.5 million to SPACO Inc. for services

April 4 (continued)
in Quality and Reliability Assurance Laboratory, and $2.3 million to Hayes International for services in Manufacturing Engineering Laboratory. (MSFC Releases 68-64, 68-65, 68-66, 68-67)

April 5: ComSatCorp, on behalf of International Telecommunications Satellite Consortium (INTELSAT), leased antenna and related facilities at Fucino, Italy, earth station from Telespazio, Italian company for space communications. Fucino facilities, approved by INTELSAT's Interim Communications Satellite Committee (ICSC), would be used for tracking, telemetry, and command duties for INTELSAT comsats. (ComSatCorp Release 68-15)

. Crash of F-111A in Thailand March 30 had been caused by failure in terrain radar guidance system, newspapers said reliable sources reported. Aircraft had reportedly bucked and gyrated severely, forcing two crew members to eject. USAF team was conducting on-site investigation and was expected to report findings in two weeks. (Horton, AP, W Star, 4/5/68, A6; Beecher, NYT, 4/6/68, 10)

. Marshall Space Flight Center had awarded Harvard Univ. $1.9-million supplementary contract for development of UV scanning spectrometer to be flown as solar experiment on first launch of Apollo Telescope Mount. Award increased total value to $6.5 million for experiments for use with manned solar observatories. (MSFC Release 68-68; SBD, 4/8/68, 210)

April 6: USAF launched two unidentified satellites from Vandenberg AFB with Atlas-F booster. (UPI, C Trib, 4/8/68; SBD, 4/9/68, 220)

. Third anniversary of launch of 85-lb Intelsat I (Early Bird), world's first commercial comsat, owned by INTELSAT and managed by ComSatCorp. Although originally designed as experimental-operational satellite with 18-mo life expectancy, comsat launched by NASA into 22,300-mi-altitude synchronous orbit over Atlantic, was still providing reliable service between North America and Europe with 100% reliability. Intelsat I had received and transmitted more than 200 hr of TV, and thousands of telephone calls, data and record messages, and other general communications without satellite service outage. TV use of Intelsat I increased from 31 programs consuming 31 hr leased time in 1965 to 160 programs and 125 hr in 1967. Highlights of TV broadcasts

April 6 (continued)
included live coverage of Atlantic splashdowns of Gemini spacecraft, sports events, public affairs, and news programs. (ComSatCorp Release 68-16)

. New York Times editorial on Apollo 6 mission: "What was illustrated... was the extraordinary difficulty of assuring that every one of the literally millions of components in such an extremely complicated system as the Saturn 5 works perfectly. But the complexity of the total Apollo mechanism for the planned manned voyage to the moon...is even greater.... This fact argues for a slow but sure approach to future Apollo tests, rather than an adventuresome policy aimed primarily at completing the job by the end of 1969.

"Regrettable as were Saturn 5's deficiencies as demonstrated in this week's test, they provide a useful warning against renewed overconfidence and the costs it could again impose." (NYT, 4/6/68, 36)

. U.S. Embassy in Thailand reported arrival of two USAF F-111A aircraft at Ta Khli Air Base to replace aircraft lost in crashes March 28 and 30. Embassy spokesman said recovery operations for second F-111A lost had been completed and all components accounted for. (UPI, W Star, 4/7/68, A14; UPI, W Post, 4/7/68, A26)

April 7: U.S.S.R. successfully launched Luna XIV unmanned spacecraft toward moon "to conduct further studies of near-lunar space," Tass announced. All systems were functioning normally and spacecraft was traveling close to planned trajectory. (Anderson, NYT, 4/8/68, 1; AP, W Star, 4/8/68, A3; GSFC SSR, 4/15/68)

. Long-nosed USAF C-131 research aircraft was being developed for Air Force Systems Command by Cornell Aeronautics Laboratory, Inc., as a unique flying simulator to test various controls, instruments, and aircraft configurations of advanced aircraft such as Advanced Manned Strategic Aircraft (AMSA), military C-5A cargo and passenger aircraft, and SST. Total In-Flight Simulator (TIFS) configuration--with nose length varying to simulate advanced aircraft and with second cockpit below and ahead of main cockpit and six independent controls--would realistically reproduce handling conditions of modeled aircraft and enable USAF to determine inexpensively in advance correct design and instrumentation for advanced aircraft. (AFSC Release 45.68)

April 7: Washington Sunday Star editorial on Apollo 6 mission: "...Saturn 5's latest performance...suggests that our astronauts may not be able to carry out their lunar mission until considerably later than optimists have suggested--possibly not until 1971, if then.... However...it is better to be safe than sorry. Saturn 5's deficiencies must be eliminated, no matter how long the job takes, before it is used to lift a manned Apollo spacecraft to the moon. Despite loose talk about a Soviet-American 'space race', there should be no all-out drive, no senseless rush, to score a first in this field." (W Star, 4/7/68, F1)

. Sidney A. Cariski, NASA Chief of Support Operations, Procurement Management, became Director of Procurement Management, Management Operations, Office of Manned Space Flight. He succeeded Daniel A. Linn, who resigned to enter private industry. (NASA Ann)

April 8: NASA selected Teledyne Systems Co. for negotiation of $950,000 15-mo contract to design and construct prototype airborne digital computer unit for Centaur launch vehicle's guidance and control system. Contract, which would include option for five additional units with required ground support equipment and spare parts, would be managed by Lewis Research Center. (NASA Release 68-64)

. Harold D. Babcock, 40-yr member of Mt. Wilson and Mt. Palomar Observatory staffs, died. He was specialist in study of spectra of sunspots and discoverer of fact that magnetic field of sun reversed polarity periodically. (NAS-NRC-NAE News Report, 5/68, 10)

April 9: U.S.S.R. successfully launched Cosmos CCXI. Orbital parameters: apogee, 1,545 km (960 mi); perigee, 199 km (123.6 mi); period, 102.1 min; and inclination, 81°. (SBD, 4/10/68, 266; GSFC SSR, 4/15/68)

. NASA launched two Javelin sounding rockets from NASA Wallops Station. One carried GSFC payload to 497-mi (800-km) altitude to observe helium ionization levels in exosphere with vacuum-ion chamber and to observe helium and oxygen-ion resonance dayglow with filtered photometer. Rocket and instrumentation performance was satisfactory. Telemetry signal was received for 16 min 40 sec. Second rocket carried Syracuse University Research Corp. vacuum-ion chamber to observe helium ionization levels in exosphere and Univ. of Southern California filtered photometer to observe helium- and

April 9 (continued)
oxygen-ion resonance dayglow to 497-mi (800-km) altitude. Rocket and instrumentation performed satisfactorily. (NASA Rpts SRL)

Federal Aviation Administration awarded $3.8-million contract to IBM's Federal Systems Div. to modernize air traffic control at 100 U.S. facilities by installing printers and keyboards to produce and initiate aircraft flight data. Equipment would provide faster coordination and reduce controllers' oral workload. Delivery of equipment, to begin April 15, would be coordinated with delivery of other automation components for National Airspace System. (FAA Release 68-24)

April 9-10: Electronic signals on medical condition of USMC volunteer patient in Tokyo were transmitted between Toyko, Houston, and Washington, D.C., via satellite and terrestrial equipment to show how worldwide diagnosis of complex medical problems could be achieved by advanced means of communications. INTELSAT II/F2 (Pacific I) comsat and AT&T landline facilities were used in demonstration for 1968 National Telemetry Conference of Institute of Electrical and Electronics Engineers (IEEE) in Houston. Signals were relayed from Brewster Flat, Wash., earth station to Conference and to computer centers at U.S. Public Health Service in Washington, D.C., and Univ. of Texas. Demonstration was directed by ITT World Communications, Inc., with cooperation of ComSatCorp and Kokusai Denshin Denwa Co., Ltd., Japan. (ComSatCorp Release 68-17; AP, W Star, 4/10/68, A18; UPI, W Post, 4/12/68, A15)

April 10: U.K.'s Jodrell Bank Experimental Station reported that U.S.S.R.'s Luna XIV spacecraft had apparently entered lunar orbit and was transmitting telemetry but no photographic signals. U.S.S.R. had made no official statement since April 7 launch. (UPI, NYT, 4/11/68, 4; Cohn, W Post, 4/11/68, A27)

. Ernest W. Brackett, Special Assistant to NASA Assistant Administrator for Industry Affairs, was appointed Chairman of NASA Board of Contract Appeals, succeeding E. M. Shafer who became Chairman of NASA Contract Adjustment Board. Matthew J. McCartin, Goddard Space Flight Center, was appointed Vice-Chairman. (NASA Release 68-65)

April 11: Luna XIV had entered orbit around moon "close to the calculated one" to study correlation between earth and moon and collect data necessary for landing cosmonauts on moon, Tass announced in first official statement since April 7 launch. Satellite had entered lunar orbit April 10 with 870-km (540.6-mi) apolune; 160-km (99.4-mi) perilune, and 2-hr 40-min period. (UPI, W Star, 4/11/68, A3; SBD, 4/12/68, 239-40; Reuters, NYT, 4/14/68, 8)

. Marshall Space Flight Center issued report containing preliminary results of April 4 Apollo 6 flight. Although "basic source of the difficulties" had not yet been determined, scientists and engineers speculated that wires carrying cutoff commands to the malfunctioning engines were interchanged. First stage had performed as planned and stage thrust was near predicted during first portion of flight. Second stage had performed satisfactorily through 1st-stage boost, 2nd-stage ignition, and early portion of 2nd-stage powered flight. First indications of anomaly were decreasing temperatures on main oxidizer valve and its control line on fifth engine and steady decrease in second engine's yaw actuator pressure. Third stage performed satisfactorily through first burn and orbital coast. Although engine and stage prestart conditions appeared normal, engine received start signal, and valves opened properly, engine did not restart. Initial data suggested that leak in one of two propellant lines to engine's augmented spark igniter may have caused insufficient or inadequately mixed propellant for proper start condition. Investigations were continuing on longitudinal oscillation of vehicle. Guidance and other instrumentation functions, telemetry performance, and onboard TV camera operation were satisfactory. (MSFC Release 68-74; AP, NYT, 4/12/68, 20)

. USAF and NASA had agreed to consolidate their photographic operations at Eastern Test Range under one contractor to save estimated $1 million first year. Single contractor, selected by competitive bid, would report to ETR contract manager. USAF and NASA each would provide one technical manager to monitor performance. New operation would be effective Jan. 1, 1969. (KSC Release 68-151)

. V/A Hyman G. Rickover (USN), testifying before House Committee on Banking and Currency hearings on H.R. 15683 to renew the Defense Production Act of 1950 as amended, warned against emergence of "fourth branch of government," a partnership of federal bureaucrats and giant corporations "with men exerting power without political responsibility." DOD's industry-oriented philosophy, lack of inhouse capability, and absence of standardized accounting procedures

April 11 (continued)
permitted government subsidization of civilian business of defense contractors and cost U.S. taxpayer billions of dollars, he said. (Transcript; Porter, W Post, 5/2/68, G2)

April 12: NASA would negotiate $900,000, one-year, cost-plus-fixed-fee contract with Chrysler Corp.'s Space Div. to study needs and configuration alternatives for an intermediate payload launch vehicle in post-1973 space operations. Payloads under consideration included long-duration manned operations in low earth orbit, unmanned satellites in synchronous orbit, logistic support for manned lunar exploration, and unmanned planetary and deep space probes. Contract would be managed by OMSF. (NASA Release 68-67; Sehlstedt, B Sun, 4/13/68)

April 14: Cosmos CCXII was successfully launched by U.S.S.R. into orbit with 200-km (124.3-mi) apogee, 180-km (111.8-mi) perigee, 88.3-min period, and 51.6° inclination. Satellite docked with Cosmos CXIII April 15 and reentered April 19. (AP, B Sun, 4/15/68; UPI, NYT, 4/15/68, 86; GSFC SSR, 4/15/68)

April 15: U.S.S.R. successfully launched Cosmos CCXIII into orbit with 254-km (157.8-mi) apogee, 186-km (115.6-mi) perigee, 89.1-min period, and 51.6° inclination. At 1:21 Moscow time (3:21 Baykonyr time) satellite was automatically docked with Cosmos CCXII (launched April 14). Tass later announced that satellites used "special closing-in systems, radio, technical and computing devices, to carry out an automatic mutual search, closing-in, docking, and rigid coupling to each other." Maneuver was second automatic docking in space and was filmed by TV cameras on board both satellites. U.S.S.R. had successfully accomplished first automatic docking Oct. 30, 1967. First successful manned docking had been conducted by U.S. March 16, 1966. Cosmos CCXII and Cosmos CCXIII remained docked in near-circular orbit 3 hr 50 min and were then separated automatically by ground command and placed into different orbits. Cosmos CCXII reentered April 19 and Cosmos CCXIII, April 20. (W Post, 4/16/68; NYT, 4/16/68; B Sun, 4/16/68; SBD, 4/16/68, 255-6)

. Flight reenactment had revealed that USAF F-111A aircraft crash March 30 had been caused by malfunction of flight control system, press said informed sources reported. Second F-111A, which North Vietnam claimed to have shot down, was still missing; U.S. officials

April 15 (continued)
speculated that aircraft had crashed in Thailand jungle area. (UPI, NYT, 4/16/68, 22; W News, 4/16/68, 7)

. Defense Projects Support Office (DPSO) was established in Special Programs Office at NASA Hq. to manage specialized tasks where NASA's unique capabilities could provide needed support to a limited number of DOD projects. M. J. Raffensperger, Director, Advanced Manned Missions Planning and Operations, Office of Manned Space Flight, was appointed Deputy Director of Special Programs Office and Acting Director of DPSO. (NASA Release 68-66; NASA Ann, 4/17/68)

. Lawrence A. Hyland, Vice President and General Manager of Hughes Aircraft Co., was selected by National Aeronautic Association to receive the Robert J. Collier Trophy for significant achievement in aeronautics and astronautics in 1967 as Hughes Surveyor program director. Trophy would be presented May 7. (NAA Release; AP, W Post, 4/16/68, A3)

. Tass announced issuance of three stamps commemorating Soviet space achievements: March 18, 1965, space walk by Alexei Leonov; Oct. 30, 1967, automatic docking of two Cosmos satellites; and Oct. 18, 1967, softlanding of Venus 4 on Venus. (W Post, 4/15/68, C20)

April 16: NASA Associate Administrator Dr. Homer E. Newell summarized Earth Resources Survey program at Fifth Symposium on Remote Sensing of Environment at Univ. of Michigan's Institute of Science and Technology in Ann Arbor. Prospects in field were promising, he said, but only projects which could not be completed using aircraft or ground-based techniques or which could be done better or more economically using space should be investigated. Greatest use of satellites for earth survey to date was for meteorological data, including global cloud-cover photos, cloud motion, and ocean temperatures, Dr. Newell explained, but U.S. still lacked "much of the data essential for worldwide long-range weather forecasting," such as data on three-dimensional fields of density, wind velocity, temperature, and water vapor within the atmosphere. Major contributions expected from research in other fields included: completion of geodetic programs which would permit determination of relative positions of any two points on earth with improved accuracy; monitoring of sea surface state, evaluation of marine biological resources, and surface observations of conditions of interest to

April 16 (continued)

oceanographers; and improved identification of spectral signature of various species for agriculture, forestry, and geology. (Text; SBD, 4/19/68, 280)

. John N. Wilford, writing in New York Times, described decline in U.S. space expenditures since 1966. "Under pressure from the war in Vietnam, civilian space spending has dropped from $5.9-billion in the peak year of 1966 to $4.8-billion this year, and it is expected to drop much lower in the fiscal year starting in July. Employment in space work at private companies, universities and Government centers has declined from 420,000 in 1966 to fewer than 300,000 today, and it is still dropping at the rate of 4,000 a month." Signs of decline were clearly visible, Wilford noted, in "ghost towns" that were once test sites, and in removal of numerous projects from NASA's post-Apollo plans. Fortunately, impact of cutback was softened because NASA had not replaced many personnel who ordinarily left agency each year and because personnel dismissed were absorbed by growing aircraft industry and expanding military space program. But there was a growing feeling, Wilford said, "that once astronauts have landed on the moon, they will have no other place of significance to go for several years because of sharp budget cuts. These cuts have trimmed to the bone all preparations for future missions. It is as if the astronauts are heading for a dead-end on the moon." (NYT, 4/16/68, 1, 36)

. U.K. Minister of Technology Anthony W. Benn announced that U.K. would withdraw from European Conference on Satellite Communications and would make no new committments to European Launcher Development Organization (ELDO), though it would increase its contribution to European Space Research Organization (ESRO) by up to 6%. U.K. officials reportedly said decision not to participate in proposed project for experimental European TV relay satellite was made in effort to avoid unrealistic projects and concentrate on nonspace aircraft and computer industries. (Shuster, NYT, 4/17/68, 79; Mott, W Post, 4/17/68, A11)

. MSFC awarded Ball Brothers Research Corp. $134,500 contract for six solar sensor systems, including one prototype and five flight units, for Apollo Telescope Mount pointing control system. (MSFC Release 68-76)

pril 17: USAF launched unidentified satellite from Vandenberg AFB using Titan IIIB-Agena D booster. (UPI, W Post, 4/18/68; SBD, 4/18/68, 275)

. NASA's Marc 42A2 Arcas booster launched from NASA Wallops Station carried GSFC payload to 4.8-mi (7.8-km) altitude in ballistic performance evaluation test. Booster and instrumentation performed satisfactorily, with ballistic parameters agreeing closely with predictions. (NASA Rpt SRL)

. USAF F-111A aircraft crash March 30 in Thailand had been caused by "a mechanic's mistake, not by a flaw in design," U.S. military command announced. Recovered aircraft revealed that pilots lost control of aircraft because tube of sealant normally used to seal fuel tanks was left loose in aircraft, hardened during low-temperature flight, and jammed flight-control system. Loss of another F-111A March 28 remained mystery and search in Thailand area where it presumably crashed had ended unsuccessfully. (UPI, W Post, 4/16/68, A8; Carroll, B Sun, 4/18/68, A5)

. Charles W. Mathews, Director of NASA Apollo Applications Program told National Space Club in Washington, D.C., that NASA's manned space plan, beyond first Apollo landing, "contemplates a balanced activity of lunar exploration and extension of man's capabilities in earth orbit." Program had been designed for flexibility so activities could be conducted in harmony with available resources. "We are also prepared to move forward at an increased pace when it is desirable and possible to do so," he said. Both civil benefits and national security implications of space program warranted continued strong support. Contingency planning would leave more room for budgetary or goal changes, thus placating critics in Congress who claimed NASA had not provided them with sufficient flexibility. Manned space flights were to be resumed by both U.S. and U.S.S.R. in near future. (Text; Lannan, W Star, 4/18/68, A5; AP, B Sun, 4/18/68, A11)

. Sen. Margaret C. Smith (R-Me.), ranking member of Senate Committee on Aeronautical and Space Sciences, on Senate floor presented Government Accounting Office review of source selection and award of major subcontract by NASA and its prime contractor, Grumman Aircraft Engineering Corp., for development of landing and rendezvous radar equipment for Apollo Lunar Module, compiled at her request. Sen. Smith explained that although another electronics firm had expressed interest in performing under fixed-price contract, RCA

April 17 (continued)
had received contract because of agreement between Grumman and RCA "before the requirements and specifications for the radar components had been defined." Noting that RCA estimated cost of $23.4 million had now increased to about $112 million, she suggested that if Grumman radar subcontract was illustrative of how NASA "maintains surveillance over its appropriated funds, it would appear that substantial savings could be realized merely by strengthening the agency's contracting practices." (NASA LAR VII/36; CR, 4/17/68, S4138-46; AP, B Sun, 4/23/68, A5)

. NASA had awarded Aerojet General Corp.'s Space Div. $316,776 contract to perform preliminary design of spacecraft for basic research on frog's balance mechanism (otolith) under weightlessness and repeated acceleration. Project, initial step in NASA's Human Factor Systems Program to investigate primary balance mechanism within inner ear, would be managed by NASA Wallops Station under direction of Office of Advanced Research and Technology. Ames Research Center would be responsible for otolith experiment package designed by Johns Hopkins Applied Physics Laboratory. (WS Release 68-8; NASA Release 68-71)

. MSFC awarded nine-month, $99,000 contract to Raymond Loewy/William Snaith, Inc., to conduct habitability studies of planned earth orbital space stations. Basic goal would be to ensure that workshop configurations were comfortable and functional structures in which to live and work. (MSFC Release 68-79)

. Naval Research Laboratory scientist Dr. Richard C. Henry, speaking at dedication of NRL's new E. O. Hulburt Center for Space Research in Washington, D.C., presented data strongly supporting closed universe concept. Aerobee sounding rocket launched from White Sands Missile Range Sept. 7, 1967, carrying soft x-ray detector, had detected radiation from large, unexpected amount of thinly-spread intergalactic hydrogen gas, evidence of existence of intergalactic matter previously supposed but undetected. Amount detected indicated presence of 100 times as much matter between galaxies as in all stars in universe--enough to fill up all space and satisfy all theoretical requirements for a closed universe. (Text; Cohn, W Post, 4/18/68, 1)

. Editorial comment on Soviet space achievements, including successful orbiting of Luna XIV and docking of Cosmos CCXII and CCXIII, urged U.S. to acknowledge challenge:

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"The Soviet Union's sense of purpose in space is apparently as steady and unwavering as it ever was. The U.S...after coming up fast from behind in a wave of feverish anxiety and enthusiasm, now seems to have lost interest. That could be a dangerous--even fatal--tendency in an age where space is of key importance to the security of the Nation. It should be reversed, before great harm is done." (P Inq, 4/17/68)

"If we muff what now looks like a good chance to beat the Russians to the moon with manned space ships, the prestige loss to this nation will probably be immeasurable. And if our space people aren't paying at least as much attention as the Russians to the military possibilities of space, then we are in grave danger and growing more so. All of which adds up...to a whole string of dire warnings to Congress not to be stingy about space projects of any description." (NY News, 4/17/68)

April 18: U.S.S.R. launched two Cosmos satellites. Cosmos CCXIV entered orbit with 370-km (229.9-mi) apogee, 199-km (123.6-mi) perigee, 90.1-min period, and 81.3° inclination. Satellite reentered June 26. Cosmos CCXV entered orbit with 403-km (249.4-mi) apogee, 255-km (158.4-mi) perigee, 91.1-min period, and 48.4° inclination. (SBD, 4/22/68, 292; GSFC SSR, 4/30/68)

. NASA announced appointment of two new members to Aerospace Safety Advisory Panel: Dr. C. D. Harrington, President of Douglas United Nuclear, Inc., for six-year term; and S. T. Harris, Officer of the Board, Texas Instruments, Inc., for four years. (NASA Release 68-72)

. Langley Research Center selected Northrop Corp.'s Norair Div. for negotiations on $2-million contract to design and construct differential maneuvering simulator. System, consisting of two identical piloted flight simulators linked electronically through central computing equipment, would be used to study future aerospace vehicle concepts. (NASA Release 68-74)

April 19: Sixty-day simulated earth-orbital mission for four UCLA students ended when they left McDonnell Douglas Corp. Missile & Space Systems Div. space cabin simulator [see Feb. 21]. Although students had tired of food and missed female companionship, attending doctor said they remained in good health. On leaving simulator they first noticed extreme humidity and "myriad smells

April 19 (continued)
and odors in normal air." Experiment had included cycles of rest and work, testing air-water samples, and manning scientific equipment. (AP, B Sun, 4/20/68, A3)

. Page Communications Engineers, Inc., and government of South Vietnam were negotiating agreement to permit Page to finance and construct $7-million earth station in Vungtau. Station, which would be used with ComSatCorp satellite to be launched in November, would have 60-channel capacity initially and would be able to expand to 120. South Vietnamese government would receive 20% of gross revenues--expected to total $4-5 million annually--for first five years and 50% for second five years, after which operation would be turned over to a South Vietnamese corporation. (Page PIO; Wilson, W Post, 4/19/68)

. NATO's Nuclear Planning Group had concluded that construction of a European ABM defense system was not justified under present circumstances, Robert C. Doty reported in New York Times. Recommendation, he said "which appears certain to be endorsed by the alliance as a whole, ends for the foreseeable future Europe interest in any multi-billion-dollar project to match the anti-missile screen now under construction by the Soviet Union."

U.S. decision in 1967 to build Sentinel ABM system to prot against possible Chinese Communist attack had promoted NATO rev of Europe's nuclear defense. Nuclear Planning Group, in two-da meeting at The Hague, had concluded that defense system, secure against "multimethod, all-out strike by a major nuclear power," was not financially or technically feasible and called for "good offense," maintaining nuclear stalemate; continual review of ABM defense; and acceptance of program for future planning and consultation with U.S. even after the pending nonproliferation treaty became effective. (Doty, NYT, 4/20/68, 2)

April 20: U.S.S.R. successfully launched Cosmos CCXVI. Orbital parameters: apogee, 265 km (164.7 mi); perigee, 195 km (121.2 mi); period, 89.1 min; and inclination, 51.8°. Satellite reentered April 28. (Anderson, NYT, 4/21/68, 28; W Star, 4/21/68, A5; GSFC SSR, 4/30/68)

. NASA Astrobee 1500 sounding rocket launched from NASA Wallops Station carried Univ. of Minnesota experiment to 776-mi (1,250-km) altitude to study levels of electric and magnetic

April 20 (continued)
field variations in magnetosphere, check operation of antenna systems for use on satellite, and verify vehicle design changes. Rocket performed satisfactorily. Instrumentation suffered partial failure, but cause had not been determined. (NASA Rpt SRL)

. White House announced that accelerated clearance system to facilitate entry for incoming passengers would be tested at John F. Kennedy International Airport in New York. One-man, multi-agency inspection would be reinforced by monitoring by specialists representing Customs, Agriculture, Immigration, and Public Health and by computerized information, to maintain security. (PD, 4/29/68, 696-7)

April 20-21: Technical review of Saturn launch vehicles, attended by about 140 scientists, engineers, and administrators, was held at Marshall Space Flight Center. Participants investigated status and flight schedule of Saturn launch vehicles. (MSFC Release 68-77; UPI, W Star, 4/21/68, A5)

April 21: U.S.S.R. successfully launched eighth Molniya I comsat. Orbital parameters: apogee, 39,719 km (24,680.2 mi); perigee, 414 km (257.2 mi); period, 11 hr 53 min; and inclination 65°. (UPI, NYT, 4/23/68, 34; GSFC SSR, 4/30/68)

. Soviet scientists reported that automatic docking of Cosmos CCXII and CCXIII April 15 had occurred only 47 min after pursuit vessel was launched. Cosmos CCXII (launched April 14) was orbiting earth at 225.3-km (140-mi) altitude and 17,500 mph when Cosmos CCXIII entered orbit three miles from it. According to Tass, satellites repeatedly changed their orbits, reoriented, maneuvered in space, and conducted various scientific experiments during four days in orbit. Soviet scientists had reportedly developed three launch systems for spacecraft intended for automatic docking in orbit: (1) simultaneous side-by-side launch with docking maneuvers beginning immediately after spacecraft separated from launch vehicles; (2) separate launches from same or different sites with second spacecraft launched as close as possible to first spacecraft in orbit as it passed over launch site [method used for April 15 docking]; and (3) separate launches of spacecraft into same plane, but with distances between them great enough to require several orbital corrections and maneuvers to close gap. (Anderson, NYT, 4/22/68, 9; SBD, 4/23/68, 296-7)

April 21: NASA announced appointment of Dr. Henry J. Smith, Deputy Director of Physics and Astronomy Programs, OSSA, as Deputy Associate Administrator for Space Science and Applications (Science), replacing Dr. John E. Naugle who was reassigned Oct. 1, 1967. Dr. Smith would be Chief Scientist for OSSA, responsible for obtaining and implementing scientific advice for the national space program. (NASA Release 68-70)

. Jet Propulsion Laboratory soil sciences group, headed by Dr. Roy E. Cameron, reported tests and cultures of Antarctic soil samples in JPL's walk-in freezer laboratory to determine what types of micro-organisms live in extreme cold and to help determine whether life existed on Mars. JPL soil samples had come from high, dry valleys in Victorialand near U.S. base at McMurdo, Antarctica. Scientists discovered bacteria, yeasts, molds, and algae, which began to grow within two weeks when Antarctic soil kept laboratory-frozen for over one year was subjected to temperature 68°F or above. Studies were sponsored by NASA and National Science Foundation. (NASA Release 68-73)

April 22: Representatives of 43 nations signed space rescue treaty at separate ceremonies in Washington, D.C., London, and Moscow. At State Dept. ceremony in Washington, D.C., President Johnson said he hoped treaty would end wasteful competitive spacemanship between U.S. and U.S.S.R. and that next decade in space would increasingly become a partnership. Treaty, which provided for assistance to astronauts in emergency and safe return of astronauts and space hardware, had been unanimously approved by U.N. General Assembly Dec. 19, 1967. It would become effective when ratified by U.S., U.S.S.R., U.K., and two other countries. (Ward, B Sun, 4/23/68, 1)

. New York Times editorial on cuts in NASA FY 1969 budget: "Now that the desired space research capability has been created, it is merely good sense to shift some of the resources thus employed to other and more urgent national needs...[such as] cleaning up the nation's polluted air and water, providing high-speed land transportation, or working out faster and cheaper ways to build new housing to replace the noxious and overcrowded slums....

"None of this means...that the United States will or should abandon the effort to explore space and exploit space technology.... But for the moment the new relatively svelte--though still very adequate--space program meets the nation's needs quite generously. (NYT, 4/22/68; CR, 5/1/68, E3646)

April 22: Editorial comment on Soviet space achievements: "Preoccupied with...Vietnam, stunned by riots at home, most Americans couldn't care less...[but] they shouldn't neglect the Soviet space challenge....

"Americans need a space program equally far-sighted.... Because it takes years to prepare for space missions, the United States might again be caught off guard by a Russian spectacular in the 1970's." (CSM, 4/22/68, 23)

April 22-24: NASA Deputy Administrator Dr. Thomas O. Paine visited Marshall Space Flight Center, Mississippi Test Facility, and Michoud Assembly Facility for tours and briefings. He was accompanied by Deputy Associate Administrator (Technical), Office of Manned Space Flight, Harold T. Luskin; Executive Officer, Office of Administrator, Col. Clare F. Farly (USA, Ret.); Aerospace Safety Advisory Panel member Dr. Charles D. Harrington; NASA Safety Director Bob P. Helgeson; and Executive Assistants James Long and Carl R. Praktish. (MSFC Release 68-86)

April 23: Senate Committee on Aeronautical and Space Sciences heard testimony in support of NASA FY 1969 budget from prominent U.S. scientists. Dr. Harry H. Hess, Princeton Univ., presented statement for the record by National Academy of Sciences President Dr. Frederick Seitz. Space program, Dr. Seitz said, was "the latest and one of the greatest human exploratory adventures in a long sequence that has enriched mankind. It offers us the promise of extending the range of our domain...to the entire solar system. We can expect many benefits along the way, some of conceptual and some of direct material value...but those which will prove to be the most rewarding are probably, in the main, still hidden from us over the horizon."

Dr. John A. Simpson, Enrico Fermi Institute and Univ. of Chicago, noted: "Researches in space have made, through the bold programs which NASA established with universities in the early 1960s, major contributions to the critical problems of generating, developing and retaining first-class scientific manpower.... The great fear at present...is that the momentum established will be dissipated by the preferentially deep budgetary cuts made by NASA in those areas which most affect the universities." He stressed "deeply felt conviction" that U.S. was "in danger of unwittingly destroying what we wish to save and need...pre-eminence in science and technology which is crucial for each major problem of the nation, from proverty to war." Actions taken in Congress in 1968 might "largely determine whether the U.S. will retain its leadership in the space sciences."

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Dr. Simpson also said beginning on Pioneer concept was "urgent," stating it was "absolutely clear that discoveries important for the progress of science and technology may be made by...experiments and observations on spacecraft moving outward from the orbit of the Earth...the program is not a gamble and a hope, but an objective of high importance and certain to produce fruitful results." (Testimony; NYT, 4/24/68, 24; W Star, 4/24/68, A21)

. Aerobee 150 MI sounding rocket launched from White Sands Missile Range carried Univ. of Colorado experiment to 111.9-mi (185.4-km) altitude to measure intensity of spectral lines in 3,400-1,100Å band. Rocket and instrumentation performed satisfactorily. (NASA Rpt SRL)

. Eleventh Saturn IB booster was successfully static fired at Marshall Space Flight Center at 1.6 million-lb thrust for 145 sec by Chrysler Corp. personnel. It would be returned to Michoud Assembly Facility for post-static checkout. Twelfth Saturn IB was enroute to MSFC for static firing. (MSFC Release 68-85)

. NASA announced that model of wheel-shaped planetary landing craft, sterilized by heat and dropped from 250-ft altitude April 4 by Jet Propulsion Laboratory, had operated successfully after impacting dry lake in Mojave Desert at 80 mph--major step in demonstrating feasibility of sending lightweight scientific landing capsule to Mars. Craft's radio transmitter turned on 30 sec after craft struck surface and operated 20 min. Anemometer deployed automatically 3 min after impact, to measure wind velocity. Following mission profile identical to projected Mars surface operations, radio turned on again 22 hr after initial transmission (when earth would again be in view). Signals from 3-w transmitter were received for another 40 min to conclude test. Craft was powered by 12-cell, silver-zinc battery, first known to survive both heat sterilization and high-velocity impact. (NASA Release 68-69; JPL Release 473)

. Stanford Univ. physicist Dr. William M. Fairbank, speaking at American Physical Society Meeting in Washington, D.C., described experiments on superconducting accelerators that would enable scientists to accelerate electrons faster and for longer periods and, possibly, to produce 10 times as much energy as world's present most powerful accelerator, 2-mi-long, 20-bev Stanford Linear Accelerator (SLAC). By immersing accelerator in liquid helium cooled to absolute zero, energy loss could be reduced so much that electrons could be fired

April 23 (continued)
continuously and accelerator kept at constant temperature. SLAC currently could be fired for only 0.001 sec because of excess heat generated by pulse. Experiments, preliminary to construction of $5-million, 500-ft-long prototype accelerator, had been conducted on 5-ft model. (Sullivan, NYT, 4/24/68, 26C; O'Toole, W Post, 4/24/-68, A17)

. Marshall Space Flight Center announced award of $1,400 to MSFC Test Laboratory Engineer John A. Hauser for invention of five-module system for purifying and filtering gas to purity necessary for use in development of Saturn rockets. (MSFC Release 68-82)

. NASA announced swearing in of Dr. Waino W. Suojanen, Chairman of Univ. of Miami's Dept. of Management, as a consultant to NASA Administrator James E. Webb. Dr. Suojanen would serve as a member of NASA Management Advisory Panel which reviewed NASA's pattern of administration and advised NASA Administration on specific aspects of organization and management. (NASA Release 68-78)

. MSFC announced appointment of Keith Wible, chief of MSFC's Manpower Utilization and Administration Office, as head of new manpower utilization system for NASA Hq Operations Management Office, OMSF. He would be succeeded by Paul L. Styles, head of MSFC's Labor Relations Office. (MSFC Release 68-83; Marshall Star, 4/24/68, 1)

. NASA announced that Astronaut Brian T. O'Leary had withdrawn from astronaut training program because he disliked piloting aircraft. Dr. O'Leary, who had completed 15 hr flying time in training program at Williams AFB, Ariz., hoped to remain with space program as researcher in planetary astronomy. Astronaut F. Curtis Michel, had received special permission to spend 80% of his time teaching and studying at Rice Univ. and 20% in astronaut training for one year. (MSC Release 68-32; AP, W Star, 4/24/68, A2; W Post, 4/24/68, 4)

. U.S. and U.S.S.R. had included "little-publicized sanctions" in proposed nonproliferation treaty, John W. Finney reported in New York Times. "Unless they sign the treaty or accept its requirements for international inspection over all their atomic activities, [reluctant] nations may find themselves cut off from assistance in developing the peaceful uses of atomic energy." Such nations would not be able to purchase atomic power plants or to obtain **nuclear** fuel from U.S. or

April 23 (continued)
U.S.S.R. Further, the European Atomic Energy Community would not receive fuel unless it entered into inspection agreement within two years with International Atomic Energy Agency. (NYT, 4/24/68, 1)

April 24: U.S.S.R. successfully launched Cosmos CCXVII into orbit with 182-km (113.1-mi) apogee, 150-km (93.2-mi) perigee, 87.6-min period, and 62.2° inclination. Satellite reentered April 26. (GSFC SSR, 4/30/68)

. NASA Apollo Program Director M/G Samuel C. Phillips (USAF) told press at NASA Hq. briefing that Apollo 6 mission, in spite of anomalies, was "a safe mission from a crew safety standpoint" as demonstrated by spacecraft's recovery in excellent condition after performing an alternate mission. He cited three substantial technical problems--J-2 engine failure because of fuel leak, amplitude of oscillations during 1st-stage burn (POGO effect), and apparent separation of large piece of paint or skin from Lunar Module adapter during ascent--and one procedural problem--premature shutdown of second of two 2nd-stage engines because of wiring error made by North American Rockwell Corp. which was not discovered by NASA in pre-launch tests. He said all could be corrected.

From demonstrations of Apollo 4 (launched Nov. 9, 1967) and information gained from Apollo 6 Gen. Phillips said he had determined "the course of action...necessary to correct and demonstrate the correction of the problems and...recommended to the Administrator of NASA that we proceed with preparations for the manned flight of 205 with the 101 spacecraft which is planned to be the first manned flight in Apollo, and...a Saturn IB...." He also recommended that NASA prepare third Saturn V (No. 503) for manned flight in late 1968 with option to revert to unmanned mission if necessary corrections did not meet requirements to ensure crew safety on manned mission. NASA Administrator James E. Webb's decision on Gen. Philips' recommendation was expected shortly. (Transcript; W Post, 4/25/68, A9)

. NASA Administrator James E. Webb urged Senate Committee on Aeronautical and Space Sciences to restore $48.3 million cut by House from NASA FY 1969 budget request for nuclear rocket program. Webb stressed importance of proceeding with U.S. development of nuclear rocket propulsion as part of total capability in aeronautics and space to: (1) meet potential civil or military requirements for space vehicles and missions;

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(2) avoid short-sighted cutoffs or constraint of promising new technological developments because they had no specific justifi in advance; (3) prove that U.S. "does not intend to limit its d ment of large launch vehicles and payload capabilities" to Satu class; and (4) serve as "central focus for continuing advance in nuclear and other technologies involved."

Responding to questions, Webb cited recent Soviet developme of fractional orbital bombardment system, automatic docking fligh and maneuvering of heavy payloads in orbit as evidence U.S.S.R. w "not neglecting any important capabilities.... Everything I know indicates they are still probing for those areas that will put the ahead the fastest and give them the lead over us that we cannot overcome in a short time." (Testimony; SBD, 4/25/68, 309; NYT, 4/25/68, 16)

. Univ. of Wisconsin professor Dr. William Kraushaar, speaking at dedication of new $4.3-million Center for Space Research at MIT, reported discovery by NASA's OSO III of high intensity of gamma rays flowing from center of Milky Way. Dr. Kraushaar said finding was first observation to support theory that galaxy centers were rich reservoirs of cosmic rays. (Wilford, NYT, 4/27/68, 40)

. U.S. leadership in physics "very likely" would soon be overtaken by U.S.S.R. and Western Europe, Dr. Marvin L. Goldberger, professor of physics at Princeton Univ., said at 105th Annual Meeting of National Academy of Sciences in Washington, D.C. Dr. Goldberger, chairman of symposium on current advances in high-energy physics, and other physicists attributed threatened loss of leadership to budget cutbacks and U.S. failure to develop apparatus for producing colliding beams of high-energy particles which would permit exploration of realms of physics inaccessible by other experiments. Plans for accelerators at Stanford Univ. and at Weston, Ill., provided for storage rings for experiments, but there seemed to be no early prospect for their construction. (Text; Sullivan, NYT, 4/25/68, 17)

. ComSatCorp reported $1.8-million net income (18 cents per share) for first quarter of 1968--$569,000 (6 cents per share) more than for first quarter of 1967--and operating revenues of record $6.9 million. As of March 31, ComSatCorp was leasing, full-time, equivalent of 754 half circuits, 453 more than on March 31, 1967. Of number leased in 1968, 421 were through two Atlantic satellites and 333 were through two Pacific satellites. One year ago only two satellites were in service, one over Atlantic and one over Pacific. (ComSatCorp Release 68-19

April 24: National Science Foundation announced award of 16 grants totaling more than $800,000 to help school systems select new science and mathematics curriculum materials and use them effectively. Funds would support conferences to train individuals and groups as competent resource personnel. After training, personnel would conduct workshops for teachers in school district where new curriculum materials were being introduced. (NSF Release 68-130)

April 25: U.S.S.R. launched Cosmos CCXVIII into orbit with 209.2-km (130-mi) apogee, 133.2-km (89-mi) perigee, and 50° inclination. Period was not disclosed. Satellite reentered same day. Simultaneously, U.S.S.R. disclosed April 24 launch of Cosmos CCXVII.

There was widespread speculation that U.S.S.R. would soon attempt new space spectacular. Evert Clark had suggested in New York Times that U.S.S.R. was secretly testing "a maneuverable rocket stage that could be used to guide bombs down from orbit or to send instruments to the moon." AP said Soviet failure to reveal period of Cosmos CCXVIII suggested spacecraft might have reentered before completing one orbit to test fractional orbital bomb system (FOBS) described by Secretary of Defense Robert S. McNamara Nov. 3, 1967. (Clark, NYT, 4/3/68, 1; AP, B Sun, 4/26/68, 2; GSFC SSR, 4/30/68)

. In statement to Senate Committee on Aeronautical and Space Sciences, Milton Klein, Manager of NASA-AEC Space Nuclear Propulsion Office summarized progress of nuclear rocket program. At the end of last year major milestone was achieved with "operation in late 1967 of a single reactor for 60 minutes at its design power of 1,100 megawatts, a duration capability adequate for most missions." Technology phase of NERVA program was nearing completion and next step was to develop engine to flight capability, funds for which were included in FY 1969 budget request, he said. No action deferring this step could be taken without losing a major portion of capability in this field. Nuclear rocket was "a focal point for pushing forward frontiers of technology...[and] only major advanced propulsion program in the Nation."

High performance of nuclear rockets had been demonstrated in nine consecutive power reactor tests. Solid base of data and underrating had been built for development of flight-rated NERVA engine. "Development of the NERVA engine at this time," Klein stressed, "would capitalize on this investment and provide a major fundamental advance in propulsion capability. Its high specific impulse will provide a broad mission versatility for the high-payload, high-energy missions...inevitably included in a viable space program." (Testimony)

April 25: Dr. Norris E. Bradbury, Director of Los Alamos Scientific Laboratory, testified at Rover Program Hearing of Senate Committee on Aeronautical and Space Sciences that, since project's basic reactor performance goals had been demonstrated along with basic elements of complete engine system, major emphasis of Rover Program should shift to development of overall flight engine. LASL would continue to support NERVA program chiefly in development and evaluation of improved fuel elements and other reactor core components. "It is my firm opinion...we are at the threshold of the use of nuclear energy in space.... There will be even further gains...as better fuel elements are inevitably developed."

"Deep space has always been known to be the true domain of nuclear energy for both power and propulsion; it is my belief that the atom will be the work horse of near space as well." (Text)

. Addressing Women's National Democratic Club in Washington, D.C., Dr. Wernher von Braun, Director of Marshall Space Flight Center, said: "...we must not seriously impair or hamper our progress in space because we cannot foresee immediate payoffs to offset the investment we are making." He urged that U.S. "come to grasp the unlimited opportunities and the promise of space exploration." U.S. space program, he said, had "brief history studded with shining achievements and an enduring future, bright with the promise of even greater discoveries and benefits to come." He cited manned orbiting space station as next major advance after initial manned lunar landing. (Text; SBD, 4/26/68, 321; W Post, 4/26/68, C3)

. European Space Research Organization (ESRO) announced cancellation of TD-1 and TD-2 solar astronomy satellites, which were to have been built under $20-million contract by an international consortium and launched from U.S. by Thor-Delta rockets. Italy had refused to pay its share of costs, feeling its share of work too slight to justify contribution, John L. Hess later reported in New York Times. Earlier U.K. had refused to contribute to proposed budget expansion of European Launcher Development Organization (ELDO), partner with ESRO in plans for European satellite communications system [see April 16] (Reuters, NYT, 4/26/68, 16; Hess, NYT, 4/28/68, 24)

. Federal Aviation Administration announced allocations of $74.7 million for construction and improvement of 397 public civil airports under Federal-Aid Airport Program (FAAP) for FY 1969. Program, developed from record 773 requests for aid by public agencies, provided $67.7 million to improve 356 existing airports and $7 million to construct 41 new public airports. (FAA Release 68-28)

April 25: FAA awarded $57,345 to McDonnell Douglas Corp., $52,663 to Western Co., and $28,000 to Bureau of Mines for additional research on use of thickened safety fuels to reduce chances and severity of post-crash fires in survivable aircraft accidents. (FAA Release T 68-15)

April 26: U.S.S.R. launched Cosmos CCXIX--10th Cosmos in April and 9th spacecraft in 12 days--into orbit with 1,747-km (1,085.5-mi) apogee; 225-km (139.8-mi) perigee, 104.7-min period, and 48.4° inclination. Soviet scientist Prof. Georgi Pokrovsky in Nedelya, Sunday supplement to Izvestia, predicted that interlinked satellites might some day form artificial Saturn rings around earth.

NASC President Dr. Edward C. Welsh said U.S.S.R.'s launch activity April 14-26 was most active 12 days in space history of any nation and "a great acceleration" of Soviet space effort. "For some time we've had indications that they're putting in an increasing rate of men and resources."

James J. Haggerty, Jr., wrote in Journal of the Armed Forces that U.S.S.R. satellite launches in 1968 might for the first time since 1957 exceed U.S. spacecraft orbited. Launches in Cosmos series, which included a variety of spacecraft, had continued to accelerate, he noted, with 34 Cosmos launches in 1966 and 59 in 1967. (Cohn, W Post, 4/27/68, A15; UPI, NYT, 4/27/68, 15; J/AF, 4/27/68, 9; GSFC SSR, 4/30/68)

. Maj. William J. Knight (USAF) flew X-15 No. 1 to 207,000-ft altitude and 3,545 mph (mach 5) from Edwards AFB. Purposes of test flight were to check Saturn insulation horizon scanner and fixed ball nose. (NASA Proj Off)

. A 15-lb pig-tailed monkey, like one scheduled to orbit earth for 30 days onboard Biosatellite D in 1969, had successfully completed simulated space flight fully instrumented with nearly 24 separate biological sensors. Test, first joining of instrumented primate and its complete array of biological instrumentation with flight-type spacecraft, met all objectives, including 15-day medical countdown, 3-day simulated flight, and 5-day monitoring. (NASA Release 68-76; W Post, 4/26/68, A19)

. NASA established Aerospace Safety Research and Data Institute at Lewis Research Center to maintain highest safety standards possible in national aerospace program by solving technical safety problems

April 26 (continued)
and providing NASA and its contractors with current information on safety data and procedures. Institute would be directed by I. Irving Pinkel, consultant on aircraft safety to USAF and Federal Aviation Administration and former Apollo 204 accident investigator and consultant. (NASA Release 68-79; LeRC Release 68-32)

. NASA published Constructing Inexpensive Automatic Picture-Transmission Ground Stations (NASA SP-5079), providing instructions for building from surplus parts a $500 ground station that could receive local cloud-cover pictures anywhere in the world from U.S. meteorological satellites. Booklet was available from Clearinghouse for Federal Scientific and Technical Information. (NASA Release 68-77)

April 27: NASA Administrator James E. Webb approved recommendation of Apollo Program Director M/G Samuel C. Phillips (USA, Ret.) that NASA proceed with preparation of third Saturn V launch vehicle for manned mission in late 1968 and retain option for another unmanned mission "if further analysis and ground testing indicate that it is the best course."

Astronauts James A. McDivitt, David R. Scott, and Russell L. Schweickart were scheduled to be launched on Saturn V in second manned Apollo space flight. First manned Apollo mission, Apollo 7 with Saturn IB booster, was to carry Astronauts Walter M. Schirra, Jr., Donn F. Eisele, and Walter Cunningham into earth orbit in third quarter of 1968. (NASA Release 68-81; W Star, 4/28/68)

. NASA successfully launched 600-lb Reentry F payload by Scout booster from NASA Wallops Station to obtain inflight fundamental research data on aerodynamic heating and transition from laminar to turbulent flow in boundary layer. Payload, graphite-tipped beryllium cone 13 ft long, tapering from 0.01 in at nose to 27.3 in at base, was designed to measure heat transfer in slender cone at hypersonic speeds for comparison with ground studies. Three of Scout's four stages were used: 1st and 2nd stages fired during ascent, boosting 3rd stage and payload to 115-mi (175-km) altitude; and 3rd stage drove payload at up to 13,500 mph through earth's atmosphere. Impact occurred 800 mi downrange, northeast of Bermuda.

Reentry F experiment, sixth mission in NASA's Reentry Heating Project, was designed and directed by Langley Research Center under sponsorship of NASA Office of Advanced Research and Technology. Payload was constructed by General Electric Co.'s Re-Entry Systems Div. (WS Release 68-9)

April 27: Aerobee 150 MOD I. sounding rocket launched from White Sands Missile Range carried Naval Research Laboratory experiment to 103.2-mi (166.1-km) altitude to photograph solar corona to get streamers and to photograph interplanetary dust shadows using two externally occulated coronographs and one solar pointing control. Rocket and instrumentation performance was satisfactory. (NASA Rpt SRL)

. Crash of USAF F-111A aircraft near Bowie, Tex., Oct. 19, 1967, had been caused by failure of experimental speed break--only one ever installed on F-111--USAF reported. Investigation had indicated hydraulic system tubing ruptured and flight control system was disrupted when bracket assembly failed at 1,000 mph. (AP, W Post, 4/27/68)

. Tass reported Moscow scientists had compared "spectrometric analysis" of cactus growing in cold areas with spectrographs of "dark areas" of Mars, and concluded areas on Mars were covered with cactus-like vegetation. Other tests on cactus, the scientists said, proved it was able to stand up to extremes of temperature and other conditions similar to those on Mars. (UPI, W Star, 4/28/68, A3)

April 29: NASA awarded $25.8-million, one-year, cost-plus-fee contract to Bendix Field Engineering Corp. for continued maintenance and operation of major portion of NASA's Manned Space Flight Network, including 11 facilities of 14-station unified S-band network for Apollo. Contract extended original two-year agreement containing three options. (NASA Release 68-82)

April 30: Dr. Wernher von Braun, Director of Marshall Space Flight Center, told Senate Committee on Aeronautical and Space Sciences he was greatly concerned about future of entire space program without propulsion capability of nuclear rocket program. Nuclear propulsion was "a must for our future space needs," he said, and should not be thought of "solely in terms of any particular mission but rather in terms of the overall increase it will give to our space exploration capability and its potential applicability to a very wide range of missions.... NERVA engine development and eventually a flight stage should be funded on the basis of technology advancement, emphasizing mission versatility.... Failure to proceed now into a development phase will result in losses of experienced personnel and cost-increase effects on the total program.... A one-year delay in funding could result in as much as two years delay in having an

April 30 (continued)
operational nuclear engine."

Major justification for nuclear rocket development was that it would provide "major advancement in space propulsion capability." Nuclear vehicle as 3rd stage on Saturn V could significantly improve payload and mission versatility, and improved capability could be utilized "to improve mission effectiveness, to increase the mission and payload reliability, and to extend the spectrum of potential missions in the late 1970's and the 1980's. Equally important...for high energy missions requiring the launch of two or more Saturn V's, with subsequent rendezvous in earth orbit, we will be able to reduce the number of Saturn V's needed through the utilization of a nuclear vehicle," at substantial cost savings.

In response to questions by Sen. Howard C. Cannon (D-Nev.), Dr. von Braun said space program was "cutting edge of our technology advancements and of many advances in the applied sciences...[because] no other program...involves so many branches of technology and science." Reduction in NASA's $60-million NERVA request to $11 million recommended by House would be disastrous, he indicated, because to make manned space operations useful, "plenty of payload" was required. AEC funding for NERVA had been approved, but if cuts were made in NASA funding, program would be nonexistent. (Testimony; Transcript; O'Toole, W Post, 5/1/68, A3)

. Secretary of Defense Clark M. Clifford asked House Committee on Armed Services to restore funds cut by Senate for compromise development program for Navy F-111B aircraft. According to compromise plan, USN would continue tests on F-111B experimental models and exploratory work on alternate aircraft, VFX-1, until March 1969 and then decide whether to proceed with F-111B or to cancel program after first eight models and develop alternate. If VFX-1 were chosen, F-111Bs already produced would provide sophisticated air defense until alternate aircraft became operational in 1973. DOD had requested $425 million for 8 F-111Bs and 60 Phoenix missiles and $30 million for R&D on VFX-1. Senate instead had approved $170-million for VF (Testimony; Sheehan, NYT, 5/1/68, 4; UPI, W Star, 5/1/68, A12)

. Very reason for existence of SST program was belief "that this is logical step in development of civil aeronautics," M/G J. C. Maxw (USAF, Ret.), director of Federal Aviation Administration SST deve ment, told Wings Club in New York. Supersonic travel was first toward hypersonic flight, he said. "Unless we take it now it's to be many years before civil aviation advances beyond subsonic if ever." Biggest problem facing SST program was sonic boom.

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have made all our program decisions...on assumption that supersonic flights over land may not be permitted. We are reasonably certain... we can operate over the oceans on an inter-continental basis," and have sufficient market to assure profitable program on that basis, he said. (Text)

. Univ. of Colorado physicist Dr. Edward U. Condon announced that Univ.'s $500,000 UFO study for USAF had been completed on schedule. Dr. Condon declined to discuss conclusions and said final report would be submitted to National Academy of Sciences in September. He protested May 14 Look magazine article, which called project a fiasco, but said completion of field investigations were not related to the controversy.

Rep. J. Edward Roush (D-Ind.), citing article on House floor, questioned scientific profundity and objectivity of project and urged Congress to take over UFO investigation from USAF. (CR, 4/30/68, H3087; Clark, NYT, 5/1/68, 5)

. Republican Coordinating Committee released statement on U.S.-U.S.S.R. relations including policy on space: "Outer space should be seen as the focus for ever increasing United States-Soviet collaboration rather than as the site of an endless series of increasingly expensive prestige races. Because our society is open, so much is known about our space program that inviting Soviet participation in the non-military projects would be unlikely to endanger national security. By insisting upon reciprocal privileges we would acquire much additional knowledge about their space efforts, thus achieving a net gain for United States security. At the same time, we must not intimate that the Soviets and ourselves have an exclusive role to play in this area. We must constantly reiterate our willingness to collaborate with NATO and other Allies in space technology." (Text; UPI, NYT, 4/30/68, 95; Unna, W Post, 4/30/68, A5; SBD, 5/1/68, 2)

. NASA awarded General Dynamics Convair Div. $4.8-million supplemental agreement for construction of two additional Centaur launch vehicles which would be used with Atlas boosters to launch two Orbiting Astronomical Observatories (OAO) in 1969 and 1970. (NASA Release 68-83)

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