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

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NOVEMBER 1967

November 1: NASA Aerobee 150 sounding rocket launched from WSMR carried Princeton Univ. payload to 109-mi (176-km) altitude on flight to determine ultraviolet spectrum of extremely hot atmosphere and interstellar matter in direction of 05 star Tau Puppis--hottest of bright stars in sky. Excellent film exposure was obtained from the spectrograph; attitude control system stabilized properly. (NASA Rpt SRL)

. NASA announced results from experiment with four "Yolo Wonder" pepper plants subjected to 45 hr of weightless flight aboard Biosatellite II (Sept. 7-9) to determine effects of space environment (weightlessness and radiation). Photographs made every 10 min (268 times) in 30 orbits appeared to demonstrate plants depend on gravity for their orientation. Plant leaves had failed to grow in normal, horizontal position, and stems had not held to the vertical position, even with supporting brackets. Disoriented condition of plants was observed when they were delivered to Dr. Samuel Johnson, principal investigator, North American Rockwell Corp. Further evidence of plants' gravity dependence came from wheat seedlings aboard Biosatellite II; Dr. Charles Lyon of Dartmouth College experimented with 75 seedlings which, grown from seed in weightlessness, had roots curving upward toward seedling shoots and out to the side. (NASA Release 67-279)

. Continuing Brazil/U.S. space cooperation, experiment to measure airglow would be carried out by National Space Commission (CNAE) of Brazil and NASA, an Aerobee 150 to be launched from Brazil's Barreiro do Inferno range this fall [see Oct. 14-15]. A monochromator would measure day airglow in equatorial regions at altitude of about 130 mi in the range of 2,000 Å. One of two kinds of upper atmosphere's visible radiation (aurora being other), airglow existed when sunlight interacted with upper atmosphere to create visible radiation.

CNAE would be responsible for preparation and operation of launching range and associated facilities, and for providing personnel for training. NASA would provide Aerobee rocket, payload, and mobile launch facility currently located in Brazil. (NASA Release 67-277)

. ComSatCorp expressed its opposition to AT&T plan to build $70.4-million underwater cable to southern Europe by 1970's end in 92-page response to FCC inquiry on need for future communication facilities in the Atlantic basin area [see Oct. 4 & 30]. James McCormack, Chairman and Chief Executive Officer of ComSatCorp, stated that proposed addition of 720 international communication circuits via new trans-Atlantic cable, designated TAT-5, would be "...unnecessary in the public interest and would act as a serious detriment to the development of a really capacious and economical global telecommunications system." He said

November 1 (continued)
ComSatCorp planned to orbit Intelsat 4 by 1970 to provide at least 5,000 circuits initially that would accommodate TV, broadband, and other transmissions in serving smaller, developing nations as well as major, technologically advanced countries. (Text; ComSatCorp Release 67-54)

. NASA Administrator James E. Webb appointed L/G August Schomburg, (USA, Ret.) as a consultant. Schomburg, whose last duty assignment was Commandant of Industrial College of the Armed Forces, would work in areas of national security and NASA's interfaces with industry and defense. He would also be involved in education in industrial affairs for NASA's field centers. (NASA Release 67-280)

November 2: XB-70 research aircraft, flow by USAF pilots Col. Joseph Cotton and L/C Emil Strumthal, reached mach 2.52 and 63,500-ft altitude in flight to test stability control and handling qualities at FTC. Other test objectives included: handling qualities at mach 1.2 and 40,000-ft altitude; unstarts; radar air speed calibration at mach 1.9 down to 1.2 and 45,000-ft altitude; nose ramp flutter function at mach 1.2 and 32,000-ft altitude, and at mach 2.55 and 64,000-ft altitude. (NASA Proj Off)

. World's largest optical telescope--Soviet 236.2-in-dia. mirror at Leningrad--might be unveiled on Nov. 7, 50th anniversary of Bolshevik Revolution, reported Space Business Daily. New telescope was reported to be 82 ft long and to weigh 275 tons; its guidance system would have a precise time-augmented design to guarantee accuracy. U.S. Mount Palomar telescope--world's largest operating mirror--now 20 years old, had diameter of 200 in. (SBD, 11/2/67, 11)

November 3: U.S.S.R. launched Cosmos CXC into orbit with 323-km (201-mi) apogee; 195-km (121-mi) perigee; 89.6-min period; and 65.6° inclination. Spacecraft reentered Nov. 11. (GSFC SSR, 11/15/67)

. NASA announced that research recently performed at Ames Research Center indicated a probability of meteoroids puncturing spacecraft at about six times greater than previous calculations. Tests which simulated meteor entry into atmosphere were conducted in AEC's Hypervelocity Planetary Gas Tunnel. ARC Director H. Julian Allen and assisting scientists Charles Shepard, Howard Stine, and Barrett Baldwin used melting or ablating tests on one stony meteorite and on gabbro--common,

November 3 (continued)

meteor-like earth rock--samples, at simulated speeds up to 35,000 mph. Tunnel tests showed that heat of entry into earth's atmosphere melted rock surface, boiled off interior water, and expanded gasses occurring in rock. Expansion of exterior rock layer by 10 to 1,000 times converted the exterior to foam, and acted as a heat shield. Foam was 2-20 times less dense than the unheated rock; depending on entry conditions, foam would or would not break off.

Past experience and theory had suggested that meteors were sand-like, and would be remains of broken up comets; in addition, studies of meteor and comet trajectories had supported current theory that comets would be like "dirty snowballs" made mostly of ice, frozen ammonia, and methane with rock and sand additives.

Opposed to these old beliefs, ARC scientists speculated that many more meteors originated in the rocky asteroid belt; further, they believed that much more solid rock would be contained in luminous clouds of comets. As a result, ARC could now prophecy the need for greater protection on long missions where the probability of meteoroid hit would be highest. (NASA Release 67-281)

. GSFC announced award of $3.4-million contract to American Science and Engineering, Inc., for development of x-ray experiment package for first spacecraft in Small Astronomy Satellite (SAS), GSFC-managed program. Spacecraft SAS-A, would map sources emitting x rays outside solar system in collecting information on position, strength, and time variation of emissions. SAS program would also have satellites search for sources radiating in the gamma ray, UV, visible, and IR regions; its data should enable selection of the most interesting stellar sources for detailed study by more sophisticated spacecraft.

Contract provided for three 140-lb experiment structures: structural and thermal test unit, prototype unit to serve also as flight backup, and flight unit. John Hopkins Univ.'s Applied Physics Laboratory would build spacecraft structure and systems, integrate and test total spacecraft before flight. Launch of 330-lb SAS-A was planned for 1970; four-stage Scout would place SAS-A in circular, equatorial orbit at 330-mi altitude. (GSFC Release G-54-67)

. Early findings obtained from Surveyor V, launched Sept. 8 and softlanded on moon Sept. 10, were summarized in Science by JPL scientists Leonard D. Jaffe and Robert H. Steinbacher. The 18,006 TV pictures taken Sept. 11-24 included views of interior of crater in which Surveyor V landed, level surface surrounding crater, star and planet sightings for attitude reference, and solar-corona sequence after local sunset. Alpha-scattering instrument produced data on lunar surface chemical composition--

November 3 (continued)
oxygen, silicon, and aluminum identified in preliminary evaluation--and labeled general chemical composition to be "similar to that of a silicate of a basaltic type," according to summary. "Material of basaltic composition at the Surveyor V landing site implies that differentiation has occurred in the moon," summary attributing this to "internal sources of heat." Early findings indicated results consistent with hypothesis that "extensive volcanic flows have been responsible for flooding and filling the marè [sea] basins." Erosion experiment, spacecraft landing effects, and other observations indicated soil had significant amounts of fine-grained material, and measurable cohesion.

Surveyor V had provided first direct chemical analysis of lunar surface, and had proved that processes and products of lunar magnetic activity were apparently similar to those of earth. Magnet experiment produced lunar results, according to the summary, that "are most similar to a terrestrial plateau basalt with no addition of free iron." (Science, 11/3/67, 631-52)

. Secretary of Defense Robert S. McNamara announced U.S.S.R.'s possible development of a Fractional Orbital Bombardment System [see Oct. 16]. While ICBM's followed a ballistic trajectory from launch to impact and had an apogee of 800 mi, FOBS, he said, was fired into a very low orbit, and before first orbit was completed, rocket engine would slow down payload and cause it to drop out of orbit--payload then following a reentry path like reentry of ICBM. He said: "...we suspect [they] are pursuing the R&D of a FOBS...[and] it is conceivable that they could achieve an initial operational capability during 1968. Because of the low altitude of their orbits, some trajectories of a FOBS would avoid detection by some early warning radars...[and] impact point cannot be determined until ignition of the rocket engine [deboosting payload]--roughly three minutes and 500 miles from the target. And the flight time can be as much as 10 minutes shorter than an ICBM."

Accuracy of FOBS would be significantly less than that of ICBM and payload a fraction of that of ICBM, according to McNamara. FOBS' disadvantages had compelled DOD to decide that "...[FOBS] would not improve our strategic offensive posture...while development of [FOBS] could be initiated at any time for relatively rapid deployment...."

Anticipating that early warning radars (including BMEWS) could not detect FOBS "...because of the low altitude of [FOBS] orbits," McNamara said: "...already we are beginning to use operationally over-the-horizon radars which possess a greater capability of detecting FOBS than does BMEWS. These will give us more warning time against a full-scale attack using FOBS missiles than BMEWS gives against a heavy ICBM launch." (Text; DOD Release 1060-67)

November 3: Communist-Chinese-oriented ABM system--deployment approved by DOD Sept. 18--was named the Sentinel System, according to Secretary of Defense Robert S. McNamara's announcement [see Sept. 18]. L/G Alfred D. Starbird (USA) was named Army's System Manager for new system; currently Director, DCA, Starbird would assume new position Nov. 15, 1967, and would be responsible for development and timely deployment in a three-pronged organization: Sentinel System Office, Washington, D.C., to be an element of C/Staff's Office, USA; Sentinel System Command, Huntsville, Ala., to develop, procure, and install new system; and Sentinel System Evaluation Agency (SSEA) at WSMR to provide independent evaluation, review, and testing. Existing Nike-X organization, under command of L/G Austin W. Betts (USA), Chief of R&D, would continue (separately from Sentinel System) to perform: R&D, design of equipment to be used for tests of the penetration capabilities of U.S. offensive missiles; and mission of protecting U.S. against large-scale attacks. (DOD Release 1059-67)

. CNO Adm. Thomas H. Moorer officially denied news reports on F-111B program cancellation or drastic change: "The reports may have originated with a manufacturer's brochure received by the Navy." Brochure would have no "official standing," he said. Earlier in the day ABC and Metromedia News reported USN and Congressional sources saying cancellation was official. In Fort Worth, General Dynamics Corp. President Frank W. Davis insisted the F-111 was meeting its objectives and even exceeding them in some cases.

Navy's highest-ranking admirals had recommended cancellation of F-111B and recasting of major features in a more economic and agile swept-wing fighter, Richard Witkin reported in New York Times. Admirals' arguments were listed. Overweight aircraft would perform only one of its two planned missions--defense of fleet against air attack. Air-to-air and air-to-ground missions would be beyond capability of F-111B, and admirals had been convinced that an aircraft capable of all missions could be developed and delivered to the fleet by 1973. To arrive at aircraft they wanted, admirals would scrap wings and fuselage of F-111B; they would keep proven features, such as TF-30 engines, Phoenix air-to-air missiles, advanced radar and electronic gear--new aircraft weighing 52,000 lbs compared with F-111B's 75,000 lbs and costing $4-6 million compared with $8-10 million. Navy's limited budget could not stand for the soaring costs (in the light of technical troubles delaying F-111B's delivery on schedule), while potential enemy's development of better aircraft called for competitive U.S. development.

An aircraft that would keep weight down to 52,000 lbs and exploit the swept-wing and engine features of F-111B had been proposed by McDonnell Douglas Corp. and Grumman Aircraft Engineering Corp; their

November 3 (continued)
promised delivery to the Navy would be less than two years behind that for F-111B, which was three years behind schedule, Witkin reported. (DOD Release 1062-67; Witkin, NYT, 11/4/67, 1; AP, W Post, 11/4/67, A10)

. At Huntsville, Ala., formal dedication of Toftoy Hall, named for the late M/G Holger N. Toftoy (USA, Ret.), U.S. missile pioneer who died Apr. 19, was made by Mrs. Hazel Toftoy, MSFC Director Wernher von Braun, and Army Missile Command Commander M/G Charles W. Eifler (USA). Toftoy Hall would house Missile Components Dept. of the Army Missile and Munitions Center and School [see Apr. 19]. (Marshall Star, 11/1/67, 1)

November 4: NASA Associate Administrator for Manned Space Flight Dr. George Mueller announced revised Apollo mission schedule of six flights in 1968 and five in 1969 using "200-series" (Uprated Saturn) and "500-series" (Saturn V) launch vehicles to test and qualify Command, Service, and Lunar Modules (C&SM and LM). Schedule for 1968 would include: Apollo/Saturn 204 (AS-204), first unmanned test of LM in earth orbit; AS-502, second unmanned flight test of Saturn V and Apollo C&SM; AS-503, third unmanned test of Saturn V and C&SM; AS-206, second unmanned flight test of LM in earth orbit; AS-205, first manned Apollo flight, a 10-day mission to qualify C&SM for further manned operations; AS-504, first manned Apollo flight on Saturn V, to provide experience with both C&SM and LM, including crew transfer from C&SM to LM and rendezvous and docking. Schedule for 1969 would include five manned flights (AS-505 through AS-509) with the first four programmed as lunar mission development flights or lunar mission simulations--AS-509 being that on which lunar landing would be made. Possibly the lunar landing might be delayed until one of the remaining six Saturn V flights beyond 1969.

All opportunities to accelerate progress in 1969 toward manned flights and a rapid accumulation of manned experience with Apollo/Saturn system would be sought, according to Mueller. (NASA Release 67-282)

. NASA appointed Edward M. Shafer, Assistant General Counsel, to become Associate General Counsel. Shafer's principal responsibilities had been in the areas of international programs, and communications satellites. He had served as Chairman of NASA Board of Contract Appeals since Jan. 1, 1965. (NASA Ann, 11/8/67)

November 5: Sen. Henry M. Jackson (D-Wash.), Chairman, Joint Committee on Atomic Energy's Military Applications Subcommittee, in informal remarks, characterized U.S.S.R. development of FOBS as: "...a warning to the world that they are hell-bent on obtaining a superioity over the U.S. in strategic weapons development," and stated: "...the significant point is that the Soviet Union has now led the way in the development of three nuclear weapon systems [ICBM, ABM, and FOBS]." Starting Nov. 6, he would preside at Subcommittee hearings on ABM systems, and he said that FOBS would be an important topic for consideration. (UPI, W Post, 11/6/67, A9)

Carl B. Squier, U.S.'s 13th Federally licensed pilot and one of its earliest air daredevils, died at Burbank, Calif. Born in Decatur, Mich., he had worked since 1929 for Lockheed Aircraft Corp, becoming president in charge of sales and working as consultant beyond his retirement. He was a friend of such notables in U.S. aviation as Wiley Post, Charles A. Lindbergh, and Capt. Edward Rickenbacker. (NYT, 11/7/67, 41)

November 5-6: NASA's 805-lb ATS III (ATS-C) (Applications Technology Satellite) was successfully launched from ETR by Atlas-Agena D booster. Primary purpose of launch was to place spin-stabilized spacecraft into geostationary orbit, operate it for at least the first 30 days, and obtain useful data from onboard experiments. Spacecraft entered elliptical transfer orbit with 22,148-mi (35,643-km) apogee; 111-mi (179-km) perigee; 10-hr 28-min period; and 28° inclination. At 16:01:00 GET (Nov. 6) apogee motor was fired to place satellite into near-synchronous orbit with 22,186-mi (35,704-km) apogee; 111-mi (179-km) perigee; 10-hr 28-min period; period; and .530° inclination where it would be allowed to drift to stationary position over the Atlantic at 47° west longitude.

ATS III was third in series of five satellites designed to improve spacecraft technology; develop long-life control systems; advance spacecraft communications; and improve long-range weather predictions. Five of spacecraft's nine major experiments--Multicolor Spin-Scan Cloud Camera (SSCC), Omega Position Location Experiment (OPLE), Self Contained Navigation System (SCNS), Image Dissector Camera (IDC), and Mechanically Despun Antenna--would be tested in space for first time. SSCC would provide first full-disk photos of earth for continuous detailed viewing of short-lived weather phenomena [see Nov. 8]. In addition, spacecraft carried VHF and SHF transponders; resistojet thruster; reflectometer experiment; communications equipment; and engineering experiments to evaluate spacecraft performance.

November 5-6 (continued)
ATS I (launched Dec. 6, 1966) had exceeded its test objectives and was still operating flawlessly. ATS II (launched April 5, 1967), though adjudged a failure, was transmitting some useful data. ATS III was last spacecraft to be launched from ETR's Complex 12 and last ATS to be launched with Atlas-Agena; two remaining spacecraft in series would be launched with Atlas-Centaur. ATS program was managed by GSFC under OSSA direction. (NASA Proj Off; NASA Release 67-276; W Post, 11/6/67, A1)

November 6: In its resolution #2260, U.N. General Assembly urged its Committee on Peaceful Uses of Outer Space to elaborate on "...agreement on liability for damage caused by the launching of objects into outer space and an agreement on assistance to and return of astronauts and space vehicles...." On July 17, Legal Subcommittee of Committee on Peaceful Uses of Outer Space, meeting in Geneva, had reached such provisional agreement [see July 17]. On July 26, 1966, U.S. and U.S.S.R. had agreed in principle that countries were internationally liable for damage caused to other states by objects they launched into outer space [see NASA SP-4007, 250].

Other concerns of the resolution were education and training for space exploration, feasibility of communications for direct broadcast from satellites, and applied satellite technology of benefit to man. On Jan. 18, 1966, Committee on Peaceful Uses of Outer Space had proposed a world conference on outer space to be held in New York. This conference should examine the impact of space data on education and communications--issues of major importance even to poor and economically retarded states [see NASA SP-4007, 20]. (Text; NASA SP-4007, 20, 250)

. Joint Committee on Atomic Energy's Military Applications Subcommittee held hearings on ABM systems and U.S. defense against ballistic missile attack; Deputy Secretary of Defense Paul H. Nitze and DOD's Director of Research and Engineering Dr. John S. Foster, Jr., presented DOD position that no system capable of defending against a heavy Soviet attack was now technological and financially feasible. Foster said: "In 1966, a new threat appeared--the probability that [Communist Chinese] were developing an ICBM. This is obviously vastly different from the Soviet threat...[not materializing until early 1970s, and relatively unsophisticated and]...against this [Communist Chinese] threat we have high assurance of providing damage denial for the whole country. Furthermore, we think we can maintain this capability against a growing [Communist] Chinese threat at least until the 1980's." (Testimony)

November 6: Rep. Craig Hosmer (R-Calif.), member, Joint Committee on Atomic Energy's Military Applications Subcommittee, during its House hearings on ABM systems, offered reply to Secretary of Defense Robert S. McNamara's announcement on Fractional Orbital Bombardment System (FOBS) [see Nov. 3]: "...[weapon] would...suppress our manned bombers by catching them on the ground with only a 3-minute attack warning...destroy the acquisition radar of any [ABM] system we might install...[and] destroy our retaliatory ICBM's in their silos." Hosmer noted that Soviets call FOBS by its code name Scrag, and said: "...May 29, 1967, issue of the American Security Council's Washington Report [contained] article...written by the exceptionally well-informed Dr. Stefan T. Possony, of the Hoover Institution on War, Revolution, and Peace at Stanford University." Inserting Possony's article into Congressional Record, Hosmer stated: "A most vital disclosure by Possony is that the Scrag warhead...would have a 30-megaton warhead, presumably sufficient to penetrate our hardened ICBM silos, ruin our ICBM missiles and thus destroy our retaliatory capacity. Despite Soviet capabilities with this size warhead and larger...McNamara continues to insist that Scrag warhead yields are only in the 1- to 3-megaton range. I believe he does so less with assured knowledge of the yield than he does wishfully, to support his continued claims that we do not need an ICBM system for protection because our missile silos are so strong they cannot be penetrated." (Testimony; CR, 11/6/67, H14638-9)

. NASA's Apollo 4 (AS-501), which would be launched by Saturn V in three days, had the power to place astronauts on moon, or telescopes in orbit beyond earth's atmosphere; American capability for major strides toward the unknown had arrived when interest in these endeavors had reached a new and understandable low, Albert Sehlstedt, Jr., reported in Baltimore Sun. Along with the new era of less than major interest in space had come the high-priority problems of the Southeast Asia war and the urban riots. Congress had gotten this message and Aviation Week for Aug. 7 had said: "An era ended for the National Aeronautics and Space Administration last week when Congress voted a $234,000,000 cut in the agency's budget authorization for fiscal 1968."

Many people during recent months had looked toward the achievement of social as well as scientific goals, reappraisement of both being called for by Congress. Because AS-501 would be one of the highest, if not the highest achievements in space hardware, the question was no longer whether man could reach into space, but "...with what urgency it should be done in the light of all the needs on earth." (Sehlstedt, B Sun, 11/7/67, A6)

November 7: NASA's Surveyor VI (Surveyor F) was successfully launched from ETR by Atlas-Centaur (AC-14) booster on 64-hr lunar intercept trajectory. Primary mission for the 2,223-lb (at launch) spacecraft was to perform a soft-landing on moon and obtain post-landing TV pictures of the lunar surface. As secondary mission spacecraft would determine relative abundance of chemical elements in lunar soil with alpha scattering instrument; obtain touchdown-dynamics, thermal, and radar-reflectivity data; and conduct vernier engine erosion experiment [see Nov. 9-24]. NASA's Explorer XXXIV, in orbit since May 24, would serve as a "solar watchdog," furnishing information on solar radiation for correct interpretation of Surveyor VI's soil analyses.

At 00:04:06 GET Surveyor VI with two-burn Centaur separated from Atlas and ignited to reach 100-mi-altitude circular parking orbit where it coasted for 12 min; Centaur then reignited to escape earth orbit and boost spacecraft toward moon. Spacecraft separated from Centaur, deployed its solar panels, and locked on the sun and the star Canopus. Based on a 56-mi target miss estimate, a 1.2-m midcourse maneuver was conducted at 00:18:41 GET to assure precise landing on target in Sinus Medii in center of moon's front face.

Surveyor VI was sixth in series of seven spacecraft designed to prove out design, develop technology of lunar soft-landing, obtain post-landing TV pictures of lunar surface, and provide basic scientific and engineering data in support of Project Apollo. Surveyor program was directed by OSSA Lunar and Planetary Programs Div.; project management was assigned to JPL; Atlas-Centaur launch vehicle was managed by LeRC; and prime contractor for spacecraft development and design was Hughes Aircraft Co. (NASA Proj Off; NASA Releases 67-278, 67-287)

. USAF successfully launched an Advanced Ballistic Re-Entry System (ABRES) module from Vandenberg AFB by Atlas-D booster. (UPI, W Post, 11/8/67, A21)

. Explorer XXVII and Vanguard II had been among the 30-40 artificial satellites to be photographed on a typical night by the three-ton light-gatherer-type camera at Smithsonian Astrophysical Observatory's Debre Zeit tracking station in Ethiopia. Robert Citron, station manager, described the operation as an "...extremely accurate way of measuring distances with the use of geodetic satellites...," in a planned program extending into 1972. Debre Zeit, functioning as hub of 12 similar stations in India, Japan, Patagonia, Spain, Brazil, and South Africa, measured earth's size and shape, gravitational pull variations, and atmospheric density changes. Planned progress would include measuring shape of world "down to 33 feet," according to Citron. He explained: "There is a widely accepted theory that the earth's land masses are

November 7 (continued)

drifting. In particular, the African continent is said to be drifting away from the Asian land masses." By using planned measuring methods using geodetic satellites, Citron hoped to explore the truth of the theory and measure the drift should the theory be true. (Reuters, NYT, 11/7/67, 36)

. President Johnson signed Public Broadcasting Act of 1967 (P.L. 90-129) which would provide new funds for broadcast facilities to give "...a wider and...stronger voice to educational radio and TV; launch major study of TV's use in Nation's classrooms and potential use throughout the world; and create Corporation of Public Braodcasting "...to assist stations and producers who aim for the best in broadcasting good music,...exciting plays, and...reports on the whole fascinating range of human activity." He indicated that he had asked Dr. Milton Eisenhower, Johns Hopkins Univ., and Dr. James Killian, MIT, to serve as members of Corporation's board of directors. He explained that the Corporation would get partial support from Government but "...it will be carefully guarded from...control."

The President said: "I believe the time has come to stake another claim in the name of all the people, stake a claim based upon the combined resources of communications. I believe the time has come to enlist the computer and the satellite, as well as television and radio and to enlist them in the cause of education. So I think we must consider new ways to build a great network for knowledge--not just a broadcast system, but one that employs every means of sending and of storing information that the individual can use." (PD, 11/13/67, 1530-2)

. Joint Committee on Atomic Energy's Military Applications Subcommittee heard testimony on missile defense from Columbia Univ.'s Professor Philip E. Mosely and Rand Corp.'s Sr. Staff Member Thomas W. Wolfe.

Mosely stated, on subject of nuclear weapons, this philosophy: "In any future period [of U.S.S.R. nuclear equality or superiority over U.S.]...we would be prudent to assume that Soviet policy would be tempted to undertake a more extensive, more acute, and more dangerous range of risks [in pursuing] its declared long-range ambition to reshape the world according to its own dogma."

Wolfe discussed: Soviet ABM program; their attitude toward ABM limitation; their ABM activities which relate to overall strategic posture; and political implications of a changing U.S./Soviet military balance. He saw their leadership seeking "wider options for global intervention," and, for this goal, he looked for the Soviets to build up their defensive and offensive nuclear power, and to extend the reach of their conventional military power. (Testimony)

November 7: The 50th anniversary celebrations of the Bolshevik Revolution had included Moscow display of five new missiles, Bruce Winters reported in Baltimore Sun. Two years ago, the Moscow display included three new missiles, one of which having warhead for "surprise blow on the first or any other orbit around the earth." The 1967 display had included: new three-stage ICBM, two-stage IRBM, submarine missile, tactical missile, and antiaircraft missile. (Winters, B Sun, 11/8/67, 1)

November 8: NASA's ATS-III, launched Nov. 5, now in 22,300-mi-altitude synchronous orbit, transmitted to NASA's Rosman, N.C., ground station a color photograph of earth which officials described as excellent in quality. The photograph, processed at GSFC, showed entire earth's disk and details of features as small as two or three miles in size. ATS-III, third of a series of five satellites managed by OSSA, carried communication, meteorology, navigation, and spacecraft technology experiments.

From its location over the equator at 47° west longitude, the spacecraft had a view of North and South America, part of Africa and Europe, and the southern part of Greenland icecap. Spacecraft's multi-color spin scan cloud camera obtained color contrast as well as brightness contrast, according to chief experimenter Wisconsin Univ.'s Dr. Verner E. Suomi. He gave this analysis of ATS-III's meteorological operations: "From a time series of pictures such as these the United States has, in effect, given South America a means to track their weather far beyond what they are able to do by conventional means. In one single photograph, the equatorial cloud-free band which was seen from ATS I [launched Dec. 6, 1966] pictures in the Pacific is also evident in the Atlantic. These pictures are ideal for continuing studies from the heat budget and convective systems. The additional meteorological information in a color photograph is more subtle, but it is there. Low clouds tend to be bluer than high clouds. This has been possible even though adjustments to color balance on the ground are still underway. There are suggestions that the muddy outflow from the Amazon River in Brazil can be seen. We have not yet been able to determine whether or not the Gulf Stream water will be visible. Also, we do not have an example of the colors in the Terminator Zone (sunrise and sunset) to determine if cloud heights can be accurately positioned." (NASA Release 67-286)

. A restructuring of the Nation's space program was outlined by NASA Administrator James E. Webb in testimony on proposed NASA FY 68 operating plan, before Senate Committee on Aeronautical and Space Sciences. Decisions which were evolved in structuring the operating plan reflected fiscal, resources, and time factors. The national fiscal situation required minimum expenditures on space for the next two years.

November 8 (continued)

Primary emphasis on completion of Apollo program and other financially important ongoing efforts would be carried out to avoid major losses. Decisions on NASA's space posture for the 1970s would be postponed until "...fiscal year 1969 budget or later." According to Webb's planning: "Our allocation of resources in fiscal year 1968 must hold open for later decision the most promising future aeronautical and space options which our past large investments will support."

FY 68 operating plan figures, presented by Webb, showed NASA's adjustments of funding under R&D operations for the remainder of FY 68. Fund reallocation (Congressional appropriation figures in parenthesis) showed: Apollo applications $253.2 (315.5) million; OSSA $568.1 (528.0) million; OART $318.7 (301.5) million; OTDA $275.0 (270.0) million. In more detail, on OSSA, physics and astronomy $141.5 (130.0) million, lunar and planetary $143.4 (125.0) million, launch vehicle procurement $141.9 (145.0) million, bioscience $41.8 (40.0) million, space applications $99.5 (88.0) million; on OART, electronics systems $39.2 (35.0) million, space vehicle systems $35.0 (no change) million, human factors systems $21.0 (no change) million, basic research $21.5 (20.0) million, space power and electric propulsion systems $44.0 (no change) million, nuclear rockets $54.0 (46.5) million, chemical propulsion $37.2 (35.0) million, and aeronautics $66.8 (65.0) million. Sustaining university was $10.0 (no change) million, and technology utilization $4.0 (no change) million.

Webb presented rather brief outline on present long-range planning for lunar and planetary mission hardware. Limited funds could continue development of flight-qualified engine for NERVA I, and would support plans for first Apollo Applications flights in 1970. Two Mars-Mariner flights for 1969 would be the "last in present program." Five Mariner flights in 1970s, two or more Titan III launches in Voyager series in 1973, and Saturn V flight in 1975 could be considered in FY 69 budget. Webb reasoned that NASA could "...use the Atlas-Centaur...and the Titan III with transtage, to move out into further planetary operations but with very limited expenditures in 1968 and 1969."

Responding to questions by Senate Committee on Aeronautical and Space Sciences, Webb referred to recent CSC decision on NASA personnel contracts and said he would join with CSC chairman and the Comptroller General in working out pattern for support contracts, the KSC contract to provide his guidelines. (Testimony; transcript)

. In a pre-launch press conference at Launch Complex #39, KSC, NASA Deputy Administrator Robert C. Seamans, Jr., referred to high points of Nov. 9 scheduled launch of Apollo 4: "...Apollo 4 launch is...most difficult and significant milestone to date [and] tomorrow we'll be flight testing the Saturn V for the first time. We'll be flight testing on Apollo

November 8 (continued)

spacecraft entering the atmosphere at lunar return speeds for the first time. We'll be live-testing our launch and operational facilities for the first time, and we'll be testing our development and operational team in its first major mission attempt for the first time. I am certain this team...will not be found wanting." (Text)

. Deputy Secretary of Defense Paul H. Nitze, in response to statement made by Rep. Craig Hosmer (R-Calif.), member, Joint Committee on Atomic Energy's Military Applications Subcommittee, during its House hearings on ABM systems [see Nov. 6], answered: "First we are taking steps to protect Minuteman against much better Soviet offenses than we actually expect. Secondly, even if any two of the three elements of our second-strike forces--our land-based ICBMs, our submarine-based Polaris and Poseidon, and our strategic bombers--were rendered useless by some unforeseeable disaster, the remaining element could by itself inflict unacceptable damage on the U.S.S.R." He compared effectiveness (number of targets destroyed) of 10 50-kt warheads in a Multiple Independent Re-entry Vehicles (MIRV) configuration to the same effectiveness of one large yield--10mt--warhead, and stated: "...the MIRVs provide much more effective payloads...by every relevant criterion of military effectiveness, even though they deliver much less total megatonnage." Response to Hosmer's statement by Nitze had been made in response to request of Joint Committee on Atomic Energy. (Text)

. FAA, despite qualified objections of air carriers, announced Dec. 15 effective date for imposition of speed limit of 250 kph (288 mph) for all aircraft operating below 10,000 ft mean sea level [see Sept. 1]. FAA believed its action would give pilots more time to "see and avoid" other air traffic in the Nation's most heavily traveled airspace. Larger airlines felt collision avoidance systems and automated terminal approach systems would go further to reduce the growing number of midair collisions; they would have preferred a speed limit from 5,000 ft down to surface. Air Line Pilots Assn. endorsed though skeptical of rule's value in collision avoidance. (W Post, 11/9/67, M4)

. President Johnson signed H.R. 12474, FY 68 NASA Appropriations bill, designated P.L. 90-131 [see Oct. 26--funding]. (NASA LAR VI/119)

. President Johnson signed Executive Order 11381 enlarging Federal Council for Science and Technology to include representatives from DOT, HUD, and Dept. of State for more effective operation. (PD, 11/13/67, 1537-8)

November 8: ERC appointed O. Hugo Schuck as Director of Office of Control Theory and Application. Schuck had been Visiting Professor of Aeronautics and Astronautics at Stanford Univ. while on leave as Director of Research at Honeywell, Inc. In his new position Schuck would supervise research on application of control theory to complex aeronautics and space vehicle systems. He had been President of the American Automatic Control Council, heading U.S. representation in the International Federation of Automatic Control. (ERC Release 67-37)

November 9: NASA's Apollo 4 (AS-501) was successfully launched from ETR at 7:00 am, EST, in first all-up test of three-stage Saturn V launch vehicle, first in-orbit restart of third (S-IVB) stage, and first use of Launch Complex 39 and ground support equipment. Launch vehicle stages performed nominally; orbital insertion, 3rd stage restart, and injection into earth-intersecting coast ellipse were accomplished satisfactorily; Command Module (CM) encountered no functional problems; and spashdown occurred within 10 mi of planned landing point. Third stage ignited to insert Command Service Module (CSM) into orbit with nominal parking apogee, 119 mi; perigee, 114 mi; period 88.2 min; inclination, 32.6°. After two revolutions in parking orbit, 3rd stage was reignited for simulated translunar injection burn, injected stage and spacecraft into earth intersecting orbit with 10,774-mi apogee. Following stage/CSM separation, Service Propulsion System (SPS) ignited for 16-sec burn, raising apogee to 11,314 mi. Spacecraft was aligned to a specific attitude to achieve thermal gradient across CM heat shield. Attitude, with CM hatch window directly toward sun, was maintained for about 4½ hrs. [CM hatch window had been replaced with instrumented test panel containing simulations of flexible thermal seals and gaps between hatch and surrounding heat shield. Successful performance of thermal seals during reentry heating would qualify seals for use on manned CMs.] SPS was then reignited for 271-sec burn to accelerate spacecraft to the most severe entry conditions that could possibly occur in a lunar-return trajectory. SPS cutoff was followed by CM/SM separation and orientation of CM to entry attitude. Atmosphere reentry at 400,000 ft occurred at flight path angle of -7.077° with inertial velocity of 36,537 fps (24,911 mph). CM landed in mid-Pacific near Hawaii, Zone 4, at 3:37 pm, EST and was recovered by carrier USS Bennington 2 hrs 14 min after touchdown.

In this significant step toward developing manned lunar landing capability, Apollo 4's flight was the first of two to three missions designed to qualify Saturn V for manned flight, and the first test of the structural integrity and compatibility of launch vehicle and spacecraft. By subjecting CM's heat shield to high heat load and heat rate, NASA was evaluating CM's design adequacy for reentry from lunar

November 9 (continued)

missions--primary objective to achieve successful manned lunar mission. Other primary mission objectives were to: confirm launch loads and dynamic characteristics; demonstrate stage separation; verify operation of launch vehicle subsystems and spacecraft subsystems; evaluate performance of space vehicle Emergency Detection System (EDS) in an open-loop configuration; and demonstrate mission support facilities and operations required for launch, mission conduct, and CM recovery.

Saturn V was the most powerful space vehicle developed in U.S. space program; in launch configuration with Apollo 4, height was 363 ft, and weight, fully fueled, was 6,220,025 lbs. Saturn V's 1st stage engines produced 7,610,000 lbs of thrust at liftoff, and the launch vehicle placed 278,699 lbs in earth orbit. This launch vehicle could place 96,000 lbs on the moon. Kerosene (RP-1) was the fuel used in the five 1st stage (S-1C) engines, while 2nd stage (S-II) engines used liquid hydrogen. The five S-II stage J-2 engines, developing total thrust of 1,000,000 lbs, were rated for operations to 117-mi altitude and to 935-mi distance downrange. Third stage (S-IVB) J-2 engine, using liquid hydrogen fuel, developed about 200,000 lbs of thrust.

Success for Apollo 4 (AS-501), according to NASA Associate Administrator for Manned Space Flight Dr. George E. Mueller, had been achieved in terms of "...pre-set primary objectives." Heat shield design, S-IVB restart, structural/thermal integrity, compatibility of launch vehicle and spacecraft, and ground support had been proven.

Direction of Apollo Program had been the responsibility of OMSF; development of Apollo spacecraft, flight crew training, and mission control the responsibility of MSC; development of Saturn launch vehicles the responsibility of MSFC; and Apollo/Saturn launch operations the responsibility of KSC. Under overall direction of OTDA, MSFN had been managed by GSFC. (NASA Proj Off; NASA Release 67-275; MSFC Release 67-226)

. Apollo Program Manager M/G Samuel C. Phillips, commented on countdown operations for Saturn/Apollo (AS-501): "...I was tremendously impressed with the smooth teamwork that this combined government/multi-industry team put together [and] you could almost feel the will with which it was being carried out. I think that's important to the progress of Apollo...perhaps even more so than some of the technical returns we'll get from this mission. I'll characterize it this way--Apollo is on the way to the moon." (Text)

. U.S. officials praised successful flight of Apollo 4 (AS-501): President Johnson said "...the whole world could see the awesome sight of the first launch of what is now the largest rocket ever flown. This launching symbolizes the power this Nation is harnessing for the peaceful

November 9 (continued)
exploration of space. The successful completion of today's flight has shown that we can launch and bring back safely to earth the space ship that will take men to the moon." NASC's Executive Secretary Dr. Edward C. Welsh said the Nation's people "...should be proud of this historic landmark in propulsion and precision, and particularly in the boost given our national space program." Looking toward the future, NASA Administrator James E. Webb praised this "...successful demonstration of the devotion and high quality workmanship of over 300,000 men and women in thousands of industrial plants, laboratories, test facilities, universities and government installations [and this] success [which] will permit us to move more rapidly on to a second launch...." (PD, 11/13/67, 1541; Text; UPI, NYT, 11/10/67, 32C)

. Blastoff of Saturn V at ETR produced one of the loudest noises in history, natural or manmade, according to reports from Columbia Univ.'s Lamont Geological Observatory, located at Palisades, N.Y. Observatory physicist Dr. William Donn labeled U.S. and U.S.S.R. nuclear explosions as the only louder man-made sounds, and 1883 fall of Great Siberian Meteorite as the only louder natural sounds on record. (AP, W Post, 11/10/67, A8)

. President Johnson announced intention to nominate M/G Richard P. Klocko (USAF), Deputy Director, National Military Command System Technical Support, Defense Communications Agency, for promotion to lieutenant general and assignment as Director, Defense Communications Agency. He would replace L/G Alfred D. Starbird (USA) who had been assigned as System Manager, BMDS. (PD, 11/13/67, 1539)

November 9-24: NASA's Surveyor VI, launched Nov. 7, became fourth U.S. spacecraft to softland on the moon when it touched down in Sinus Medii after 64-hr flight and began transmitting first of 30,065 detailed television pictures to JPL Deep Space Facilities, Goldstone, Calif.

Landing sequence began when Surveyor VI shifted its normal cruising attitude to position main retrorocket. Triggered by radar, main retromotor slowed spacecraft to 374 mph; retromotor then ejected. Vernier engines cut off at 13 ft above lunar surface and spacecraft landed.

First photos transmitted showed one of spacecraft's landing pads resting on sand-like soil similar to that pictured in previous Surveyor photos. Later pictures confirmed that area was rough and pitted with craters; they revealed a region strewn with rocks up to two feet in diameter and a huge cliff described by USGS scientist Dr. Eugene Shoemaker as "the most rugged feature...yet seen on the moon." Efforts

November 9-24 (continued)
to reestablish communications with Surveyor V, which had softlanded Sept. 10, for simultaneous communications with Surveyor VI proved futile.

On Nov. 17 Surveyor VI's vernier engines were fired for 2.5 sec, lifting spacecraft to 10-ft altitude before it touched down 8.5 sec later 8 ft west of original resting point. Purpose of translation--first planned change of location ever accomplished after conclusion of initial flight--was to test lunar surface bearing strength; determine depth of original footprints made by spacecraft; obtain stereo-type effect by comparing photos taken of same area from different positions; and study engine erosion effects. Post-translation photos showed cratering and scouring effect on areas under engines and confirmed that alpha scattering instrument--which had stopped functioning properly after operating successfully for 43 hrs and providing excellent data on chemical composition of lunar soil--had come to rest upside down. Communications with spacecraft were halted Nov. 24 to preserve battery power during cold of lunar night.

Performance of Surveyor VI was near flawless. Surveyor I (launched May 30, 1966), Surveyor III (launched April 17, 1967), and Surveyor V (launched Sept. 8, 1967) had all softlanded successfully and transmitted photos to earth. Surveyor II (launched Sept. 20, 1966) failed to softland because of an ignition failure. Communications with Surveyor IV (launched July 14, 1967) were lost seconds before it was scheduled to softland and its condition could not be determined. (NASA Proj Off; NASA Release 67-278; JPL Release; AP, B Sun, 11/10/67, 1; Reuters, W Post, 11/10/67, 1)

November 10: NASA successfully launched ESSA VI (TOS-D), sixth meteorological satellite in ESSA's Tiros Operational Satellite (TOS) system, from WTR using three-stage Thrust-Augmented-Thor-Delta booster. Primary mission objective was to provide global cloud coverage on a regular, daily basis with six-month-nominal and three-month-minimum spacecraft lifetime. Satellite achieved near polar, sun-synchronous orbit with 920-mi (1,482-km) apogee; 872-mi (1,402-km) perigee; 114.8-min period; and 102.1° inclination. Wheel orientation maneuver was scheduled for completion during 18th orbit at which time first photos would be programmed and NASA would check out spacecraft before turning its operation over to ESSA.

An advanced version of the cartwheel configuration, 286-lb ESSA VI carried two Automatic Picture Transmission (APT) camera systems modified with improved magnetic shielding to prevent slight banding visible in previous ESSA APT photos. Cameras would photograph earth's cloud cover

November 10 (continued)
and immediately transmit pictures to local APT stations. ESSA VI would supplement ESSA II and ESSA IV, replacing them when they became inoperable.

ESSA financed, managed, and operated TOS system; GSFC was responsible for procurement, launch, and initial checkout of spacecraft in orbit. ESSA I was launched Feb. 3, 1966; ESSA II, Feb. 28, 1966; ESSA III, Oct. 2, 1966; ESSA IV, Jan 26, 1967; and ESSA V, April 20, 1967. All five satellites were still operating. (NASA Proj Off; ESSA Release 67-82)

. Letter to President Johnson from Rep. William F. Ryan (D-N.Y.), member of House Committee on Science and Astronautics, expressed assessment of U.S. space program after Saturn/Apollo flight of Nov. 9: U.S. had captured lead in space race with the U.S.S.R. Representative Ryan urged the President to renounce the space race, and "...to make a serious request for the beginning of far-ranging international cooperation to reduce the costs and increase the benefits of space exploration--to remove the wasteful duplication of two great nations...." (Text)

November 11: Command Module apogee camera film for Apollo 4 flight was processed at MSC. High-quality pictures of the earth were obtained from approximately one hour before to one hour after apogee [see Nov. 9]. (NASA Proj Off)

November 12: In news release, Sen. Claiborne Pell (D-R.I.), member of Senate Committee on Foreign Relations, called for an international ocean-space treaty to regulate nations' development of deep-ocean riches; he claimed mankind would benefit should U.S. and U.S.S.R. relations in this regard reach those of space law treaty [see Oct. 10]. In regulating man's behavior in deep-ocean space, beyond territorial and continental shelf limits, he acknowledged U.S. was already exploring possible diplomatic initiatives. In U.N. circles, he said, a Maltese resolution "...suggests that marine resources be turned over to an international organization which will supervise their exploitation and distribute the benefits to underdeveloped nations" [see Nov. 1]. (Text)

November 13: U.S.S.R. Mikoyan E-266 twin-tailed fighter aircraft--NATO designation Foxbat--averaged 1,804 mph over closed 1,000-km (621-mi) course, carrying two-ton payload. Soviets claimed world speed record. (Av Wk, 11/13/67, 35)

November 13: NASA announced establishment of an Astronomy Missions Board to be chaired by Harvard College Observatory Director Dr. Leo Goldberg. Twelve astronomers and physicists would make up the Board which would advise NASA through Associate Administrator for Space Science and Applications Dr. John E. Naugle. Executive Director for the Board would be OSSA's Deputy Director of Physics and Astronomy Dr. Henry Smith. The Board would develop and review scientific objectives and general strategy for space astronomy missions involving sounding rockets, balloons, and satellites and would recommend designs for missions, telescopes, and other equipment. Excluded from the Board's responsibility would be studies of moon and planets from close range and earth orbital observations of the earth. (NASA Release 67-284)

. DOD would be forced to turn to space technology for early warning, using either manned or unmanned spacecraft to counteract Soviet decision to develop Fractional Orbital Bombardment Systems (FOBS) [see Nov. 3], Aviation Week contended. Because they believed that the U.S.S.R. could use FOBS "...to foil existing [BMEWS] radars," DOD planners would place initial reliance on HF, over-the-horizon radars. "The Soviet objective appears to be to slash the 15-30 min warning time now available from BMEWS to a mere 3-4 min for a FOBS attack...." Over-the-horizon radars depended on ionospheric reflection which would make them subject to interruption during sunspot activity; further, these radars would be relatively vulnerable to jamming. MOL and, ultimately, continuously manned or unmanned space patrols could receive DOD support if it appeared that the Soviets were succeeding in their plans for penetrating future U.S. missile defenses. (Av Wk, 11/13/67, 31)

November 14: Rep. George P. Miller (D-Calif.), Chairman, House Committee on Science and Astronautics, spoke to National Space Club in Washington: "Impressive as our launch vehicles, spacecraft, and scientific instrumentation may be, I have always viewed the space program principally as an investment in people, not hardware." He stated his belief that a principal contribution of the National space effort had been "...its stimulation of young people's interest in education [and] much of the credit for the revitalization of American education in recent years must be given to the space program." Emphasizing the role of education, he noted that scientists and engineers were challenged in keeping current with new knowledge. Universities were made active partners of industry and Government through sustaining university and training grants and laboratory construction, funded by NASA.

Because of current fiscal situation the NASA educational support had been drastically reduced, Representative Miller noted, and seemed likely to remain at a lower level for some time [see Oct. 17].

November 14 (continued)
Universities had to look to private sources for support previously supplied by Federal government.

Representative Miller said he had agreed to serve as chairman of board of trustees for National Space Club's Scientific and Educational Foundation. Underwriting of individual scholarships and fellowships would be main thrust of the Foundation's support. He called upon industrialists "...to think of their contributions to higher education less as a charitable gift than as an investment." (Text)

November 15: NASA X-15 (No. 3) crashed in Mohave Desert when the aircraft "...exceeded its structural limitations during the final portions of the reentry maneuver," X-15 Accident Investigating Board suspected. X-15's pilot, Maj. Michael J. Adams, did not use ejection system and was killed, the first fatality in the 191 flights since the three X-15s started their flight operations, June 8, 1959. Usual flight plan called for aircraft to ascend at a sharp angle after being dropped by B-52 aircraft. After engine burnout, plan called for coasting up into high thin air, then dropping back in pancake style into thicker air for reentry. According to a NASA spokesman, the aircraft had risen to about 260,000 ft and encountered trouble on the way down. "There apparently was some sort of control malfunction as the pilot attempted to pull out of his descent," spokesman said. Radar and telemetry data received during flight were excellent, data being received down to an altitude of 60,000 ft.

Speed and altitude records for winged aircraft--4,534 mph, by Maj. William J. Knight (USAF), and 354,200 ft, by NASA's Joseph A. Walker (who had since died in crash of XB-70 No. 2 and F-104 aircraft)--had been set by X-15s. Two crash landings of X-15 aircraft had occurred; pilots had survived and aircraft had been restored to flight status. X-15 No. 3 pilot, Maj. Adams, 37, had finished USAF training in 1952, flown in combat in Korea, and graduated with honors from Aerospace Research Pilots School. Although assigned to MOL program, he had requested transfer to X-15 operations.

FRC announced: "At the present time, the X-15 Accident Investigating Board is continuing its work, in an attempt to determine the probable cause of the X-15-3 accident. The Board reviewed the radar and telemetry data obtained from the X-15 flight of November 15. Other members of the investigating board are mapping the area where various parts of the X-15 were recovered. The parts of the aircraft, after having a position recorded, are being returned to NASA's Flight Research Center, where they will be examined." (FRC Release 26-67; AP, NYT, 11/16/67, 15)

November 15: In message transmitting to Congress annual report on U.S. participation in U.N. for 1966, President Johnson cited successful negotiation of space law treaty as an: "...outstanding accomplishment... which bans weapons of mass destruction from space and calls for peaceful cooperation in its exploration and use." He also cited success of U.N. Development Program to provide economic assistance and approval of charter for U.N. Industrial Development Organization to help new nations create industries best suited to their development needs. Noting that not all U.N. progress was dramatic or widely reported, he commended representatives' unnoted work to fight ignorance, hunger, and disease, and to promote economic and social development. (PD, 11/20/67, 1568-9)

. NASA Administrator James E. Webb, at Chicago meeting of American Petroleum Institute, spoke on space program's technological and social benefits in assessing developing capabilities which would "...serve our nation's future needs." He called attention to "...special equipment that will automatically monitor ground, underseas cable, or satellite circuits carrying high-speed traffic [and] the entire international communications network structure of the world...more valuable today than it was just a few years ago." Speaking about the dynamics of rocket technology, Webb pointed out: "...the rocket technology that carried Surveyor to the moon provided astronomers with an improvement in resolution beyond that provided by Ranger by another factor of 1000. That is 1000 times more detail than the Ranger results which themselves were 1000 times better than anything before."

Webb turned the direction of his talk to a comparison of U.S.S.R. and U.S. achievements: "[U.S.S.R.] is now building a rocket bigger than Saturn V, I feel sure." He explained that the Saturn V-Apollo system "...permits us to operate out as far as the moon with large payloads of about 100,000 pounds." Webb went on to compare U.S.S.R. and U.S. planetary exploration work for exploration of the planet Venus: "The Russians sent a capsule weighing 845 pounds into the atmosphere of Venus and we made a close fly-by. But in many ways the Mariner [U.S.] data is more complete. It reaches down to about 6 miles from the surface of Venus, while the Venus 4 [U.S.S.R.] data appear to have stopped at about 15 miles up."

He explained how NASA's system for making the most of the Nation's technological capabilities uses "...a Government-industry-university research base and provides a direct channel for industry to apply new knowledge to industry problems." He referred to work done on the campuses of 200 universities: "...the number of scientists, engineers, researchers, technicians and graduate students participating in NASA activity has grown to about 10,000. Of these, about 1000 are involved as scientific or engineering investigators." Summing up the technological situation, Webb concluded: "...at any foreseeable budget level

November 15 (continued)

NASA will maintain the base of knowledge that will determine the ability of this country to plan, undertake and accomplish successfully new and difficult aeronautical and space objectives." (Text)

. In testimony before House Committee on Interstate Commerce's Transportation and Aeronautics Subcommittee, Rep. John W. Wydler (R-N.Y.), member, House Committee on Science and Astronautics, urged passage of H.R. 3400--bill to allow Secretary of Transportation to prescribe aircraft noise abatement regulations. Representative Wydler cited complaints from churches whose religious services had been interrupted; doctors whose patients' mental and physical health had been impaired; schools whose classes had been disrupted; and individuals whose lives had been inhumanly intruded upon by jet aircraft noise. Passage of the bill was imperative, he said, because aircraft noise had become "something that dominates the lives of those who have to live with it to the point where it actually destroys the way in which they are living."

Secretary of Transportation Alan S. Boyd told Subcommittee that DOT was trying to find a solution to the problem, but he admitted his disbelief that "...there will ever be such a thing as a quiet airplane. Despite our far longer experience with the problems of truck noise and railroad noise, we have not been able to produce quiet vehicles in those modes of transportation." Boyd expressed his conviction that "...we will be able, by technological and regulatory means, to reduce the impact of aircraft noise exposure for the majority of Americans who are...subject to excessive noise exposure." He said bill [H.R. 3400] was "...the mechanism by which we can assure future aircraft are substantially quieter than out present generation [of aircraft]." (Transcript)

. Sentinel System--Communist Chinese-oriented ABM system--would be located in accordance with DOD's survey of potential areas which would provide optimum advantages for the area-defense weapons and their radars; DOD identified the first ten geographical areas chosen for survey: Albany, Ga.; Chicago, Ill.; Dallas, Tex.; Grand Forks AFB, N Dak.; New York City; Oahu, Hawaii; Salt Lake City, Utah; Seattle, Wash.; Boston, Mass.; and Detroit, Mich. [see Nov. 3]. This list was not complete, and the areas were not final choices.

Sentinel System would give protection to all U.S. cities and, because of long range of Spartan missile, relatively few batteries could protect entire country against the kind of light and relatively unsophisticated attack that the Communist Chinese might be capable of by the mid-70s, DOD announcement said. (DOD Release 1088-67)

November 15: Fog-dispersal methods would be tested by World Weather, Inc., under Air Transport Assn. contract, with costs defrayed by 33 ATA member airlines. The $100,000-contract would explore seeding warm fog--above 32° F--with new materials which would cause water droplets to combine into larger drops to become precipitation. Materials would be dispensed into fog from aircraft or from ground equipment.

United Air Lines had started successful cold-fog seeding program in 1963--using dry ice pellets--and program now involved several airlines and seeding operations at 17 airports. Warm-fog seeding, starting Nov. 15 at Sacramento, Calif., would be technically managed by UAL Meteorology Manager W. Boynton Beckwith; tests would run to Feb. 29, 1968. (ATA Release)

November 16: NASA announced Boeing Co. had been awarded incentive fee of $1,811,611 for two missions--Lunar Orbiter IV, $1,061,111; Lunar Orbiter V, $750,500--completing performance fee portions of Boeing contract, and totaling $6,809,053 in such awards for all five Lunar Orbiters. Previous incentive awards--Lunar Orbiter I, $1,995,312; Lunar Orbiter II, $1,948,725, Lunar Orbiter III, $1,053,405--had been earned by Boeing.

After initial goal to photograph potential moon landing sites had been achieved by first three Lunar Orbiters, NASA's contract modification set a new goal aimed at more advanced scientific missions for Lunar Orbiters IV and V; it provided that Boeing could earn through outstanding performance remaining awards fees not earned on previous flights. Modified contract provisions still recognized amounts of original Lunar Orbiter IV and V award fees.

When making the award, NASA's Incentive Award Fee Board for Lunar Orbiter noted that Lunar Orbiter IV had photographed moon's "entire front," and Lunar Orbiter V had completed photography of "opposite side." (NASA Release 67-285)

First F-111A USAF squadron would not likely be operational in Southeast Asia before November 1968 despite Pentagon "leak" that squadron's scheduled appearance was February 1968, predicted Norman Sklarewitz in Wall Street Journal. Of 75 aircraft required for readying of squadron and planning of tactical fighter wing, only two production and six test models had arrived for pilot training at Nellis AFB. At least nine months would be required for pilot training plus several more months for unit training after arrival of sufficient production models at Nellis AFB, he said. (Sklarewitz, WSJ, 11/16/67, 14)

November 16: Dr. Donald F. Hornig, Director of OST and science advisor to the President, addressing science writers' seminar in St. Louis, doubted that there would be any value to having scientists become part-time politicians in effort to promote greater public support of scientific activity. He said a scientist who used his skill in explaining complex subjects to laymen was "...a much better politican than anyone trying to be an amateur on serious political matters."

Noting that rate of growth of Federal support of science activities had slowed in recent years, Hornig said $17 billion was still being spent annually on science activities, including $1.8 billion on academic science in universities. (AP, NYT, 11/19/67, 2; Federal Support for Academic Sciences and Other Educational Activities in Univ. and Col., July 67)

. Two scientists, speaking before American Physical Society meeting in New York City, discussed plasma properties of solar wind, and earth's magnetosphere. Iowa Univ.'s Director of Physics and Astronomy Depts. Dr. James A. Van Allen believed that particles--protons and electrons--penetrated magnetosphere to populate the outer radiation belt, indicating existence of a peculiar dynamo effect. Los Alamos Scientific Laboratory scientist Dr. A. J. Hundhausen reported Vela bomb-detection satellites observed peculiar solar wind properties--a motion reflecting fluid and electrical characteristics. (Sullivan, NYT, 11/17/67, 21)

. Venus IV's launch site and launch vehicle had been prepared with assistance from military rocket experts, Deputy Commander Colonel General Vladimir Tolubko of Soviet strategic rocket forces reported in U.S.S.R.'s trade-union newspaper Trud. In emphasizing the role played by military specialists in the June 12 launching, Tolubko said they provided guidance during "first 10 minutes of the rocket's flight," and relinquished control to "the command measuring complex." This complex, he wrote, had been controlling, for a decade, "various space apparatuses," presumably both military and scientific vehicles, according to Baltimore Sun. "[Complex] receives measuring information and telemetry data from stations in Moscow, Siberia, the Far East as well as from special ships in the Atlantic and Pacific oceans," Tolubko stated. Baltimore Sun reported: "Some Western observers believe all of the country's massive lifting rockets fall technically under military control because of their potential as intercontinental missiles. Further command reverts to civilian hands if the rocket is on a scientific mission." (B Sun, 11/17/67, A11)

November 16: Soviet journalist Alexander Boiko, in the weekly Moscow News, accused Secretary of Defense Robert S. McNamara of making up "fabrications" about the Soviet orbital bomb system, designated FOBS by DOD [see Nov. 3]. Boiko wrote: "Why is it necessary for McNamara to make up fabrications about the Soviet Union? The U.S.S.R. has always scrupulously adhered to its international obligations [and] we want to feel that others do likewise." Boiko continued: "The U.S.S.R. is most certainly carrying out large-scale space research, but by what right does McNamara connect this with intentions to use outer space for military purposes?" In presenting an analysis of DOD intelligence information on possible existence for FOBS, McNamara had referred to U.S.S.R. tests of a system that supposedly could release nuclear bombs from an orbiting vehicle, but had not said experimental vehicles carried even simulated weapons. (Winters, B Sun, 11/17/67, 11)

November 16-17: First U.S. high-altitude investigations of aircraft wake turbulence were made by FAA, with assistance from National Aeronautical Establishment (NAE) of Ottawa, Canada, LaRC, and (for radar tracking) NASA Wallops Station. FAA's Convair 880 jet transport cruised at 30,000-ft altitude in restricted airspace southwest of NASA Wallops Station, Va., and trailed colored smoke to outline wake vortices. Two instrumented T-33 jet aircraft, following in wake vortices at distances of 1,000-12,000 ft, recorded wake vortice core diameter, circular velocity, and downward settling during dissipation. Information would be used in evaluating air traffic control standards for separation of enroute aircraft. Although current tests were the first for U.S. in wake turbulence studies at high altitudes, joint LaRC/FAA airport wake turbulence tests had progressed for several years. (FAA Release T 67-24)

November 18: Soviet references to low-altitude nuclear weapon that would drop on target before completing full orbit of earth appeared to confirm Secretary of Defense Robert S. McNamara's analysis of DOD intelligence reports that U.S.S.R. had a nuclear-warhead missile capable of sudden attack from relatively low altitude [see Nov. 3]. In commemorating U.S.S.R. Rocket and Artillery Forces Day, Strategic Rocket Forces Commander-In-Chief Marshal Nikolai I. Krylov and Colonel General Nikolai V. Yegorov described missiles that could deliver "...nuclear warheads...along ballistic and orbital trajectories." (Anderson, NYT, 11/19/67, 15)

November 19: Development of ocean data environmental science services acquisition (ODESSA) system consisting of unmanned deep-sea automated buoys which record simultaneously oceanographic and meteorological data was announced by ESSA. Each buoy would support a group of surface and subsurface electronic sensing packages which would gather and transmit data to central recording station console, either aboard ship or on land. Data could also be recorded at each buoy station on magnetic tape record.

In addition to providing a valuable research tool for oceanographers, the ODESSA system would have potential use for study of pollution in harbors and estuarine waters, and fish habitats; its major role would serve ESSA's investigations of the continuous exchange process occurring at interface between air and sea, the announcement said. (ESSA Release 67-80)

. Rear-engine aircraft, built by Sierradyne Corp., and leased by Northrop Corp., was being flight-tested at Dulles International Airport. The 670-lb S-1 experimental aircraft had 87.5-hp engine, 200-mph maximum speed, 20-ft wing span, and 18-ft length. Power plant was placed in fuselage, near to aircraft's center of gravity, with nose space left free for equipment. Reduction of cockpit noise, elimination of "propwash," and improved visibility were accomplished by design. (Northrop Corp.; Corrigan, W Post, 11/19/67, D8)

. Using $55,000 NASA grant, UCLA had purchased a 24-in telescope with photometer and spectrograph for observatory at Thacher School, Ojai, California, New York Times reported. Telescope was 15th largest in California and already had produced the most complete spectrographic coverage of stellar explosion of star, Nova Delphini. (NYT, 11/19/67, 73)

. Development of new 60-mph hydrofoil, designated Burevestnik, had used aircraft turbine engines and water-jet propulsion, Soviet trade-union newspaper Trud reported. The Soviet craft had completed its tests to prove that its hardware was much superior to diesel-engine and propeller models previously developed by Soviets. (NYT, 11/20/67, 85)

November 20: First Indian-developed rocket, Rohini-75, designed to carry meteorological experiments, was successfully launched from Thumba Equatorial Launching Station (TERLS). (Reuters, NYT, 11/21/67, 5)

November 20: NASA named crews for first two manned Saturn V/Apollo flights. Prime crew for AS-504 (first mission), scheduled for 1968: James A. McDivitt, commander; David R. Scott, CM pilot; and Russell L. Schweickart, LM pilot. Backup crew would be Charles Conrad, Jr., commander; Richard F. Gordon, CM pilot; and Alan L. Bean, LM pilot. Prime crew for AS-505 (second mission), scheduled for 1969: Frank Borman, commander; Michael Collins, CM pilot; and William A. Anders, LM pilot. Backup crew would be Neil A. Armstrong, commander; James A. Lovell, CM pilot; and Edwin E. Aldrin, LM pilot. A three-astronaut support team was named for each flight crew: for AS-504--Edgar D. Mitchell, Fred W. Haise, Jr., and Alfred M. Worden; and for AS-505--Thomas F. Mattingly II, Gerald P. Carr, and John S. Bull. (MSC Release; AP, W Star, 11/21/67, A2)

. Rep. Joseph E. Karth (D-Minn.), Chairman of House Committee on Science and Astronautics' Manned Space Flight Subcommittee, speaking on floor of House, praised the success of NASA's Surveyor program: "It successfully demonstrated the technique of soft-landing [and]...together with the successfully concluded Lunar Orbiter program, it found and certified manned landing sites...." He continued: "[Surveyor program] has supplied scientists with the first real information on the chemical composition of the lunar surface. In the eastern Sea of Tranquillity, for example, Surveyor V determined that the surface was made up of the same elements common to the surface of the earth; namely, oxygen, silicon, and aluminum." He concluded: "Since both Surveyor and its Centaur booster encountered enormous problems in the early stages of development, the eventual success of the program demonstrated the skill, perseverance, and determination of the NASA-industry-university team." Representatives Karth's remarks were entered in Congressional Record. (CR, 11/20/67, H15619)

. Soviet jet transport, Il-62, carrying delegation of Soviet aviation experts who would negotiate final technical details of proposed Moscow-New York air link [see Nov. 4, 1966] with FAA, landed at Dulles International Airport after 11-hr flight from Moscow to Washington.

As a result of increasing complaints about jet noise and FAA's lack of authority to regulate it [see Nov. 15], Port Authority of New York had insisted that noise measurement tests be made on Il-62 at Dulles before initiation of direct Moscow-to-New York flights. New York Port Authority had done pioneering work on noise problem.

Operational safety of Il-62, and alternate landing sites at Washington, D.C., Philadelphia, and Boston had already been approved

November 20 (continued)

by FAA for joint use by Pan American Airways and Aeroflot, official Soviet airline. (Hoffman, W Post, 11/21/67, A4; B Sun, 11/21/67, A8)

. NASA appointed Vincent L. Johnson as Deputy Associate Administrator for Space Science and Applications (Engineering). Johnson's former position of Director of Launch Vehicle and Propulsion Programs was filled by Joseph B. Mahon, former Agena Program Manager and Deputy Director of Launch Vehicle and Propulsion Programs. Both appointments were made by Dr. John E. Naugle, Associate Administrator for Space Science and Applications. (NASA Release 67-289)

. The U.S. should expect "an early Soviet attempt to send a large payload around the moon and recover it on earth," Rep. George P. Miller (D-Calif.), Chairman, House Committee on Science and Astronautics, said in releasing committee report: "Review of Soviet Space Program," prepared by Dr. Charles S. Sheldon II, Chief of Library of Congress' Science Policy Research Div. This 1957-67 review drew comparisons with the corresponding program in U.S. Rep. Miller commented: "At the same time that space efforts in the United States appear to be slackening, the pace of Soviet space flight has picked up by about 60 percent this year over the corresponding ten months total of last year. The strong technological base the Russians are building through a sustained, long-term commitment to space [assures them] sophisticated and intricate planetary probes...unmanned or manned space platforms... [application of] aerospace technology systems management to a great variety of industrial and social purposes here on earth."

Commenting on "whether there is a space race" committee report gave "no simple, direct answer"... [but suggested]..."at the present time both the Soviet Union and the United States have put large resources of somewhat similar size into very broadly based programs of great strength."

Competition in overall space capability, especially on weight lifting and thrust of launch vehicles used by U.S. and U.S.S.R. was illustrated: "In connection with the NASA Administrator's August 1967 pronouncement on the expected large Soviet vehicle [Saturn V class], he made a plea for support of an American nuclear stage to mount on Saturn V in order to leapfrog the Russians. A month later, Leonid Sedov in Moscow stated his belief in the importance of nuclear propulsion for the very large rockets which will soon be needed."

Contents included: U.S.S.R. launch vehicles and sites; U.S.S.R. and U.S. space flight statistics; description and interpretation of U.S.S.R. flight programs; comparative discussion of U.S. programs; and U.S.S.R. space policy and plans. (Text; NASA SP-4007, 212; Committee Release, 11/20/67)

November 20: In the last decade, the Nation acquired vast new knowledge, wrote NASA Administrator James E. Webb in Aerospace Technology's Seventh Annual NASA issue, and it entered "...a new era, a stirring period of exploration and adventure comparable to the Age of Discovery in the 14th and 15th Centuries." Benefits from our mastery of space, he said "...are opening to us and others new sources of national power and new arenas in which to seek international cooperation as important to our future and the future of the world as sea power and air power have been in the past." He challenged: "Unless we are prepared to move ahead with new programs of [planetary exploration, and work with useful machines and systems in earth orbit]...we will be backing out of the Space Age almost before we enter it." (Webb, Aero Tech, 11/20/67, 24-5)

. Karl Harr, president of Aerospace Industries Assn., spoke before Metropolitan Baltimore Chamber of Commerce on the impact of U.S. space effort, and the risk that it would be weighed and evaluated in "oversimplified terms." A huge and complex effort should not be judged by superficial aspects alone while forgetting that concentration of "our best industrial, economic, scientific and intellectual resources, organized to an unprecedented degree..., has an impact on every aspect of our national life."

Harr listed several factors that would affect national decisions. He noted the strangeness of the unknown medium of space, "...for which our ultimate capabilities are yet to be determined." The international competitive aspects, he said: "...accord a measure of initiative to others." Further, Harr concluded, "...we have not yet as a nation firmly established the relative priority of [space effort] in terms of other national priorities."

"Today we find ourselves both in midstream in our national space effort and at a crossroads as to future efforts.... It is essential that we delay no longer in sorting out that which is valid and enduring, in terms of your total interest and mine, from that which is superficial or transitory." (Text)

November 20-21: NASA announced preliminary information on cause of X-15 No. 3 crash [see Nov. 15], said research missions in X-15 No. 1 and No. 2 had been suspended by FRC until review of flight operating procedures was completed. X-15 No. 1 had been awaiting captive flight checkout under wing of B-52 carrier plane since work on auxiliary power unit and wiring had been completed. X-15 No. 2 was under repair at North American Rockwell plant following damage to lower stub fin on its tail, but was expected to be flying by February 1968.

Cause of X-15 No. 3 crash was unknown, NASA reported. The pilot--Maj. Michael J. Adams--had difficulty with control booster system;

November 20-21 (continued)
NASA said X-15 failed to recover from a dive from extremely high altitude, the pilot losing control above 200,000 ft and regaining it briefly about 80,000 ft.

Setting unofficial world speed and altitude records, the three X-15s had flown 191 times, No. 3 having had 65 flights. The aircraft were built by North American Rockwell (formerly NAA) under a cooperative program involving USAF, USN, and NASA. (NASA Proj Off)

November 21: U.S.S.R. launched Cosmos CXCI into orbit with 518-km (322-mi) apogee; 281-km (174-mi) perigee; 92.2-min period; and 71° inclination. Equipment and instruments functioned satisfactorily. (Aero Tech, 12/4/67, 17)

. NASA FY 68 operating plan was presented by Administrator James E. Webb in testimony before House Committee on Science and Astronautics; it reflected accommodation of the fund reductions by appropriation actions of Congress during recent months--20% for R&D programs other than Apollo, 50% for construction of facilities, and 7% for administrative operations [see Nov. 8, Senate presentation]. He reviewed decisions restructuring NASA effort at least through FY 69.

The first scheduled Apollo Applications flights of 1970--reflecting a "limited number with limited objectives"--Webb said would begin with a "...precursor training mission for scientists-astronauts with certain earth orbital experiments, and then proceed with dual launch missions with the Orbital Workshop and the Apollo Telescope Mount." Launch vehicle/spacecraft hardware for follow-on Apollo Applications flights would depend on funding "some time after FY 1969," because of stringent FY 69 budgetary guidelines.

Future planning for Uprated Saturn--acknowledging necessity for production termination after vehicle No. 216--he said included FY 68-funded lead time items "...to hold open the option of continued production...at the rate of two per year." Webb explained that he held open the option of definite termination of Uprated Saturn production, intending to "...preserve competition among the companies involved and between solid, liquid, and, where applicable, nuclear propulsion systems." To preserve competition would cost $3.5 million from FY 68 funds. He announced NASA/DOD discussions "...to consider carefully future national requirements for large launch vehicles, including a possible new booster of the 100,000-pound in earth orbit class."

Webb stressed the need for planetary exploration utilizing both orbiters and landers in a long-term program: "We do not believe that it is the policy of the Nation or the intent of Congress that the

November 21 (continued)
United States abandon the field of planetary exploration." Present program still had two Mars-Mariner 1969 flights; continuity depended on NASA's current $143.4-million allocation to lunar and planetary category which would serve as basis for reestablishing future programs in FY 69 budget.

Webb said development of NERVA I flight-qualified engine could proceed "...with the amounts that we and the AEC have available in FY 1968," longer-range planning again dependent on "an affirmative decision" in the Administration's FY 69 budget for NASA. (Text)

. Operation of ESSA VI had been turned over to ESSA, NASA announced [see Nov. 10]. (NASA Proj Off)

. DOD announced appointment of Dr. Eberhardt Rechtin, JPL Assistant Director for Tracking and Data Acquisition, to new position of Director, Advanced Research Projects Agency. In his new position, Rechtin would be responsible for planning, initiating, and directing research and development programs assigned by Director of Defense Research and Engineering Dr. John S. Foster, Jr. (DOD Release 1107-67)

November 22: NASA reported its space engineers at JPL's Space Flight Operations Facility, using Goldstone DSN station, had sent commands to check on Mariner IV's camera and data storage system; spacecraft, launched Nov. 28, 1964, had now traveled about 1.5 billion miles, and was circling the sun between earth and Mars. Mariner IV had been commanded to take TV pictures of black space, in checking on camera's condition and data storage system's ability to record on magnetic tape after long space environment exposure. The spacecraft had responded perfectly. NASA also reported commands were sent to switch Mariner V's transmitter from high gain directional to low gain omnidirectional antenna, mission of spacecraft being terminated; Mariner V, launched June 14, had completed its Venus mission and was in solar orbit between orbits of Venus and Mercury at a position about 74 million miles from earth and about 60 million miles from sun. NASA reported that it might be possible to recontact Mariner V in Sept. 1968 when spacecraft's antennas would be pointed once again toward earth.

Both Mariners would remain in solar orbit indefinitely; however, because Mariner IV's stabilizing nitrogen gas supply would be expected to run out in the next few weeks, spacecraft would drift and solar panels would no longer face the sun. Data reception would end because storage batteries would no longer receive charge. (NASA Release 67-291)

November 23: Cosmos CXCII was launched by U.S.S.R. into 760-km (472-mi) -altitude circular orbit with 99.9-min period and 74° inclination. Equipment and instruments functioned normally. (Av Wk, 12/4/67, 33)

. Cosmic dust detector to measure cosmic dust influx into earth's atmosphere and meteoroid registration would be tested in NASA/German Ministry for Scientific Research (BMwF) cooperative project, part of a continuing program first started July 19, 1967 [see NASA SP-4006, 339]. Influx of cosmic dust would be measured by charge emission in detectors (developed by Max Planck Institute of Nuclear Physics, Heidelberg, Germany) which would be launched on NASA-supplied Nike-Apache sounding rockets from ESRO's range in Kiruna, Sweden, May or June, 1968. NASA would supply rocket launcher, and train Germans in rocket preparation and launching. BMwF would provide two payload packages and ground support equipment. (NASA Release 67-288)

. Program aimed at increasing U.S.'s trained manpower working in oceanography and improving oceanographic applied research and information exchange would be developed by NSF's Office of Sea Grant Programs, according to Director Robert Abel. Under National Sea Grant College and Program Act, passed Oct. 15, 1966, and funded by FY 68 $4-million operating budget, financial assistance would be provided for university development of curricula leading to degrees in ocean engineering and junior college training programs turning out technicians for work in ocean sciences. Ultimately, program could lead to scientific progress in all fields relating to the seas--defense, shipping, agriculture, mining, and weather prediction. Financial programs were viewed by NSF officials as a means to ease "manpower and know-how shortage" slowing U.S. progress in oceanography. (AP, NYT, 11/24/67, 30C)

November 25: U.S.S.R. successfully launched Cosmos CXCIII. Orbital parameters: apogee, 354 km (220 mi); perigee, 203 km (127 mi); period, 89.9 min; inclination, 65.7°. (AP, NYT, 11/26/67, 46)

. National Policy Panel of the U.N. Assn. of the U.S.A. published report "Stopping the Spread of Atomic Weapons." Report favored proposed treaty ending spread of nuclear weapons, urged U.S. to open its peaceful nuclear reactors to inspection by I.A.E.A., recomended specific international facilities and arrangements for handling explosions for peaceful purposes, asked for a fairer balance between nuclear and non-nuclear nations, and called for inclusion of U.N. guarantee (based on U.S. and U.S.S.R. power) against "nuclear blackmail." Panel report's "underlying theme" was that some nations might refuse to sign if the two major

November 25 (continued)
powers avoided treaty terms that were designed to meet concerns of nonnuclear states, that "...special units be created within International Atomic Energy Agency to assure that technical, industrial innovations in civilian nuclear energy be made available on a pooled, non-discriminatory basis." (Finney, NYT, 11/26/67, 12; Marder, W Post, 11/26/67, 1)

November 26: U.S.S.R.'s long-held superiority in large boosters had given it an advantage over U.S. in terms of nuclear warhead protection, according to Pentagon sources. The advantage would become significant both offensively and defensively because of present developments in ABM defenses--developments designed to destroy incoming warheads in outer space with intensive x-ray emissions [see May 9]. Soviet scientists could easily add more shielding to their warheads to halt x-ray bombardments from U.S. antimissile missiles article noted, but U.S. was handicapped by weight limitations of its lower-thrust boosters. "Some officials," article said, "are concerned that the hardness of Russian warheads will lessen seriously the protective capability of the Pentagon's planned [ABM systems]...[and]... that U.S. offensive missiles now need more protection...to survive Russian anti-missile explosions and reach their targets." U.S. answer might lie in new lightweight composite materials under development; made by winding and inorganically bonding filaments of such materials as carbon, silcia, and graphite, they would strengthen heat shield at little penalty in weight. (B Sun, 11/27/67, A1)

November 27: In apparent sharp increase in testing, U.S.S.R. would launch fourth 1967 test series of "carrier rockets" into the Pacific between Nov. 28 and Dec. 30, according to Tass announcement [see May 29, Sept. 2, Oct. 30]. Aircraft and ships were warned not to enter either of two 129-km (80-mi)-wide target areas northwest and south of Midway Island, a U.S. possession, between noon and midnight local time each day, Tass said. UPI quoted observers on Soviet aims: "To test new and bigger Soviet rockets...to send a man to the moon and bring him back [and] to expand recent Soviet experiments on the landing of space capsules at sea, change from former landing of capsules on Soviet soil." UPI said series would involve launchings of 3,000-4,000 mi on down-range course from the Soviet Union, change from maximum of 6,000 mi for past launchings. Past announcements by U.S.S.R. on three 1967 "carrier-rocket" series had termed all three "successful." (UPI, W Star, 11/27/67, A5)

November 27: Former Vice President and current leader for Republican Presidential nomination Richard M. Nixon, appearing on National Educational TV Network, said "...very likely...some of those appropriations [for the space program] are excessive." Referring to the space program as "a sacred cow," he called for the President to be "a balance wheel" in evening off the pressure from "vested interests." He defended a Congressman's right when representing an area with important space business to fight for more funds. (SBD, 11/29/67, 140)

November 27-29: American Astronautical Society's Astronautics International Conference was held in New York City.

Coupling a plea for constructive realism with a denunciation of U.S.S.R.'s lip service and lack of sincerity toward international space cooperation, NASA Assistant Administrator for International Affairs Arnold W. Frutkin discussed various ways for understanding the meaning of "international space cooperation." No Russians attended the conference--two speakers and one cosmonaut declined invitations. Frutkin explained that cooperation from the practicioner's point of view meant "...joint projects, jointly undertaken, jointly carried out, and jointly profitable."

Realistic cooperative projects practicing space cooperation on an international scale were cited by Frutkin to be: NASA's program; ESRO/ELDO complex for combining "...ten European nations in spacecraft development and seven nations in large vehicle development;" and INTELSAT satellite telecommunications consortium which now includes "...some sixty nations in day-to-day operational space communications traffic."

He discussed U.S. benefits from the NASA cooperative program and included in addition to "...gold flow [for] foreign purchase of space hardware and services," Canadian ionospheric investigations, West German barium cloud technique, Italian atmospheric density measurements, and French global wind circulation studies.

Frutkin referred to ESRO's program as "...a true pooling of resources [which] goes well beyond the NASA cooperative program. In the ESRO case, common facilities have been planned, financed and operated on an international basis by an international governmental agency..."

Though hopeful for the future of meaningful space cooperation, Frutkin noted budgetary limitations for "developed nations," and both technological and budgetary limitations for "developing nations." (Text)

MSC Director Dr. Robert R. Gilruth discussed manned space flight "from Mercury to Apollo." He said Mercury defined man's survivability

November 27-29 (continued)

in space, Gemini defined man's operational capability, and Apollo would be first in utilizing space for manned exploration. "To progress in ten short years from exploring survivability to utilization on the most difficult exploration mission ever undertaken implies a rate of change in technical capability which has no real parallel in history," he said. Deep space and lunar operations would be faced as "...two new major dimensions to our space capabilities...." Gilruth said that space explorers would be coping with the need for: huge amounts of energy; extremely precise navigation to hit target and, on return, the reentry corridor; and radiation protection that could include the intensities generated by solar flares. Lunar explorers would require a vehicle designed to: operate entirely outside earth's atmosphere; descend to and ascend from lunar surface; and propel reliably while exhibiting "...the relative sophistication of a throttleable engine."

Brief crytic description of man returning from his first lunar exploration trip, according to Gilruth, would list accomplishments: "...an age-old dream [in visiting] his nearest neighbor in space [and] a key to the riddle of Earth's relation to its nearest neighbor [and] a chance of understanding the creative forces that formed his own home-Earth." Gilruth explained: "For the first time he will have soared beyond the confines of Earth's gravity and felt the pull of a foreign planet [and] personally viewed our whole planet as a small bluish ball only four times the span of the lunar disk. These experiences may well produce profound changes in man's attitude towards himself and his world comparable to those wrought by Galileo's dramatic demonstration of the Copernican theory, changes which should tend to inspire man to place the affairs of his very small house in order." (Text)

November 28: SST design refinements reflecting 1966 recommendations made by 240-man Government and airline evaluation team in 1966 were announced by Boeing Co. Vice President H. W. Withington. Prototype refinements were still to be reviewed by FAA and described in detail to the 26 airlines which had reserved SST deliveries. Changes included addition of canard surfaces, incorporation of direct-lift control, lengthening fuselage by 12 ft, and provision of more convenience in passenger boarding and deplaning, explained Withington. He cited progress in component and subsystem testing and in wind-tunnel investigations. The first metal (titanium alloy billets) for actual airliner prototypes was under production. Firms selected as major contractors, Withington said, were preparing for work on assemblies and Boeing was making ready facilities for construction of the two prototypes. He said that a titanium fabrication facility would be completed as part of the Boeing Development Center and would include a furnace large enough for heat-

November 28 (continued)
treating sheets of titanium 70 ft long and 10 ft wide. Withington explained that the full-scale demonstration mockup, constructed in 1966, had been dismantled to make room for a dimensionally accurate engineering mockup to be constructed at Boeing Co. (Boeing Release)

. NASA announced closing of its Western Support Office, Santa Monica, Calif., and reduction in size of its Pasadena Office, and plans to determine manpower requirements for continuing functions in Los Angeles area. NASA centers or NASA Hq would perform functions eliminated from the two west coast offices. Work at the offices had included contract administration, financial management and disbursement, public affairs, personnel services, procurement, and administration of NASA contract with CIT for JPL's operation. (NASA Release 67-292)

. JPL Director Dr. William H. Pickering appointed William H. Bayley, General Manager of Deep Space Network (DSN), as Assistant Laboratory Director for Tracking and Data Acquisition. In new post, Bayley would direct worldwide DSN which JPL has operated for NASA. Bayley succeeded Dr. Eberhardt Rechtin, who had taken leave of absence from JPL to accept post of Director, DOD's Advanced Research Projects Agency [see Nov. 21]. (JPL Release 461/11-67)

November 29: Australia successfully launched her first satellite, WRESAT I (Weapons Research Establishment Satellite), from Woomera Rocket Range. Orbital parameters: apogee, 1,249 km (776 mi); perigee 170 km (106 mi); period, 98.9 min; and inclination, 83.3°. (Aero Tech, 12/4/67, 17; GSFC Historian)

. Secretary of Defense Robert S. McNamara would take new post as President of World Bank, receiving nomination approved by President Johnson. McNamara said that President George Woods of the World Bank had offered him the position on Apr. 18 but because of deep obligation to serve the President, his decision had been deferred. He noted that President Johnson had informed him about the middle of October that nominations to succeed Mr. Woods would soon have to be made and the President had asked him if he was still interested. Coming to an understanding that the post would go to McNamara, agreement had been reached that McNamara would stay on the job "...at least long enough into next year to complete the work on the military program and financial budget for fiscal year 1969." (DOD Release 1130-67; NYT, 11/30/67, 16)

November 29: Assistant Secretary of Defense for International Security Affairs Paul C. Warnke, in hearings before Senate Committee on Foreign Relations, presented DOD views on ocean space activities by nations. He considered S. Joint Res. 111, introduced by Sen. Norris Cotton (R-N.H.), ranking minority member of Senate Committee on Commerce, and S.Res. 172 & 186, introduced by Sen. Claiborne Pell (D-R.I.), member of Senate Committee on Foreign Relations. He cited primary concern and interest of DOD to be "...use by [U.S.] of the ocean environment for purposes of maintaining or enhansing our national security."

Pointing out deep ocean exploitation was a subject whose ramifications involved "unsettled areas" of international law--one area being "the appropriate breadth of the continental shelf"--Warnke cited the 1958 Geneva Convention on the Continental Shelf and noted that Congressional policy "...in this field is manifested in the Marine Resources and Engineering Development Act of 1966."

He stated that DOD supported "...the need for care [comprehensive studies on ocean exploration and exploitation] which is reflected in Senate Joint Resolution 111...." On security grounds, he specifically objected to S.Res. 186's Section IV on "use of seabed and subsoil of ocean space for peaceful purposes only" until thorough studies could be completed leading to "a sound judgment consistent with security" of U.S. Further objection was voiced by Warnke on a "sea guard" which S.Res. 186 called for; his argument cited "...the difficult political and military problems inherent in the organizing of international peacekeeping or enforcement agencies or forces." (Testimony)

November 30: DOD was studying contract performance under its letter contract with Pratt & Whitney for F-111 engines. Orr Kelly, reporting in Washington Star, stated: "The Defense Dept. has ordered a high-level investigation of [Pratt & Whitney operations] in an effort to cut [F-111 engine costs], Pentagon sources said today." A firm price had not been set--final contract negotiations would begin in early 1968--but negotiation and fact-finding teams, headed by Asst. Secretary of Navy for Installations and Logistics Graeme C. Bannerman/ Chief of Naval Material Adm. I. J. Galantin, and Procurement Control and Clearance Div. Chief Gordon W. Rule, respectively, would continue to work for final contract containing "target costs, profits and prices to the government," according to Kelly's article. Rising costs were reflected in history of F-111 engine procurement: 1961 cost estimate, $270,000; 1965 Pratt & Whitney ceiling price for British government, $400,000; 1966 Pratt & Whitney letter contract estimates to U.S. Government, $700,000 to $750,000. Article stated that negotiations on price of engine were "not related to the quality;" futher, negotiations would not delay aircraft's development, according to a Navy official. DOD

November 30 (continued)
sources emphasized price differences could not be taken "...as a full measure of the rise in price because there have been significant improvements in the engine, giving it greater thrust, since 1961." Article noted that, after letter contract was signed, Naval Air Systems Command had asked the Performance Technology Corp. to make an independent investigation of Pratt & Whitney operations. At issue were 2,053 TF-30 engines manufactured in four-year period 1967-1970. (Kelly, W. Star, 11/30/67, 1)

. Dr. Alan T. Waterman, 75, a distinguished physicist and for 12 years Director of National Science Foundation, died at the National Institutes of Health. During WW II, he had served on the National Defense Research Committee, and in the Office of Scientific Research and Development. More recently, he had been a member of NASA's Historical Advisory Committee. President Johnson said: "The American people mourn the passing of a foremost man of science and of human purpose, Dr. Alan T. Waterman. Our Government has lost a trusted counselor. As Chief Scientist of the Office of Naval Research and as first Director of the National Science Foundation, he left an indelible stamp of achievement on one of the most vital areas in American life. He will be missed. But succeeding generations will be wiser for his skill and richer for the foresight that marked his long career." (PD, 12/8/67, 1648; W Post, 12/2/67, B6)

GPO 937-450

COMMENT DRAFT

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

DECEMBER 1967

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

(HHR-23)

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D E C E M B E R 1 9 6 7

December 1: General aviation (nonairline) pilots in 1966 flew 104,706 aircraft a record 3.3 billion mi in 21 million hrs, consuming 512 million gal of gasoline and jet fuel, FAA reported. The 10% increase in number of active general aviation aircraft over the 95,442 in 1965 was largest yearly increase since 1946. Miles flown increased by 30% and hours by 26%. Most active segment of general aviation operations was business flying, which accounted for 33% of total hours and 46% of total miles. (FAA Release 67-84)

. At dedication of Georgia Institute of Technology's Space Science and Technology Center, NASA Administrator James E. Webb reviewed NASA-Georgia Tech relationships: "In the first year of the NASA Traineeship program, Georgia Tech was one of the ten original schools. It is one of five schools...that started NASA's new program of Systems Design Traineeships in September.... Thirty-eight NASA regular trainees and five design trainees are enrolled at Georgia Tech this fall.

"The...Center we are dedicating is one of 36 such facilities that NASA has helped to build and support on university campuses... [which] are in a very real sense a new and valuable kind of 'capital asset' that will pay dividends to our nation--and to the states in which they are located--for many years to come. Here...for example, in the past few years NASA has invested $6.5 million for research, training, and the facility dedicated today....

"Even under our reduced budget NASA is sponsoring sustaining research here at a level of some $300,000 annually.... In project research, NASA has funded a cumulative total of some $2.1 million at this university.... The total picture of cooperation...would also include a cooperative student program...started with...NACA, in 1952. There are currently 31 Georgia Tech cooperative students at [MSC] and six at [LaRC]. More than 125 Georgia Tech alumni are employees of [MSC], and 60 alumni are at [LaRC]...." (Text)

. Frank J. Magliato, Special Assistant to the NASA Administrator, was appointed NASA Executive Secretary, replacing John R. Biggs who became Special Assistant to the Associate Administrator for Advanced Research and Technology. (NASA Ann, 12/1/67)

. ERC Director James C. Elms announced the appointment of Dr. Richard J. Hayes, Chief of ERC's Space Guidance Laboratory, as ERC Assistant Director. In his new position Dr. Hayes would become one of five Assistant Directors and would manage activities of two of the center's nine laboratories. He would be responsible for research in guidance and control of future aeronautical and space vehicles. (ERC Release 67-40)

December 2: 25th anniversary of first controlled, self-sustaining nuclear reaction, achieved by the late Enrico Fermi at Univ. of Chicago in 1942. At two-day meeting at Univ. of Chicago sponsored by AEC and the International Atomic Energy Agency, AEC Chairman Dr. Glenn T. Seaborg said U.S. nuclear plants currently generated 2.8 million kw of electrical power. By 1980, he said, figure would reach 150 million kw and by 2000, 700 million kw.

President Johnson, stressing significance of the anniversary, said: "Throughout history, man has struggled to find enough power--enough energy--to do his work in the world. He domesticated animals, he sold his brother into slavery, and enslaved himself to the machine--all in the desperate search for energy.... By learning the secret of the atom, we have given mankind, for the first time in history, all the energy he can possibly use." Urging acceptance of a nonproliferation treaty, he noted that countries with a single reactor, while generating electricity, could produce enough plutonium to make dozens of bombs every year. Even if their purpose were peaceful, he said, "the fact remains that the secret diversion of even a small part of the plutonium they create could soon give every nation power to destroy civilization...." To prove U.S.' desire to halt spread of nuclear weapons he announced that "when such safeguards are applied under the treaty, the [U.S.] will permit the International Atomic Energy Agency to apply its safeguards to all nuclear activities in the [U.S.]--excluding only those with direct national significance." (Sullivan, NYT, 12/3/67, 1; PD, 12/11/67, 1650-1)

. Trendex Poll conducted for Thiokol Chemical Corp. in six American cities indicated that interest in the national space program had dropped to lowest in more than four years. Some 41% of persons questioned thought the Government was spending too much on the space program; 83% thought more attention should be given to water pollution, 82% to air pollution, 68% to training unskilled workers, 51% to beautification program, 45% to antipoverty drive, and 26% to space exploration. Competition to achieve first manned lunar landing was favored by 51%, compared to 77% in September 1965, and opposed by 35%. Most significant change of attitude, Trendex said, was increase in number of respondents who did not know whether they favored the competition--14%, compared to 1% in 1963. (NYT, 12/3/67, 28; Thiokol PIO)

. FAA announced establishment of a one-year study (Jan. 1-Dec. 31, 1968) of causes of near midair collisions. To encourage persons involved in the near collisions to make the full report vital to study's success, FAA said that no action would be taken against any person involved in a reported near collision during the period of the study. In addition, FAA would withhold the report and the identity of persons

December 2 (continued)
involved from public disclosure at the reportee's request. By obtaining full, frank, and complete cooperation, FAA hoped to obtain information necessary for evaluation and development of air traffic control procedures. (FAA Release 67-85)

. Moscow Aviation Institute professor Feliks Zigel had called for a "joint effort of all the scientists of the world," to determine the nature of unidentified flying objects (UFOs), according to Soviet press agency Novosti. Group of which he was a member had had 200 reports of sightings, Zigel said. Typical of these was "a luminous orange-colored crescent flying with its outward bend forward. Its surface is only a little duller than that of the moon. The horns of the crescent throw out jets, sometimes with sparks. The outer contour of the crescent is sharp and the inner contour blurred and wavy." The main task, Zigel asserted, was to organize a systematic study of the phenomena from astronomical and meteorological observatories to determine whether the objects were of protoplasmic or extraterrestrial origin. "Unfortunately, certain scientists both in...[U.S.S.R. and U.S.] deny the very existence of the problem instead of helping to solve it.... The U.F.O. phenomenon is a challenge to mankind. It is the duty of scientists to take up this challenge, to disclose the nature of the U.F.O. and to establish the scientific truth." (Kamm, NYT, 12/10/67, 70)

December 3: U.S.S.R. launched Cosmos CXCIV into orbit with 333-km (207-mi) apogee; 205-km (127-mi) perigee; 89.7-min period; and 65.7° inclination. Equipment and instruments functioned satisfactorily, and spacecraft was successfully recovered Dec. 11. (GSFC SSR, 12/15/67; W Post, 12/6/67, B2; Interavia, 12/14/67, 6)

. "Evaluation of Apollo 4 mission data...continues to confirm initial reports that Spacecraft 017 met all flight objectives without problems," NASA announced. Detailed systems analyses were still in process, but evidence to date indicated spacecraft systems operated properly during Nov. 9 mission and met all specifications.

First Service Propulsion System (SPS) burn had occurred as scheduled; second SPS burn, however was 13 sec longer than planned because of a switchover to ground control after burn was started by onboard guidance and navigation system. Although review of the burn was still being conducted, NASA had already determined that there had been no failure in onboard systems involved. Because of the longer-than-planned SPS burn, spacecraft's reentry velocity was .0058% higher than expected; actual velocity was 24,913 mph, compared

December 3 (continued)

with nominal 24,772 mph. Increased velocity caused higher Command Module (CM) maximum heat rate--620 BTUs per sq ft per sec instead of planned 586 BTUs. Maximum rate expected on lunar return was 480 BTUs. Maximum g's on reentry was 7.3, compared with expected 8.33 g's, because of a shallower reentry flight-path angle.

Cabin pressure remained between 5.6 and 5.8 psi during entire mission, indicating negligible leakage rate. Cabin air temperature remained stable at 60°F during orbit and increased to 70°F during reentry. Structural performance of the spacecraft and Lunar Test Article 10-R (a simulated lunar module) during launch and boost phase was satisfactory. Earth landing system functioned as planned; all parachutes inflated properly, and recovery aids deployed and operated normally. Heat shield performance was good; maximum char thickness was 3/4 in, and charring of crew compartment heat shield was less than expected. Fuel cell and cryogenic subsystems functioned normally, with fuel cells producing potable sterile water and demonstrating excellent load-sharing and thermal-control capability. CM and SM reaction-control systems, electrical power subsystem, and spacecraft sequential devices operated normally, with all functions occurring at scheduled times.

Guidance and control system and the mission control programmer performed properly. Range-to-go at drogue parachute deployment calculated was 2.2 nm. Comparisons with measured landing point indicated better than predicted performance. All communications objectives were accomplished. Each MSFN station, Apollo tracking ship Vanguard, and at least two of the Apollo/Range Instrumentation Aircraft established two-way communications with the spacecraft as planned. (NASA Release 67-294; Hines, W Star, 12/3/67, A20; SBD, 12/5/67, 172-3)

. As of Nov. 15, U.S. had dropped 1,630,500 bombs on North and South Vietnam since July 1965--twice the tonnage dropped during the Korean War, and three times that dropped in the Pacific Theater during World War II--George C. Wilson reported in the Washington Post. (Wilson, W Post, 1/5/68, 4)

. William Littlewood, a former vice president of American Airlines and developer of the DC-3 aircraft, died at age 69. Recipient of numerous awards--including Wright Brothers Medal, Flight Safety Foundation Medal, and Guggenheim Medal--Littlewood had been a member of NACA, Flight Safety Foundation, Cornell Aeronautical Laboratory board of directors, U.K. Royal Aeronautical Society, and Canadian Aeronautics and Space Institute. (NYT, 12/5/67, 45; W Star, 12/5/67, B4)

December 4: French experimental aerotrain Le Zinc reached 215 mph in test on 4.2-mi track at Gometz-la-Ville, France, claiming new world record for track vehicles. Previous 195 mph record had been set by a French Aerotrai Co. locomotive. Le Zinc, a half-size experimental model of an aerotrain designed by Jean Berlain, rode on a 1/10-in-thick air cushion over a concrete track. Full-scale model, driven by turbo-propeller, would carry 80 passengers up to 250 mph. (Hess, NYT, 12/5/67, 1)

. Izvestia announced completion of one of the world's largest atomic research reactors, designed to produce and test materials that could provide heat and power for long-duration space flights. Material Investigations Reactor (MIR), located in Melekess reactor development center in Volga River Valley, reportedly could generate 100,000 kw of heat at full power from fuel elements containing 90% uranium 235. Designed to produce an intense flux of neutrons to irradiate test materials rapidly, MIR could attain maximum neutron flow of 500,000 billion neutrons per sq cm per sec. Highest flux attained to date was 600,000 billion, achieved by AEC's Savannah River reactor in 1965-1966 demonstration. (Shabad, NYT, 12/10/67, 72)

. NASA's total procurement in FY 67 fell to $4.651 billion--8% below FY 66--and procurement actions dropped to 283,000--11% less than FY 66--because of budget reductions, Aerospace Technology reported. NASA's "Annual Procurement Report, Fiscal Year 1967" disclosed that 83% of net dollar value went directly to business firms; 4% to education and other non-profit institutions; 5% to Cal Tech for operating JPL; and 8% to other Government agencies. NASA continued its policy of making greater use of incentive contracts, awarding 81 new incentive contracts and converting 11 cost-plus-fixed-fee contracts to incentive awards during FY 67. North American Rockwell Corp. led in dollar amount of NASA awards, receiving 25.46% of total. (Aero Tech, 12/4/67, 46)

. Thomas O'Toole, writing in the Washington Post, reviewed NASA's "growing role in the Vietnam war." Both NASA and DOD were reluctant to disclose the size of NASA's defense effort, he charged, "but it's known that [OART] is spending between $4 million and $5 million a year directing the efforts of 100 scientists and engineers to tasks vital to the Vietnam war." Results of NASA research, he said, included: a new acoustic detector able to locate mortars by measuring ground vibrations; a more-steerable parachute; aircraft engines too quiet to be heard during approach; a scissors-like sling for helicopter rescues; and a helicopter which did not make a chopper noise. Although NASA willingly participated in defense research, its authorization to do so was "fuzzy", he said, based only on a section of the 1958

December 4 (continued)

National Aeronautics and Space Act which directed NASA to make available to defense organizations "discoveries that have military value or significance." NASA was "nervous" about its military role, he asserted, because of its unclear authorization; fear of Congressional inquiry and possible budget cuts; and fear of international reaction.

Sen. Strom Thurmond (R-S.C.) later attacked O'Toole's article on the Senate floor: "One might expect that if...a story of this sort were to be dug up, the article would express gratification that the taxpayer's money was being used on behalf of the American people... [and not purport to be] shocked that NASA projects help our national objective.... I am firmly of the conviction that anything that can be developed technically to save a single American life in Vietnam, especially by any individual or organization that is being paid by American taxpayers, belongs freely to our soldiers....

"The article is obviously a patently calculated leak. The informed details it provides on NASA's research and technical work proves this.... This is a shocking thing, that is not a matter of press freedom, or even of press license, but plain aid and comfort to the enemy.... Publishers and editors should accept their responsibility to prevent such...news coverage and to prevent too, the violation of security classifications on subjects that involve adversely the preservation of the lives of American fighting men." (O'Toole, W Post, 12/4/67, A1; NASA LAR VI/128)

. Michael Getler, in Aerospace Technology editorial, cited U.K.'s lack of "willingness to invest at home in the pursuit of new technology needed to compete and to grow," as a major reason for devaluation of the British pound [see Nov. 18]. Comparing French and U.K. economies Getler noted that France had invested heavily in her own industry to support a large-scale military buildup and an expensive national space program. "In contrast to French willingness to pay for the cost of [R&D], the British have tended to treat their big companies solely as manufacturers....

"While the British have purchased [U.S.] Polaris missiles...the French have built their own. The British...now are buying U.S.-built F-4s and F-111s, while the French continue to design and build newer versions of their own Mirage family, and are now exporting them....

"The British national space program is virtually non-existent despite a growing realization...[by] Parliament that investment in a properly scaled effort can be of great importance in developing [British] technology.... There is no suggestion that the British take on a multi-billion dollar effort, but there certainly are grounds to support investment in a $100 million program...that would be directed at developing satellites with some obvious commercial applications."

December 4 (continued)

Although U.K.'s purchases of U.S. goods were "good business for American industry," Getler noted, "the long range risk to this country is that an old and comparably faithful ally will be weakened in the process. Eventually, the British will tire of buying U.S. weapons... [but will have] no R&D base...to fall back on...." (Getler, Aero Tech, 12/4/67, 58)

December 5: NASA Aerobee 150A sounding rocket launched from NASA Wallops Station carried 300-lb payload containing two white rats to 85-mi (137-km) altitude in first of four experiments to study behavior of the white rats in an artificial gravity field and determine minimum level of gravity needed by biological organisms during space flight. Two arms of payload were extended after rocket burnout, producing a centrifuge with artificial gravity levels between .35 and 1.65 g's. During five minutes of free fall rats selected their own gravity levels by walking along tunnel runway. Data on their movement and position were telemetered to ground stations. Payload impacted 70 mi downrange in the Atlantic; no recovery was attempted. (WS Release 67-36; NASA Release 67-290; NASA Rpt SRL)

. Aerobee 150 sounding rocket launched by NASA from WSMR carried 14-in telescope with new STRAP III stellar pointing control to 96.8-mi (155-km) altitude in Johns Hopkins Univ. experiment to measure vacuum spectral emission lines from atmospheres of Venus, Jupiter, and Regulus. STRAP III, used for first time, rocket, and other instruments performed satisfactorily. (NASA Rpt SRL)

. ELDO's Europa I rocket was launched from Woomera Rocket Range but was automatically destroyed in mid-air after French Coralie 2nd stage failed to ignite. U.K.'s Blue Streak 1st stage performed satisfactorily. Purpose of suborbital flight test was to evaluate performance of the Coralie and separation of the three stages. (AP, NYT, 12/6/67, 16; SBD, 12/7/67, 189)

. USAF launched an unidentified satellite from Vandenberg AFB toward polar orbit using Titan III-Agena D booster. (UPI, W Post, 12/6/67, A24)

. MSFC awarded IBM Corp a $1,292,218 supplemental contract for configuration management of 27 instrument units for Saturn V and Uprated Saturn I. Agreement, effective thrbugh June 1970, brought total value of contract to $200,644,441. (MSFC Release 67-236)

December 5: Gerald J. Mossinghoff, Director of the Office of Legislative Planning at U.S. Patent Office, was named director of Congressional Liaison Div. in NASA's Office of Legislative Affairs. (NASA Release 67-297)

December 5-6: New York Academy of Sciences held ceremonies marking its 150th anniversary.

Dr. Hilliard V. Paige, General Electric Co. Vice President and general manager of Missile and Space Div., compared roll of the space program in stimulating technological development to that of World Wars I and II. World War I, he said, marked real beginning of American aviation activities. World War II led to current U.S. leadership in production of jet aircraft. Space program was current counterpart of this stimulus, he noted, but program was declining because of crippling budget and program cuts.

Former Astronaut M. Scott Carpenter (Cdr., USN) described his experiences living in Sealab 2 (see Aug. 28, 1965) and plans for a larger Sealab 3 in 1968. In addition to Sealab experiment, series of special vehicles would be tested, he said: Deep Submergence Rescue Vehicle (DSRV-1) to rescue men from disabled submarines resting on ocean floor; Deep Submergence Search Vehicle (DSSV) to conduct research on ocean floor, collecting and surfacing small objects; Nuclear Powered Deep Submergence Research and Ocean Engineering Vehicle (NR-1) which would run along ocean floor on wheels; and Large Object Salvage System (LOSS) to develop a variety of tools, from surface craft with strong lifting ability, to equipment enabling swimmers to operate effectively in deep water. (Sullivan, NYT, 12/6/67, 35; 12/24/67, E3; NY Academy of Sciences PIO)

December 6: NASA Aerobee 150 sounding rocket launched by NASA from WSMR carried GSFC payload to 131-mi (210-km) altitude in experiment to measure spectral irradiance of Gamma Velora and Zeta Puppis with a UV stellar spectrograph, star tracker, and modified attitude-control system (STRAP). Rocket and instruments performed satisfactorily. (NASA Rpt SRL)

. News briefing on results of Lunar Module (LM) flammability tests, conducted as a result of Jan. 27 Apollo fire, was held at MSC. Using a full-scale boilerplate mockup of LM cabin interior fabricated specifically for the test program by Grumman Aircraft Engineering Corp., fires were deliberately set in 41 tests to investigate the flammability and propagation properties of all interior LM materials, contractor fire-hazard fixes, crew equipment and stowage areas, and apparent propagation paths. Although results indicated that most LM areas were

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adequately protected against propagation of an accidental fire, four materials which under specific conditions might act as flame propagation media were ordered replaced. In addition, beta cloth containers for food and flight data would be modified to completely enclose the stored items; flight data file and crew procedure notebooks would be redesigned to minimize their flammability; and procedures would be developed to control location and quantity of loose items and to combat onboard fire. Similar tests would be conducted in the Command Module (CM). (Transcript; AP, B Sun, 12/7/67, A3)

. British Defense Ministry denied report by London Evening Standard that U.K. would cancel its agreement with U.S. to purchase 50 F-111 variable sweep-wing aircraft because devaluation of the pound would increase cost of the aircraft. Devaluation of the pound from $2.80 to $2.40 Nov. 18 added one sixth of original cost to total, but arrangements were reportedly being made to adjust the contract, possibly by increasing U.S. purchases of U.K. military equipment to help offset aircraft cost. (Flowers, B Sun, 12/7/67, A11)

. U.K. was considering halting its activities at Woomera Rocket Range because of large expense due to distance between England and the Australian range and fact that only a few of its missile projects required such an extensive facility, Space Business Daily reported. (SBD, 12/6/67, 181)

. Jerome F. Lederer, NASA Manned Space Flight Safety Director, received Flight Safety Foundation's Distinguished Service Award for distinguished service in achieving safer utilization of aircraft. (NASA Hq WB, 50)

December 7: Javelin sounding rocket launched by NASA from Churchill Research Range reached 500-mi (805-km) altitude in GSFC-Southwest Center for Advanced Studies experiment to study "ionosphere-protonosphere transition region at L values beyond the plasma pause." Rocket and instrumentation, including a magnetic mass spectrometer, two Langmuir probes, a magnetometer, and a Lunar Aspect Sensor, performed satisfactorily. (NASA Rpt SRL)

. NASA reported that RAM C-1 spacecraft had met all mission objectives and officially classified the mission a success. Spacecraft was launched Oct. 19 to assess the effectiveness of water addition technique in alleviating spacecraft reentry blackout. Effects of water injection in reducing RF attenuation and blackout were observed during 50% of total VHF blackout period (approximately two thirds of

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total water-addition time). During last one third of water injection period, no signal recovery was observed. NASA concluded that water addition was effective in reducing attenuation of the X-band signal down to 130,000-ft altitude and that reentry communications problem could be significantly reduced by utilization of higher transmission frequencies. (NASA Proj Off)

. NASA established Aerospace Safety Advisory Panel to review safety studies and operations plans; report on them to the NASA Administrator and advise him of any hazards in facilities and proposed operations; and perform other duties. Panel, consisting of a chairman, vice chairman, and seven other members, would review, evaluate, and advise on all elements of NASA's safety program. (NMI-1156.14)

. GSFC scientist Dr. Norman F. Ness reported new findings on moon's nature and environment. Findings, based on data obtained from Explorer XXXV in lunar orbit, indicated that: (1) no supersonic shock front preceded moon to impede flow of solar wind toward the lunar surface; (2) a sizable empty cavity or solar wind void existed behind the moon away from the sun; (3) moon had practically no magnetic field, and therefore no complex magnetosphere, surrounding radiation belts, or lunar ionosphere; and (4) moon's average electrical conductivity was low (under 1,800°F). Findings did not appear to create any additional hazards to Apollo manned lunar landing program. Explorer XXXV, launched into lunar orbit from ETR July 22, to study interaction of solar wind with the moon and investigate the lunar environment, was first satellite to orbit the moon without having a midcourse maneuver capability and the only operating satellite currently in lunar orbit. (NASA Release 67-295)

. Four students from UCLA would spend 60 days in simulated space cabin at McDonnell Douglas Corp.'s Santa Monica, Calif., plant in early 1968 under $200,000 NASA contract for research in biotechnology and human factors. Test, which would take place in a closed system using recirculated water and oxygen, would be longest ever attempted with crew subsisting in long-duration flight conditions. Crew members, currently undergoing training for test, would have only radio contact with outside but would be under close observation by medical personnel at all times. (NASA Release 67-296)

. NASA contract activity:
Negotiations were initiated with McDonnell Douglas Corp. on a $21-million contract for Improved Delta launch support services. Contract would cover 20 launchings from WTR and ETR during 21-mo

December 7 (continued)
period beginning Jan. 1, 1968 and would provide for inspection, check-out, and actual launch.

Negotiations were concluded with North American Rockwell Corp. on a $812-million, cost-plus-fixed-fee contract for continuation of Apollo Command and Service Module Program from Dec. 4, 1966, through program completion. Contract covered engineering, design, manufacture, analysis, and testing pertaining to Apollo spacecraft and related equipment, including production of four additional spacecraft through S/C 115A; contained improved plans for quality, reliability, assurance, and safety; and provided for an award fee based on achievement of specified management objectives. (NASA Releases 67-298, 67-299)

. R/A Rawson Bennett II (USN, Ret), former chief of naval research (1955-1961) and head of Project Vanguard, died at his home in Arlington, Va. (W Star, 12/9/67, A23)

December 8: Maj. Robert H. Lawrence, Jr. (USAF), first Negro selected for a mission in the Nation's space program, was killed during routine training flight when his F-104 aircraft crashed on landing at Edwards AFB. Copilot Maj. Harvey J. Royer (USAF), chief of operations at USAF's Aerospace Research Pilot School, was injured. USAF appointed a board of officers to investigate the crash. Selected June 30, to train for DOD's Manned Orbiting Laboratory (MOL) program, Major Lawrence was ninth astronaut--first in DOD astronaut program--to be killed in an accident and fifth to die in an air crash; three others had died in Jan. 27 Apollo fire and one in an automobile accident. Memorial services were conducted at Edwards AFB and in Chicago. (W Post, 12/9/67, A1; AP, NYT, 12/10/67, 44; B Sun, 12/11/67, A15)

. Apollo Command Module (CM) No. 009, launched on a ballistic mission Feb. 25, 1966, and successfully recovered, would be modified by North American Rockwell Corp. and reused in series of dry-land impact tests at MSC. It was first of four previously-used CMs to undergo the tests. (NAR Release NL-15)

. Robert F. Thompson, Assistant Manager of MSC's Apollo Applications Program Office since its establishment in July 1966, was appointed Manager of that program. Post had been vacant since April 1967 when MSC Deputy Director George M. Low, who had been Acting Manager, became Manager of the Apollo Spacecraft Program Office. (MSC Release 67-73; MSC Roundup, 12/22/67, 1)

December 8: Kurt Jung, member of West Germany's Bundestag Defense Committee, said West Germany had allotted $25,000,000 to purchase 220 F-4 Phantom jet aircraft from McDonnell Douglas Co. to replace ill-fated Lockheed F-104G Starfighter aircraft, lost to overuse or crashes. (AP, B Sun, 12/9/67, 1)

December 9: USAF launched an unidentified satellite from Vandenberg AFB using a Thor-Agena D booster. (Aero Tech, 12/18/67, 10)

. International Atomic Energy Agency (IAEA) would conduct first world-wide computerized exchange of nuclear data under $100,000 pilot program, Kathleen Teltsch reported in the New York Times. U.S., U.S.S.R., and EURATOM would supply indexes of new atomic literature, patents, university theses, and conference papers which IAEA would program for a computer. System was expected to store more than 100,000 entries, each including title, author's name, key words in English, and an abstract. (Teltsch, NYT, 12/11/67, 27)

December 10: Aerobee 150 sounding rocket was launched by NASA from WSMR, carrying ARC payload to 99.2-mi (159.5-km) altitude to verify performance of SPARCS (Solar Pointing Aerobee Rocket Control System) and map the flight path magnetic field. Rocket and instrumentation performed satisfactorily. (NASA Rpt SRL)

. AEC successfully detonated a nuclear explosion 4,240 ft underground in Farmington, N.Mex., creating a 160-ft-dia cavity. No radioactivity was released. The $4.7-million, 26-kiloton Project Gasbuggy explosion, first commercial nuclear explosion in Plowshare program for peaceful uses of atomic energy, was an attempt to unlock natural gas deposits trapped in rock formation too dense to be tapped by normal drilling methods. Analyses would be conducted for several months to analyze gas flow, determine reasons for any increases in potential production, and check for presence of radioactivity in gas. Test was sponsored jointly by AEC, El Paso Natural Gas Co., and Bureau of Mines. (AEC Release K-281; WSJ, 12/11/67, A1, A2; Smith, NYT, 12/11/67, 1)

. JPL scientists Dr. Dimiter I. Tchernev and Dr. George W. Lewicki had developed recording method which used pulsed laser beam to record magnetic spots (bits) on thin magnetic film, retaining several hundred times more data psi of film than was generally stored on present magnetic film or tape. Success of new process might permit storage of data for 500 photos onboard interplanetary spacecraft on a one inch square strip of film; retention of 10 million bits of scientific data psi of film by onboard computers; and substantial reduction in computer size. Project was being funded by NASA at rate of $175,000 a year. (JPL Release 463)

December 10: Boeing Co. President William M. Allen received Los Angeles Chamber of Commerce's 1967 Kitty Hawk Memorial Award for distinguished civilian achievement in aviation. Award for distinguished achievement in military aviation was presented to Air Force Academy Commandant Col. Robin Olds. (Av Wk, 12/25/67, 68; Boeing PIO)

December 11: NASA Deputy Administrator Dr. Robert C. Seamans, Jr., testifying before the House Committee on Merchant Marine and Fisheries' Subcommittee on Oceanography, summarized NASA's activities connected with national marine science program. NASA's activities, which were primarily exploratory, were aimed at ascertaining what potential benefits could be gained in oceanography through the application of space techniques and equipment, he said. Major areas included: (1) investigation of the applicability of existing space technology to problems of oceanography; (2) studies of remote sensing of oceanographic phenomena, including analysis of data obtainable from space missions not originally conceived for oceanographic purposes such as Gemini, Tiros, and Nimbus photos; and (3) development and test of remote sensors for viewing and discrimination of oceanographic phenomena.

Spacecraft, Dr. Seamans said, "will not supplant surface, subsurface, and airborne research and monitoring systems; rather they will supplement them. The absolute accuracy, three dimensional capability, and selective resolution of these conventional systems will continue to be necessary and must be utilized as a part of the overall system to their best advantage. However, Earth-orbiting spacecraft have unique advantages for obtaining certain types of marine data as follows: repetitive world-wide coverage, greater frequency of observation (once or twice daily for polar orbiting satellites and continuous for geostationary satellites), ability to observe remote areas at will, and an 'all-weather' capability for certain parameters." (Testimony; SBD, 12/20/67, 257)

. Model No. 001 of delta-wing Anglo-French Corcorde supersonic aircraft was publicly displayed in Toulouse, France. The 132-passenger, 1,450-mph aluminum aircraft was scheduled to make its first flight Feb. 28 and enter commercial service in 1971--three years earlier than 277-passenger, 1,800-mph U.S. SST. U.S. airlines accounted for more than half of the 74 orders already placed. (Garrison, NYT, 12/12/67, 1; B Sun, 12/12/67, 1; NYT, 12/24/67, D33)

. Boeing Co. revealed details of design proposals for Airborne Warning and Control System (AWACS) being evaluated by USAF. Proposed designs, result of a one-year study conducted by Boeing, used a Boeing 707 jet aircraft to house extensive radar and communications equipment for dual-purpose capability in air defense and as a tactical

December 11 (continued)

flying command post. Main radar antenna was housed in a 30-ft-dia rotodome on top of aircraft's vertical stabilizer to assure excellent radar performance and minimize reduction of aircraft performance. (Boeing Release S-9051)

. "Our national security depends upon progress in science and technology as much as or more than any other aspect of our national strength," Dr. Alexander H. Flax, Assistant Secretary of the Air Force for Research and Development said at Univ. of Tennessee Space Institute in Tullahoma. "The Federal budget for research and development test and evaluation [RTD&E] has experienced a steady and phenomenal growth over the past twenty-five years...from 7/10s percent in 1941 to almost 3% in 1965. Most recently, we have been through a period of highly accelerated growth in which the initiation of a massive space program added to a rising curve of cost for development, and acquisition of ballistic missiles resulted in RDT&E growth rates...of 20% per year.... This trend, if it were to continue from the level of '66 for ten years, would result in a Federal RDT&E budget almost as large as the total budget of today by that time." (NASA LAR VI/129)

. Philadelphia Inquirer editorial on Dec. 8 death of Maj. Robert H. Lawrence, Jr., (USAF): "[His death] deprives the Nation of another highly trained scientist who had been selected for future service in space....

"With the toll of astronauts now at nine victims, it is significant that not one has been lost in space itself.... Our astronauts are not only men who have extensive educational qualifications but who have equally extensive experience as test pilots and similar extremely hazardous activities....

"They may put their lives on the line willingly, but the Nation should strive to safeguard them as much in their non-space activities as...in space." (P Inq, 12/11/67, 10)

December 11-14: Some 100 representatives of Government and industry attended Orbital Workshop design meeting at MSFC to discuss structures, mechanical systems, propulsion, instrumentation, communications, crew station, and electrical systems. A five-day Orbital Workship mockup review would be held in late January 1968 with a McDonnell Douglas Corp. mockup containing most recent design concepts on display. (NASA Release 67-239)

December 12: Two sounding rockets were launched from NASA Wallops Station. Nike-Apache carried Univ. of Colorado experiment to 60-mi (96.4-km) altitude to obtain a vertical profile of the density of nitric oxide in 47-75-mi (75-120-km) -altitude region with a scanning UV monochromator. Payload was first to utilize Tomahawk clamshell nose cone. Instruments performed satisfactorily, but late ignition of rocket's 2nd stage caused 12-mi (20-km) loss in apogee. Nike-Cajun carrying GSFC-instrumented payload used grenade-explosion technique to measure temperature, pressure, density, and wind in 22-59-mi (35-95-km) -altitude region in coordination with nitric oxide experiment. Rocket performed satisfactorily, reaching 68-mi (109.6-km) altitude. The near-simultaneous launches were intended to permit analysis of theory relating nitric oxide concentration to temperature and absorption of radio energy. (NASA Rpt SRL)

. President Johnson, on tour of Michoud Assembly Facility, reaffirmed support for U.S. space leadership. "Ten years ago, we could put scarcely 100 pounds into orbit about the earth. Today we can orbit 285,000 pounds. That is progress. That is something we are proud of...[and] something we are doing together.

"In the 9 years since I first introduced in the...Senate the Aeronautics and Space Act of 1958, we have seen the power of our rocket engines increase 50 times--from 150,000 to 7,500,000 pounds of thrust in the engines that you build here.

"Not long ago we had to stand by and watch other countries accomplish what we could not accomplish. I will never forget the days of Sputnik 1 and Sputnik 2, and the real concern....

"We were the most scientifically advanced nation on the face of the earth but we did not launch man's first earth satellite.

"We were backward because we did not choose to adventure. We did not choose to have vision. We did not choose to look forward. Now let us remember that our future achievements--or our future failures--will depend on how far ahead we choose to look and how far ahead we choose to think.

"If we think second, and if we look third, then we are going to wind up not being first.

"...we will advance in space to the extent that our people and their representatives are prepared for us to advance and are prepared to pay the cost of that advance. We may not always proceed at the pace we desire. I regret...that there have been reductions and there will be more. There have been interruptions, and I hope that we have had all we can take. But I do have faith and confidence in the American people.

"We will not surrender our station. We will not abandon our dream. We will never evacuate the frontiers of space to any other nation." (SBD, 12/13/67, 218; PD, 12/18/67, 1696-7)

December 12: USAF awarded Martin Marietta Corp. a $4,392,994 increment to a previously awarded contract for design, development, fabrication, and delivery of Titan III boosters. (DOD Release 1169-67)

December 13: NASA's Pioneer VIII (Pioneer C), third 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 Thor-Delta booster into orbit around the sun. Orbital parameters: aphelion, 1.0080 astronomical units (au) or 101.2 million mi (162.8 million km); perihelion, .9892 au or 91.5 million mi (147.2 million km); period, 386.6 days; and inclination, .057°. Primary mission objective of the 145-lb, drum-shaped satellite was to collect scientific data relative to interplanetary phenomena including magnetic field, plasma, and cosmic ray measurements for two or more passages of solar activity. As secondary mission Pioneer VIII would: (1) investigate continuously characteristics of the magetosheath, investigate the geomagnetospheric tail, and acquire data when a highly-significant solar event occured; (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 relations; and (4) provide target for checkout and training of MSFN equipment and operations personnel by launching a Test and Training Satellite (TTS) as secondary payload. The 40-lb TTS-1, carried pickaback on 2nd stage, was successfully ejected after 3rd-stage burnout, and entered orbit with 303-mi (488-km) apogee; 187-mi (301-km) perigee; 92-min period; and 33° inclination. Pioneer VIII separation, boom deployment, and initial solar orientation occurred as planned; all seven experiments--including an interplanetary dust detector and a radio propagation experiment--functioned satisfactorily; and on Dec. 15 spacecraft successfully completed maneuver which orientated the spin axis perpendicular to ecliptic plane.

Pioneer VI (launched Dec. 16, 1965) and Pioneer VII (launched Aug. 17, 1966) were currently 144 million mi and 68 million mi, respectively, from earth and were still returning excellent data. Pioneer program was managed by ARC under OSSA direction. (NASA Releases 67-293, 67-310; NASA Proj Off; W Post, 12/14/67, A17; AP, B Sun, 12/14/67, 1)

. Dr. John S. Foster, Jr., Director of Defense Research and Engineering, discussed importance of defense R&D and problem of choosing among new technological developments available. Speaking before the Dallas Chapter of the Assn. of the U.S. Army and the Dallas Council on World Affairs, he noted that over 80% of all the scientists and engineers who had ever lived were alive today; scientific and technical manpower had increased 400%, compared to 50% for labor force; and 1/3 of all U.S. R&D supported national defense. Current defense R&D funding was $8 billion.

December 13 (continued)

Discussing problem of selecting proposed projects, he described a new tool and procedure called the Development Concept Paper--"a short, single document...[which] requires that...parties agree to a common document that states the issues, the assumptions, the alternative courses of action available, the pros and cons for each." With this type of presentation, he said, the Secretary of Defense could more easily and more objectively decide whether to approve or reject a project, and if approved, the paper could be transmitted to project's implementors as a guide. This new tool, he indicated, would be used in future to avoid repetition of past inappropriate decisions in which precious resources were wasted, such as air-launched Skybolt missile and B-70 aircraft which proved too vulnerable after $2 billion had been spent on their development; and C5-A subsonic transport aircraft, currently being produced for operation in 1969, whose production had been delayed since late 1950's pending development of a system to utilize it. From such cases, Dr. Foster noted, "we have repeatedly learned that money is not enough. That enthusiasm is not enough. That technical innovation is not enough. We need critical analysis of purposes, missions, threats, and requirements. We also need realistic tested advanced alternatives produced by our investment in research. And to gain wise management decisions, we must join these together in constructive confrontation." (Text)

. U.S.S.R. and Communist bloc countries--including Bulgaria, Hungary, East Germany, Mongolia, Poland, Romania, and Czechoslovakia--had agreed to conduct "a program of joint launchings of sputniks and rockets," Evert Clark reported in the New York Times. Yugoslavia had declined admission to the group, choosing instead to join INTELSAT. U.S.S.R. reportedly had constructed or would construct tracking stations in Cuba, U.A.R., Mali, and "some other countries of Asia and Africa." Since U.S.S.R.'s land mass stretched over 2/3 of earth's circumference, U.S.S.R. had less need for tracking stations in other countries than U.S., and assigned little or no responsibility to nation where station was located. NASA, however, had bilateral agreements with more than 70 nations covering joint activities from student exchanges to satellite launches. ' (Clark, NYT, 12/14/67, 26C)

December 14: NASA's Surveyor V spacecraft, resting on the moon, responded to turn-on commands from Goldstone, Calif. station at beginning of its fourth lunar day. Spacecraft had operated during its second lunar day but had failed to respond during third. Battery was still functioning, and camera and alpha-scattering instrument were responding to commands. (NASA Proj Off; W News, 12/15/67, 5)

December 14: NASA's OSO IV, launched from ETR Oct. 18, had achieved its primary and secondary objectives and was continuing to operate satisfactorily. Although anomalies occurred in some of the nine experiments, and three were turned off, all of the pointed experiments had operated as planned for more than one solar rotation, and the wheel experiments had obtained useful data. (NASA Proj Off)

. Surveyor VI briefing was held at NASA Hq.

Dr. Leonard D. Jaffe, JPL Surveyor Project Scientist, said Surveyor VI had discovered or confirmed that: (1) lunar maria were covered primarily with very fine, .001-in-dia particles but also with "some coarse particles and rocks up to a yard across"; (2) particles stuck together weakly and were not suspended above lunar surface; (3) radar return was from surface and not from subsurface layer; (4) strength of lunar maria was three to eight pounds psi at one- to two-inch depth; (5) composition of rock was basic and basaltic with very little meteoritic iron on the surface; (6) surface was extremely uniform; and (7) particles were cohesive and adhesive, but there was "no need for concern" about manned spacecraft's sinking or being covered by sticky soil in maria sites investigated.

Simultaneous operation of Surveyors V and VI would permit measurement of moon's "wobble" or physical libration by obtaining spacecraft's range and range rate, Dr. John A. O'Keefe, Assistant Chief of GSFC's Laboratory for Theoretical Studies, explained. "The moon has a sort of a nose [Sinus Medii, landing site of Surveyor VI] that sticks out in front. The earth's gravity takes hold of that nose and wiggles it... back and forth as the earth slightly moves either way." Although scientists had a fairly good idea of the size of the "nose" and how firmly earth could grab it, they did not know how the moon would respond to the pull, he said. Response depended on whether lunar mass was concentrated toward the center, in which case it would yield easily, or toward the outside, in which case moon's inertia would be much stronger. Dr. O'Keefe also showed Surveyor VI photos of lunar surface lit by sunshine. In one, corona was traceable out to a distance of 30 solar radii from the sun--furthest ever traced. Another revealed persistence of a line of light after the instant of true sunset. Line, which had appeared less clearly in previous Surveyor photos, he said, could be explained either as a layer of .001-in-thick particles or as lunar material floating a short distance from surface because of electrostatic charges.

Surveyor VI mission represented "the completion of two major milestones of lunar surface exploration--namely, the investigation and certification of four prime candidates for future manned landings and the scientific evaluation of four...widely separated regions in the moon's equatorial belts," Surveyor Program Manager Benjamin Milwitzky

December 14 (continued)
asserted. To maximize the scientific value of the last Surveyor mission in the series, NASA had established a group of scientists to study and recommend possible landing sites for Surveyor G. As a result of group's recommendations, NASA had selected Tycho crater, south of the equator, as primary target, and Frau Mauro, north of the equator, as an alternate. Highland Tycho area was "risky as a landing site," he said, because it was covered by ridges, grooves, and rocks, but it would provide scientific data for comparison with data from previous lowland maria landing sites. Surveyor G, scheduled for launch Jan. 7, 1968, would be equipped with surface sampler, TV cameras, alpha-scattering instrument, and minor payload items such as magnets on footpads and surface sampler scoop and special mirrors. (Transcript; Reistrup, W Post, 12/15/67, A20; W Star, 12/15/67, A7)

. Stanford Univ. School of Medicine biochemists Drs. Arthur Kornberg and Merhven Goulian successfully synthesized a simple, biologically-active form of DNA (deoxyribonucleic acid) from inert materials. The man-made DNA virus--a basic molecule of life--was capable of reproducing itself and generating new viruses. Discovery could eventually make it possible to create artificial viruses that could attack diseases such as cancer and leukemia; modify genes and produce specific biological change; and cure hereditary defects such as diabetes, hemophilia, and mental retardation.

President Johnson, speaking at Smithsonian Institution ceremony marking 200th anniversary of Encyclopedia Britannica. cited creation of active DNA as "a spectacular breakthrough in human knowledge.... These men have unlocked a fundamental secret of life. It opens a wide door to new discoveries in fighting disease and building much healthier human beings." (W Post, 12/15/67, A10; Randal, W Star, 12/15/67, 1; O'Toole, W Post, 12/15/67, A1; PD, 12/18/67, 1712-5)

. Three Soviet scientists confined in a small chamber for 70 days suffered hallucinations and "psychological changes," Tass announced. Scientists, who subsisted on "dehydrated meat, cottage cheese, various tinned food and concentrates," lost weight, and their muscle tone deteroriated despite daily exercise on a bicycle stand. All three recovered. (W Post, 12/15/67, A20; SBD, 12/15/67, 236)

December 15: NERVA (Nuclear Engine for Rocket Vehicle Application) reactor (NRX-A6) was successfully ground-tested by NASA and AEC at Jackass Flats, Nev., achieving major goal of one-hour duration for nuclear rocket technology program and demonstrating that rocket reactors could be operated for periods of time longer than those

December 15 (continued)

required for most space missions. Test, in which reactor operated for 60 min at 1,100-mw design power, was sixth in series to obtain additional data on reactor characteristics under extended operation duration in joint NASA-AEC Rover program. (AEC Release K-285; Aero Tech, 1/1/68, 13)

. U.S.S.R. announced successful completion of rocket tests in second Pacific area near Midway Island to test equipment for spacecraft landings at sea. Tests in other area had been completed Dec. 13. Series, which began Nov. 28, had been scheduled to last until Dec. 30. (UPI, NYT, 12/14/67, 16; SBD, 12/18/67, 246)

. Univ. of Iowa professor Dr. James A. Van Allen, writing in Science, warned against "abandoning in situ study of the planets to the Soviet Union." Citing important contributions made by unmanned planetary probes, he noted that intelligible telemetry signals had been received from Mariner IV from ranges as great as 320 million km and that the spacecraft was still operating properly 36 mo after launch. Entire Mariner V mission, he said, "was conducted with such precision and competence as to draw cheers from even the most hardened professionals." Although successful Mariner missions had been accomplished at a cost of less than 2% of NASA budget, Congress had failed to provide for preparatory work for any specific planetary mission beyond Mariner Mars '69, he said. "Even more devastating is the reluctance of NASA to forcefully request adequate funding for such work...despite the existence of well-conceived programs of great scientific potential.... The basic technology is available, and a rich diversity of feasible experiments has been proposed...." Despite evidence that U.S.S.R.'s planetary exploration plans were both ambitious and increasingly competent, he said, U.S. "is now allowing its own high competency in planetary exploration to decay...." (Science, 12/15/67)

The New York Times later commented: "Professor Van Allen is entirely right in his complaint...that [U.S.] is spending a ridiculously small sum...on planetary exploration by unmanned rockets.

"...the cost-effectiveness in scientific terms of the nation's planetary program is far greater than that of the Apollo program for a manned flight to the moon, the nearly bottomless well into which the vast majority of NASA's funds are now going. The existing allocation of funds is scientifically irrational, explicable principally in terms of the propaganda and public relations returns envisaged from 'winning' the moon race." (NYT, 12/19/67, 46)

December 16: Cosmos CXCV was successfully launched by U.S.S.R. Orbital parameters: apogee, 375 km (233 mi); perigee 211 km (131 mi); period, 90.1 min; and inclination, 65.7°. Spacecraft reentered Dec. 23. (GSFC SSR, 12/30/68; SBD, 12/19/67, 251)

. U.N. Committee on the Peaceful Uses of Outer Space approved space rescue treaty proposed by U.S. and U.S.S.R. Draft was submitted to General Assembly for final approval [see Dec. 19]. (NYT, 12/17/-67, 1)

December 17: First flight of USAF RF-111A reconnaissance aircraft was successfully conducted at Fort Worth, Tex. Reconnaissance equipment and flight-test instruments were checked out during three-hour flight. RF-111A was fourth F-111 model to be flight tested; other versions--F-111A tactical fighter, FB-111A strategic bomber, and USN's F-111B--had logged more than 6,500 flying hrs. Of 1,016 supersonic flights made by F-111 models, 213 had exceeded mach 2. (AFSC Release 210.67; DOD Release 1182-67)

. 64th anniversary of first powered flights by Orville and Wilbur Wright from Kitty Hawk, N.C. Proclamation issued by President Johnson to commerate their achievements cited "...their inventive genius [which] revolutionized transportation, and gave rise to great new industries that have strengthened America's defense and economy."

Igor I. Sikorsky, consulting engineer at United Aircraft Corp's Sikorsky Aircraft Div., received the Wright Brothers Memorial Trophy at Aero Club's annual Wright Brothers Memorial Dinner in Washington, D.C. (NAA Release)

. Walter Sullivan, writing in the New York Times, listed proposed projects to use atomic explosions for commercial applications which were being considered by AEC. Project Sloop, a 20-kiloton, $13,175,-000 explosion at 1,200-ft depth, would shatter a large body of copper ore in southeastern Arizona. Highly diluted acid would then be pumped into the broken rock to convert the copper into a soluble compound which could be pumped out. Project Bronco would shatter a northeastern Colorado shale oil deposit beyond reach of conventional extraction methods. Heat from the blast would liquify the oil so that it would flow into the central cavity for extraction. Projects Dragon Trail and Ruleson would use nuclear explosion to carve a huge gas storage area beneath a Renovo, Pa., site. Other proposals included use of explosions to break through impermeable rock formations in Arizona so that rain water could sink in and be stored underground and to dig canals, harbors, and mountain passes. According to AEC price list, charge for 10-kiloton explosion would be $350,000 and for

December 17 (continued)
a two-megaton explosion, $600,000, excluding charges for safety studies, site preparation, transportation and emplacement of the devices, and support services. (Sullivan, NYT, 12/12/67, E7; Plowshare)

December 18: USNS Mercury, third Apollo insertion-injection tracking ship, left General Dynamics Corp.'s Quincy, Mass., shipyard after successfully completing final contractor instrumentation systems tests. Ship docked in Hoboken, N.J., where it would undergo inspection and instrumentation adjustments prior to range testing and final preparations in Florida for Apollo 503 mission. Mercury, her two sister ships Vanguard and Redstone, and reentry ships Huntsville and Watertown were part of National Range Instrumentation Ship pool. They would be equipped with special antennas for communications between Apollo astronauts and mission control via Atlantic and Pacific satellites. For Apollo missions they would be operated as part of GSFC-operated MSFN which supported Apollo with tracking, command, and voice and telemetry communications via land lines, microwave, submarine cable, and comsats. Operation of Apollo ships was assigned to WTR; crew was provided by Military Sea Transport Service, and technical instrumentation crew by USAF. (NASA Release 67-305)

. Rep. William F. Ryan (D-N.Y.) charged that the House Committee on Science and Astronautics and the Senate Committee on Aeronautical and Space Sciences had defaulted on their responsibility to report to the American public about the Congressional hearings which had been held on the Jan. 27 Apollo accident. In a statement inserted in the Congressional Record, Rep. Ryan said that since Congress seemed reluctant "to face some unpleasant truths and to ask some hard questions that need to be asked," he had prepared his own report based on the hearings and on the hundreds of letters, documents, and personal commentaries he had received. Much of this correspondence, he said, which cited deficiencies and negligence which were both intentionally ignored and unintentionally overlooked, was made in confidence for fear of reprisals by NASA or NASA-contractor employers.

Rep. Ryan concluded that Congress overfunded and underexamined the validity of major technological programs and the success and integrity of their administration. Having an excellent space program, he said, "is essential both to our pride and to our progress...[but] it is essential as well that we throw off the shackles of the space race and declare our intention to make rational plans designed to meet the needs of America not distorted by the conceptions and value judgments of another nations. It is essential that we examine our national priorities with the utmost care and make certain that

December 18 (continued)

the space program is neither made a handy villain by its critics nor a handy saviour by its spokesmen. We must establish reliability and make a sober and objective appraisal of the space program's role in our society." Congress, he asserted, ought to: (1) demand that NASA adopt new standards of candor, present regular status reports, and clarify its budget presentations, and that a panel of independent experts be created to provide objective technical evaluation of NASA management and planning procedures; (2) relinquish romanticism and evaluate each program in terms of specific objectives and social value; (3) revise its attitudes about hearings on the space program, being sure to call both friendly and hostile witnesses; and (4) establish a realistic view so that the space program could be assigned its proper place in national priorities and receive whatever funds necessary. (CR, 12/18/67, A6320-9; Ryan's Off)

. ELDO Technical Director Dr. W. H. Stephens announced that ELDO would develop Europa III following development of Europa II [see Aug. 28]. Europa III booster would have Europa I 1st stage (Blue Streak) and liquid hydrogen-oxygen 2nd stage with two 14,000-lb-thrust rocket engines. Configuration would be able to boost 6,000-lb payload into low earth orbit. Using high-energy 3rd stage, new launch vehicle would be able to place 1,200 lbs into synchronous orbit; adding two strap-on solid rocket motors rated at 420,000 lbs thrust each, launch vehicle could place 4,000 lbs into synchronous orbit.

Low thrust, very high specific impulse systems were being considered, Stephens said, for use in transferring payloads from low to high orbits, and for accelerating to escape speeds. Using Dragon reactor technology, a small reactor could also be employed in such a system. (Space Pro, 12/18/67, 150)

. Several Latin American nations, including Argentina, Brazil, and Mexico, were interested in making extensive use of Kourou space research base, French Guiana, [see Sept. 20] according to Centre National d'Etudes Spatiales (CNES) sources. New equatorial range would be fully operational in 1969, with first segment handling sounding rocket firings early in 1968. Initial plans for Kourou facility had included three launch pads, but CNES was already making plans to expand the facility. One new pad would handle Scout and Thor-Able vehicles, subject to agreement with U.S. (Space Pro, 12/18/67, 150)

. Paul E. Cotton, Director of Management Operations, OMSF, was appointed director of OART's Programs and Resources Div. Cotton would replace William E. Hanna, Jr., who had been named Director of the Bureau of Data Processing and Accounts in the Social Security Administration. (NASA Release 67-304)

December 18: New York Times editorial on space rescue treaty approved by U.N. Committee on the Peaceful Uses of Outer Space Dec. 16: "[Treaty]...is a substantial advance, but what must remain worrisome is the attitude toward such mishaps that will be shown [by] countries refusing to approve the pact. The largest of the abstainers, of course, is likely to be China.

"Even without this gap, the treaty has limitations. The suspicious will note that...the launching nation has no right to join in the search until and unless requested to do so by the authorities governing the area where the ship has landed. Nor does the treaty define with precision how long the latter authorities may hold a space vehicle and its crew before returning them...[or specify] payment for damages caused by errant spacecraft.

"The important fact, however, is not that the rescue treaty has deficiencies. Most treaties do. Far more significant is the demonstration it has provided of intimate and fruitful Soviet-American cooperation for achievement of a common end...." (NYT, 12/18/67)

December 19: U.S.S.R. launched Cosmos CXCVI into orbit with 887-km (551-mi) apogee; 225-km (140-mi) perigee; 95.5-min period; and 45° inclination. Equipment and instruments performed satisfactorily. (AP, NYT, 12/20/67, 35; SBD, 12/20/67, 258; GSFC SSR, 12/30/67)

. Uprated Saturn I (SA-211) 1st stage was successfully static-fired for 35 sec at MSFC by Chrysler Corp. personnel. Stage would be shipped to Michoud Assembly Facility for post-firing checkout after completion of a 145-sec, full-duration captive firing. (MSFC Release 67-243)

. JPL scientists continued efforts to reestablish contact with Surveyors V and VI resting on the moon. Surveyor V (launched Sept. 8) had responded immediately to turn-on commands during its fourth lunar day Dec. 14 and later transmitted 67 recognizable 200-line pictures. Following unsuccessful attempts to reposition the Antenna/Solar Panel Positioner on Dec. 16, transponder signals were lost, and complete loss of signal occurred. Surveyor VI (launched Nov. 7) had also responded to turn-on commands Dec. 14, but telemetry lock-up was poor and erratic signals were lost completely after 2½ hrs. Attempts to reactivate both spacecraft for simultaneous communications and additional data would continue until end of lunar day Dec. 22. (NASA Proj Off; AP, NYT, 12/20/67, 29)

. USA-USAF-USN X-22A V/STOL research aircraft designed and built by Bell Aerosystems Co. under USN contract completed its 100th successful test flight at Niagara Falls (N.Y.) International Airport. The four-engine, dual-tandem, ducted-propeller aircraft had made 239

December 19 (continued)
vertical and 100 short takeoffs and 245 vertical and 94 short landings. During 40.9 hrs of actual flying time 54 vertical/horizontal transitions had been conducted. Present aircraft was second of two models in X-22A program; first model crashed Aug. 8, 1966 after completing 15 flights. Second model would be tested through 1968 and would then be delivered to a tri-service group at Patuxent (Md.) Naval Air Test Center for further evaluation. (Bell Release 92; NYT, 12/25/67, 42)

. In its final 1967 session U.N. General Assembly unanimously endorsed new space rescue treaty and urged signature by all countries. Primary provisions: (1) immediate notification when astronauts landed in other countries; (2) assistance to these astronauts, including rescue efforts on the high seas; (3) safe and prompt return of the astronauts; and (4) notification and return of objects launched into outer space. Treaty would be open to all nations and would become effective when ratified by U.S., U.S.S.R., U.K., and two other countries.

President Johnson, praising the agreement, said: "I hope that this agreement will help to ensure that nations will assist astronauts in the event of accidents or emergency. The agreement would carry forward the purpose of this administration to promote international cooperation in the peaceful uses of outer space." (Teltsch, NYT, 12/17/67, 1; Estabrook, W Post, 12/20/67, A20; UPI, NYT, 12/21/67, 29; SBD, 12/21/67, 263; PD, 1/1/68, 1763)

. NASA announced establishment of Apollo Lunar Exploration Office within OMSF to increase effectiveness of directing Apollo lunar exploration and planning for post-Apollo lunar exploration. New office, headed by former Lunar Orbiter Manager Lee R. Scherer under general direction of Apollo Program Director M/G Samuel C. Phillips (USAF), would consist of Flight Systems Development and Lunar Science divisions. It would be responsible to OSSA for scientific aspects of Apollo lunar exploration; OSSA would review operating plans, science SR&T tasks, mission objectives and plans, and scientific payloads and principal investigators for specific missions. (NASA Ann, 12/19/67)

. NASA was negotiating with McDonnell Douglas Corp. on a $10-million, fixed-price-incentive contract for 10 improved 2nd stages for the Delta launch vehicle. Procurement for new stages would include modified versions, larger in diameter than original Delta, to be mated to new elongated Thor 1st stages which would be incorporated in the Delta configuration beginning in 1968. (NASA Release 67-306)

December 20: France's first variable-sweep-wing jet aircraft, the Mirage G, flew 1,500 mph in public debut at Istres, France, military airport. Dassault-built aircraft was world's fourth variable-sweep-wing model and first built in Western Europe; others were American F-111, and Soviet Sukhoi and Mikoyan. (W Post, 12/21/67, A31)

. United Aircraft Corp. turbotrain, powered by gas turbine engine similar to those used in jet aircraft, reached 170 mph during test run in New Jersey, setting new speed record for passenger train in U.S. Train, designed for future passenger service between Boston and New York City, would be operated by New Haven Railroad under DOT contract. (W Post, 12/21/67, A7)

. NASA and Italian Space Commission (ISC) agreed to jointly launch Italy's third San Marco satellite (San Marco C) from mobile launcher in Indian Ocean off the coast of Kenya, Africa. Spacecraft would measure air density by continuously monitoring spacecraft's drag forces; investigate ionospheric characteristics which interfered with long-range radio transmissions; and conduct other upper-atmosphere experiments in 1969 and 1970. San Marco Project, provided for under May 31, 1962 cooperative agreement, was a mutual program of NASA and ISC with no exchange of funds. NASA supplied launch vehicle and provided personnel training and tracking and data acquisition services. ISC was responsible for design, fabrication, and testing of payload and for launching of satellite built by Centro Ricerche Aerospaziali (CRA) of the Univ. of Rome. San Marco I was launched December 14, 1964, and San Marco II, April 26, 1967. (NASA Release 67-303; A&A 67)

. NASA Thesaurus (SP-7030) was published by NASA to provide a standardized list of terms for indexing and retrieving documents in the NASA scientific and technical information system. The three-volume set, containing approximately 15,000 indexing terms and scope notes, subject categories, and a cross reference for each term, would be available through Superintendent of Documents, GPO. (NASA Release 67-308)

. New reconnaissance camera system for use in Vietnam on RF-4C aircraft was undergoing tests at Wright-Patterson AFB, Ohio, to determine camera's operating capability and devise techniques to enhance low-altitude aerial photography capability. Developed by AFSC's Aeronautical Div., fully automated camera could take six black and white or color pictures per second during daytime or nighttime reconnaissance and could provide stereo coverage at extremely low altitudes and supersonic speeds. (AFSC Release 192.67)

December 20: NASA announced appointment of Bob P. Helgeson, Deputy Manager of AEC's Hanford Project in Richland, Wash., as NASA Director of Safety. He would report to Associate Administrator for Organization Harold B. Finger and would be responsible for "developing and implementing safety programs throughout NASA...[with] broad authority over all safety activities, including those involving manned and unmanned flights in aeronautics and space, and ground and test research operations." Helgeson would replace George D. McCauley, who retired. (NASA Release 67-307; UPI, W Post, 12/21/67, A2)

. Ben W. Hersey, Chief of KSC's Personnel Office, announced that more than 200 additional permanent employees would be hired for KSC's Civil Service staff by July 1968. First consideration would be given to personnel at MSFC and other NASA centers where personnel reductions had occurred. (KSC Release 443-67)

. Secretary of Interior Stewart L. Udall had invited a number of distinguished U.S. scientists to serve on an advisory committee to evaluate how widespread sonic booms expected from SST might destroy the national resource of tranquility, David Hoffman reported in the Washington Post. Discussions would include effect of sonic boom on wildlife, national parks, and Indian adobe structures in the Southwest. (Hoffman, W Post, 12/20/-67, A1)

December 21: USAF launched an experimental reentry vehicle by Atlas-F booster from Vandenberg AFB as part of Advanced Ballistic Reentry Systems (ABRES) program. (Aero Tech, 1/1/68, 13)

. Communications with NASA's Mariner IV Mars probe, launched Nov. 28, 1964, were terminated because of greatly reduced telemetry availability. Spacecraft had responded to series of commands Oct. 25-27 and had continued operating satisfactorily until it exhausted its gas supply Dec. 7 and began to pitch, roll, and yaw. On Dec. 10 and 11 Mariner IV recorded 83 micrometeoroid hits which apparently induced severe perturbations in pitch and yaw causing degraded signal strength. During its 3.06-yr lifetime Mariner IV had traveled more than 1.5 billion mi in heliocentric orbit, taken world's first close-up photos of Mars from 5,500-mi altitude, and returned excellent data. (NASA Proj Off; AP, B Sun, 12/23/67; W Post, 12/23/67, A5)

. FAA proposed that all civil turbojet aircraft be required to carry altitude warning devices to signal pilots visually and aurally when they were approaching or deviating from a preselected altitude. Signals were preset when device was installed and activated at a point within a prescribed band as aircraft approached a preset

December 21 (continued)
altitude. Device was aimed primarily at alerting pilots' sense of altitude awareness, particularly during high-speed climb and descent maneuvers. (FAA Release 67-87)

. Hughes Aircraft Co. had completed negotiations with the government of Brazil on a $3.8-million contract for construction of a comsat earth station at Itaborai, near Rio de Janeiro. Brazilian Telecommunications Co. (EMBRATEL) would spend an additional $1 million or more for site preparation and buildings. Station, which would initially handle TV and 120 two-way telephone conversations via INTELSAT satellites over the Atlantic, would be completed within one year. (Hughes Release; Montgomery, NYT, 12/22/67, 63)

. Aerospace industry sales in 1967 would total $27.3 billion--a 13% increase in 1966 sales--and in 1968 would reach $29.2 billion, Aerospace Industries Assn. (AIA) predicted. Commercial transport aircraft production and DOD procurement had increased significantly in 1967, while NASA sales had declined from $4.9 billion to $4.1 billion. (AIA Release 67-55)

. Existence of a secret three-station system which would have enabled SAC to broadcast final messages to its surviving bomber and missile forces in event of a general nuclear attack on U.S. was revealed by Howard Silber in the Omaha World-Herald. System, operational since July 1963, had completed its mission and was being superseded by newer devices. Located near West Point, Wisner, and Tekamah, Neb., each constantly manned station had consisted of a guard house and three trailer-type vehicles housing launch control equipment, electronics equipment, and a Blue Scout-Junior rocket. The three-stage rockets were to have been launched in sequence so their messages could be sounded at specific prearranged intervals at altitudes of more than 100 mi. (Omaha W-H, 12/21/67, 1; AP, NYT, 12/22/67, 31)

December 22: ERC awarded $99,151 to TRW Systems, Inc., and $99,370 to RCA for research on a satellite system to provide more efficient navigation and air traffic control for aircraft and ships in North Atlantic area in 1975. Both companies would conduct eight-month studies to determine best technical approach, identifying related problems and requirements. (ERC Release 67-47)

. MSFC awarded Mason-Rust Co. a one-year, $8,990,826 contract extension for continued provision of services--including transportation, safety and security, supply, communications, and custodial services--at Michoud Assembly Facility. Extension brought total cost-plus-award-fee contract to $39,073,652. (MSFC Release 67-246)

December 22: U.S. R&D funding in 1968 would total about $26.5 billion, $700 million (3.5%) more than 1967 estimate, Battelle Memorial Institute (BMI) said in its annual forecast. BMI noted that "significantly, for the first time since reliable figures for total research and development expenditures became available, it is estimated that for [CY] 1968 the increase in Federal spending on research in the social sciences will be greater than the increase in the physical sciences." This trend, forecast said, was partly because of reductions in growth of military, space, and atomic energy programs and because of increasing national concern with education, health, urban, employment, and welfare problems. (AP, NYT, 12/23/67, 7; BMI PIO)

. ERC Director James C. Elms announced appointment of Dr. D. M. Warschauer as Chief of ERC's Component Technology Laboratory. Dr. Warschauer had been Manager of Itek Corp.'s Physics Laboratory since 1965. (ERC Release 67-45)

. J. V. Reistrup, in the Washington Post, reported that the Senate Committee on Aeronautical and Space Sciences had prepared a draft report on Apollo accident hearings which would be published in early 1968. The report, which had been revealed as a result of Rep. William Ryan's (D-N.Y.) Dec. 18 criticisms on Congress' failure to produce such a report, was said to be critical of NASA but to have reaffirmed Apollo lunar-landing goal. (Reistrup, W Post, 12/22/67, A1)

. U.S.S.R., reversing its previous policy of ignoring UFO (unidentified flying object) reports, had created a commission to study UFO sightings, Time reported. Commission, headed by Air Force Gen. Anatoli Stolyerov, would consist of 18 scientists and Air Force officers, supported by 1,000 field observers. Flurry of UFO sightings had been reported in recent weeks by presumably reliable Aeroflot and military pilots who usually described them as sickle-shaped. (Time, 12/22/67, 21)

December 24: Communist China exploded her seventh nuclear device at Lop Nor test site in Sinkiang Province. Low yield of test marked reversal of trend since first test Oct. 16, 1964. Yield size had increased progressively, culminating with June 17, 1967 explosion of hydrogen bomb. Test was not announced by Communist Chinese officials, but was detected by AEC. (AEC Release K-289; Finney, NYT, 12/25/67, 1)

. Robert Walker, writing in the New York Times, reviewed new applications for industrial use of gold. In telephone industry, gold was used for coating electromechanical switchgear and for transmitter domes; in computers, for coating metal tapes and electroplating printed circuits; and in automotive industry, for connecting alternator-regulator systems.

December 24 (continued)

To aerospace industry, one of gold's most important characteristics was that it reflected heat and light. Gold was used to coat the "umbilical cord" which connected Astronaut Edward H. White II to Gemini IV spacecraft (June 3, 1965); to cover shrouds that contracted very hot jet aircraft engine parts; and to coat satellites so that they reflected more than 90% of sun's heat. By adding oxides to gold coatings space scientists used the gold to absorb infrared energy which could be converted to electrical energy. (Walker, NYT, 12/24/67, 1F)

December 25: Washington Evening Star editorial on space rescue treaty approved by U.N. Dec. 19: "International cooperation in space has made another advance...'prompted by sentiments of humanity' in an era when manned flights to the moon and beyond will require all countries to be on the alert for possible tragic misadventures.

"There has been some grumbling in the U.N. over the fact that there is as yet no provision in international law for the payment of damages a country might suffer as a result of spatial mishaps--for example, the crashing of a spaceship on a populated area or on some vital economic or military installation. This matter, however, can and will be taken care of in a special treaty that almost certainly will be worked out in the coming year." (W Star, 12/25/67)

December 26: U.S.S.R. successfully launched Cosmos CXCVII. Orbital parameters: apogee, 505 km (314 mi); perigee, 220 km (137 mi); period, 91.5 min; and inclination, 48.5°. (GSFC SSR, 12/30/67; Aero Tech, 1/1/68, 13)

. First flight test of Apollo Lunar Module (LM), designated Apollo 5, was scheduled no earlier than Jan. 17, 1968, NASA announced. The 31,700-lb LM, one of three modules comprising the Apollo spacecraft, was designed to carry two astronauts from lunar orbital flight to a landing on the moon, then back to the Apollo spacecraft in lunar orbit. It would be launched on the 6-hr 30-min test flight by 1.6-million-lb-thrust Uprated Saturn I (AS-204) originally scheduled for first manned Apollo mission in February 1967, and would not be recovered. Primary objective of the unmanned Apollo 5 flight would be verification of LM's flight readiness for manned operations in space. Test would flight qualify LM descent stage propulsion engine, including restart; ascent stage propulsion engine; systems; structures; and staging. (NASA Release 67-313; UPI, NYT, 12/27/67, 15; AP, W Post, 12/27/67, A4)

December 26: In response to FCC inquiry on future communications in Atlantic area--currently served by two comsats and four cables--ComSatCorp President Joseph V. Charyk and AT&T Vice President Richard R. Hough presented their proposals in separate letters to FCC Chairman Rosel H. Hyde. Hough, advocating a fifth underwater cable, said that although AT&T supported the idea of a global comsat system, all of the international carriers believed the cable project was "the right way to add to our capabilities at this time." The best service, he said, could be provided by "a balanced, integrated network of both cables and satellites."

Charyk charged that the cable would not be economically feasible: "...when a new cable is laid to carry traffic that could otherwise be carried at no extra cost by satellite facilities which must be established in any case, the ultimate customer must bear the cable cost as an addition to the already committed costs of service." As traffic was diverted from comsats to a cable, a greater share of satellite revenue requirement would have to be carried by routes not served by the cable, primarily less developed countries with smaller traffic streams. U.S., he said, was committed to develop the INTELSAT system. To assure that U.S. met this commitment, "the advanced [comsat] system must be in operation in the time frame we have proposed for INTELSAT IV. It is essential that a vigorous advanced satellite development program be under way during 1968." (Texts; Smith, NYT, 12/29/67, 43)

December 27: U.S.S.R. launched Cosmos CXCVIII into orbit with 281-km (175-mi) apogee; 265-km (165-mi) perigee; 89.8-min period; and 65.1° inclination. Equipment and instruments performed satisfactorily. (GSFC SSR, 12/30/67)

. NASA's ATS III, launched from ETR Nov. 5, had successfully met its mission objective of operating for 30 days and obtaining useful data from onboard experiments. Resistojet thruster had experienced valve malfunction, but thrust data were still being obtained. Multicolor Spin-Scan Cloud Camera successfully transmitted 123 photos before it was turned off because of an arcing problem. Omega Position Location Experiment was successfully operated in communications tests with aircraft in flight over the Atlantic Ocean, and all other experiments except Self-Contained Navigation System, which was scheduled to be operated in spring 1968, had been successfully operated. (NASA Proj Off)

. Apollo/Saturn V 3rd stage was flown from McDonnell Douglas' Sacramento, Calif., plant to KSC via Super Guppy aircraft. Other stages for third Apollo/Saturn V mission had been transported to KSC by barge. Boeing-built 1st stage, aboard NASA barge Poseidon, and NAR-built 2nd stage, aboard Point Barrow, had reached KSC Dec. 26. IBM instrument unit

December 27 (continued)
would be flown to KSC from IBM's Huntsville, Ala., plant via Super Guppy Dec. 29. Stages would be assembled in KSC's Vehicle Assembly Building (VAB). (KSC Release 445-67; MSFC Release 67-245)

. ComSatCorp awarded J. W. Bateson Co., Dallas, Tex., a $7.9-million contract for construction of a new research laboratory near route 70-S in Montgomery County, Md., 30 mi from ComSatCorp's Washington, D.C., headquarters. Construction would begin immediately. (ComSatCorp Release 67-56; W Post, 12/28/67, F9)

. President Johnson was expected to ask Congress for the smallest civilian space budget in six years for FY 69, Evert Clark reported in the New York Times. According to informed sources, the FY 69 request would probably be close to $4 billion. DOD's space budget request, however, was expected to be higher than record $2-billion requested for FY 68, chiefly because USAF's MOL would require more development funds. (Clark, NYT, 12/28/67, 6)

December 28: NASA Wallops Station awarded Doyle and Russell, Inc., a $1,233,644, fixed-price contract for construction of a new launch complex. Work, to be completed within one year, would include construction of an assembly shop, launch pad and mobile shelter, launch terminal building, liquid fuel storage area, launch control building, and substation enclosure. (WS Release 67-38)

. Soviet scientists had compiled a structural and geological map of the lighted side of the moon to aid in selection of lunar landing sites, Tass announced. (Reuters, W Post, 12/29/67, D6)

December 29: NASA announced personnel changes, effective Jan. 1, 1968. Adm. W. F. Boone (USN, Ret.), Assistant Administrator for Defense Affairs, would retire after five years of service with NASA. He would continue to serve as a part-time consultant. Functions of General Boone's office would be included in new Office of Department of Defense and Interagency Affairs, headed by Gen. Jacob E. Smart (USAF, Ret.). General Smart, Assistant Administrator for Policy, would be replaced by Deputy Associate Administrator for Advanced Research and Technology Dr. Alfred J. Eggers, who would also continue as a Special Assistant to the NASA Administrator on aerospace safety.

NASA Administrator James E. Webb, expressing his appreciation for Admiral Boone's service, praised the "effective cooperation developed between [DOD] and NASA in the...buildup...of large launch vehicles and spacecraft required for a lunar landing and exploration... in large measure due to [his] leadership...." (NASA Release 67-314)

December 29: ERC Director James C. Elms announced appointment of Dr. Richard M. Head, Manager of ERC's Aeronautics Programs Office, as ERC Chief Scientist. In his new position Dr. Head's responsibilities would include research in ERC aeronautics and space programs and on solar flares. (ERC Release 67-44)

. Univ. of Brussels glaciologist Dr. Edgard E. Picciotto was shipping four tons of snow from Plateau Station in Antarctica to Brussels for analyses to determine chemistry and rate of fall of microscopic dust particles from space. Study, supported by NSF, would be conducted in cooperation with Ohio State Univ. and Belgian Atomic Center. Since the Antarctic snow was not contaminated by urban air pollution and never melted, extraterrestrial dust remained lodged as it fell in layers of snow. Plateau Station area, Dr. Piccioto said, was "the only place on earth [where] you can retrieve atmospheric precipitation from before the industrial revolution and the atomic bombs." Ideally, the dust should have been collected in space, but space collection was too expensive and would be contaminated by spacecraft. Dr. Picciotto would extrapolate annual worldwide total from fallout rate at Plateau Station. Preliminary results suggested a 100,000-ton annual worldwide rate. (Reinhold, NYT, 1/9/68, 4)

December 30: Edwin H. Land, President of the Polaroid Corp.; Igor I. Sikorsky, former engineering manager of United Aircraft Corp.'s Sikorsky Aircraft Div.; and George B. Kistiakowsky, Harvard Univ. chemistry professor, were among 12 scientists named by President Johnson to receive the 1967 National Medal of Science. Presentations would be made in early 1968. (PD, 1/6/68, 11)

December 31: AEC Chairman Dr. Glenn T. Seaborg reviewed highlights of AEC's 1967 activity. "Outstanding...was the trend by electric utilities to go nuclear. During the year, utilities announced plans for at least 32 nuclear power plants and ordered 30 reactors...[representing] a capacity of more than 24 million kilowatts.... The nation enters the New Year with 15 operable nuclear power plants and 21 under construction. The trend points to a generating capacity by nuclear plants of between 120,000 and 170,000 net electrical megawatts by the end of 1980, or 25 percent of the total national capacity." Other activities included: continued R&D with DOD for strong nuclear defense capability; testing of first model of a cardiac pacemaker; limited distribution of a purified multiple vaccine which provided immunity to several different flu viruses with one innoculation; continued development of food irradiation program; sixth successful test of NERVA; and successful Project Gasbuggy nuclear explosion. In addition, AEC conducted research

December 31 (continued)
which provided numerous spin-off benefits to industry and sponsored lectures, demonstrations, and exhibits. (AEC Release K-286; AP, W Post, 12/31/67, D14)

During December: JPL scientist Sidney J. Slomich, writing in Astronautics and Aeronautics, emphasized need for national purpose to apply the highly-advanced technology of space. "New impetus would be gained through the establishment of a coordinating national organization, governmental or private, to take advantage of the potential of advanced technology through modern communication techniques. The situation calls for a comprehensive national effort, with leadership coming from the highest levels of government to break down further interdisciplinary, interagency, organizational, and psychological and occupational barriers and to check out in detail a wide variety of potential applications like those cited above, relating them to the country's and the world's most pressing problems.... Emphasis should be on the application of the vast array of existing techniques, not on the development of new ones, and on near-term objectives--no longer, say, than two or three years. Government agencies, the universities, publicly and privately supported research centers...must be banded together into a cooperative effort devoted to applying to the problems of our age the many solutions the new high technology makes possible. There is needed...a public or private national organization, a research center, and, above all, a national purpose to bring this about." (Slomich, A&A, 12/67, 54-8)

. Claude Witze, in Air Force and Space Digest, claimed that USAF pilots testing F-111A were enthusiastic about the aircraft's potential. "These...pilots consider the F-111A weapon system the greatest single technological jump designed for their mission since the wedding of the jet engine and modern avionics. The F-111A, they predict, will let them hit tactical targets harder, with greater accuracy, and at longer ranges than any other airplane...." Accelerated F-111A testing and training program begun at Nellis AFB, Nev., in July had accumulated encouraging statistics, he said: "By September, the new wing had set an unprecedented record. During that month, the five planes flew a total of 304.1 hours, an average utilization rate of 60.8 hours per aircraft. In October, the month in which the first production model was delivered...it was 59.7 hours per aircraft. The stated requirement for the F-111A is thirty hours per aircraft. The best previous records set at Nellis on other aircraft have been in the area of thirty-eight hours a month per aircraft...with systems far less complex than those of the F-111A." In addition, he noted, F-111A had set "an extraordinary record for

During December (continued)
safety. Far fewer aircraft have been lost than USAF experienced in previous similar programs." (AF/SD, 12/67, 45-55; CR, 12/5/67, S1788-90)

. Writing in Astronautics and Aeronautics, Hudson Institute scientists Herman Kahn and Anthony J. Wiener listed possible events and discoveries that could occur by the year 2000. List, according to the authors, showed "that as a result of the long-term trends toward accumulation of scientific and technological knowledge and the institutionalization of change through research, development, innovation, and diffusion, many important new things are likely to happen in the next few decades." List included: extension of life expectancy to more than 150 yrs; antigravity, practical use of gravity waves; interstellar travel; substantial lunar or planetary bases or colonies; and discovery of extraterrestrial life and, possibly, communication with extraterrestrial intelligence. (Kahn, Wiener, A&A, 12/67, 28-48)

During 1967: In 1967, U.S. orbited 87 spacecraft; U.S.S.R., 67; France, 4; Italy, 1; and Australia, 1. U.S. total included 66 launches by DOD, one satellite orbited by NASA as a secondary payload, and 20 successful NASA missions in 22 attempts--highest percent of successes in one year to date.

Highlighting NASA space achievements were closeup photographs of the moon provided by Surveyor and Lunar Orbiter spacecraft; softlanding on the moon by Surveyors III, V, and VI; successful Venus flyby by Mariner V; and preparation of a UV chart of sun's surface temperature from OSO IV photos of the sun. Surveyors III, V, and VI radioed more than 50,000 closeup photos of the moon and conducted on-site chemical analyses of the lunar soil, confirming its being similar to basaltic rock on earth. First launch from lunar surface was accomplished when Surveyor VI's retrorockets were fired, lifting spacecraft and translating it to another site eight feet away. NASA launched Lunar Orbiters III, IV, and V, successfully completing the five-mission program and obtaining detailed photos of entire lunar surface--with 100 times the detail possible with earth-based telescopes--including eight prospective Apollo manned landing sites. Mariner V passed within 2,600 mi of Venus and radioed data on Venutian atmosphere and effects of solar wind.

Ground tests in Project Apollo were continued in preparation for three-man Apollo/Saturn space flight planned for 1969. As a result of flash fire in which three astronauts died Jan. 27 during ground test at KSC, intensive studies were conducted to devise new safety measures. Nearly all combustible materials were removed from the spacecraft, and the hatch was redesigned for fast escape. Apollo program climaxed

During 1967 (continued)

Nov. 9 with successful maiden flight of Saturn V which orbited unmanned Apollo 4 spacecraft.

Applications satellites launched included three INTELSAT comsats for ComSatCorp and three ESSA meteorological satellites for ESSA. ATS II provided first continuous high-quality photos of earth from geostationary orbit, and Biosatellite II provided new knowledge on effects of radiation and weightlessness on life forms. Scientific achievements included orbiting of OSO III and IV, OGO IV, Explorer XXXIV and XXXV satellites, and Pioneer VIII interplanetary spacecraft.

Some 180 meteorological sounding rockets and 105 scientific sounding rockets were launched, and RAM C-1 spacecraft was launched on suborbital mission to measure effectiveness of water-injection concept in maintaining communications during reentry.

Some 12 flights of X-15 rocket research aircraft were conducted, including record-setting 4,534 mph (mach 6.72) flight by Maj. William J. Knight (USAF). Following crash Nov. 15 in which first fatality in 191 X-15 tests occurred, flights were suspended pending a review of the accident. NASA-USAF flight research continued with 14 flights of XB-70 supersonic aircraft. President Johnson authorized FAA to procede with SST prototype construction, contracts were signed with Boeing Co. and General Electric Co., and construction was begun. Research programs were initiated for wing-structure designs for hypersonic aircraft which could make sustained flights at 5,300 mph (mach 8), and studies were undertaken to reduce aircraft noise. M2-F2 lifting-body vehicle crashed May 10, during its second flight of the year.

DOD program included orbiting of two Vela nuclear-detection satellites and 11 IDCSP comsats; static test-firing of Titan IIIM 1st stage; and beginning of construction of MOL launch complex at Vandenberg AFB.

Among the highlights in propulsion technology was the third and final test firing of the 260-in-dia solid-propellant rocket motor, producing 5.8 million lbs of thrust. One test of NERVA nuclear reactor was conducted in which NRX-A6 was operated at full design power for 60 min, achieving major goal of one-hour-duration operation. Phoebus 1B was operated at 1,500 mw for 30 min, and Phoebus 2C-F underwent series of systems tests with conventional fuel.

Tracking, communications, and data acquisition reached greatest volume in 1967 with a large number of unmanned satellites and space probes. MSFN stations conducted tracking operations with Lunar Orbiter spacecraft as targets after completion of missions' photo-acquisition phases, and new Apollo Manned Space Flight Network was completely checked out using TTS-1, launched as secondary payload with Pioneer VIII. At end of 1967, NASA's Office of Tracking and Data Acquisition was simultaneously supporting 50 flight programs for NASA; six in cooperative international programs; and 12 for DOD.

During 1967 (continued)

U.S.S.R. launched 67 payloads, including 61 Cosmos satellites, one Venus probe, one Soyuz spacecraft, and three Molniya I comsats. Venus IV landed on the Venutian surface and transmitted atmospheric data; Soyuz I, after 25-hr manned flight, crashed on landing, killing the pilot; and Cosmos CLXXXVI and Cosmos CLXXXVIII unmanned spacecraft achieved world's first automatic docking in space. (NASA Release 67-301; Space Flight Record 1958-1967; NASA Proj Off)

. International space events were highlighted by ratification of space law treaty approved by U.N. Dec. 19, 1966, and endorsement of a new treaty providing for rescue of astronauts. Draft of space rescue treaty, negotiated by the Legal Subcommittee of the U.N. Committee on the Peaceful Uses of Outer Space, was endorsed Dec. 19, and would become effective following ratification by five nations, including U.S., U.S.S.R., and U.K.

NASA's international program included orbiting of U.K.'s Ariel III and ESRO's ESRO II and assistance with orbiting of Italy's San Marco II--first satellite to be launched from a platform at sea. Some 124 scientists from 26 countries participated in research at NASA centers; scientific sounding rockets were launched from six sites in cooperation with Argentina, Brazil, West Germany, India, Japan, and Norway; and by the end of 1967 84 countries had cooperated with U.S. in space research activities.

Kenya, Korea, Peru, and Tanzania joined the International Telecommunications Satellite Consortium (INTELSAT), bringing total membership to 60.

Australia successfully launched her first satellite, WRESAT I. (NASA Release 67-301; EH; ComSatCorp PIO; NASA International Programs)