

THIS FILE IS MADE AVAILABLE THROUGH THE DECLASSIFICATION EFFORTS AND RESEARCH OF:

# THE BLACK VAULT

THE BLACK VAULT IS THE LARGEST ONLINE FREEDOM OF INFORMATION ACT / GOVERNMENT RECORD CLEARING HOUSE IN THE WORLD. THE RESEARCH EFFORTS HERE ARE RESPONSIBLE FOR THE DECLASSIFICATION OF THOUSANDS OF DOCUMENTS THROUGHOUT THE U.S. GOVERNMENT, AND ALL CAN BE DOWNLOADED BY VISITING:

[HTTP://WWW.BLACKVAULT.COM](http://www.blackvault.com)

YOU ARE ENCOURAGED TO FORWARD THIS DOCUMENT TO YOUR FRIENDS, BUT PLEASE KEEP THIS IDENTIFYING IMAGE AT THE TOP OF THE .PDF SO OTHERS CAN DOWNLOAD MORE!

# Biographical Appendix

## A

**Spiro T. Agnew** (1918- ) was elected vice president of the United States in November 1968, serving under Richard M. Nixon. He served as chair of the 1969 Space Task Group that developed a long-range plan for a post-Apollo space effort. *The Post-Apollo Space Program: Directions for the Future* (Washington, DC: President's Science Advisory Council, September 1969) developed an expansive program that included building a space station, a space shuttle, a lunar base, and a mission to Mars (this last goal had been endorsed by Agnew at the time of the *Apollo 11* launch in July 1969). This plan was not accepted by Nixon, and only the Space Shuttle was approved for development. See Roger D. Launius, "NASA and the Decision to Build the Space Shuttle, 1969-72," *The Historian* 57 (Autumn 1994): 17-34.

**Neil A. Armstrong** (1930- ) was the first American to set foot on the Moon, on July 20, 1969, as commander of *Apollo 11*. He had become an astronaut in 1962, after having served as a test pilot with the National Advisory Committee for Aeronautics (1955-1958) and NASA (1958-1962). He also flew as command pilot on *Gemini VIII* in March 1966. In 1970 and 1971 he was deputy associate administrator for the Office of Advanced Research and Technology at NASA headquarters. In 1971 he left NASA to become a professor of aerospace engineering at the University of Cincinnati and to undertake private consulting. See Neil A. Armstrong, et al., *First on the Moon: A Voyage with Neil Armstrong, Michael Collins and Edwin E. Aldrin, Jr.* (Boston: Little, Brown, 1970); Neil A. Armstrong, et al., *The First Lunar Landing: 20th Anniversary/as Told by the Astronauts, Neil Armstrong, Edwin Aldrin, Michael Collins* (Washington, DC: National Aeronautics and Space Administration EP-73, 1989).

**Henry H. (Hap) Arnold** (1886-1950) was commander of the Army Air Forces in World War II and was the only air commander ever to attain the five-star rank of general of the armies. He was especially interested in the development of sophisticated aerospace technology to give the United States an edge in the achievement of air superiority, and he fostered the development of such innovations as jet aircraft, rocketry, rocket-assisted take-off, and supersonic flight. After a lengthy career as an Army aviator and commander that spanned the two world wars, he retired from active service in 1945. See Henry H. Arnold, *Global Mission* (New York: Harper & Brothers, 1949); Flint O. DuPre, *Hap Arnold: Architect of American Air Power* (New York: Macmillan, 1972); Thomas M. Coffey, *Hap: The Story of the U.S. Air Force and the Man Who Built It* (New York: Viking, 1982).

**Isaac Asimov** (1920-1992) was born in Petrovichi, Russia, and came to the United States in 1923. He became a member of the faculty, in biochemistry, at Boston University but gained his greatest fame as a writer of extremely sophisticated science fiction. He is best known for the Foundation trilogy (1951-1953), as well as *I, Robot* (1950) and *Fantastic Voyage* (1966). In all, Asimov published more than 200 books during his life, many of them fiction but also some nonfiction. See "Isaac Asimov," biographical file, NASA Historical Reference Collection, NASA Headquarters, Washington, D.C.

**Norman R. Augustine** (1935- ) was born in Denver, Colorado, and has long been a key person in the aerospace industry. He became chairman and CEO of the Martin Marietta Corporation in the 1980s. Previously, he had served as the *Under Secretary of the Army, Assistant Secretary of the Army for Research and Development*, and as an Assistant Director of Defense Research and Engineering in the Office of the Secretary of Defense. In 1990 he was appointed to head the Advisory Committee on the Future of the U.S. Space Program for the Bush administration. This panel produced the *Report of the Advisory Committee on the Future of the U.S. Space Program* (Washington, DC: Government Printing Office, December 1990). The study was enormously important in charting the course of the space program in the first half of the 1990s. See Norman R. Augustine, *Augustine's Laws* (Washington, DC: American Institute for Aeronautics and Astronautics, 1984); "Norman R. Augustine," biographical file, NASA Historical Reference Collection.

## B

**James E. Beggs** (1926- ) served as NASA Administrator from July 10, 1981, to December 4, 1985, when he took an indefinite leave of absence pending disposition of an indictment from the Justice Department for activities taking place prior to his tenure at NASA. This indictment was later dismissed, and the U.S. Attorney General apologized to Beggs for any embarrassment. His resignation from NASA was effective on February 25, 1986. Prior to NASA, Beggs had been executive vice president and a director of General Dynamics Corp. in St. Louis, Missouri. Previously, he had served with NASA in 1968-1969 as associate administrator for the Office of Advanced Research and Technology. From 1969 to 1973 he was under secretary at the Department of Transportation. He went to Summa Corp., Los Angeles, California, as managing director of operations and joined General Dynamics in January 1974. Before joining NASA, he also had been with Westinghouse Electric Corp., in Sharon, Pennsylvania, and in Baltimore, Maryland, for thirteen years. A 1947 graduate of the U.S. Naval Academy, he served with the Navy until 1954. In 1955 he received a master's degree from the Harvard Graduate School of Business Administration.

**David E. Bell** (1919– ) was budget director for President Kennedy from 1961 to 1962. A Harvard University-trained economist, Bell had previously been a member of the staff of the Bureau of the Budget and special assistant to the president during the Truman administration before returning to the Harvard faculty during the late 1950s. Between 1962 and 1966 he served as head of the Agency for International Development, and then he was vice president of the Ford Foundation. While budget director, Bell was responsible for working with NASA in establishing a realistic financial outlook for Project Apollo.

**Spencer M. Beresford** (1918-1992) was a general counsel for NASA between 1963 and 1973. A Washington lawyer, he served as a naval officer in World War II and the Korean War, but in 1954 he became general counsel for the Foreign Operations Administration. In 1957 he joined the Legislative Reference Service of the Library of Congress, and in 1958 and 1959, he was special counsel to the House Select Committee on Astronautics and Space Exploration. He performed a similar duty for the House Committee on Science and Technology, 1959-1962. After completing his assignment at NASA in 1973, Beresford became general counsel for the Office of Technology Assessment. See "Spencer M. Beresford," biographical file, NASA Historical Reference Collection.

**Chesley Bonestell** (1888-1986) was a world-famous artist who was known as the creator of significant space-oriented artwork. From 1944 on, he mostly worked in space art and illustrated numerous books such as Willy Ley's *The Conquest of Space* and articles such as Wernher von Braun's articles for the *Collier's* magazine series on space-flight in the 1950s. He also illustrated space sets for science fiction films such as *Destination Moon* (1950). See "Chesley Bonestell," *Ad Astra*, July/August 1991, p. 9.

**Karel J. Bossart** (1904-1975) was a pre-World War II immigrant from Belgium, who was involved early on in the development of rocket technology with the Convair Corporation. In the 1950s he was largely responsible for designing the Atlas ICBM booster with a very thin, internally pressurized fuselage instead of massive struts and a thick metal skin. See Richard E. Martin, *The Atlas and Centaur "Steel Balloon" Tanks: A Legacy of Karel Bossart* (San Diego: General Dynamics Corp., 1989); Robert L. Perry, "The Atlas, Thor, Titan, and Minuteman," in Eugene M. Emme, ed., *A History of Rocket Technology* (Detroit, MI: Wayne State University Press, 1964), pp. 143-55; John L. Sloop, *Liquid Hydrogen as a Propulsion Fuel, 1945-1959* (Washington, DC: NASA SP-4404, 1978), pp. 173-77.

**Lewis M. Branscomb** (1926– ) is a Harvard University-trained physicist who served in a variety of university and public service posts before becoming the chief scientist of the IBM Corporation (*American Men and Women of Science, 1989-1990* [New York: R.R. Bowker, 1990], p. 692).

**Wernher von Braun** (1912-1977) was the leader of what has been called the "rocket team," which had developed the German V-2 ballistic missile in World War II. At the conclusion of the war, von Braun and some of his chief assistants—as part of a military operation called Project Paperclip—came to America and were installed at Fort Bliss in El Paso, Texas, to work on rocket development and use the V-2 for high altitude research. They used launch facilities at the nearby White Sands Proving Ground in New Mexico. Later, in 1950 von Braun's team moved to the Redstone Arsenal near Huntsville, Alabama, to concentrate on developing a new missile for the Army. They built the Army's Jupiter ballistic missile, and before that the Redstone, used by NASA to launch the first Mercury capsules. The story of von Braun and the "rocket team" has been told many times. See, as examples, David H. DeVorkin, *Science With a Vengeance: How the Military Created the US Space Sciences After World War II* (New York: Springer-Verlag, 1992); Frederick I. Ordway III and Mitchell R. Sharpe, *The Rocket Team* (New York: Thomas Y. Crowell, 1979); Erik Bergaust, *Wernher von Braun* (Washington, DC: National Space Institute, 1976).

**Styles Bridges** (1898-1961) (R-NH) served as governor of New Hampshire, 1935-1937, and was elected to the Senate in 1936. During the early years of NASA, he was the ranking Republican member of the Appropriations Committee, a member of the Armed Services Committee and its preparedness investigating subcommittee, as well as the Aeronautical and Space Sciences Committee. He was the leader of his party's conservative wing and a strong proponent of military preparedness. Bryce Harlow told Eisenhower in 1958 that Bridges was "a walking 25 votes in the Senate, the most skilled maneuverer on the Republican side" (quoted in Robert A. Divine, *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite* [New York: Oxford University Press, 1993], p. 140).

**Bernard Brodie** (1910-1977) was a well-known political scientist who specialized in studies of Cold War strategy, especially nuclear policy. With a Ph.D. from the University of Chicago, he was a member of Project Rand, later the Rand Corporation, and prepared numerous studies and books for public policy purposes.

**Detlev W. Bronk** (1897-1975) was president of the National Academy of Sciences, 1950-1962, and a member of the National Aeronautics and Space Council. A scientist, he was president of The Johns Hopkins University, 1949-1953, and Rockefeller University, 1953-1968.

**Percival Brundage** (1892-1981) was the first deputy director and then director of the Bureau of the Budget, 1954-1958. Thereafter, he went on to a series of business and financial positions.

**Nikolai A. Bulganin** was chairman of the Soviet Council of Ministers, and he was heavily involved in the negotiations over the freedom of space issue in terms of flying over territories.

**George H.W. Bush** (1924- ) served as president of the United States between 1989 and 1993. Before that, he had been a diplomat, director of the Central Intelligence Agency (CIA), and vice president under Ronald Reagan (1981-1989).

**Vannevar Bush** (1890-1974) was one of the most powerful members of the scientific and technological elite to emerge during World War II. An aeronautical engineer on the faculty at the Massachusetts Institute of Technology, Bush lobbied to create and then headed the National Defense Research Committee in 1940 to oversee science and technology in the federal government. Later, its name was changed to the Office of Science Research and Development, and Bush used it as a means to build a powerful infrastructure for scientific research in support of the federal government. Although he went to the Carnegie Institution after the war, Bush remained a powerful force in shaping post-war science and technology by serving on numerous federal advisory committees and preparing several influential reports. See David Petechuk, "Vannevar Bush," in Emily J. McMurray, *et al.*, eds., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 285-88.

## C

**Howard W. Cannon** (1912- ) (D-NV) was first elected to the Senate in 1958 and served until 1983.

**Jimmy Carter** (1924- ) was president of the United States between 1977 and 1981. Previously, he had been a naval officer and businessman before entering politics. He entered politics in the Georgia State Legislature (1962-1966) and later served as the governor of Georgia (1971-1975).

**Benjamin Chidlaw** (1900- ) was a career U.S. Air Force officer. He entered the U.S. Army Air Corps in 1924 as a pilot and progressed through a series of ranks until he became chief of the Materiel Division at General Headquarters, Army Air Forces, in 1942. He was deputy commander of the Army Air Forces for the Mediterranean Theater, 1944-1945, and deputy at the Air Materiel Command, 1945-1949. He served as commander of several research and development organizations for the Air Force and retired as a four-star general in 1955.

**William Clark** was Ronald Reagan's assistant for National Security Affairs and chair of the Senior Interagency Group (Space) that worked on the decision to develop the Space Station.

**Arthur C. Clarke** (1917- ), one of the most well-known science fiction authors, has also been an eloquent writer on behalf of the exploration of space. In 1945, before the invention of the transistor, Clarke wrote an article in *Extraterrestrial Relays* describing the possibility of geosynchronous orbit and the development of communication relays by satellite. He also wrote several novels, and the most well-known was *2001: A Space Odyssey*, based on a screenplay of the same name that he prepared for Stanley Kubrick. The movie is still one of the most realistic depictions of the rigors of spaceflight ever to be filmed.

**Francis H. Clauser** (1913- ) was a leading research aerodynamicist in academia and the aerospace industry until the 1970s. He worked with the Douglas Aircraft Co., 1937-1946, and served as chair of aerospace studies at The Johns Hopkins University, 1946-1960. He then served in a variety of academic appointments; from 1969 until retirement in 1980, he was the Clark B. Millikin Professor of Aerospace Engineering at the California Institute of Technology.

**Anslley Johnson Coale** (1917- ) received a Ph.D. from Princeton University in 1947 and worked in several capacities with the federal government in social science and population statistics. He became a professor of economics at Princeton in 1947 and also directed the Office of Population Research between 1959 and 1973. He was especially involved in research associated with population loss from a nuclear holocaust.

**William Congreve** (1772-1828) of Great Britain was an artillery officer and inventor, who was best known for his work on black powder rockets that could be used for bombardment of enemy fortifications. He based his rocketry on the pioneering work of Indian prince Hyder Ali, who had successfully used them against the British in 1792 and 1799 at Seringapatam. Congreve's rockets were used in the Napoleonic Wars and in the War of 1812 (Frank H. Winter, *The First Golden Age of Rocketry: Congreve and Hale Rockets of the Nineteenth Century* [Washington, DC: Smithsonian Institution Press, 1990]).

**Donald Clarence Cook** (1909-1981) was a government official, lawyer, and businessman who held numerous posts from 1935 to 1945 in the Securities and Exchange Commission (SEC), as well as staff positions in other agencies and in Congress before being appointed SEC member in 1949. In 1952 he became chair of the SEC. He joined the American Electric Power Company in 1953, and he served as its president between 1962 and 1972 and as its chair from 1971 to 1976 ("Cook, Donald C[larance]," *Current Biography* 1982, p. 462).

**Nicolaus Copernicus** (1473-1543) of Poland symbolized the spirit of scientific inquiry that came to dominate the Renaissance. The son of a prosperous merchant, when his father died Copernicus was raised by his uncle, Lucas Watzelrode, the Bishop of Ermland. He was educated at the University of Cracow, where he excelled at mathematics, and at the University of Bologna in Italy, where he began to study astronomy. Copernicus developed complex models of movement for the Earth and other planets around the Sun. His "Heliocentric Solar System" concept gained acceptance slowly, but a century after his death was accepted as the norm for the scientific community (Edward Rosen, "Nicolaus Copernicus," *Dictionary of Scientific Biography* [New York: Charles Scribner's Sons, 1971], 3: 401-402).

**John J. Corson** (1905-1990) was a management consultant with McKinsey & Co. since 1951, remaining there until 1966. T. Keith Glennan contracted with McKinsey & Co. for a series of studies. These included: "Organizing Headquarters Functions," two volumes, December 1958; "Financial Management—NASA-JPL Relationships," February 1959; "Security and Safety—NASA-JPL Relationships," February 1959; "Facilities Construction—NASA-JPL Relationships," February 1959; "Procurement and Subcontracting—NASA-JPL Relationships," February 1959; "NASA-JPL Relationships and the Role of the Western Coordination Office," March 1959; "Providing Supporting Services for the Development Operations Division," January 1960, on the transfer of the Army Ballistic Missile Agency to NASA; "Report of the Advisory Committee on Organization," October 1960; and "An Evaluation of NASA's Contracting Politics, Organization, and Performance," October 1960. All are in "T. Keith Glennan," correspondence files, NASA Historical Reference Collection.

**Alan Cranston** (1914- ) (D-CA) served in the U.S. Senate from 1969 to 1991.

**Robert Cutler** (1895-1974) was a lawyer and banking executive. He practiced law in Boston from 1922 to 1942 and then became president and director of the Old Colony Trust Co., 1946-1953, and its chairman for the next several years. He served as special assistant for security affairs for President Eisenhower, 1953-1960. From 1960 to 1962 he served as executive director of the Inter-American Development Bank.

**Cyrano de Bergerac, Savinien** (1619-1655) was a French writer whose works combined political satire and fantasy. As a young man, he joined the company of guards, but he was wounded at the siege of Arras in 1640 and retired from military life. He then studied under philosopher and mathematician Pierre Gassendi, whose influence was significant. His two best known written works were his two novels of spaceflight to the Moon. He has become famous in the twentieth century largely through the 1897 novel by Edmond Rostand, who described him as a gallant and brilliant, but ugly man with the large nose ("Cyrano de Bergerac, Savinien," *The New Encyclopedia Britannica* [Chicago: Encyclopedia Britannica, Inc., 1987 ed.], 3: 829).

## D

**Edward E. David, Jr.** (1925- ), served as science advisor to President Richard M. Nixon in 1970 and then as director of the Office of Science and Technology. Previously, he had served as executive director of research of Bell Telephone Laboratories, 1950-1970. For a discussion of the President's Science Advisory Committee, see Gregg Herken, *Cardinal Choices: Science Advice to the President from Hiroshima to SDI* (New York: Oxford University Press, 1992).

**Merton E. Davies** (1917- ) was educated at Stanford University and worked at the Douglas Aircraft Co., 1940-1948, and at the Rand Corporation since 1948. He served as a member of the U.S. delegation to the Surprise Attack Conference in Geneva in 1958 and on the imaging teams of *Mariner 6* and *7* in 1969, *Mariner 9* in 1971, and *Voyager* in 1977.

**Kurt H. Debus** (1908-1983) earned a B.S. in mechanical engineering (1933) and an M.S. (1935) and Ph.D. (1939) in electrical engineering, all from the Technical University of Darmstadt in Germany. He became an assistant professor at the university after receiving his degree. During the course of World War II, he became an experimental engineer at the A-4 (V-2) test stand at Peenemünde (see entry for Wernher von Braun), rising to become superintendent of the test stand and test firing stand for the rocket. In 1945, he came to the United States with a group of engineers and scientists headed by von Braun. From 1945 to 1950 the group worked at Fort Bliss, Texas, and then moved to the Redstone Arsenal in Huntsville, Alabama. From 1952 to 1960 Debus was chief of the missile firing laboratory of the Army Ballistic Missile Agency. In this position, he was located at Cape Canaveral, Florida,

where he supervised the launching of the first ballistic missile fired from there, an Army Redstone. When the Army Ballistic Missile Agency became part of NASA, Debus continued to supervise missile and space vehicle launchings, first as director of the Launch Operations Center and then of the Kennedy Space Center (as it was renamed in December 1963). He retired from that position in 1974 ("Kurt H. Debus," biographical file, NASA Historical Reference Collection).

**Thomas Digges** was an astronomer and mathematician who modified Dante's medieval conceptions of the universe in his *Description of the Caelestiall Orbes* (1576), adopting a Copernican view that placed the Sun in the center of the universe.

**Everett Dirksen** (1896-1969) (R-IL) served in the U.S. Senate from 1951 to 1969 and in the U.S. House of Representatives from 1933 to 1949. He served as the Republican leader in the Senate from 1959 until 1969 (*Current Biography 1969*, p. 465).

**Walt Disney** (1901-1966) was the creator of Mickey Mouse and several other animated characters. In 1955 his weekly television series aired the first of three programs related to spaceflight. The first of these, "Man in Space," premiered on March 9, 1955, with an estimated audience of 42 million. The second show, "Man and the Moon," also aired in 1955 and sported the powerful image of a wheel-like space station as a launching point for a mission to the Moon. The final show, "Mars and Beyond," premiered on December 4, 1957, after the launching of Sputnik I (obituary in *New York Times*, December 16, 1966, p. 1).

**Allen Frances Donovan** (1914- ) was an accomplished aeronautical engineer who worked for several aeronautical firms between 1936 and 1946. He then headed the aeronautical mechanics department at Cornell University from 1946 to 1955. He later became a corporate executive with the Aerospace Corporation, serving as senior vice president, technical, 1960-1978. He also served on several government advisory boards, including the President's Science Advisory Committee, 1959-1968.

**James H. Doolittle** (1896-1993) was a longtime aviation promoter, air racer, Air Force officer, and aerospace research and development advocate. He had served with the U.S. Army Air Corps between 1917 and 1930, and then he was manager of the aviation section for Shell Oil Co. between 1930 and 1940. In World War II Doolittle won early fame for leading the April 1942 bombing of Tokyo, and then he was commander of a succession of air units in Africa, the Pacific, and Europe. He was promoted to the rank of lieutenant general in 1944. After the war he was a member of the Air Force's Scientific Advisory Board and the President's Scientific Advisory Committee. At the time of Sputnik, he was chair of the National Advisory Committee for Aeronautics and the Air Force Scientific Advisory Board. In 1985, the Senate approved his promotion in retirement to four-star general (General James H. (Jimmy) Doolittle with Carroll V. Glines, *I Could Never Be So Lucky Again: An Autobiography* [New York: Bantam Books, 1991]; Carroll V. Glines, *Jimmy Doolittle: Daredevil Aviator and Scientist* [New York: Macmillan, 1972]; "James H. Doolittle," biographical file, NASA Historical Reference Collection).

**Walter Dornberger** (1895-1980) was Wernher von Braun's military superior during the German rocket development program of World War II. He oversaw the effort at Peenemünde to build the V-2, fostering internal communication and successfully advocating the program to officials in the German army. He also assembled the team of highly talented engineers under von Braun's direction and provided the funding and staff organization necessary to complete the technology project. After World War II Dornberger came to the United States and assisted the Department of Defense with the development of ballistic missiles. He also worked for the Bell Aircraft Co. for several years, helping to develop hardware for Project BOMI, a rocket-powered spaceplane. See Walter R. Dornberger, *V-2*, trans. by James Cleugh and Geoffrey Halliday (New York: Viking, 1958); Gerald L. Borrowman, "Walter R. Dornberger," *Spaceflight* 23 (April 1981): 118-19.

**Russell C. Drew** (1931- ) has been an influential physicist who served in the U.S. Navy from 1953 through 1973, and he spent much of his career working on nuclear submarine ballistic missile programs. He also served as assistant to the President's Science Advisor, 1966-1972, and director of the staff of the President's Space Task Group. His last assignment, as a naval captain, was as the head of the Office of Naval Research (London). Thereafter, he served as the director of the Science and Technology Policy Office of the National Science Foundation, 1973-1976, and in several capacities in the aerospace industry since 1976.

**Hugh L. Dryden** (1898-1965) was a career civil servant and an aerodynamicist by discipline who had also begun life as something of a child prodigy. He graduated at age 14 from high school and went on to earn an A.B. in three years from The Johns Hopkins (1916). Three years later (1919) he earned his Ph.D. in physics and mathematics from the same institution, even though he had been a full-time employee of the National Bureau of Standards since June 1918. His career at the Bureau of Standards, which lasted until 1947, was devoted to studying airflow, turbulence, and particularly the problems of the boundary layer—the thin layer of air next to an airfoil that causes

drag. In 1920 he became chief of the aerodynamics section in the bureau. His work in the 1920s on measuring turbulence in wind tunnels facilitated research in NACA that produced the laminar flow wings used in the P-51 Mustang and other World War II aircraft. From the mid-1920s to 1947, his publications became essential reading for aerodynamicists around the world. During World War II his work on a glide bomb named the Bat won him a Presidential Certificate of Merit. He capped his career at the Bureau of Standards by becoming its assistant director and then associate director during his final two years there. He then served as director of NACA from 1947-1958, after which he became deputy administrator of NASA under T. Keith Glennan and James E. Webb (Richard K. Smith, *The Hugh L. Dryden Papers, 1898-1965* [Baltimore, MD: The Johns Hopkins University Library, 1974]).

**Lee A. DuBridge** (1901- ), a physicist with a Ph.D. from the University of Wisconsin (1926), became director of the radiation laboratory at the Massachusetts Institute of Technology after an academic career capped to that point by a deanship at the University of Rochester, 1938-1941. He was president of the California Institute of Technology between 1946 and 1969, when he resigned to serve as science advisor to President Richard M. Nixon. He had been involved in several governmental science advisory organizations before taking up his formal White House duties in 1969 and serving in that capacity until 1970 ("Lee A. DuBridge," biographical file, NASA Historical Reference Collection).

**Allen W. Dulles** (1893-1969), younger brother of President Eisenhower's more famous secretary of state, served as director of the Central Intelligence Agency (CIA) from 1953 to 1961.

**John Foster Dulles** (1888-1959) served as secretary of state under President Eisenhower, 1953-1959.

**John R. Dunning** (1892-1975) was a physicist who conducted the early experiments in nuclear fission that helped lay the groundwork for developing the atomic bomb. He later became the dean of the School of Engineering at Columbia University (obituary in *New York Times*, August 28, 1975, p. 36).

**Frederick C. Durant III** (1916- ) was heavily involved in rocketry in the United States between the end of World War II and the mid-1960s. He worked for several different aerospace organizations, including Bell Aircraft Corp., Everett Research Laboratory, the Naval Air Rocket Test Station, and the Maynard Ordnance Test Station. He later became the director of astronautics for the National Air and Space Museum, Smithsonian Institution. In addition, he was an officer in several spaceflight organizations, such as president of the American Rocket Society (1953), president of the International Astronautical Federation (1953-1956), and governor of the National Space Club (1961).

## E

**Dwight D. Eisenhower** (1890-1969) was president of the United States between 1953 and 1961. Previously, he had been a career U.S. Army officer and was Supreme Allied Commander in Europe during World War II. As president, he was deeply interested in the use of space technology for national security purposes and directed that ballistic missiles and reconnaissance satellites be developed on a crash basis. On Eisenhower's space efforts, see Rip Bulkeley, *The Sputniks Crisis and Early United States Space Policy* (Bloomington: Indiana University Press, 1991); R. Cargill Hall, "The Eisenhower Administration and the Cold War: Framing American Astronautics to Serve National Security," *Prologue: Quarterly of the National Archives* 27 (Spring 1995): 59-72; Robert A. Divine, *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite* (New York: Oxford University Press, 1993).

**John D. Erlichman** was a senior assistant to the president during the Nixon administration. See John Erlichman, *Witness to Power: The Nixon Years* (New York: Simon and Schuster, 1982).

## F

**Philip J. Farley** (1916- ) earned a Ph.D. from the University of California, Berkeley, in 1941 and was on the faculty at Corpus Christi Junior College from 1941 to 1942 before entering government work—for the Atomic Energy Commission, 1947-1954, and for the State Department, 1954-1969. From 1957 to 1961 he was a special assistant to the secretary of state for disarmament and atomic energy, and from 1961 to 1962 his responsibilities shifted to atomic energy and outer space. After several years of assignment to the North Atlantic Treaty Organization (NATO), he returned to Washington and became deputy secretary of state for political-military affairs, 1967-1969. Then from 1969 to 1973 he became deputy director of the U.S. Arms Control and Disarmament Agency.

**William Finan** was a staff member with the Bureau of the Budget during the Eisenhower administration. He was a member of the Purcell Panel that assessed spaceflight capabilities for the U.S. government in 1957 and 1958.

**Daniel J. Fink** was chair of the NASA Advisory Council's Task Force that produced the 1983 "Study of the Mission of NASA."

**James Brown Fisk** (1910-1981) received his Ph.D. in physical science from the Massachusetts Institute of Technology in 1935 and served in a variety of educational and industry positions. Most importantly, he was heavily involved in work at Bell Telephone Labs, serving as president from 1959 (obituary in *New York Times*, August 13, 1981, p. D21).

**Peter M. Flanigan** (1923- ) was an assistant to the president on the White House staff, 1969-1974. Previously, he had been involved in investment banking with Dillon, Read, and Co. He returned to business when he left government service. His position in the White House from 1969 to 1972 involved him in efforts to gain approval to build the Space Shuttle.

**Alexander H. Flax** (1921- ) was an aeronautical engineer, with a Ph.D. in physics, who worked in several important positions in universities and industry. He worked for Curtiss-Wright, 1940-1944; the Piasecki Helicopter Corporation, 1944-1946; and Cornell University, 1946-55. He served in scientific positions with the U.S. Air Force, 1955-1969, and as assistant secretary of the Air Force for research and development, 1963-1969. Thereafter, he became vice president for research for the Institute for Defense Analysis.

**James C. Fletcher** (1919-1991) was born on June 5, 1919, in Millburn, New Jersey. He received an undergraduate degree in physics from Columbia University and a doctorate in physics from the California Institute of Technology. After holding research and teaching positions at Harvard and Princeton Universities, he joined Hughes Aircraft in 1948 and later worked for the Guided Missile Division of the Ramo-Wooldridge Corporation. In 1958 Fletcher co-founded the Space Electronics Corporation in Glendale, California, which after a merger became the Space General Corporation. He was later named systems vice president of the Aerojet General Corporation in Sacramento, California. In 1964 he became president of the University of Utah, a position he held until he was named NASA administrator in 1971. He served until 1977. He served as NASA administrator a second time, for nearly three years following the loss of the Space Shuttle *Challenger* in 1986 until 1989. During his first administration at NASA, Dr. Fletcher was responsible for beginning the Shuttle effort. During his second tenure he presided over the effort to recover from the *Challenger* accident. See "Fletcher, James C., Administrator's Files," NASA Historical Reference Collection.

**Gerald R. Ford** (1913- ) (R-MI) was elected to the House of Representatives in 1948 and served there until he became vice president in 1973 following the resignation of Spiro T. Agnew. He then served as president, 1974-1977, following Richard M. Nixon's resignation in the wake of the Watergate break-in.

**William C. Foster**, later the head of the Arms Control and Disarmament Agency, was President Eisenhower's representative to the U.S./U.S.S.R. summit at Geneva, Switzerland, in 1955. One of his responsibilities was to obtain freedom of space for overflight by spacecraft.

**Robert A. Frosch** (1928- ) was NASA administrator throughout the administration of President Jimmy Carter, 1977-1981. He earned undergraduate and graduate degrees in theoretical physics at Columbia University, and between September 1951 and August 1963 he worked as a research scientist and director of research programs for Hudson Laboratories of Columbia University. Until 1953 he worked on problems in underwater sound, sonar, oceanography, marine geology, and marine geophysics. Thereafter, Frosch was first associate and then director of the laboratories. In September 1963 Dr. Frosch came to Washington to work with the Advanced Research Projects Agency (ARPA), Department of Defense, serving as director for nuclear test detection (Project VELA) and then as deputy director of the Advanced Research Projects Agency. In July 1966 he became assistant secretary for research and development for the Navy, responsible for all Navy programs of research, development, engineering, test, and evaluation. From January 1973 to July 1975 he served as assistant executive director of the United Nations Environmental Program. While at NASA Frosch was responsible for overseeing the continuation of the development effort on the Space Shuttle. During his tenure, the project underwent testing of the first orbiter, *Enterprise*, at NASA's Dryden Flight Research Facility in southern California. The orbiter made its first free flight in the atmosphere on August 12, 1977. He left NASA with the change of administrations in January 1981 to become vice president for research at the General Motors Research Laboratories. See "Frosch, Robert A., Administrator's Files," NASA Historical Reference Collection.

**Eugene G. Fubini** (1913- ) was a noted physicist. A native of Italy, he came to the United States in 1938 to work for CBS and was responsible for microwave and international broadcasting. He worked for the U.S. military in World War II and then in a succession of technical and scientific positions with the Department of Defense in the post-war era. Since 1969 he has served as a consultant with Texas Instruments and IBM.

**Craig Fuller** was President Ronald Reagan's Cabinet secretary in the early 1980s and arranged for NASA's space station proposal to be discussed at a meeting of the Cabinet Council for Commerce and Trade.



## G

**Yuri Gagarin** (1934-1968) was the Soviet cosmonaut who became the first human in space with a one-orbit mission aboard the spacecraft *Vostok 1* on April 12, 1961. The great success of that feat made the gregarious Gagarin a global hero, and he was an effective spokesman for the Soviet Union until his death in an unfortunate aircraft accident.

**Galileo Galilei** (1564-1642) used the newly invented telescope to view the bodies of the universe and to develop to its most advanced state in the pre-nineteenth century the "Heliocentric System" of the Solar System. Galileo made four important observations that convinced him that Copernican cosmology was correct, as described by writers Lloyd Motz and Jefferson Hane Weaver: "(1) the moon's surface is cratered and highly irregular, thus negating the theory that celestial bodies are 'perfect'; (2) the phases of Venus and those of the moon are similar, proving that Venus revolves around the sun and not around the earth; (3) four moons (satellites) revolve around Jupiter, illustrating in miniature the Copernican model of the solar system; and (4) the Milky Way consists of numerous points of light, which Galileo correctly interpreted as very distant stars" (p. 42). Galileo ran afoul of ecclesiastical authorities because of his observations, but they quickly became the standard explanation for understanding the workings of the universe (Lloyd Motz and Jefferson Hane Weaver, *The Story of Physics* [New York: Avon Books, 1992]).

**Dave Garroway** (1913-1982) was a television and radio personality who hosted the "Today Show" for NBC between 1952 and 1961 (obituary in *New York Times*, July 22, 1982, p. D22).

**S. Everett Gleason** (1905- ) was a longtime government official in the Department of State and for a time its official historian.

**T. Keith Glennan** (1905-1995) was the first NASA administrator. Born in 1905 in Enderlin, North Dakota, Glennan was educated at Yale University, and he then worked in the sound motion picture industry with the Electrical Research Products Company. He was also studio manager of Paramount Pictures, Inc., and Samuel Goldwyn Studios in the 1930s. Glennan joined Columbia University's Division of War Research in 1942, serving through the war, first as administrator and then as director of the U.S. Navy's Underwater Sound Laboratories at New London, Connecticut. In 1947 he became president of the Case Institute of Technology. During his administration, Case rose from a primarily local institution to rank with the top engineering schools in the nation. From October 1950 to November 1952 he served as a member of the Atomic Energy Commission. He also served as administrator of NASA while on leave from Case, between August 7, 1958, and January 20, 1961. Upon leaving NASA Glennan returned to the Case Institute of Technology, where he continued to serve as president until 1966. See J.D. Hunley, ed., *The Birth of NASA: The Diary of T. Keith Glennan* (Washington, DC: NASA SP-4105, 1993).

**Robert H. Goddard** (1882-1945) was one of the three most prominent pioneers of rocketry and spaceflight theory. He earned his Ph.D. in physics at Clark University in 1911 and went on to become head of the Clark physics department and director of its physical laboratories. He began to work seriously on rocket development in 1909 and is credited with launching the world's first liquid-propellant rocket in 1926. He continued his rocket development work with the assistance of a few technical assistants throughout the remainder of his life. Although he developed and patented many of the technologies later used on large rockets and missiles—including film cooling, gyroscopically controlled vanes, and a variable-thrust rocket motor—only the last of these contributed directly to the furtherance of rocketry in the United States. Goddard kept most of the technical details of his inventions a secret and thus missed the chance to have the kind of influence his real abilities promised. At the same time, he was not good at integrating his inventions into a workable system, so his own rockets failed to reach the high altitudes he sought. See Milton Lehman, *Robert H. Goddard: A Pioneer of Space Research* (New York: Da Capo, 1988); J.D. Hunley, "The Enigma of Robert H. Goddard," *Technology and Culture* 36 (April 1995—forthcoming).

**Harry J. Goett** (1910- ) earned a degree in physics from Holy Cross College in 1931 and one in aeronautical engineering from New York University in 1933. After holding a number of engineering posts with private firms, he became a project engineer at Langley Aeronautical Laboratory in 1936. He later moved to Ames Aeronautical Laboratory, where he was chief of the full-scale and flight research division, 1948-1959. During the the last year at Ames he became director of the Goddard Space Flight Center, a post he held until July 1965, when he became a special assistant to NASA Administrator James E. Webb. Later that year he became director for plans and programs at Philco's Western Development Laboratories in California and ultimately retired from a position with Ford Aerospace and Communications ("Harry J. Goett," biographical file, NASA Historical Reference Collection).

**Barry M. Goldwater** (1909- ) (R-AZ) was a U.S. senator from 1953 to 1965. In 1964 he ran unsuccessfully for president of the United States against Lyndon Johnson. He was an outspoken conservative and became the leader and later elder statesman for the right wing of the Republican party.

**Andrew Jackson Goodpaster** (1915- ) was a career Army officer who served as defense liaison officer and secretary of the White House staff from 1954 to 1961, being promoted to brigadier general during that period. He later was deputy commander, U.S. forces in Vietnam, 1968-1969, and commander-in-chief, U.S. Forces in Europe, 1969-1974. He retired in 1974 as a four-star general but returned to active duty in 1977 and served as superintendent of the U.S. Military Academy, a post he held until his second retirement in 1981.

**William R. Graham** (1937- ), with a Ph.D. in physics from the California Institute of Technology and a Ph.D. in electrical engineering from Stanford University, was a founder and executive of R&D Associates, Marina Del Rey, California, and became deputy administrator of NASA on November 25, 1985. In 1980 Graham served as an advisor to candidate Ronald Reagan and was a member of the president-elect's transition team. Graham had also served for three years prior to coming to NASA as chair of the General Advisory Committee on Arms Control and Disarmament. Graham left NASA in October 1986 to become director of the White House Office of Science and Technology Policy, a position he held until June 1989 when he left government service to join Jaycor, a high-technology company headquartered in San Diego, California. See "Graham, William R., Deputy Administrator Folders," NASA Historical Reference Collection.

**Virgil I. "Gus" Grissom** (1927-1967) was chosen with the first group of astronauts in 1959. He was the pilot for the 1961 Mercury-Redstone 4 (*Liberty Bell 7*) mission (a suborbital flight), command pilot for *Gemini III*, and backup command pilot for *Gemini VI*. He had been selected as commander of the first Apollo flight at the time of his death in the Apollo fire in January 1967. See Betty Grissom and Henry Still, *Starfall* (New York: Thomas Y. Crowell, 1974); The Astronauts Themselves, *We Seven* (New York: Simon and Schuster, 1962).

**Aristid V. Grosse** (1905- ) was born in Riga, Russia, and trained in engineering at the Technische Hochschule in Berlin. He came to the United States in 1930 and was on the chemistry faculty at the University of Chicago, 1931-1940. He then went to Columbia University briefly before working on the Manhattan Project during the war years. In 1948 he became a faculty member at Temple University, presiding over the Research Institute (now Franklin Institute) through 1969.

## H

**Fritz Haber** (1868-1934) was a German research chemist who received the Nobel Prize for developing nitrates from ammonia, which were put to numerous agricultural and industrial uses.

**John P. Hagen** (1908-1990) was director of the Vanguard program during the 1950s. He had been an astronomer at Wesleyan University, 1931-1935, before working for the Naval Research Laboratory, 1935-1958. With the creation of NASA, he became the assistant director of spaceflight development, 1958-1960, and in 1962 he returned to higher education, becoming a professor of astronomy at Pennsylvania State University (obituary in *New York Times*, September 1, 1990, p. 25).

**James C. Hagerty** (1909-1981) had been on the staff of the *New York Times* from 1934 to 1942, the last four years as legislative correspondent in the paper's Albany bureau. He served as executive assistant to New York Governor Thomas Dewey from 1943 to 1950 and then as Dewey's secretary for the next two years, before becoming press secretary for President Eisenhower from 1953 to 1961.

**Edward Everett Hale** (1822-1909) was a writer in the United States during the middle part of the nineteenth century. He was best known for his short story "The Man Without a Country," about a conspirator in the 1803 attempt of Aaron Burr to create a separate nation in the American West. He was widely regarded as one of the foremost literary figures of his time and was the primary speaker at the dedication of the Civil War cemetery in Gettysburg in 1863, at which Abraham Lincoln gave his famous address (Jean Holloway, *Edward Everett Hale: A Biography* [Austin: University of Texas Press, 1956]).

**Donald H. Heaton** was an Air Force officer who from 1951 to 1957 as a lieutenant colonel and colonel had served on various subcommittees of the NACA committee on power plants for aircraft as well as on the committee itself. Available information does not indicate just when he joined NASA headquarters, but the August 1959 telephone directory shows him working in the office of the assistant director of propulsion within the Office of Space Flight Development. He served in a variety of positions connected with launch vehicles, and in June 1961 Associate Administrator Robert Seamans appointed him chairman of an ad hoc task group to formulate plans and determine the resources necessary to carry out a manned lunar landing. His group submitted its summary report in August 1961. He appears to have left NASA headquarters sometime between June and October 1963. See "Donald H. Heaton," biographical file, NASA Historical Reference Collection and headquarters telephone directories for the period; on his committee's report, see especially Courtney G. Brooks, James M. Grimwood, and Loyd S. Swenson, Jr., *Chariots for Apollo: A History of Manned Lunar Spacecraft* (Washington, DC: NASA SP-4205, 1979), pp. 45, 70-72.

**F. Edward Hebert** (1901-1979) (D-LA) was elected to the U.S. House of Representatives in 1932 and came to Washington as part of the Democratic sweep that led to the "New Deal" legislation of 1933-1935. He retired from office in 1976 after being stripped of his chairmanship of the House Armed Services Committee (obituary in *New York Times*, December 31, 1979, p. A13).

**Robert A. Heinlein** (1907-1988) was a well-known science fiction author who began publishing stories before World War II and continued a celebrated career until his death. He published more than sixty books; among the best known were *Starship Troopers* (1952), *Stranger in a Strange Land* (1961), and *The Moon is a Harsh Mistress* (1966) (obituary in *New York Times*, May 10, 1988, p. D2).

**Klaus P. Heiss** (1942- ) is an Austrian-born economist who prepared a major economic feasibility study for the Space Shuttle program in 1971. He later worked with Econ, Inc., and founded and headed Space Transportation Corp., in Princeton, New Jersey. See "Heiss, Klaus P.," biographical file, NASA Historical Reference Collection.

**Christian A. Herter** (1895-1966) was under secretary of state, 1957-1959, and then succeeded John Foster Dulles as secretary of state from 1959-1961. He never achieved the level of mutual understanding with President Eisenhower that Dulles had enjoyed, however, and thus failed to have the sort of influence in developing the administration's foreign policy that his predecessor had achieved (Chester A. Pach and Elmo Richardson, *The Presidency of Dwight D. Eisenhower* [Lawrence, KS: University Press of Kansas, 1987], p. 204).

**Harry H. Hess** (1906-1969) was one of the senior scientists involved in analyzing the lunar samples returned to Earth by Project Apollo. Blair Professor of Geology at Princeton University, he was chair of the Space Science Board of the National Academy of Sciences during the Apollo era.

**William M. Holaday** (1901- ) was special assistant to the secretary of defense for guided missiles between 1957 and 1958. He was then Department of Defense director of guided missiles in 1958 and chairman of the civilian-military liaison committee, 1958-1960. Previously, Holaday had been associated with a variety of research and development activities, notably as director of research for the Socony-Mobil Oil Co., 1937-1944 ("William M. Holaday," biographical file, NASA Historical Reference Collection).

**D. Brainard Holmes** (1921- ) was involved in the management of high-technology efforts in private industry and the federal government. He was on the staff of Bell Telephone Laboratories, 1945-1953, and at RCA, 1953-1961. He then became deputy associate administrator for manned spaceflight at NASA, 1961-1963. Thereafter, he assumed a series of increasingly senior positions with Raytheon Corp., and he served as chairman of Beech Aircraft since 1982. See "D. Brainard Holmes," biographical file, NASA Historical Reference Collection; "Holmes, D(yer) Brainard," *Current Biography 1963*, pp. 191-92.

**Donald F. Hornig** (1920- ), a chemist, was a research associate at the Woods Hole Oceanographic Laboratory, 1943-1944, and a scientist and group leader at the Los Alamos Scientific Laboratory, 1944-1946. He taught chemistry at Brown University starting in 1946, rising to the directorship of Metcalf Research Laboratory, 1949-1957, and also serving as associate dean and acting dean of the graduate school from 1952 to 1954. He was Donner Professor of Science at Princeton from 1957 to 1964, as well as chairman of the chemistry department from 1958 to 1964. He was a special assistant to the U.S. president on science and technology from 1964 to 1969 and president of Brown University from 1970 to 1976. See Gregg Herken, *Cardinal Choices: Science Advice to the President from Hiroshima to SDI* (New York: Oxford University Press, 1992).

**Norman H. Horowitz** (1915- ) was a biologist educated at the California Institute of Technology (Caltech), receiving a Ph.D. in 1939. He made a career as a scientist at both Caltech and the Jet Propulsion Laboratory in Pasadena, California. At the Jet Propulsion Laboratory, he worked as a scientist on the Viking Mars lander program.

**Hubert H. Humphrey** (1911-1978) (D-MN) served in the U.S. Senate, 1949-1964 and 1971-1978. As a senator, he pressed for the creation of a Cabinet-level Department of Science and Technology in early 1958, which was defeated by the president's proposal to establish NASA. He was vice president of the United States between 1965 and 1968 under Lyndon Johnson (obituary in *New York Times*, January 14, 1978, p. 1).

**Jerome C. Hunsaker** (1886-1984) was a senior aeronautical engineer at the Massachusetts Institute of Technology. He was heavily involved in the development of the science of flight in America for the first three-quarters of the twentieth century. See Roger D. Launius, "Jerome C. Hunsaker," in Emily J. McMurray, et al., eds., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 980-81.

## J

**Henry M. ("Scoop") Jackson** (1912-1983) (D-WA) was first elected to the House of Representatives in 1940 and to each succeeding Congress until 1952, when he was elected to the Senate, where he served until the mid-1980s. During the Eisenhower administration he was a leading advocate of greater attention to the development of the U.S. missile program.

**Robert Jastrow** (1925- ) earned a Ph.D. in theoretical physics from Columbia in 1948 and pursued post-doctoral studies at Leiden, Princeton (Institute for Advanced Studies), and the University of California at Berkeley before becoming an assistant professor at Yale, 1953-1954. He then served on the staff at the Naval Research Laboratory from 1954 to 1958. In the last year he was appointed chief of the theoretical division of the Goddard Space Flight Center. He became director of the Goddard Institute of Space Studies in 1961 and stayed at its helm for twenty years before becoming professor of earth sciences at Dartmouth. He specialized in nuclear physics, plasma physics, geophysics, and the physics of the Moon and terrestrial planets ("Robert Jastrow," biographical file, NASA Historical Reference Collection).

**Clarence L. (Kelly) Johnson** (1910-1990) was one of the foremost aircraft designers in the United States. As the head of the Lockheed Aircraft Corporation's famous "Skunk Works" design center, he headed the effort to build the U-2 reconnaissance aircraft in the 1950s. He also worked on the F-80 "Shooting Star," which was the first U.S. jet aircraft, and the SR-71 "Blackbird" reconnaissance plane that still holds speed records. During World War II he was also responsible for the design of the P-38 twin-tailed fighter, "Lightning." He worked for Lockheed from 1933 until his retirement as senior vice president in 1975. See Clarence L. "Kelly" Johnson with Maggie Smith, *Kelly: More Than My Share of it All* (Washington, DC: Smithsonian Institution Press, 1985).

**Louis A. Johnson** (1891-1966) was the assistant Secretary of the U.S. Department of War (1937-1940) and then secretary of defense, 1949-1950. See obituary in *New York Times*, April 25, 1966, p. 31.

**Lyndon B. Johnson** (1908-1973) (D-TX) was elected to the House of Representatives in 1937 and served until 1949. He was a senator from 1949 to 1961, vice president of the United States under President Kennedy from 1960 to 1963, and president from then until 1969. Best known for the social legislation he passed during his presidency and for his escalation of the war in Vietnam, he was also highly instrumental in revising and passing the legislation that created NASA and in supporting the U.S. space program as chairman of the Committee on Aeronautical and Space Sciences and of the preparedness subcommittee of the Senate Armed Services Committee. He was later effective as chairman of the National Aeronautics and Space Council when he was vice president. (On his role in support of the space program, Robert A. Divine, "Lyndon B. Johnson and the Politics of Space," in Robert A. Divine, ed., *The Johnson Years: Vietnam, the Environment, and Science* [Lawrence: University of Kansas Press, 1987], pp. 217-53; Robert Dallek, "Johnson, Project Apollo, and the Politics of Space Program Planning," unpublished paper delivered at a symposium on "Presidential Leadership, Congress, and the U.S. Space Program," sponsored by NASA and American University, March 25, 1993.)

**U. Alexis Johnson** (1908- ) was a longtime member of the U.S. Foreign Service and served in a number of embassies around the world. A specialist in Asian affairs, he was attached to the embassy in Tokyo, 1935-1938; consul general to Japan, 1947-1949; and ambassador to Japan, 1966-1969. He served on several international commissions and in numerous senior positions with the Department of State in Washington, D.C., most significantly as under secretary of state for political affairs beginning in 1969 until his retirement.

**S. Paul Johnston** was director of the Institute for Aeronautical Sciences. He was also a member of the 1957-1958 Purcell Panel that assessed spaceflight capabilities for the U.S. government.

## K

**Joseph Kaplan** (1902-1991) was born in Tapolcza, Hungary, and came to the United States in 1910. He trained as a physicist at The Johns Hopkins University and worked on the faculty of the University of California at Berkeley from 1928 until his retirement in 1970. He directed the university's Institute of Geophysics, later the Institute of Geophysics and Planetary Physics, from the time of its creation in 1944. Kaplan was heavily involved in efforts in the 1950s to launch the first artificial Earth satellite, serving as the chair of the U.S. National Committee for the International Geophysical Year, 1953-1963. See "Kaplan, Joseph," biographical file, NASA Historical Reference Collection; Joseph Kaplan, "The Aeronomy Story: A Memoir," in R. Cargill Hall, ed., *Essays on the History of Rocketry and Astronautics: Proceedings of the Third Through the Sixth History Symposia of the International Academy of Astronautics* (Washington, DC: NASA Conference Publication 2014, 1977), 2: 423-27; Joseph Kaplan, "The IGY Program," *Proceedings of the IRE*, June 1956, pp. 741-43.

**Theodore von Kármán** (1881-1963) was a Hungarian aerodynamicist who founded the Aeronautical Institute at Aachen before World War I and achieved a world-class reputation in aeronautics through the 1920s. In 1930 Robert A. Millikan and his associates at the California Institute of Technology lured von Kármán from Aachen to become the director of the Guggenheim Aeronautical Laboratory at Caltech (GALCIT). There, he trained a generation of engineers in theoretical aerodynamics and fluid dynamics. With its eminence in physics, physical chemistry, and astrophysics as well as aeronautics, it proved to be an almost ideal site for the early development of U.S. ballistic rocketry. See Judith R. Goodstein, *Millikan's School: A History of California Institute of Technology* (New York: W.W. Norton, 1991); Clayton R. Koppes, *JPL and the American Space Program: A History of the Jet Propulsion Laboratory* (New Haven: Yale University Press, 1982); Michael H. Gorn, *The Universal Man: Theodore von Kármán's Life in Aeronautics* (Washington, DC: Smithsonian Institution Press, 1992).

**Amron Harry Katz** (1915- ) was a physicist who worked with the Rand Corporation in Santa Monica, California, between 1954 and 1969. He was a specialist in aerospace reconnaissance.

**William W. Kellogg** (1917- ) was a meteorologist with the Rand Corporation between 1947 and 1959. Thereafter, he held a senior position with the National Center for Atmospheric Research in Boulder, Colorado.

**John F. Kennedy** (1916-1963) was president of the United States, 1961-1963. In 1960 Kennedy, a senator from Massachusetts between 1953 and 1960, ran for president as the Democratic candidate, with party "wheelhorse" Lyndon B. Johnson as his running mate. Using the slogan, "Let's get this country moving again," Kennedy charged the Republican Eisenhower administration with doing nothing about the myriad social, economic, and international problems that festered in the 1950s. He was especially hard on Eisenhower's record in international relations, taking a "cold warrior" position on a supposed "missile gap" (which turned out not to be the case) wherein the United States lagged far behind the Soviet Union in ICBM technology. On May 25, 1961, President Kennedy announced to the nation a goal of sending an American to the Moon before the end of the decade. The human spaceflight imperative was a direct outgrowth of it; Projects Mercury (at least in its latter stages), Gemini, and Apollo were each designed to execute it. On this subject, see Walter A. McDougall, . . . *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985); John M. Logsdon, *The Decision to Go to the Moon: Project Apollo and the National Interest* (Cambridge, MA: MIT Press, 1970).

**Robert F. Kennedy** (1925-1968) was attorney general during the administration of his brother, John F. Kennedy, and a candidate for the Democratic nomination for the presidency in 1968 at the time of his assassination. He was involved in the 1961 decision to go to the Moon as a senior advisor (as well as attorney general) in the Kennedy administration. On his career, see Arthur M. Schlesinger, Jr., *Robert Kennedy and His Times* (Boston: Houghton Mifflin, 1978).

**Johann Kepler** (1571-1630), a young German astronomer, began work with Tycho Brahe in Prague, Czechoslovakia, in 1599. When Brahe died in 1601, Kepler inherited his position and continued his observations for a method of mathematically solidifying the Copernican view of the universe. He developed his three laws of planetary motion, and he was interested in cosmology and dabbled in astrology. His last book, *Somnium*, was completed shortly before his death and related a fantastic story of space travel that was memorable for its exposition of the Copernican model to explain planetary motion (Owen Gingerich, "Johannes Kepler," *Dictionary of Scientific Biography* [New York: Charles Scribner's Sons, 1970], 7: 289-90).

**Robert S. Kerr** (1896-1963) (D-OK) had been governor of Oklahoma from 1943-1947 and was elected to the Senate the following year. From 1961 until 1963 he chaired the Aeronautical and Space Sciences Committee. See Anne Hodges Morgan, *Robert S. Kerr: The Senate Years* (Norman: University of Oklahoma Press, 1977).

**George A. Keyworth II** (1939- ) was director of the Office of Science and Technology Policy and science advisor to President Ronald Reagan between 1981 and 1986. Formerly the head of the Los Alamos Scientific Laboratory, Keyworth was a Ph.D. in nuclear physics from Duke University in 1968. He began work at Los Alamos after graduation and remained there until 1981. See "Keyworth, George A(Ibert), 2d," *Current Biography Yearbook 1986*, pp. 265-68.

**Nikita S. Khrushchev** (1894-1971) was premier of the Soviet Union from 1958 to 1964 and first secretary of the Communist Party from 1953 to 1964. He was noted for an astonishing speech in 1956 denouncing the crimes and blunders of Joseph Stalin and for gestures of reconciliation with the West in 1959-1960, ending with the breakdown of a Paris summit with President Eisenhower and the leaders of France and Great Britain in the wake of Khrushchev's announcement that the Soviets had shot down an American U-2 reconnaissance aircraft over the Urals on 1 May 1960. Then in 1962 Khrushchev attempted to place Soviet medium-range missiles in Cuba. This led to an intense crisis in October, after which Khrushchev agreed to remove the missiles if the United States promised to make no more attempts to overthrow Cuba's Communist government. Although he could be charming at

times, Khrushchev was also given to bluster (extending even to shoe-pounding at the U.N.) and was a tough negotiator, although he believed, unlike his predecessors, in the possibility of Communist victory over the West without war. For further information about him, see his *Khrushchev Remembers: The Last Testament* (Boston: Little, Brown, 1974); Edward Crankshaw, *Khrushchev: A Career* (New York: Viking, 1966); Michael R. Beschloss, *Mayday: Eisenhower, Khrushchev and the U-2 Affair* (New York: Harper and Row, 1986); Robert A. Divine, *Eisenhower and the Cold War* (New York: Oxford University Press, 1981).

**James R. Killian, Jr.** (1904-1988), was president of the Massachusetts Institute of Technology (MIT) between 1949 and 1959. He was on leave between November 1957 and July 1959 when he served as the first presidential science advisor. President Dwight D. Eisenhower established the President's Science Advisory Committee (PSAC), which Killian chaired, following the Sputnik crisis. After leaving the White House staff in 1959, Killian continued his work at MIT, but in 1965 he began working with the Corporation for Public Broadcasting to develop public television. Killian described his experiences as a presidential advisor in *Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President for Science and Technology* (Cambridge, MA: MIT Press, 1977). For a discussion of the PSAC, see Gregg Herken, *Cardinal Choices: Science Advice to the President from Hiroshima to SDI* (New York: Oxford University Press, 1992).

**Jeane J. Kirkpatrick** (1926- ) was U.S. Permanent Representative to the United Nations.

**Henry Kissinger** (1923- ) was assistant to the president for national security affairs, 1969-1973, under President Richard Nixon and secretary of state thereafter until 1977 under Nixon and President Gerald Ford. In these positions he was especially involved in international aspects of spaceflight, particularly the joint Soviet/American flight, the Apollo-Soyuz Test Project, in 1975.

**George B. Kistiakowsky** (1900-1982) was a pioneering chemist at Harvard University, associated with the development of the atomic bomb, and later an advocate of banning nuclear weapons. He served as science advisor to President Eisenhower from July 1959 to the end of the administration. He later served on the advisory board to the Arms Control and Disarmament Agency from 1962 to 1969 (*New York Times*, December 9, 1982, p. B21; "George B. Kistiakowsky," biographical file, NASA Historical Reference Collection).

**William F. Knowland** (1908-1974) (R-CA) served in the Senate between 1945 and 1959 (*Washington Post*, October 5, 1959, p. C3; *Guide to Research Collections of Former United States Senators, 1789-1982* [Washington, DC: Government Printing Office, 1983], p. 291).

**Joseph J. Knopow** was a young Lockheed engineer who helped develop an infrared radiometer and telescope to detect the hot exhaust gases emitted by long-range jet bombers and, more important, large rockets in the mid-1950s. This aircraft-tracker and missile-detection system became a standard method of targeting enemy air- and spacecraft.

## L

**Melvin Laird** (1922- ) was secretary of defense during the Nixon administration.

**Edwin Land** was president of the Polaroid Corporation, as well as a member of the 1957-1958 Purcell Panel that assessed spaceflight capabilities for the U.S. government.

**Harold Lasswell** (1902-1978) was a political scientist at Yale University. He was especially interested in public opinion polling, the uses of propaganda, and the democratic political process.

**James S. Lay, Jr.** (1911-1987), was a senior official in the National Security Council, first as assistant executive secretary, 1947-1950, and then as executive secretary, 1950-1961. He then served as deputy assistant to the director of the Central Intelligence Agency (CIA), 1961-1964, and the executive secretary of the Intelligence Board through 1971.

**Tom Lehrer** (1928- ) was a satirist who wrote and recorded several folk songs in the 1960s that made light of current events. His last album, *That Was the Year That Was* (1965), contained the satirical song "Wernher von Braun," dealing with the relationship of science to ethics. See "Lehrer, Tom," *Current Biography 1982*, pp. 227-30.

**Curtis E. LeMay** (1906-1990) was a career Air Force officer who entered the Army Air Corps in the 1920s and rose through a series of increasingly responsible Army Air Forces commands in World War II. After the war, LeMay built the Strategic Air Command into the premier nuclear deterrent force in the early 1950s. He also served as deputy chief of staff, 1957-1961, and chief of staff, 1961-1965, of the U.S. Air Force. He retired as a four-star

general in 1965, and he ran for vice president with independent candidate George C. Wallace in 1968. See Thomas M. Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown Pub., 1986).

**Samuel Lenher** (1905- ) was a chemical manufacturing executive with the Dupont Corporation in Wilmington, Delaware, from 1929 until his retirement.

**Willy Ley** (1906-1969) was an extremely effective popularizer of spaceflight, first in Germany and then after 1935 in the United States, to which he emigrated after Hitler's ascension to power. He helped found the large and significant German "Verein für Raumschiffahrt" (Society for Spaceship Travel, or VfR) in 1927. He also wrote several books that dealt with the dream of spaceflight. One of the most important was *Rockets: The Future of Travel Beyond the Stratosphere*, first published in 1944. In it Ley labored to convince interested readers that rockets would soon be able to carry humans off the surface of the Earth. One of the earliest books on rocketry for the general public, this work became a reference source for future science fiction and reality writing. A revised edition appeared in 1947, titled *Rockets and Space Travel*, and another in 1952, *Rockets, Missiles, and Space Travel*. An obituary can be found in the *New York Times*, June 25, 1969, p. 47.

**Charles A. Lindbergh** (1902-1974) was an early aviator who gained fame as the first pilot to fly solo across the Atlantic in 1927. His public stature following this flight was such that he became an important voice on behalf of aerospace activities until his death. He served on a variety of national and international boards and committees, including the central committee of the National Advisory Committee for Aeronautics in the United States. He became an expatriate living in Europe, following the kidnapping and murder of his two-year-old son in 1932. In Europe during the rise of fascism, Lindbergh assisted American aviation authorities by providing them with information about European technological developments. After 1936 he was especially important in warning the United States of the rise of Nazi air power. He assisted with the war effort in the 1940s by serving as a consultant to aviation companies and the government, and after the war he lived quietly in Connecticut and then in Hawaii. See Walter S. Ross, *The Last Hero: Charles A. Lindbergh* (New York: Harper and Row, 1967).

**James E. Lipp** (1910- ) earned a Ph.D. in aeronautical engineering from the California Institute of Technology in 1935, and he then worked for the Douglas Aircraft Co., 1935-1948. Thereafter, he went to work for the Rand Corporation and eventually headed its aerospace division.

**Alan M. Lovelace** (1929- ) was born in St. Petersburg, Florida, and was educated at the University of Florida, Gainesville, receiving a B.S. in chemistry in 1951, an M.S. in organic chemistry in 1952, and a Ph.D. in organic chemistry in 1954. Shortly after the end of the Korean conflict, he served in the U.S. Air Force from 1954 to 1956. Thereafter, Dr. Lovelace began work as a government scientist at the Air Force Materials Laboratory at Wright-Patterson Air Force Base in Dayton, Ohio. In January 1964 he was appointed chief scientist of the Air Force Materials Laboratory. In 1967 he was named director of the Air Force Materials Laboratory, and in October 1972 he was named director of science and technology for the Air Force Systems Command at headquarters, Andrews Air Force Base, Maryland. In September 1973 he became the principal deputy to the assistant secretary of the Air Force for research and development. In September 1974 Dr. Lovelace left the Department of Defense to become the associate administrator of the NASA Office of Aeronautics and Space Technology. With the departure of George Low as NASA deputy administrator in June 1976, Dr. Lovelace became deputy administrator, serving until July 1981. He retired from NASA to accept a position as corporate vice president—science and engineering with the General Dynamics Corporation in St. Louis, Missouri. See "Lovelace, Alan M.," Deputy Administrator files, NASA Historical Reference Collection.

**George M. Low** (1926-1984), a native of Vienna, Austria, came to the United States in 1940 and received an aeronautical engineering degree from Rensselaer Polytechnic Institute (RPI) in 1948 and an M.S. in the same field from that school in 1950. He joined NACA in 1949, and at the Lewis Flight Propulsion Laboratory, he specialized in experimental and theoretical research in several fields. He became chief of manned spaceflight at NASA headquarters in 1958. In 1960 he chaired a special committee that formulated the original plans for the Apollo lunar landings. In 1964 he became deputy director of the Manned Spacecraft Center in Houston, the forerunner of the Johnson Space Center. He became deputy administrator of NASA in 1969 and served as acting administrator from 1970 to 1971. He retired from NASA in 1976 to become president of RPI, a position he still held at his death. In 1990 NASA renamed its quality and excellence award after him ("Low, George M.," Deputy Administrator files, NASA Historical Reference Collection).

**Percival Lowell** (1855-1916) was the U.S. astronomer who predicted the existence of the planet Pluto. A Boston Brahmin, Lowell was a gentleman scholar who was involved in literature, writing several books on his travels around the globe. He also served as counselor and foreign secretary to the Korean Special Mission to the United States. Lowell developed an interest in astronomy in middle age, and he founded an observatory in Flagstaff, Arizona, to study the Solar System, especially Mars. He was enamored with the prospect of life on the red planet

and theorized that its "canals" were the product of intelligent life (William Graves Hoyt, *Lowell and Mars* [Tucson: University of Arizona Press, 1976]).

## M

**Richard C. McCurdy** (1909- ), an engineer specializing in petroleum, was associate administrator for organization and management at NASA headquarters, Washington, D.C., 1970-1973, and a consultant to the agency from 1973 to 1982.

**Neil H. McElroy** (1904-1972) became secretary of defense in 1957 and served through 1959. He had previously been president of Procter & Gamble and returned there in December 1959 to become chairman of the board. He served in that position until October 1972, a month before his death.

**Walter A. MacNair** (1901- ) was an electrical engineer who worked with the Bell Telephone Laboratories, 1929-1952, and the Consolidated Electrodynamics Corporation thereafter.

**Robert S. McNamara** (1916- ) was secretary of defense during the Kennedy and Johnson administrations, 1961-1968. Thereafter, he served as president of the World Bank, where he remained until retirement in 1981. As secretary of defense in 1961 McNamara was intimately involved in the process of approving Project Apollo by the Kennedy administration. See "McNamara, Robert S(trange)," *Current Biography Yearbook 1987*, pp. 408-13; John M. Logsdon, *The Decision to Go to the Moon: Project Apollo and the National Interest* (Cambridge, MA: MIT Press, 1970).

**John W. Macy, Jr.**, was chair of the Civil Service Commission during the Kennedy administration. He served as a member of a study committee in 1961 to ascertain the viability of "contracting out" considerable functions in aerospace research and development. The 1961 study was known as the "Bell Report" because the chair of the committee was David E. Bell, director of the Bureau of the Budget.

**Frank J. Malina** (1912-1981) was a young Ph.D. student at the California Institute of Technology in the mid-1930s, when he began an aggressive rocket research program to design a high-altitude sounding rocket. Beginning in late 1936 Malina and his colleagues started the static testing of rocket engines in the canyons above the Rose Bowl, with mixed results, but a series of tests eventually led to the development of the WAC Corporal rocket during World War II. After the war Malina worked with the United Nations and eventually retired to Paris to pursue a career as an artist. See "Malina, Frank J.," biographical file, NASA Historical Reference Collection.

**Gordon Manning** was a journalist for several periodicals. He was a staff writer for *Collier's*, 1948-1949, and worked in a series of increasingly responsible positions for *Newsweek*, 1949-1964. Between 1961 and 1964 he was executive editor. Thereafter, he worked with television, first as vice president and director of news for CBS, 1964-1972, and then as executive producer of NBC News, 1975-1978.

**Hans Mark** (1929- ) became NASA deputy administrator in July 1981. He had previously served as secretary of the Air Force from July 1979 until February 1981 and as under secretary of the Air Force since 1977. In February 1969 Mark became director of NASA's Ames Research Center in Mountain View, California, where he managed the center's research and applications efforts in aeronautics, space science, life science, and space technology. Born in Mannheim, Germany, he came to the United States in 1940, and he became a citizen in 1945. He received a Ph.D. in physics from the Massachusetts Institute of Technology in 1954. Upon leaving NASA he became Chancellor of the University of Texas at Austin. See "Mark, Hans," Deputy Administrator files, NASA Historical Reference Collection.

**Robert P. Mayo** (1916- ) was an economist and President Richard Nixon's first director of the Bureau of the Budget. On July 1, 1970, when the Bureau of the Budget was replaced with the Office of Management and Budget, Mayo was shifted to the White House as a presidential assistant. In July 1970 he left Washington to assume the presidency of the Federal Reserve Bank of Chicago ("Mayo, Robert P(orter)," *Current Biography 1970*, pp. 282-84).

**John B. Medaris** (1902-1990) was a major general commanding the Army Ballistic Missile Agency when T. Keith Glennan tried to incorporate it into NASA in the late 1950s. He attempted to retain the organization as part of the Army, but with a series of Department of Defense agreements, the Air Force obtained primacy in space activities, and Medaris could not succeed in his effort. Medaris also worked with Werner von Braun to launch *Explorer I* in early 1958. He retired from the Army in 1969 and became an Episcopal priest, later joining an even more conservative Anglican-Catholic church ("Medaris, John Bruce," biographical file, NASA Historical Reference Collection; John B. Medaris with Arthur Gordon, *Countdown for Decision* [New York: Putnam, 1960]).



**Ruben F. Mettler** (1924- ) was an electronics and engineering company executive who worked for the Hughes Aircraft Co., 1949-1954; Ramo-Wooldrige Corp., 1955-1958; TRW Space Technology Laboratories, 1958-1965; and TRW Systems Group, 1965-1968. He became president and chief operating officer of TRW Inc., 1969-1977, and then TRW chairman of the board and CEO, 1977-1988.

**Stuart Miller** (1927- ) was a research engineer in industry, working with the Chrysler Corporation, 1952-1953, and the General Electric Co., 1953-1977.

**Robert A. Millikan** (1868-1953) was a Nobel Prize-winning physicist at the California Institute of Technology (Caltech). Best known for his research on cosmic rays, he also built Caltech into a world-class educational and scientific institution, over which he presided until his retirement in 1946. For more information on Millikan, see Robert H. Kargon, *The Rise of Robert Millikan: Portrait of a Life in American Science* (Ithaca, NY: Cornell University Press, 1982); *The Autobiography of Robert A. Millikan* (New York: Prentice-Hall, 1950).

**Wilbur D. Mills** (1909-1992) (D-AR) was a member of the U.S. House of Representatives from 1939 to 1977. He served as chair of the powerful House Ways and Means Committee, 1957-1975 (obituary in *New York Times*, May 3, 1992, p. I53).

**L. Arthur Minnich, Jr.** (1918- ), was assistant staff secretary in the White House, 1953-1960. A historian by training, he also served on the faculty of Lafayette College before 1953. After leaving the White House, he served as the executive secretary of UNESCO.

**Oskar Morgenstern** (1902- ) was a German-born and -trained economist. He came to the United States in 1925 and worked at Princeton University after 1938. He founded and headed Mathematica, Inc., which provided economic analyses to government and industry.

**Frank E. "Ted" Moss** (1906- ) (D-UT) was first elected to the Senate in 1958 and served until 1977. Between 1972 and 1977 he served as chair of the Senate Space Committee.

**George E. Mueller** (1918- ) was associate administrator for the Office of Manned Space Flight at NASA headquarters, 1963-1969, where he responsible for overseeing the completion of Project Apollo and for beginning the development of the Space Shuttle. He moved to the General Dynamics Corporation, as senior vice president in 1969, and remained until 1971. He then became president of the Systems Development Corporation, 1971-1980, and then its chairman and chief executive officer, 1981-1983. See "Mueller, George E.," biographical file, NASA Historical Reference Collection.

**Edmund Muskie** (1914- ) (D-ME) served in the U.S. Senate, 1959-1981.

**Dale D. Myers** (1922- ) served as NASA deputy administrator from October 1986 until 1989. He had previously been under secretary of the U.S. Department of Energy from 1977 to 1979. From 1974 to 1977 he was vice president at Rockwell International and president of the North American Aircraft Group in El Segundo, California. He was also the associate administrator for the Office of Manned Space Flight at NASA from 1970 to 1974. From 1969 to 1970 Myers served as vice president/program manager of the Space Shuttle Program at Rockwell International. He was also vice president and program manager of the Apollo Command/Service Module Program at North American-Rockwell from 1964 to 1969. After leaving NASA in 1989 Myers returned to private industry. See "Myers, Dale D.," Deputy Administrator files, NASA Historical Reference Collection.

## N

**John E. Naugle** (1923- ) was trained as a physicist at the University of Minnesota and began his career studying cosmic rays by launching balloons to high altitudes. In 1959 he joined NASA's Goddard Space Flight Center in Greenbelt, Maryland, where he developed projects to study the magnetosphere. In 1960 he took charge of NASA's fields and particles research program. He also served as NASA's associate administrator for the Office of Space Science and as the agency's chief scientist before his retirement in 1981. See John E. Naugle, *First Among Equals: The Selection of NASA Space Science Experiments* (Washington, DC: NASA SP-4215, 1991).

**Richard G. Neustadt** (1919- ) was a Harvard University-trained political scientist who made a career in public policy analysis. He served for a time (1946-1953) with the federal government in Washington and thereafter in academia at Columbia University (1954-1964) and Harvard University (since 1964). He was an informal advisor to presidents and their associates between the 1940s and the 1980s. See Richard E. Neustadt and Ernest R. May, *Thinking in Time: The Uses of History for Decision Makers* (New York: Free Press, 1986).

**Isaac Newton** (1642-1727) created a scientific explanation of the workings of the universe that held sway until the twentieth century. Based on the concept of gravity and three laws of motion that related to it, the Newtonian construct placed astronomy and physics on a firm mathematical foundation. Born in England, Newton was educated at Trinity College in Cambridge. As a relatively young man, by 1667 he had developed his ideas on universal gravitation and its consequences, the nature of white light, and the calculus. In the same year, he was elected a fellow of Trinity College and two years later succeeded to the chair of his mentor Isaac Barrow. In 1696 Newton was named warden of the mint and became its master in 1699. While still officially associated with Cambridge, his work at the mint effectively ended Newton's academic career (James R. Newman, ed., *The World of Mathematics* [New York: Simon and Schuster, 1956], pp. 256-78; Lloyd Motz and Jefferson Hane Weaver, *The Story of Physics* [New York: Avon Books, 1992]).

**Kenneth D. Nichols** (1907- ) worked on the Manhattan Project in World War II and served in a variety of special weapons activities with the Department of Defense. In the early 1950s he was involved in directing the guided missile research and development effort for the secretary of defense. He also held posts with the Atomic Energy Commission and with industry.

**Richard M. Nixon** (1913-1994) was president of the United States between January 1969 and August 1974. Early in his presidency Nixon appointed a Space Task Group under the direction of Vice President Spiro T. Agnew to assess the future of spaceflight for the nation. Its report recommended a vigorous post-Apollo exploration program culminating in a human expedition to Mars. Nixon did not approve this plan, but he did decide in favor of building one element of it, the Space Shuttle, which was approved on January 5, 1972. See Roger D. Launius, "NASA and the Decision to Build the Space Shuttle, 1969-72," *The Historian* 57 (Autumn 1994): 17-34.

## O

**Hermann J. Oberth** (1894-1989) is one of the three recognized fathers of spaceflight. A Transylvanian by birth but a German in his family heritage, he was educated at the Universities of Klausenburg, Munich, Göttingen, and Heidelberg. His doctoral dissertation being rejected because it did not fit into any established scientific discipline, he published it privately as *Die Rakete zu den Planetenräumen* (*The Rocket into Interplanetary Space*) in 1923. It and its expanded version, titled *Ways to Spaceflight* (1929), set forth the basic principles of spaceflight and directly inspired many subsequent spaceflight pioneers, including Wernher von Braun. See his "Hermann Oberth: From My Life," *Astronautics*, June 1959, pp. 38-39, 100-106; Frank Winter, *Rockets into Space* (Cambridge, MA: Harvard University Press, 1990), pp. 17-25; Helen B. Walters, *Hermann Oberth: Father of Space Travel* (New York: Macmillan, 1962).

**Charles R. O'Dell** (1937- ) was trained as an astronomer at the University of Wisconsin and was project scientist for the Hubble Space Telescope project, 1972-1983, at the Marshall Space Flight Center. He has been on the astronomy faculty at several universities, including the University of Houston where he is Buchanan Professor of Astrophysics.

**Hugh Odishaw** (1916-1984) became assistant to the director of the National Bureau of Standards from 1946 to 1954, served as executive director of the U.S. National Committee for the International Geophysical Year from 1954 to 1965, and then became the executive secretary of the Division of Physical Sciences in the National Academy of Sciences from 1966 to 1972.

**Thomas F. (Tip) O'Neill** (1912-1994) (D-MA) served in the U.S. House of Representatives from 1953 until 1987. For much of his later service in the House, he was speaker.

**Don Richard Ostrander** (1914-1972) was a career Air Force officer who became a major general in 1958. He was deputy commander of the Advanced Research Projects Agency in 1959 and became director of NASA's launch vehicle programs in late 1959 as NASA began taking over responsibility for the Saturn program. He left NASA in 1961 and retired from the Air Force in 1965 as vice commander of the Ballistic Systems Division, Air Force Systems Command, to become vice president for planning of the Bell Aero Systems Corporation ("Don Richard Ostrander," biographical file, NASA Historical Reference Collection).

**Carl F.J. Overhage** (1910- ) earned his Ph.D. in physics at the California Institute of Technology in 1937 and served as acting director of research for Technicolor Motion Picture Corp. until 1941, when he joined the staff of the radiation laboratory at the Massachusetts Institute of Technology (MIT) from 1942 to 1945. After a stint with Eastman Kodak from 1946 to 1954, he joined the Lincoln Laboratories of MIT, becoming its director from 1957 to 1964, after which he served as a professor of engineering.

## P

**Thomas O. Paine** (1921-1992) was appointed deputy administrator of NASA on January 31, 1968. Upon the retirement of James E. Webb on October 8, 1968, he was named acting administrator of NASA. He was nominated as NASA's third administrator March 5, 1969, which was confirmed by the Senate on March 20, 1969. During his leadership the first seven Apollo manned missions were flown, in which twenty astronauts orbited the earth, fourteen traveled to the Moon, and four walked on its surface. Paine resigned from NASA on September 15, 1970, and he returned to the General Electric Co. in New York City as vice president and executive of the Power Generation Group, where he remained until 1976. In 1985 the White House chose Paine as chair of a National Commission on Space to prepare a report on the future of space exploration. Since leaving NASA fifteen years earlier Paine had been a tireless spokesperson for an expansive view of what should be done in space. The Paine Commission took most of a year to prepare its report, largely because it solicited public input in hearings throughout the United States. The commission's report, *Pioneering the Space Frontier*, was published in a lavishly illustrated, glossy format in May 1986. It espoused a "pioneering mission for 21st-century America"—"to lead the exploration and development of the space frontier, advancing science, technology, and enterprise, and building institutions and systems that make accessible vast new resources and support human settlements beyond Earth orbit, from the highlands of the Moon to the plains of Mars." The report also contained a "Declaration for Space," which included a rationale for exploring and settling the Solar System and outlined a long-range space program for the United States.

**Richard S. Perkin** (1906- ) was co-founder and president of Perkin-Elmer Corp., 1937-1960, and then chairman of the board.

**James A. Perkins** (1911- ) was vice president of the Carnegie Corporation from 1951 to 1963 and president of Cornell University from 1963 to 1969. He served on the Kimpton Committee of 1959 to assess the space effort.

**Rocco Petrone** (1926- ) was heavily involved at NASA with the development of the Saturn V booster used to launch Apollo spacecraft to the Moon in the 1960s and early 1970s. He worked at the Marshall Space Flight Center and became its director in 1973. He left Marshall in 1974 for a position at NASA headquarters in Washington, D.C., in 1974, and he retired from the agency in 1975. He then became president and chief executive officer of the National Center for Resource Recovery.

**Samuel C. Phillips** (1921-1990) was trained as an electrical engineer at the University of Wyoming, but he also participated in the Civilian Pilot Training Program during World War II. Upon his graduation in 1942 Phillips entered the Army infantry but soon transferred to the air component. As a young pilot, he served with distinction in the Eighth Air Force in England—earning two distinguished flying crosses, eight air medals, and the French *croix de guerre*—but he quickly became interested in aeronautical research and development. He became involved in the development of the incredibly successful B-52 bomber in the early 1950s and headed the Minuteman intercontinental ballistic missile program in the latter part of the decade. In 1964, by this time an Air Force general, Phillips was lent to NASA to head the Apollo moon landing program, which, of course, was unique in its technological accomplishment. He went back to the Air Force in the 1970s and commanded the Air Force Systems Command prior to his retirement in 1975. See "Gen. Samuel C. Phillips of Wyoming," *Congressional Record*, August 3, 1973, S-15689; Rep. John Wold, "Sam Phillips: One Who Led Us to the Moon," *NASA Activities*, May/June 1990, pp. 18-19; obituary in *New York Times*, February 1, 1990, p. D1.

**William H. Pickering** (1910- ) obtained his bachelor's and master's degrees in electrical engineering and then a Ph.D. in physics from the California Institute of Technology before becoming a professor of electrical engineering there in 1946. In 1944 he organized the electronics efforts at the Jet Propulsion Laboratory (JPL) to support guided missile research and development, becoming project manager for Corporal, the first operational missile that JPL developed. From 1954 to 1976 he was director of JPL, which developed the first U.S. satellite (*Explorer I*), the first successful U.S. cislunar space probe (*Pioneer IV*), the Mariner flights to Venus and Mars in the early to mid-1960s, the Ranger photographic missions to the Moon in 1964-65, and the Surveyor lunar landings of 1966-1967 ("William H. Pickering," biographical file, NASA Historical Reference Collection).

**William Proxmire** (1915- ) (D-WI) served in the U.S. Senate between 1957 and 1989.

**Claudius Ptolemy** (fl. 127-145) of Alexandria, Egypt, was responsible for the development of the "Ptolemaic System" of understanding the universe. It placed the Earth at its center with the planets, Moon, Sun, and stars orbiting overhead. Ptolemy based his system on observations of celestial bodies and the application of mathematical models that adequately explained the movements he observed. He also catalogued 1,022 stars (Owen T. Gingerich, gen. ed., *The Cambridge General History of Astronomy*, Vol. 1 [New York: Cambridge University Press, 1984]).

**Allen E. Puckett** (1919- ) earned his Ph.D. at the California Institute of Technology in 1949 and went to work for Hughes Aircraft Co. that year, becoming its executive vice president from 1965 to 1977 and its president thereafter. He served as a member of the Nixon transition team's Task Force on Space, which was led by Dr. Charles Townes, to make recommendations on the new administration's efforts in aerospace.

**Edward M. Purcell** (1912- ) was a professor of physics at Harvard University and also served on the president's Scientific Advisory Committee from 1957 to 1960 and 1962 to 1965. He had been co-winner of the Nobel Prize in physics in 1952 (with Felix Bloch) for the discovery of nuclear magnetic resonance in solids.

**Donald L. Putt** (1905-1988) was a career U.S. Air Force officer who specialized in the management of aerospace research and development activities. Trained as an engineer, he entered the Army Air Corps in 1928 and worked in a series of increasingly responsible posts at the Air Materiel Command and general headquarters of the Air Force. From 1948 to 1952 he was director of research and development for the Air Force, and he was first vice commander and then commander of the Air Research and Development Command between 1952 and 1954. Thereafter until his retirement in 1958, he served as deputy chief of the development staff at Air Force headquarters.

## Q

**Donald A. Quarles** (1894-1959) was a deputy secretary of defense between 1957 and 1959. Just after World War II he had been a vice president first at Western Electric Co. and later at Sandia National Laboratories, but in 1953 he accepted the position of assistant secretary of defense (research and development). He was also secretary of the Air Force between 1955 and 1957.

## R

**Ronald Reagan** (1911- ) was elected president of the United States in 1980 and assumed office in January 1981; he served until 1989. During his presidency the maiden flight of the Space Shuttle took place. In 1984 he mandated the construction of an orbital space station. Reagan declared that "America has always been greatest when we dared to be great. We can reach for greatness again. We can follow our dreams to distant stars, living and working in space for peaceful, economic, and scientific gain. Tonight I am directing NASA to develop a permanently manned space station and to do it within a decade." See Sylvia D. Fries, "2001 to 1994: Political Environment and the Design of NASA's Space Station System," *Technology and Culture* 29 (July 1988): 568-93.

**Sally K. Ride** (1951- ) was the first American woman to fly in space. She was chosen as an astronaut in 1978 and served as a mission specialist for STS-7 (1983) and for STS-41G (1984). She was also a member of the Presidential Commission on the Space Shuttle *Challenger* Accident in 1986, and from 1986 to 1987 she chaired a NASA task force that prepared a report on the future of the civilian space program, titled *Leadership and America's Future in Space* (Washington, DC: U.S. Government Printing Office, 1987). Ride resigned from NASA in 1987 to join the Center for International Security and Arms Control at Stanford University. She left Stanford in 1989 to assume the directorship of the California Space Institute, part of the University of California at San Diego. See "Ride, Sally K.," biographical file, NASA Historical Reference Collection.

**Louis N. Ridenour** (1911- ) received his Ph.D. in physics from the California Institute of Technology in 1936, and he began work at Princeton University. In 1938 he moved to the University of Pennsylvania, where he remained until 1947. He then went to the University of Illinois, but he left there in 1951 to become vice president of the International Telemeter Corp. He also served in several positions with scientific organizations in the federal government, most significantly as chief scientist with the U.S. Air Force in the early 1950s.

**Walter O. Roberts** (1915-1990) was an astronomer at the University of Colorado's High Altitude Observatory. He was also instrumental in the creation of the National Center for Atmospheric Research in 1960, and he directed the program on food, climate, and the world's future for the Aspen Institute for Humanistic Studies, 1974-1981. He was heavily involved in the debate over "nuclear winter" and the possibility of the "Greenhouse Effect" on the Earth in the 1980s. See "Roberts, Walter Orr," *Current Biography Yearbook 1990*, p. 660.

**Nelson A. Rockefeller** (1909-1979) was vice president of the United States from 1974 to 1977. He had previously been the Republican governor of New York, 1958-1973 (obituary in *New York Times*, January 26, 1979, p. 27).

**William P. Rogers** (1913- ) was chair of the presidentially mandated blue ribbon commission investigating the *Challenger* accident in January 1986. It found that the failure had resulted from a poor engineering decision, an O-ring used to seal joints in the solid rocket booster that was susceptible to failure at low temperatures, introduced innocently enough years earlier. Rogers kept the commission's analysis on that technical level, and he documented the problems in exceptional detail. The commission, after some prodding by Nobel Prize-winning

scientist Richard P. Feynman, did a credible job of grappling with the technologically difficult issues associated with the accident. See *Report of the Presidential Commission on the Space Shuttle Challenger Accident, Vol. I* (Washington, DC: U.S. Government Printing Office, June 6, 1986).

**H.E. Ross** was one of the leaders of the British Interplanetary Society from the time of its inception in 1933. Ross wrote a 1939 article in the society's journal that outlined a method of accomplishing a lunar mission. The effort leading to the article had begun in London in February 1937 when the British Interplanetary Society formed a technical committee to conduct feasibility studies.

**Herbert J. Rowe** (1924- ) was NASA associate administrator for external affairs, 1975-1978. He also worked with several high-technology industrial firms, including the Aerovox Corporation.

**Richard B. Russell, Jr.** (1897-1971) (D-GA), was a U.S. Senator from 1933 until his death. He was an influential force in the Senate, and he served as chair of the Senate Armed Services Committee, 1951-1969.

**Cornelius Ryan** was an influential journalist who worked for *Collier's* magazine in the 1950s and was in large measure responsible for the issues of the magazine devoted to space that appeared between 1952 and 1955. He became best known for his World War II trilogy: *The Longest Day: June 6, 1944* (1959); *A Bridge Too Far* (1974); and *The Last Battle* (1966).

## S

**Robert M. Salter, Jr.** (1920- ) was a physicist who worked with North American Aviation, 1946-1948; the Rand Corporation, 1948-1954; Lockheed Aircraft Co., 1954-1959; Quantatron, Inc., 1960-1962; and Xerad, Inc., since 1962. He was responsible for much of the early thinking at Rand on the possibility of an artificial Earth-orbiting satellite.

**Leverett Saltonstall** (1892-1979) (R-MA) was governor of Massachusetts from 1939 to 1944, when he won election to the U.S. Senate. He served in the Senate from then until 1967 and became one of its Republican leaders.

**Giovanni Schiaparelli** (1835-1910) was an Italian astronomer and senator of the Kingdom of Italy. He studied astronomy in Berlin, beginning in 1854 under Johann F. Encke. Two years later he was appointed assistant observer at Pulkovo Observatory, Russia. In 1860 he returned to Italy as an observer at Brera Observatory in Milan. There he made controversial observations of Martian *canali*, or straight lines, that set off speculation about the possibility of intelligent life who had constructed them. He also discovered the asteroid Hesperia and correctly calculated the Perseid meteor showers (Frederick I. Ordway III, "The Legacy of Schiaparelli and Lowell," *Journal of the British Interplanetary Society*, January 1986, pp. 18-22).

**Bernard A. Schriever** (1910- ) earned a B.S. in architectural engineering from Texas A&M in 1931 and was commissioned in the Army Air Corps Reserve in 1933 after completing pilot training. Following broken service, he received a regular commission in 1938. He earned an M.A. in aeronautical engineering from Stanford in 1942 and then flew sixty-three combat missions in B-17s with the 19th Bombardment Group in the Pacific Theater during World War II. In 1954 he became commander of the Western Development Division (soon renamed the Air Force Ballistic Missile Division), and from 1959 to 1966 he was commander of its parent organization, the Air Research and Development Command, renamed the Air Force Systems Command in 1961. As such, he presided over the development of the Atlas, Thor, and Titan missiles, which served not only as military weapon systems but also as boosters for NASA's space missions. In developing these missiles, Schriever instituted a systems approach, whereby the various components of the Atlas and succeeding missiles underwent simultaneous design and testing as part of an overall "weapons system." Schriever also introduced the notion of concurrency, which has been given various interpretations but essentially allowed the components of the missiles to enter production while still in the testing phase, thereby speeding up development. He retired as a general in 1966. See Jacob Neufeld, "Bernard A. Schriever: Challenging the Unknown," *Makers of the United States Air Force* (Washington, DC: Office of Air Force History, 1986), pp. 281-306; Robert L. Perry, "Atlas, Thor . . .," in Eugene M. Emme, ed., *A History of Rocket Technology* (Detroit, MI: Wayne State University Press, 1964), pp. 144-160; Robert A. Divine, *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite* (New York: Oxford University Press, 1993), p. 25.

**Glenn T. Seaborg** (1912- ) earned a Ph.D. in physics from the University of California at Berkeley in 1937 and worked on the Manhattan Project in Chicago during World War II. Afterward, he became associate director of Berkeley's Lawrence Radiation Laboratory, where he and associates isolated several transuranic elements. For this work, Seaborg received the Nobel Prize in 1951. He also served as chair of the Atomic Energy Commission, 1961-1971, and thereafter returned to the faculty of the University of California at Berkeley. See David Petchuk, "Glenn T. Seaborg," in Emily J. McMurray, et al., eds., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 1803-1806.

**Robert C. Seamans, Jr.** (1918- ), had been involved in aerospace issues since he completed his Sc.D. degree at the Massachusetts Institute of Technology (MIT) in 1951. He was on the faculty at MIT's department of aeronautical engineering between 1949 and 1955, when he joined the Radio Corporation of America as manager of the Airborne Systems Laboratory. In 1958 he became the chief engineer of the Missile Electronics and Control Division and joined NASA in 1960 as associate administrator. In December 1965, he became NASA deputy administrator. He left NASA in 1968 and became secretary of the Air Force in 1969, serving until 1973. Seamans was president of the National Academy of Engineering from May 1973 to December 1974, when he became the first administrator of the new Energy Research and Development Administration. He returned to MIT in 1977, becoming dean of its School of Engineering in 1978. In 1981 he was elected chair of the board of trustees of Aerospace Corp. ("Robert C. Seamans, Jr.," biographical file, NASA Historical Reference Collection; Robert C. Seamans, Jr., *Aiming at Targets* [Beverly, MA: Memoirs Unlimited, 1994]).

**Alan B. Shepard, Jr.** (1923- ), was a member of the first group of seven astronauts in 1959 chosen to participate in Project Mercury. He was the first American in space, piloting Mercury-Redstone 3 (*Freedom 7*) and was backup pilot for Mercury-Atlas 9. He was subsequently grounded because of an inner ear ailment until May 7, 1969 (during which time he served as chief of the Astronaut Office). Upon returning to flight status Shepard commanded Apollo 14, and in June 1971, he resumed duties as chief of the Astronaut Office. He retired from NASA and the U.S. Navy on August 1, 1974, to join the Marathon Construction Company of Houston, Texas, as partner and chairman. See Alan Shepard and Deke Slayton, *Moonshot: The Inside Story of America's Race to the Moon* (New York: Turner Publishing, Inc., 1994); The Astronauts Themselves, *We Seven* (New York: Simon and Schuster, 1962).

**George P. Shultz** (1920- ) served as director of the Office of Management and Budget after 1970, during the Nixon administration. Before that he had been Nixon's secretary of labor. During the Reagan administration, 1981-1989, Shultz served as secretary of state ("Shultz, George P(ratt)," *Current Biography Yearbook 1988*, pp. 525-30).

**Albert F. Siefert** (1915- ) was a longtime federal employee who entered federal service in 1937 and moved from being executive officer for the National Institutes of Health to NASA in 1958. In 1959 he was NASA's chief negotiator in the transfer of the Army Ballistic Missile Agency to the space agency from his position as director of business administration, and in 1963 he moved to the deputy director position at the Kennedy Space Center in Florida. In 1969 Siefert left NASA to become a program associate at the University of Michigan's Institute for Social Research ("Albert F. Siefert," biographical file, NASA Historical Reference Collection).

**Milton A. Silveira** (1929- ) was a longtime NASA employee, who worked at the agency's Lewis Research Center, 1955-1963, and at the Manned Spacecraft Center in Houston, 1963-1967. He also served as deputy manager of the orbiter project at the Johnson Space Center, 1967-1981; assistant to the deputy administrator at NASA, 1981-1983; and NASA chief engineer, 1983-1986.

**Abe Silverstein** (1908- ), who earned a B.S. in mechanical engineering (1929) and an M.E. (1934) from Rose Polytechnic Institute, was a longtime NACA manager. He had worked as an engineer at the Langley Aeronautical Laboratory between 1929 and 1943 and had moved to the Lewis Laboratory (later, Research Center) in a succession of management positions, the last (1961-1970) as director of the center. Interestingly, in 1958 Case Institute of Technology had awarded him an honorary doctorate. When T. Keith Glennan arrived at NASA, Silverstein was on a rotational assignment to the Washington headquarters as director of the Office of Space Flight Development (later, Office of Space Flight Programs) from the position of associate director at Lewis, which he had held since 1952. During his first tour at Lewis he had directed investigations leading to significant improvements in reciprocating and early turbojet engines. At NASA headquarters he helped create and direct the efforts leading to the spaceflights of Project Mercury and establish the technical basis for the Apollo program. As Lewis's director he oversaw a major expansion of the center and the development of the Centaur launch vehicle. He retired from NASA in 1970 to take a position with Republic Steel Corp. On the career of Silverstein, see Virginia P. Dawson, *Engines and Innovation: Lewis Laboratory and American Propulsion Technology* (Washington, DC: NASA SP-4306, 1991), passim; "Abe Silverstein," biographical file, NASA Historical Reference Collection.

**S. Fred Singer** (1924- ), a physicist at the University of Maryland, proposed a Minimum Orbital Unmanned Satellite of the Earth (MOUSE) at the fourth Congress of the International Astronautics Federation in Zurich, Switzerland, in the summer of 1953. It had been based on two years of previous study conducted under the auspices of the British Interplanetary Society, which had built on the post-war research of the V-2 rocket. The Upper Atmosphere Rocket Research Panel at White Sands discussed Singer's plan in April 1954. In May Singer presented his MOUSE proposal at the Hayden Planetarium's fourth Space Travel Symposium. MOUSE was the first satellite proposal widely discussed in non-governmental engineering and scientific circles, although it never was adopted. See "Singer, S. Fred," biographical file, NASA Historical Reference Collection.

**Maurice H. Stans** (1908- ) was a longtime Republican in Washington. He served in several positions with the Eisenhower administration, notably as deputy director of the Bureau of the Budget between 1957 and 1958 and then as its director from 1958 to 1961. In 1969 he was appointed secretary of commerce for the Nixon administration and served until 1972. He was finance director of the 1972 Nixon re-election campaign and pleaded guilty in 1975 to five misdemeanor charges of violating campaign laws ("Maurice H. Stans," biographical file, NASA Historical Reference Collection).

**Frank Stanton** (1908- ) earned a Ph.D. from Ohio State University in 1935 and went on to become a business executive, serving most notably as president of CBS, Inc., from 1946 to 1971 and its vice chairman from 1971 to 1973.

**Edward V. Stearns** (1922- ) was trained in physics at the University of California at Berkeley and worked in several research positions in industry and universities. He was a physicist with the Rand Corporation, 1949-1954, and assistant chief engineer with the Lockheed Missile and Space Co. after 1954.

**John C. Stennis** (1901-1995) (D-MS) was elected to the Senate in 1947 and served until 1989. He was a member of the Appropriations, Armed Services, and Aeronautical and Space Sciences Committees in the early 1960s. In 1988 NASA's National Space Technology Laboratories in Mississippi became the John C. Stennis Space Center in his honor ("John C. Stennis," biographical file, NASA Historical Reference Collection).

**Ted Stevens** (1923- ) (D-AK) was elected to the U.S. Senate in 1968 and has served to the present.

**Lewis L. Strauss** (1915-1974) was chairman of the Atomic Energy Commission from 1953 to 1958 and was secretary of commerce from 1958 to 1959. He also held the rank of admiral in the U.S. Navy.

**Stuart Symington** (1901-1988) (D-MO) served in the Senate between 1953 and 1977. He entered government in 1945 when his fellow Missourian, Harry S. Truman, appointed him chair of the Surplus Property Board. He later served Truman as secretary of the Air Force and was an outspoken advocate of building a strong aerospace presence. As such, he repeatedly charged the Eisenhower administration with balancing the budget at the expense of national security and was one of its most vocal critics after the launch of Sputnik, predicting what proved to be a fallacious missile gap between the United States and the Soviet Union. He left the Senate in 1977 (*New York Times*, December 15, 1988, p. D26; Robert A. Divine, *The Sputnik Challenge: The U.S. Response to the Soviet Satellite* [New York: Oxford University Press, 1993], pp. 20, 43, 125, 178-183).

## T

**Olin ("Tiger") E. Teague** (1910-1981) (D-TX) was first elected to the House of Representatives in 1946 and served in each succeeding Congress through the 95th (1977-1979). He was appointed to the new Science and Astronautics Committee in the 86th Congress (1959-1961).

**Charles H. Townes** (1915- ) was trained in physics at Duke University and specialized in the development of laser and maser technology. He first worked for the Bell Telephone Laboratories, and in 1948 he joined the faculty of Columbia University, leaving there in 1961 to move to the Massachusetts Institute of Technology and on to the University of California. For his work on the maser, Townes received the Nobel Prize in 1964. See David E. Newton, "Charles H. Townes," in Emily J. McMurray, et al., eds., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 2042-44.

**Richard H. Truly** (1937- ) was a career naval aviator who split time between naval assignments and NASA in the 1960s. In 1965 he was selected to participate in the Air Force's Manned Orbiting Laboratory program and transferred to NASA as an astronaut in August 1969. He served as capsule communicator for all three Skylab missions in 1973 and the Apollo-Soyuz mission in 1975. He was also involved in the Space Shuttle flight test program, and he piloted *Columbia* (STS-2) in 1981 and *Challenger* (STS-8) in 1983. He became NASA's associate administrator for the Office of Space Flight on February 20, 1986, leading the effort to return to flight following the *Challenger* accident. He served as NASA administrator between 1989 and 1992, and he then became vice president and director of the Georgia Tech Research Institute, Georgia Institute of Technology, in Atlanta ("Truly, Richard H.," NASA Administrator Folders, NASA Historical Reference Collection).

**H.S. Tsien** (1909- ) was a Chinese national who received a Ph.D. in aeronautics in 1939 from the California Institute of Technology (Caltech) and worked on the development of rocket technology at his alma mater through World War II. He was on the faculty of the Massachusetts Institute of Technology from 1946 to 1949, when he returned to Caltech. In the 1950s his loyalty to democratic institutions was questioned, and he was deported from the United States to the People's Republic of China. There, he was largely responsible for the development of ICBM rocket technology, especially the "Long March" launch vehicle.

**Konstantin E. Tsiolkovskiy** (1857-1935) is one of the three recognized pioneers of spaceflight. A schoolteacher in Kaluga, Russia, Tsiolkovskiy theorized about the flight of rockets and spacecraft, calculated many of the equations required for the successful launch of rockets, and speculated on the development of space vehicles and permanent space colonies. See Arkady Kosmodemyansky, *Konstantin Tsiolkovskiy* (Moscow, USSR: Nauka, 1985).

**Nathan F. Twining** (1897-1982) was a career pilot in the Army and the Air Force, commanding the 13th Air Force in the Pacific, the 15th Air Force in Europe, and then the 20th Air Force again in the Pacific during World War II. He became chief of staff of the Air Force in 1953 and chairman of the Joint Chiefs of Staff from 1957 to 1960 (Donald J. Mrozek, "Nathan F. Twining: New Dimensions, a New Look," in John L. Frisbee, ed., *Makers of the United States Air Force* [Washington, DC: Office of Air Force History, 1987], pp. 257-80).

## V

**Max Valier** (1893-1930) was an early advocate of the use of rockets for spaceflight. A German, he had been educated in engineering in Berlin, and as a young man in the 1920s he began experimenting with rockets with the "Verein für Raumschiffahrt" (VfR), the Society for Spaceship Travel of which Wernher von Braun and Hermann Oberth were prominent members. He was also interested in using rockets for propelling ground vehicles, and he built a rocket-powered automobile. He died in a crash of this car in 1930 (I. Essers, *Max Valier: A Pioneer of Space Travel* [Washington, DC: NASA TT F-664, 1976]).

**James A. Van Allen** (1914- ) was a pathbreaking astrophysicist best known for his work in magnetospheric physics. Van Allen's January 1958 *Explorer I* experiment established the existence of radiation belts—later named for the scientist—that encircled the Earth, representing the opening of a broad research field. Extending outward in the direction of the Sun approximately 40,000 miles, as well as stretching out with a trail away from the Sun to approximately 370,000 miles, the magnetosphere is the area dominated by Earth's strong magnetic field. See James A. Van Allen, *Origins of Magnetospheric Physics* (Washington, DC: Smithsonian Institution Press, 1983); David E. Newton, "James A. Van Allen," in Emily J. McMurray, et al., eds., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 2070-72.

**Cyrus R. Vance** (1917- ) had a long career as a senior government official in various Democratic administrations. He had been general counsel for the Department of Defense during the Kennedy administration of the early 1960s and was also secretary of the Army from 1962 to 1964. He was deputy secretary of defense from 1964 to 1967. He served as secretary of state for President Jimmy Carter in the latter half of the 1970s ("Vance, Cyrus R[oberts]," *Current Biography* 1977, pp. 408-11).

**Jules Verne** (1828-1905) was one of the leading writers of his time, as well as one of the founders of the literary genre of science fiction. He described in his novels the possibility of spaceflight, the use of submarines for travel beneath the ocean, and a variety of other visionary technologies that were realized in the twentieth century (I.O. Evans, *Jules Verne and His Work* [New York: Twayne, 1966]).

## W

**Alan T. Waterman** (1892-1967) was the first director of the National Science Foundation (NSF), from its founding in 1951 until 1963. Waterman received his Ph.D. in physics from Princeton University in 1916; he then served with the Army's Science and Research Division in World War I, on the faculty of Yale University in the interwar years, with the War Department's Office of Scientific Research and Development in World War II, and with the Office of Naval Research between 1946 and 1951. He and NASA leaders contended over control of the scientific projects to be undertaken by the space agency, with Waterman's NSF being used as an advisory body in the selection of space experiments. See "Waterman, First NSF Head, Dies at 75," *Science* 158 (8 December 1967): 1293; Norris S. Hetherington, "Winning the Initiative: NASA and the U.S. Space Science Program," *Prologue: The Journal of the National Archives* 7 (Summer 1975): 99-108; John E. Naugle, *First Among Equals: The Selection of NASA Space Science Experiments* (Washington, DC: NASA SP-4215, 1991).

**James E. Webb** (1906-1992) was NASA administrator between 1961 and 1968. Previously, he had been an aide to a congressman in New Deal Washington, an aide to Washington lawyer Max O. Gardner, and a business executive with the Sperry Corporation and the Kerr-McGee Oil Co. He had also been director of the Bureau of the Budget between 1946 and 1950 and under secretary of state from 1950 to 1952 (W. Henry Lambright, *Powering Apollo: James E. Webb of NASA* [Baltimore, MD: The Johns Hopkins University Press, 1995]).

**R.S. Wehner** (1915- ) was a research scientist with the Radio Corporation of America, 1943-1945; the Airborne Instrument Laboratory, 1945-1948; the Rand Corporation, 1948-1951; and the Hughes Aircraft Co., 1951-1959.



**Caspar W. Weinberger** (1917- ), a longtime Republican government official, was a senior member of the Nixon, Ford, and Reagan administrations. For Nixon he was deputy director (1970-1972) and director (1972-1976) of the Office of Management and Budget. In this capacity, had a leading role in shaping the direction of NASA's major effort of the 1970s, the development of a reusable Space Shuttle. For Reagan he served as secretary of defense, where he also oversaw the use of the Shuttle in the early 1980s for the launching of classified Department of Defense payloads into orbit. See "Weinberger, Caspar W(illard)," *Current Biography 1973*, pp. 428-30.

**H.G. Wells** (1866-1946) was a noted futurist and one of the founders of the literary genre of science fiction. His novels described a future filled with technology, some of it terrifying, and contact with extraterrestrial beings, much of it disastrous (Lovat Dickson, *H.G. Wells: His Turbulent Life* [New York: Atheneum, 1969]).

**Edward C. Welsh** (1909- ) had a long career in various private and public enterprises. He had served as legislative assistant to Senator Stuart Symington (D-MO), 1953-1961, and was the executive secretary of the National Aeronautics and Space Council through the 1960s.

**Fred L. Whipple** (1906- ) was a University of California at Berkeley Ph.D. in astronomy who served on the faculty of Harvard University. He was involved in efforts in the early 1950s to expand public interest in the possibility of spaceflight through a series of symposia at the Hayden Planetarium in New York City and articles in *Collier's* magazine. He was also heavily involved in planning for the International Geophysical Year, 1957-1958. As a pathbreaking astronomer he pioneered research on comets. See Raymond E. Bullock, "Fred Lawrence Whipple," in Emily J. McMurray, et al., eds., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 2167-70.

**Jerome B. Wiesner** (1915-1994) was science advisor to President John F. Kennedy. He had been a faculty member of the Massachusetts Institute of Technology and had served on President Eisenhower's Science Advisory Committee. During the presidential campaign of 1960 Wiesner had advised Kennedy on science and technology issues and prepared a transition team report on the subject that questioned the value of human spaceflight. As Kennedy's science advisor he tussled with NASA over the lunar landing commitment and the method of conducting it. See Gregg Herken, *Cardinal Choices: Science Advice to the President from Hiroshima to SDI* (New York: Oxford University Press, 1992).

**Walter C. Williams** (1919- ) earned a B.S. in aerospace engineering from Louisiana State University in 1939 and went to work for NACA in 1940, serving as a project engineer to improve the handling, maneuverability, and flight characteristics of World War II fighters. Following the war he went to what became Edwards Air Force Base to set up flight tests for the X-1, including the first human supersonic flight by Capt. Charles E. Yeager in October 1947. He became the founding director of the organization that became the Dryden Flight Research Facility. In September 1959 he assumed the associate directorship of the new NASA space task group at Langley that was created to carry out Project Mercury. He later became director of operations for the project and then associate director of NASA's Manned Spacecraft Center in Houston, subsequently renamed the Johnson Space Center. In 1963 Williams moved to NASA headquarters as deputy associate administrator of the Office of Manned Space Flight. From 1964 to 1975 he was a vice president for Aerospace Corporation. Then from 1975 to 1982 he served as chief engineer of NASA, retiring in 1982 ("Walter C. Williams," biographical file, NASA Historical Reference Collection).

**Charles E. Wilson** (1886-1972) was an industrialist with General Electric who worked with the Office of Defense Mobilization in the 1950s.

## Y

**John F. Yardley** (1925- ) was an aerospace engineer who worked with the McDonnell Aircraft Corporation on several NASA human spaceflight projects from the 1950s and into the 1970s. He also served as NASA associate administrator for the Office of Space Flight between 1974 and 1981. Thereafter, he returned to McDonnell Douglas as president, 1981-1988 ("Yardley, John F.," biographical file, NASA Historical Reference Collection).

**Chuck Yeager** (1923- ) was the U.S. Air Force test pilot who piloted the X-1 research aircraft on the first supersonic powered flight in 1947. Thereafter, he served in several Air Force positions, retiring as a brigadier general. See Chuck Yeager, *Yeager* (New York: Bantam Books, 1982).

**Herbert F. York** (1923- ) had been associated with scientific research in support of national defense since World War II. He was director of the Livermore Radiation Laboratory for the University of California before moving to the Department of Defense in March 1958 as chief scientist of the Advanced Research Projects Agency. He became the Department of Defense's director of research and engineering in December 1958 during a Department of

Defense reorganization; this was the third-ranking civilian office after the secretary and deputy secretary of defense. He served as director of defense research and engineering until 1961. He then moved to the University of California at San Diego, where he was chancellor and a professor of physics. He also served as a member of the President's Science Advisory Committee under both Eisenhower and Johnson and was later the chief negotiator for the comprehensive test ban during the Carter administration ("Dr. Herbert F. York," biographical file, NASA Historical Reference Collection; Herbert F. York, *Making Weapons, Talking Peace: A Physicist's Odyssey from Hiroshima to Geneva* [New York: Basic Books, 1987]).



# Index

## A

- Abbot, Charles G., 136, 140  
"Ad Hoc Panel on Man-in-Space, Report of," 378, 408-12  
Adams, L.H., 295  
Adams, Walter S., 136  
Advanced Research Projects Agency (ARPA), DOD, 225, 226, 227, 634, 636-37, 643, 650  
Advent project, 447  
Aerobee Launch Vehicle, 14, 303, 310  
Aerobee-Hi Launch Vehicle, 223  
Aerojet Corp., 11, 14, 153, 154, 156, 157  
Aeronautical Board, War Department, 214  
*Aeronautical Sciences, Journal of*, 145-53  
Aeronautics and Astronautics Coordinating Board, 472, 524  
Aerophysics Development Corp., 278, 280  
Aerospace Corp., 436, 614, 657, 664  
Africa, 509  
Agena Booster, 404, 406, 407, 425, 430, 441-42, 480-83  
Agnew, Spiro T., and Space Task Group (1969), 383-85, 513, 519, 543, 622  
Agriculture, Department of, 497, 499, 513, 520, 570-71, 577, 654, 670  
Air Corps Jet Propulsion Research Project, 153, 154, 156, 157  
Air Defense Command, 205, 209  
Air Force Meteorological Research Center, Cambridge, Massachusetts, 203  
Air Force Proving Ground, Cocoa, Florida, 182  
Air Force Regulation 200-2, 210  
Air Force, United States, 178, 207-11, 214, 215, 217, 222, 224, 236, 245, 274, 275, 359, 373, 384, 389, 436, 515, 587, 614-15, 639, 644-46, 657, 673, 683, 708, 716; and Ballistic Missile Command (BMC), 630  
Air Intelligence Service Squadron, 210  
Air Research and Development Command (ARDC), 221, 269, 278  
Air Technical Intelligence Center, 202-206, 210  
Allen, Joe, 715  
Allen, Lew, 735  
Allis-Chalmers, Inc., 218  
*Almagest*, 1  
Alouette project, and Canada, 479  
Alvarez, Luis W., 202, 205, 206, 241  
American Association for the Advancement of Science (AAAS), 616  
American Interplanetary Society, 9, 12, 281  
American Institute of Aeronautics and Astronautics, 281  
American Rocket Society, 12, 157, 274; and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
American Telephone and Telegraph (AT&T) Corp., 439, 464  
Ames Research Center, California, 389, 477, 587, 611, 647, 717; and field center roles, 689-711  
Anacostia, Maryland, 202  
"Analysis of Reports of Unidentified Aerial Objects," 210  
Anderson, Clinton P., 492, 642  
Annapolis, Maryland, 12  
Antwerp, Belgium, 13  
Apollo Applications Program (AAP), 383-85, 499, 501, 504-05, 514, 521, 714  
Apollo, Project, 9, 409, 441, 457, 460-63, 484, 469, 495-96, 502-03, 506, 513-15, 517, 522, 527-29, 532, 545, 547-48, 598, 612-13, 616, 620, 622, 686, 714, 716, 730; and Apollo 11, 384, 385, 392, 519, 521-23, 525, 529, 556, 580-81, 618, 672; and Command Module, 481-82; and decision for, 379-81; and Lunar Excursion Module (LEM), 481-82, 517, 715; review of, 381-82; and Saturn Launch Vehicle, 674-77, 681-82, 684; and Service Module, 481-82; and project, 582  
Aquinas, Thomas, 22  
Archer, Harry J., 283  
Ariel projects, and United Kingdom, 479  
Arms Control and Disarmament Agency, 228, 593-94, 604

Armstrong, Neil A., 392  
 Army Air Corps, United States, 10, 11  
 Army Air Forces, United States, 12, 15, 153, 213, 214, 614  
 Army Ballistic Missile Agency (ABMA) (also see Marshall Space Flight Center), 611-12, 630, 636  
 Army Map Service, 289  
 Army Ordnance Guided Missile Development Group/Division, 178, 189, 195, 274-81  
 Army, United States, 14-15, 179, 180, 214, 221-22, 227, 274, 275, 612, 614, 630, 644, 657, 673; and "Minimum Satellite Vehicle: Based on Components Available from Missile Developments of the Army Ordnance Corps," 274-81  
 Arnold, Henry H. (Hap), 10-11, 153, 213, 215  
 Asia, Southeast, 439  
 Asimov, Isaac, 16, 17  
 Associated Universities, Inc., 206  
*Astronautica Acta*, 314-24  
 Astronomy, 1-3  
 Atlantic Missile Range, 399, 460, 673  
*Atlantic Monthly*, 3-4, 23-55  
 Atomic Energy Act, 511  
 Atomic Energy Commission (AEC), 268, 341-42, 413, 436, 443, 449-50, 452, 455, 459, 461, 497, 513, 611, 614, 629-37, 642-43, 647, 654-55, 657, 659, 667  
 Atomic Peace Ship (also see Eisenhower, Dwight), 632  
 Atwood, Wallace W., Jr., 136, 140, 295  
 Atlas Launch Vehicle, 15-16, 219, 224, 310, 359, 373, 379, 388, 404, 406, 410, 419, 425, 430, 441-42, 449, 451, 462, 480, 483, 494, 589, 645  
 Auburn, Massachusetts, 7, 136  
 Augustine, Norman R., and "Augustine Commission," 626-28, 741-743  
*Autour de la Lune (Around the Moon)*, 4

---

**B**

Bahrein, 716  
 Baker, James, 217  
 Baker-Nunn, Inc., 227  
 Ballistic Missile Early Warning System (BMEWS), 227  
 Baltimore, Maryland, 5, 8  
 Barr, William J., 283  
 Battelle Memorial Institute, 203  
 Bauer, H.E., 676  
 "Bazooka," 8, 156  
 "Beacon Hill" Study, 217  
 Beech Aircraft Company, 656  
 Beggs, James M., 587, 724; and decision to build the space station, 390-92, 600; and named NASA administrator, 389  
 Bell Aircraft Co., 8  
 Bell, David, 614; and "Bell Report," 615, 627, 651-72  
 Bell Laboratories, 214, 217, 288, 439, 633  
 Bell Telephone Corp., 280, 633  
 Bellefontaine, Ohio, 204  
*Bellfortis*, 5  
 Beltsville, Maryland, 649  
 Bendix Aviation, Inc., 218  
 Beresford, Spencer M., 511  
 Berkner, Lloyd V., 202, 203, 206; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Berning, W., 299  
 Bing Crosby Enterprises, 272  
 "B.I.S. Space Ship, The," 140-45  
 Bison Bomber, 218  
 Blechman, Barry, 559  
 Bloemfontein, South Africa, 195  
 Blue Book, Project, 208  
 Blue Scout program, 451

- Board of National Intelligence Estimates, CIA, 215-16  
 Boeing Corporation, 550, 552, 617-18, 674  
 Bollay, Eugene, and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 Bollay, William, 280  
 Bonestell, Chesley, 177, 179  
 Bossart, Karel J., 15  
*Boston American*, 86  
 Boston, Massachusetts, 178  
 Bowen, Ira S., and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 Branscomb, Lewis M., 511  
 von Braun, Wernher, 6, 9, 12-15, 17-19, 84, 140, 178, 179, 267, 427, 433, 715; and Apollo decision, 379-81; and "Can We Get to Mars?," 176, 195-200; and *Collier's* magazine, 17-19, 176-77; and "Crossing the Last Frontier," 176, 179-88; and decision to build the space shuttle, 386-88; and "Man in the Moon: The Journey," 176, 189-94; and "Minimum Satellite Vehicle: Based on Components Available from Missile Developments of the Army Ordnance Corps," 274-81; and Nixon space policy, 385-86; and post-Apollo planning, 382-85; and Project Orbiter, 221-22, 308, 310; and V-2 (A-4) Rocket, 12-15, 17, 180-81, 237, 239, 267, 429; and Walt Disney, 19  
 Breckinridge, Henry, 136  
 "Brick Moon, The," 3-4, 24-55  
 Bridges, Styles, 380, 433-37  
 Britain, 509  
 British-Australian Guided Missile Range, Australia, 312  
 British Interplanetary Society, 9, 314; and "B.I.S. Space Ship, The," 140-45  
*British Interplanetary Society, Journal of the*, 9; and "B.I.S. Space Ship, The," 140-45  
 Brodie, Bernard, 215  
 Brookhaven National Laboratories, 206  
 Bronk, Detlov W., and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Brown, George, 427, 437-38  
 Brown University, 378, 408, 657  
 Brundage, Percival, 324-25, 611, 637, 641; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Brzezinski, Zbigniew, 575  
 Bulganin, Nikolai, 223, 350  
 Bumper, Project, 14-15  
 Burbank, California, 222  
 Bureau of Aeronautics, U.S. Navy, 12, 156, 157, 214  
 Bureau of the Budget (BOB), 307, 408, 437, 439, 454-55, 466-67, 473, 490, 495, 499, 611, 614, 620, 622, 632, 637-38, 643-45; Apollo decision, 379-81; and "Bell Report," 651-72; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Aeronautics and Space Act of 1958, 334, 377; and post-Apollo planning, 382-85; renamed Office of Management and Budget (OMB), 386; and review of Apollo, 381-82, 435; and Space Task Group (1969), 384-85, 544-45 (see also Office of Management of Budget)  
 Bureau of Labor Statistics, 669  
 Bureau of Standards, 643  
 Burr, Aaron, 23  
 Burston-Marstellar, 717  
 Bush, George H., 625, 741  
 Bush, Vannevar, 382

## C

---

- C-119 Aircraft, 216  
 California Institute of Technology (Caltech), 10-11, 145, 154, 156, 206, 219, 298, 512, 611, 614, 630, 657  
 California, University of, Berkeley, 206, 383  
 California, University of, Los Angeles (UCLA), 178  
 Cambridge, Massachusetts, 203  
 "Camel News Caravan," 18  
 "Can We Get to Mars?," 176, 195-200  
 Canada, 486, 507; and Alouette project, 479  
 Cannon, Joseph, 715  
 Cape Canaveral, Florida, 15, 429, 436, 469, 612, 673

- Cape Kennedy, Florida, and Merritt Island Launch Facility, 484  
 Carnegie Corporation, 633  
 Carnegie Institution of Washington, 87, 136, 140  
 Carpenter Steel Co., 97  
 Carter, James E. (Jimmy), 388-89, 390, 559, 575; and "Civil and Further National Space Policy" (NSC 42), 389, 575  
 Case Institute of Technology (CIT), 377, 647-49  
 Cavers, Dean David, 633  
 Centaur Booster, 404, 406, 407, 410, 419, 425, 429, 441, 450-51, 482-83, 487, 645-46, 707  
 Central Intelligence Agency (CIA), 19-20, 201-206, 215-16, 217, 220, 225, 326, 329, 331, 373-75, 593-94, 598, 604  
*Challenger* Space Shuttle, 390, 392, 624, 730-31; and "Rogers Commission Report," 723-29  
 Chicago, Illinois, 269  
 Chidlaw, Benjamin, 11  
 Chrysler Corporation, 656, 674  
 Churchill, Winston, 178  
 Cicero, 1-2  
 Chadwell, E. Marshall, 206  
 China, People's Republic of, 10  
 "Civil and Further National Space Policy," 389  
 Civil Service Commission, United States (also see Office of Personnel Management), 614, 620, 671  
 Civil War, 616  
 Clark College/University, Worcester, Massachusetts, 7, 86, 135, 136, 137-38, 140  
 Clark, Ralph, E., 206  
 Clark, Ray, 673-74  
 Clark, William, 594  
 Clarke, Arthur C., 16, 17  
 Clauser, Francis H., 215, 511-12  
 Cleveland, Ohio, 377, 647-49  
 Coale, Ansley, 215  
 Cocoa, Florida, 182, 312  
 Cole, Judy, 715  
 College Park, Maryland, 314  
*Collier's Magazine*, 17-19, 176-77; and "Can We Get to Mars?," 176, 195-200; and "Crossing the Last Frontier," 176, 179-88; and "Is There Life on Mars?," 176, 194-95; and "Man in the Moon: The Journey," 176, 189-94; and "What Are We Waiting For?," 18, 176, 177-79  
 Columbia Broadcasting System (CBS), 18, 437  
 Columbia University, 267, 657  
 Columbus, Ohio, 203  
 Commerce, Department of, 227, 442, 449, 499, 513, 520, 577, 592-95, 604, 606-07, 654-55, 670; and Office of Technical Services, 643  
 Commercial Space Working Group, 610  
 Committee on Guided Missiles, DOD, 214  
 Committee on the Peaceful Uses of Outer Space, 229  
 Committee on Space Research (COSPAR), 368  
 Committee on Special Capabilities, DOD, 221-23  
 Communications Satellite Act of 1962, 464  
 Communications Satellite Corporation, and "Early Bird" satellite, 478  
 ComSat Corporation, 497  
 Congress, United States, 228, 307, 326, 328, 498, 511, 513, 515, 546, 563, 568, 618, 620, 627, 631-32, 636, 645, 647, 674, 713-14, 734; and Apollo decision, 379-81; and "Bell Report," 651-672; and decision to build the space shuttle, 386-88; and post-Apollo planning, 382-85; and National Aeronautics and Space Act of 1958, 334-45, 377, 397, 529; and Nixon space policy, 385-86; and Paine Commission, 392; and review of Apollo, 381-82; and Space Shuttle program, 550, 554  
 Congreve, William, 5  
*Conquest of Space, The*, 176  
 Consolidate Vultee Aircraft (Convair) Division, 15, 645-46  
 Cook, Donald, 427, 437  
 Cooper, Gordon, 480  
 Cooper, John Cobb, 633  
 Cooper, William 712  
 Copernicus, Nicolas, 2, 22  
 Cornell Aeronautical Laboratories, 217

Corson, John J., 633  
 Courier Communications Satellite, 227, 442  
 Cranston, Alan, 714  
 Crawford, Frederick C., 648  
 Crippen, Robert, 730  
 Crow, Pete, 715  
 "Crossing the Last Frontier," 176, 179-88  
 Cuba, 556  
 Cutler, Robert, 219; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Curtiss-Wright Aeronautical Co., 8  
 Curtiss-Wright XLR25-CW-1 Engine, 8  
 Cyrano de Bergerac, Savinon de, 3

## D

Davenport, William 712  
 David, Edward, 548-49  
 Davies, E. Merton, 215  
*Day the Earth Stood Still, The*, 17, 20  
 Defense, Department of (DOD), 8, 11, 15, 21, 181, 214, 216, 220, 221, 224, 225, 228, 266, 269, 306, 398, 400, 418, 423, 424, 428, 433, 436, 439-41, 449, 451, 454-55, 459-60, 464, 468, 471-72, 498, 500, 502, 509-10, 516, 518-20, 522, 524, 526-27, 532, 534, 537, 541-43, 560, 570-72, 577, 580, 604-09, 611, 619, 629-31, 638-44, 647-50, 654-55, 659, 667, 669-73, 716, 721-22; and Apollo decision, 379-81; and commercialization of satellite communications, 447; and decision to build the space shuttle, 386-88; and decision to build the space station, 390-92; and Defense Reorganization Act of 1947, 614; and Explorer program, 221-22, 228, 644; and freedom of space, 213-29, 230, 308; and International Geophysical Year (IGY), 19, 20, 200-201, 220-23, 224-25, 227, 228, 314; and Manned Orbital Laboratory (MOL), 480, 496, 499, 515; and *Meeting the Threat of Surprise Attack*, 219-20; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Reconnaissance Office, 373-75; and National Security Council, 200, 218, 222, 229, 308-13, 324-28; and Nixon space policy, 382-86; and "Open Skies" doctrine, 213-29, 230; and "Policy on Outer Space, U.S." (NSC 5814), 345-59, 360; and "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520), 200, 308-13, 326, 328; and post-Apollo planning, 382-85; and "Problem of Space Programs," 413-15; and "Project Feed Back Summary Report," 269-74; and Project Vanguard, 14, 221-23, 224-25, 228, 395, 402, 644; and "Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377; and reconnaissance programs, 219-20, 222-23, 227-28, 348, 354, 373-75; and "Report on the Present Status of the Satellite Problem," 267-69; and review of Apollo, 381-82; and satellite reconnaissance, 216-17, 221-24, 227-28, 269-74, 348, 354, 373-75; and Space Shuttle program, 549-54, 582, 591-93; and Space Station program, 594-95; and "Surprise Attack Conference," 227-28; and Technological Capabilities Panel ("Surprise Attack Panel"), 218-19, 221, 225, 309; and U-2 program, 219-20, 222-23, 227; and "U.S. Policy on Outer Space," 362-73; and "Wiesner Report," 379, 416-23  
 Dehavilland Twin Otter, 588  
 Delhi, India, 716  
 Delta Launch Vehicle, 388, 404, 478, 482, 589  
 Description of the Caelestial Orbes, 22  
 Dessau, Germany, 9  
 Digges, Thomas, 22  
 Dirksen, Everett, 383, 490, 492  
 Discoverer program, 451, 460  
 Disney, Walt, 19  
 Distant Early Warning (DEW) Line, 218, 219, 227  
*Divine Comedy, The*, 22  
 Donovan, Allen, 217  
 Doolittle, James A., 394, 632  
 Dorman, B.L., 283  
 Dornberger, Walter, 13  
 Douglas Aircraft Company, Inc., 236, 617-18, 675; and "Preliminary Design of an Experimental World-Circling Spaceship," 236-45  
 Dow, W.G., 299  
 Drew, Russ, 549  
 Droessler, Earl J., 295  
 Dryden, Hugh L., 394, 435-39, 461, 464, 483, 620, 645, 647-48  
 Dryden Flight Research Center, California, 477, 611; and field center roles, 689-711



DuBridge, Lee A., 219, 512-13, 543  
 Dulles, Allen W., 225, 329; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Dulles, John Foster, 331  
 Dunning, John R., 266-67  
 Durant, Frederick C., III, 201-206, 274  
 Dyna-Soar, Project, 227, 426, 451, 459-60

---

**E**

"Early Bird" satellite system, and Communications Satellite Corporation, 478  
 Earth Resources Observation System (EROS), 693  
 Earth Resources Technology Satellite (ERTS), 554  
 Eastman Kodak, Inc., 217  
 Eaton, E.L., 299  
 Echo Communications Satellite, 442, 478  
 Economics Policy Council (EPC), 610  
 Edwards Air Force Base, California, 647  
 von Eichstadt, Konrad Kyser, 5  
 Einstein, Albert, 395  
 Eisenhower, Dwight D., 19, 218, 388, 466, 468, 492, 511, 614, 628, 631, 637, 643, 647-48; and Ad Hoc Panel on Man-in-Space, 378, 408-12; and establishes NASA, 226; and Atomic Peace Ship, 632; and Explorer program, 221-22, 228; and freedom of space, 213-29, 230, 308; and establishes National Reconnaissance Office, 373-75; and Geneva Summit, 222-23, 227-28; and International Geophysical Year (IGY), 19, 20, 200-201, 220-23, 224-25, 227, 314; and "Introduction to Outer Space," 332-34; and *Meeting the Threat of Surprise Attack*, 219-20; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Security Council, 200, 218, 222, 229, 308-13, 324-28; and "Open Skies" doctrine, 213-29, 230, 611; and no more "Pearl Harbors," 215-16, 221, 222-23, 225, 227; and "Policy on Outer Space, U.S." (NSC 5814), 345-59, 360; and "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520), 200, 308-13, 326, 328; and "Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377; and "Project Feed Back Summary Report," 269-74; and Project Vanguard, 14, 221-23, 224-25, 228, 395, 402; and reconnaissance programs, 219-20, 222-23, 227-28, 348, 354, 373-75; and "Report on the Present Status of the Satellite Problem," 267-69; and satellite reconnaissance, 216-17, 221-24, 227-28, 269-74, 348, 354, 373-75; and "Surprise Attack Conference," 227-28; and Technological Capabilities Panel ("Surprise Attack Panel"), 218-19, 221, 225, 309; and U-2 program, 219-20, 222-23, 227; and U.S. Policy on Outer Space," 362-73  
 Eizenstat, Stuart, 559  
 El Paso, Texas, 13  
 Electronics Research Center, Massachusetts, 484  
 Ellsworth, Robert, 514  
 Energy, Department of, 577  
 Energy Research and Development Administration (ERDA), 570  
 "Engineering Techniques in Relation to Human Travel at Upper Altitudes," 262-66  
 Environmental Protection Agency (EPA), United States, 570  
 Environmental Science Services Administration (ESSA), 520  
 Ehrlichman, John, 35, 546, 558-59  
 "Exploration of the Universe with Reaction Machines," 59-84  
 European Space Agency (ESA), 580, 582, 708  
 European Space Research Organization (ESRO), 486, 509  
 Explorer Project, 221-22, 228, 478-79, 486, 644  
 Extended Duration Orbiter (also see Shuttle, Space), 599

---

**F**

Fairbanks, Richard, 579  
 Farley, Clare, 438  
 Federal Aviation Administration (FAA), 654  
 Federal Communications Commission (FCC), 439  
 Feed Back, Project, 218, 221, 245, 269-74  
 Finan, William, 632  
 Fink, Daniel J., and "Study of the Mission of NASA," 717-23  
*First Men in the Moon, The*, 4  
 Fisk, James, 633

Flagstaff, Arizona, 4, 55  
 Flanigan, Peter M., 546  
 Flax, Alexander, and "Flax Committee," 548  
 Fleming, John A., 136  
 Fletcher, James C., 549, 567, 685, 730; and decision to develop the space shuttle, 386-88, 555, 558-59; and *Leadership and America's Future in Space*, 392-93; and named NASA administrator, 386, 392; and "Problems and Opportunities at NASA," 711-17  
 "Flight Analysis of the Sounding Rocket," 145-53  
 Flight Research Center, Dryden, California, 477  
*Forbidden Planet*, 17  
 Ford Foundation, 633  
 Forrestal, James, 178  
 Fort, Charles, 204  
 Fort Bliss, Texas, 13  
 Fort Devens, Massachusetts, 135, 136  
 Fort McHenry, Maryland, 5  
 Foster, William C., 228  
 Fournet, Dewey J., 202, 203  
 France, 509, 580  
*Frau im Mond (The Girl in the Moon)*, 85  
 Freeman, Fred, 177, 179  
 Friedman, Herb, 715  
 Frosch, Robert, 711  
 Fubini, Eugene, 548  
 Fuller, Craig, 595  
 Future Programs Task Group, 473-90

## G

---

Gagarin, Yuri, 379, 423, 492, 494  
 Galilei, Galileo, 2, 3, 395  
 Gallup Poll, 16  
 Gamma Ray Observatory, 584  
 Gardner, Trevor, 218-19  
 Garland, William N., 203, 206  
 Garn, Jake, 726  
 Gemini program, 457, 460, 462-63, 480-82, 492-94, 496  
 General Services Administration (GSA), 614, 667  
 Garroway, Dave, 18  
 General Accounting Office, United States (GAO), 563, 571  
 General Motors Corporation, 656  
 General Tire and Rubber Co., 11  
 Geneva, Switzerland, 222, 227-28, 610  
 Geological Survey, United States (USGS), 693  
 Gerson, N.C., 298, 299  
 Gleason, S. Everett, and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Glenn, John, 480  
 Glennan, T. Keith, 377, 614, 645, 647  
 Global Atmospheric Sampling Program, 708  
 Goddard, Robert H., 1, 6-7, 10, 11, 12, 13, 16, 59, 133, 146, 157; and *A Method of Reaching Extreme Altitudes*, 7, 86-132; and *Liquid-Propellant Rocket Development*, 8, 134-40  
 Goddard Space Flight Center, Maryland, 378, 484, 611-12; and field center roles, 689-711  
 Goett, Harry J., 379  
 Goldwater, Barry, 714  
 Gore, Albert Sr., 642  
 Goudsmit, Samuel A., 202, 206  
 Graham, William, 723  
 Gravity Probe-B project, 709  
 Great Falls, Montana, 202, 204  
 Greenbelt, Maryland, 378  
 Griggs, David T., 205

Grissom, Virgil I. (Gus), 15  
 Groo, Elmer S. (Todd), 688, 717  
 Grosse, Aristid V., 266; "Report on the Present Status of the Satellite Problem," 267-69  
 Grumman Corporation, 550, 552, 674  
 Guggenheim Aeronautical Laboratory, California Institute of Technology (CALCIT), 10-11; and "A Review and Preliminary Analysis of Long-Range Rocket Projectiles," 155-76; and "Flight Analysis of the Sounding Rocket," 145-53; and "Memorandum on the Possibilities of Long-Range Rocket Projects," 153-55  
 Guggenheim, Daniel, 134, 135, 137, 140  
 Guggenheim, Florence, 134, 137, 140  
 Guggenheim Fund, 7-8, 134, 137, 140

## H

---

Haber, Fritz, 177  
 Haber, Heinz, 178  
 Hagen, John P., and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Hagerty, James C., 200-201, 331  
 Hale, Edward Everett, 3-4; "Brick Moon, The," 24-55  
 Haley, Andrew G., and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 Halley's comet, 580, 584  
 Hammond, Victor, 673  
 Haneda Air Force Base, Japan, 204  
 Hansen, 437-38  
 Harvard Observatory, 217, 243  
 Harvard University, 178, 189, 194, 217, 228, 633, 657  
 Haurwitz, B., 298, 299  
 Hayden Planetarium, New York City, 18, 176, 178, 314  
 Hayward, Thomas, 427  
 Health, Education, and Welfare, Department of, 520, 570-71, 654  
 Heaton, Donald, 673  
 Hebert, Eddie, 714  
 Heinlein, Robert A., 16  
 Heiss, Klaus P., 549  
 Heller, Gerhard, 280  
 Herter, Christian A., and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Hess, Harry H., 511  
 High Energy Astronomical Observatory (HEAO), 709  
 Hitchcock, James J., 220  
 Hodgkins Fund, 7, 86  
 Holaday, William M., and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Hollywood, California, 179  
 Holmes, D. Brainerd, 381, 454, 461  
 Hoover, Lt. Cdr., 275  
 Hoover, Herbert, Jr., 223  
 Hornig, Donald F., and Ad Hoc Panel on Man-in-Space, 378, 408-12  
 Horowitz, Norman H., 511  
 Housing and Urban Development, Department of, 520  
 Hrones, John, 648  
 Hubble Space Telescope (also see Space Telescope project), 726, 741; and "Hubble Space Telescope Optical Systems Failure Report," 735-741  
 Hughes Danbury Optical Systems, Inc. (also see Perkin Elmer Corp.), and Hubble Space Telescope, 736  
 Humphrey, Hubert, 643  
 Hunsaker, Jerome C., 10  
 Huntsman, Jon, 547  
 Huntsville, Alabama, 14, 15, 17, 179, 189, 195, 281, 429, 715-16  
 Hynek, J. Allen, 200-206, 207

---

IBM Corp., 209, 617-18  
 Illinois, University of, 657  
 Infrared Astronomy Satellite (IRAS), 598  
 Institute for Aeronautical Sciences, 632  
 Integrated National Space Plan, 440, 446  
 Intelligence Advisory Committee, CIA, 202  
 Intelsat, 509  
 Intercontinental Ballistic Missiles (ICBM), 10, 15-16, 217, 395, 432, 446, 448, 633, 645  
 Interior, Department of, 497, 499, 513, 520, 570-71, 577, 670  
 International Astronautical Federation, 274, 314  
 International Bank for Reconstruction and Development, 554  
 International Council of Scientific Unions (ICSU), 20-21, 295, 368  
 International Geophysical Year (IGY), 19, 20, 200-201, 220-23, 224-25, 227, 228, 274, 329, 366; and National Committee's "Summary of the Eighth Meeting," 295-308; and "Policy on Outer Space, U.S." (NSC 5814), 345-59, 360; and "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520), 200, 308-13, 326, 328; and "Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377  
 International Polar Year, 21  
 International Scientific Radio Union, 314; and National Committee's "Summary of the Eighth Meeting," 295-308  
 International Union of Geodesy and Geophysics (IUGG), 314; and National Committee's "Summary of the Eighth Meeting," 295-308  
 "Introduction to Outer Space," 332-34  
 Inyokern, California, 312  
 "Is There Life on Mars?," 176, 194-95  
 Italy, 486, 509  
 Itek, Inc., 217

---

## J

Jackson, Henry, 631, 715  
 Jacobs, Kenneth H., 283  
 Japan, 580  
 Jastrow, Robert, 712  
 Jet-Assisted Take-Off (JATO), 8, 10-11  
*Jet Propulsion*, 281-94  
 Jet Propulsion Laboratory (JPL), Pasadena, California, 11, 14-15, 611, 630, 636, 645-47, 657, 691-92, 735, 743; and affiliation with NASA, 614; and field center roles, 689-711; and "Memorandum on the Possibilities of Long-Range Rocket Projects," 153-55; and "A Review and Preliminary Analysis of Long-Range Rocket Projectiles," 155-76; and sounding rockets, 145-53  
 Johns Hopkins University, 206  
 Johnson, Kelly, 222  
 Johnson, Louis, 217  
 Johnson, Lyndon B., 434, 468, 473, 490, 495, 511; and Apollo Applications Program (AAP), 383-85; and Apollo decision, 379-81; and "Great Society," 622; and National Aeronautics and Space Act of 1958, 334-45, 377; and post-Apollo planning, 382-83; and review of Apollo, 381-82, 424, 427, 429, 433; and U.S.-Italian San Marcos project, 466  
 Johnson Space Center, Texas, 588, 626, 715; and field center roles, 689-711  
 Johnson, U. Alexis, 543  
 Johnston, S. Paul, 632-33  
 Joiner, Col. W.H., 154  
 Joint Chiefs of Staff, 359-60  
*Journal of Aeronautical Sciences*, 145-53  
*Journal of the British Interplanetary Society*, 9, 140-45  
 Joyce, J. Wallace, 295  
 Juno Launch Vehicle, 406  
 Jupiter, 507, 580  
 Jupiter Launch Vehicle, 14-15, 219, 221, 395, 402, 419, 478, 712

## K

- 
- Kahn, Genghis, 5  
 Kaluga, Soviet Union, 59  
 Kaplan, Joseph, 177, 178; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Kapsitsa, Peter, 308  
 von Kármán, Theodore, 10-11; and "Memorandum on the Possibilities of Long-Range Rocket Projects," 153-55  
 Karpenko, Anatoly, 308  
 "Katusha," 11  
 Katz, Amron, 215  
 Kellogg, William, 215  
 Kelly, Albert J., 673  
 Kendrick, J.B., 280  
 Kennedy, John F., 229, 383, 388, 467-68, 473, 491, 597, 614, 621; and Apollo as crash program, 461; and Apollo decision, 379-81, 595, 600; and Gagarin flight, 379, 423, 612; and launch vehicles, 414-15; and prestige in space, 414; and review of Apollo, 381-82, 424, 427; and "Problem of Space Programs," 413-15; and Alan Shepard ceremony, 440; and space policy of, 379-82; and speech before Congress on sending Americans to the Moon, 453-54; and "Wiesner Report," 379, 416-23, 499  
 Kennedy, Robert, 492, 621  
 Kennedy Space Center, Florida, 588, 612, 625-27, 685, 733; and field center roles, 689-711  
 Kepler, Johann, 3  
 Kerr, Robert S., 380, 433-35  
 Key, Francis Scott, 5  
 Keyworth, George A., II, 392, 590  
 Khrushchev, Nikita, 223  
 Killian, James R., 637, 641, 645, 647-48; and "Introduction to Outer Space," 332-34; and "Killian Committee," 397, 416-23, 628-31; and *Meeting the Threat of Surprise Attack*, 219-20; and Presidential Science Advisor, 225, 611; and "Purcell Panel," 632; and Technological Capabilities Panel ("Surprise Attack Panel"), 218-19, 222, 225, 309  
 King, Martin Luther, 621  
 Kirkpatrick, Jeanne, 392  
 Kissinger, Henry, 559  
 Kistiakowsky, George, 228, 241, 408  
 Klaatu, 17, 20  
 Klep, Rolf, 177, 179  
 Knopow, Joseph J., 224  
 Knowland, William, 631  
 Kochanowski, Paul, 716  
 Korolev, Sergei, 715

## L

- 
- Labor, Department of, 654  
 Laird, Melvin, 384, 519-20  
 Land, Edwin, 217, 219, 632  
 Landsat program, 565, 598  
 Lang, Fritz, 85  
 Langley Research Center, Virginia, 477, 587, 611, 647, 650, 717; and field center roles, 689-711  
 Langley, Samuel P., 650  
 Large Area Crop Inventory Experiment (LACIE), 711-13  
 Lasswell, Harold, 215  
 Latin America, 509  
 Lawrence Livermore National Laboratory, 632  
 Lay, James S., 312-13  
 Leghorn, Richard, 217  
 Lehrer, Tom, 12-13  
 LeMay, Curtis E., 213-14, 236  
 Lenher, Samuel, 511  
 Lewis, C.S., 5  
 Lewis Research Center, Ohio, 477, 587, 611, 647, 717; and field center roles, 689-711  
 Ley, Willy, 18-19, 176, 179  
*Life*, 176

Lincoln Laboratory, 657  
 Lincoln, Project, 217  
 Lindbergh, Charles A., 7, 134, 135, 136, 140  
 Lipp, James E., 215; and "Project Feed Back Summary Report," 269-74; and "The Utility of a Satellite Vehicle for Reconnaissance," 245-61, 269  
*Liquid-Propellant Rocket Development*, 8, 134-40  
 Little, Arthur D., Inc., 206  
 Locke, Richard Adams, 23  
 Lockheed Corporation, 550, 552  
 Lockheed Missile Systems Division, 222, 223, 224  
 LOKI Boosters, 275-79  
 London, United Kingdom, 331, 350  
 Long Playing Rocket Project, 295; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Long Range Plan, NASA (1959), 377-38, 403-407  
 Los Alamos, New Mexico, 241  
 Los Alamos National Laboratory, 241, 630  
 Los Angeles, California, 178, 269  
 Lovelace, Alan, 711-17  
 Low, George M., 386-88, 389, 548, 558-59, 579, 623-24, 685-88, 715  
 Lowell Observatory, Flagstaff, Arizona, 4, 55, 195  
 Lowell, Percival, 4, 55-58, 195  
 Luna 16 project, 598  
 Lunar Excursion Module (LEM), 481, 488

## M

---

McClellan, John, 643, 714  
 McCloskey, Chester M., 283  
 McCoffus, Charlie, Ballad of, 650-51  
 McDaniel, Keith K., 283  
 McElroy, Neil, 225, 650  
 McKinsey & Company, 633  
 McMillan, Dr., 241  
 MacNair, Walter, 214  
 McNamara, Robert S., 426, 439-40, 614, 654; and Apollo decision, 379-81; and post-Apollo planning, 382-85; and review of Apollo, 381-82, 424  
 MacNeil, Nick, 559  
 Macy, John W., 614, 654  
 Malina, Frank J., 10-11, 12, 154; and "A Review and Preliminary Analysis of Long-Range Rocket Projectiles," 155-76; and "Flight Analysis of the Sounding Rocket," 145-53  
 Magnus, Albert, 5  
 Magnuson, Warren, 492, 714  
 Mahon, George, 714  
 "Man and the Moon," 19  
 "Man in the Moon: The Journey," 176, 189-94  
 "Man in Space," 19  
 "Man Without a Country, The," 23  
 Manned Spacecraft Center, Texas, 484, 513, 612  
 Manhattan Project, 178, 241, 266, 614  
 Manned Orbital Laboratory (MOL), and Department of Defense, 480, 496, 499, 515  
 Manning, Gordon, 18, 176-77  
 Marble, John P., 295  
 Mark, Hans, 389, 587-89; and decision to build the space station, 390-92  
 Mariner project, 479, 507, 528  
 Mars, 55-58, 460, 493, 522, 580, 597, 600, 742-43; and manned landing, 497, 504, 523, 530, 537, 540, 545; and Mariner probe, 479, 507, 528; and Viking project, 622  
 "Mars and Beyond," 19  
*Mars and Its Canals*, 4, 55  
 Mars Excursion Module, 531, 540  
 Martha's Vineyard, Massachusetts, 649

Mason, Edward, 633  
 Marshall Space Flight Center, 429-30, 611, 618, 678, 680, 683-84, 715-16; and field center roles, 689-711; and possible closing of, 713-14  
 Martin, Glenn L. Co., 14  
 Martin Marietta Corp., 626, 656, 741  
 Martz, E.P., Jr., 280  
 Marvin, C.F., 136  
 Maryland, University of, 314  
 Massachusetts Institute of Technology (MIT), 10, 217, 230, 379, 416, 611, 614, 647, 657  
 Mathematica, Inc., 549-50  
 Mayo, Robert P., 385, 543-46  
 McCurdy, Richard, 548-49  
 McDonnell Douglas Corporation, 550, 552, 615, 674-77, 683  
 McGill University, 633  
 Medaris, John B., 221  
 Medicare program, 547  
*Meeting the Threat of Surprise Attack*, 219-20  
*Megiste Syntaxis*, 1  
 "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Mercury, 507, 580  
 Mercury, Project, 378, 379, 404, 408-409, 411, 419, 422, 426, 429-30, 441, 450, 460, 463-64, 469, 480-81  
 Merriam, John C., 136, 140  
 Merritt Island Launch Facility, Florida, and Cape Kennedy, 484  
*Method of Reaching Extreme Altitudes, A*, 7, 86-132  
 Mettler, Ruben F., 511  
 Michoud Assembly Facility, Louisiana, 469, 484  
 Miller, Stuart, 217  
 Millikin, Robert A., 10, 136  
 Mills, Wilbur, 714  
*Mikwaukee Sentinel*, 86  
 "Minimum Orbital Unmanned Satellite of the Earth (MOUSE), Studies of a," 314-24  
 "Minimum Satellite Vehicle: Based on Components Available from Missile Developments of the Army Ordnance Corps," 274-81  
 Minimum Satellite Vehicle Project, 274-81  
 Minnesota Mining and Manufacturing Co., 272  
 Minnich, L.A., 631  
 Minuteman Launch Vehicle, 219, 432, 616  
*Mirabilis Mundi, De (On the Wonders of the World)*, 5  
 Mission from Planet Earth program (MFPE), 742-43  
 Mission to Planet Earth program (MTPE), 742-43  
 Missile Detection and Alarm System (MIDAS), 227, 451  
 Mississippi Test Center, 469, 484  
 Mitre Corporation, 657  
 Mitterand, Francois, 596  
 Model Cities program, 547  
 Moffett Field, California, 647  
 Mondale, Walter, 568  
 Monitor project, 478  
*Moon Hoax*, 23  
 Moore, Gary, 18  
 Morgan Spring Co., 100  
 Morgenstern, Oskar, 549  
 Mortensen, Jim, 717  
 Moss, Frank, 714  
 Mount Wilson Observatory, 87, 283  
 Mueller, George, 494, 615-16  
 Munger, William P., 283  
 Murray, Bruce, 716  
 Museum of Natural History, New York City, 176  
 Muskie, Edmund, 715  
 Myers, Dale D., 615

## N

- National Academy of Engineering, 589
- National Academy of Public Administration (NAPA), 626-27, 730
- National Academy of Sciences, 10, 153, 221, 308, 589, 634, 637-38, 712, 715; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308; and "Planetary Exploration; 1968-1975" report", 497
- National Advisory Committee for Aeronautics (NACA), 14, 226, 334, 340, 345, 359, 394, 449, 463-64, 477, 580, 611-12, 614, 620-21, 629-42, 644-45, 647-49, 688, 715, 717; and Special Committee on Space Technology, 394-403
- National Aeronautics and Space Act of 1958, 226, 334-45, 377, 397, 476, 483, 529, 563, 571, 580, 587, 611-12, 622, 685-86
- National Aeronautics and Space Administration (NASA), 6, 8, 14, 345, 640; and "Ad Hoc Panel on Man-in-Space, Report of," 378, 408-12; and administrator of, 337-38; and Advisory Committee on the Future of the U.S. Space Program ("Augustine Commission"), 626-28, 741-743; and Apollo, 9; and Apollo Applications Program (AAP), 383-85, 501, 514, 521; and Apollo decision, 379-81; and Armed Service Procurement Regulations of 1947; and Carter space policy, 388-89; and "Civil and Further National Space Policy," 389; and creation, 611; and decision to build the space shuttle, 386-88; and decision to build the space station, 390-92; and economic stimulation, 566, 569; and Equal Employment Opportunity (EEO) record, 572; and established, 226, 334-45; and international cooperation, 339, 354-55; and launch vehicles, 414-15, 419-20; and *Leadership and America's Future in Space*, 392-93; and Long Range Plan of (1959), 377-38, 403-407; and "Management Study Group Recommendations," 730-35; and Mercury project, 378, 379, 404, 408-409, 411, 419, 422, 430, 464, 469, 480-81; and missions of, 227, 335-36, 392-93; and National Commission on Space, 392; and Nixon space policy, 383-86; and *Pioneering the Space Frontier*, 392; and plans of, 1959-1960, 377-79; and post-Apollo planning, 382-85; and prestige in space, 414; and "Problems and Opportunities in Manned Space Flight," 384; and "Problem of Space Programs," 413-15; and property rights to inventions, 342-44; and Reagan space policy, 389-90, 623; and recommendations from NACA, 394-403; and relations with Department of Defense, 11, 339; and reports of, 339-40; and review of Apollo, 381-82; and Space Task Group (1969), 383-85, 392, 513, 515, 519, 530-31, 540, 543-45, 553; and Strategic Planning Council, 733; and "Study of the Mission of NASA," 717-23; and "Wiesner Report," 379, 416-23, 499
- National Aeronautics and Space Council, 336-37, 415, 418, 433-34, 467-68, 472, 502, 511, 525, 548, 622; and Apollo decision, 379-81; and review of Apollo, 381-82, 424, 427; and post-Apollo planning, 382-85; and "Problem of Space Programs," 413-15; and "U.S. Policy on Outer Space," 362-73; and Space Task Group (1969), 383-85, 513; and "Wiesner Report," 379, 416-23
- National Broadcasting Corp. (NBC), 18
- National Commission on Space, 392
- National Committee for the IGY, U.S., 221; and "Summary of the Eighth Meeting," 295-308
- National Defense Research Committee, 153, 154, 156
- National Environmental Policy Act, 609
- National Geographic Society, 195
- National Indications Center, CIA, 220, 228
- National Institutes of Health (NIH), 570-71
- National Oceanic and Atmospheric Administration (NOAA), 577, 605, 712
- National Research Council, 298, 630
- National Science Foundation (NSF), 221, 223, 225, 226, 308, 449, 513, 560, 570, 615, 631, 634, 637-38, 643, 647, 654, 656-57, 659, 666, 710; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308; and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94
- National Space Council, 625-26, 741, 743
- National Security Act of 1947, 214, 373
- National Security Council (NSC), 200, 218, 222, 229, 307, 437, 544-45, 604; and Civil and Further National Space Policy" (NSC 42), 575-78, 590-93; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and "National Space Policy" (NSC 37), 574-76, 610; and "Policy on Outer Space, U.S." (NSC 5814), 345-59, 360; and "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520), 200, 308-13, 326, 328; and Policy Review Committee (PRC), 575, 577; and "Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377; and "U.S. Policy on Outer Space" (Space Council, 1960), 362-73
- National Security Decision Directives, 590
- National Telecommunications and Information Administration (NTIA), 577
- National Watch Committee, 220



*Nauchnoye Obozreniye (Science Review)*, 6  
 Naugle, John E., 688  
 Navaho Launch Vehicle, 15, 217  
 Naval Engineering Experiment Station, 12  
 Naval Ordnance Test Station, California, 312, 611  
 Naval Research Laboratory (NRL), 14, 221, 223, 286, 298, 301, 611-12, 643, 710, 715  
 Naval Research, Office of, 274, 275  
 Naval School of Aviation Medicine, 284  
 "Navigation of Space, The," 6  
 Navy Air Missile Test Center, California, 312  
 Navy, United States, 12, 15, 156, 157, 202, 214, 221-22, 223, 224, 225, 227, 274, 275, 279, 359, 380, 436, 497, 612, 615, 639, 644, 673, 715  
 Neasham, R.S., 202  
 Nekrassoff, V.A., 329  
 Nelson, Bill, 726  
 Neptune, 507  
 Neustadt, Richard E., 413-415  
 New Deal, 614  
 Newell, Homer E., Jr., and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308; and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 Newman, Bob, 717  
 Newspaper Publishers Association, 438  
*Newsweek*, 546  
 Newton, Isaac, 2-3, 5, 180, 217, 395  
 New York City, 716  
 New York City, New York, 18, 86, 176, 178, 269  
*New York Times*, 7, 86, 133  
 New York University, 657  
 Nichols, Kenneth D., 266  
 Nike Project, 683; and Ajax Booster, 678; and Hercules Booster, 678; and Zeus Booster, 432, 678  
 Nimbus communications satellite, 439, 449, 477  
 Nixon, Richard M., 345, 379, 388, 512-13, 519, 522, 597, 622; and decision to build the space shuttle, 86-88, 558, 624; and post-Apollo planning, 383-85; and space policy of, 385-86; and Space Task Group (1969), 383-85; and Task Force on Space, 499  
 Nobel Prize, 10  
 North Atlantic Treaty Organization (NATO), 228, 349  
 North American Aviation, Inc., 218; and Rocketdyne Division, 617-19  
 North American Rockwell Corp., 674  
 North American Weather Consultants, 289  
 Nova Launch Vehicle, 406, 407, 409-12, 441, 450  
 Nuclear Engine for Rocket Vehicle Application (NERVA), 547  
 Nyack, J. Allen, 202

---

**O**

Oberth, Hermann, 6, 9, 11, 13, 16, 23, 59, 84-86  
 O'Dell, Charles, R., 511  
 Oder, Frederick C.E., 202, 203  
 Odishaw, Hugh, and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308, 633  
 Office of Defense Mobilization, 218  
 Office of Management and Budget (OMB), 386, 546-49, 563, 572, 577, 593, 604, 607, 620, 712, 714; and decision to develop the space shuttle, 386-88, 571 (see also Bureau of the Budget)  
 Office of Personnel Management (OPM), United States, 620, 628  
 Ohio State University, 206, 207  
 O'Keefe, John, and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 O'Neill, Tip, 714  
 "Open Skies" Doctrine, 213-29, 230  
 Orion, Project, 420  
 Orbiter, Project, 221-22, 308, 310  
 Orbiting Astronomical Observatory (OAO), 463, 479, 507

Orbiting Geophysical Observatory (OGO), 479  
 Orbiting Solar Observatory (OSO), 479, 507  
 Ostrander, Don R., 673  
*Out of the Silent Planet*, 5  
 Overhage, Carl, 217

---

**P**

Pacific Missile Range, 399  
 Pacific Northwest Regional Commission, 693  
 Pacific Palisades, California, 278, 280  
 Packard, Jack, 648  
 Page, Thornton, 202, 206  
 Paine, Thomas O., 522, 622; and chairs National Commission on Space, 392; and named NASA administrator, 384; and *Pioneering the Space Frontier*, 392; and "Problems and Opportunities in Manned Space Flight," 384; and resigns as NASA administrator, 386; and Space Task Group (1969), 383-85, 513-14, 519, 543-44  
 Pal, George, 17  
 Palomar Observatory, 283  
 Paperclip, Project, 13  
 Pasadena, California, 10  
 Patent and Trademark Office, United States, 643  
 Pathfinder program, 605  
 Patrick Air Force Base, Florida, 312  
 Patterson, Robert, 213, 215  
 Patton, James R., Jr., 283  
 Pauli, Fritz K., 281  
 PBM3C Flying Boat, 12  
 Pearl Harbor, Hawaii, 215, 216, 225  
 Peavey, R.C., and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Peenemünde Rocket Development Center, 13, 267, 331  
 People's Republic of China, 10  
*Perelandra*, 5  
 Perkin, Richard, 217  
 Perkin-Elmer, Inc. (also see Hughes Danbury Optical Systems, Inc.), 217; and Hubble Space Telescope, 736  
 Perkins, James A., 633  
 Petrone, Rocco, 673-74, 715  
 Phillips, Samuel C., 615-16, 625; and "NASA Management Study Group Recommendations," 730-35  
 Photo Interpretation Laboratory, Anacostia, Maryland, 202  
 Photo Records and Services Division, U.S. Air Force, 218  
*Physics and Medicine of the Upper Atmosphere: A Study of the Aeropause*, 262-66  
 Piersing, William H., 645-47, and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Pierce, John R., and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 "Pilot Lights of the Apocalypse: A Playlet in One Act," 230-35  
 Pioneer project, 479  
*Pioneering the Space Frontier*, 392  
 Planning Research Corporation, 657  
 Pluto, 507  
 Point Mugu, California, 312  
 Polaero, Hans R., 281  
 Polaris Missile, 15, 219  
 Polaroid, Inc., 217, 632  
 "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520), 200, 308-13, 326, 328  
 "Policy on Outer Space, U.S." (NSC 5814), 345-59, 360  
 Policy on Outer Space, U.S." (Space Council, 1960), 362-73  
 Pompton Plains, New Jersey, 12  
*Popular Science News*, 6  
 Port Huron, Michigan, 204  
 Porter, Richard B., 283  
 Possony, Stephen, 202  
 Pravda, 329-30  
 "Preliminary Design of an Experimental World-Circling Spaceship," 236-45

"Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377  
 Presidential Science Advisor, 225, 392; and "Introduction to Outer Space," 332-34; and "Killian Committee," 397, 416-23, 629  
 Presidential Science Advisory Committee (PSAC), 309, 548, 666; and Ad Hoc Panel on Man-in-Space, 378, 408-12; and Apollo decision, 379-81; and "Introduction to Outer Space," 332-34; and "Killian Committee," 397, 416-23, 629; and post-Apollo planning, 382-85; and review of Apollo, 281-82; and Space Task Group (1969), 383-85  
 President's Advisory Committee on Government Organization, 611, 637  
 Presque Isle, Maine, 204  
 Price, Don K., 633  
 Princeton University, Princeton, New Jersey, 86, 215, 657  
 "Problems and Opportunities in Manned Space Flight," 384  
 Proxmire, William, 383, 490, 492-94, 714-15  
 Ptolemy, 1-2  
 Puckett, Allen E., 511  
 Purcell, Edward, 217; and "Purcell Panel," 632, 634  
 Putt, Donald, 224

---

**Q**

Quarles, Donald A., 221-22, 223, 224, 225, 228, 329, 648; and "Report on the Present Status of the Satellite Problem," 267-69

---

**R**

Radcliff, J.D., 199  
 Radiation Laboratory, MIT, 230  
 Radio Corporation of America (RCA), 218, 227, 271-74  
*Die Rakete zu den Planetenraumen (Rockets in Planetary Space)*, 6, 84-86  
 Rand Corp., 213-15, 216, 217, 221, 224, 225, 230, 245, 614, 657, 664; and "Project Feed Back Summary Report," 269-74; and "The Utility of a Satellite Vehicle for Reconnaissance," 245-61, 269  
 Ranger project, 430, 442, 446, 480  
 Rayburn, Sam, 345  
 Reaction Motors, Inc., 12  
 Reagan, Ronald, 389-92, 579, 593-94, 625, 730; and decision to build the space station, 390-92, 623; and *Leadership and America's Future in Space*, 392-93; and National Commission on Space, 392; and *Pioneering the Space Frontier*, 392  
 Redstone Arsenal, Alabama, 14, 176, 189, 195, 274, 276, 280-81  
 Redstone Launch Vehicle, 15, 406, 632; and "Minimum Satellite Vehicle: Based on Components Available from Missile Developments of the Army Ordnance Corps," 274-81  
 Rensselaer Polytechnic Institute, 389, 579  
 Research and Development Committee/Board, War Department/DOD, 214, 215, 217  
 "Review and Preliminary Analysis of Long-Range Rocket Projectiles, A," 155-76  
 Ride, Sally K., 392-93; and *Leadership and America's Future in Space*, 392-93  
 Ridenour, Louis N., 215, 217, 241; and "Military Security and the Atomic Bomb," 230; and "Pilot Lights of the Apocalypse: A Playlet in One Act," 230-35  
 Roadman, Charles, 673  
 Roberts, E.B., 295  
 Roberts, Walter O., 511  
 Robertson, H.P., 202, 205, 206  
 Rockefeller, Nelson A., 312-13, 611, 637, 641  
 Rocketdyne Division (also see North American Aviation Co.), 617-19  
 Rocketry; *Collier's* and, 17-19; GALCIT and, 10-11; Robert H. Goddard and, 1, 6-7, 10, 11, 12, 13, 16, 59, 86-132, 133, 134-40; and ICBMs, 10, 15-16, 432; and modern war, 11-13; and post-war development, 13-15; Project Bumper and, 14-15; Reaction Motors, Inc., and, 12; rocket societies and, 8-9; science fiction and, 16-17; and technology of, 5, 10-15;  
 Rogers, William P., and Presidential Commission on Challenger Accident, 624, 723-729  
 Rome, Italy, 301, 305  
 Romick, Darrell C., 283  
 Root, Eugene, 215  
 Rose Bowl, Pasadena, California, 0  
 Rosen, Milton W., 295, 298; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308; and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94

Ross, H.E., and "B.I.S. Space Ship, The," 140-45  
 Roswell, New Mexico, 7-8, 134  
 Rover, Project, 420, 443, 449-50, 454, 461  
 Rowe, Herb, 714, 717  
 Rubel, John H., 435-36  
 Rubenstein, David, 559  
 Rudolph, Walter N., 295  
 Rupelt, E.J., 202  
 Russell, Richard, 383, 492  
 Ryan, Cornelius, 18, 176-77

## S

---

St. Elmo's Fire, 204-205  
 SAINT program, 451  
 Salter, Robert M., Jr., 215; and "Engineering Techniques in Relation to Human Travel at Upper Altitudes," 262-66; and "Project Feed Back Summary Report," 269-74; and "Utility of a Satellite Vehicle for Reconnaissance, The," 245-61, 269  
 Saltonstall, Leverett, 631  
 Samek, Michael J., 283  
 SAMOS program, 451  
 San Antonio, Texas, 177  
 San Clemente, California, 388  
*San Francisco Examiner*, 86  
 San Marcos project, 466  
 Sanger, Eugen, 10, 146  
 Santa Monica, California, 215, 236, 269  
 Sasser, Jim, 714  
*Saturday Evening Post*, 176  
 Saturn, 507, 580, 600  
 Saturn Launch Vehicle, 6, 383, 386, 404, 406, 407, 409-12, 413, 419-20, 425, 426, 429-30, 433, 441, 450, 457, 460, 481-84, 487, 489, 493-96, 503, 506, 514-18, 617-18, 622, 675-78, 680-84, 715  
 Schacter, Oscar, 179  
 Schade, Otto, 272  
 Schaefer, Hermann J., and "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 Schiaparelli, Giovanni, 4, 195  
 Scientific Research and Development, Office of, 657  
 Schilling, G.F., and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Schriever, Bernard A., 15-16, 427  
 Schultz, George, 387  
 Science Advisory Committee, Office of Defense Mobilization, 218, 219  
 Scientific Advisory Panel, CIA, 19-20  
 Science and Technology, proposed Department of, 611, 643  
 Science and Technology Policy, Office of (OSTP), 390, 473, 572, 575, 578, 593, 604, 610, 665, 722  
 "Scientific Satellite Program," 221  
 Scout Launch Vehicle, 14-15, 404, 406, 478, 482  
 Seaborg, Glenn T., 543, 614, 673  
 Seamans, Robert C., Jr., 384-85, 461, 464, 492, 511, 519, 522, 543  
 Seasat project, 598, 698  
 Seifert, Howard S., 283  
 Senior Interagency Group (SIG) for Space, 390, 604, 606, 610; and decision to build the space station, 390-92, 590-95, 599, 600  
 Sergeant Launch Vehicle, 14  
 Shapley, A. Harlow, 243; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Shepard, Alan B., Jr., 15, 380, 440, 453  
 Sherman Anti-Trust Act of 1890, 616  
 Shultz, George P., 546-47, 558  
 Shuttle, Space (also see Space Transportation System), 547, 549, 551-59, 564-68, 571-73, 576, 578, 580-99, 600-01, 608, 624-28, 702-03, 708-09, 715-16, 721-23, 742-43; and Carter space policy, 388-89; and decision to develop, 386-88; and "Rogers Commission Report," 723-30  
*Sidereus Nuncius*, 2

- Sidereal Messenger*, 2  
 Siepert, Albert F., 672  
 Silveira, Milton, 389, 587-89  
 Silverstein, Abe, 648  
 Singer, S. Fred, "Minimum Orbital Unmanned Satellite of the Earth (MOUSE), Studies of a," 314-24; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Siple, Paul A., 295  
 Skyhook Project, 216  
 Skylab Project, 547, 556, 558, 622, 714-15  
 Skyvan, Shorts, 588  
 Slidell, Louisiana, 700  
 Smith, A.M.O., and "Flight Analysis of the Sounding Rocket," 145-53  
 Smith, Francis B. (Frank), and Future Programs Task Group 473  
 Smith, Harry B., 202  
 Smith, Kent, 648  
 Smith, Margaret Chase, 493  
 Smithsonian Institution, 7, 86, 134, 135, 137, 140, 643, 650  
 Smyth Report, 178  
 Snark Missile, 217  
 Society for Spaceship Travel, 8-9  
 Solar Max project, 598  
*Somnium (Dream)*, 3  
 Soviet Union, 6, 11, 12, 18, 177, 424, 427-430, 432, 434, 436, 438, 440, 444-49, 453-57, 462, 474, 483, 490, 492-97, 501-03, 506-07, 509, 515, 529, 536, 555-59, 567, 580-81, 598, 631, 647; and Ad Hoc Panel on Man-in-Space report, 378, 408-12; and Apollo decision, 379-81; and capabilities in space, 345-59, 362-73; and Cold War, 613; and decision to build the space shuttle, 386-88; and freedom of space, 213-29, 230, 309; and Geneva Summit, 222-23, 227-28; and International Geophysical Year (IGY), 19, 20, 200-201, 220-23, 224-25, 227, 228; and *Meeting the Threat of Surprise Attack*, 219-20; and Nixon space policy, 383-86; and Nuclear and Space Talks (NST), 610; and "Open Skies" doctrine, 213-29; "Policy on Outer Space, U.S." (NSC 5814), 345-59, 360; and "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520), 200, 308-13, 326, 328; and post-Apollo planning, 382-85; and "Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377; and reconnaissance programs, 219-20, 222-23, 227-28, 348, 354, 373-75; and "Report on the Present Status of the Satellite Problem," 267-69; and review of Apollo, 381-82; and satellite reconnaissance, 216-17, 221-24, 227-28, 269-74, 348, 354, 373-75; and Soyuz, 515, 582; and "Surprise Attack Conference," 227-28; and Technological Capabilities Panel ("Surprise Attack Panel"), 218-19, 221, 225, 309; and U-2 program, 219-20, 222-23, 227; and "U.S. Policy on Outer Space" (Space Council, 1960), 362-73; and Yuri Gagarin flight, 379, 423, 474, 492, 494, 612  
 Soyuz project, 515, 582  
 Space Debris Policy (also see National Security Council, and National Space Policy), 610  
 Space Exploration Control Group, 636-37  
 Space Exploration Initiative (SEI), 741  
 Spaceflight; *Collier's* and, 17-19; and dreams of, 1, 3-5; and enthusiasm for, 1, 3-5; and escape velocity for, 7; GALCIT and, 10-11; and imagination for, 16-20; and progenitors of, 6-8; and rocket societies, 8-9  
 Spacelab, 596, 692, 701-02, 709  
 Space Task Group (1969), 383-85, 392, 515, 522-26, 530-31, 536-37, 540, 543-45, 553, 622  
 Space Telescope project, 565, 567, 578, 714  
 SPACETRACK program, 451  
 Space Transportation System (also see Space Shuttle), 521, 524, 534, 538-39, 545, 549-51, 557-59, 590-93, 600-01, 605-09, 622, 624-28, 702-03, 708-09, 721-23, 742-43; and "Rogers Commission Report," 723-30  
 Space Travel Symposium, 176, 178, 314  
 SPASUR program, 451  
 Special Committee for the International Geophysical Year (CSAGI), and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Special Committee on Space Technology (NACA), 394-403  
 Spilhaus, A.F., and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Spratling, Willis, Jr., 283  
 Sputnik I, 16, 17, 19, 21, 220, 225, 228, 329-30, 331, 332, 394, 448, 474, 494, 580, 600, 612, 628-29, 632, 647  
 Sputnik II, 225, 228, 628-29  
 Stanford Research Institute, 657  
 Stanford University, 614, 657  
 Stans, Maurice, 643-45  
 Stanton, Frank, 427, 437-38

"Star Spangled Banner, The," 5  
 State, Department of, 220, 223, 268, 307, 326, 331, 438, 577, 594, 604  
 Station, Space, 390-92, 538-39, 545, 585, 588-89, 593-98, 605, 620, 623, 626, 724, 730-33, 742  
 Steadman, Dick, 559  
 Stearns, Edwards, 215  
 Stehling, Kurt R., 283  
 Stennis, John, 714-15  
 Stephenson, H.K., 295  
 Stern, Al, 559  
 Stevenson, Adlai, 714  
 Stevenson, David B., 202  
 STOCK, Project, 203  
 Strategic Defense Initiative, 607  
 Strauss, Louis L., 268, 327  
 Strong, Philip G., 202  
 Stroud, W., 299  
 Suez Crisis, 220  
 "Summary of the Eighth Meeting," National Committee for the IGY, 295-308  
 Sunnyvale, California, 223  
 "Surprise Attack Conference," 227-28  
 Surprise Attack Panel ("Technological Capabilities Panel"), 218-19, 222, 225, 309; and *Meeting the Threat of Surprise Attack*, 219-20  
 Surveyor program, 442, 446, 492  
 Symington, Stuart, 631  
 Syncom satellites project, 464, 478  
 System for Nuclear Auxiliary Power (SNAP), 449  
 Systems Development Corporation, 657  
 Swayze, John Cameron, 18

---

## T

Task Force on Space, 499-500  
 Tass, 329-30  
 Teague, Olin E. (Tiger), 674, 714  
 Technological Capabilities Panel ("Surprise Attack Panel"), 218-19, 222, 225, 309; and *Meeting the Threat of Surprise Attack*, 219-20  
 Telstar project, 464, 478  
 Temple University, 266  
 Tennessee Valley Authority, 672  
*Terre à la Lune, De la (From the Earth to the Moon)*, 4  
 Texas, rural, story of electricity for, 439  
*That Hideous Strength*, 5  
 Third Law of Motion, Newton's, 5, 180  
 Thor Launch Vehicle, 16, 219, 225, 359, 373, 404, 406, 419, 449, 451, 482, 683  
 Thrust Assisted Orbiter Shuttle design (TAOS), 549-53  
 Tikhonravov, M.K., 177  
 Tiros Communication Satellite, 227, 439, 442, 447, 464, 477, 486  
 Titan Launch Vehicle, 15, 16, 219, 388, 419, 425, 430, 441-42, 459-60, 480-82, 494, 589, 645  
 "Today" Show, 18  
 Toftoy, H.N., 275  
 Townes, Charles, 383; and Task Force on Space, 499-500, 511-12  
 Townsend, John W., Jr., and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Tracking and Data Relay Satellite, 726  
 Trade Representative, United States, 607  
 TRANSIT program, 451  
 Transportation, Department of, 497, 499, 516, 570-71, 604, 606, 609  
 Treasury, Department of, 571  
 Tremonton, Utah, 202, 204  
 Truly, Richard, 741  
 Truman, Harry S., 214; and "Report on the Present Status of the Satellite Problem," 267-69

Tsien, H.S., 10, 154; and "A Review and Preliminary Analysis of Long-Range Rocket Projectiles," 155-76  
 Tsiolkovskiy, Konstantin Edwardovich, 6, 23, 309, 329, 330, 356; and "Exploration of the Universe with Reaction  
 Machines," 59-84  
 Tuhy, Ivan E., 283  
 Tuve, Merle A., 295  
 Twining, Nathan F., 359-60

---

**U**

U-2 Aircraft, 219-20, 222-23, 227  
 Unidentified Flying Objects (UFO), 19-20, 201-11  
 United Kingdom, 486; and Ariel project, 479  
 United Nations, 10, 179, 227-28, 229, 349, 509, 554  
 United States Army, see "Army, United States"  
 United States Army Air Corps, see "Army Air Corps, United States"  
 United States Army Air Forces, see "Army Air Forces, United States"  
 United States Air Force, see "Air Force, United States"  
 United States Congress, see "Congress, United States"  
 United States Navy, see "Navy, United States"  
 Upper Atmosphere Research Panel, 277, 314  
 Uranus, 507  
 Utah, University of, 386  
 "Utility of an Artificial Unmanned Earth Satellite: A Proposal to the National Science Foundation, Prepared by  
 the ARS Space Flight Committee, November 24, 1954, On the," 281-94  
 "Utility of a Satellite Vehicle for Reconnaissance, The," 245-61, 269

---

**V**

V-1 Rocket, 13  
 V-2 (A-4) Launch Vehicle, 13-15, 17, 180-81, 237, 239, 267, 303, 314, 429  
 Valier, Max, 9  
 Van Allen, James A., 177, 285, 511; and "Minimum Orbital Unmanned Satellite of the Earth (MOUSE), Studies of  
 a," 314-24; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308, 633  
 Van Allen Belts, 478, 644  
 Vance, Cyrus, 373-75  
 Vandenberg Air Force Base, California, 588  
 Vanguard, Project, 14, 221-23, 224-25, 228, 267, 274, 329, 395, 402, 449, 629, 644, 647; and "Memorandum of  
 Discussion at the 322d Meeting of the National Security Council," 324-28; and "Policy on Outer Space, U.S."  
 (NSC 5814), 345-59, 360; and "Policy on U.S. Scientific Satellite Program, Draft Statement of" (NSC 5520),  
 200, 308-13, 326, 328; and "Preliminary U.S. Policy on Outer Space" (NSC 5814/1), 360-61, 377  
 Vega project, 645-47  
 Venus, 460, 493, 522; and Soviets' shot at, 430; and Mariner probe, 479, 507, 580, 598  
 Verein fur Raumschiffahrt (VfR or Society for Spaceship Travel), 8-9, 12-13, 18, 179  
 Verne, Jules, 4, 7, 16, 133  
 Vertical/Short Take off and Landing (V/STOL) project, 476, 487, 489, 587, 703  
 Vestine, E.H., 295  
 Veterans Administration, United States, 571  
 Vietnam, 491, 495-96, 622  
 Viking Launch Vehicle, 14, 221, 223, 303, 310  
 Viking Project (probe to Mars), 622, 714  
 Vitro, Inc., 218  
 Voskhod system, 494  
 Vostok system, 494  
*Voyage dans la Lune (The Voyage to the Moon)*, 3  
 Voyager project, 581

---

**W**

WAC Corporal Rocket, 12, 14-15, 180-82, 267  
 Walker, T.B., 299  
 Wallops Island Facility, Virginia, 399, 436, 636, 647; and field center roles, 689-711  
 War Department, 135, 213, 214  
*War of the Worlds*, 4-5, 20

Washington, D.C., 11, 18, 203, 204, 209, 269, 275, 295, 297, 298, 301, 312  
*Washington Post*, 308  
 Waterman, Alan T., 221, 223, 615, 654; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 Weather Bureau, United States, 227, 449, 452, 455, 459, 461, 464, 477  
 Webb, James E., 379, 384, 389, 434, 457, 461, 467-68, 490, 492, 494-95, 512, 613-14, 622, 654, 672, 714; and Apollo decision, 379-81; and post-Apollo planning, 382-83; and *Challenger* accident investigation, 723; and Future Programs Task Group, 723-24; and review of Apollo, 381-82, 423, 433-440  
*Wege zur Raumschiffahrt (Ways to Spaceflight)*, 85  
 Wehner, R.S., and "The Utility of a Satellite Vehicle for Reconnaissance," 245-61, 269  
 Weinberger, Caspar W., 546-47; and decision to build the space shuttle, 386-87; and decision to build the space station, 390-92, 600-01  
 Wells, H.G., 4, 16, 20  
 Welsh, Edward C., 427, 437  
 West Germany, 509, 596  
 Western Test Range, 482  
 Westford program, 451  
 Westinghouse Electric Corp., 218  
 "What Are We Waiting For?," 18, 176, 177-79  
 Whipple, Fred L., 176-77, 178, 189; and "Is There Life on Mars?," 176, 194-95; and National Committee for the IGY's "Summary of the Eighth Meeting," 295-308  
 White Sands Proving Ground, New Mexico, 13-14, 180, 267, 278, 280, 312, 314  
 Wiesner, Jerome B., 615, 654; and lunar orbital rendezvous approach, 456; and named presidential science advisor, 379; and "Wiesner Report," 379, 416-23, 499; and review of Apollo program, 424  
 Williams, Walt, 715  
 Wilson, Charles E., 215, 225; and "Memorandum of Discussion at the 322d Meeting of the National Security Council," 324-28  
 Wise, Robert, 17  
 Woo, Harry, 202  
 Woods Hole, Massachusetts, 649  
 Woomera, Australia, 312  
 Worcester, Massachusetts, 7, 93, 100  
 World Meteorological Organization (WMO), 509  
 World War I, 8, 567  
 World War II, 8, 16, 230, 613-14, 617, 636, 647-48, 655-57; and GALCIT, 10-11; and Project Paperclip, 13; and Reaction Motors, Inc., 12; and rocketry development, 11-13; and scientific research, 213; and Wernher von Braun, 12-13  
 Wright Field, Ohio, 280  
 Wright, Jim, 714  
 Wright-Patterson Air Force Base, Ohio, 616  
 Wright, Cdr., 275  
 WS 117L Program, 221, 222, 223, 224, 308, 358-59, 373  
 WS 119L Program, 216-17  
 Wyckoff, P.H., 299

---

**X**

X-1 Aircraft, 12  
 X-2 Aircraft, 8  
 X-15 Aircraft, 359, 451, 463, 639

---

**Y**

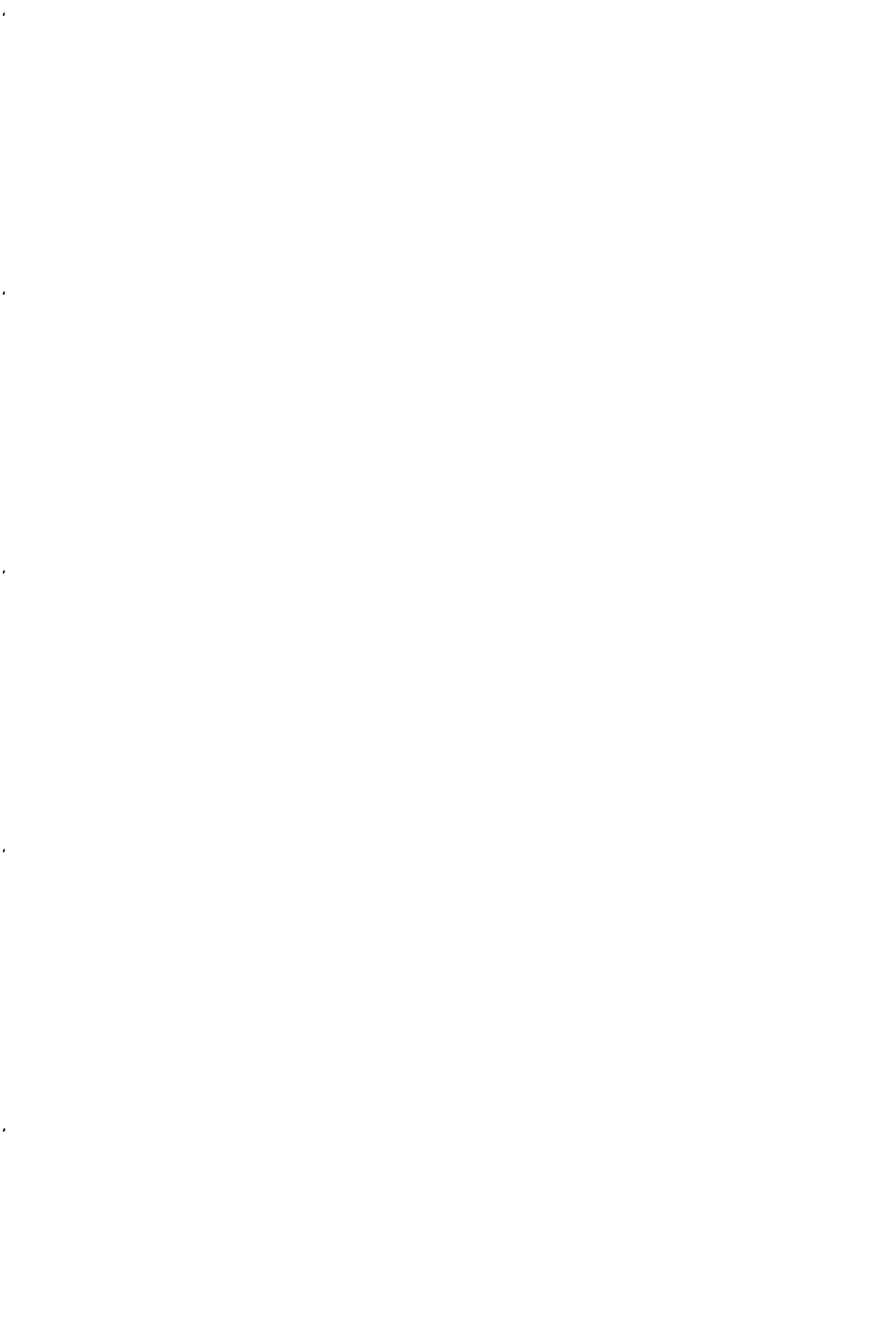
Yaak, Montana, 204  
 Yale University, 215  
 Yarborough, Ralph W., 643  
 Yardley, John F., 615, 715  
 Yeager, Chuck, 392  
 Young and Rubicam, 717  
 York, Herbert, 632, 634

---

**Z**

Zurich, Switzerland, 314





# The NASA History Series

## **Reference Works, NASA SP-4000:**

Grimwood, James M. *Project Mercury: A Chronology*. (NASA SP-4001, 1963).

Grimwood, James M., and Hacker, Barton C., with Vorzimmer, Peter J. *Project Gemini Technology and Operations: A Chronology*. (NASA SP-4002, 1969).

Link, Mae Mills. *Space Medicine in Project Mercury*. (NASA SP-4003, 1965).

*Astronautics and Aeronautics, 1963: Chronology of Science, Technology, and Policy*. (NASA SP-4004, 1964).

*Astronautics and Aeronautics, 1964: Chronology of Science, Technology, and Policy*. (NASA SP-4005, 1965).

*Astronautics and Aeronautics, 1965: Chronology of Science, Technology, and Policy*. (NASA SP-4006, 1966).

*Astronautics and Aeronautics, 1966: Chronology of Science, Technology, and Policy*. (NASA SP-4007, 1967).

*Astronautics and Aeronautics, 1967: Chronology of Science, Technology, and Policy*. (NASA SP-4008, 1968).

Ertel, Ivan D., and Morse, Mary Louise. *The Apollo Spacecraft: A Chronology, Volume I, Through November 7, 1962*. (NASA SP-4009, 1969).

Morse, Mary Louise, and Bays, Jean Kernahan. *The Apollo Spacecraft: A Chronology, Volume II, November 8, 1962-September 30, 1964*. (NASA SP-4009, 1973).

Brooks, Courtney G., and Ertel, Ivan D. *The Apollo Spacecraft: A Chronology, Volume III, October 1, 1964-January 20, 1966*. (NASA SP-4009, 1973).

Ertel, Ivan D., and Newkirk, Roland W., with Brooks, Courtney G. *The Apollo Spacecraft: A Chronology, Volume IV, January 21, 1966-July 13, 1974*. (NASA SP-4009, 1978).

*Astronautics and Aeronautics, 1968: Chronology of Science, Technology, and Policy*. (NASA SP-4010, 1969).

Newkirk, Roland W., and Ertel, Ivan D., with Brooks, Courtney G. *Skylab: A Chronology*. (NASA SP-4011, 1977).

Van Nimmen, Jane, and Bruno, Leonard C., with Rosholt, Robert L. *NASA Historical Data Book, Vol. I: NASA Resources, 1958-1968*. (NASA SP-4012, 1976, rep. ed. 1988).

Ezell, Linda Neuman. *NASA Historical Data Book, Vol II: Programs and Projects, 1958-1968*. (NASA SP-4012, 1988).

Ezell, Linda Neuman. *NASA Historical Data Book, Vol. III: Programs and Projects, 1969-1978*. (NASA SP-4012, 1988).

*Astronautics and Aeronautics, 1969: Chronology of Science, Technology, and Policy*. (NASA SP-4014, 1970).

*Astronautics and Aeronautics, 1970: Chronology of Science, Technology, and Policy*. (NASA SP-4015, 1972).

*Astronautics and Aeronautics, 1971: Chronology of Science, Technology, and Policy*. (NASA SP-4016, 1972).

*Astronautics and Aeronautics, 1972: Chronology of Science, Technology, and Policy*. (NASA SP-4017, 1974).

*Astronautics and Aeronautics, 1973: Chronology of Science, Technology, and Policy*. (NASA SP-4018, 1975).

*Astronautics and Aeronautics, 1974: Chronology of Science, Technology, and Policy*. (NASA SP-4019, 1977).

*Astronautics and Aeronautics, 1975: Chronology of Science, Technology, and Policy*. (NASA SP-4020, 1979).

*Astronautics and Aeronautics, 1976: Chronology of Science, Technology, and Policy*. (NASA SP-4021, 1984).

*Astronautics and Aeronautics, 1977: Chronology of Science, Technology, and Policy.* (NASA SP-4022, 1986).

*Astronautics and Aeronautics, 1978: Chronology of Science, Technology, and Policy.* (NASA SP-4023, 1986).

*Astronautics and Aeronautics, 1979-1984: Chronology of Science, Technology, and Policy.* (NASA SP-4024, 1988).

*Astronautics and Aeronautics, 1985: Chronology of Science, Technology, and Policy.* (NASA SP-4025, 1990).

Gawdiak, Thor Y. Compiler. *NASA Historical Data Book, Vol. IV: NASA Resources, 1969-1978.* (NASA SP-4012, 1994).

Noordung, Hermann. *The Problem of Space Travel: The Rocket Motor.* Ernst Stuhlinger, and J.D. Hunley, with Jennifer Garland. Editors. (NASA SP-4026, 1995).

**Management Histories, NASA SP-4100:**

Rosholt, Robert L. *An Administrative History of NASA, 1958-1963.* (NASA SP-4101, 1966).

Levine, Arnold S. *Managing NASA in the Apollo Era.* (NASA SP-4102, 1982).

Roland, Alex. *Model Research: The National Advisory Committee for Aeronautics, 1915-1958.* (NASA SP-4103, 1985).

Fries, Sylvia D. *NASA Engineers and the Age of Apollo.* (NASA SP-4104, 1992).

Glennan, T. Keith. *The Birth of NASA: The Diary of T. Keith Glennan,* edited by J.D. Hunley. (NASA SP-4105, 1993).

**Project Histories, NASA SP-4200:**

Swenson, Loyd S., Jr., Grimwood, James M., and Alexander, Charles C. *This New Ocean: A History of Project Mercury.* (NASA SP-4201, 1966).

Green, Constance McL., and Lomask, Milton. *Vanguard: A History.* (NASA SP-4202, 1970; rep. ed. Smithsonian Institution Press, 1971).

Hacker, Barton C., and Grimwood, James M. *On Shoulders of Titans: A History of Project Gemini.* (NASA SP-4203, 1977).

Benson, Charles D. and Faherty, William Barnaby. *Moonport: A History of Apollo Launch Facilities and Operations.* (NASA SP-4204, 1978).

Brooks, Courtney G., Grimwood, James M., and Swenson, Loyd S., Jr. *Chariots for Apollo: A History of Manned Lunar Spacecraft.* (NASA SP-4205, 1979).

Bilstein, Roger E. *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles.* (NASA SP-4206, 1980).

Compton, W. David, and Benson, Charles D. *Living and Working in Space: A History of Skylab.* (NASA SP-4208, 1983).

Ezell, Edward Clinton, and Ezell, Linda Neuman. *The Partnership: A History of the Apollo-Soyuz Test Project.* (NASA SP-4209, 1978).

Hall, R. Cargill. *Lunar Impact: A History of Project Ranger.* (NASA SP-4210, 1977).

Newell, Homer E. *Beyond the Atmosphere: Early Years of Space Science.* (NASA SP-4211, 1980).

Ezell, Edward Clinton, and Ezell, Linda Neuman. *On Mars: Exploration of the Red Planet, 1958-1978.* (NASA SP-4212, 1984).

Pitts, John A. *The Human Factor: Biomedicine in the Manned Space Program to 1980.* (NASA SP-4213, 1985).

Compton, W. David. *Where No Man Has Gone Before: A History of Apollo Lunar Exploration Missions.* (NASA SP-4214, 1989).

Naugle, John E. *First Among Equals: The Selection of NASA Space Science Experiments*. (NASA SP-4215, 1991).

Wallace, Lane E. *Airborne Trailblazer: Two Decades with NASA Langley's Boeing 737 Flying Laboratory*. (NASA SP-4216, 1994).

**Center Histories, NASA SP-4300:**

Rosenthal, Alfred. *Venture into Space: Early Years of Goddard Space Flight Center*. (NASA SP-4301, 1985).

Hartman, Edwin, P. *Adventures in Research: A History of Ames Research Center, 1940-1965*. (NASA SP-4302, 1970).

Hallion, Richard P. *On the Frontier: Flight Research at Dryden, 1946-1981*. (NASA SP-4303, 1984).

Muenger, Elizabeth A. *Searching the Horizon: A History of Ames Research Center, 1940-1976*. (NASA SP-4304, 1985).

Hansen, James R. *Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917-1958*. (NASA SP-4305, 1987).

Dawson, Virginia P. *Engines and Innovation: Lewis Laboratory and American Propulsion Technology*. (NASA SP-4306, 1991).

Dethloff, Henry C. *"Suddenly Tomorrow Came . . .": A History of the Johnson Space Center, 1957-1990*. (NASA SP-4307, 1993).

Hansen, James R. *Spaceflight Revolution: NASA Langley Research Center from Sputnik to Apollo*. (NASA SP-4308, 1995).

**General Histories, NASA SP-4400:**

Corliss, William R. *NASA Sounding Rockets, 1958-1968: A Historical Summary*. (NASA SP-4401, 1971).

Wells, Helen T., Whiteley, Susan H., and Karegeannes, Carrie. *Origins of NASA Names*. (NASA SP-4402, 1976).

Anderson, Frank W., Jr., *Orders of Magnitude: A History of NACA and NASA, 1915-1980*. (NASA SP-4403, 1981).

Sloop, John L. *Liquid Hydrogen as a Propulsion Fuel, 1945-1959*. (NASA SP-4404, 1978).

Roland, Alex. *A Spacefaring People: Perspectives on Early Spaceflight*. (NASA SP-4405, 1985).

Bilstein, Roger E. *Orders of Magnitude: A History of the NACA and NASA, 1915-1990*. (NASA SP-4406, 1989).

Logsdon, John M. Logsdon, with Lear, Linda J., Warren-Findley, Jannelle, Williamson, Ray A., and Day, Dwayne A. *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program, Volume I: Organizing for Exploration*. (NASA SP-4407, 1995).

**"New Series in NASA History," published by The Johns Hopkins University Press:**

Cooper, Henry S. F., Jr. *Before Lift-Off: The Making of a Space Shuttle Crew*. (1987).

McCurdy, Howard E. *The Space Station Decision: Incremental Politics and Technological Choice*. (1990).

Hufbauer, Karl. *Exploring the Sun: Solar Science Since Galileo*. (1991).

McCurdy, Howard E. *Inside NASA: High Technology and Organizational Change in the U.S. Space Program*. (1993).

Lambright, W. Henry. *Powering Apollo: James E. Webb of NASA*. (1995).

