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ASTRONAUTICS AND AERONAUTICS

NOVEMBER 1968

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

(HHR-23)

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NOVEMBER 1968

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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 MLaba 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)

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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)



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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."

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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

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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 147-1b, 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

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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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November 8 (continued)

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

November 8 (continued)

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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November 11 (continued)

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)

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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)

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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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November 13 (continued)

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)



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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)

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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 bright star in constellation Cassiopeia, using gyro-stabilized spectrograph, ACS, and recovery system. Rocket and instruments performed satisfactorily. ACS stabilized rocket on target at star. 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

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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." (Wolfe, 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)



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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)

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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

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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)



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)

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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

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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

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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)



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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)

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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

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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 IIT 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)

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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



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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

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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)