

COMMENT DRAFT

N O T F O R R E L E A S E

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

OCTOBER 1968

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

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OCTOBER 1968

October 1: NASA 10th Anniversary: National Space Club presented special award to President Johnson at White House citing his legislative and executive leadership of national space program and gave commemorative dinner in Washington, D.C. At dinner Sen. Clinton P. Anderson (D-N.Mex.) and Rep. George P. Miller (D-Calif.) presented retiring NASA Administrator James E. Webb award for his outstanding contributions to national space effort. In telegram tribute to Webb, President Johnson said, "The Nation is in his debt. He will be deeply missed but gratefully remembered as his dreams continue to become reality in the years ahead."

Telegram from Vice President Hubert Humphrey said, "The span of achievement which measures a decade of space progress is one which should be a source of pride to all of us. Now a new decade beckons, with new challenges, and new opportunities. And, such is the nature of the space age that we dare not become complacent about our rate of progress or the scope of our past accomplishments. It is unthinkable that we would allow ourselves to be surpassed in technology by any other nation. I have never questioned that space endeavors have contributed significantly to the strengthening and enrichment of our whole society, through a teamwork approach by private industry, our universities, and the Federal Government. By means of this program we have vitalized our economy, developed improved methods of management, stimulated our educational system, produced new goods and services, added to our store of scientific knowledge, and buttressed our national security." Telegram from Republican Presidential candidate Richard M. Nixon said, "The space program must continue to be one of our national imperatives, and it must be supported at a level assuring efficient and steady progress."

Anniversary ceremonies included open house and annual awards presentation at Marshall Space Flight Center Sept. 28-29. (NSC Newsletter; Texts; Marshall Star, 9/25/68, 4)

During its first 10 yr NASA had completed 23⁴ major U.S. and international launches plus thousands of sounding rocket launches. Of these 23⁴, 189 were launch vehicle successes and 17⁴, spacecraft or mission successes, with two missions still under evaluation. For these launches NASA had developed rockets ranging from 88,000-lb thrust to Saturn V with 7.5-million-lb thrust capable of sending nearly 100,000-lb payload to moon. First phase of manned flight program, Project Mercury, had begun seven days after NASA was established. Six manned Mercury flights had proved man could go into space and function as pilot-engineer-experimenter for up to 3⁴ hr weightless flight before returning to earth. Gemini program announced in 1961 had demonstrated work could be performed in orbit outside spacecraft in more than 12 hr extravehicular activity.

October 1 (continued)

Gemini included 52 experiments, among them 17 scientific--in astronomy, biology, geology, meteorology, and physics. Seven rendezvous techniques and nine dockings had been accomplished during Gemini. More than 2,000 hr manned spaceflight experience gained through Mercury and Gemini had contributed heavily to Apollo, including 16 flights of unmanned Saturn launch vehicle which had confirmed Apollo engineering concepts and qualified all systems for manned missions. Although Apollo fire on Jan. 27, 1967, had delayed manned missions, it had resulted in safer spacecraft and improved suits for astronauts.

Ahead were two manned missions for 1968; possibly five for 1969, culminating in landing of U.S. astronauts on moon. Facilities at NASA installations in U.S. were worth more than \$2.5 billion and peak 35,000 staff included some of Nation's top scientists. Industrial work force had peaked at 400,000 and was dropping to 200,000. NASA had established global tracking network capable of communicating with vehicles as far away as far side of sun. Its aeronautics program conducted R&D on noise abatement, flight safety, supersonic and hypersonic aircraft, lifting-body vehicles, and V/STOL aircraft. NASA's technological advances included development of new electronic parts, alloys, adhesives, lubricants, valves, and pumps, as well as progress in minaturization. More than 2,500 technical innovations applicable in industry, medicine, and other nonaerospace activities had resulted from 10 yr of NASA progress. In Christian Science Monitor, Neal Stanford said, "It is...science satellites and the new technology developed that are counted on to return to the tax-paying public the dividends that some say will make space the best investment man ever made." (Marshall Star, 9/25/68, 5; Wilford, NYT, 10/1/68; CSM, 10/5/68)

In Washington Sunday Star special report, "A Decade in Space," John Lannan commented on NASA's 10th anniversary: "...the space agency's real promise for improving the general welfare of mankind as set forth in the Space Act which brought it into being has apparently been too slow in being fulfilled. The fact that the space investment is only now starting to pay off, and at an increasingly rapid pace, is going unnoticed in the glare of present problems, past mishaps and the imminence of the Apollo venture. Where NASA's real goals lie are in the future--the near future and the near earth. Spin-off, the serendipity of technology, has long been used as a justification for the vast sums poured into space, but little beyond Teflon-coated frying pans have impinged on the tax-payer's mind." (W Star, 9/29/68, A1)

October 1 (continued)

In Space Digest article, Gen. James Ferguson, Commander of Air Force Systems Command, described "A Decade of Cooperation--The Military-NASA Interface." AFSC's FY 1969 "NASA support expenditures amounted to millions of dollars and thousands of man-years in effort. The sums of money, and, more important, the human technological resources we are currently expending on the nation's space programs are of great consequence since they are the foundations of our future benefits. ...we are acutely aware that the fate of future generations lies in space...It is a sad commentary to state that technology has provided us with the means to conduct wars. But it is heartening to realize that one day technology will provide us with the means to prevent wars. (Space Digest, 10/68, 71-3)

NASA Assistant Administrator for DOD and Interagency Affairs Jacob E. Smart wrote in Space Digest, "The tenth anniversary...marks the end of a decade of concerted effort across a broad front to advance the nation's capabilities in aeronautics and space. It has been a decade of accomplishment that has few peers in this country's history. ...the good working relationships...between NASA and DOD have been of immeasurable benefit to them both, and the nation's space effort is the stronger for it. ...with the prospect of tighter budgets likely, the maintenance of such relationships--and their improvement--assumes an increasing importance. The need to stretch the appropriations dollars to the maximum may be partly met by fresh efforts to find common ground where cooperation will produce economies as well as mutual benefits." (Space Digest, 10/68, 68-70)

- Dr. Finn J. Larsen, Deputy Director of Defense Research and Engineering, DOD, testified before House Committee on Science and Astronautics' Subcommittee on Advanced Research and Technology: "If our civil aviation is to continue its dramatic progress, the greatest single requirement is to accomplish...complete system engineering. The...planning must consider not only the aircraft in flight as a system, but also the entire problem of moving people from destination to destination"--calling for "planning and resources on a considerably larger scale than are now available."

NASA's responsibility for U.S. aeronautical research "should continue." DOD had used NASA research, augmenting it for defense as necessary, with "excellent coordination for many years." Military R&D was specialized, but much was transferable to civil aviation. Long-term goals of smokeless combustors and silent aircraft would be of mutual benefit. SAGE air defense computer system had contributed to FAA radar beacon system and new national standards. Much improved

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October 1 (continued)

altimetry reporting came from DOD development for high-performance jet aircraft. Common digitizer was joint DOD-FAA project, as was TPX-42 airport traffic control facility. Some 30 projects for all-weather landing and 20 navigational programs had been sponsored in recent years. Eleven aircraft carriers had pilot "hands-off" capability for blind landing. Microwave scanning-beam landing systems were in testing. Collision avoidance, V/STOL, and cargo-handling R&D had civil application. (Text)

- . Dr. Frank D. Drake, Director of Cornell Univ.'s Arecibo Ionospheric Observatory in Puerto Rico, said he had detected first distinct pattern to radio signals from two pulsars. He told radioastronomy seminar at National Radio Astronomy Observatory, Green Bank, W. Va., that pulse rate could be explained only if source were star of extraordinary density spinning at incredible speed--such as neutron star. If correct, findings would be first scientific proof that hypothetical neutron stars actually existed. (Wilford, NYT, 10/2/68; Lannan, W Star, 10/2/68, A20)
- . MIT physicist and radioastronomer Dr. Bernard Burke and teams of scientists using 140-ft "Big Dish" antenna at National Radio Astronomy Observatory began first radioastronomy test of Einstein's general theory of relativity in attempt to discover gravity's effect on universe. Among three basic tests proposed by Einstein to test his theory to account for action of all bodies under gravitational force was one to measure bending of light from distant source as it passed an energetic body like the sun. Dr. Burke's experiment, one of three recent tests, measured signals from newly discovered quasars to determine amount of bending they underwent in passing the sun. If light, in form of quasar radiowaves, was bent, Einstein theory would receive added support; if it was not bent as much as he predicted, or if astronomers were unable to detect significant bending, theory would remain intact until further proof was provided. (NRAO Proj Off; Lannan, W Star, 10/1/68, A9)
- . MSFC announced it had selected RCA for negotiation of \$5.1-million cost-plus-fixed-fee contract for logistics and engineering support for Saturn ground computer systems and associated equipment. Contract would cover Oct. 1, 1968, through June 30, 1970. (MSFC Release 68-231)
- . President Johnson announced resignation of Leonard H. Marks as Director of U.S. Information Agency in time to head U.S. delegation to negotiate permanent arrangements for INTELSAT at February 1969 conference in Washington, D.C. (PD, 10/7/68, 1433; Halloran, W Post, 10/2/68, A8; AP, NYT, 10/2/68, 23)

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October 1: Arnold W. Frutkin, working since Feb. 1 as Special Assistant to NASA Associate Administrator, completed his temporary assignment and resumed his duties as Assistant Administrator for International Affairs. (NASA PAO; NASA Ann, 10/2/68)

- . Lucius D. Battle, former Assistant Secretary of State for Near Eastern and South Asian Affairs, became ComSatCorp Vice President for Corporate Relations. (ComSatCorp Release 68-51; AP, W Post, 10/1/68, A2)

October 2: U.S.S.R. launched Cosmos CCXLIV into orbit with 158-km (98.2-mi) apogee, 140-km (87-mi) perigee, 87.4-min period, and 49.6° inclination. Satellite reentered same day. (GSFC SSR, 10/15/68)

- . Sen. Stuart Symington (D-Mo.) said on Senate floor, "In the past ten years, money expended by the Defense Department for R&D has almost doubled, from \$4 billion to about \$8 billion. Yet since 1955, the United States has not produced a single modern fighter; in fact, it has produced no combat plane except the TFX series. The Navy version of that plane has already been abandoned; and the Air Force has once again found it necessary to ground their version because of technical difficulties." Despite "all those billions we have developed no air superiority fighter capable of competing against a first-class air force such as the Soviets possess today." He said U.S. was losing its lead on seas as well because "our various Government branches produce arguments, whereas the Soviets produce the submarines." (Text; NY News, 10/3/68, 18)
- . Sen. Clinton P. Anderson (D-N.Mex.), Chairman of House Committee on Aeronautical and Space Sciences, told Senate, "Ten years from now NASA will be celebrating its 20th anniversary. I hope that the chairman of the Committee...at that time will be able to stand here and congratulate the agency and its people for 20 years of accomplishment and say that the United States is still first in space and in aeronautics. But unless we are vigilant and supply the agency with the needed authorizations and appropriations, that statement will not be made." (CR, 10/2/68, S11844)
- . NASA awarded Chrysler Corp.'s Space Div. \$10,545,753 cost-plus-award-fee extension to \$77,877,486 contract for KSC support services. Extension, for July 1 through Dec. 31, covered necessary manpower and material to provide design and sustaining engineering, modification, testing, refurbishing, and launch support of KSC-designed equipment and Saturn IB launch operations. (KSC Release KSC-418-68)

October 2: MSFC announced it had awarded American Science and Engineering, Inc., \$5,413,000 addition to contract for final design, fabrication, assembly, integration, test qualification, and acceptance of prototype and flight unit x-ray spectrographic telescope, part of Apollo Telescope Mount. Award brought total value of contract to \$11,617,471. (NASA Release 68-170; MSFC Release 68-234)

October 3: Aurorae (ESRO I) satellite, designed, developed, and constructed by European Space Research Organization under July 8, 1964, NASA-ESRO agreement, was successfully launched by NASA from WTR by four-stage Scout booster. Orbital parameters: apogee, 949.4 mi (1,528 km); perigee, 160.9 mi (259 km); period, 102.8 min; and inclination, 93.7°. Primary NASA mission objectives were to place Aurorae into planned orbit and provide tracking and telemetry support. The 185-lb cylindrical satellite carried eight experiments to study aurora borealis (Northern Lights) and other related phenomena of polar ionosphere, representing six different organizations from U.K., Denmark, Sweden, and Norway. All experiments were operating as planned, and their scientific objectives were being achieved.

Aurorae was second successful ESRO satellite launched by NASA. IRIS I, launched May 16 to replace ESRO II-A which had failed to achieve orbit May 29, 1967, had entered planned orbit and conducted solar-astronomy and cosmic-ray studies. ESRO was responsible for experiment instrumentation, delivery of spacecraft to launch site, equipment and personnel necessary to mate spacecraft to launch vehicle, and spacecraft testing. NASA provided Scout launch vehicle, conducted launch operations, and supplied data and tracking acquisition support. (NASA Proj Off; NASA Release 68-158; AP, W Star, 10/4/68; GSFC SSR, 10/15/68)

. Cosmos CCXLV was launched by U.S.S.R. into orbit with 481-km (298.9-mi) apogee, 272-km (169-mi) perigee, 92-min period, and 70.9° inclination. (GSFC SSR, 10/15/68)

. NASA Deputy Administrator, Dr. Thomas O. Paine, presented NASA FY 1969 interim operating plan to Senate Committee on Aeronautical and Space Sciences. Although President Johnson had not yet signed appropriations bill, Bureau of the Budget had indicated NASA's share of \$6 billion expenditure reduction might amount to \$350 million. This meant limitation of use of FY 1969 appropriations to \$3.85 billion, Dr. Paine said. "Our actions also have had to be constrained by our current instructions within the Executive Branch to hold expenditures to a minimum in 1970 as well as in 1969, and to be prepared for the eventuality of budgetary limitations in FY 1970 even more restrictive than those in FY 1969. I am personally convinced that the nation's space program requires an increase in funding in FY 1970 and I am hopeful...we will succeed in

October 3 (continued)

establishing the need for a significant increase. Until this decision is made...we have no alternative but to proceed with an interim operating plan...which, where possible, holds open options we can exercise in FY 1970 if the budget is higher but which does not overcommit us if the FY 1970 budget is lower."

Plan retained \$2.025 billion authorized for Apollo program--\$14 million below budget request. It reduced authorized \$253.2 million for Apollo Applications, to \$150 million, amount "required to work toward the important but sharply limited and deferred Apollo Applications program we now propose." This would include cessation of Saturn IB launch vehicle production after completion of 14th (Saturn 214) and discontinuation of Saturn V at completion of first 15 vehicles. Single Saturn I workshop and single Apollo Telescope Mount (ATM) would be launched in early 1970s. Authorized \$5 million for advanced missions would be cut 50% to \$2.5 million, for continued studies related to manned earth-orbital and lunar missions. Authorized \$136.9 million would be reduced to \$132.1 million for physics and astronomy with level of effort in supporting research and technology and data analysis approximately 10% lower than in FY 1968.

The \$92.3 million authorized for lunar and planetary exploration would be cut to \$75.8 million, with \$6.8 million for lunar and \$69 million for planetary--to support Mariner-Mars 1969 mission, reacquisition of telemetry from Mariner V, and Mariner-Mars 1971 mission. Plan also supported in FY 1969, at reduced funding level, capability to conduct Mars mission during 1973 opportunity in keeping with NAS recommendation [see Sept. 19]. Overall scope of mission would be reduced and schedule compressed. Operating plan provided for construction of two 210-ft antennas for Mars and other missions during 1970s. Launch vehicle procurement authorization of \$115.7 million would be cut to \$100.2 million and bioscience from \$33 million to \$32.7 million, which was \$15 million below budget request and required slip of 6-12 mo in 21-day Biosatellite missions.

Space applications authorization of \$98.7 million would be retained; program change necessitated by May 18 destruction of Nimbus B would result in launch of replacement, Nimbus B2, in spring 1969. Aeronautics R&D budget would remain at authorized \$74.9 million, while FY 1969 effort in nuclear rockets would be limited and NERVA development deferred until 1970, when \$7.5 million withheld in FY 1969 could be added to allow total of \$39.5 million. Of \$180.5 million total authorization for basic research, space vehicle systems, electronics system, human factor systems, space power and electric propulsion systems, and chemical propulsion, interim plan would provide \$178.4 million, reduction

October 3 (continued)

of \$21.5 million from NASA's budget request. Work in long-endurance life-support-equipment technologies would proceed as planned but in other areas, research and technical development would be reduced, especially efforts in support of advanced space missions. Tracking and data acquisition budget would be reduced from \$289.8 million authorized to \$280 million, providing full Apollo schedule support but limiting support for spacecraft aloft and on future missions.

Construction of facilities funds had been reduced from \$39.6 million authorized to \$21.8 million appropriated. Operating plan would increase figure to \$35.7 million by transferring funds from R&D appropriation. Facility planning and design funds were reduced from \$3 million requested to \$1 million. Interim operating plan anticipated transfer of \$20.1 million from R&D to administrative operations, bringing total to \$623.3 million instead of \$603.2 million in authorization and appropriations acts and \$648.2 million requested by NASA in budget. Dr. Paine emphasized that administrative operations appropriation did not cover only "administrative" expenses; it covered direct costs of operating NASA laboratories, research centers, development centers, and launch centers.

NASA Administrator James E. Webb told Committee, "...when you use words such as 'Congress consistently has supported the Apollo program,' you must add 'at a minimum level.' We have clearly indicated in every budget that the basis on which we were going forward with this support by Congress was one that did not take into account unusual risks and happenings and was, in effect, based on success in all these efforts." Webb said NASA Apollo funding was related to success on various operations and did not include "a return to test flight on the Saturn IB should we not be able to make the shift to the big rocket after this next flight." From 1961 to 1969, Webb said, "we have not had the funds to proceed except in a manner that would permit us, within the total budget, to do this lunar landing within this decade and on an all-up systems test basis. So the excruciatingly painful period of all-up testing on the Saturn V is yet ahead of us." (Testimony; Transcript)

- . NASA's HL-10 lifting-body vehicle, flown by NASA test pilot John A. Manke, successfully completed eleventh flight from Edwards AFB. Vehicle with full load of fuel was carried to altitude, where successful jettison test was performed before launch from B-52 aircraft. Purpose of flight was pilot proficiency. (NASA Proj Off)

October 3: Boeing Co. said it would build one-fifth size thermal models of manned space stations under \$156,500 NASA contract to determine their feasibility for predicting temperatures in full-size earth-orbiting station. (Boeing Release S-9840)

- . NASA said spacecraft and parts of Agena 2nd stage of Nimbus B weather satellite launched unsuccessfully May 18, including two SNAP-19 nuclear power generators, had been found Sept. 30 by crew of research submarine four miles south of San Miguel Island off California coast. Pictures taken by submarine indicated three- by six-inch graphic cores of generators were intact; surrounding magnesium-thorium alloy casings were almost completely decayed since they dissolved in sea water almost immediately. Each core contained three pounds of plutonium. AEC had spent \$200,000 searching for missing nuclear sources. Nimbus B had been destroyed shortly after launch when it veered off course. (NASA Release 68-171; Lannan, W Star, 10/4/68, A16; AP, NYT, 10/11/68, 10)
- . Senate, after secret session, defeated by vote of 45 to 25 amendment by Sen. John S. Cooper (R-Ky.) to eliminate from \$71.8-billion defense appropriations bill \$387.4 million requested by Administration to start deployment of Sentinel antiballistic missile system. Final action on largest defense appropriations bill in U.S. history was deferred until Oct. 4. (CR, 10/2/68, S11872-85; AP, W Star, 10/2/68, A4; Finney, NYT, 10/3/68, 1; Lardner, W Post, 10/5/68, 1)

October 4: NASA-USAF review board report said failure of Nimbus B mission May 18 had been caused by improper installation of yaw-rate gyro 90° from design position in the Thorad-Agena launch vehicle. Board recommended revision of test procedures which failed to discern error and redesign of gyro mounting brackets to make improper installation impossible. Repeat mission, Nimbus B2, would be launched in spring 1969 because of flight's importance to meteorological research. (NASA Release 68-171; UPI, H Chron, 10/5/68)

- . ComSatCorp, on behalf of INTELSAT, awarded Hughes Aircraft Co. \$72-million contract for INTELSAT IV advanced comsats. Hughes would deliver within 22 mo four flight spacecraft, one prototype, associated spacecraft test equipment, and necessary ground equipment. (ComSatCorp Release 68-52; WSJ, 10/7/68, 3)

October 5: U.S.S.R. successfully launched Molniya I-10 to relay telephone and telegraph communications and TV programs to far northern and far eastern U.S.S.R. and to central Asia. Orbital

October 5 (continued)

parameters: apogee, 39,639 km (2,463.1 mi); perigee, 429 km (266.6 mi); period, 711.9 min; and inclination, 64.8° . (UPI, W Star, 10/7/68, A9; AP, NYT, 10/8/68, 2; GSFC SSR, 10/15/68)

- . Republican Presidential candidate Richard M. Nixon issued policy statement, "The Research Gap: Crisis in American Science and Technology." U.S. was "shortchanging" its scientific community and risking research gap between U.S. effort and that of U.S.S.R. "Faced with dynamic possibilities for science, the current Administration is hobbled by the static philosophy that technological potentialities are limited.... This attitude is particularly perilous in the realm of defense.... In few areas of development is activity so intense and productive as in Soviet military research and development." While U.S.S.R. graduated twice as many scientists annually as U.S., American scientific community was "demoralized" by wavering attitudes toward R&D. "Scientific activity cannot be turned on and off like a faucet. The withdrawal of support disperses highly trained research teams, closes vital facilities, loses spinoff benefits, and disrupts development momentum.... The United States must end this depreciation of research and development in its order of national priorities.... It would be an urgent goal of my administration to devise effective means by which it could cooperate with industry and the academic community in an effort to make maximum use of scientific advances to help solve major national problems.... Our goal is to make the United States first again in the crucial area of research and development." (Text; Walsh, Science, 10/18/68, 335-7)

October 6: In Washington Sunday Star William Hines commented on James E. Webb's resignation as NASA Administrator: "Yes...there was a James Webb. He had his faults, God knows, and a peculiar style. Most people would have done the job differently. But, on balance, it is difficult to see how anyone could have done it much better." (W Star, 10/6/68, C4)

October 7: U.S.S.R. launched Cosmos CCXLVI into orbit with 317-km (197-mi) apogee, 145-km (90.1-mi) perigee, 89.1-min period, and 65.3° inclination. Satellite reentered Oct. 12. (InteraviaAir-Letter, 10/8/68, 11; GSFC SSR, 10/15/68)

- . Resignation of James E. Webb as NASA Administrator, announced Sept. 16, became effective. (NASA Off of Administrator)

October 7: Sen. Stuart Symington (D-Mo.) said in statement put into Congressional Record, "I am now confident...serious consideration should be given to canceling the entire Air Force F-111 series.... If the plane is fundamentally unsound--and that would now appear to be the case--its termination would prevent the loss of additional billions of dollars--and what is more important, save the lives of many pilots." He said October report of Preparedness Investigating Subcommittee of Senate Committee on Armed Services "points up the grave security deficiencies that have resulted from the Department of Defense forcing the Air Force and Navy to put all the eggs of their aircraft development into one unfortunate basket." (Text; CR, 10/7/68, S12148-51; Witkin, NYT, 10/8/68, 18; W Post, 10/8/68, A11)

- . In National Observer, Peter T. Chew criticized Americans as "uncertain, timid farers in space." During "19-month interregnum in manned space flight" occasioned by Jan. 27, 1967, Apollo fire, "Americans have become obsessed with the race question at home and the Vietnam War abroad.... If some doomsayers are to be believed, the vast U.S. space science and technology establishment put together during the last decade will be systematically dismantled once the manned Apollo landing has been accomplished because NASA has 'no clear mandate' to go on; cornfields will reclaim the great rocket and spacecraft-testing sites...; the solar system will become the exclusive playground of Soviet cosmonauts." Yet NASA's mandate to explore space "for the benefit of all mankind" had been set down in legislation establishing the agency and did not end with the moon. If anything, "the moon is the first stepping stone." Dr. Wernher von Braun "stands almost alone among the country's leaders in his ability to express in understandable terms just why we are going to the moon--and beyond.... To critics of the space program he replies, '...Man was born with an insatiable nosiness about his natural environment. ...it seems to pay off handsomely, but often in the most unexpected way, to keep satisfying his curiosity about the world around him.'" (Natl Obs, 10/7/68)
- . Newsweek said NERVA project had "become one more casualty of cutbacks in the space program." Workers at Nevada test site "say only a skeleton staff will be left on the project by spring." (Newsweek, 10/7/68)
- . NASA announced it had awarded Technical Information Services Co. \$4.3-million cost-plus-award-fee contract for continued operation of NASA's Scientific and Technical Information Facility at College Park, Md. Contract would extend through November, 1969, with two one-year options. Current contractor was Leasco Systems and Research Corp. (NASA Release 68-173)

October 7: NASA Administrator James E. Webb issued order dissolving Apollo 20⁴ Review Board established Jan. 27, 1967, to investigate Apollo fire of that date. (Text)

October 8: Antennas on NASA's Explorer XXXVIII (launched July 4) were each successfully extended to 750-ft maximum length and damper boom to maximum 630 ft by ground command. Satellite's antennas had been initially deployed to 455 ft each July 22 and extended to 600-ft each Sept. 24. Maximum extension completed planned antenna deployment sequence. (NASA Release 68-174; NASA Proj Off)

- . Senate unanimously approved space rescue treaty, providing for rescue and return of astronauts downed on foreign soil. It had been signed by 75 nations. (CR, 10/8/68, S12215-6; AP, B Sun, 10/9/68, A10)
- . NASA Associate Administrator for Manned Space Flight, Dr. George E. Mueller, addressed Ninth National Conference of United Press International Editors and Publishers in Washington, D.C.: "For the conception and construction of the equipment necessary to the safe transport of men into space and for their accomplishment of productive tasks in that new atmosphere, a new mix of professional and scientific disciplines has been created which has forced cooperation between engineers and medical doctors. Many of the technologies which are essential to our sending three men to the moon and back did not exist a few years ago. They had to be invented, adapted or developed.... We now have the giant boosters which have released man from his atmosphere, and...life support systems that can maintain him in space. As a result of the cleanliness requirements of the space program we have the largest 'clean rooms' in the world--rooms which hospitals are now emulating.... Over 600 computers now comprise the largest and most advanced communications system in the world. The fuel cell, which had lain dormant for many years, was activated to power spacecraft in orbit. Thirty public utility companies now have a \$27,000,-000 program for the adaptation of the fuel cell for home power units. We had to know on a real-time basis how fast the hearts of the astronauts were beating while they were in space...how much oxygen they were using, and how their muscles were responding...so we invented another new system, biosensor to computer to data gathering equipment, and through communications network to the Manned Spacecraft Center at Houston--from 100...or 800...or from $\frac{1}{4}$ of a million miles out in space. And a half a dozen newly formed companies are now manufacturing these adapted space-created instruments for the use of doctors and hospitals here on earth." (Text)

October 8: Commenting on James E. Webb's retirement, Sen. John Stennis (D-Miss.) said on Senate floor, "I have been a member of the Committee on Aeronautical and Space Sciences since about the time Mr. Webb was appointed to head NASA. I am not given unduly to praise a man. I am not impressed by a title. I am impressed by a record. But I am certainly impressed with the fact that Mr. Webb carried out his responsibilities for NASA with an expenditure of \$34 billion, in what might be called a crash program; and I have not seen any evidence of any activity of his except that clothed in the highest degree with integrity, honesty, frankness and openness in his dealings with the committee, with Congress, as well as with the public." (CR, 10/8/68, S12227-8)

- . Dept. of State said it would issue visas to 35 Soviet space scientists to attend 19th Congress of International Astronautical Federation (IAF) in New York Oct. 13-19. However, it might recommend cancellation of sightseeing tour of KSC arranged with NASA by American Institute of Aeronautics and Astronautics (AIAA) for scientists from 34 countries attending both IAF Congress and AIAA annual meeting in Philadelphia Oct. 21-25. No Soviet scientist had yet visited KSC, "apparently out of concern that the United States would ask for reciprocal rights in Russia for American scientists," said New York Times. Rep. Paul G. Rogers (D-Fla.), in letter to Secretary of State Dean Rusk, had said visit was inappropriate in light of U.S.S.R.'s invasion of Czechoslovakia, imprisonment of Pueblo crew by North Korea, Soviet aid to North Vietnam, and existence of Communist regime in Cuba. (NYT, 10/9/68)

October 9: Univ. of California at Los Angeles astronomer Dr. Kurt Riegel and graduate student Mark Jennings reported discovery of cloud of intensely cold interstellar hydrogen gas near region of galaxy where star formation was known to be taking place, about 3,000 light years from earth in direction of Milky Way. Dr. Riegel said, "The implication is that the process of star formation may in some way depend on the cooling of the gas floating around between the stars." (Getze, LA Times, 10/9/68)

- . NASA was completing tests for USAF Cambridge Research Laboratories in which individual plastic hailstone models were dropped from 20,000- to 25,000-ft altitudes near NASA Wallops Station to study speed at which hailstones fell to earth and its effect on their size and growth rate in atmosphere. Wind-tunnel tests had confirmed theory that size and weight to which naturally formed hailstones would grow was related to speed they fell and thus to length of time spent in storm clouds. Shape and surface roughness affected fall speed by

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October 9 (continued)

changing drag characteristics. Wallops test data would check tunnel results and would be applied in predicting growth of real hailstones. (NASA Release 68-172)

October 10: Aerobee 150 MI sounding rocket launched by NASA from WSMR carried Naval Research Laboratory experiment to 109.2-mi (174.7-km) altitude to obtain stellar spectra in Scorpius in 1,000-1,600Å far ultraviolet range and photometric data on stellar fluxes. Rocket performed satisfactorily. Scientific objectives were not achieved because attitude control system (ACS) malfunctioned and vehicle failed to capture and point at desired targets. Experiment performed as expected, but because of ACS malfunction no film was advanced by spectograph or aspect camera. Some photometric data were obtained by Geiger tube photometers. (NASA Rpt SRL)

- . Australian House of Representatives, by 60-30 vote, defeated opposition Labor Party motion to condemn government for ordering 24 F-111C fighter-bombers from U.S. Crashes, delays, and cost increases had led to major criticism of government. Deliveries of aircraft were 18 mo behind schedule. Latest U.S. estimate of cost, including spares and ground equipment, was \$294.63 million, about one-fourth Australian defense budget for 1968-69. There was no ceiling price on aircraft and no way Australia could cancel contract without \$200-million penalty. (AP, W Post, 10/11/68, A11; NYT, 10/9/68, 12)
- . NASA announced it had requested proposals by Nov. 18 in its program to build two experimental turbofan jet engines and to conduct intensive test program [see Aug. 18]. Objective was to reduce two major sources of noise--interaction of jet exhaust with outside air and noise created by fan--to produce turbofan demonstrator engine operational at noise level at least 15-20 db below those powering DC-8 and 707 aircraft. Specifications were developed at LeRC with assistance on contract from Allison Div. of General Motors Corp. and Pratt & Whitney Div. of United Aircraft Corp. while McDonnell Douglas Corp. studied feasibility of integrating quiet engine with DC-8. (NASA Release 68-175)
- . Sen. John J. Sparkman (D-Ala.) on Senate floor said: "President Johnson is properly called the principal architect of America's space program. As Senator and Vice President he worked unceasingly to assure this country a role of leadership in the exploration of space.... Under President Johnson's leadership in the Senate the Space Act was passed in 1958, creating the National Aeronautics and Space Administration... setting up a charter to win for this country a preeminence in the

October 10 (continued)

peaceful exploration of space. NASA pulled together widely scattered efforts in space and built an organization unique in this country's history. It has contributed to the technological competence so vital to modern industrial society." (NASA LAR VII/108)

- . Federal Aviation Administration published report, SRDS Program Goals, Achievements and Trends, on 50 Systems Research and Development Service projects undertaken in FY 1968. Beacon tracking level of terminal automation would provide aircraft identity, altitude, and computed ground speed on air traffic control radarscopes. Over three years, automated radar tracking system ARTS III would be installed at 62 busiest airports. Computer-aided approach spacing (CAAS) system would give more consistent spacing of landing aircraft. R&D eventually would lead to Category III all-weather landing systems (AWLS) at major airports, permitting aircraft to land with zero ceiling and runway visual range. (FAA Release T-68-39)

October 11: Cosmos CCXLVII was launched by U.S.S.R. into orbit with 343-km (213.1-mi) apogee, 215-km (133.6-mi) perigee, 89.9-min period, and 65.4° inclination. Satellite reentered Oct. 19. (GSFC SSR, 10/15/68; 10/31/68)

- . U.S.S.R.'s Zond V could be precursor to next step in flying complex unmanned missions to Venus or Mars as well as to carrying men to moon, RAND Corp. scientist Merton E. Davies and Cal Tech scientist Bruce M. Murray wrote in Science. Soviet descriptions of Zond V suggested U.S.S.R. might plan to send pair of spacecraft to Mars in late February or early March. One might land on Mars and cast off satellite to orbit it and relay signals to earth; other might fly by Mars and return to earth with film of Mars surface. Speculations were based on Pravda and Krasnaya Zvezda (Red Star) articles by Soviet Prof. A. Dmitriyev, which said "information from space" must be delivered "directly to the scientists' laboratory" free of "encumbrances and distortions of radioed signals." He said Zond V had successfully completed assignment of developing means and methods for returning space devices. Also, U.S.S.R. had previously sent pair of spacecraft on planetary mission and might repeat mission to take advantage of favorable Mars or Venus positions for flyby or landing attempts. (Science, 10/11/68, 245-6; Cohn, W Post, 10/11/68, A9)

October 11: President Johnson sent NASA Semiannual Reports covering period July 1, 1966, to Dec. 31, 1967, to Congress with message of transmittal, saying, "I commend these reports to your attention. They contain, I believe, concrete evidence that NASA is moving forward, and that America is contributing mightily in the worldwide effort to conquer space for the benefit of all mankind." (NASA LAR VII/111)

- . In TV program to viewers in Texas, New Mexico, Arkansas, and Oklahoma, Republican Presidential candidate Richard M. Nixon said a Republican administration would strive to make U.S. "first in space." He said, "I don't want the Soviet Union or any other nation to be ahead of the United States.... Let's emphasize the moon shot and others where we can make a direct break-through." (W Star, 10/12/68, A1)
- . President Johnson vainly urged Senate ratification of nuclear non-proliferation treaty: "If the treaty does not go into effect soon, an increasing number of countries will see it in their national interest to go nuclear...[and] the advent of new nuclear powers could force upon us this dilemma: either withdrawing our influence and commitment from areas of the world which are vital to our interests; or having other nations trigger a nuclear conflict which could involve us." He said if Senate found it impossible to remain in session to act on ratification, he might call special session after election. However, after consulting with President Johnson, Senate Majority Leader Mike Mansfield, (D-Mont.) announced he was laying treaty aside for this session of Congress because to call it up during closing days would result in "a divisive political dispute" that could convert it into partisan issue and imperil its eventual approval. (PD, 10/14/68, 1481; CR, 10/11/68, S12685-90; Finney, NYT, 10/11/68, 12; Kilpatrick, W Post, 10/12/68, A14)
- . NASA task force appointed by Assistant Administrator for University Affairs Francis B. Smith announced publication of A Study of NASA University Programs, containing assessment of programs and their benefit to NASA and academic community. NASA university programs had "made major contributions to aeronautics and space program. Research sponsored...has generated new concepts, has developed new technology, and has created unique facilities for further education and research. Over 50 percent of all experiments flown on NASA satellites have been generated by university programs. Universities have awarded at least 500 graduate degrees and provided continuing education opportunities to thousands...[and] university consultants have given policy, scientific, and engineering advice to NASA at all levels." (Text; NASA, Release 68-177)

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October 11: NASA had asked its contractors to cut KSC personnel 10% in effort to save \$40 million by July 1. Boeing Co. had already announced plans to reduce 4,400-man force to 4,000. Chrysler Corp. would keep 1,000 of its 1,200. Cutbacks were due to NASA budget cuts and affected only 2% of work force. (NASA PAO; W Star, 10/11/68, A3)

- . Comparison of infrared images of lunar eclipses of Dec. 19, 1964, and April 13, 1968, showed thermal anomalies of lunar maria unchanged after $3\frac{1}{2}$ yr, Air Force Cambridge Research Laboratories researchers reported in Science. Graham R. Hunt, John W. Salisbury, and Robert K. Vincent wrote that hundreds of hot spots that cooled more slowly than surroundings were strikingly similar in images from both eclipses. One new, linear thermal anomaly had been discovered, whose close relation to lunar crustal fracture line suggested it might be of internal origin. Origin could give clue to formation of craters. (Science, 10/11/68, 252-4)
- . Dr. William H. Avery, head of Aeronautics Div., Johns Hopkins Applied Physics Laboratory, explained to Johns Hopkins audience idea for aerial car transportation (ACT) system based on ski-lift principle, designed for local trips of under 10 mi within urban areas, and linked with high-speed transit system for longer distances. Series of small cars would move along elevated rail, operated by electrically powered cable 12 to 14 ft above pavement. (Christmas, W Star, 10/14/-68, B3)

October 11-22: NASA's Apollo 7 (AS-205), first manned mission in Apollo lunar landing program, was successfully launched from KSC Launch Complex 34 at 11:02 am EDT by Saturn IB booster. Primary objectives were to demonstrate command and service module (CSM) and crew performance; demonstrate crew, space vehicle, and mission support facilities; and demonstrate CSM rendezvous capability. All launch events occurred as planned and spacecraft, carrying Astronauts Walter M. Schirra, Jr. (commander), Donn F. Eisele (CM pilot), and R. Walter Cunningham (LM pilot), entered initial orbit with 190.1-mi (306-km) apogee, 142.3-mi (229-km) perigee, 89.9-min period, and 31.6° inclination. Saturn IB 2nd stage (S-IVB) manned control test was completed with excellent results, and S-IVB separated from CSM on schedule. Crew successfully transposed CSM and simulated docking by maneuvering CSM to within four or five feet of S-IVB.

On second day Schirra told ground controllers that crew was too busy to set up portable camera for live TV coverage because of minor but time-consuming difficulties. Astronauts had to pump waste water

October 11-22 (continued)

manually from spacecraft, Schirra and Eisele had trouble with their biomedical harnesses, Schirra had head cold symptoms, spacecraft evaporator system required maintenance, and hatch windows blurred and were bordered by mysterious "small hairs like fuzz." Crew fired SPS engine for 10 sec and 8 sec to set up rendezvous and maneuvered CSM to within 70 ft of tumbling spent 2nd stage, simulating techniques to be used on future flights if LM were to become disabled in lunar orbit. Crew took close-up photos of IM adapter attached to 2nd stage. S-IVB reentered earth's atmosphere Oct. 18 and splashed into Indian Ocean.

On third day crew, which had already accomplished half its objectives, photographed clouds and earth and continued checking out spacecraft systems. Power failure in spacecraft's AC electrical system was quickly restored, but overloading prompted officials to reschedule third SPS burn 20 hr sooner than planned. Burn positioned and sized ellipse for CM reaction control system deorbit in case of emergency and set up auxiliary gaging system test. Astronauts, all with head colds, appeared on national TV for 7 min for first time live from space. Crew displayed hand-printed signs bearing greetings from "the lovely Apollo room high atop everything."

Second live telecast for 11 min Oct. 15 showed closeups of spacecraft interior and astronauts so clear that observers could read astronauts' lips. Third TV appearance Oct. 16, which included nine-minute tour of spacecraft, won astronauts honorary membership in American Federation of Television and Radio Artists. Later, crew successfully fired SPS engine for fourth burn, demonstrating 20,500-lb-thrust engine's minimum impulse capability. As spacecraft passed over Hurricane Gladys in Gulf of Mexico, astronauts photographed storm and relayed data to Weather Bureau hurricane center. They also took pictures of a "long plume" of air pollution. Crew continued spacecraft checkout, guidance and navigation procedures, and TV operations on seventh day, but fourth telecast was smudgy. Successful 67-sec fifth SPS burn--longest to date--was performed out of plane to test auxiliary gaging system and readjust ellipse for lifetime and CM reaction control system deorbit.

On ninth day astronauts showed viewers exceptionally sharp pictures of main control panels in fifth TV broadcast and performed close-order drill to demonstrate movement in weightless environment. Sixth SPS burn, essentially a duplicate of fourth minimum impulse test burn, was successfully conducted. Seventh burn, on following day, adjusted time phasing for backup SM reaction-control-system deorbit burns. At 259:39 GET astronauts fired SPS engine for eighth time, to deorbit CSM for reentry. CM/SM separation, parachute deployment, and other reentry events were nominal, and spacecraft

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October 11-22 (continued)

splashed down in Atlantic 8 mi north of recovery ship U.S.S. Essex at 7:11 am EDT Oct. 22. Crew was picked up by helicopter and flown to recovery ship within one hour after splashdown.

All primary Apollo 7 mission objectives were achieved, as well as every detailed test objective and three not originally planned. Crew comfort and safety were enhanced by a change in cabin atmosphere to 100% oxygen in flight, hot meals, and relatively complete freedom of motion in spacecraft. Engineering accomplishments included live TV from space and drinking water produced as by-product of fuel cells. NASA's ATS III applications technology satellite relayed TV pictures to Europe. Service module SPS main engine, largest thrust engine to be manually thrust-vector controlled, proved itself by accomplishing longest and shortest manned SPS burns and largest number of inflight restarts. Manual tracking, navigation, and control achievements included full optical rendezvous, daylight platform realignment, optical platform alignments, pilot control of launch vehicle attitude, and orbital determination by sextant tracking of another vehicle. Mission also accomplished first digital-autopilot-controlled engine burn and first manned S-band communications.

All launch vehicle systems performed satisfactorily; spacecraft systems functioned with some minor anomalies, countered by backup subsystem, change in procedures, isolation, or careful monitoring so that no loss of systems support resulted.

Apollo 7 spacecraft had been redesigned for safety. Original two-piece side hatch had been replaced by a quick-opening, one-piece hatch. Flammability within CM had been reduced by extensive materials substitution, and systems redundancy had been expanded to reduce single failure points. Saturn IB launch vehicle carried less telemetry and instrumentation equipment, to lower weight and increase payload capability. New propellant lines to augmented spark igniter had been installed in J-2 engine to prevent failure which had occurred on Apollo 6.

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 and had been recovered in excellent condition. Apollo program was directed by NASA Office of Manned Space Flight; MSC was responsible for Apollo spacecraft 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 Releases 68-168K, 68-179; Cohn, W Post, 10/12/68, A1; 10/13/68,

October 11-22 (continued)

Al; AP, B Sun, 10/12/68, A10; O'Toole, W Post, 10/12/68, A1; 10/15/68, A1; 10/16/68, A1; 10/17/68, A3; 10/18/68, A3; 10/21/68, A1; 10/23/68, A1; Lannan, W Star, 10/13/68, A1; 10/19/68, A1; W Star, 10/17/68, A2; Sehlstedt, B Sun, 10/23/68, A1; 10/24/68, A3; W Post, 10/23/68, A20)

October 12: Washington Post editorial noted Apollo spacecraft costs and that total cost of space program to date was upwards of \$20 billion. "The expenditure of sums of money like these cannot be justified in terms of the military or civilian spin-off, although both have been substantial, or of the knowledge we have gained about the atmosphere surrounding our planet. But they can be justified in terms of the national prestige that is to be won or lost in space and of the inevitable fate of man to pursue knowledge towards its ultimate end in hope of some day achieving a better understanding of what the earth and universe are all about. It is in this latter hope that we cheer the astronauts on, wish them well in their planned 163 orbits of the earth, pray for their safe return, and urge those who make the crucial decisions about the future space program to proceed with all deliberate speed to reach the goal President Kennedy put before us." (W Post, 10/12/68, A12)

- . South African Defense Minister Pieter W. Botha had announced plans, at annual conference of newspaper publishers, to establish nation's first experimental missile test and launching base on Zululand coast. (Reuters, NYT, 10/13/68, 74)
- . Page Communications Engineers, Inc., subsidiary of Northrop Corp. had received \$5.25-million contract to build first Middle East comsat earth station in Iran. (W Star, 10/12/68, C5)

October 13: New observations from Britain's Jodrell Bank Experimental Station indicated distance estimates to pulsars had been 30 times too short. Observations from Australia's Molonglo Radio Observatory had identified pulsar PSR 1749-28, believed to be three times more distant than 10 others observed to date. Despite great distance its pulses were more powerful than those of all but one other. From these observations, Jodrell's Dr. Graham Smith believed pulsars lay in distant halo, not in Milky Way. (Sullivan, NYT, 10/13/68, 74)

- . U.S. State Dept. said there was no intention of blocking tour of KSC by scientists attending International Astronautical Federation Congress Oct. 13-19 and American Institute of Aeronautics and Astronautics

October 13 (continued)

annual meeting Oct. 19-20. Group included 40 delegates from U.S.S.R. AIAA also had arranged lecture tour of U.S. for Soviet space scientist Prof. Leonid I. Sedov of Moscow Univ. (Wilson, W Post, 10/14/68, A3)

October 13-19: At 19th Congress of International Astronautical Federation (IAF) in New York, NASC Executive Secretary, Dr. Edward C. Welsh, in opening address read message from NASC Chairman, Vice President Hubert H. Humphrey: "We take considerable pride in the United States with the generally open nature of our space program and in the manner in which we have attempted to cooperate with other nations in space participation as well as in the dissemination of facts and theories gleaned from our space experience. ...man has now begun to make the space far beyond the Earth's surface a part of his library of education and his scope of achievement. Now more than ever before the way of the future must be the way of nations working together to harness the forces of nature so that the peaceful pursuits of mankind may flourish." Dr. Welsh said, "I would place high on the list of benefits those which flow from increased international cooperation in the field of space. ...stimulated by the universal desire for knowledge [it] has brought somewhat closer together the peoples of the world. ...as the practical applications of space become more evident in the form of weather predictions, communications, and increased knowledge of the world's limited natural resources, additional strength is added to the foundation for peace." (Text)

Daniel and Florence Guggenheim International Astronautics Award of \$1,000, made annually by International Academy of Astronautics in recognition of outstanding contribution to progress of space research and exploration over five-year period, was presented Oct. 18 at Congress banquet to Dr. Zdenek Svestaka of Astronomical Institute of Czechoslovak Academy of Sciences. He was Chairman of Commission on Solar Activity of the International Astronomical Union. (IAF IAA Release 34; AIAA Release 10/13/68)

Soviet scientist Prof. Leonid I. Sedov in news conference said U.S.S.R. was not in race to the moon with U.S. "The question of sending astronauts to the moon at this time is not an item on our agenda. The exploration of the moon is possible, but it is not a priority." Prof. Sedov said Soviet timetable for manned expeditions would depend on next series of flight tests using Zond rocket. Zond V was successful, he said, "because the capsule returned safely, which was the purpose of the flight." Regarding U.S.-U.S.S.R.

October 13-19 (continued)

scientific cooperation, "it's successful implementation is very much dependent on international relations." At present, he said, close relations did not exist. (NYT, 10/15/68, 48)

Informal meeting of international space scientists, organized by Northwestern Univ. UFO expert Dr. J. Allen Hynek, in conjunction with IAF Congress, discussed advisability of world cooperation on UFOs. While several speakers urged international cooperation such as uniform UFO report forms, it was agreed that no action should be taken until after appearance of Univ. of Colorado report expected later in year. (Sullivan, NYT, 10/16/68, 12)

Dr. Harold Masursky, U.S. Geological Survey astrogeologist reported analysis of data from spacecraft that had orbited and crashed into or landed intact on moon had shown area was largely a basin similar to that of Pacific Ocean. It seemed more like earth than had been previously believed. Lunar interior had been molten. Deep cracks in its crust were lined with craters where molten material had erupted from below. He said study of remains of giant crater in western Texas had shown features analagous to lunar craters with mountain in center. (Sullivan, NYT, 10/19/68, 19)

October 14: NASA successfully launched two Nike-Cajun sounding rockets two hours apart from Point Barrow, Alaska, to 80-mi (128.8-km) altitudes. Purpose of launch was to obtain data on variation of temperature, pressure, and wind profile by detonating 19 grenades per rocket at prescribed times and recording the sound arrivals on ground. Data would be compared with data from two launches to be conducted from Churchill Research Range Oct. 15. Rockets and instruments performed satisfactorily; sound arrivals were recorded for all grenade ejections. Good data were anticipated. (NASA Rpts SRL)

- . Special committee of National Academy of Sciences had nominated Duke Univ. biochemist Dr. Philip Handler, Chairman of National Science Foundation's National Science Board, to succeed Dr. Frederick Seitz as NAS president. Election by mail ballot would be held in December. (NYT, 10/14/68, 33)
- . Barron's editorial criticized concentration of space funding on manned lunar program rather than on military: "Congress in its wisdom already has curtailed funds for manned flights after the lunar landing-- the so-called Apollo Applications Program--and it could usefully wield

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October 14 (continued)

an even sharper axe. The money might far better go toward the military exploitation of space, which, for the past seven years, has suffered from dangerous neglect. Thus, out of the vast sums spent on space, at most one dollar in six has had a military bearing. In turn, with the possible exception of the Manned Orbital Laboratory...nearly every cent of the so-called military budget has gone for hardware with a passive or defensive aim, notably satellites for reconnaissance, communications, navigation and weather forecasting. In striking contrast, the Soviet Union has developed and tested...a weapon aptly known as Scrag, which can hurl a guided missile carrying a nuclear payload of 15 megatons or more into a partial orbit (hence, fractional) round the earth. To anyone in his right mind, FOBS constitutes a gross violation of the outer space treaty, which prohibits the placing of nuclear warheads in orbit. However, according to the confused legal eagles in the State Department and Pentagon (if not to some future hapless populace which finds itself on ground zero), anything less than a full orbit goes.... In the interest of survival, here is one balance the U.S. must move swiftly to redress.... The first duty of government is to protect its people. Neither the Kennedy nor the Johnson Administration has honored that trust." (Barron's, 10/14/68, 15)

- . American Independent Party platform in regard to science and technology: "...Emphasis on the further exploration and utilization of space must be renewed. This, again, is a highly competitive area between nations, but not for this reason alone, but for the welfare and security of this nation, we must not be lacking in our efforts in this field...." [Party had been organized by Alabama Gov. George C. Wallace who was its Presidential candidate.] (W Post, 10/14/68, A10)

October 15: NASA launched two Nike-Cajun sounding rockets from Churchill Research Range to obtain data on variation of temperature, pressure, and wind profile by detonating 19 grenades per rocket at prescribed times and recording sound arrivals on ground. Rockets reached 78.8-mi (126.8-km) and 77.8-mi (123.5-km) altitudes and performed nominally. Sound arrivals were recorded from all grenades. Data would be compared with data from Oct. 14 Point Barrow, Alaska, launches. (NASA Rpts SRL)

- . NASA Nike-Tomahawk sounding rocket launched from NASA Wallops Station carried Univ. of Michigan payload to 211-mi (340-km) altitude to investigate role of quenching, dissociative recombination, ionospheric decay, and nonthermal electrons on airglow during decay period immediately following sunset. Rocket and instruments performed satisfactorily; peak

October 15 (continued)

altitude was as predicted, and 570 sec of telemetry was received. All measuring systems functioned properly and scientific objectives were met. (NASA Rpt SRL)

- . Kennedy Space Center Director, Dr. Kurt Debus, said Saturn IB Launch Complexes 34 and 37 would be put on standby basis until beginning of Apollo Applications program in late 1970, with resultant reduction of 1,315 personnel. Shutdown, forced by space budget cuts would save NASA \$20 million. Some 10% of 2,400 contract work force would be affected, with 1,000 engineers and technicians continuing to work in other areas. Complexes ~~were~~ to have been maintained in event Saturn V launch vehicle encountered serious development problems, but Dr. Debus said this insurance was no longer needed. (KSC Release 463-68; AP, B Sun, 10/16/68, A7)
- . U.K. Minister of State in Ministry of Technology, J. P. W. Mallalieu, told House of Commons U.K. would have to pay U.S. equivalent of \$60 million in cancellation fees and other expenses connected with termination of its order for 50 F-111 aircraft Jan. 16, 1968. Order was valued at \$650 million but this would have risen to \$1 billion with computation of spares and 10-yr interest. (WSJ, 10/15/68, 17)

October 16: Aerobee 150 MI sounding rocket launched by NASA from WSMR carried Lockheed Missiles & Space Co. experiment to 96.6-mi (155-km) altitude to obtain quantitative measurements of spectrum and intensity of solar x-ray flux in 2- to 30-kev range, determine distribution on sun, and observe galactic x-ray sources. Rocket and instruments performed satisfactorily. All detection systems on payload acquired useful data. Communications, maintained with both satellite x-ray monitor and ground-based optical observer, indicated sun was in non-flaring state with increasing activity on west limb. (NASA Rpt SRL)

- . Ray Cromley commented in Washington Daily News: "It is one of the tragedies of the moon race that earth satellite programs which could revolutionize certain aspects of agriculture, mineral exploration, TV broadcasting, navigation, weather forecasting and flood control are being squeezed unmercifully by Apollo. It is now clear that these unpublicized, unromantic programs promise unbelievably large payoffs. The U.S. return...has been conservatively estimated at \$400 million to \$1 billion for every \$100 million invested after feasibility research is completed. The investments could be private, public or a mixture of both." (W News, 10/16/68, 31)

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October 16: U.S. and Australia signed five-year agreement in Canberra to expand scientific cooperation through exchanges of scientists and information. They agreed to participate in joint research projects and to include scientists and institutions from other countries in some projects. (Reuters, NYT, 10/17/68, 14)

- . MSFC issued to NAR's Rocketdyne Div. two contract modifications to extend engine production and delivery. An \$8.4-million supplement was awarded for extension of J-2 engine production through April 30, 1970, because of overall stretch-out of launch vehicle production. Under extension, J-2 engine production would be cut from three engines per month to one. Contract for F-1 engine deliveries was extended through June 1970 under \$4-million modification which decreased F-1 production rate from two engines per month to one. (MSFC Releases 68-246, 68-247)
- . Experimental, miniature, deep-exploration submarine Alvin sank in 4,500 ft of water during launch operation 120 mi south of Cape Cod when cable holding it to mother ship broke. No one was aboard. Woods Hole Oceanographic Institute, which operated vessel, expected to recover it. (W Post, 10/17/68, A30; AP, W Star, 10/17/68, All)
- . 1968 Nobel Prize for medicine and physiology was awarded in Stockholm to Dr. Marshall Warren Nirenberg, National Heart Institute; Dr. Har Gobind Khorana, Univ. of Wisconsin; and Dr. Robert W. Holley, Salk Institute, for genetic research pointing way to combatting hereditary illness. (B Sun, 10/17/68, A3; Lee, NYT, 10/17/68, 1)

October 17: NASA's ATS IV applications technology satellite reentered earth's atmosphere over the South Atlantic southwest of St. Helena island. Spacecraft, launched Aug. 10, had remained in parking orbit, tumbling uncontrollably, when Centaur engines failed to reignite for second burn. (NASA Release 68-188)

- . NASA issued summary of combined findings of Accident Board and Review Board appointed to investigate May 6 accident which destroyed Lunar Landing Research Vehicle (LLRV) at Ellington AFB. Pilot, Astronaut Neil A. Armstrong, had to eject few seconds after loss of helium pressure in propellant tanks caused premature shutdown of attitude control rocket system. Helium had been inadvertently depleted earlier than usual in flight. Armstrong incurred minor injuries. Review Board, appointed by then NASA Deputy Administrator Dr. Thomas O. Paine to study accident's possible impact on Apollo program, discovered no unfavorable effects on lunar landing project,

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October 17 (continued)

particularly lunar module. It agreed with Accident Investigation Board in calling for improvements in design and operating practices in LLRV and urged more stringent control over such flying programs and greater attention to all NASA lunar landing simulators. (NASA Release 68-182)

- . Atmospheric scientists at JPL and Ohio State Univ. announced successful high-altitude test of balloon-borne spectrometer to measure atmospheric radiation emitted in four-micron region. Data, obtained on flight from National Center for Atmospheric Research Station at Palestine, Tex., indicated sunlight reflected from earth would pose no significant obstacle to continuous effective operation of radiation sensors on spacecraft in earth orbit. Researchers concluded satellite-borne instrument could probe earth's lower atmosphere to provide basis for global weather prediction. Test marked step in NASA program to define experiments for manned earth-orbiting missions in Apollo Applications program. (NASA Release 68-176; Pasadena Star-News, 10/17/68)

October 18: RAM C-2 radio attenuation measurement mission launched Aug. 22 was adjudged successful by NASA. Good quality measurements of electron and ion concentrations in flow field were obtained at discrete locations along the spacecraft during reentry. (NASA Proj Off)

- . XB-70A, flown by NASA test pilot Fitzhugh Fulton, successfully reached 52,000-ft altitude and mach 2.18 in flight from Edwards AFB to evaluate XAF-exiter vane systems, air vehicle performance, and handling qualities. (XL-70 Proj Off)
- . USAF announced lifting of three-week ban on F-111 flights but reimposed severe limits on speeds and maneuvers in force before halt. Restrictions would be lifted following reinforcement of high-stress area of wing box to distribute load more evenly. Investigation of Aug. 27 ground fatigue testing failure had shown it was "due to an isolated small crack induced during manufacturing process in the metal surrounding a bolt hole." No other such imperfections had been found. USAF said Sept. 23 F-111 accident at Nellis AFB had occurred when pilot lost control because of excessive rearward shift of aircraft's center of gravity following fuel transfer to which crew had given inadequate attention. (DOD Release 947-68; Witkin, NYT, 10/19/68, 1; Sun, 10/19/68, 4; AP, W Post, 10/19/68, All; W Star, 10/22/68, A9)

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October 18: ComSatCorp reported net income of \$5,054,000 (50 cents per share) for first nine months of 1968. Income included \$1,750,000 (17 cents per share) for third quarter. (ComSatCorp Release 68-56)

- . NASA announced it had released tracking ship USNS Watertown from priority role of reentry support for Apollo missions, thus effecting reduction in operational costs required by budgetary curtailments. Manned Space Flight Network land stations in Pacific, Apollo tracking ship Huntsville, and Apollo range instrumentation aircraft would serve returning Apollo spacecraft landing in preselected Pacific area. (NASA Release 68-181)
- . Sen. Gordon L. Allott (R-Colo.) in letter to Science scored "Understanding Gap" between scientific community and Congress and taxpayers on Federal R&D funding. "We are limited to a great degree by revenue taken in by the Treasury if we are to make the financing of our national debt manageable. Within our admitted lack of expertise, coupled with an appalling lack of national goals or a system of priorities, I think we do a fair job of spreading out the federal dollar. We could do better, though, with some constructive help from the scientific community from an objective and realistic appraisal of the circumstances and of existing realities, and we could benefit from the establishment of some system, either a joint Committee or something similar, which would view research on an overall basis, which would review national goals and aspirations and which might...make a stab at setting up some type of priority list." U.S. "might well benefit if...the scientific community would become 'involved,' would drop the cloak of mystery, and take the time to explain, not just to us in Congress, but to Mr. Taxpayer as well, just what it's all about." (Science, 10/18/68, 214-8)

October 19: U.S.S.R. launched Cosmos CCXLVIII into orbit with 543-km (337.4-mi) apogee, 473-km (293.9-mi) perigee, 94.7-min period, and 62.2° inclination. (InteraviaAirLetter, 10/21/68, 6; UPI, W Post, 10/21/68, A11; GSFC SSR, 10/31/68)

- . USAF test pilot Maj. William J. Knight was named 1968 winner of Harmon International Aviator's Trophy as "world's outstanding pilot for exceptional individual piloting performance." He had piloted X-15 No. 2 to 4,520 mph Oct. 3, 1967. Maj. Knight held both command pilot and USAF astronaut's command wings, having piloted research aircraft to 280,000-ft altitude. (NYT, 10/20/68, 84; CSM, 10/21/68)

October 20: Cosmos CCXLIX was launched by U.S.S.R. into orbit with 2,158-km (1,304.9-mi) apogee, 491-km (304.1-mi) perigee, 112.1-min period, and 62.3° inclination. (AP, B Sun, 10/21/68, A4; GSFC SSR, 10/31/68)

October 21: ComSatCorp, on behalf of INTELSAT consortium, signed \$72-million contract with Hughes Aircraft Co. for construction of INTELSAT IV series of advanced comsats--four spacecraft and one prototype, with test and ground equipment. (ComSatCorp Release 68-57)

- . Richard Witkin in New York Times quoted "reliable sources" as saying Assistant Secretary of Defense for Systems Analysis, Dr. Alain C. Enthoven, had forwarded paper to Undersecretary of Defense Paul H. Nitze proposing further cuts in F-111 production, including cancellation of interim bomber version. Dr. Enthoven, specialist in calculating cost effectiveness of competing weapons systems, claimed many projected F-111 missions could be performed by much cheaper aircraft such as Ling-Temco-Vought A-7. (NYT, 10/21/68, 25; Business Week, 10/26/68)

October 21-25: At Fifth Annual Meeting and Technical Display of American Institute of Aeronautics and Astronautics (AIAA) in Philadelphia, Boeing Co. Vice President John M. Swihart announced abandonment of swing-wing design for SST in favor of fixed-delta-wing aircraft with four independently mounted engines under triangular tail. Final detailed design would be given to FAA by Jan. 15 deadline. New design differed from delta-winged Anglo-French Concorde and Soviet Tu-144 in wider wing span and horizontal tail which, according to Boeing Vice President in charge of SST H. W. Withington, made possible superior control at low speeds which compensated for more drag encountered with sweep-back angle of wing. Aircraft cost would be same as swing-wing, \$40 million. It would carry same number of passengers, 280 or more, at same maximum speed, 1,800 mph. (Witkin, NYT, 10/22/68, 77; UPI, W Post, 10/22/68, A1; AP, W Star, 10/22/68, A3)

Dr. William H. Pickering, Director of Jet Propulsion Laboratory, received \$5,000 AIAA Louis W. Hill Space Transportation Award "for devising, developing and supervising significant space and satellite programs for military and civilian agencies of the United States Government." NASA Ames Research Center Director H. Julian Allen was named Honorary Fellow of AIAA, highest membership award given by Institute. It was presented annually to two Americans and one foreign

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October 21-25 (continued)

national. Other 1968 recipients were James S. McDonnell, Chairman of Board, McDonnell Douglas Corp., and England's Sir Frank Whittle, often called father of jet engine. (AIAA Releases; ARC Release 68-15; ARC Astrogram)

October 22: Dr. Wernher von Braun, Director of Marshall Space Flight Center, told reporters before addressing Sales Executive Club luncheon in New York, Apollo 7 flight had gone so well that less had been learned from it than expected. If there were any major flaws in spacecraft they did not show up on the mission. Circumlunar flight in December would be undertaken only if study of Apollo 7 showed it could be done without unnecessary risk. (NYT, 10/24/68, 33)

- . DOD Systems Analysis Office cost-effectiveness proposal submitted to Secretary of Defense Clark Clifford called for elimination from budget of new nuclear submarines requested by Adm. Hyman Rickover, reduction in funds already approved for purchase of antisubmarine weapons, and retirement of more than 20 diesel-powered submarines, said George C. Wilson in Washington Post. Proposal, according to sources, was to postpone high-speed submarine and cancel development of "quiet" one. Its severity "illustrates the money pinch the Pentagon finds itself in as it tries to cut billions from its fiscal 1969 budget as well as the new budget." (W Post, 10/22/68, A10)

October 23: NASA successfully deployed 40-ft-dia parachute with predicted 10-lb-per-cubic-ft dynamic pressure at mach 3.5. Parachute was ejected from five-foot-long cannister which had been propelled to 33-mi altitude by three-stage rocket launched from WSMR. Test was to determine possible use of parachute for aerodynamic deceleration in planetary entry missions. Another test in Project SHAPE (Supersonic High Altitude Parachute Experiments) was scheduled for November. (NASA Release 68-185; AP, NYT, 10/27/68, 66)

- . ATS IV mission (launched Aug. 10 and reentered Oct. 17) was adjudged a failure by NASA. Satellite had remained in elliptical parking orbit instead of entering planned synchronous orbit when Centaur engines failed to reignite for second burn. The resulting highly elliptical orbit precluded meaningful return of gravity gradient data. Day-night camera operated, but attitude dynamics precluded reception other than smeared unintelligible pictures. Electrical operation of ion engines, microwave multiple access, and microwave wide band was verified. Boom camera returned good photos, including some of earth. (NASA Proj Off)

October 23: NASA's HL-10 lifting-body vehicle, piloted by Maj. Jerauld R. Gentry (USAF), failed to climb to desired 45,000-ft altitude after air-launch from B-52 aircraft, apparently because of rocket engine malfunction. Vehicle glided to smooth 225-mph emergency landing on Rosamond Dry Lake. Flight from Edwards AFB was to have been HL-10's first powered flight. (NASA Proj Off; LA Times, 10/24/68)

. Apollo 7 editorial comment:

Washington Post: "...as the men in the space program go over the data on Apollo 7 and consider the alternatives of manned or unmanned flight on Apollo 8, they must not allow anyone's desire to beat the Russians, or to get around the moon by the end of 1968, or to fan public interest in the future of space exploration to enter into their calculations. Only if they are convinced that our knowledge is sufficient, our spacecraft is totally adequate, and our men are ready should they give the go to Astronauts Borman, Lovell and Anders for a Christmas trip into space." (W Post, 10/23/68, A24)

Washington Evening Star: "To those who have made a close study of the space program, [Walter M.] Schirra is the astronaut's astronaut; the man whose ability stands out in that company of the super-able. To those in the know, Schirra is the mischievous perfectionist, the naval officer who lives by the book when he isn't too busy carrying out an elaborate practical joke. But Schirra will surely be remembered by the public as the astronaut who caught cold, who growled when the alarm clock rang, and who blew up when he was pushed too far. And it may be that Schirra's greatest contribution to the space program is that he, the most superlative of the supermen, forcefully demonstrated to the world that his is completely and refreshingly human." (W Star, 10/23/68, A20)

Baltimore Sun: "The toting up and analysis of all the information brought home this time must be left to the teams of experts. So must the decisions as to what comes next, and the planning such decisions call for. The public is content to know that three men in a spaceship have added another brave and brilliant chapter to a history of which all of us are unreservedly proud." (B Sun, 10/23/68, A6)

- . MSFC issued McDonnell Douglas Corp. \$2,395,955 supplemental contract agreement for qualification test program to verify capability of maintaining S-IVB stage auxiliary propulsion system modules for up to 90 days with propellants loaded. Award brought total value of contract to \$965,568,493. (MSFC Release 68-252)

October 24: X-15 No. 1, flown by NASA test pilot William H. Dana, successfully reached 250,000-ft altitude and 3,682 mph (mach 5.04) in flight from Edwards AFB. Purpose of flight was to conduct WTR experiment and check out fixed alpha cone and fluidic probe. (X-15 Proj Off; AP, W Post, 10/25/68; SBD, 10/29/68, 289)

- . Second Minuteman III ICBM was successfully launched by USAF from underground silo at AFETR. First test had been conducted Aug. 16. (AFETR PIO; Reuters, P Inq, 10/25/68; SBD, 10/29/68, 289)
- . NASA was negotiating with General Electric Co. for data management system costing in excess of \$750,000 for 15 mo. It would be used to monitor data from Barbados Oceanographic Meteorological Experiment (BOMEX), in which NASA would assist ESSA during 1969. Data from satellites, five to seven ships, many buoys, and from high in atmosphere to bottom of ocean would be processed by system. (NASA Release 68-251)
- . Rep. Alphonzo Bell (R-Calif.) told American Astronautical Society meeting in Los Angeles, "In evaluating space spending as a budget priority, it is vital to consider the relationship of space to defense....Both Russia and the United States have advance surveillance capacity....Both nations have almost unlimited plans for developing their capabilities in this area. Mutual distrust is just one reason for this. The other is concern about the mounting capacity of other nations, particularly China, to produce and deliver nuclear weapons. As long as the threat of nuclear war from any source continues, Russia and the United States will be producing ever more sophisticated orbital 'spies in the skies.' ...That is why the space program of the United States never is going to be abandoned. It will always be high on the list of spending priorities. The reason is not charming, but basic. We need to be in space to protect ourselves....In the somewhat more distant future the harvest of human rewards...now only beginning... will prove that space research and space applications justify a continuing high priority." (Text; Aero Daily, 10/29/68)

October 25: Soyuz 2 was successfully launched by U.S.S.R. into orbit with 229-km (142.3 mi) apogee, 191-km (118.7-mi) perigee, 88.6-min period, and 51.7° inclination. Satellite later was used in rendezvous maneuvers with manned Soyuz 3 [see Oct. 26-30] and reentered Oct. 28. (Lannan, W Star, 10/27/68, A1; SBD, 10/28/68, 279; GSFC SSR, 10/31/68)

October 25: In statement to the press, Secretary of Defense Clark Clifford announced decision to proceed with program for turbine electrical drive [quiet] submarine. He had ordered construction of high-speed nuclear-propelled attack submarine July 1. "The close re-examination...just completed has convinced me that costly as it is [\$150 to \$200 million compared with \$78 million for new Sturgeon class nuclear attack submarine], there is no cheaper and effective way to achieve in equal time desired progress in noise suppression." (DOD Release 971-68)

- . NASA announced that H. Julian Allen, who joined NACA in 1936, would retire as Director of Ames Research Center Nov. 15. ARC Associate Director John F. Parsons would serve as Acting Director. Leading authority on supersonic and hypersonic wind-tunnel design, Allen had originated concept of bluntness for reentry shapes--as used in Apollo spacecraft--and had received NACA's Distinguished Service Medal, NASA Medal for Exceptional Scientific Achievement, AIAA Sylvanus A. Reed Award, and Air Force Assn.'s Air Power Trophy. After his retirement Allen would be available to NASA as a consultant. (NASA Release 68-183; SBD, 10/28/68, 272; NASA Ann)
- . New York Times editorial commented on failure of swing-wing design for SST: "More than ever now the burden of proof is on those who urge that billions of taxpayers' dollars be spent on an American SST. The fallibility of their judgment has been demonstrated in the loss of the swing-wing gamble. Is there reason to suppose that their optimistic forecasts about the profits to be made from such an airplane are any sounder? The aerodynamics of different wing configurations is not the only thing that needs to be assessed in the current re-examination of the SST." (NYT, 10/25/68, 46)
- . In Washington Evening Star Carl T. Rowan wrote: "Some disenchanted Americans shake their heads as they note the poverty, the hunger, the sickness, the ignorance that plague the earthlings about them, and they ask what logic provokes our government to ignore critical problems at hand while investing vast sums in space ventures of doubtful value. ...we have become an 'either/or' society...Even though our gross national product is now running at a fantastic level of \$871 billion a year, it is absolutely inconceivable to most taxpayers that we can have guns and butter, space spectacles and dramatic domestic change.... Well, no man of vision, imagination, or hope can possibly believe that we are wrong to search the darkest reaches of outer space....Who can say that contributions to medicine, to weather control, to science in general, to the problems of feeding man, to national defense, and ultimately to peace may flow from the space program? ...The space program

October 25 (continued)

is..., inherently and intrinsically, justification enough for spending \$340 for every man, woman, and child in America. But are we not wise to ask: what is man profited if he harness the universe and yet fail to conquer the meanness,...the hatreds, that dog those who inhabit the earth?...Much of the public is not in a mood to finance anything else. So we shall be stuck with the ordeal of setting priorities where there is scant room for making choices." (W Star, 10/25/68, A15)

- . MSFC announced Boeing Co. contract modifications totaling \$4,652,364 for Saturn V R&D, to: install over 4,000 instrumentation and data acquisition systems in special 2nd stage structural test verification program to confirm design of lighter weight, more powerful 2nd stage for fourth Apollo/Saturn V and subsequent vehicles; perform an abort and alternate mission analysis for Apollo/Saturn vehicles 503 through 510; and perform reliability, quality, and component qualification program, special prelaunch analysis, telemetry systems, and Saturn V Apollo operations system safety program. Total value of Boeing Saturn V systems engineering and integration contract was now \$213,443,238. (MSFC Release 68-253)
- . USAF's Space and Missile Systems Organization announced award of initial increments to cost-plus-fixed-fee contracts with McDonnell Douglas Corp.: \$5-million increment was awarded to \$9,829,177 contract for reentry vehicle developmental flight tests; \$756,285 increment was awarded to \$1,739,105 contract for reentry vehicle environmental components tests. (DOD Release 974-68)
- . Edward J. Schmidt, Special Assistant to General Electric Co.'s Vice President for R&D, was sworn in by NASA Acting Administrator, Dr. Thomas O. Paine, as consultant to the Administrator in management operations as affected by scientific and technical information. (NASA Release 68-189)

October 26: Business Week editorial: "...since the tragedy on the launch pad...[Jan. 27, 1967] NASA and its thousands of supporting companies have done a tremendous job in rebuilding the spacecraft and in perfecting the safety and reliability of the entire Apollo system. The clear message of Apollo 7 is that NASA now has a spacecraft that can take men to the moon and back safely. This is a triumph for NASA and for U.S. science, engineering, and management. (Business Week, 10/26/68)

October 26-30: U.S.S.R. successfully launched Soyuz 3, carrying Cosmonaut Georgy T. Beregovoy, from Baikonur Cosmodrome with "a powerful rocket-booster," Tass announced. Spacecraft entered orbit "close to the preset one," with 205-km (127.4-mi) apogee, 183-km (113.7-mi) perigee, 88.3-min period, and 51.7° inclination; all equipment was functioning normally. Launch was first manned Soviet mission since Soyuz I (April 23-24, 1967) in which Cosmonaut Vladimir M. Komarov was killed when spacecraft crashlanded following reentry.

Tass later announced that during first revolution Soyuz 3 "approached" to within 200 m (656 ft) of unmanned Soyuz 2 (launched Oct. 25), initially by "an automatic system"; subsequent operations were performed manually by Beregovoy. On Oct. 27, Tass said, Beregovoy "independently oriented the ship in space and switched on the motor," to alter spacecraft's orbit; continued conducting scientific, technical, medical, and biological experiments and research; transmitted TV pictures of cabin interior; and approached Soyuz 2 for second time before it reentered Oct. 28. Soyuz 3 remained in orbit until Oct. 30, completing 94 hrs 51 min and 64 revolutions, before it softlanded "with the use of aerodynamics," in a preset area in Soviet territory. Flight was first successful manned docking for U.S.S.R. U.S. had conducted first manned docking March 16, 1966. (Lannan, W Star, 10/27/68, A1; O'Toole, W Post, 10/27/68, A1; Kamm, NYT, 10/27/68; SBD, 10/28/68, 279; 10/31/68, 297; AP, W Post, 10/28/68, A1; GSFC SSR, 10/31/68)

October 27: Lightweight plastic foam invented by ARC scientists Dr. John A. Parker and Salvatore Riccitiello showed great promise for industrial fire protection, particularly fuel fires. Extremely light polyurethane with additives formed tough, protective char layer when exposed to flame, while simultaneously releasing fire-extinguishing gases which helped to quench flame. Used to fill airspaces within structures, foam would prevent oxygen from reaching and feeding a fire. Demonstrations had shown it suitable for fire protection in aircraft, spacecraft, homes, and other structures. Other possible uses included automobiles, boats, trains, oil refineries, paint and chemical processing, and laboratories. Foam was resistant to heat flow, making it an excellent insulator. (NASA Release 68-187)

October 27: In New York Times article John N. Wilford said some NASA Hq. officials were "hesitant to approve a lunar orbit mission out of fear of being criticized for taking undue risks by skipping preliminary test flights. They are worried about the spacecraft's electrical system, which developed some minor 'bugs' during Apollo 7, and the propulsion system, even though the on-board rocket apparently performed well in eight firings during Apollo 7." If lunar mission was decided on, it would probably be launched Dec. 21 when moon's position to earth would require minimum midcourse rocket firing maneuvers for landing and light conditions would give good view of potential lunar landing site. First astronauts on moon were expected to stay less than 24 hr, to demonstrate it could be done. In time astronauts would make many return trips and would roam moon's surface in "moon buggies." Day might come when people would establish lunar colonies. (NYT, 10/27/68, 12E)

- . Dr. Lise Meitner, nuclear physicist who was for 30 yr scientific partner of Dr. Otto Hahn, Nobel Prize winning discoverer of nuclear fission, died in Cambridge, England, at age 89. She had been forced to leave her work with Dr. Hahn and flee Nazi Germany's antisemitism in March, 1938, nine months before he announced results of experiments which indicated atom could be split. Dr. Meitner was credited with having laid much of theoretical groundwork for atomic bomb. Though it was she who named the phenomenon "nuclear fission," she took pains to disassociate her work from the bomb itself. (NYT, 10/28/68, 1)

October 28: NASA outlined six steps which would lead to final decision during week of Nov. 11 on next Apollo manned mission. Apollo 8, scheduled for December, was planned as manned earth-orbital mission on Saturn V vehicle. Because of Apollo 7 success, NASA was considering alternative mission possibilities: earth-orbital mission deeper into space, circumlunar flyby, and lunar orbit. Steps--laid out by Associate Administrator for Manned Space Flight, Dr. George E. Mueller, and Apollo Program Director, L/G Samuel C. Phillips--were: detailed analysis and review of Apollo 7 results to determine any necessary spacecraft changes; final certification of solutions to Apollo 6 problems; certification of strengthened Saturn V 2nd and 3rd stage fuel lines and elimination of pogo in 1st stage; completion of ground tests before Apollo 8 command and service module (CSM) certification for lunar flight; completion of flight computer programs for deep space and lunar missions; rehearsal of CSM operations tests with mathematical models, and delivery of Apollo 8 CM computer program; and completion of design certification reviews of launch vehicle and spacecraft subsystems. Dr. Thomas O. Paine, NASA Acting Administrator,

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October 28 (continued)

said, "The final decision on whether to send Apollo 8 around the Moon will be made after a thorough assessment of the total risks involved and the total gains to be realized in this next step toward a manned lunar landing. We will fly the most advanced mission for which we are fully prepared that does not unduly risk the safety of the crew." (NASA Release 68-190; UPI, NYT, 10/29/68, 14)

- . Washington Evening Star editorial: "The Russians are going to the moon just as fast as their technology will carry them....It is, of course, impossible to judge what lies ahead or guess what problems either nation may encounter before the lunar landings are carried out. But if all goes well it looks as though both nations might be ready to go in about a year. We would have no objection at all if a way could be found to 'fix' the race, and an agreement reached to make the landings literally simultaneous. It would be one way of assuring that neither nation would pursue the goal of national prestige to the point of tragedy." (W Star, 10/25/68, A10)
- . Republican Vice-Presidential candidate, Maryland Gov. Spiro T. Agnew, said on visit to Manned Spacecraft Center during Houston campaign trip, "We will not tolerate America becoming second best" in our space exploration. (W Star, 10/29/68, A5; UPI, W News, 10/29/68, 3)

October 29: ESSA said "very minor" solar flare reported at 7:18 am EST was accompanied by large radio burst that could interfere with radio communication. It was too small to affect U.S.S.R. Cosmonaut Georgy Beregovoy in orbit. (UPI, W Post, 10/30/68, A23)

- . French Defense Minister Pierre Messmer said plans for 1969 hydrogen bomb testing around Fangataufa Atoll in South Pacific would include miniaturization of H-bomb and perfection of ground-to-ground and sea-to-ground strategic missiles. France's first atomic submarine would start sea tests, and second would be launched. Military budget for 1969 allocated \$1.3 billion for nuclear weapons and delivery systems and \$476 million for nuclear construction. (AP, B Sun, 10/30/68; W Post, 10/30/68, A20)
- . Army Map Service technicians were building 22- by 14-ft hand-carved model of landing site astronauts would see on approaching lunar "target area," to assist NASA in simulating manned landings on moon. Model, part of lunar module simulator (LMS), would be constructed from high-fidelity lunar relief map made from Orbiter IV and V photography. (DOD Release 966-68)

October 29: NASA announced retirement, effective Nov. 1, of Werner R. Kuers, Director of Marshall Space Flight Center's Manufacturing Engineering Laboratory since 1961. (MSFC Release 68-257; Marshall Star, 10/30/68, 1)

- . MSFC awarded Boeing Co. \$1,404,548 contract modification to predict and evaluate orbital heating effects of liquid hydrogen boil-off, supply thermal criteria, and profiles related to Saturn V 2nd stage, assist with Saturn V preflight reviews, and provide configuration accounting. Award brought total contract to \$212,128,585. (MSFC Release 68-256)

October 30: Award of \$70,000 Nobel Prizes in physics and chemistry to Univ. of California at Berkeley Prof. Luis W. Alvarez and Yale Univ. Prof. Lars Onsager, respectively, meant U.S. had won all three Nobel science categories for 1968, as it had in 1946. Awards in medicine and physiology [see Oct. 16] went to U.S. geneticists. Dr. Alvarez was cited for "decisive contributions" in early 1960s to physics of subatomic particles and techniques for their detection. Dr. Onsager was honored for findings published in 1931 and sometimes regarded as fourth law of thermodynamics, "the reciprocity relations of Onsager," which could determine interrelation between voltage and temperature as electric current flowed through metal wire. Awards would be presented in Stockholm Dec. 10. (Lannan, W Star, 10/30/68, A1; Lee, NYT, 10/31/68, 1; O'Toole, W Post, 10/31/68, A25)

October 31: U.S.S.R. launched two Cosmos satellites. Cosmos CCL entered orbit with 845-km (525.1-mi) apogee, 753-km (469.7-mi) perigee, 100.6-min period, and 74° inclination. Cosmos CCLI entered orbit with 226-km (140.4-mi) apogee, 170-km (105.6-mi) perigee, 88.3-min period, and 64.7° inclination. Instruments were functioning normally. (GSFC SSR, 10/31/68; SBD, 11/4/68, 12)

- . Dr. William H. Pickering, Jet Propulsion Laboratory Director, and Dr. Lee A. DuBridge, California Institute of Technology President, presided at unveiling of historical marker at JPL commemorating test-firing of rocket engine Oct. 31, 1936, by students of Cal Tech's Guggenheim Aeronautical Laboratory under the late Dr. Theodore von Kármán. With firing, Cal Tech had become first university actively to sponsor rocket research. Its work had gained Government sponsorship and later had led to establishment of JPL. (JPL Release 492; Diebold, LA Times, 11/1/68)

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October 31: National Academy of Sciences President, Dr. Frederick Seitz, announced William W. Rubey, professor of geology and geophysics at Univ. of California, Los Angeles, had been named Director of Lunar Science Institute, Houston, Tex. NAS had accepted interim responsibility for operation of Institute until consortium of universities could be formed to assume its direction. Formation of Institute had been announced by President Johnson March 1, 1968, to provide base for academic scientists participating in lunar exploration program, working in Lunar Receiving Laboratory, or using other facilities of Manned Spacecraft Center devoted to study of the moon. It was to serve also as center for analysis and study of lunar data obtained from NASA unmanned missions. (NASA Release 68-191; NAS Release)

During October: Soviet Science in the News, Electro-Optical Systems, Inc., publication, said review of Soviet technical press indicated U.S.S.R. would attempt to orbit manned space station within the year and that it possessed "well-devised and thoroughly realizable designs." First "rooms" of station would comprise Cosmos or Proton booster joined with Soyuz spacecraft. Additional rooms would combine solid and inflatable elements like polyethylene. Tests of water recovery systems in Pacific indicated broadening of Soviet techniques. Six vessels had been completed for ocean recoveries of spacecraft. Conclusion of Soviet scientists that weightlessness had adverse effect on human skeletal composition seemed to indicate space station would use artificial gravity. "Rotation of space station of from 40 to 60 meters in diameter would generate sufficient artificial gravity to allow large number of scientists to work in space." (SSN, 10/68, 1; Aero Daily, 10/16/68)

- . Dr. Robert C. Seamans, Jr., MIT professor and consultant to former NASA Administrator James E. Webb, was nominated as AIAA President for 1969. (A&A, 10/68, 106)

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COMMENT DRAFT

N O T F O R R E L E A S E

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(HHR-23)

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NOVEMBER 1968

November 1: U.S.S.R. launched Cosmos CCLII from Baikonur Cosmodrome into orbit with 2,148-km (1,334.7-mi) apogee, 531-km (330-mi) perigee, 112.4-min period, and 62.3° inclination. (SBD, 11/4/68, 12; GSFC SSR, 11/15/68)

November 2: President Johnson presented NASA Distinguished Service Medal, NASA's highest award, to recently retired NASA Administrator James E. Webb at ceremony in Johnson City, Tex. He also awarded cluster to NASA Exceptional Service Medal held by Apollo 7 commander Walter M. Schirra, Jr., and Exceptional Service Medals to Apollo 7 Astronauts R. Walter Cunningham and Donn F. Eisele.

President said U.S. was "ready to take that first great step out into the solar system and on to the surface of the nearest of the many mysterious worlds that surround us in space." Noting that Apollo 7 had logged more than 780 man-hours in space--more than had been logged "in all Soviet manned flights to date"--and had accomplished 56 mission objectives, as many "in this one flight as were accomplished in the first five manned flights of the Gemini spacecraft," he said: "This is not important as either a game or a contest. But it is important because the United States of America must be first in technology if it is to continue its position in the world. I believe today, as I did when we had our original hearings that created the Space Administration, that the United States must be first."

President read citation presenting Medal to Webb for "outstanding leadership of America's space program from 1961 through 1969.... More than any other individual he deserves the credit for the great achievements of the United States in the first decade of space, and for helping man to reach outward toward the stars."

Webb responded: "The citation and medal...should, in my view, be converted into some kind of holographic substance so it could be divided into thousands of parts...and each part should really go to an outstanding person in NASA, in our scientific group, working in our universities, and in the great industrial organizations of this country that have really done the work." (Text)

- . In Prague newspaper Mlada Fronta, Czechoslovak Academy of Sciences' astronomer Dr. L. Krivsky said "very dangerous" radiation from solar radio storm might have forced premature ending of U.S.S.R.'s Soyuz III mission Oct. 30. He implied, said New York Times, that U.S.S.R. had either been unaware or had failed to consider radio storm forecast for late October. (NYT, 11/3/68, 35)

November 2: Business Week commented on results of "two bad decisions by agencies of the federal government." Boeing Co. was scrapping swing-wing concept on SST in favor of fixed-wing and "word seeped out of the Pentagon that a real fight has developed over whether to cut back production of...F-111." How were such mistakes to be prevented in future? "One lesson that emerges...is that the government must learn to avoid premature commitment to any huge-scale project.... Another lesson is that in such major decisions, an independent, technologically competent judgment should be brought to bear on the issue. On the F-111, the President's Science Advisory Council did not even look at the design features of the aircraft. On the SST, a Special Presidential Advisory Committee was set up, but it was chaired by [then Secretary of Defense Robert S.] McNamara and was dominated by top Administration officials. Such changes in procedures may not wipe out all mistakes, but they could greatly reduce the chances of astronomically costly blunders." (Bus Wk, 11/2/68)

November 4: President Johnson released Noise--Sound Without Value, report of Federal Council for Science and Technology task force, and challenged industry, universities, and public authorities to attack noise in environment from many sources. He directed Federal departments and agencies to undertake or expand noise abatement programs. Among recommendations endorsed by President, report said NASA should complete studies of community response to airport noise, in addition to HEW, DOT, and HUD studies of effects. NASA and DOT should continue air transport noise abatement research. DOD and NASA should continue to study and set standards for noise in special situations. DOT should develop sonic-boom-control standards. (Text; PD, 11/11/68, 1575-6)

- New York Times editorial commented on award of all 1968 Nobel Prizes in science and medicine to U.S. citizens: "...there are real and important roots of American scientific prowess which need to be understood and fostered so that future achievement may match or excel that of the past. This country's hospitality to refugees from political tyranny and to those seeking to better themselves economically has brought rich rewards particularly in science and technology. The nation's huge investment in education has permitted able young people to develop their talents. Generous Government support of basic research has given the nation's scientists the tools and the material security needed for the realization of their potential excellence. The abundant returns from these policies provide good reason for maintaining them so that American science can continue to flower." (NYT, 11/4/68, 46)

November 5: Soviet Academy of Sciences President Mstislav V. Keldysh told Moscow news conference Soyuz III spacecraft flown by Cosmonaut Georgi T. Beregovoy Oct. 30 was intended only for earth orbit. He said U.S.S.R. might send animal on lunar mission before sending human to ascertain that cosmic radiation was not too dangerous. (AP, B Sun, 11/6/68, A2)

- . USAF awarded separate \$3,941,500 contracts to Westinghouse Electric Corp. and Hughes Aircraft Co. for 20-mo competition to develop new attack radar system for ZF-15A (formerly FX) advanced air superiority fighter aircraft. Awards were initial obligations of contracts which would total \$22 million during FY 1969 and FY 1970. Winner would be selected after flight tests and evaluation of both radar prototypes. (DOD Release 1006-68; WSJ, 11/6/68, 13)

November 6: National Radio Astronomy Observatory astronomers at Green Bank, W. Va., disclosed discovery of first pair of pulsars, near Crab Nebula 6,000 light yr from earth. Through association with the decayed star, they might provide clue as to pulsars' identity. (Cohn, W Post, 11/7/68, A4)

- . With task of designing equipment for U.S. space program largely over and because of cuts in NASA spending, hundreds of scientists and engineers were losing their jobs or getting out "while the getting is good," said Peter H. Prugh in Wall Street Journal. Boeing Co. was laying off several hundred at New Orleans and Cape Kennedy; its Huntsville work force was down from 4,600 in 1966 to 3,000, with more cuts coming. Chrysler Corp. had cut employment at New Orleans from 3,300 to 1,500, while most of its 900 Cape Kennedy employees faced layoffs or shifts to other cities. Huntsville office of Alabama State Employment Service said area employment had declined 3,500 in past year with biggest drop in aerospace field. Space scientists and engineers were finding even mundane jobs difficult to land because of their specialized skills and relatively high salary demands. Exodus was worrying space experts, "who fret that a new emphasis on U.S. space efforts or new military needs would leave companies hard pressed to fill the rows of desks being vacated now." (WSJ, 11/6/68, 1)
- . AFSC Commander, Gen. James Ferguson, addressing Fourth Biennial Guidance Test Symposium, Holloman AFB, N.Mex., cited missile guidance needs and said that U.S.S.R. was "working night and day to upset the status quo."

1 9 6 8

November 6 (continued)

There are a number of possible advances or even breakthroughs that would give them decided advantages over us. We would be most unwise to let them take a lead in technology through our lack of decisive effort. We must, at all times, maintain a technical momentum in order for our nation to maintain adequate strength across the entire spectrum of deterrence." (Text)

- . NASA announced appointment of Dr. Mathias P. Siebel as Director of Marshall Space Flight Center's Manufacturing Engineering Laboratory, replacing W. R. Kuers, who retired Nov. 1. Dr. Siebel had been Deputy Director of Laboratory since he went to MSFC in 1965. (MSFC Release 68-262)
- . Ham, first chimpanzee successfully launched on space flight [Jan. 31, 1961], was among five great apes at National Zoo who reacted positively to tuberculosis tests, according to zoo veterinarian, Dr. Clinton W. Gray. Animals were under treatment and expected to be fit for exhibiting again within 60 to 90 days. (Schaden, W Star, 11/6/68, B2)

November 7: NASA Nike-Apache sounding rocket launched from NASA Wallops Station carried GSFC payload to 64.4-mi (103.6-km) altitude to determine absolute value of positive ion concentration in D and E regions of ionosphere. Quadrupole mass spectrometer for measuring relative abundance of positive ions malfunctioned and, consequently, launch of two supporting rockets was postponed. Vehicle performance and trajectory were good and experimental related events functioned well and on time. (NASA Rpt SRL)

- . Leading Soviet space scientist, Prof. Leonid I. Sedov, had told Univ. of Tennessee Space Institute press conference Zond V mission was "definitely" precursor of deep space probes, Aerospace Daily reported. U.S.S.R. would send spacecraft around planets and bring them back. Spacecraft would relay data from space and also return with scientific information. (Aero Daily, 11/7/68, 29)
- . ARC Astrogram reported successful completion of first in series of studies by Ames Biomedical Research Branch in which primates had been restrained in chairs for 98 days to provide information on calcium metabolism and bone mineralization when normal weight load on bones was altered as in weightlessness in space. Results showed that with application of weight loads on certain bones loss of calcium

November 7 (continued)

in urine was within normal limits; without load, control animal's calcium loss was elevated and lasted throughout experiment. X-rays showed normal bone mineralization in vertebrae and bones of loaded pig-tailed monkey, while unloaded animal sustained mineral loss. Studies would determine methods for prevention of bone changes and improve safety and efficiency of manned space flights. (ARC Astrogram, 11/7/68, 2)

- . NASA released Delta launch vehicle for Nov. 8 launch of Pioneer D after completion of "corrective actions" to prevent repetition of vehicle's first flight failure Sept 18. Delta No. 59, carrying INTELSAT III-A (INTELSAT III/F-1), had been destroyed shortly after liftoff when vehicle began breaking up. (NASA Release 68-195)
- . U.S.S.R. celebrated 51st anniversary of Bolshevik Revolution in Moscow with missile display which included no new weapons. (AP, W Star, 11/7/68, A3)

November 8: NASA's Pioneer IX (Pioneer D), fourth in series of five spacecraft designed to provide continuing measurements over the solar cycle at widely separated points in interplanetary space, was successfully launched from ETR by Thrust-Augmented Improved Thor-Delta (DSV-3E) booster into orbit around the sun. Orbital parameters: aphelion, 0.99 astronomical units (au), or 92.04 million mi (148.10 million km); perihelion, 0.75 au, or 69.71 million mi (112.19 million km); period, 297.55 days; and inclination 0.09°

Test and Training Satellite TETR II, carried pickaback on 2nd stage, was successfully ejected after 3rd stage burnout and entered orbit around earth with 587.2-mi (945-km) apogee, 231.8-mi (373-km) perigee, 97.9-min period, and 32.8° inclination. S-band transponder was operating properly. TETR II was follow-on to TETR I (formerly designated TTS I; launched pickaback on Pioneer VIII Dec. 13, 1967), which was highly successful in testing Apollo communications network.

Primary mission objective of 147-lb, drum-shaped Pioneer IX was to collect scientific data on electromagnetic and plasma properties of interplanetary medium for period covering six or more passages of solar activity centers. As secondary mission, Pioneer IX would: (1) acquire data when highly significant solar event occurred; (2) refine primary determinations of earth and moon masses, the astronomical unit, and osculating elements of earth's orbit; (3) provide synoptic study of solar-interplanetary

November 8 (continued)

relations; and (4) provide target for checkout of Manned Space Flight Network equipment and training of operations personnel by launching Test and Training Satellite as secondary payload. Pioneer IX separation, boom deployment, and first solar orientation occurred as planned and all eight experiments were operating properly and returning good data.

Pioneer VI (launched Dec. 16, 1965), Pioneer VII (launched Aug. 17, 1966), and Pioneer VIII (launched Dec. 16, 1967) were all successful and were continuing to transmit excellent data. Pioneer program was managed by ARC under OSSA direction. (NASA Proj Off; NASA Release 68-192; UPI, W News, 11/8/68; W Post, 11/9/68, A10; AP, LA Times, 11/9/68; Lannan, W Star, 11/11/68, A17; SBD, 11/12/68, 46; GSFC, SSR, 11/15/68)

- . American Nuclear Society held panel session in Washington, D.C., on "The U.S. Space Program: Achievements and Objectives."

Dr. Edward C. Welsh, NASC Executive Secretary, declared, "We must step up the rate at which we tap the vast potential of nuclear energy for the space activities of tomorrow. ...if we do not make greater use of nuclear energy, we will neglect our mission of learning rapidly more and more about the solar system in which we live and about the planet where we reside. In the field of propulsion, chemical rockets, both liquid and solid, can be vastly improved when combined with the products of nuclear technology." Combining nuclear stage with Saturn V "will greatly increase that rocket's power of achievement. This is not only an opportunity to increase the thrust of the rocket but also to increase its efficiency. Not only will we have the vast power of the atom at our command, but it will be compact, self-contained, long lived, highly maneuverable, and virtually independent of its surrounding environment....The partnership of atomic energy and space seems, therefore, to be an entirely natural one. Space missions can grow with their greatly enhanced capabilities instead of being constrained by a lack of them. Atomic energy will enable the space effort to reach for the infinite." (Text)

NASA Associate Administrator for Advanced Research and Technology James M. Beggs discussed "Research and Technology for the Future": "The difference between success and failure of [NASA] missions...lies in our knowledge of the flight sciences and our skill for applying this knowledge to the development and operation of space vehicles.... A natural characteristic of technology is its multiapplicability; an improvement in guidance or communication equipment, for example, may find many uses in space missions as well as non-aerospace applications.

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A key to making this process productive, as measured by the creation of new knowledge and techniques, is a continuing research program, well planned and well supported, that has a good balance between the effort in the scientific and engineering disciplines and in the technologies needed to explore the unknown." (Text)

Dr. Wernher von Braun, MSFC Director, said, "The first practical application of space electric power systems, which have been under development over the past 10 years, may well be found in our second generation orbital space station program. Consistent with our present estimates of station initial power requirements, and allowing for growth, a zirconium hydride reactor coupled with a thermoelectric conversion system is being studied for application on such a space station." (Text; Reuters, B Sun, 11/14/68, A10)

- MSFC announced Boeing Co. had been issued \$239,000 contract for 10-mo study defining two-stage derivative of Saturn V launch vehicle. With 1st (S-IC) and 3rd (S-IVB) stages and instrument unit of Saturn V, vehicle could place up to 158,000 lb in low earth orbit. Varying number of F-1 engines in S-IC could tailor vehicle to specific missions. Five-engine configuration could put into orbit Saturn I Workshop with airlock and multiple docking adapter, plus Apollo Telescope Mount and Apollo CSM and three-man crew. Three Saturn IB vehicles would be required to do same job. Vehicle could resupply space stations and could be used for synchronous orbits and unmanned moon and planetary flights at major savings over three-stage Saturn V. Two-stage version was called, "Intermediate 20." With Centaur 3rd stage, vehicle could send about 15,000 lb to Jupiter or Saturn.

MSFC also had signed \$22,826,736 contract modification with North American Rockwell Corp.'s Rocketdyne Div. for continued production support of J-2 engines used on Saturn IB and Saturn V boosters. Modifications would improve engines' versatility. (MSFC Releases 68-264, 68-266)

- NAS-NRC Space Science Board issued Physics of the Earth in Space--A Program of Research: 1968-1975, report of NASA-supported study by 31 scientists at Woods Hole, Mass, Aug. 11-24. Report, dated October and fourth by Board to provide guidance for NASA's programs in space physics, said results of decade of research by artificial satellites were "revolutionary; few of the concepts of the early 1950's have survived without major revision and totally unexpected discoveries have provided fundamentally new theoretical challenges." And "results of today's space research on the physics of the Earth in space become the engineering design data of tomorrow's civilian

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and defense applications programs."

Report defined program of satellite, space probe, and sounding rocket missions for concerted attack on questions of fundamental physical mechanisms of sun-earth system, in contrast to past decade's exploratory surveys. It emphasized coordinated investigations, new experimental techniques, and major observation effort during 1974-1975 low solar activity. Recommendations included continued NASA support for balloon, aircraft, and ground-based observations and of advanced development of spacecraft instruments; better means of data handling and adequate support for data analysis; and restoration of NASA program of predoctoral traineeship grants to 1966 level. (Text)

- . Astronomers reported in Science conclusion neither NASA's Mariner V (launched June 14, 1967, for flyby of planet Venus) nor U.S.S.R.'s Venus IV (launched June 12, 1967) had reported atmospheric conditions near level of mean surface of planet. Von R. Eshleman and Gunnar Fjeldbo of Stanford Univ., John D. Anderson and Arvydas Kliore of Jet Propulsion Laboratory, and Rolf B. Dyce of Cornell-Sydney Univ. Astronomy Center at Arecibo (Puerto Rico) Ionospheric Observatory had made new determination of radius of planet, based on concurrent ranging from earth to Mariner V near encounter and to surface of Venus. Extrapolations of measurements had given surface values for mid-latitudes of close to 100 atmospheres pressure and 700° K temperature (within 100°), rather than Soviet values of 19±2 atmospheres and 544±10° K. Soviet probe apparently was not designed to work through such thick atmosphere. Simple ambiguity (times two) in Venus IV altimeter reading could explain supposition that probe reached Venus surface, "since this would bring all other data into excellent agreement." (Science, 11/8/68, 661-5)
- . At press conference, inventor-scientist Stanford R. Ovshinsky described production of electronic devices--including desktop computers; flat, tubeless TV sets that could be hung on walls; and missile guidance systems impervious to destruction by man-made radiation. Devices were made of amorphous materials whose electrical properties differed from transistor materials. Balance of energy forces within amorphous glasses was such that application of voltage of right minimum strength made material switch from insulator to conductor. (Stevens, NYT, 11/11/68, 1)
- . American Telephone & Telegraph Co. said it had asked FCC to authorize its acquisition of 70 additional satellite communications circuits from ComSatCorp. Purchase would boost AT&T circuits to 396. (WSJ, 11/8/68, 5)

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November 9: Apollo 7 commander Walter M. Schirra, Jr., received from Italian Ambassador to U.S. Egidio Ortona gold medallion award by Assn. of Man in Space, group of Italian scientists and jurists, at Washington, D.C., party in his honor. (Billington, W Star, 11/11/68, B7)

November 10: On nationwide "Meet The Press" TV interview, Astronaut Walter M. Schirra, Jr., commented on NASA budget cuts: "We've built up a fantastic technology [but] talented people are starting to leave.... We should let it be known that we are in this for the future, not just one flight." Cost of manned missions was justified in quest for knowledge not only outward, but earthward, too. Astronauts were "looking at portions of the earth that had never been documented before. A crew can see something and respond to it, on earth or the moon." Fellow Apollo 7 crewman R. Walter Cunningham said never had U.S.S.R. crewmen "functioned in the same operational conditions as we." U.S.S.R. was putting fewer higher trained persons in orbit, "serving mainly as biological specimens." (AP, W Post, 11/11/68, A2; AP, B Sun, 11/11/68, A5)

- NASA announced it soon would begin series of test flights at LaRC of XC-142 tilt-wing VTOL aircraft on loan from USAF, to determine operational problems in airport terminal areas during poor visibility. XC-142, for which Ling-Temco Vought, Inc., was prime contractor, was propeller-driven and powered by four GE turboshaft engines. NASA also was testing Ryan Aeronautical Co.'s XB-5A, which it had modified as XV-5B, and Hawker Siddeley P-1127 vectored jet VTOL aircraft. (NASA Release 68-194)
- In Sunday New York Times Walter Sullivan described "The Sun-Spot Menace to Astronauts." Apollo 7 and U.S.S.R.'s Soyuz III served as reminders that sunspots were reaching their 11-yr peak. If eruptions were particularly severe, protons were hurled out at almost speed of light. These could penetrate spacecraft. While Apollo 7 astronauts were never in danger, Soviet spacecraft placed in orbits reaching north beyond latitude 51° might "nudge zone" within which protons ejected by sun "rain fiercely on the atmosphere." Major flare had occurred Oct. 30. If astronauts had been in orbit--particularly if they had been outside spacecraft--they could have been subjected to hazardous radiation. Many warnings preceded this event. For moon journey it should be possible to postpone or cut short flight if sun looked ominous. In any miscalculation, radiation exposure to astronauts inside spacecraft would be severe only during most intense outbursts. However, on prolonged journeys to other planets there would be no escape. "It may therefore be necessary to

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November 10 (continued)

design the spacecraft so that a portion of its interior will be shielded from such radiation." (NYT, 11/10/68, 7E)

November 10-17: Zond VI automatic space station was successfully launched by U.S.S.R. and placed on lunar trajectory from parking orbit of another satellite to explore outer space and test spacecraft systems, Tass announced. All equipment was functioning normally. Speculation, later confirmed, was that spacecraft would attempt to circle moon on same route taken by Zond V Sept. 15-21. On Nov. 14 Tass announced that Zond VI had circled moon at minimum distance of 2,420 km (1,503.8 mi) and had conducted studies of physical characteristics of near lunar space before continuing its journey back to earth.

Zond VI reentered and softlanded in a predetermined area in Central Asia Nov. 17. Unlike Zond V, which had plunged directly through upper atmosphere, Zond VI skipped across outer layers of atmosphere to reduce its reentry speed and then resumed its descent with aerodynamic forces. Announcing recovery, Tass said Zond VI had for first time tested a "more complex and promising method of the return of spacecraft from interplanetary trajectories--the method of controlled descent with the use of aerodynamical lifting force (aerodynamical quality) of the descending craft....

"The braking of the descending apparatus in the atmosphere...was effected along a trajectory with two immersions in the atmosphere. During the first immersion...the second cosmic speed...[11 km per sec, 24,607 mph] was reduced to 7.6 kilometers a second (17,000 mph) through aerodynamical braking. In doing so, the descending apparatus... was oriented through the onboard control system in such a way that it, passing through the dense layers of the atmosphere, left them and next continued along the ballistic trajectory until the second immersion... [in which] the further lowering of the descending apparatus was also effected along the trajectory of controlled descent with the use of aerodynamical qualities which ensured its return to the Earth in the pre-set district."

Zond VI was sixth spacecraft in Zond series [see Sept. 15-21]. (AP, W Star, 11/11/68, 1; NYT, 11/15/68, 8; GSFC SSR, 11/15/68, 11/30/68; Winters, B Sun, 11/19/68, 1; Kamm, NYT, 11/19/68, 1; SBD, 11/19/68, 71-2)

November 11: Senate Democratic Leader Sen. Mike Mansfield (D-Mont.) in interview said Senate debate on ratification of nuclear nonproliferation treaty could begin before President-elect Richard M. Nixon's

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inauguration Jan. 20. He had asked speedy review by Foreign Relations Committee when Congress reconvened Jan. 3. (AP, W Star, 11/11/68, A7)

November 12: NASA Acting Administrator, Dr. Thomas O. Paine, announced at NASA Hq. news briefing that Apollo 8--carrying Commander Frank Borman, CM Pilot James A. Lovell, Jr., and LM Pilot William A. Anders--would be launched from ETR Dec. 21 on open-ended lunar orbital mission of at least six days. Spacecraft would circle moon 10 times at 70-mi altitude before returning to earth. Dr. Paine explained: "After a careful and thorough examination of all of the systems and risks involved, we have concluded that we are now ready to fly the most advanced mission for our Apollo 8 launch in December, the orbit around the moon...."

"We have reached this conclusion after a long series of intensive investigations of the status of our program, the flight hardware, ground support equipment, status of our training."

L/G Samuel C. Phillips, Apollo Program Director, cited two categories of new risks with a lunar orbital mission: "In the one...the spacecraft propulsion system must operate properly in order to propel the spacecraft back out of lunar orbit and on its way back to earth. And the other category of risks are those that are inherent in being some three days away from the earth as opposed to...between a half an hour and three hours which the crew is away from the earth in a low earth orbital mission." Although increased reliance would have to be placed on dependability of life support and electric power systems and mission would have to take on additional risks, Gen. Phillips said, "The progression of risk between the Apollo 7 mission which we have flown and the Apollo 8 mission which we have designed is a normal progression of risks in a logically stepped development, flight test program." (Transcript; NASA Release 68-199; Schmeck, NYT, 11/13/68, 1; O'Toole, W Post, 11/13/68, 1; Sehlstedt, B Sun, 11/13/68, 1)

- . British engineer Michael O'Hagan, manager of space and military systems in government contracts dept. of Standard Telephone & Cables Co., told Conservative Party seminar in London that U.S. was "actually buying land with mineral rights" in other countries after using satellites to discover its location. Hawker Siddeley Group Ltd. scientist K. C. C. Pardoe said countries could use satellites to spy on rival nations' crops and decide best time for marketing. (Reuters, W Post, 11/13/68, A25)

November 12: FAA issued 1968 edition of National Airport Plan, annual assessment of civil airport needs for commercial and private flying. U.S. would require 800 new airports--including 22 for airline traffic and 748 for general aviation--during next five years to relieve congestion and accommodate growth. Plan included recommendation for 25 STOL ports in heavily congested areas. (FAA Release 68-74)

- . Office of Secretary of Defense issued list of 100 companies and subsidiaries awarded largest dollar volume of military prime contracts of \$10,000 or more in FY 1968. Total of these was \$26.2 billion, 1.9% over FY 1967. U.S. companies received \$38.8 billion, 1% less than in FY 1967. No. 1 on list was General Dynamics Corp., F-111 manufacturer with \$2.24 billion in contracts; No. 2., Lockheed Aircraft Corp., \$1.87 billion; No. 3, General Electric Co., \$1.49 billion. McDonnell Douglas Corp. fell from first place in 1967 to fifth with \$1.1 billion. (Text; Wilson, W Post, 11/19/68, D7; WSJ, 11/19/68, 27)
- . New York State Supreme Court Justice Abraham N. Geller issued temporary order blocking sale of Cornell Aeronautical Laboratory to EDP Technology, Inc., Washington, D.C., for \$25 million. Order had been requested by State Attorney General Louis J. Lefkowitz, who alleged alteration of Laboratory from public purposes to profit making organization would be a "major change detrimental to the national interest, to the quality and effectiveness of the laboratory and to the...public." New York State had sought to purchase facility but was reportedly unable to match EDP Technology Inc.'s offer. (AP, NYT, 11/13/68, 11)

November 12-14: Twelve nations attending Third European Space Conference in Bonn decided to work toward creation of single European Space Authority, in effort to end dependence on U.S. space research. Committee was appointed to draft convention for new body encompassing 6-nation ELDO, 10-nation ESRO, and 12-nation CETS and functioning somewhat like NASA. Member nations would be free to choose programs they would support--which could mean small group would work on launchers as well as working with number of other nations on space applications and research.

Day preceding conference, ELDO meeting had resolved, with Britain abstaining, to proceed with launcher development on scale designed to hold down costs. Britain had proposed European nations abandon project, rely on U.S. boosters, and concentrate on space applications, particularly communications. Britain agreed, however, to fulfill commitment to support launcher program until 1971. (W Post, 11/15/68, A20; Greenberg, Science, 12/6/68, 1108-9)

November 13: U.S.S.R. launched Cosmos CCLIII from Plesetsk Cosmodromone into orbit with 337-km (209.4-mi) apogee, 216-km (134.2-mi) perigee, 90-min period, and 65.4° inclination. Equipment functioned normally and satellite reentered Nov. 18. (SBD, 11/14/68, 53; GSFC SSR, 11/15/68; 11/30/68)

- . NASA announced it had assigned Astronauts Thomas P. Stafford, John W. Young, and Eugene A. Cernan as prime crewmen for Apollo 10 mission, scheduled for second quarter of 1969 as second manned flight of lunar module. Backup crew would be Astronauts L. Gordon Cooper, Donn F. Eisele, and Edgar D. Mitchell. Flight crew support team was Astronauts Joseph H. Engle, James B. Irwin, and Charles M. Duke, Jr. Mission probabilities ranged from earth orbital operations to lunar orbital flight, with separation and docking of command and service module and lunar module. (NASA Release 68-201; AP, W Star, 11/14/68, A7; W Post, 11/14/68, A12; AP, NYT, 11/14/68, 21; Sehlstedt, B Sun, 11/14/68, 1)
- . NASA's HL-10 lifting-body vehicle, flown by NASA test pilot John S. Manke, completed first powered flight after air launch from B-52 aircraft near Lancaster, Calif., to demonstrate successful operation of XLR-11 rocket engine and to investigate effects of engine operation on basic stability and control of wingless vehicle. Manke said craft climbed and maneuvered in "marvelous fashion." Increased performance expected in successive flights would simulate lifting-body spacecraft during terminal portion of flight.

Manke ignited two of four chambers in HL-10's rocket engine and climbed from 35,000 to 43,250 ft, reaching top speed of 610 mph (mach 0.8) during 184-sec engine burn. Eventually speeds of 1,000 mph and altitudes to 80,000 ft were expected. Oct. 23 HL-10 flight had ended with early shutdown of rocket engine. (NASA Proj Off; NASA Release 68-198; FRC Release 26-68; AP, B Sun, 11/14/68, A10; LATNS, W Post, 11/14/68, A22)
- . NASA Associate Administrator for Space Science and Applications, Dr. John E. Naugle, addressed International Meeting of American Nuclear Society, Washington, D.C. In past decade NASA had developed "impressive capability" in "competent and creative people who make up our government-university-industry team." It was "prepared to accomplish any goal in space exploration which the new administration may establish." NASA future included "broad, balanced, Planetary Program" emphasizing Mars but examining other planets like Mercury and Jupiter; major lunar exploration program in 1970s; astronomy program covering

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optical astronomy, x-ray and gamma ray fields, and low-frequency radio astronomy; and increased emphasis on space applications programs, with major efforts toward surveying earth's resources from space and continuing developments in meteorology and communications. (Text)

- . Dr. Abe Silverstein, Director of Lewis Research Center was announced as winner of Rockefeller Public Service Award in science category. He had supervised plans for rocket installation on Lunar Orbiter and Surveyor spacecraft.

Leonard C. Meeker, State Dept. legal adviser, won award in foreign affairs and international administration for his work on 1967 space law treaty. (W Post, 11/14/68, B7)

- . New York Times editorial, "After the Lunar Landing," said first priority would probably go to study of moon's surface and resources. "Beyond this exploration, the moon--once accessible to men--will immediately become a laboratory world for expanding knowledge in astronomy, physics, chemistry, geology and a host of other sciences. For both purposes...it will be desirable to create one or more permanent manned communities on the moon as soon as possible....As the pioneers in space, the United States and the Soviet Union have the responsibility now to begin organization of the vast international effort that must follow the coming triumph of human courage and human ingenuity. And the United Nations, of course, is the body whose flag must fly over future lunar settlements and whose...institutions must be harnessed to the task of meeting the extraterrestrial problems ahead." (NYT, 11/13/68, 40)
- . Purdue Univ. Prof. James E. Etzel said in Evanston, Ill., interview that technique for processing sewage sludge by bombarding it with ionizing radiation from chemical emitter of gamma rays could save \$1 billion a year if used by all U.S. cities. Process was pioneered by Etzel and Gordon S. Born of Purdue in cooperation with Jerome Stein, director of R&D for Chicago Sanitary District. District was giving top priority to plan, which would cut solid-waste-processing costs by more than half. Treated sludge would be completely disinfected, odorless, and compressed to 1/3 its volume under process which Prof. Etzel said "we think... represents the most significant use of isotopes the Atomic Energy Commission has yet seen." (Randal, W Star, 11/14/68, A5)
- . USAF awarded \$8.5 million addition to contract with Northrop Corp. for F-5 aircraft. (WSJ, 11/13/68, 7)

November 14: NASA announced it had authorized JPL to proceed with construction of two Mariner spacecraft for 1971 Mars orbit with funds allocated under approved FY 1969 NASA appropriations bill. In combined mission to assist in establishing touchdown sites for 1973 Mars lander mission, spacecraft would be launched by Atlas-Centaur boosters into orbit around Mars to examine Mars polar cap, provide high-resolution coverage of selected areas, and permit oblique views of broad areas of Mars' surface and, possibly, its moons, Phobos and Deimos. Each spacecraft would complete trip from earth to Mars in six months, with May 1971 launch and November 1971 arrival, and would orbit Mars for three months or more. (NASA Release 68-196; B Sun, 11/14/68, A10; W Post, 11/14/68, D16)

- . Washington Evening Star editorial commented on scheduled December launch of Apollo 8: "...this promises to be one Christmas when the thoughts of all...will contain more than visions of sugarplums, of laden stockings, of gifts about to be received and bills about to come due. It is, in fact, just possible that NASA will succeed in putting that missing ingredient back into the yule season, and that more prayers will be offered this Christmas than at any time in the past 2,000 years." (W Star, 11/14/68, A14)
- . At hearing of Congressional Joint Economic Committee's Subcommittee on Economy in Government, A. E. Fitzgerald, Deputy for Management Systems in USAF financial office, said ultimate cost to DOD of 58 C-5A cargo aircraft might be "100% above the original estimate" of \$1.279 billion for Lockheed Aircraft Corp. airframes. General Electric Co. estimate of \$459 million for engines was not expected to double, he said. Increase resulted from rise in manufacturing costs, higher subcontracting prices, and rising administrative costs, rather than gross original underestimate, although there was probably some original underestimate on Lockheed's part. Fitzgerald said DOD was weighing all factors before deciding action on option for 62 additional C-5As which would expire Jan. 31. (Crowther, B Sun, 11/14/68, A12; AP, NYT, 11/14/68, 10; Porter, W Post, 11/14/68, A1)
- . Soviet aviation experts told Pravda they had successfully tested "ornithopter," aircraft which flew by waving its wings like a bird. Craft was said to have "withstood all aerodynamic tests" and to have greater lifting power than ordinary aircraft. Pravda said test "opens unheard of prospects." (UPI, P Inq, 11/15/68)

November 15: NASA Aerobee 150 MI sounding rocket launched from WSMR carried Princeton Univ. Observatory experiment to 108-mi (174-km) altitude to obtain UV radiation of star γ Cas with 1Å resolution, using gyro-stabilized spectrograph, ACS, and recovery system. Rocket and instruments performed satisfactorily. ACS stabilized rocket on target at γ Cas. Spectra were obtained on three exposures and payload was recovered in excellent condition. (NASA Rpt SRL)

- NASA released plans for lunar landing experiments. First U.S. astronauts to land on moon in 1969 would place three scientific experiments on lunar surface instead of more complex Apollo Lunar Surface Experiments Package (ALSEP) originally planned. Change was necessitated by uncertainties in workload required to deploy ALSEP by astronauts in pressurized suits on moon's surface. Mission's primary objective would be to prove Apollo system by achieving successful moon landing and safe return to earth. During first landing, two astronauts would leave spacecraft for up to three hours on moon's surface, making observations and photographing area in vicinity of landed spacecraft, collecting soil and rock samples, and deploying experiments.

Scientific and medical data would be obtained at each of increasingly complex levels of activity on expenditure of astronauts' energy, monitoring their ability to perform in vacuum, extreme temperature, and 1/6 gravity for planning of longer, more complex missions. Experiments were (1) passive seismometer (self-contained 100-lb seismic station with earth-moon communications link, designed to last up to one year), (2) 70-lb laser ranging retro-reflector, and (3) 1-lb solar-wind-composition experiment. They would provide data on internal activity of moon; data to improve measurement of earth-moon distance and fluctuation of earth's rotation rate and measurement of variations in gravitational constant G, as well as to test theory of intercontinental drift by direct measurements from different continents; and would entrap noble gases (helium, neon, krypton, xenon) from solar wind for analysis.

In second lunar landing mission, astronauts would deploy full geophysical station or ALSEP and conduct detailed field geology investigation. (NASA Release 68-200)

- U.S.S.R.'s Zond V automatic space station [see Sept. 15-21] had carried first living organisms--wine flies, turtles, meal worms, plants, bacteria, and seeds--around moon and returned them safely to earth, Pravda announced. Turtles had lost about 10% of their body weight but remained very active and showed no loss of appetite. Preliminary blood tests indicated no substantial deviation from laboratory control animals, but analysis of test turtles 21 days after flight revealed excess glycogen and iron in their livers. (AP, W Star, 11/15/68, A4; B Sun, 11/16/68, A4)

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November 15: NASA Honor Awards ceremony was held at Washington, D.C., with Dr. Thomas O. Paine, Acting Administrator, making the presentations. Alexander H. Flax, Assistant Secretary of the Air Force (Research and Development), was guest speaker.

Distinguished Service Medal, NASA's highest honor, was presented to Secretary Flax; Edmond C. Buckley, former NASA Associate Administrator for Tracking and Data Acquisition; Paul G. Dembling, NASA General Counsel; and Abe Silverstein, Director of Lewis Research Center.

NASA Exceptional Scientific Achievement Medal went to LeRC's G. Mervin Ault, Edmond E. Bisson, and John C. Evvard; JPL's Richard M. Goldstein, Alan Rembaum, Lewis D. Kaplan, and Conway W. Snyder; MSFC's Otto A. Hoberg and Hans H. Hosenthien; LaRC's Mark R. Nichols; ARC's William A. Page and John A. Parker.

Exceptional Service Medal recipients were: Mac C. Adams, Walter Boone, Richard L. Callaghan, Arnold W. Frutkin, Alfred S. Hodgson, Mildred V. Morris, Boyd C. Myers, Hq.; Robert M. Crane (posthumous), William R. Schindlar, Michael J. Vaccaro, ARC; Robert J. Darcey, Herman E. LaGow, Robert J. McCaffery, GSFC; Philip Donely, Paul F. Fuhrmeister, Harry H. Hamilton, LaRC; Robert C. Duncan, Electronics Research Center; Fred H. Felberg, Alvin R. Luedecke, JPL; Arthur Rudolph, MSFC; Hubert Ray Stanley, Wallops Station.

Group Achievement Award went to Apollo 7 Flight Operations Team, Instrumentation Ships Team, Mariner Occultation Experiment Team, OGO Project Team, Sonic Boom Investigating Team, and Surveyor Team. (Program; MSFC Release 68-267; Marshall Star, 11/13/68, 1; Pasadena Independent, 11/15/68; ARC Astrogram, 11/21/68, 1)

- . Dr. R. G. McIver, head of aeromedical research at Holloman AFB, N.Mex., said tests on chimpanzees had shown astronaut experiencing sudden decompression outside spacecraft might live at least three minutes in total vacuum, giving his companions time to get him inside pressurized cabin. Survival of astronauts in ruptured space cabin would depend on presence of one man wearing space suit and thus able to place other crewmen in suits after they lost consciousness. Earlier, scientists had predicted sudden death for astronauts experiencing space vacuum decompression. Revised estimates of life expectancy were based on simulated space capsule experiments with 150 chimps. (AP, B Sun, 11/16/68, A4)
- . Science editorial on NASA administration: "In terms of numbers of dollars or of men, NASA has not been our largest national undertaking, but in terms of complexity, rate of growth, and technological sophistication it had been unique.... Keeping all of [its] parts--often working right at the edge of technological knowledge and capacity--finely

November 15 (continued)

tuned and in close harmony has been an organization achievement of high order....Ever since the space program began to take shape there has been talk of technological spin-offs. It may turn out that the most valuable spin-off of all will be human rather than technological: better knowledge of how to plan, coordinate, and monitor the multitudinous and varied activities of the organizations required to accomplish great social undertakings." (Wofle, Science, 11/15/68, 753)

- . In Washington Post George C. Wilson said Secretary of Defense Clark Clifford's office had recommended cutback in USAF's order for FB-111, bomber version of TFX, from 253 to 90, a saving of \$1.5 billion. While DOD was under pressure to reduce spending by \$3 billion, said Wilson, argument "goes to the heart of the strategic question of unmanned missiles vs. manned bombers." (W Post, 11/15/68, 1)
- . Draft U.N. resolution approved by Italy, Japan, Yugoslavia, Pakistan, India, Brazil, Argentina, Chile, and Mexico and circulated to members of Geneva Disarmament Conference said nuclear nonproliferation treaty and its security guarantee, as signed by 80 countries, were not good enough. It called for further disarmament measures and transfers of nuclear technology. Although resolution did not directly challenge treaty, it did tend to raise new obstacles to ratification by some important countries. U.S., U.K., and U.S.S.R. had indicated opposition to the resolution. (deOnis, NYT, 11/17/68, 3)
- . Formal establishment of Science and Public Policy Studies Group temporarily housed at MIT became effective. Designed as focus of interest and information for scholars, universities, and government officials engaged in teaching and research in science and public policy, group would organize symposia, act as clearing house for information, facilitate exchange of experience and ideas for academic courses, and develop priorities for science and political policy research. Any university with active teaching and research program in science and public policy could become affiliate. Some 50 had indicated interest. Funding for two-year period was from university contributions and matching Sloan Foundation grant. Prof. Eugene B. Skolnikoff of MIT would serve as chairman. (Group Ann)
- . Director Frank Drake of Cornell Univ. Radio Astronomy Observatory at Arecibo, Puerto Rico, told meeting of Council for the Advancement of Science Writing at Evanston, Ill., that pulsar discovered Nov. 14 near Crab Nebula was almost certainly a neutron star. It was second discovery during week [see Nov. 6] and was located by Arecibo radio dish telescope. (Randal, W Post, 11/16/68, A5; Sullivan, NYT, 11/20/68, 31)

November 15: Lockheed Aircraft Corp. President A. Carl Kotchian told Tokyo press conference he hoped discussions under way between Japanese industry officials would lead to joint space program to produce booster rocket and space vehicle suitable for Japan's general space requirements. (DJNS, W Star, 11/15/68, C13)

- . Edward Wenk, Jr., Executive Secretary of Marine Resources Council, told new American Oceanic Organization in Washington, D.C., "We are ready for the next step in Federal management of marine affairs--creation of an independent civilian operating agency." Chairman of new group, Rep. George E. Shipley (D-Ill.), member of House Appropriations Committee, said, "I think that we will see the time that this country will spend as much in oceanography as we are spending in the space program." (Corrigan, W Post, 11/17/68, K1)

November 16: U.S.S.R.'s Proton IV, largest unmanned scientific satellite to date, was launched into orbit with 472-km (293.3-mi) apogee, 248-km (154.1-mi) perigee, 91.7-min period, and 51.5° inclination. Satellite weighed 17 metric tons (37,478 lb), including 12.5-metric ton (27,557.5-lb) scientific payload to continue studies of cosmic rays. Equipment was functioning normally. (AP, W Star, 11/17/68, A18; Kamm, NYT, 11/17/68, 1; SBD, 11/19/68, 72-3; GSFC SSR, 11/30/68)

- . Apollo 8 prime crew--Astronauts Frank Borman, James A. Lovell, Jr., and William A. Anders--held press conference at MSC on Apollo 8 flight plan. Commander Borman explained that an important feature of mission's flight plan was establishment in advance of decision points when crew could decide whether to continue mission as planned or return to earth: "...the first one [decision point] will be whether we commit to translunar injection [from parking orbit] or not.... But even if we do commit...we have regular abort times along the course to the moon, so that we could--in case of a system problem... stop at any time and come back. Then we finally reach a point where it would be swifter to just go on around the moon than it would be to try to abort. The next great point is before we burn lunar orbit injection...." Once in lunar orbit crew would receive abort data regularly and have option to return to earth every two hours. "The mission, if all works well, will be a relatively simple one," Borman said. "...we designed Apollo, we said we were going to the moon, and...finally when we get down to examining the details and saying we are really going, people start getting a little queasy about it. But I have no hesitancy about the hardware." (Transcript; O'Toole, W Post, 11/17/68, A8)

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November 16: USAF launched experimental reentry vehicle from Vandenberg AFB by Atlas booster. (UPI, NYT, 11/18/68, 31)

November 17: Boeing Co. in Washington, D.C., publicly displayed scale model of new fixed-wing design for SST with downward-bent wings in-board toward fuselage and vertical tail placed well forward of horizontal tail. SST Program Director M/G Jewell C. Maxwell said in interview, "I think we have a much greater feeling of confidence than we have had in some time. We now have a design in hand that seems able to do the job." Boeing would submit new design to Government in mid-January but, said New York Times, "there is some nervousness about the receptivity of the new Congress for a budget request that will probably come close to \$300 million for the fiscal year ending June 1970." Current estimates of overall SST cost were \$1.5 billion. To date 26 airlines had reserved delivery positions for 122 aircraft. (NYT, 11/18/68, 93)

- . In Washington Sunday Star William Hines said speculation had begun on successor to James E. Webb as NASA Administrator. "The man who is holding Webb's place on an 'acting' basis--Dr. Thomas O. Paine, formerly of the General Electric Company--is not regarded as a candidate. More likely is Bernard A. (Bennie) Schriever, the 58-year-old retired Air Force general who is chiefly responsible for today's missile arsenal. Had Vice President Humphrey won [presidential election], retired astronaut John H. Glenn, Jr., the first American to orbit the Earth, was a favorite for the NASA post. But Glenn, closely identified with Kennedy democrats, is now out of place in the Nixon official family." (W Star, 11/17/68, F4)
- . In New York Times Walter Sullivan said nuclear specialists who met in Stockholm during April and June at invitation of International Institute for Peace and Conflict Research had confirmed effectiveness of new method of distinguishing man-made explosion from natural earthquake at thousands of miles by comparing magnitude of seismic event in waves crossing earth's surface with magnitude of "body waves" from same event that have passed through earth's depths. Analysis by U.S., U.K., Canadian, and U.S.S.R. scientists had shown strength of surface waves related to body waves was consistently less in bomb explosions than in earthquakes. (NYT, 11/17/68, 1)

November 18: Bullet fragment in brain of holdup victim Joseph Barrios was successfully repositioned into brain membrane by whirling patient in Ames Research Center centrifuge, subjecting him to force of 6 g. Fragment had moved from critical central ventricle to lateral ventricle when doctors at O'Connor Hospital in San Jose, Calif., somersaulted Barrios on rotating chair, but fragment could move again. Force of centrifuge--normally used by NASA for space research--imbedded fragment in membrane of left ventricle, where it was expected to remain safely encapsulated by scar tissue. Dec. 16 x-rays showed fragment had not moved since centrifuge treatment. Barrios was sent home from hospital Dec. 17. (Brody, NYT, 11/21/68, 37; AP, W Post, 11/21/68, A3; ARC Astrogram, 12/8/68, 1; ARC Medical Services Branch)

- . Announcement was made that Astronaut Walter M. Schirra, Jr., would receive Kitty Hawk Memorial Trophy for distinguished achievement in aeronautics at annual Wright Brothers memorial banquet in Beverly Hills, Calif., Dec. 6. (UPI, W Star, 11/19/68, A2)
- . Air Transport Assn. of America reported to NASA Conference on Pavement Grooving & Traction Studies at Langley Research Center that 15- to 19-mo use at three major airports had convinced airlines that runway surface grooving was "an effective aid in overcoming hydroplaning" during wet landings. Grooving increased stopping capability of large turbine-powered aircraft on wet runways and those with standing water. Airline operation evaluation confirmed conclusion of NASA research and "dispelled earlier fears that grooving might damage runways or aircraft." (Text; NYT, 11/24/68, 84)
- . USAF denied decision had been made to cut back or cancel FB-111 production [see Nov. 15], Wall Street Journal said, but reports persisted that fewer than 253 would be purchased because of their high cost and indifferant performance. Aerospace Daily said its sources reported recommended cutback of more than 50% was "essentially accurate" and put figure at "about 100" to give USAF Unit Equipment force of 90 aircraft. (WSJ, 11/18/68, 12; Aero Daily, 11/18/68)

November 18-21: During Geneva conference of International Astronautical Federation on Basic Environmental Problems of Man in Space, Dr. Boris B. Yegorov, only physician to travel in space (launched in U.S.S.R.'s Voskhod I Oct. 12, 1964), told press conference he believed planetary flights would be achieved by 1987. U.S.S.R. was experimenting with 8- to 10-volt electrical shocks administered to improve circulation and stimulate muscles of astronauts to enable them to endure strain of returning to earth after prolonged period in confined space

November 18-21 (continued)

capsule. He claimed problem of weightlessness was same for short or long flights and urged immediate planning for flights to galaxies outside solar system.

Dr. Walton W. Jones, NASA Director of Biotechnology and Human Research, said before IAF conference U.S. could keep astronauts in earth orbit a year within 10 yr if it would allocate sufficient resources to project. ARC experiments had shown rats subjected to gravitational pull 4.7 times above normal had increased life expectancy. He said after meeting that NASA planned experiments with rats at zero gravitation to determine if aging process was suspended while man was free from gravitational pull.

Dr. J. F. Kubis of Fordham Univ. emphasized importance of psychological factors in selecting space crews. On long flight, "lack of privacy, crowding, and continuous exposure to interaction will become sources of aggravating stress." He recommended no more than one in crew with dominant personality.

Soviet scientist Dr. N. N. Gurovsky told conference condition of two dogs after 22-day orbital flight (in Cosmos CX Feb. 22-March 16, 1966) had aroused forebodings on effect of year-long flights on astronauts. Loss of calcium in bones would make them prone to breaking. Both dogs had developed liver and intestinal ailments including edemas. Human beings could expect same effects. Earlier reports had noted dogs suffered muscular reduction, dehydration, and confusion in adjusting to walking.

Cal Tech Prof. Fritz Zwicky said apparently unexplained deaths each year could be due to blows from meteors or heavy nucleons in cosmic rays. (Hamilton, NYT, 11/20/68, 31; 11/21/68, 18; AP, B Sun, 11/22/68, 1)

November 19: Vice President Hubert H. Humphrey spent five hours in briefings at KSC, ascending to spacecraft level of Apollo 8 moon rocket, performing simulated rendezvous and practicing formation flying inside mock spacecraft and lunching with NASA officials and Apollo 8 Astronauts Frank Borman, James A. Lovell, Jr., and William A. Anders. During visit he said, "The space program has contributed greatly to the structure of our nation.... I have felt it has been underfunded at times and we will pay the price. I feel it is a wise investment on the part of Congress and the public. I'll do what I can as a private citizen and a former chairman of the space council to see it is funded." (KSC Release KSC-496-68; AP, W Star, 11/20/68, A8; AP, W Post, 11/20/68, C1; Today, 11/20/68, 1)

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November 19: Soviet Prof. Georgy I. Petrov in Izvestia said successful recovery of Zond VI opened way "for creation of spacecraft able to get to the moon, Mars, Venus and other planets and return to earth." Such experiments, he said, "will allow us in the near future to create long-lasting orbital stations, moon laboratories manned by scientific personnel.... The passenger ships will differ from the present spacecraft, but now we are witnessing their birth." In another dispatch Tass said basic problem of reentry by spacecraft at "second cosmic speed," about 25,000 mph, had been solved by Zond VI. (UPI, W Star, 11/20/68, B11)

- . In answer to queries [see Nov. 16] DOD issued statement on increased cost of C-5A, world's largest aircraft. "At the beginning of this program over three years ago, the Air Force estimated that the cost of development and production of the first 58 airplanes would be \$2.3 billion. The corresponding estimate for the 120 airplanes ultimately contemplated was \$3.1 billion. Current estimates, including economic escalation and all other factors, are \$3.25 billion and \$4.3 billion, indicating increases of 41% and 39% respectively." Additional costs had resulted from increased labor and materials costs due to Vietnam war and "unprecedented demand for civilian aircraft"; introduction of new technology; and modifications to overcome technical difficulties. (Text; WSJ, 11/20/68, 2; AP, W Post, 11/20/68, A3; Kelly, W Star, 11/20/68, A11)

November 20: NASA Acting Administrator Dr. Thomas O. Paine in speech before AIA Fall Conference in Phoenix, Ariz., said, "Today the United States stand at the crossroads." In FY 1969 NASA was operating close to "breakpoint" level. Below \$4-billion budget 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." Budget above \$4 billion would "not only allow us to...carry forward major programs, but might permit...modest investments aimed at reducing costs of future space activities."

Pointing to "long-term results of the tremendous technological effort...mounted during World War II" and "still being exploited today," Dr. Paine urged that as "we tackle grave social ills, we've got to continue to forge ahead in other areas. We must worry about how we create new wealth as much as we do about how we better distribute today's wealth. It would be an international tragedy if America were to turn back now from its forward thrust in space at the end of an astonishingly productive first decade." (Text)

November 20 (continued)

James M. Beggs, NASA Associate Administrator for Advanced Research and Technology, discussed three major aerospace needs: increased aeronautical research, low-cost boosters, and use of nuclear energy in space. In aircraft technology, NASA was "increasing...effort by increases in old and new aeronautical disciplines, in V/STOL technology, and in noise reduction." Pressing need for boosters as reliable as existing boosters but far more economical, "means a fresh approach to the entire concept of boosters and a critical examination of each step...from the drawing board to the end of the boost operation." NASA was recommending that the NERVA engine development be continued with engine and stage ready for a mission as early as 1977. "We are working with other NASA offices in studying planetary and other types of missions that can use the high performance capability of a nuclear engine. We are also working jointly with the AEC on nuclear electric power generation." (Text)

- . In BBC TV interview Jodrell Bank Experimental Station Director, Sir Bernard Lovell, said U.S. Apollo 8 plan for manned lunar orbit was "On a scientific basis...wasteful and silly.... We've reached the stage with automatic landings when it's not necessary to risk human life to get information about the moon. Within a few years this information could be obtained by automatic, unmanned instruments." Sir Bernard said he was full of admiration for project but added, there was "a dangerous element of deadline beating in it."

NASA Associate Administrator for Manned Space Flight, Dr. George E. Mueller, commented, "The purpose is not scientific but to take an important step in developing the capability of landing men on the moon." In telephone interview from Huntsville, Ala., he said, "We are taking no undue risks."

Apollo 8 crewman William A. Anders told news conference at KSC, "We are flying primarily an operational mission and we strongly feel that a manned platform in lunar orbit with the operational equipment we have can add significant bits and pieces to scientific knowledge.... We think it will be a real boon for future Apollo flights to have the photographic, navigation, tracking, mapping, and other knowledge we'll bring back." (AP, B Sun, 11/21/68, 1; NYT, 11/21/68, 19; O'Toole, W Post, 11/21/68, A3)

- . Survey by Aerospace Industries Assn. of America predicted decline in aerospace industry employment from 1,431 million in March to 1,400 million by December because of continuing decline in space program

November 20 (continued)

and leveling off of employment requirements in aircraft production and R&D programs. Employment was expected to remain at December level through March 1969. Aircraft production and R&D employees were expected to decline from 854,000 to 833,000, or by 2.5%. Missiles and space employment was expected to drop from 517,000 to 507,000, or 1.9%. Scientists and engineers would continue to form 16% of aerospace employment, with technicians making up 6% of aerospace industry employment. (AIAA Release 68-56)

- . Soviet trade union newspaper Trud said mass production of powerful intercontinental rockets had started at U.S.S.R.'s "Rocket City" because "the conquest of space is expanding." Device made at the unidentified city "will help our scientists discover new mysteries of the universe for the good of man." (UPI, NYT, 11/22/68, 22)
- . GSFC awarded \$3,127,001 one-year extension of cost-plus-award-fee contract to Fairchild-Hiller Corp. for scientific and engineering support services at GSFC. (GSFC Release G-53-68)

November 21: Cosmos CCLIV was successfully launched by U.S.S.R. from Plesetsk Cosmodrome. Satellite entered orbit with 332-km (206.3-mi) apogee, 210-km (130.5-mi) perigee, 89.9-min period, and 65.4° inclination and reentered Nov. 29. (UPI, NYT, 11/22/68, 22; GSFC SSR, 11/30/68; SBD, 12/2/68, 129)

- . NASA Aerobee 150A sounding rocket successfully launched from NASA Wallops Station carried 300-lb payload containing two white rats to 101-mi (162.5-km) altitude in third of four experiments to study rats' behavior in artificial gravity field and determine minimum level of gravity needed by biological organisms during space flight. During five minutes of free fall, rats selected artificial gravity levels created through centrifugal action by walking along tunnel runway in extended arms of payload. Data on their position and movement were telemetered to ground stations. Payload impacted 69 mi downrange in the Atlantic. (WS Release 68-21)
- . National Science Foundation released Research and Development in Industry, 1966. Total 1966 industrial R&D expenditure was \$15.5 billion, with industry accounting for 70% of nation's R&D performance. Federal Government R&D performed in industry reached \$8.3 billion, 53% of industrial total. In January 1967, 163,900--30% of total--industrial scientists and engineers were engaged in

November 21 (continued)

R&D directly supported by Federal Government. In 1966, NASA and DOD financed work of 89% of R&D scientists and engineers employed by industry on Federal projects, with 54,000 working on NASA projects, an increase of 50% over 1963. DOD-financed scientists and engineers decreased 23% in same period. (Text)

- . At awards dinner of National Institute of Social Sciences in New York, Charles A. Lindbergh said, "My hope that aviation would cause better relationships between our earth's peoples gave way to realization that the airplane's primary significance lay in its power of destruction.... My fascination with the rocket as a space-exploring vehicle has been replaced by my alarm at its ability to wipe out our civilization overnight." Lindbergh and his wife, Anne Morrow, received gold medals for "distinguished service to humanity" for their work in conservation. (UPI, W Star, 11/22/68, A2)
- . Washington Evening Star said U.K. and Australian governments had drawn up joint plans for largest telescope in Southern Hemisphere, 150-in optical telescope at Siding Spring Mountain Observatory of Australian National Univ. It would cost \$10.5 million. (W Star, 11/21/68, A6)
- . ComSatCorp announced it had requested proposals for construction of two new earth stations near Talkeetna, Alaska, and Apra Heights, Guam. (ComSatCorp Release 68-63)

November 22: JPL announced its astronomers had determined asteroid Icarus was about half mile in diameter and rotated every $2\frac{1}{2}$ hr from data received during three-day series of seven microwave probes. Icarus was clocked at speeds from 36,000 mph to 1,450 mph at 4-million-mi distance--closest approach it had made to earth in 19 yr. A 450,000-w transmitter on 85-ft antenna at Goldstone Tracking Station in Mohave desert beamed radar waves at 2,388-mc frequency. Reflected echoes were received by 210-ft antenna 14 mi distant. Average radar round trip to Icarus was 43 sec. JPL radar astronomer, Dr. Richard M. Goldstein, said indications were that Icarus was "rough, even jagged, and perhaps shaped like a peach stone." Radar reflections were unable to indicate whether its surface was stony or metallic. If metallic, Dr. Goldstein said, its radius might be as small as 300 m; if stony, 600 m, which fixed Icarus' diameter at 600 to 1,200 m, with 900 m a probable figure. (NASA Release 68-197; AP, W Star, 11/20/68, A8; Goldstein, Science, 11/22/68, 903-4)

November 22: National Academy of Sciences issued The Mathematical Sciences: A Report. Before World War II, U.S. was consumer of mathematics and mathematical talent. Now it was "universally recognized as the leading producer of these." Graduate education in mathematical sciences at major U.S. centers "is far superior to that in all but two or three centers in the rest of the world," but shortage of college teachers was likely to worsen before it improved. Report recommended continued and increased Federal support for basic research including NASA programs, computer science, applied mathematics, graduate apprenticeships, and faculty improvement. It projected that, by 1970, 41,000 students would be majoring in mathematics and 1,864,800 majoring in other subjects would be enrolled in mathematics courses. (Text; Schwartz, NYT, 11/24/68, 74)

- . Dr. Donald F. Hornig, President Johnson's Special Assistant for Science and Technology, would join Eastman Kodak Co. in "executive capacity" in early January, Science reported. He would also become professor of chemistry at Univ. of Rochester. (Science, 11/22/68, 881)
- . U.S. and Romania signed agreements to exchange information on peaceful uses of atomic energy, scientific delegations, and unclassified technical literature and films. Romanian graduate students would be assigned to U.S. laboratories and universities. (Cohn, W Post, 11/21/68, E1; AP, NYT, 11/24/68, 43)

November 23: First Lady, Mrs. Lyndon B. Johnson, and daughter, Mrs. Lynda Robb, paid their first visit to KSC and participated in simulated moon landing in lunar landing module replica. Presenting model of Apollo Lunar Landing Module for display in Lyndon B. Johnson Presidential Library, NASA Acting Administrator, Dr. Thomas O. Paine, said model would bear plaque listing "a few of the many contributions to our space program of Lyndon B. Johnson-- as Senate Majority Leader, as Chairman of the Senate Aeronautics and Space Sciences Committee, as Chairman of the National Aeronautics and Space Council when he was Vice President, and then as President of the United States." Dr. Paine told Mrs. Johnson "we trust that this model of the lunar landing module will signify to the many visitors to the Lyndon B. Johnson Presidential Library the President's vision and leadership that has carried this nation outward into the new ocean of space." (KSC Release KSC-500-68; Shelton, W Star, 11/25/68, E3; Blair, NYT, 11/24/68, 41)

December 24: Cornell Univ. scientists reported pulsar lying in or near Crab Nebula with fastest pulse rate of pulsars discovered thus far was slowing pulse tempo at rate of one part in 2,000 a year. Discovery was made with 1,000-ft-dia antenna at Arecibo (Puerto Rico) Observatory. Walter Sullivan in New York Times said discovery encouraged view that astronomers "are penetrating an entire new realm of physics...physics of superdense matter (in the form of so-called neutron stars), magnetic fields far beyond anything observable in the laboratory and superpowerful gravity." (NYT, 11/25/68, 53)

- . New York Times article said at least eight nations, including U.S. and U.S.S.R., were building astronomical observatories in Chile, which had been termed ideal site because of its latitude, near 30° South. Association of Universities for Research in Astronomy, Inc. (AURA), dependency of NSF, had invested \$19 million thus far in observatory at Cerro Tololo at Lat. 32°. Other groups investing in Chilean observatories were: European Southern Observatory (ESO), consortium of West Germany, France, Holland, Belgium, Sweden, and Denmark; and Soviet Astronomical Mission, which had one U.S.S.R. wide-field reflecting telescope of Schmidt type in operation but intended to build 100-in reflector. Main European instrument would be 140-in reflector. A 36-in telescope at U.S. observatory had already photographed powerful ray-emitting star whose existence had previously only been suspected. Main AURA project, 158-in telescope, would be available to any qualified astronomer. (NYT, 11/24/68, 27)
- . USAF launched experimental Advanced Ballistic Reentry System (ABRES) vehicle from Vandenberg AFB. (AP, W Post, 11/25/68, 9)
- . In New York Times, Reuters said Nuclear Emergency Team (NET) of DOD Defense Atomic Support Agency based in Albuquerque, N.M., could be enroute to accident involving nuclear weapons anywhere in world on two hour's notice. It could secure area rescue personnel, minimize radiation hazards, and provide expert advice and assistance. Each U.S. military service had several 15-man NET teams capable of reporting to NET Hq. within 30 min. (NYT, 12/1/68, 144)

November 25: Four foreign firms who handled all Argentine overseas telephone calls and telecommunications, with multimillion-dollar investment, had been notified by lower echelons of Argentine government that its national carrier ENTEL would be exclusive

November 25 (continued)

international carrier and would reserve all communications satellite channels for itself, Washington Evening Star reported. Argentina was to link up with ComSatCorp and INTELSAT on completion of earth station at Balcarce in June. Firms--U.S.-based ITT World Communications Co.; Transradio, which had RCA hookup; Western Telegraph of U.K.; and Italcable of Italy--had banded together to propose mixed government-carrier company to own and operate Argentine earth station. (O'Leary, W Star, 11/25/68, A15)

- . C-130 troop and supply carrier, used as pick-up aircraft for satellites dropping special reconnaissance photos into sea, had developed serious wing cracks which would cost USAF \$11 million to repair, Bob Horton reported in Washington Evening Star. USAF had been reinforcing wings but would have to build entire new wing on 400 C-130 models B through E to ensure long service. Model C-130A was not affected. (W Star, 11/25/68, A3)
- . New York Times editorial commented on NAS report on status and needs of American mathematics [see Nov. 22]: "...this era--often called the age of the computer--is really the time of the most widespread and fruitful application of mathematics ever known.... In this period of retrenchment in Government expenditures, the National Academy report calls for increased Federal expenditures in aid of both research and education in mathematics.... The cost of supporting American mathematics is so slight in relation to the vast potential benefits that even the most economy-minded Congressman should be chary of using his ax." (NYT, 11/25/68, 46)
- . Harold T. Luskin, Director of Apollo Applications in NASA Office of Manned Space Flight, died in Bethesda, Md., of respiratory illness. He had joined NASA in March 1968 and had become Apollo Applications Director in May. He was past president of American Institute of Aeronautics and Astronautics and had been associated with Douglas Aircraft Co. for 20 yr and Lockheed Aircraft Corp. for 9 yr. He had held engineering and management positions in connection with Agena space vehicle, USAF Manned Orbiting Laboratory, X-3 supersonic research aircraft, and DC-8. (NASA Ann, 11/26/68; W Post, 11/27/68, C3; Marshall Star, 11/27/68, 1; W Star, 11/27/68, B4)
- . Dr. Paul Allman Siple, polar explorer and geographer who had accompanied Adm. Richard E. Byrd to Antarctica and science adviser to U.S. Army 1946-1963 and since 1967, died at Arlington, Va., at age 59. (NYT, 11/27/68, 47)

November 26: NASA Associate Administrator for Manned Space Flight, Dr. George E. Mueller, told National Space Club in Washington, D.C., unique conditions in space suggested use of orbiting space stations for certain manufacturing processes. "For instance, liquid floating in a weightless environment, takes the shape of a perfect sphere. Thus, it is conceivable that metal ball bearings could be manufactured in space to tolerances impossible on earth, yet at a cost, including transportation, less than we can now achieve. Perfect bearings would reduce friction and noise levels to the vanishing point. Free-fall casting techniques could be utilized to cast large flawless optical blanks for telescopes and by proper combinations of spinning and electrostatic forces we should be able to shape the surface as well."

Stable foams for mixtures of liquified materials and gases, impossible to produce satisfactorily on earth, could be produced in weightlessness, resulting in "a steel foam almost as light as balsa wood with many of the properties of solid steel." Composite materials like steel of different densities and properties and glass also could be produced. (Text; Schmeck, NYT, 11/27/68, 48; Sehlstedt, B Sun, 11/27/68, A6)

- . NASA Associate Administrator, Dr. Homer E. Newell, told annual convention of National Council for Social Studies at GSFC, "...because of the length of time between investment in basic scientific research and important use of the results thereof, support by Congress and the public of basic research is hesitating and often outright skeptical. The development and application of technology to the quick solution of current problems is better understood and more readily supported. Yet the fact is that technology to be used in the solution of a practical problem rests ultimately upon the results of basic research performed years, and often many years, ago." Experience proved, he said, "that the effort to select the basic research to support in terms of predicted usefulness would over and over again preclude support of the research that in time would prove to be the most valuable." (Text)
- . NASA and Univ. of Texas dedicated world's third largest telescope, 107-in, 150-ton instrument at McDonald Observatory, Mount Locke, Tex. Observatory Director, Dr. Harlan J. Smith, said it had been booked a year in advance. The \$5-million observatory would emphasize studies of moon and other planets. Government scientists hoped for information to help them design spacecraft to visit planets. (UPI, NYT, 11/27/68, 26)
- . French Prime Minister Maurice Couve de Murville announced France's 1969 atomic test program would be canceled and credits would be reduced for Concorde supersonic aircraft as part of austerity program to save

November 26 (continued)

French franc from devaluation. French contribution to Concorde development would be cut by \$12 million. It was not known how much delay move might cause in program, with first prototype scheduled to fly in late December. (AP, W Star, 11/26/68, 1; Loucheim, W Post, 11/27/68, A1; Tanner, NYT, 11/27/68, 1)

November 27: NASA awarded Allis-Chalmers \$3,500,000 contract to flight-qualify Multimission Fuel Cell Assembly, an improved fuel cell electrical power system for Apollo Applications (AA) program. System had been developed under three previous NASA contracts since 1962. Allis-Chalmers would produce two assemblies for use in qualification program and two for delivery to MSC. (NASA Procurement Off; MCS Roundup, 12/6/68, 1)

- . U.K. became first nuclear power to ratify nuclear nonproliferation treaty. At Washington, D.C., ceremony, British Charge d'affaires Edward E. Tompkins handed instruments of ratification to Director William C. Foster of U.S. Arms Control and Disarmament Agency. (NYT, 11/28/68, 9)
- . Soviet journal Aviatsiya i Kosmonavtika (Aviation and Cosmonautics) said Soviet scientists had concluded "basis of a linked system for providing man with vital necessities on board spaceship will be the cultivation of higher plants.... Scientists believe that artificial soil could be used for space plant growing." Once spacecraft left earth gravitation field, "plants will be fixed in special holders and sprayed with concentrated solutions containing all necessary substance." (UPI, NYT, 11/29/68, 22)
- . USN's Sealab III was carried by barge to San Clemente Island, Calif. It would be lowered 600 ft to Pacific Ocean bottom to serve as working and living quarters for five teams of 8 to 10 men setting up underwater trolley line, building dry and lighted hut on sea floor, starting lobster farm, and training porpoises and sea lions to fetch and carry. Sealab III, submerged to three times depths of Sealab I and Sealab II, was final experiment in Sealab program. (AP, W Star, 11/28/68, A36)

November 28: NASA announced Mexican cities Gomez Palacios and Torreon had been saved from flooding in wake of Hurricane Naomi when Automatic Picture Transmission (APT) station at Mexico City relayed data from ESSA VI satellite indicating weather was clearing. Mexican authorities thus were saved from opening dangerously filled dam which would have inundated the cities. (NASA Release 68-203; UPI, NYT, 12/1/68, 77)

- Canadian scientist I. A. Stewart, Operations Manager of National Research Council's Churchill Research Range, said at first International Aerospace Exposition in Montreal he believed range, operated jointly by U.S. and Canada, could be converted for \$1 million to accommodate satellite launching pad. Canada could thus rise to ranks of space-age power, he said. Of more than 200 on staff, only one was from U.S. (CP, NYT, 12/1/68, 13)

November 29: U.S.S.R. launched Cosmos CCLV from Plesetsk Cosmodrome into orbit with 317-km (197-mi) apogee, 211-km (131.1-mi) perigee, 89.6-min period, and 65.4° inclination. Spacecraft reentered Dec. 7. (GSFC SSR, 11/30/68; 12/15/68; SBD, 12/2/68, 129)

- MSFC announced it had requested proposals from 11 aerospace companies for six-month design and definition study for dual mode lunar roving vehicle (LRV) capable of transporting astronauts on lunar surface and of performing automated, long-range scientific traverses across moon under remote control from earth.

Vehicle was to permit manned sorties of up to 6 mi from landed spacecraft, with total round-trip of more than 18 mi. After astronauts left moon, LRV would be placed in remote control mode for automated long-range (600 or more mi) geological and geophysical trips for one year. It would collect up to 200 lb lunar samples and measure terrain, then rendezvous with manned spacecraft for return of samples to earth. (MSFC Release 68-274; SBD, 12/3/68, 134; Marshall Star, 12/4/68, 1)

- FAA announced it had issued RFP for collection and analysis of information on engineering, economic, and operational aspects of proposed construction of airports on offshore water sites, including floating airports and those to be built on fill, piles, polders, or in areas protected by dikes. (FAA Release 68-75; NYT, 12/2/68, 94)
- World's largest vacuum telescope, scheduled for spring 1969 completion at Sunspot, N.Mex., could provide method of predicting solar flares, Associated Press said. Housed in 135-ft concrete needle atop mountain

November 29 (continued)

ridge 4,000 ft above WSMR, at Sacramento Peak Observatory, telescope was brainchild of USAF astronomer Dr. Richard Dunn, who told AP, "Prediction of solar flares would give us time to warn astronauts working outside the radiation shielding of a spacecraft to take cover and allow us to predict periods of radio communication interference." Project cost \$3.5 million. (AP, NYT, 12/1/68, 65)

November 30: European Launcher Development Organization (ELDO) attempt to place 550-lb Italian ELDO F-7 into polar orbit failed when technicians lost contact with payload shortly after launch. Satellite, launched from Woomera Rocket Range by booster with U.K. Blue Streak 1st stage, French Coralie 2nd stage, and West German Astris 3rd stage, stopped transmitting after abbreviated seven-second 3rd stage burn and could not be tracked. (Reuters, NYT, 12/1/68, 11)

During November: In Air Force and Space Digest interview General Electric Co. Vice President Gerhard Neumann, head of GE Aircraft Engine Group, said postponement of essential R&D during past several years had "mortgaged" nation's technological future. He saw hazards in current DOD contracting policies which kept industry from taking "reasonable risks" because they imposed implacable performance guarantees. He blamed parsimonious funding on Vietnam War requirements and urged lost ground be regained as soon as priorities permitted. In era of R&D austerity, Neumann advocated "lot more" work in advanced-engine research by NASA. (AF/SD, 11/68, 58)

. Secretary of Defense Clark M. Clifford wrote in Air Force and Space Digest, "Not too many years ago, the War and Navy Departments were concerned almost exclusively with men and simple machines. Defense industries were regarded as mere munitions-makers.... We now have a military-industrial team with unique resources of experience, engineering talent, management and problem-solving capacities, [it] must be used to help find the answers to complex domestic problems as it has found the answers to complex weapon systems. Those answers can be put to good use by our cities and our states, by our schools, by large and small businesses alike. The nation will be the better and the stronger." (AF/SD, 11/68, 76-7)

In Air Force and Space Digest Capt. Gerald T. Rudolph (USAF) of AFSC Space and Missiles Systems Organization scored lack of progress in adopting systems technology to solve "nation's mounting social

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During November (continued)

problems." He found two major reasons for lag: "the public does not entirely understand [it], largely because the aerospace industry has been unable to define it adequately and explain how it is used. And...American society has always been reluctant to accept the kind of centralized authority required to implement systems solutions, especially at the community and regional levels."

Every effort should be made, he said, to surmount obstacles because "it is the judgment of many experts that systems technology will prove to be the most valuable parcel of knowledge to come out of present day space technology." (AF/SD, 11/68, 79-81)

- . J. S. Butz, Jr., in Air Force and Space Digest article "The Men Behind Soviet Aircraft Design" wrote: "Top Russian designers are exuberant realists; and they operate under a 'prototype' system of development that is probably the most competitive and technically stimulating in the world. This system is similar to the one employed in the United States until the mid-1950s and the odds appear strong that the U.S. will return to such an approach in the 1970s, rejecting the strong dependence on 'systems analysis' and 'cost-effectiveness' studies that characterized the 1960s." (AF/SD, 11/68, 62-7)

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