ASTRONAUTICS AND AERONAUTICS

1967

Reel #80

COMMENT DRAFT

NOT FOR RELEASE

ASTRONAUTICS AND AERONAUTICS 1967

A CHRONOLOGY ON SCIENCE, TECHNOLOGY AND POLICY
(HHR-23)

Text Drafted
by
Science and Technology Division
Library of Congress

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

(PLEASE RETURN COMMENTS AND SURPLUS COPIES TO EH)

ASTRONAUTICS AND AERONAUTICS

A CHRONOLOGY ON SCIENCE, TECHNOLOGY, AND POLICY

1967

CONTENTS

	Page
Foreword	iii
Abbreviations of References	iv

Chronology

(Segments Issued Monthly)

January	1
Provisional Index-January	(i)
February	40
Provisional Index-February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

ASTRONAUTICS AND AERONAUTICS 1967

FOREWORD

The pace, breadth, and impact of research, development, and utility of space and aeronautical activities demand concurrent historical bookkeeping. This draft chronology is a preliminary edition circulated for comment, correction, addition, and immediate NASA use. Comments on the 1966 edition indicated timely reference value. Monthly segments for 1967 will be made available as soon as they are drafted.

Monthly chronologies and indexes are drafted by the Science and Technology Division of the Library of Congress utilizing source materials and inputs collected by the NASA Historical Staff and the Library of Congress. The Library's team is headed by Mrs. Anne Horton. NASA's general editor is Dr. Frank W. Anderson, Jr., Deputy NASA Historian; Mrs. Helen T. Wells is technical editor.

A chronology prepared from open sources represents only the first step in the historical process. Only a few readers confuse the timely use of available sources with the quest for the full and complicated history of the entire space exploration effort as well as its impact upon science, technology, public policy, and society. The NASA Historical Staff requires and appreciates the generous assistance of those making history in documenting the record for the future. Comments, criticism, and additions should be directed to the NASA Historical Staff (EH).

Eugene M. Emme
NASA Historian (EH)

ABBREVIATIONS OF REFERENCES

Listed here are abbreviations for sources cited or likely to be cited in subsequent monthly segments. This list does not include all sources provided in the chronology, for some of the references cited are not abbreviated. Only those references which appear in abbreviated form are listed below.

A&A	AIAA's magazine, Astronautics & Aeronautics
A&A 66	NASA Astronautics and Aeronautics 1966 [this publication]
ABC	American Broadcasting Company
AEC Release	Atomic Energy Commission News Release
AF Info. Pol. Ltr.	Air Force Information Policy Letter for Commanders
AF/SD	Air Force and Space Digest magazine
AFOSR Release	Air Force Office of Scientific Research News Release
AFSC Release	Air Force Systems Command News Release
AIAA Release	American Institute of Aeronautics and Astronautics News Release
AIP News	American Institute of Physics News
AP	Associated Press
ARC Release	NASA Ames Research Center News Release
Atlanta J/Const.	Atlanta Journal and Constitution newspaper
Av. Daily	Aviation Daily newsletter
Av. Wk.	Aviation Week and Space Technology magazine
Balt. Sun	Baltimore Sun newspaper
CBS	Columbia Broadcasting System
Chic. Trib.	Chicago Tribune newspaper
ComSatCorp Release	Communications Satellite Corporation News Release
CR	Congressional Record
CSM	Christian Science Monitor newspaper
CTNS	Chicago Tribune News Service
DAC Release	Douglas Aircraft Co. News Release
DMSSD Apogee	Douglas Missile and Space Systems Div. Apogee
DOD Release	Dept. of Defense News Release
EH	NASA Historical Staff
ESSA Release	Environmental Science Services Administration News Release
FAA Release	Federal Aviation Agency News Release
FonF	Facts on File
FRC Release	NASA Flight Research Center News Release
FRC X-Press	NASA Flight Research Center's FRC X-Press
GE Forum	General Electric Forum magazine
Goddard News	NASA Goddard Space Flight Center's Goddard News

GSFC Release	NASA Goddard Space Flight Center News Release
GSFC SSR	NASA Goddard Space Flight Center's Satellite Situation Report
Houston Chron.	Houston Chronicle newspaper
J/Armed Forces	Journal of the Armed Forces magazine
JPL Release	Jet Propulsion Laboratory News Release
KSC Release	John F. Kennedy Space Center, NASA, News Release
Langley Researcher	NASA Langley Research Center's Langley Researcher
LaRC Release	NASA Langley Research Center News Release
L.A. Times	Los Angeles Times newspaper
Lewis News	NASA Lewis Research Center's Lewis News
LRC Release	NASA Lewis Research Center News Release
Marshall Star	NASA George C. Marshall Space Flight Center's Marshall Star
Minn. Trib.	Minneapolis Tribune newspaper
MSC Release	NASA Manned Spacecraft Center News Release
MSC Roundup	NASA Manned Spacecraft Center's Space News Roundup
M/S Daily	Missile Space Daily newsletter
MSFC Release	NASA George C. Marshall Space Flight Center Release
NAA Skywriter	North American Aviation, Inc., Los Angeles Skywriter
NAA Release	North American Aviation, Inc., News Release
NAA Release	National Aeronautic Association News Release
NANA	North American Newspaper Alliance
NASA Ann.	NASA Announcement
NASA Auth. Hearings	NASA Authorization [FY 1968] Hearings
NASA Hq. Bull.	NASA Headquarters' Weekly Bulletin
NASA Hq. PB	NASA Headquarters Personnel Bulletin
NASA LAR VI/8	NASA Legislative Activities Report, Vol. VI No. 8
NASA Off. Int. Aff.	NASA Office of International Affairs
NASA Proj. Off.	NASA Project Office
NASA Release	NASA (Hq.) News Release
NASA Rpt. SRL	NASA Report of Sounding Rocket Launching
NASA SP-4006	NASA Special Publication #4006
NASA X-15 Proj. Off.	NASA (Hq.) X-15 Project Office
NASC Release	National Aeronautics and Space Council News Release
NAS-NRC Release	National Academy of Sciences-National Research Council News Release
NBC	National Broadcasting Company
NMI-	NASA Management Instruction-

NN	NASA Notice
NSC Release	National Space Club News Release
NYT	New York Times newspaper
NYTNS	New York Times News Service
OAR Release	Office of Aerospace Research (USAF) News Release
Orl. Sent.	Orlando Sentinel newspaper
Phil. Eve. Bull.	Philadelphia Evening Bulletin newspaper
Phil. Inq.	Philadelphia Inquirer newspaper
Pres. Doc.	National Archives and Records Service's Weekly Compilation of Presidential Documents
Sat. Eve. Post	Saturday Evening Post magazine
SBD	Space Business Daily newsletter
Sci. Amer.	Scientific American magazine
Sci. Serv.	Science Service
S.F. Chron.	San Francisco Chronical newspaper
SR	Saturday Review magazine
Tech. Wk.	Technology Week magazine
Testimony	Congressional testimony, prepared statements
Text	Prepared report or speech text
Transcript	Official transcript of news conference or Congressional hearing
UPI	United Press International
U.S. Naval Inst. Proc.	U.S. Naval Institute Proceedings magazine
U.S. News	U.S. News and World Report magazine
USS-T Trans.	Translation by NASA Scientific and Technical Information Div., Translators
Wallops Release	NASA Wallops Station News Release
Wash. Daily News	Washington Daily News newspaper
Wash. Eve. Star Wash. Sun. Star	Washington Evening/Sunday Star newspaper
Wash. Post	Washington Post newspaper
WBE Sci. Serv.	World Book Encyclopedia Science Service
WJT	World Journal Tribune newspaper
WSJ	Wall Street Journal newspaper

JANUARY 1967

January 1: NAS had received over 400 applications for NASA astronaut training with one week remaining before Jan. 8 deadline. NAS had been asked by NASA to recruit and nominate a group of scientists and engineers for final selection and training as astronauts "to conduct scientific experiments in manned orbiting satellites and to observe and investigate the lunar surface and circumterrestrial space." Applicants were required to be U.S. citizens no taller than six feet born after Aug. 1, 1930; have a doctorate degree in the natural sciences, medicine, or engineering; and meet physical requirements for pilot crew members. (NASA Release 66-333)

. Twentieth anniversary of Atomic Energy Commission (AEC).

January 2: Spanish scientists had submitted to the Spanish government a five-year, $10,000,000 space research program, the Chicago Tribune reported. According to Comision Nacional de Investigación del Espacio (CONIE) President Gen. Rafael Calvo Rodes, primary program objectives would be to gather scientific data and gain practical experience in designing and launching rockets. During separate, $1,500,000 preparatory program which was completed in December 1966, Spain launched her first rocket, collected data, conducted preliminary experiments, trained technical personnel, and prepared permanent launching sites; during next phase, Spain would build her own Skua rockets. (Darrah, Chic. Trib., 1/3/67)

. "The moon is not a dead body, but a living, breathing organism," Tass reported following successful completion of lunar surface studies by U.S.S.R.'s LUNA XIII. Prof. Nikolay Kozyrev's 1964 claim that Aristarchus crater had smoke, gas, or dust rising from it had been confirmed by observations from earth of possible lunar volcanoes or eruptions of lunar dust; results of lunar-surface studies; a "special glow" discovered by Pulkovo Observatory near Kepler crater; and "manifestation of moon's geological life," recorded in 1966. (UPI, NYT, 1/3/67, 10)

. Aerospace industry must develop new type of management to cope with its record $26-billion workload during 1967, Robert Hotz wrote in Aviation Week. "What makes the current management problem so acute is the fact that military demands are reaching a peak at the same time that commercial aviation is soaring on the greatest boom in its history. During 1965, the aerospace industry actually manufactured slightly more commercial airframe pounds than military--an historic milestone. The industry also has under development six new types of airline jet transports for which there were no prior military programs and which must be financed from privately raised funds. This is another unprecedented task for aerospace managements to tackle...." (Hotz, Av. Wk., 1/2/67, 11)

January 2: U.S. experts believed establishment of permanent lunar colonies and exploitation of lunar resources were among long-range goals of Soviet space program, Heather M. David reported in Technology Week. Analysis of research reports had indicated that future Soviet missions directed toward these objectives would include: (1) orbiting of three or four cosmonauts for three weeks; (2) extensive practice of extravehicular activity and assembly in orbit; (3) orbiting of animals to continue studying effects of long-term weightlessness and radiation; and (4) lunar landing of animals for observation. David predicted preparations for interplanetary travel would be initiated shortly after establishment of permanent lunar colonies. (David, Tech. Wk., 1/2/67, 18)

. The New York Times called for fuller and more open debate on cost and consequences of Sst program: "The SST's priority is debatable and so is its financing. The industry may be right in asserting that the costs of development are so huge that no company can afford to take the risk on its own. It points out that the backing of both Britain and France has been required to launch the Concorde. But if the combined efforts of two countries and their aircraft industries are needed for that much less ambitious project, the American SST might be more safely and soundly developed if it commanded the combined resources of the entire American industry and the Government.

"What is at stake is not the commitment to proceed with the SST. That decision has been made and cannot--and should not--be reversed. But if the SST is to be sound economically as well as technologically, the Administration and the industry must be less secretive and indefinite about the costs and how they are to be financed. An open debate is needed on how to get the most for the taxpayers' money." (NYT, 1/2/67, 18)

January 3: Group of NASA officials, headed by MSFC Director Dr. Wernher von Braun, arrived at McMurdo Station in the Antarctic beginning 10-day expedition to observe environmental conditions--including temperatures, isolation factors, and survival techniques--for comparison and possible application to problems of spaceflight. (MSC Roundup; NYT, 1/4/67, 10; AP, Wash. Post, 12/22/67, A21)

. Joseph J. Tymczyszyn, a senior FAA test pilot and chief of FAA's West Coast Supersonic Transport Development Field Office, had emerged as the test pilot most likely to certify the Sst, Mitchell Gordon disclosed in the Wall Street Journal. Tymczyszyn, certifier of both the Boeing 707 and the Douglas DC-8 jetliners for U.S. service, had already spent four years familiarizing himself with Sst operation, and had logged more than 1,000 hrs. in Sst simulators. (Gordon, WSJ, 1/3/67, 1)

January 3: Philadelphia Inquirer praised success of U.S.S.R.'s LUNA XIII and urged that U.S. continue its intensive lunar-landing program: "Space treaty or no space treaty, the competitive moon race goes on and even though nobody really likes the idea, the U.S. has to try to do better than the Soviet Union's Luna 13....

"No one can guess for certain what strategic role it [the moon] might play if...the Soviet Union were to make technological advances that would enable it to deny the use of space to the rest of the world.

"Luna 13 has chalked up a meaningful achievement for the Russian space program. Americans should not be tempted to underrate it." (Phil. Inq., 1/3/67)

. Underground nuclear detonation conducted Dec. 3, 1966, by AEC for ARPA had confirmed decoupling theory--that an underground explosion could be muffled significantly by firing it in a cavity--DOD announced. Further experiments would be conducted under Project Sterling to "develop a better understanding of the problems of seismic detection." (DOD Release 10-67)

. USAF announced plans to train 3,247 pilots a year--an increase of 15% over present level--and provide a ninth Undergraduate Pilot Training (Upt) facility at Randolph AFB. Increase was required because of Vietnam war. (DOD Release 2-67; AP, NYT, 1/4/67, 30)

January 4: XB-70 No. 1 research aircraft piloted by NASA test pilot Fitzhugh Fulton and North American Aviation, Inc., pilot Van Shepard reached mach 2.53 and 60,400-ft. altitude during flight at Edwards AFB for national sonic boom program. (NASA Proj. Off.)

. A record number of visitors--246,838--toured MSFC in 1966. (MSFC Release 67-1)

. British government would launch an all-British satellite within $2\frac{1}{2}$ yrs., Reuters reported. According to a Daily Mail article, a 200-lb. satellite would be launched from Woomera Rocket Range with new Black Arrow rocket. (Reuters, NYT, 1/4/67, 40)

. Unarmed Mace A missile, launched by USAF from Eglin AFB, Fla., during target-interception practice, went out of control and accidently flew over the western tip of Cuba before crashing into the sea. (Wilson, Wash. Post, 1/5/67, A1)

. Replacement of obsolete missiles by more advanced types had resulted in the largest surplus-disposal program since the end of World War II, Frederick Taylor asserted in the Wall Street Journal. DOD was reportedly

January 4 (continued)
trying to dispose of more than 200 phased-out Atlas and Titan I missiles and their sites, and it seemed probable that within a few years 800 Minuteman I, 600 Polaris, and 54 Titan II missiles also would become obsolete, adding to the surplus. (Taylor, WSJ, 1/4/67, 1)

January 5: NASA Administrator James E. Webb addressed Armed Forces Reserves Joint Assembly at NASA Hq.

"It is a mistake to think of the space program only in terms of the rockets and spacecraft we launch. These are the focal points of our attention, but we are also developing the ability to organize and manage vast scientific and technical enterprises that involve large segments of our economic, social, and political decision-making process. This complex interdevelopment of technological power and of the social organization necessary to control, direct, and exploit it ...is a central element of the space age." (Text)

. Press briefing on future OSSA programs was held at NASA Hq. Edgar M. Cortright, Deputy Administrator for Space Science and Applications, served as moderator.

Associate Administrator for Space Science and Applications Dr. Homer E. Newell stressed the importance of basic research to all national scientific programs. "...the results of basic research are vital to the realization of practical applications. When we began the NASA program, we had the sounding rocket, we had the capability of putting together small satellite launchers and to apply those techniques, and we built the best program on those techniques that we could. Now we have manned flight capabilities; we have large boosters, the ability to get out further into the solar system than ever before.... Now is the time to profit by those capabilities, to continue the basic research."

Sunblazer probe that could be launched into orbit around the sun and transmit radio signals back to earth was discussed by Jesse L. Mitchell, Director of Physics and Astronomy Programs. Spacecraft would determine electron density in solar atmosphere by measuring time it took signals to travel from spacecraft back to earth. NASA was also considering a plan to launch a satellite toward Jupiter, then use Jupiter's magnetic field to push the spacecraft toward other planets and eventually hurl it into space 1-10 trillion miles away.

Oran W. Nicks, Director of Lunar and Planetary Programs, outlined plans for unmanned missions to Mars and Venus, beginning with a small instrumented probe scheduled for launch in June 1967. In the 1971 Mars and 1972 Venus missions, teams of two spacecraft would be launched by a modified Saturn V booster. One spacecraft would penetrate planet's atmosphere; take measurements as it sped toward planet's surface; and

January 5 (continued)

flash data to the second spacecraft--programed to fly past the planet --before crashlanding. Data would be transmitted to earth by the fly-by spacecraft. Missions would pave the way for later spacecraft with improved equipment--possibly including TV cameras--to softland on the planets.

Thumb-sized desert mice fitted with tiny radio transmitters and telemetry equipment which could broadcast mouse's temperature up to six months were being conditioned for future spaceflight, Dr. Orr E. Reynolds, Director of Bioscience Programs, disclosed. "Astromouse" --which ate only sunflower seeds and never drank water--might be orbited with three astronauts in Apollo spacecraft. Others might be launched into interplanetary space in a Pioneer study of biological specimens outside earth's gravitational field.

Plans for a multi-purpose satellite that would combine the functions of many unmanned spacecraft currently in orbit were revealed by Dr. Morris Tepper, Deputy Director of Space Applications and Director of Meteorology. Developed under unified space applications program, satellite would carry equipment to observe weather conditions; relay communications to distant earth stations; provide navigation traffic control for ships and aircraft; and compile data on earth's natural resources.

No mention of unmanned scientific lunar probes was made during the briefing. When asked later in an interview whether he thought interest in unmanned exploration of the moon would diminish after astronauts landed, Dr. Newell replied: "Not at all." Although astronauts would dominate lunar exploration, unmanned Surveyor spacecraft would probably land in unsafe areas, and Lunar Orbiter photography missions would continue for mapping. Discussion of unmanned lunar missions had been omitted because "we wanted to tell about the newer of new things in our thinking." (Transcript; Hines, Wash. Sun. Star, 1/8/67, A16)

. U.S. must "answer the post-Apollo question...very soon," Douglas Aircraft Co. Vice President and General Manager J. P. Rogan told AIAA/AAS Space Forum in Washington, D.C. He suggested that U.S. develop five "building blocks" which would maintain options for any future course of action chosen: (1) long-duration orbital experience; (2) reusable spacecraft; (3) reusable launch vehicles; (4) nuclear-powered stages; and (5) improved secondary power systems. (Text)

. U.S.S.R. had developed a device that enabled jet aircraft to take off almost straight up, reaching the stratosphere "in a matter of minutes," Komsomolskaya Pravda reported. Article did not include detailed description of device but indicated it consisted of rocket engines that provided sudden thrust of tremendous force. (AP, NYT, 1/7/67, 10)

January 5: At least 200 Anglo-French Concorde supersonic aircraft would have already been sold by 1974 when the U.S. supersonic transport was scheduled to go into operation, Concorde sales manager E. H. Burgess speculated at a London news conference. Construction of first prototype, which would make its maiden flight Feb. 28, 1968, was two or three weeks ahead of schedule, he said. (AP, NYT, 1/6/67, 62M)

. Refunds totaling $35 million "probably will be paid" by FAA to Lockheed Aircraft Corp. and Pratt & Whitney Div., United Aircraft Corp. for their losses in Sst design competition, the Wall Street Journal speculated. Boeing Co. and General Electric Co. had been selected Dec. 31, 1966, to continue development and refinement of their Sst designs. (WSJ, 1/5/67)

. Object, believed to be "probable" 10th moon of Saturn discovered by French astronomer Dr. Audouin Dollfus of Meudon Observatory in December 1966, had been sighted by Richard L. Walker of the U.S. Naval Observatory, Walter Sullivan reported in the New York Times. New moon, believed to be a 150-mi.-dia. "snowball" of very light, frozen material, was in orbit 52,000 mi. from Saturn with a period of 18 hrs. Confirmation was uncertain, however; Walker, in a telephone interview, said the object was so close to the rings of Saturn that it could be a lump in the rings, rather than a moon. (Sullivan, NYT, 1/5/67, C17)

January 6: Harold B. Finger, Director of Nuclear Systems and Space Power in NASA Hq. OART and Manager of AEC-NASA Space Nuclear Propulsion Office, was temporarily assigned additional duty of heading group of NASA officials who would analyze needs for procedural revisions and functional alignments within NASA Hq. (NASA Release 67-2)

. NASA's SURVEYOR I spacecraft, which softlanded on the moon June 2, 1966, was reactivated on the lunar surface for 12 hrs. to transmit data on the motion of the moon. JPL said the new data would be used to help "refine the Moon's distance from the Earth, its position in orbit at a given time, and other elements of its velocity and motion." (SBD, 1/11/67, 42)

. USAF reported that an SR-71 strategic reconnaissance aircraft was missing and presumed down after test flight from Edwards AFB. (UPI, Wash. Post, 1/7/67, 3)

January 7: Patent for a method of determining whether life exists on other planets had been granted to aeronautical engineer Albin M. Nowitzky, Stacy V. Jones reported in the New York Times. Unlike previous proposals involving distant observations, Nowitzky's concept

January 7 (continued)
called for an automated spacecraft landing on a planet's surface to make tests free from earthly contamination and influence. A soil sample would be taken, mixed with distilled water, and sterilized. Part of the resulting "nutrient" would be transferred to a test chamber, exposed to the planet's atmosphere, and sealed, while the remaining part would be used as a "control." Sensors in the test chamber would register any metabolic reaction, and these data would be telemetered to earth or to an orbiting satellite. (Jones, NYT, 1/7/67, 34)

. French scientists were teaching monkeys that pressure on one out of five buttons produced a gum drop, in preparation for series of space-flights with Vesta sounding rocket from Hammaguir Range, AP reported. Researchers hoped to determine effects of weightlessness on animals' behavior patterns. (AP, Wash. Eve. Star, 1/7/67, A2)

January 8: Explosive growth of world's population in the 20th century was an instinctive preparation of mankind for challenges of space travel and resettlement on other planets, Soviet scientist Igor M. Zabelin contended in Pravda. "...two very striking facts--the explosive growth of mankind and the exploration of space--do not coincide by accident. Some inner motivations are leading mankind to new and unknown shores and, therefore, it is gathering its strength and reorganizing [its social structure]." This explosion was imperative to supply the manpower necessary for the space age, he asserted, because the solar system could not be conquered with "only three billion human beings." (Anderson, NYT, 1/9/67, 1)

. New York Times questioned FCC's ability to investigate adequately the organization of a domestic comsat system. "The questions faced by the Federal Communications Commission and Congress...go far beyond the obvious ones of whether Comsat's present monopoly in the international satellite field should be extended to the new area or whether private corporations should be empowered to launch separate systems for television or press transmission....

"Perhaps the most worrisome aspect of the tangle...is the incapacity of the F.C.C. to grapple with such problems in total terms.... [It] has neither the research staff nor the funds to discharge its planning responsibilities with anything approaching adequacy. The country must now look to it for decisions it is ill-equipped to give on the organization of a new satellite system and on the future of noncommercial TV." (NYT, 1/8/67, 12E)

January 9: William M. Magruder, Lockheed Aircraft Corp., had been selected to receive Flight Safety Foundation's 1967 Richard Hansford Burroughs Test Pilot Award, Aviation Week reported. (Av. Wk., 1/9/67, 13)

January 10: U.S. space program could benefit from experience and scientific research in the Antarctic, group of NASA officials headed by MSFC Director Dr. Wernher von Braun concluded after studying U.S. installations and activities at McMurdo Station since Jan. 3. Interest in the Antarctic was based on research being conducted there which was applicable to spaceflight and on way Americans worked under conditions of stress, isolation, and extreme cold--conditions similar to those on the moon and in spaceflight. The group also observed minute fungi and algae growing in Antarctic and studied methods being used to detect living organisms, as preparation for detecting and studying such growths possibly existing in harsh environments of other planets. (Durdin, NYT, 1/15/67, 87)

. MSFC had exercised one-year, $10,451,092 renewal option of cost-plus-award-fee contract with Mason-Rust Co. for continued support services at Michoud Assembly Facility. (MSFC Release 67-6)

. Designs of both American Sst and Anglo-French Concorde would have to be modified to meet standards proposed by their potential customers, International Air Transport Assn. (IATA) Director General Knut Hammarskjold asserted. He advised that aircraft be modified to meet all of the organization's requirements, even if it meant postponing delivery date.

The Wall Street Journal later commented: "Since IATA's members include most of the world's major airlines...Mr. Hammarskjold's words plainly deserve attention.... [He] appears to have shot a large hole in the SST supporters' main argument for haste. It is that the British and French are already well ahead of the U.S.... Calm consideration would appear even more mandatory for the Government, saddled as it is with a war and a budget whose income side long ago since has lost touch with outgo.... A late blooming success is far better than a dismal early failure." (UPI, NYT, 1/11/67, 73; WSJ, 1/17/67, 18)

. President Johnson, in his State of the Union address before joint session of Congress, deferred decision on deploying a Nike-X antimissile missile system despite evidence that U.S.S.R. was building a defensive system near Moscow. "We have a solemn duty to slow down the arms race...if that is at all possible, in both conventional and nuclear weapons and defenses.... I realize any additional race would impose on our peoples

January 10 (continued)
and on all mankind for that matter, an additional waste of resources with no gain in security to either side." The President said he intended to seek international agreements "bearing directly on this problem." He did not mention the U.S. space program in his address. (Pres. Doc., 1/16/67, 26-39)

January 10-11: Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight, discussed achievements and objectives of U.S. space program in a series of lectures at the Univ. of Sydney Summer School, Australia. After emphasizing intimate interrelationship between NASA's unmanned and manned programs, Dr. Mueller assessed Mercury and Gemini flights: "In the Mercury program, we established man's capabilities in short space flights and we laid the foundation for manned space flight technology. In the Gemini program, we gained operational proficiency, learned about man's capabilities in flights lasting up to two weeks, and developed new techniques." The Apollo program, he said, was proceeding on schedule, and several alternative post-Apollo programs were under consideration: "(1) Direct economic benefits, with emphasis on extensive earth-orbital activities; (2) Lunar exploration and science; (3) Planetary exploration and science; (4) Maximum effort aimed at pre-eminence in earth-orbital, lunar, and planetary activities; (5) Balanced combination of economic benefits, lunar and planetary exploration, and science." (Text)

January 11-14: NASA launched ComSatCorp's INTELSAT II-B ("LANI BIRD II") comsat from ETR by three-stage Thrust Augmented Improved Delta booster into elliptical transfer orbit in preparation for geostationary orbit. Transfer orbit had 22,904-mi. (36,875-km.) apogee; 185-mi. (298-km.) perigee; 10-hr. 54-min. period; and 26° inclination. On Jan. 14 ComSatCorp fired apogee motor transferring satellite into geostationary orbit over the Pacific.

Scheduled to enter commercial service Jan. 27, INTELSAT II-B would provide 24-hr. communications service between U.S. and earth stations in Hawaii, Japan, and Australia; assist in fulfilling Project Apollo communications requirements; and provide military communications between Hawaii and Japan, and Thailand and the Philippines for National Communications System (NCS). It was second satellite in ComSatCorp's Intelsat II program to place two comsats in synchronous orbit--one over the Pacific, one over the Atlantic; first satellite--INTELSAT II-A ("LANI BIRD")--was launched by NASA Oct. 27, 1966, but failed to achieve synchronous orbit because apogee motor malfunctioned. Subsequent "systems tests" of the apogee motor at Arnold Engineering Development Center indicated malfunction had been thermal in nature. Intelsat II comsats, larger and

January 11-14 (continued)
improved versions of EARLY BIRD (INTELSAT I) satellite, were capable of handling television and data transmissions of up to 240 voice channels. (NASA Proj. Off.; ComSatCorp Release; UPI, NYT, 1/8/67, 18; 1/12/67, 8; 1/15/67, 57; AP, Wash. Sun. Star, 1/8/67, A18; Reddig, Wash. Eve. Star, 1/11/67, A5; Wash. Post, 1/12/67, C1)

January 11: Initial flight test of USAF's Scramjet (supersonic combustion ramjet)--forerunner of hypersonic aircraft--was partially successful. Launched by Scout booster from Vandenberg AFB, vehicle accomplished primary goal by demonstrating it could separate properly from booster, but failed to perform some secondary missions. (AP, NYT, 1/14/67, 4; Tech. Wk., 1/23/67, 3)

. French research balloon, released from southwest France Jan. 5 and last heard from over Mongolia, was found in North Carolina. Purpose of flight was to test onboard equipment: radio transmitter, barometer, and device for measuring angle of sun above horizon. (AP, NYT, 1/13/67, 43)

. Rep. Frank T. Bow (R-Ohio) introduced bill (H.R. 112) to establish a Government-owned Supersonic Transport Authority to supervise and privately finance with Government guarantee the development and construction of the Sst prototype. (CR, 1/11/67, H104)

. Senate Commerce Committee unanimously approved President Johnson's nomination of Alan S. Boyd as Secretary of Transportation. (NASA LAR VI/2)

. Sonic booms from military aircraft had caused damage to prehistoric cliff dwellings in Canyon de Chelly National Monument in Arizona and to geological formations in Bryce Canyon National Park in Utah, National Park Service said in report to Interior Secretary Stewart L. Udall. Report also cited potential damage to cliff dwellings in Mesa Verde National Park in Colorado. Secretary Udall announced he had received promise of cooperation from USAF, and would seek aid of FAA and special NAS sonic panel. (NYT, 1/12/67, 1)

. AFSC had awarded Hughes Aircraft Co. $9,000,000 initial increment to contract for R&D of an experimental comsat. (DOD Release 21-67)

. Latest Trendex poll indicated 69% of Americans believed U.S. space program should continue at its present pace even if U.S.S.R. were to achieve first manned lunar landing. (Jackson, L.A. Herald-Examiner, 1/11/67)

January 11: Communist China had been placing considerable emphasis on large-scale production of weapons, particularly medium-range missiles capable of delivering atomic warheads, CIA Director Richard Helms disclosed in a closed briefing of the Joint Congressional Committee on Atomic Energy. (NYT, 1/12/67, 4)

January 12: JPL had selected TRW Systems, Inc., for negotiations on a $1-million contract for design, modification, fabrication, and testing of the propulsion subsystem for the 1969 Mariner Mars mission. (NASA Release 67-4)

January 13: Lunar Orbiter news briefing was held at NASA Hq.

Dr. Leonard Reiffel, Apollo Program, OMSF, said that 635 LUNAR ORBITER I and II photos of the 1,000-mi. Apollo strip near moon's equator had "removed any doubt that there are numbers of suitable places for Apollo to land satisfactorily." Of the regions photographed, 10 sites appeared to have smooth areas; detailed analysis of three of these had revealed two areas that were only about 6% crater-marked. Dr. Reiffel said Apollo landing site should be 3- to 5-mi.-dia. oval area, relatively free of craters and boulders, with 30 mi. of smooth terrain approaching it and no more than 7° slope. In addition, since moon's optimum light ranged from 7° to 20° and sun moved across moon 13° per day, landing sites ideally should be spaced 26° apart at this longitude to allow for launch delays. "We...need not one site or a couple of sites ideally, but we would like, in order to make life as simple as possible, to have a number of sites. Then at the specific time of the launch...we will pick a set of three...."

Dr. Lawrence Rowan, U.S. Geological Survey, said Lunar Orbiter photos had shown that moon's dark mare was smoothest terrain; bright rays had variable roughness and upland plains appeared very rough. He said photos indicated that mass movement on the moon modified both mare and upland.

LaRC Lunar Orbiter Project Manager Dr. Clifford H. Nelson, discussing future Lunar Orbiter missions, said Lunar Orbiter 3 would be "site confirmation" flight to photograph areas already determined by LUNAR ORBITERs I and II as promising for Apollo landings. Spacecraft 4 and 5 might be used to photograph 400 lunar sites of primary scientific interest. Capt. Lee R. Scherer, Lunar Orbiter Project Manager, OSSA, noted that one Lunar Orbiter in polar orbit around the moon could survey 80% of moon's front face with 10 times resolution of earth-based photos. "These types of missions would provide a framework upon which to base major decisions concerning our total lunar exploration program after these initial manned landings," Scherer said.

January 13 (continued)

Display of one LUNAR ORBITER I photo--first ever taken of earth from interplanetary distances--reopened discussion about possibility of life on Venus. Dr. Homer E. Newell, NASA Associate Administrator for Space Science and Applications, said that photo, which showed earth as an indistinctly detailed, cloud-shrouded crescent, bore striking resemblance to Venus as depicted in earth-based telescopic photos. If Venus could be photographed as clearly as earth, "we might see holes in the clouds," Newell suggested. Current prevailing scientific theory was that solid clouds surrounded Venus trapping infrared radiation and making planet too hot to support life. (Transcript; Clark, NYT, 1/14/67, 12)

. Pilot Joseph Cotton (Col., USAF) and co-pilot Van Shepard, North American Aviation, Inc., flew XB-70 No. 1 research aircraft to mach 2.57 and 61,-000-ft. altitude in flight at Edwards AFB for national sonic boom program. (NASA Proj. Off.)

January 14: USAF launched an unidentified satellite from Vandenberg AFB with Thor-Agena D booster. (UPI, NYT, 1/16/67, 18)

. U.S.S.R. tested first missiles in November 1947 and first multistage ballistic missile 10 yrs. later, Pravda disclosed in tribute to Sergey Korolev, "chief constructor of space systems for U.S.S.R.," on first anniversary of his death. (Reuters, NYT, 1/16/67, 20)

. New U.S. Ambassador to the U.S.S.R. Llewellyn E. Thompson carried special message from President Johnson to Soviet leaders in Moscow, which reportedly appealed for mutual agreement not to deploy antimissile systems. Ambassador Thompson's mission was first diplomatic followup to President Johnson's Jan. 10 State of the Union address in which the President indicated that U.S. had decided to defer deployment of such a system and hoped U.S.S.R. would do the same. (NYT, 1/15/67, 23)

January 15: Senate Minority Leader Everett M. Dirksen (R-Ill.) suggested on ABC's "Issues and Answers" TV program that Government expenditures on the space program be cut to avoid a tax increase. "I've been looking at that space program, I don't mind telling you. Does it really make a difference whether we get to the moon this year or next year, or the following year?

"I doubt very much whether it makes a great deal of difference. And if we reconcile ourselves to that thesis, then of course there is a place where you can make a very substantial budget cut." (Wash. Eve. Star, 1/16/67, A5)

January 15: Prolonged pause in Soviet manned spaceflights had been causing considerable speculation in U.S. political and scientific circles, Stephen S. Rosenfeld wrote in the Washington Post. Speculation ranged from predictions that the Soviets were moving on to a new "family" of larger spacecraft to suggestions they had paused to solve serious problems encountered in prolonged weightlessness. (Rosenfeld, Wash. Post, 1/15/67, E3)

. Laser applications in industry and space were rapidly increasing, William Smith noted in the New York Times. A solar-powered laser was being developed for communication across the 50 million mi. between earth and Mars, and Dr. Henry Lewis, director of RCA's David Sarnoff Research Center, predicted the laser would also play a very important role in tracking space vehicles. Said Dr. Lewis: "The laser fits the bill with greater accuracy than radar is capable of obtaining." (Smith, NYT, 1/15/67, F1)

January 16: GSFC engineers had successfully used an electric "screwdriver" to restore power to EXPLORER XXXIII satellite, in orbit 252,900 mi. from earth, saving the spacecraft from an almost certain power blackout. Emergency repair--believed to be the most distant satellite "fix" ever accomplished--was conducted via Rosman, N.C., tracking station. Engineers turned off the spacecraft transmitter so that an increased power surge through the other electronic systems eliminated the suspected short circuit. (NASA Release 67-5)

. Undulating, banana-shaped barium cloud, released from a Nike-Iroquois sounding rocket launched from Eglin AFB in USAF experiment on air currents, touched off dozens of reports of Ufo's throughout southeastern U.S. (UPI, NYT, 1/18/67, 48)

. U.S. could have a permanent manned space station in orbit by 1970, predicted Charles W. Mathews, Director of Saturn/Apollo Applications, NASA Hq. OMSF, in Space Business Daily interview. Mathews said that by clustering various modules, instrument packages, and spacecraft in orbit for reuse and utilizing resupply of expendables and crew replacement, it would be possible to extend capabilities of hardware currently under development to the point where such a space station could be permanently manned in about three years. (SBD, 1/16/67, 63)

. This New Ocean: a History of Project Mercury (SP-4201) by Loyd S. Swenson, Jr., James M. Grimwood, and Charles C. Alexander was published by NASA. It was NASA's first major program history published and was available to public from Superintendent of Documents, GPO. (NASA Release 67-1)

January 16: MSFC awarded Sanders Associates, Inc., $2,149,548 contract for logistic support of Saturn V operational display systems used to present information on vehicle's status during simulated and actual launch preparations. (MSFC Release 67-8)

. V/Adm. Hyman G. Rickover (USN) received Printing Industries of Metropolitan New York's Franklin Award for "advancement of scientific knowledge and furtherance of democracy." In his acceptance speech, Admiral Rickover said citizens in a democracy had a duty to become educated so they could support social action against harmful technologies. "There is a knowledge gap of vast dimension between the public and that small elite of highly intelligent, highly educated experts who understand science and have the use of technology.... A free society cannot, in the long run, bear the burden of having a mass of voters who lack the education they need to make them responsible citizens. Society ceases to be free if a pattern of life develops where technology, not man, becomes central to its purpose. We must not permit this to happen lest the human liberties for which mankind has fought, at so great a cost of effort and sacrifice, be extinguished." (Gilroy, NYT, 1/17/67, 27)

. Photos taken Jan. 9 by two teenage brothers, purportedly showing a helicopter-sized Ufo hovering over Lake St. Clair near Detroit, did not "indicate an obvious hoax" and were being studied further for authenticity, Dr. J. Allen Hynek, USAF consultant on Ufo's and Chairman of Northwestern Univ. Astronomy Dept., disclosed in a telephone interview. (Hofmann, NYT, 1/17/67, 10)

. Dr. Robert J. Van de Graaff, inventor of the Van de Graaff particle accelerator used in nuclear physics research and cancer therapy, died at age 65. (AP, NYT, 1/17/67, 35)

January 17: XB-70 No. 1 research aircraft was piloted by Col. Joseph Cotton (USAF) and NASA test pilot Fitzhugh Fulton to mach 2.54 and 60,200-ft. altitude in flight at Edwards AFB for national sonic boom program. (NASA Proj. Off.)

. Feasibility of using nuclear engines on USAF's C-5A transport so it could stay aloft for several months was being studied by LRC, Charles Harper, Director of Aeronautics Div., NASA OART, reported in Washington Post interview. NASA was concentrating on the hardware necessary to transfer nuclear reactor heat to the jet engines; if this problem could be solved, Harper said the next question would be "what good does it do the Air Force" to have engines of unlimited endurance. Plans specified that nuclear reactors operate only after takeoff to avoid danger of radiation on the ground. (Wilson, Wash. Post, 1/18/67, 1)

January 18: USAF Titan III-C booster launched from ETR successfully inserted eight Initial Defense Communications Satellite Program (Idcsp) comsats into random equatorial orbits.

Powered flight of Titan III-C was close to planned parameters. Transtage and payload were inserted into parking orbit with 113-mi. (182-km.) apogee and 106-mi. (171-km.) perigee where first transtage burn made necessary course corrections. Second transtage burn 66 min. later moved stage and load into transfer orbit with 21,000-mi. (33,810-km.) apogee and 120-mi. (193-km.) perigee. Third burn put satellite dispenser frame and eight satellites into near-synchronous, 21,000-mi.-altitude orbit. At 6 hrs. 11 min. GET, the 100-lb. satellites were ejected separately into slightly different orbital paths. USAF officials reported all satellites were functioning properly.

Eight new satellites, combined with seven others launched by USAF June 16, 1966, would reinforce DOD's worldwide communications system and provide reliable, full-time radio link between Washington, D.C., and U.S. troops in Vietnam and other distant outposts. (UPI, NYT, 1/19/67, 7; AP, Balt. Sun, 1/19/67, 1; Av. Wk., 1/23/67, 32)

. NASA appointed Francis W. Kemmett to succeed Dr. James A. Hootman as Executive Secretary of the Inventions and Contributions Board, Office of Industry Affairs. (NASA Ann.)

. NASA Astronauts M. Scott Carpenter and Edwin E. Aldrin, Jr., tested space simulator at Martin Co.'s plant near Littleton, Colo. Unit, which provided 6° of freedom, was linked to computer that determined exertion forces on astronaut as he performed simple tasks in simulated weightless environment. (Denver Post, 1/19/67)

. NASA-USAF XB-70 flight research program should be exploited because it could contribute greatly to understanding operational problems of the Sst, Alvin S. White, formerly an NAA XB-70 test pilot and currently TWA's Manager of Flight Research and Development, told Aviation Daily. "I think that airplane [XB-70] has tremendous potential...it can provide the least expensive way to do a lot of things. We could feed the B-70 into the air traffic control system to learn how it can cope with SSTs. We could test fly prototype engines at very high speeds, and it could contribute a lot to understanding sonic boom problems over air routes." (Av. Daily, 1/18/67)

. Najeeb Halaby, Pan American World Airways, Inc., Vice President and former FAA Administrator, praised the Johnson Administration's "carefully calculated risk" in the development of the Sst, in a speech before the Wings Club in New York. He suggested that as a result both the Government and industry involved in producing the aircraft "are in a position to make a better decision and a better

January 18 (continued)
plane than...France, Britain, and the Soviet Union." Halaby said aviation industry had a duty "to help the President and the Congress make the most prudent and the most temporary investment of public funds in a national interest venture." (NYT, 1/19/67, 57)

. Sun's illumination of a missile's shock wave had caused strange aerial phenomenon seen throughout southwestern U.S. Jan. 17, USAF officials at Vandenberg AFB reported. (AP, NYT, 1/19/67)

January 19: U.S.S.R. launched COSMOS CXXXVIII into earth orbit with 293-km. (182-mi.) apogee; 193-km. (119-mi.) perigee; 65° inclination; and 89.2-min. period. Equipment was performing satisfactorily. (SBD, 1/20/67, 98)

. USAF ramjet-powered missile, called the low-altitude supersonic vehicle (Lasv), was air-launched from F-100 Super Sabre aircraft in successful flight test at Holloman AFB. Marquardt Corp., designer of the ramjet, was conducting the flight test program for the vehicle under an $11-million USAF contract. (UPI, Wash. Post, 1/20/67, A15)

. Charges that many specifications for construction of $25-million tank chamber at Plum Brook Station were being compromised were denied by Dr. Abe Silverstein, Director of NASA Lewis Research Center which operated station. Charges, made by Plum Brook employee and referred to Rep. Charles A. Mosher (R-Ohio), were being investigated by GAO. Silverstein said almost all the allegations were "not true" or represented a difference in judgment between himself and the complaining employee: "It's a matter of his judgment against ours, and I don't have to accept it." (Thomson, Cleveland Plain Dealer, 1/20/67)

. Project Themis, a university-based program to establish new academic centers of excellence in research areas important to DOD's long-range scientific and technological goals, was announced by Secretary of Defense Robert S. McNamara. McNamara said more than 400 universities had been asked to submit proposed programs by Feb. 15. During 1967, $20 million had been authorized for the project, and DOD expected to initiate up to 50 new departmental centers before the end of the year. (DOD Release 44-67)

. United Air Lines President George E. Keck, in a speech before International Aviation Club in Washington, D.C., echoed similar pleas by executives of Pan Am and TWA in calling for "expeditious but orderly" advancement of U.S. Sst program. Although Sst "is a pretty real one on the drawing boards," Keck said there were "certainly some important

January 19 (continued)
decisions and actions that have to be taken here to make it a reality." Among these, determination of a "sound, reasonable" financing plan was of paramount importance. (NYT, 1/22/67, 50)

January 20: Saturn V 3rd stage (S-IVB) was completely destroyed in explosion 10 min. before it was scheduled to be ignited in test at Douglas Aircraft Corp.'s Sacramento plant. NASA later determined accident had been caused by faulty welding in high-pressure helium sphere. (UPI, Wash. Post, 1/27/67, A2; UPI, NYT, 1/22/67, 29; UPI, Wash. Post, 1/28/67, A7)

. NASA should prepare a list of priorities for its future programs to guide Congress in making any budget cuts required by the Vietnam war, Chairman of the Senate Committee on Aeronautical and Space Sciences Clinton Anderson (D-N.Mex.) told Baltimore Sun reporter Albert Sehlstedt, Jr. Senator Anderson insisted he was not necessarily predicting cuts in the FY 1968 budget, but observed that "something might have to give a little" while so much was being spent on the war. (Sehlstedt, Jr., Balt. Sun., 1/21/67)

. F-111A aircraft, lent by USAF to NASA to obtain basic flight research data for the design and development of advanced variable sweep wings, was delivered to FRC. (NASA Release 67-7)

. MSFC awarded $100,000 six-month contract to Bell Aerosystems Co. for flight testing of Bell's "pogo stick" one-man flying vehicle at LaRC's 1/6 gravity test facility. Pogo stick was being evaluated for Apollo lunar surface mission use. (MSFC Release 67-12; Marshall Star, 1/25/67, 3)

. ComSatCorp advised FCC of plans to award four-month study contracts--one to Lockheed Missiles and Space Co. for $272,000; one to Hughes Aircraft Co. for $299,000--for research on multi-purpose synchronous comsats. Lockheed had proposed an inertia-wheel stabilization concept, and Hughes a spin-stabilized approach for stabilizing a spacecraft in synchronous orbit. (ComSatCorp Release)

. Theory that chlorophyll--a key compound of terrestrial life--exists in outer space was proposed by Dr. Fred M. Johnson of Electro-Optical Systems, Inc., at Univ. of California science symposium. Dr. Johnson said that light absorption patterns of interstellar dust obtained by spectroscopic examination had clearly demonstrated the presence of chlorophyll. Confirmation of his theory could indicate that life in forms familiar to man exists on other planets both in the earth's galaxy and throughout the universe. (NYT, 1/21/67, 9)

January 21: LUNA XII, first Soviet satellite to successfully transmit photos to earth from lunar orbit, had completed its mission and broken radio contact with ground stations, Tass announced. Satellite had been launched Oct. 22, 1966. (Wash. Post, 1/22/67, A23; UPI, NYT, 1/23/67, 7)

. "Serious difficulties" had developed in Soviet program to land a man on the moon and it would take "no little time" to solve them, Cosmonaut Gherman Titov said in Aviatsiya i Kosmonavtika. (UPI, NYT, 1/23/67, 21)

. Report that Communist China would launch a "space vessel" in 1967 appeared in Red Flag, newspaper of the Red Guard of the Peking Aeronautical Institute. U.S. experts had been crediting Communist China with capability to launch a satellite since her successful guided missile nuclear weapon test Oct. 27, 1966. (NYT, 1/22/67, A4)

January 22: William E. Zisch, Vice Chairman of the Board of Aerojet General Corp., was sworn in as a part-time consultant to NASA Administrator James E. Webb on technology development and utilization of NASA-developed technology by nonaerospace industries. (NASA Release, 67-8)

. Lifting-body vehicles, with their ability to maneuver and land on conventional runways, might become the spacecraft of the future, J. V. Reistrup suggested in the Washington Post. Because a naval recovery fleet would not be required, space missions could become a day-to-day operation; crews might use the vehicles to inspect foreign spacecraft, repair U.S. satellites, make reconnaissance flights, fly in search and rescue operations, or take replacement crews and supplies up to manned space stations. NASA and USAF had been testing various types of lifting-body vehicles: M2-F2 and HL-10 in piloted glide tests, and a small automated model of SV-5 as part of Prime--Precision Recovery Including Maneuvering Entry--program. (Reistrup, Wash. Post, 1/22/67)

. Growing confidence that U.S. would accomplish a manned lunar landing by 1970 had plunged space planners into an urgent debate over post-Apollo plans, John Wilford wrote in the New York Times. Should the U.S. concentrate on unmanned and manned exploration of Mars or Venus? An expanded lunar-oriented program? Giant manned laboratories in earth orbit for research and surveillance? Networks of communications and meteorological satellites? Or a series of instrument probes to comets, asteroids, and the outer planets? Such questions had opened a searching reexamination into the value of space exploration, and some critics were urging a less ambitious and costly program, with

January 22 (continued)

more emphasis "on the problems that confront us here on earth." While the debate continued, NASA was said to favor concentrating on manned orbiting laboratories that would exploit present technology. Although a broad range of space goals was considered attainable in the next two decades, NASA officials said failure to define post-Apollo objectives soon could cause U.S. to find itself unprepared to achieve any major space goal before the mid-1970's. (Wilford, NYT, 1/22/67, 1)

January 23: New extraterrestrial mineral had been analyzed with electron microprobe and named "niningerite" by ARC geochemists Drs. Klaus Keil and Kenneth Snetsinger. Named for Dr. H. H. Nininger, whose research on meteorites paralleled and confirmed early ARC research on blunt-body reentry shapes, the iron magnesium sulfide mineral was found in six stoney meteorites estimated to be about 4.5 billion years old. (ARC Release; Science, 1/27/67, 451-3)

. Technology Week marked beginning of its 2nd decade of publishing by asking some of the Nation's leading educators, scientists, and engineers to project their goals for technology. AEC Chairman Dr. Glenn T. Seaborg emphasized the need for man to first choose goals for technology: "...we must give more thought to guiding the direction of our technological future.

"...if there are any ultimate goals for technology we will know what they are only when we all agree on the goals of man."

MSFC Director Dr. Wernher von Braun proposed an earth resources management system employing space technology--principally, resource-sensing satellites--to meet the needs of the world's rapidly growing population. Said Dr. von Braun: "...I am firmly convinced that one of the great future contributions of our space program will be in helping to manage more effectively the utilization of our world resources."

In discussing long-delayed peaceful application of nuclear explosions--Project Plowshare--Dr. Edward Teller, Associate Director of Lawrence Radiation Lab., suggested that questions of safety, fear of the unknown, limited nuclear test ban, and international politics were chief obstacles to program. Until these obstacles were removed, Plowshare would continue to lie dormant.

Prof. Isaac Asimov, Boston Univ. School of Medicine, foresaw that mankind, now faced with the practical need for working under low-gravity conditions, would have to develop "low-gravity engineering." Low-gravity engineering might also prove useful in future exploration beneath the sea.

Dr. Joshua Lederberg, Professor of Genetics at Stanford Univ. School of Medicine, proposed that man's central technological goal was the harmonization of his technical goals, a process Dr. Lederberg

January 23 (continued)

called "eutechnics." He went on to declare: "In the eutechnical society, the penultimate crime may become to introduce any technological innovation as a subsystem benefit without analyzing its impact on the whole future of man. The ultimate one would be to deny man his humanity by denying him the chance to think, to know himself."

Dr. Charles S. Draper, head of MIT's Aeronautics and Astronautics Dept., emphasized the need to establish an adequate balance between "directly beneficial" and "remedial" technologies. As air and water pollution, land damage from mining, soil erosion, and other problems become acute, man must give more thought to remedial actions for disturbances inflicted on the environment. Dr. Draper suggested space vehicle technology as "...an excellent model for the technology of overall environmental control for the earth."

Gen. Bernard A. Schriever (USAF, Ret.), former AFSC Commander, believed that the big challenge of the next 25 yrs. would be the effective management of technology for the public good. Schriever suggested that: "the systems management concept [developed in Nation's military and space programs] will be required to bring these technologies to bear on these problems...."

Clarence L. Johnson, Lockheed Aircraft Corp. Vice President, listed 10 aerospace projects which, he felt, should receive major attention during next 20 yrs. Among these projects were use of nuclear power plants in aerial transports to reduce fuel-to-cargo ratios, solution of sonic boom problems, and development of high-density fuels.

Dr. Athelstan F. Spilhaus, dean of Univ. of Minnesota's Institute of Technology, explored the objectives and benefits of geotechnology --use of geophysical and geochemical knowledge "to intervene in the natural processes of our environment on a massive--and even global --scale." Dr. Spilhaus said he believed the public would "...welcome ...an imaginative experiment in city living designed to remove the chores, dirt, delays, and human wastage, and emphasize the opportunities for social, cultural, economic and recreational advantages that high-density living provides."

In final article, TRW Vice Chairman Simon Ramo wrote: "We are in the science era of mankind; we are not yet in the social era of mankind.... A quick look at our society shows that science's greatest challenge now and for the next few decades is for the application of science to human needs." (Tech. Wk., 1/23/67, 32-79)

. U.K. and France had agreed to develop and build a variable-sweep-wing fighter aircraft and three types of helicopters, Aviation Week reported. Development costs were expected to total $560 million. Total world market for the fighter was estimated at 1,000 aircraft; and for the helicopters, 750. (Av. Wk., 1/23/67, 35)

January 23: GEMINI XII Astronaut Edwin E. Aldrin, Jr., speaking to the 15th annual Women's Forum on National Security in Washington, D.C., urged that critics of the U.S. space program be cognizant of its by-products, notably its contributions to science, medicine, and education. "As a parent, I'd think any effort that was beamed at raising the sights of youth would be worth the money," Aldrin said. (Dean, Wash. Eve. Star, 1/24/67, B10)

. France announced plans to launch her fourth satellite from Hammaguir Range Feb. 3 to test tracking device based on the use of laser beams. (UPI, WJT, 1/23/67, 10; UPI, Phil. Eve. Bull., 1/23/67)

. Soviet newspapers revealed that two cities devoted entirely to scientific research were being constructed near Moscow, Theodore Shabad reported in the New York Times. The first, Pushchino, would be devoted entirely to research in biology and related fields; the second, Krasnaya Pakhra, would specialize in earth sciences. (Shabad, NYT, 1/23/67, 1, 8)

January 23-27: Texas Symposium on Relativistic Astrophysics, sponsored by Yeshiva Univ., Univ. of Texas, Southwest Center for Advanced Studies, and NASA's Goddard Institute for Space Studies, was held in New York City. In opening session, Dr. Allan R. Sandage of Mt. Palomar Observatory announced observation of what was apparently the greatest explosion ever recorded by man. Explosion occurred in quasar 3C-446 many millions or billions of years ago, and caused it to increase in brilliance 20-fold in a matter of weeks or months.

Cal Tech's Dr. Maarten Schmidt told conference of a new quasar, PKS 0237-23, that appeared to be farther from earth than any other reported to date. PKS 0237-23, receding at 80% the speed of light, was most remarkable, however, because it displayed two "red shifts" --displacement toward red end of the light spectrum as objects speed away. If both shifts were indicators of velocity, it would mean that part of the quasar was receding from earth 17,000 mps more slowly than the rest.

Dr. Riccardo Giacconi of American Science and Engineering, Inc., and Dr. Sandage reported that second starlike source of intense x rays had been discovered by Oct. 11 sounding rocket and later telescopic observation. Of 30 known x-ray sources, only one had previously been linked to a starlike object. Finding of second source, located in constellation Cygnus, persuaded a number of astronomers that such visible objects represented a new type of celestial phenomenon, perhaps related to the manner in which stars are formed.

Princeton Univ. physicist Dr. Robert H. Dicke revealed an observation that might invalidate Einstein's general theory of relativity. Dr. Dicke told the conference that his experiments showed the sun to be flattened at the poles and that the oblateness was sufficient to

January 23-27 (continued)
explain a significant portion of Mercury's orbital behavior, without recourse to relativity. It was the precise conformity of Mercury's orbit to Dr. Einstein's predictions that was the chief pillar of his theory. "It wouldn't surprise me if general relativity is just plain wrong," Dr. Dicke commented. (NYT, 1/24/67, 22; 1/26/67, 18; 1/28/67, 1, 12; 1/29/67, 62)

January 24: President Johnson's message to Congress on the FY 1968 budget said in part: "In 1961, this Nation resolved to send a manned expedition to the moon in this decade. Much hard work remains and many obstacles must still be overcome before that goal is met. Yet, in the last few years we have progressed far enough that we must now look beyond our original objective and set our course for the more distant future...we have no alternative unless we wish to abandon the manned space capability we have created.

"This budget provides for the initiation of an effective follow-on to the manned lunar landing. We will explore the moon. We will learn to live in space for months at a time. Our astronauts will conduct scientific and engineering experiments in space to enhance man's mastery of the environment...." The President recommended that NASA proceed with the Voyager program for an unmanned landing on Mars in 1973 and continue "other unmanned investigations nearer the earth...

"These new ventures are the result of careful planning and selectivity," Mr. Johnson said. "We are not doing everything in space that we are technologically capable of doing...we are choosing those projects that give us the greatest return on our investment...." (Text, CR, 1/24/67, S755)

. President Johnson submitted his FY 1968 Budget Request to Congress. Total space budget recommended was $7.242 billion. Of this sum, NASA would receive $5.050 billion; DOD, $1.998 billion; AEC, $151.6 million; ESSA, $34.8 million; U.S. Geological Survey, $4.8 million; Agricultural Research Service, $.4 million; and NSF, $2.8 million.

NASA FY 1968 budget would keep Project Apollo on schedule and provide major hardware funding for several new programs: (1) $454.7 million for Apollo Applications (Aa); (2) $71.5 million for Voyager; (3) $68.9 million for Mariner to provide for Mariner/Mars 1971 program; (4) $2 million for five Sunblazer missions to study solar corona; (5) $35.5 million for Applications Technology Satellite (Ats) to provide new configuration with large directable antenna; and (6) $2.3 million for Voice Broadcast Satellite. Funding for aeronautics research almost doubled from $35.9 million in FY 1967 to $66.8 million with most of increase attributable to increased study of X-15 and XB-70 aircraft, hypersonic ramjet, aircraft noise reduction, delta X-15 aircraft, and Sst. Programs terminated or deferred by FY 1968 budget included

January 24 (continued)

Jupiter probe, Surveyor and Lunar Orbiter (no follow-on funds), large solid motor project, Atlas-Agena combination, and new launch vehicle development. $60-$100 million were placed in President's Contingency Fund pending decision on development of Nerva nuclear propulsion system.

Major portions of DOD's space budget would be spent on: (1) Manned Orbiting Laboratory (Mol)--$430 million; (2) Titan III-C launch vehicle; and (3) military comsats. Most of ESSA's funds would support increased activity on satellite sensors and systems in support of World Weather Watch and improved techniques for weather forecasts, river and flood prediction, and other warning services. (Text, NYT, 1/25/67, 20-23; Tech. Wk., 1/30/67, 14-33; Av. Wk., 1/30/67, 23-38)

. Briefing on NASA FY 1968 budget was held at NASA Hq.

NASA Administrator James Webb said: "...I believe that on this budget we can build an excellent foundation for the work that we as a nation will need to do in 1970 and beyond.

"I believe it is a balanced program that makes the best use of the resources that we have created since 1958. I believe it includes those items that enable the Congress and the country to clearly see and judge the issues which are basic to our future in space.

"I believe it assumes success. That is, that it is a minimum budget for the work that is required and does not provide for losses of stages or for unexpected catastrophes such as are always a possibility in this program.

"...finally, I believe that this budget indicates that we have proven in the National Aeronautics and Space Administration that the space capability of this nation can be developed, that this job he is putting in this budget can be done, and I believe it indicates clearly that he believes it is important that we continue to develop our national space capability...." (Transcript)

. Six Nike-Tomahawk sounding rockets launched from KSC carried 134-lb. Marshall/Univ. of Michigan Probe (Mump) instrumented payloads to altitudes up to 206 mi. (331 km.) into the thermosphere. Rockets and equipment functioned satisfactorily and data--including atmosphere density and temperature measurements and ion and electron density measurements--were telemetered to ground; no recovery was attempted. Objective of program was to obtain additional data needed to develop a more accurate model of earth's upper atmosphere for orbital-lifetime and space-vehicle-dynamics analyses. (Marshall Star, 2/1/67, 4; Wash. Post, 1/26/67, A5)

January 24: Dr. James I. Vette, staff scientist at Aerospace Corp.'s Space Science Lab., was named Director of the National Space Science Data Center (NSSDC)--a $1,491,600 central facility for collection, organization, storage, retrieval, and dissemination of space science data obtained from satellites, sounding rockets, balloons, and high-altitude aircraft--nearing completion at GSFC. (NASA Release 67-6)

. New members of House Committee on Science and Astronautics were named: Reps. Jack Brinkley (D-Ga.); Bob Eckhardt (D-Tex.); Larry Winn, Jr. (R-Kan.); Guy Vander Jagt (R-Mich.); Jerry L. Pettis (R-Calif.); Donald E. Lukens (R-Ohio); and John E. Hunt (R-N.J.). (NASA LAR VI/8, 11; Committee Ofc.)

. USAF Avionics Lab., Wright-Patterson AFB, was conducting experiments with 6-mi.-long laser beam to learn how atmospheric conditions affect laser communications, AFSC announced. Experimental results to date indicated that communications were severely limited by fog and heavy rain, although transmissions could penetrate such conditions for a few thousand feet at reduced volume. (AFSC Release 254.66)

. Secretary of State Dean Rusk, in keynote address to annual meeting of House Committee on Science and Astronautics' Panel on Science and Technology, suggested that many of the potential perils of advancing technology might be avoided if a group of experts were impanelled every five years "to explore our technological future.... The values of this type of forecasting to policy judgments is obvious," Rusk said. "In most cases a true technological innovation does not reach full bloom for some years--the first basic patent on the transistor was, after all, issued in 1930...." He recommended that panel members be selected from the natural sciences, the social sciences, and industry. (Text)

. President of Aerospace Industries Assn. Dr. Karl G. Harr, Jr., testifying before Senate Special Subcommittee on Scientific Manpower Utilization, urged that the systems approach--"an extremely high degree of capability to evaluate, plan and do certain complex and difficult things" --be applied beyond the national defense and space effort to "problems connected with improving the quality of American life.... Many of these problems, such as air pollution and water pollution control, relief of traffic congestion, provision of adequate food supply, school systems, housing, and crime control are already fully identified and very much on the front burner of public concern." Harr pointed out the need for experimentation in the application of the systems approach to gain breadth of experience and emphasized that efforts should be aimed at regional, state, and municipal levels. "It remains for us as a nation to find the various political formulae for its application

January 24 (continued)
wherever needed. Whatever the cost it will be far cheaper to solve these problems than not to...." (Testimony)

. At the AIAA Aerospace Sciences Meeting in New York, the 1967 Goddard Award--AIAA's highest--was presented to LRC engineers Irving A. Johnsen and Seymour Lieblein and former LRC engineer Robert O. Bullock for their work 10 yrs. ago which led to development of the transonic compressor for jet-powered aircraft. (LRC Release 67-4)

January 25: XB-70 No. 1 research aircraft was flown by NASA test pilot Fitzhugh Fulton and North American Aviation, Inc., test pilot Van Shepard to mach 1.41 and 35,000-ft. altitude to obtain data on stability and control maneuvers. (NASA Proj. Off.)

. NASA Administrator James E. Webb, testifying at Senate Committee on Aeronautical and Space Sciences' hearings on aeronautical R&D, recommended establishing a "civil aircraft technology" to counteract growing divergence between requirements for civil and military aircraft systems. Webb observed that most modern military aircraft could not be readily redesigned into economical commercial systems: "When unit costs were low and interaction between the elements of the design were small, a manufacturer could afford a substantial element of uncertainty to developing a new airplane, since it was not too difficult or costly to correct deficiencies exposed during flight operations...." With the complexities of modern aircraft, however, deficiencies would lead to "major escalations in cost and could mean financial disaster for a commercial venture.... Economics thus require the designer to take an increasingly conservative approach in applying new and advanced concepts...." This conservatism was causing an increasing gap between "the advanced technology that research indicates is possible and the technology actually being used in commerce. To assure pre-eminence in aeronautics, advanced technology must continually be incorporated into new designs...."

Webb said NASA was working closely with Dept. of Transportation and FAA to identify and solve critical and specialized civil aviation technology requirements. He cited major efforts in supersonic transport field, including work on second-generation propulsion, sonic boom phenomena, and aircraft handling qualities; and study of jet engine noise-suppression problems. (Testimony)

. Orbiting satellites could survive Van Allen radiation belts 10 to 100 times longer than originally estimated if their outer shells were shaped like spheres, Dr. Charles Mack, MIT Lincoln Lab, suggested at AIAA's Aerospace Sciences Meeting in New York. Basing his prediction

January 25 (continued)
on results from new MIT-developed technique to simulate Van Allen belts, Dr. Mack said that radiation would always strike the surface of a sphere at wide angles, improving the chances of scattering and thereby decreasing the amount of absorption. Ideal spacecraft would be 10-ft.-dia. sphere with instrumentation in the core, Dr. Mack said. Most current satellites were smaller and carried instruments near surface. New York Times writer John Wilford reported that GSFC planned to have MIT-type simulator in operation by 1969. (Wilford, NYT, 1/26/67, 10)

. The Washington Post commented on NASA's FY 1968 budget: "Exploration of the moon. Giant orbiting space stations, with as many as a dozen men living and working in them for as long as a year. Unmanned landings on Mars.

"These are the goals the United States has set for itself in outer space in the 1970s. With a budget request for fiscal 1968 of $5.05 billion, more than $500 million of it for dramatic new programs to carry us beyond a manned landing on the moon, President Johnson has made it clear that the United States is in space to stay, no matter what the Soviet Union does or does not do...." (Wash. Post, 1/25/67, A18)

January 26: NASA successfully launched ESSA IV, fourth meteorological satellite in ESSA's Tiros Operational Satellite (Tos) system, from WTR using three-stage Thor-Delta booster. Satellite achieved nearly -polar, sun-synchronous orbit with 888-mi. (1,429-km.) apogee; 822-mi. (1,323-km.) perigee; 113-min. period; and 102° inclination. Wheel orientation maneuver was scheduled for completion during 18th orbit, at which time first photos would be programed and two-week spacecraft checkout and evaluation program would begin.

An advanced version of the cartwheel configuration, 290-lb. ESSA IV carried two Automatic Picture Transmission (Apt) camera systems which would photograph earth's cloudcover and immediately transmit pictures to local Apt ground stations. ESSA IV was replacing ESSA II in the Tos system because orbital drift had severely limited ESSA II's usefulness.

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; and ESSA III, Oct. 2, 1966. (NASA Proj. Off.; ESSA Release 67-17)

. U.S.S.R. launched COSMOS CXXXIX into earth orbit with 210-km. (130-mi.) apogee; 144-km. (89-mi.) perigee; and 50° inclination. Equipment was functioning normally. (Wash. Post, 1/26/67, E1)

January 26: Messages from President Johnson and Japan's Prime Minister Eisaku Sato were exchanged between Washington, D.C., and Tokyo in ceremony inaugurating commercial service via ComSatCorp's INTELSAT II-B ("LANI BIRD II") comsat. In President Johnson's message, delivered by Chairman of the Senate Commerce Committee Warren G. Magnuson (D-Wash.), he said: "The beginning of Pacific satellite service tonight is more than a great technical feat: It is a promise of deeper understanding between the peoples of East and West...." Ceremony also included live color television exchanges and telephone, teletype, facsimile, and photograph transmissions between the two capital cities. INTELSAT II-B was launched by NASA from ETR Jan. 11. (ComSatCorp Release)

. Apollo Applications (Aa) briefing was held at NASA Hq.

Dr. George E. Mueller, Associate Administrator for Manned Space Flight, presented most detailed statement to date on the program. He said plans were to form an "embryonic space station" in 1968-69 by clustering four Aa payloads launched with Uprated Saturn I boosters. First mission would be launch of manned spacecraft, followed several days later by launch of spent S-IVB stage converted into a workshop. After two spacecraft had docked, crew would enter workshop through an airlock. 28 days later they would prepare workshop for storage and return to earth in their spacecraft. In three to six months, second manned capsule would be launched on 56-day mission to deliver resupply module to workshop and rendezvous with unmanned Apollo Telescope Mount (Atm), fourth and last launch in series. Cluster would be joined with multiple docking launched on S-IVB workshop. Emphasizing the importance of manning the Atm, Dr. Mueller said: "...if there is one thing the scientific community is agreed on it is that when you want to have a major telescope instrument in space it needs to be manned.

"First of all you need him to point it. Second, you need him to be able to change the films and so on. Thirdly, you need him to maintain it so when something goes wrong he can fix it instead of having to sit here on the ground and be frustrated by the fact that some little gadget didn't quite trip when it should have...." Dr. Mueller said principle areas toward which $454.7 million FY 1968 post-Apollo effort would be directed were "development of extended flight capability, the conduct of manned astronomical and Earth observations from space, and continued exploration of the Moon." (Transcript; Marshall Star, 2/1/67, 7-8; Clark, NYT, 1/30/67, 2; Reistrup, Wash. Post, 1/27/-67, A7)

. In his annual "defense posture" statement to the Senate Armed Services and Defense Appropriations Committees, U.S. Secretary of Defense McNamara made a determined attempt both to persuade Congress not to insist on a U.S. antimissile defense and to dissuade the U.S.S.R. from continuing her efforts to deploy such a system. McNamara said U.S. and Soviet

January 26 (continued)
nuclear missiles were so effective that neither country could hope to protect itself against the other in time of war, and an increase in defensive capability by one power could easily be offset by an increase in the offensive capability of the other.

A major policy statement by Soviet Defense Minister Malinovsky published in Kommunist had stressed strategic offensive missiles, without referring to U.S.-U.S.S.R.'s burgeoning antimissile defense system. (Frykland, Gwertzman, Wash. Eve. Star, 1/26/67, D3)

January 27: Representatives of 62 nations signed space law treaty (See Dec. 8, 1966) at separate ceremonies in Washington, D.C., London, and Moscow. Notable absentees were Communist China, Albania, and Cuba. Representatives of France said they would sign after studying treaty further. At White House ceremony, attended by Soviet Ambassador Anatoly Dobrynin, British Ambassador Sir Patrick Dean, and U.S. Ambassador to the U.N. Arthur Goldberg, President Johnson described treaty as the "first firm step toward keeping outer space free forever from the implements of war" and said it would assure that American and Soviet astronauts "will meet someday on the moon as brothers and not as warriors." Treaty, which limited military activities in space, had been agreed upon by U.S. and U.S.S.R. Dec. 8, 1966, and unanimously approved by U.N. General Assembly Dec. 19. It would become effective when ratified by U.S., U.S.S.R., U.K., and two other countries. (Kilpatrick, Wash. Post, 1/28/67, 1; Frankel, NYT, 1/28/67, 1)

. Three-man crew for NASA's first manned Apollo spaceflight (AS-204) died, apparently instantly, when flash fire swept through their Apollo I spacecraft mated to an Uprated Saturn I booster 218 ft. above the ground. Crew was Virgil I. Grissom, one of seven original Mercury astronauts; Edward H. White II, first American to walk in space; and Roger B. Chaffee, preparing for his first spaceflight. Accident, worst in the history of the U.S. space program, occurred at 6:31 p.m. EST at KSC's Launch Complex 34 during first major rehearsal for scheduled Feb. 21 mission.

Immediately after tragedy, MSC Director Dr. Robert Gilruth, Chairman of the Board of North American Aviation, Inc., Lee Atwood, and NASA's Apollo Program Director M/G Samuel C. Phillips flew to KSC from Washington, D.C. General Phillips described the accident at a press conference Jan. 28: "The facts briefly are: at 6:31 p.m. (EST) the observers heard a report which originated from one of the crewmen that there was a fire aboard the spacecraft..." At T-10 and holding in the countdown, observers saw a "flash fire" break out inside the spacecraft, penetrate its shell, and surround its exterior with smoke. Rescue workers rushed to the pad area but could not open the hatch for five minutes. Phillips

January 27 (continued)
said astronauts' only hope of escape would have been to open hatch manually with a crank tool. He refused to speculate on how long accident would delay the Apollo program or on source of the fire, but admitted that "if there is an ignition source...in pure oxygen this, of course, has flash-fire potential." His statement that spacecraft was operating on internal power when fire broke out was corrected Feb. 3 by NASA Deputy Administrator Dr. Robert C. Seamans: "The fuel cells in the service module were not in use, and the so-called internal power was being supplied by batteries having the same characteristics as the fuel cells but located external to the spacecraft."

NASA immediately appointed a board of inquiry (see Jan. 28) and announced that all data had been impounded pending its formal investigation. Unmanned Apollo flights would proceed on schedule, but manned flights were postponed until board's inquiry was completed. Apollo I backup crew--Walter M. Schirra, Jr., Donn F. Eisele, and Walter Cunningham--were expected to be named prime crew for rescheduled mission. (NASA Proj. Off.; NASA Release 67-16; NYT, 1/28/67, 1, 18; 1/29/67, 1, 48, E1; Wash. Post, 1/28/67, A1, A7; 1/29/67, A1, A18; Wash. Eve. Star, 1/28/67, A1, A4; Wash. Sun. Star, 1/29/67, A1, A6)

. NASA awarded Boeing Co. net bonus of $1,895,312 in accordance with incentive contract provisions for superior performance of LUNAR ORBITER I spacecraft. Boeing Co. was prime contractor for LUNAR ORBITER I, launched by NASA Aug. 10, 1966, on mission to orbit the moon and photograph possible landing sites for Apollo astronauts. (NASA Release 67-14)

. JPL issued Rfp's to industry on contracts for preliminary design and definition studies of an unmanned Voyager landing capsule. Two identical Voyager spacecraft would be launched by a single Saturn V booster in 1973 and 1975 to conduct scientific studies of Mars and search for extraterrestrial life. From the industrial proposals, due in March, two to four contractors would be chosen. (NASA Release 67-15)

. U.S.S.R. was definitely trying to achieve the first manned lunar landing, concluded a 920-page report on the Soviet space program prepared by Library of Congress Legislative Reference Service for Senate Committee on Aeronautical and Space Sciences. "...materials gathered from Soviet sources on future lunar missions reveal this pattern of complete unanimity: the lunar mission is desirable and necessary; it must be a manned mission; it is certain to succeed...." Report characterized Soviet space program as "well-planned, orderly, and vigorously pursued with concentration on specific, limited objectives, each achieving a marked advance beyond the one preceding." There was said to be no

January 27 (continued)
evidence "of either Soviet disenchantment with the program or a desire ...to cut it back. On the contrary, space specialists have underscored the durability of the Soviet commitment to space exploration...." Report was entitled: Soviet Space Programs, 1962-65; Goals and Purposes, Achievements, Plans, and International Implications. (Text)

January 28: NASA Deputy Administrator Dr. Robert C. Seamans, Jr., appointed Apollo 204 Review Board to investigate Jan. 27 accident at KSC which killed Astronauts Virgil I. Grissom, Edward H. White II, and Roger B. Chaffee: Dr. Floyd L. Thompson, Director of LaRC, Chairman; Astronaut Frank Borman, MSC; Maxime Faget, MSC; E. Barton Geer, LaRC; George Jeffs, North American Aviation, Inc.; Dr. Frank A. Long, Cornell Univ.; Col. Charles F. Strang, Norton AFB, Calif.; George C. White, Jr., NASA Hq.; and John Williams, KSC. Three advisory members were added later: Charles W. Mathews, Director of Saturn/Apollo Applications, NASA Hq. OMSF; John Yardley, McDonnell Co. executive; and L/Col. William D. Baxter (USAF). LaRC Chief Counsel George Mallay would serve as counsel to the board. (NASA Release 67-16; Wilford, NYT, 1/30/67, 2)

. Senate Aeronautical and Space Sciences Committee would conduct a "full review" of the Jan. 27 accident at KSC which killed three Apollo astronauts, Chairman Clinton P. Anderson (D-N.Mex.) announced. (NYT, 1/29/67, 47; Wash. Post, 1/29/67, A18)

. The Nation mourned the deaths of NASA Apollo Astronauts Grissom, White and Chaffee.

President Johnson: "Three valiant young men have given their lives in the nation's service. We mourn this great loss and our hearts go out to their families."

Vice President Humphrey: "The deaths of these three brilliant young men...is a profound and personal loss to me.... The United States will push ever forward in space and the memory of the contributions of these men will be an inspiration to all future space-farers."

NASA Administrator James Webb: "We've always known that something like this would happen sooner or later, but it's not going to be permitted to stop the program.... Although everyone realized that some day space pilots would die, who would have thought the first tragedy would be on the ground?"

Former President Eisenhower: "The accident that took the lives of three of our highly trained, skilled and courageous American astronauts is a tragic loss to our entire nation...." (UPI, Wash. Eve. Star, 1/28/67, 1; AP, NYT, 1/29/67)

January 28: New York Times praised signing of space law treaty and suggested further cooperation in space.

"Surely the present is an appropriate time for another effort ...the President could suggest to the Soviet Union that a precedent from Antarctic practice be followed in the future. Both the United States and the U.S.S.R. plan in the next few years to orbit capsules containing more than three astronauts and to put exploratory parties of men on the moon for stays of several weeks' duration.

"It would be in the spirit of the Space Treaty to have such groups contain at least one representative of the other nation, just as in the Antarctic today Soviet and American scientists work at each other's bases. Agreement on such a first step would do much to build the mutual trust and confidence needed to make possible the far greater degree of international cooperation that the inexhaustible challenges of space require of all nations." (NYT, 1/28/67, 26C)

. Continuing shortage of physicists was threatening the Nation's scientific progress, American Institute of Physics warned in its biennial report on physics manpower. Study, prepared under an NSF grant, said U.S. colleges and universities were not producing enough graduates to meet growing demand of education, research, and industry. In recent years--during a time of rapid growth in total college enrollment----there had been a continuing decline in the number of physics majors and a leveling off of physics baccalaureate degrees awarded. (NYT, 1/29/67, 1)

. Communist China charged that U.S.S.R. had betrayed Vietnamese people by signing space law treaty with U.S. and other nations Jan. 27. (Reuters, NYT, 1/29/67, 9)

January 28-29: Press commentary on deaths of Astronauts Grissom, White, and Chaffee.

Washington Evening Star: "There is bitter irony in the fact that the first disaster in our space program came during a simulated launch, a checkout in preparation for the real thing. From the beginning, it has been feared that some fatal mishap was inevitable. But most people had expected it during an actual launch, in space, during re-entry or in landing--hardly during a routine test with the rocket still on its pad...." (Wash. Eve. Star, 1/28/67, A6)

New York Times: "By chance, Grissom, White and Chaffee died on the day the space treaty was formally signed in Washington, London, and Moscow. Behind the unprecedented international cooperation represented by that treaty's conclusion was the knowledge that space

January 28-29 (continued)
holds more than enough risks for men without adding the horrors arising from strife among nations. The tragedy at Cape Kennedy underlines that somber reality." (NYT, 1/29/67, 10E)

Baltimore Sun: "They were brave men. When a man finally does put a foot on the surface of the moon, Grissom and White and Chaffee will be notable among those who assisted him in getting there." (Balt. Sun, 1/29/67, 30)

. Most Soviet reporting of Jan. 27 flash fire in which three Apollo astronauts died was factual. A few members of Soviet and Italian press, however, charged that "haste" had contributed to the accident.

Radio Moscow: "We in the Soviet Union are deeply grieved at the news of the tragedy at Cape Kennedy.

"The courage of Virgil Grissom, Edward White, and Roger Chaffee had won our esteem and we join in paying homage to their memories...."

Trud (Moscow): "The astronauts became the victims of the space race created by the leaders of the United States space program. Recently, the hurry, the haste in space flights has continued to grow. There were a number of flaws in the Apollo system."

La Stampa (Turin, Italy): "Technical revisions must be brought about so that the tragedy will not repeat itself...perhaps the rigorous time schedule...ought to give way to slower and more secure rhythm."

Il Popolo (Rome). The accident offered "questions for reflection, above all an invitation to weigh in proper measure the margin of risk that accompanies all the conquest of man.... It is ironic that this happened, just when any danger seemed to be less proximate, during a normal exercise on earth." (AP, NYT, 1/30/67, 2, 3; AP, Balt. Sun, 1/30/67; Trud, 1/29/67, 3, USS-T Trans.)

January 29: Memorial service for Astronaut Roger B. Chaffee was held in Houston. Among those attending were Dr. Wernher von Braun, Director of MSFC; Dr. Robert Gilruth, Director of MSC; and Dr. George E. Mueller NASA Associate Administrator for Manned Space Flight. (Bloom, Wash. Post, 1/30/67)

. Greatest damage to Apollo I spacecraft in which three astronauts died in Jan. 27 flash fire seemed to have occurred near point where electrical cables from launch pad entered cabin, reported Aviation Week writer George Alexander, who represented news media when NASA authorized one person to visit KSC's Launch Complex 34. Alexander said the spacecraft "looked like the inside of a furnace...the interior ...is a darkened, dingy compartment. Its walls are covered with a slate-gray deposit of smoke and soot; its floor and couch frame are

January 29 (continued)
covered with ashes and debris--most of it indeterminate...." (UPI, NYT, 1/30/67; Wash. Post, 1/30/67, A1, A2; Wash. Eve. Star, 1/30/67, A1, A3)

January 30: Separate memorial services were held in Houston for Astronauts Virgil I. Grissom and Edward H. White II. Among those attending were Dr. Wernher von Braun, Director of MSFC; Dr. Robert Gilruth, Director of MSC; Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight; Astronaut Alan Shepard; and former Astronaut John Glenn. (Hines, Wash. Eve. Star, 1/30/67, 1)

. NASA had awarded Electro Optical Systems, Inc., a $2-million contract for design, fabrication, and testing of the power subsystem for the 1969 Mariner Mars mission. (NASA Release 67-17)

. Princeton Univ. physicist Dr. Roman Smoluchowski told annual meeting of American Physical Society in New York that huge amounts of energy emitted by Jupiter--three times the amount it received from the sun --could be accounted for by a gradual shrinking of the planet. Dr. Smoluchowski said that Jupiter was losing gravitational energy because it was shrinking about 1/50th of an inch a year, and that it was this lost energy that it was emitting. Shrinkage was occurring, he reported, because liquid and solid molecular forms of hydrogen, which comprise planet's outermost layer, were gradually being compressed into metallic hydrogen, which comprises the next innermost layer. Rate of compression, according to Dr. Smoluchowski's calculations, would yield just the right amount of shrinkage to account for the observed amount of energy Jupiter emits. (NYT, 1/31/67, C52)

. U.S.S.R. had perfected and tested an antimissile device that used x rays generated by a nuclear blast to paralyze or disintegrate incoming missiles hundreds of miles from their targets, U.S. News & World Report said. There was no comment from DOD. (U.S. News, 1/67)

January 30-31: NASA launched 18 sounding rockets in sets of two at two-hour intervals from Churchill Research Range and Pt. Barrow, Alaska, between 6:15 p.m. and 8:20 a.m. EST to gather meteorological data between 12- and 124-mi. altitudes. 12 Nike-Apaches launched from Churchill ejected vapor cloud experiments between 43- and 124-mi. altitudes; drift of vapor trails was recorded photographically to obtain data on wind directions and speeds. 6 Nike Cajuns launched from Pt. Barrow carried acoustic grenades which were ejected and

January 30-31 (continued)
detonated at programed altitudes to provide correlative data on atmospheric conditions. Experiment series was being conducted by GSFC under OSSA direction. (NASA Release 67-13)

January 31: Nike-Apache sounding rocket carrying 55-lb. payload to obtain electron density profile was launched from NASA Wallops Station to 121-mi. (193-km.) altitude. Minutes later, Nike-Cajun grenade experiment was launched over the Atlantic for atmosphere temperature support data at 50- to 56-mi. (80- to 90-km.) altitudes. Launchings, first two in series of three to study relation of high absorption radio waves in ionosphere to seasonal temperature variations in upper atmosphere, were conducted by NASA for Univ. of Illinois, GCA Corp., and GSFC. Rockets and equipment functioned satisfactorily. (Wallops Release 67-4)

. XB-70 No. 1 research aircraft was piloted by NASA test pilot Fitzhugh Fulton and Col. Joseph Cotton (USAF) to mach 1.35 and 37,000-ft. altitude to conduct stability and control maneuvers. (NASA Proj. Off.)

. Ninth anniversary of first U.S. satellite, EXPLORER I. In defiance of the original predicted lifespan that should have ended six years ago, the satellite was circling the earth 14 times daily and had completed 43,000 orbits. (MSFC Release 67-17)

. President Johnson transmitted his annual Report to the Congress on United States Aeronautics and Space Activities.

He wrote in covering letter: "America's space and aeronautics programs made brilliant progress in 1966. We developed our equipment and refined our knowledge to bring travel and exploration beyond earth's atmosphere measurably closer. And we played a major part in preparing for the peaceful use of outer space...." The President cited accomplishments of NASA's Gemini, Lunar Orbiter, and Surveyor programs and noted that during 1966 U.S. had put into earth orbit or escape missions 100 spacecraft--"a record number of successful launches for the period. We launched weather satellites, communications satellites and orbiting observatories....

"These accomplishments--and the promise of more to come--are the fruits of the greatest concerted effort ever undertaken by any nation to advance human knowledge and activity. Space, so recently a mystery, now affects and benefits the lives of all Americans...."

In separate chapter, National Aeronautics and Space Council (NASC) said that although U.S. continued to lead space technology competition in number and variety of successful missions, "USSR maintains its lead in weight of payloads orbited.... Certainly the hiatus in Soviet manned space activity during 1966 is no basis for complacency

January 31 (continued)

on our part as their preparations for future flights appear to be ambitious and the resources being devoted to space competence and performance are absolutely and relatively impressive."

Dept. of State said it was pleased to be able to forward SURVEYOR I and LUNAR ORBITER I photos to missions abroad for appraisal by foreign scientists. It also said foreign reaction to receiving cloud-cover photos from U.S. satellites in Automatic Picture Transmission (Apt) system had been "encouraging." (Text)

. Flash fire swept through oxygen-filled pressure chamber at Brooks AFB, Tex., killing Airman 2/C William F. Bartley, Jr., and Airman 3/C Richard G. Harmon in accident similar to the one Jan. 27 which killed three Apollo astronauts at KSC. Fire struck at 9:45 a.m. EST, about 12 min. after airmen had entered the chamber to take blood samples from rabbits under observation to determine effects of pure oxygen on the blood. Cabin pressure was brought down to ground level within 13 sec. after fire had ignited, but both men died from burns within several hours. Col. James B. Nuttall, commander of USAF School of Aerospace Medicine, said there were no plans to change research methods because of accident. "As you have seen, it is not safe," but he said one-gas systems were less complicated and more reliable than two-gas systems. (AP, Wash. Eve. Star, 2/1/67, A3; O'Toole, Wash. Post, 2/1/67, 1)

. Eric Severeid offered a eulogy on CBS-TV News for three Apollo astronauts who died at KSC Jan. 27: "Grissom and White and Chaffee --mortals who aspired to the moon and eternal space--were returned to the earth today from which they came and to which we all belong.

"They had lived life more intensely in a very few years than most of us do in our lifetimes and they shall be remembered far longer.

"They were among the men who wield the cutting edge of history and by this sword they died....

"We are told they will be replaced. This only means that other such men will take their places. The three cannot be replaced. There never was a replaceable human being." (Text)

. Funeral services were held for Apollo astronauts who died in Jan. 27 flash fire at KSC. All three men were buried with full military honors: Virgil I. Grissom (L/Col., USAF) and Roger Chaffee (LCdr., USN) at Arlington National Cemetery, and Edward H. White II (L/Col., USAF) at West Point. President Johnson and hundreds of dignitaries attended services at Arlington; Mrs. Johnson and Vice President Humphrey were among the attendants at West Point. (Hines, Wash. Eve. Star, 1/31/67, A1, A6; Secrest, Wash. Post, 2/1/67, B1; Casey, Wash. Post, 2/1/67, A1, A4)

January 31: British government awarded Manchester Univ. a $126,000 grant to design a successor to radiotelescope at Jodrell Bank Experimental Station. New radiotelescope would have an aerial dish 400 ft. in dia., and would cost about $11.2 million to build. (AP, Wash. Eve. Star, 2/1/67, A3; AP, NYT, 2/2/67, 2)

During January: Edgar M. Cortright, NASA Deputy Associate Administrator for Space Science and Applications, reviewed in Astronautics & Aeronautics the achievements of U.S. unmanned spacecraft: "For exploring the farthest reaches of space, for probing its most unknown and hazardous regions, for continuous monitoring of many diverse phenomena, for day-in, day-out practical utility, and as precursors of all space activity, automated spacecraft remain without peer." Among unmanned spacecraft worthy of future development, Cortright named Voyager, Mariner, a Jupiter probe, a new Applications Technology Satellite (Ats), a Synchronous Meteorological Satellite, a Voice/TV Broadcast Satellite, and a Navigation Satellite. (A&A, 1/67, 22-8)

. Dr. Karl G. Harr, Jr., President of the Aerospace Industries Assn., emphasized the importance of U.S. space effort to our total national interest in Aerospace: "As a nation...we have probably never learned as much in so short a length of time as from our space effort.... Leaving aside the advantages in scientific knowledge, national prestige, defense insurance, domestic economics, and everything else, the task of conquering space requires far and away the greatest technological reach man has ever attempted.... As it has in the past, this will set the pace for our total national technological advance. Every aspect of our national life which is influenced in any degree by such advances will be the beneficiary." Harr cited a range of future alternatives that would extend the Nation's technological reach: (1) more ambitious, wholly automated program, including extraterrestrial probes and new applications for earth-orbiting spacecraft; (2) expanded manned spacecraft program which might involve construction of a "permanent" space station or a manned lunar base; and (3) manned expedition to Mars. (Aerospace, 1/67, 2-7)

. Wall Street Journal staff reporters interviewed experts in many fields for series of articles on probable developments between 1967 and 2000. Jonathan Spivak, in lead-off article, reported that MSFC Director Dr. Wernher von Braun and more than a score of prominent U.S. scientists and engineers were making optimistic forecasts of future U.S. space achievements. Insufficient money and lack of nuclear rockets could present serious problems, yet most space experts foresaw the following major possibilities for the next few decades: (1) Early 1970's:

During January (continued)

Extended lunar exploration by astronauts; earth orbital flights of three months' duration to determine effects of prolonged weightlessness. (2) Mid-1970's: Landing of unmanned spacecraft on Mars to search for signs of life; launching of first civilian space station; operation of satellite systems to aid civilian ship and aircraft navigation and to survey earth's natural resources; development of improved comsats; use of meteorological satellites to produce accurate long-range global weather forecasts. (3) Late 1970's: First flight of six-man spacecraft, circling Mars and returning to earth in 600 days; orbiting of giant astronomical telescope above earth's atmosphere; establishment of semi-permanent base on moon. (4) Mid-1980's: Landing of men on Mars for 10-20 days of exploration. (5) The 1990's: Launching of unmanned probes to Jupiter, Saturn, and perhaps other planets; longer-duration astronaut exploration of Mars; maintenance of small colony on moon; manned flights around Jupiter and Saturn.

Jerry Bishop, focusing specifically on electronic communications in second article, said that researchers were envisioning creation of a vast network of facilities over the next three decades that would use present technology--notably, comsats--to make instant audio, visual, and facsimile transmissions available worldwide. Same network would also enable computers to exchange information with each other and communicate with users located elsewhere. Although such services were not considered economically feasible at present, communications experts expressed confidence that demand for picture phones and facsimile would be high enough and costs low enough to bring about wide-spread introduction of the services before the end of the century. (Spivak, WSJ, 1/6/67, 1; Bishop, WSJ, 1/16/67, 1)

. Press commented on President Johnson's failure to authorize Sst prototype construction.

New York Times: "Now the basic size and shape of the plane have been settled.... Yet neither [company] has been told when to quit refining the designs that resulted from a three-year, Government-sponsored competition and begin 'cutting metal' on flight test models --a step that had been expected on Jan. 1. The companies can take only intermediate steps until the President and the Congress decide how fast the plane should be built, how industry and Government are to divide the financial risk, and whether another, smaller plane should be built for domestic routes...." (Clark, NYT, 1/8/67, E2)

Wall Street Journal: "President Johnson evidently has decided to postpone for some time the $4.5 billion [Sst] program.... This decision ...hasn't been publicly disclosed, but is nonetheless obvious to Congressional and Administration officials.... ' How long the delay will last

During January (continued)

depends on whether it has resulted solely from current budget pressures generated by the Vietnam war or is based on a belief that the growing criticism of the SST--as an allegedly costly and technically unsound project that will 'benefit the jet set' and be an 'ear shattering' nuisance to everyone else--is justified." (Zimmerman, WSJ, 1/3/67, 2)

Washington Evening Star: "Competitors in the SST sweepstakes had been hoping...that the winner would receive the green light to build a flyable prototype airplane right away. What Boeing and GE got instead, was a month-to-month commitment to do more of what they have been doing for 2½ years--study, design, analyze.... One thing is certain about the SST program at this point: there will be no big new government funding until fiscal 1969 at the earliest." (Hines, Wash. Eve. Star, 1/2/67, A10)

. An advanced concept in solid rocketry was demonstrated when Lockheed Propulsion Co. static-fired large-scale motor with two interconnected combustion chambers for 7.5 min. Firing--longest ever achieved by high-performance solid-propellant gas generator--was 80% successful. Lockheed Vice President Kenneth H. Jacobs commented: "The firing demonstrates the feasibility of a large-scale, all-solid rocket propulsion system for spacecraft attitude control and trajectory adjustment." (Marshall Star, 2/1/67, 5)

. Sen. Edward W. Brooke (R-Mass.) and Sen. Charles H. Percy (R-Ill.) were assigned to vacancies on the Senate Committee on Aeronautical and Space Sciences created by the resignations of Harry F. Byrd, Jr. (D-Va.), and Sen. George D. Aiken (R-Vt.). (Senate Comm.)

. McDonnell Co. and Douglas Aircraft Co. announced plans to "proceed immediately" with merger negotiations. (WSJ, 1/16/67, 2)

PROVISIONAL INDEX-JANUARY

Aa. See Apollo Applications.
AAS. See American Astronautical Society.
Accident, 4, 7, 18, 29-30, 31, 32, 33, 34, 36
Advanced Research Projects Agency (ARPA), 4
AEC. See Atomic Energy Commission.
AEDC. See Arnold Engineering Development Center.
Aerojet General Corp., 19
Aerospace Corp., 25
Aerospace Industries Assn., 25, 37
Aerospace industry, 2
AFSC. See Air Force Systems Command.
AIAA. See American Institute of Aeronautics and Astronautics.
AIAA/AAS Space Forum, 6
AIAA Aerospace Sciences Meeting, 26
Aiken, Sen. George D., 39
Aircraft, 2, 4, 6, 7, 11, 13, 15, 16, 17, 18, 21, 23, 26, 35
Aircraft, supersonic transport (Sst), 3, 7, 9, 11, 16-17, 17-18, 23, 26, 38-39
Air Force Systems Command (AFSC), 11, 21, 25
Albania, 29
Aldrin, L/C Edwin E., Jr. (USAF), 16, 22
Alexander, Charles C., 14
Alexander, George, 33
American Astronautical Society (AAS), 6
American Institute of Aeronautics and Astronautics (AIAA), 6, 26
American Institute of Physics, 32
American Physical Society, 34
American Science and Engineering, Inc., 22
Ames Research Center (ARC), 20
Anderson, Sen. Clinton P., 18, 31
Anniversary, 2, 13, 35
Antarctica, 3, 9, 32
Antimissile missile system, 9, 13, 28-29, 34
Apollo (program), 10, 12, 18, 23, 29-30
Apollo (spacecraft), 6, 29-30
Apollo (AS-204) accident, 29-30, 31, 32, 33, 34, 36
Apollo Applications (Aa), 14, 23, 28
Apollo (AS-204) Review Board, 31
Apollo Telescope Mount (Atm), 28, 38
Applications Technology Satellite (Ats), 23, 37
Apt. See Automatic Picture Transmission.
ARC. See Ames Research Center.
Aristarchus (moon crater), 2
Arizona, 11
Arlington National Cemetery, 36
Armed Forces Reserves Joint Assembly, 5

I N D E X

Arnold Engineering Development Center (AEDC), 10
ARPA. See Advanced Research Projects Agency.
Asimov, Dr. Isaac, 20
"Astromouse", 6
Astronaut, 2, 6, 16, 22, 23, 29-30, 31, 32, 33, 34, 36, 38
Astronautics and Aeronautics, 37
Astronomy, 7, 22, 28, 37, 38
Astrophysics, 22-23, 34
Atlantic Ocean, 10, 35
Atlas (missile), 5
Atlas-Agena (booster), 24
Atm. See Apollo Telescope Mount.
Atomic Energy Commission (AEC), 2, 4, 20, 23
Ats. See Applications Technology Satellite.
Atwood, Lee, 29
Australia, 4, 10
Automatic Picture Transmission (Apt), 27, 36
Aviation Daily, 16
Aviation Week, 2, 9, 21, 33
Aviatsiya i Kozmonavtika, 19
Award, 9, 15, 26, 30
Balloon, 11, 25
Baltimore Sun, 18, 33
Bartley, Airman 2/C William F., Jr., 36
Baxter, L/C William D. (USAF), 31
Bell Aerosystems Co., 18
Bishop, Jerry, 38
Black Arrow (rocket), 4
Boeing Co., 7, 30, 39
Boeing 707 (jetliner), 3
Borman, L/C Frank (USAF), 31
Boston Univ. School of Medicine, 20
Bow, Rep. Frank T., 11
Boyd, Alan S., 11
Brinkley, Rep. Jack, 25
Brooke, Sen. Edward W., 39
Brooks AFB, Tex., 36
Bryce Canyon National Park, Utah, 11
Bullock, Robert O., 26
Burgess, E. H., 7
Burroughs, Richard Hansford, Test Pilot Award, 9
Byrd, Sen. Harry F., Jr., 39
C-5A (cargo transport), 15
California, Univ. of, 18
California Institute of Technology (Cal Tech), 22
Cal Tech. See California Institute of Technology.
Calvo Rodes, Gen. Rafael, 2

I N D E X

Canada, 34
Canyon de Chelly National Monument, Ariz., 11
Cape Kennedy, Fla., 33
Carpenter, Cdr. M. Scott (USN), 16
Central Intelligence Agency (CIA), 12
Chaffee, LCdr. Roger B. (USN), 29-30, 31, 32, 33, 36
Chicago Tribune, 2
China, Communist, 12, 19, 29, 32
Chlorophyll, 18
Churchill Research Range, Canada, 34
CIA. See Central Intelligence Agency.
Cliff dwellings, sonic boom damage, 11
Colorado, 11, 16
Comision Nacional de Investigacion del Espacio (CONIE), 2
Communications Satellite Corp. (ComSatCorp), 8, 10, 18, 28
Computer, 38
ComSatCorp. See Communications Satellite Corp.
Concorde (U.K.-France) supersonic transport, 3, 7, 9
Congress, 8, 18, 23, 24, 28, 38
    Joint Congressional Committee on Atomic Energy, 12
Congress, House
    Committee on Science and Astronautics
        Panel on Science and Technology, 25
Congress, Senate
    Committee on Aeronautical and Space Sciences, 18, 26, 30, 31, 39
    Committee on Armed Services, 28-29
    Committee on Commerce, 11, 28
    Committee on Defense Appropriations, 28-29
    Committee on Labor and Public Welfare
        Special Subcommittee on Scientific Manpower Utilization, 25
CONIE. See Comision Nacional de Investigacion del Espacio.
Contract, 9, 11, 12, 18, 30, 34
Cornell Univ., 31
Cortright, Edgar M., 5, 37
Cosmonaut, 3, 19
COSMOS CXXXVIII, 17
COSMOS CXXXIX, 27
Cotton, Col. Joseph (USAF), 13, 15, 35
Cuba, 4, 29
Cunningham, Walter, 30
Cygnus (constellation), 22
Daily Mail, 4
David, Heather M., 3
Dean, Ambassador Sir Patrick, 29
Defense, Dept. of, 4, 16, 17, 23-24, 28, 34
Delta, Thrust Augmented Improved (booster), 10
Detroit, Mich., 15

I N D E X

Dicke, Dr. Robert H., 22
Dirksen, Sen. Everett M., 13
Dobrynin, Ambassador Anatoly, 29
DOD. See Defense, Dept. of.
Dollfus, Dr. Audouin, 7
Douglas Aircraft Co., Inc., 6, 18, 39
Douglas DC-8 (jetliner), 3
Draper, Dr. Charles S., 21
Earth resources management system, 20
Eastern Test Range (ETR), 10, 16, 28
Eckhardt, Rep. Bob, 25
Edwards AFB, Calif., 4, 7, 13, 15
Eglin AFB, Fla., 4, 14
Einstein, Dr. Albert, 22-23
Eisele, Maj. Donn F. (USAF), 30
Eisenhower, President Dwight D., 31
Electro-Optical Systems, Inc., 18, 34
Environmental Science Services Administration (ESSA), 23-24, 27
ESSA. See Environmental Science Services Administration.
ESSA I (meteorological satellite), 27
ESSA II, 27
ESSA III, 27
ESSA IV, 27
ETR. See Eastern Test Range.
"Eutechnics", 21
EXPLORER I (U.S. satellite), 35
EXPLORER XXXIII, 14
Explosion
    nuclear, 4
    quasar 3C-446, 22
Extraterrestrial life, 7-8, 9, 13, 18
F-100 (Super Sabre), 17
F-111A (supersonic fighter), 18
FAA. See Federal Aviation Agency.
Faget, Maxime, 31
FCC. See Federal Communications Commission.
Federal Aviation Agency (FAA), 3, 7, 11, 26
Federal Communications Commission (FCC), 8, 18
Finger, Harold B., 7
Flight Research Center (FRC), 18
Flight Safety Foundation, 9
Florida, 4, 14
France, 3, 11, 17, 21, 22, 29
Franklin Award, 15
FRC. See Flight Research Center.
Fulton, Fitzhugh, 4, 15, 26, 35

I N D E X

GAO. See Government Accounting Office.
GCA Corp., 35
Geer, E. Barton, 31
Gemini (program), 10, 35
GEMINI XII, 22
General Electric Co., 7, 39
Geotechnology, 21
Giacconi, Dr. Riccardo, 22
Gilruth, Dr. Robert, 29, 33, 34
Glenn, Col. John H., Jr. (USMC, Ret.), 34
Goddard Award, 26
Goddard Institute for Space Studies, 22
Goddard Space Flight Center (GSFC), 14, 25, 27, 35
Goldberg, Ambassador Arthur J., 29
Gordon, Mitchell, 3
Government Accounting Office (GAO), 17
Grimwood, James M., 14
Grissom, L/C Virgil I. (USAF), 29-30, 31, 32, 33, 34, 36
GSFC. See Goddard Space Flight Center.
Halaby, Najeeb, 16
Hammaguir Range, Algeria, 8, 22
Hammarskjold, Knut, 9
Harmon, Airman 3/C Richard G., 36
Harper, Charles, 15
Harr, Dr. Karl G., Jr., 25, 37
Hawaii, 10
Helicopter, 21
Helms, Richard, 12
HL-10 (lifting-body vehicle), 19
Holloman AFB, N. Mex., 17
Hootman, Dr. James A., 16
Houston, Tex., 33
Hughes Aircraft Co., 11, 18
Humphrey, Vice President Hubert H., 31, 36
Hunt, Rep. John E., 25
Hynek, Dr. J. Allen, 15
Hypersonic aircraft, 11, 23
IATA. See International Air Transport Assn.
Idcsp. See Initial Defense Communications Satellite Program.
Illinois, Univ. of, 35
Initial Defense Communications Satellite Program (Idcsp), 16
INTELSAT I ("EARLY BIRD") (communications satellite), 11
INTELSAT II-A ("LANI BIRD"), 10
INTELSAT II-B ("LANI BIRD II"), 10, 28
International Air Transport Assn. (IATA), 9
International Aviation Club, 17

I N D E X

Italy, 33
Jacobs, Kenneth H., 39
Japan, 10, 28
Jeffs, George, 31
Jet Propulsion Laboratory (JPL), 7, 12, 30
Jodrell Bank Experimental Station (U.K.), 37
Johnsen, Irving A., 26
Johnson, Clarence L., 21
Johnson, Dr. Fred M., 18
Johnson, Mrs. Lyndon B., 36
Johnson, President Lyndon B., 9, 11, 13, 16, 23, 27, 28, 31, 35, 36, 38
Jones, Stacy V., 7
JPL. See Jet Propulsion Laboratory.
Jupiter (planet), 5, 24, 34
Keck, George E., 17
Kein, Dr. Klaus, 20
Kemmett, Francis W., 16
Kennedy Space Center (KSC), 24, 29-30, 31, 33, 36
Kepler (moon crater), 2
Kommunist, 29
Komsomolskaya Pravda, 6
Korolev, Sergey, 13
Kozyrev, Nikolay, 2
Krasnaya Pakhra, U.S.S.R., 22
KSC. See Kennedy Space Center.
Lake St. Clair, Mich., 15
Langley Research Center (LaRC), 18, 31
LaRC. See Langley Research Center.
Laser, 14, 22, 25
La Stampa, 33
Lasv. See Low-altitude supersonic vehicle.
Launch Complex 34, KSC, 29, 33
Lawrence Radiation Laboratory (Univ. of Calif.), 20
Lederberg, Dr. Joshua, 20
Lewis, Dr. Henry, 14
Lewis Research Center (LRC), 15, 26
Library of Congress
    Legislative Reference Service, 30
Lieblein, Seymour, 26
Lifting-body vehicle, 19
Lincoln Laboratory, MIT, 26
Littleton, Colo., 16
Lockheed Aircraft Corp., 7, 9, 21
Lockheed Missiles and Space Co., 18
Lockheed Propulsion Co., 39
London, U.K., 29, 32
Long, Dr. Frank A., 31

I N D E X

Low-altitude supersonic vehicle (Lasv), 17
"Low-gravity engineering", 20
LRC. See Lewis Research Center.
Lukens, Rep. Donald E., 25
LUNA XII (U.S.S.R. lunar probe), 19
LUNA XIII, 2, 4
Lunar Orbiter (program), 6, 12-13, 24, 30, 35-36
Lunar Orbiter (spacecraft), 12-13, 30
LUNAR ORBITER I, 12-13, 30, 36
LUNAR ORBITER II, 12
M2-F2 (lifting-body vehicle), 19
Mace A (missile), 4
Mack, Dr. Charles, 26-27
Magnuson, Sen. Warren G., 28
Magruder, William M., 9
Malinovsky, Defense Minister Rodion, 29
Mallay, George, 31
Management, 2, 21
Manchester Univ. (U.K.), 37
Manned orbiting laboratories, 19, 24
Manned Orbiting Laboratory (MOL), 24
Manned Spacecraft Center (MSC), 29, 31, 33
Mariner (program), 12, 23, 34, 37
Marquardt Corp., 17
Mars (planet), 5, 12, 14, 19, 23, 27, 34, 38
Marshall Space Flight Center (MSFC), 3, 4, 9, 15, 18, 20, 24
Martin Co., 16
Mason-Rust Co., 9
Massachusetts Institute of Technology (MIT)
    Aeronautics and Astronautics, Dept. of, 21
    Lincoln Lab., 26-27
Mathews, Charles W., 14, 31
McDonnell Co., 31, 39
McMurdo Station, Antarctica, 3, 9
McNamara, Robert S., 17, 28-29
Mercury (planet), 23
Mercury, This New Ocean: a History of Project Mercury (SP 4201), 14
Mesa Verde National Park, Colo., 11
Meteorite, 20
Meudon Observatory, France, 7
Michigan, 15
Michigan, Univ. of, 24
Michoud Assembly Facility, 9
Minnesota, Univ. of, 21
Minuteman I (missile), 5
Missile, 4, 5, 9, 12, 13, 28-29, 34

I N D E X

MIT. See Massachusetts Institute of Technology.
Mitchell, Jesse L., 5
MOL. See Manned Orbiting Laboratory.
Mongolia, 11
Moon
  colony, 3, 38
  crater, 2
  exploration, 6, 10, 23, 27, 28, 32, 38
  landing sites, 12
  lunar base, manned, 37, 38
  motion, 7
  photography, 6, 12-13, 19
  probe, 2, 4, 6, 7, 12-13, 19
  surface, 2, 12
Moon, Saturn's 10th, 7
Moscow, U.S.S.R., 9, 13, 22, 29, 32, 33
Mosher, Rep. Charles A., 17
MSC. See Manned Spacecraft Center.
MSFC. See Marshall Space Flight Center.
Mt. Palomar Observatory, 22
Mueller, Dr. George E., 10, 28, 33, 34
Mump (probe), 24
NAS. See National Academy of Sciences.
NASA. See National Aeronautics and Space Administration.
NASA Office of Space Science and Applications (OSSA), 5, 35
NASC. See National Aeronautics and Space Council.
National Academy of Sciences (NAS), 2, 11
National Aeronautics and Space Administration (NASA)
  accident, 18, 29-30, 31, 32, 33, 36
  Antarctic expedition, 3, 9
  astronaut, 2, 6, 16, 22, 23, 29-30, 31, 32, 33, 34, 36, 38
  award, 26
  budget, 18, 23, 24, 27
  contract, 9, 12, 15, 18, 30, 34
  launch
    satellite, 10, 27
    sounding rocket, 24, 34, 35
  personnel, 2, 7, 16, 19, 25
  program
    Apollo, 10, 12, 18, 23, 29-30
    Apollo Applications (Aa), 14, 23, 28
    Gemini, 10, 35
    Jupiter probe, 24, 37
    Lunar Orbiter, 6, 12-13, 24, 30, 35-36
    Mariner, 12, 23, 34, 37
    Mercury, 10, 14

National Aeronautics and Space Administration (cont.)
post-Apollo, 6, 10, 19-20, 23-24, 28
Sunblazer, 5
Surveyor, 6, 7, 24, 35-36
Voyager, 22, 23, 30, 37
scientist-astronaut, 2
space program, 4, 5-6, 10, 11, 13, 18, 19, 20-21, 22, 23, 24, 27, 33, 35, 37, 38
X-15, 23
National Aeronautics and Space Council (NASC), 35
National Communications System (NCS), 10
National Park Service, 11
National Science Foundation (NSF), 23, 32
National Sonic Boom Program, 4, 13, 15
National Space Science Data Center (NSSDC), 25
NCS. See National Communications System.
Nelson, Dr. Clifford H., 12
Nerva. See Nuclear Engine for Rocket Vehicle Application.
New York, N.Y., 16, 22, 26, 34
New York Times, 3, 7, 8, 14, 19, 22, 27, 32, 38
Newell, Dr. Homer E., 5, 13
Nicks, Oran W., 5
Nike-Apache (sounding rocket), 34, 35
Nike-Cajun (sounding rocket), 34, 35
Nike-Iroquois (sounding rocket), 14
Nike-Tomahawk (sounding rocket), 24
Nike-X (antimissile missile system), 9
Nininger, Dr. H. H., 20
"Niningerite" (extraterrestrial mineral), 20
Noise reduction, 23
North American Aviation, Inc., 4, 13, 26, 29, 31
North Carolina, 11, 14
Northwestern Univ. Astronomy Dept., 15
Norton AFB, Calif., 31
Nowitzky, Albin M., 7
NSF. See National Science Foundation.
NSSDC. See National Space Science Data Center.
Nuclear detection, 4
Nuclear Engine for Rocket Vehicle Application (Nerva), 24, 37
Nuclear explosion, 4
Nuclear propulsion, 15, 21, 24
Nuttall, Col. James B. (USAF), 36
OSSA. See NASA Office of Space Science and Applications.
Pacific Ocean, 10
Pan American World Airways, 16, 17
Peking Aeronautical Institute, 19

I N D E X

Percy, Sen. Charles H., 39
Pettis, Rep. Jerry L., 25
Philadelphia Inquirer, 4
Philippines, 10
Phillips, M/G Samuel C. (USAF), 29-30
Physicists, 32
Planets, life on, 7-8, 9, 13, 18
Plowshare, Project, 20
Plum Brook Station (LRC), 17
"Pogo stick" (one-man flying vehicle), 18
Pt. Barrow, Alaska, 34
Polaris (missile), 5
Il Popolo, 33
Pratt and Whitney Div. (United Aircraft), 7
Pravda, 8, 13
Precision Recovery Including Maneuvering Entry (Prime), 19
Prime. See Precision Recovery Including Maneuvering Entry.
Princeton Univ., 22, 34
Printing Industries of Metropolitan New York, award, 15
Probe, 5, 6, 19, 23, 24, 37, 38
Pulkovo Observatory, U.S.S.R., 2
Pushchino, U.S.S.R., 22
Quasar
    3C-446, 22
    PKS 0237-23, 22
Radioastronomy, 37
Radio Corporation of America (RCA), 14
Radio Moscow, 33
Radiotelescope, 37
Ramjet, 17, 23
Ramo, Simon, 21
Randolph AFB, Tex., 4
RCA. See Radio Corporation of America.
Record, 4
Red Flag, 19
"Red shift", double, in quasar PKS 0237-23, 22
Reiffel, Dr. Leonard, 12
Reistrup, J. V., 19
Relativity, 22-23
"Remedial" technology, 21
Report to the Congress on United States Aeronautics and Space Activities, 35
Reynolds, Dr. Orr E., 6
Rickover, V/Adm. Hyman G. (USN), 15
Rocket-assisted vertical takeoff, U.S.S.R., 6
Rocket propulsion, all-solid, 39
Rogan, J. P., 6

I N D E X

Rome, Italy, 33
Rosenfeld, Stephen S., 14
Rosman, N. C., 14
Rowan, Dr. Lawrence, 12
Rusk, Secretary of State Dean, 25
Sacramento, Calif., 18
Sandage, Dr. Allan R., 22
Sanders Associates, Inc., 15
Sarnoff, David, Research Center, RCA, 14
Satellite
    communications, 8, 10, 11, 16, 18, 19, 24, 28, 38
    foreign, 2, 4, 17, 19, 22, 27
    meteorological, 19, 27, 37, 38
    multi-purpose, 6
    navigation, 37, 38
    unidentified, 13
    voice/TV broadcast, 37, 38
Sato, Prime Minister Eisaku, 28
Saturn (planet), 7
Saturn I (booster), Uprated, 28, 29
Saturn V (booster), 5, 15, 18, 30
Scherer, Capt. Lee R., 12
Schirra, Cdr. Walter (USN), 30
Schmidt, Dr. Maarten, 22
Schriever, Gen. Bernard A. (USAF, Ret.), 21
Scientists as astronauts, 2
Scout (booster), 11
Scramjet. See Supersonic combustion ramjet.
Seaborg, Dr. Glenn T., 20
Seamans, Dr. Robert C., 30, 31
Sehlstedt, Albert, Jr., 18
Severeid, Eric, 36
Shabad, Theodore, 22
Shepard, Capt. Alan B., Jr. (USN), 34
Shepard, Van, 4, 13, 26
Silverstein, Dr. Abe, 17
Skua (U.K. sounding rocket), 2
Smoluchowski, Dr. Roman, 34
Snetsinger, Dr. Kenneth, 20
Solar corona, 23
Sonic boom, 4, 11, 13, 15, 16, 21, 26
Sounding rocket, 8, 14, 24, 34
Southwest Center for Advanced Studies, 22
Soviet Space Programs, 1962-65; Goals and Purposes, Achievements, Plans, and International Implications, 30-31
Soviet Union. See U.S.S.R.
Space Business Daily, 14

I N D E X

Space law treaty, 4, 29, 32
Space program, national, 4, 5-6, 10, 11, 13, 18, 19, 20-21, 22, 23, 24, 27, 33, 35, 37, 38
Space race, 4, 11, 14, 27, 30-31, 33, 35-36
Space results, 2, 13, 21, 24, 25, 28
Space simulator, 16
Space station, manned, 2, 14, 27, 28, 37, 38
Spain, 2
Spilhaus, Dr. Athelstan F., 21
Spivak, Jonathan, 37
SR-71 (strategic reconnaissance aircraft), 7
Sst. See Supersonic transport.
Stanford Univ. School of Medicine, 20
State, Dept. of, 36
Sterling, Project, 4
Strang, Col. Charles F. (USAF), 31
Sullivan, Walter, 7
Sun, 5, 17, 22, 23
Sunblazer (probe), 5, 23
Supersonic combustion ramjet (Scramjet), 11
Supersonic transport (Sst), 3, 7, 9, 11, 16, 17, 18, 23, 26, 38-39
Supersonic Transport Authority, 11
Surveyor (program), 6, 7, 24, 35-36
SURVEYOR I (lunar probe), 7, 36
SV-5 (lifting-body vehicle), 19
Swenson, Loyd S., Jr., 14
Sydney, Univ. of, Australia, 10
Tass, 19
Taylor, Frederick, 4
Technology Week, 3, 20-21
Telescope, orbiting, 28, 38
Teller, Dr. Edward, 20
Tepper, Dr. Morris, 6
Test pilot award, 9
Texas, Univ. of, 22
Texas Symposium on Relativistic Astrophysics, 22
Thailand, 10
Themis, Project, 17
This New Ocean: a History of Project Mercury (SP 4201), 14
Thompson, Dr. Floyd L., 31
Thompson, Ambassador Llewellyn E., 13
Thor-Agena D (booster), 13
Thor-Delta (booster), 27
Tiros Operational Satellite (Tos), 27
Titan I (missile), 5
Titan II (missile), 5

I N D E X

Titan III-C (booster), 16, 24
Titov, L/C Gherman S., 19
Tokyo, Japan, 28
Tos. See Tiros Operational Satellite.
Transonic compressor, 26
Transportation, Dept. of, 11, 26
Trans-World Airlines, 17
Treaty, space law, 4, 29, 32
Trendex poll, 11
Trud, 33
TRW Systems, Inc., 12, 21
Turin, Italy, 33
Tymczyszyn, Joseph J., 3
Udall, Interior Secretary Stewart L., 11
Ufo. See Unidentified Flying Object.
U.K. See United Kingdom.
U.N. See United Nations.
Underground nuclear test, 22
Undergraduate Pilot Training (Upt), 4
Unidentified flying object (Ufo), 14, 15
United Aircraft Corp., 7
United Air Lines, 17
United Kingdom (U.K.), 3, 4, 17, 21, 37
United Nations (U.N.), 29
University, 10, 17, 18, 20, 21, 22, 24, 26-27, 31, 32, 34, 35, 37
USAF. See U.S. Air Force.
U.S. Air Force (USAF)
    aircraft, 4, 7, 11, 13, 15, 16, 17, 18, 23, 26, 35
    Avionics Lab., Wright-Patterson AFB, 25
    contract, 17
    launch
        low-altitude supersonic vehicle (Lasv), 17
        missile, 4
        satellite, 13, 16
        Scramjet, 11
    lifting-body vehicle, 19
    MOL, 24
    School of Aerospace Medicine, 36
    test, 11
    Ufo, 14
    Undergraduate Pilot Training (Upt), 4
    X-15, 23
U.S. Geological Survey, 12, 23
U.S. Naval Observatory, 7
U.S. News & World Report, 34

I N D E X

U.S.S.R. (Union of Soviet Socialist Republics)
agreement, 4, 29, 32
antimissile missile system, 9, 13, 28-29, 34
launch, satellite, 17, 27
missile, 13
space program, 3, 14, 19, 30-31, 35-36
Utah, 11
Van Allen radiation belt, 26-27
simulator, 27
Van de Graaff, Dr. Robert J., 15
Vandenberg AFB, Calif., 11, 13, 17
Vander Jagt, Rep. Guy, 25
Variable sweep wing, 18, 21
Venus (planet), 5, 13, 19
Vertical takeoff, rocket-assisted, U.S.S.R., 6
Vesta (sounding rocket), 8
Vette, Dr. James I., 25
Vietnam, 4, 16, 18, 32, 39
Voice Broadcast Satellite, 23
Von Braun, Dr. Wernher, 3, 9, 20, 33, 34, 37
Voyager (program), 22, 23, 30, 37
Walker, Richard L., 7
Wallops Station (NASA), 35
Wall Street Journal, 3, 4, 7, 9, 37, 38
Washington, D.C., 16, 17, 22, 28, 29, 32
Washington Evening Star, 32, 39
Washington Post, 14, 15, 19, 27
Webb, James E., 5, 19, 24, 26, 31
Weightlessness, 3, 8, 14, 16, 38
Western Test Range (WTR), 27
West Point, 36
White, Alvin S., 16
White, L/C Edward H., II (USAF), 29-30, 31, 32, 33, 34, 36
White, George C., Jr., 31
White House, 29
Wilford, John, 19, 27
Williams, John, 31
Wing, variable sweep, 18, 21
Wings Club, 16
Winn, Rep. Larry, Jr., 25
Women's Forum on National Security, 22
Woomera Rocket Range, Australia, 4
World Weather Watch, 24
Wright-Patterson AFB, Ohio, 25
WTR. See Western Test Range.
X-15 (rocket research aircraft), 23

I N D E X

XB-70 (supersonic aircraft), 4, 13, 15, 16, 23, 26, 35
X-ray
    antimissile use, 34
    source, 22
Yardley, John, 31
Yeshiva Univ., 22
Zabelin, Igor M., 8
Zisch, William E., 19

GPO 919-898