Biographical Appendix

A

William A. Anders (1933– ) was a career United States Air Force officer, although a graduate of the U.S. Naval Academy. Chosen with the third group of astronauts in 1963, he was the backup pilot for Gemini 9 and lunar module pilot for Apollo 8. Anders resigned from NASA and the Air Force (active duty) in September 1969 and became Executive Secretary of the National Aeronautics and Space Council. He joined the Atomic Energy Commission in 1973, and became chairman of the Nuclear Regulatory Commission in 1974. He was named U.S. Ambassador to Norway in 1976. Later he worked as a Vice-President of General Electric and then as Senior Executive Vice President-Operations, Textron, Inc. Anders retired as Chief Executive Officer of General Dynamics in 1993, but remained Chairman of the Board. See “Anders, W. A.,” biographical file 000082, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC and (http://www.jsc.nasa.gov/Bios/htmlbios/anders-wa.html).


William S. Augerson (1929– ) was assigned to the Human Factors Section of the NASA Space Task Group in 1958 where he worked on the development of Life Systems for Project Mercury. In 1945 he joined the U.S. Navy to serve as an electronics technician and the next year entered Bowdoin College where he majored in physics and English, graduating with honors in 1949. He continued his education at Cornell University where he earned his M.D. in 1955. Dr. Augerson then entered active duty in the U.S. Army, interning at Brooke Army Hospital, San Antonio, Texas. His other posts included Division Surgeon for the 4th Infantry in 1957–58 and Army Liaison Officer for Bioastronautics Research at the U.S. Air Force Aeromedical Laboratory at Wright-Patterson Air Force Base in 1958. He would eventually retire from the Army with the rank of general. See “Gen. Augerson, William S.,” biographical file 000118, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

B

Richard L. Callaghan (1925– ) served as NASA’s Assistant Administrator for Legislative Affairs from 1963-1967. An Army veteran of the World War II European Theatre, he received a B.S. from Georgetown University Foreign Service School in 1950 and an LL.B. from the George Washington University Law School in 1957. While attending law school, Callaghan worked in various legislative offices in Washington, DC, including that of Montana Senator James E. Murray. He also served as the staff director of the Senate Committee on Interior and Insular Affairs from 1955 until he joined NASA in 1962 as Special Assistant to Administrator James E. Webb. In 1968 he received the NASA Exceptional Service Medal for his work in the organization. See “Callaghan, R. L.,” biographical file 000279, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

M. Scott Carpenter (1925– ) piloted the Mercury 7 mission in 1962, making him the second American to orbit Earth. He earned his bachelor’s degree in aeronautical engineering from the University of Colorado in 1949, after which he was commissioned in the U.S. Navy. Carpenter served in the Korean War as a Naval aviator and then served as a test pilot for the Navy from 1954 to 1957. Two years later he was selected as one of the original seven astronauts to serve in the Mercury program. Upon completion of his mission, Carpenter took a leave of absence from NASA and participated in the Navy’s SEALAB II program, thus making him the first person to hold both the titles of astronaut and aquanaut. After retiring from the Navy in 1969, he finished his distinguished career working in the private sector. Carpenter’s awards include the Navy’s Legion of Merit, the Distinguished Flying Cross, the NASA Distinguished Service Medal, and the Collier Trophy. (http://www.jsc.nasa.gov/Bios/htmlbios/carpenter-ms.html) accessed 27 September 2006.

Michael Collins (1930– ) served as command module pilot on Apollo 11 in 1969, remaining in lunar orbit while Neil Armstrong and Buzz Aldrin became the first two people to walk on the Moon. Born in Rome, Italy, Collins graduated from high school in Washington, DC and went on to earn a bachelor of science degree from the United States Military Academy at West Point in 1952. Collins chose an Air Force career upon graduation from West Point and served as an experimental flight test officer at Edwards Air Force Base in California. He also piloted the Gemini 10 mission in 1966 during which he successfully rendezvoused and docked with separately launched target vehicles. His awards include the Presidential Medal for Freedom in 1969 as well as the NASA Exceptional Service medal. (http://www.jsc.nasa.gov/Bios/htmlbios/collins-m.html) accessed 2 October 2006.

L. Gordon Cooper Jr. (1927–2004) piloted the Mercury 9 mission in 1963, which concluded the operational phase of Project Mercury. He was commissioned into the Air Force after attending three years at the University of Hawaii. After serving four years in Munich, Germany, Carpenter came back to the U.S. and earned a bachelor of science in aeronautical engineering in 1956 from the Air Force Institute of Technology. He spent the next three years as a test pilot at Edwards Air Force Base and was then selected as one of the original seven Mercury astronauts. After Mercury, Carpenter also served as command pilot of the Gemini 5 mission, thus becoming the first person to make two orbital flights

Walter Cunningham (1932– ) was in the third group of astronauts selected by NASA in October 1963 and served as the lunar module pilot in the Apollo 7 mission, the first piloted flight test of the third generation United States spacecraft. After graduating from Venice High School in California, he joined the Navy in 1951 and began flight training the following year. In 1953, Cunningham joined a Marine squadron where he served on active duty until 1956. He then went on to earn both a bachelor’s and a master’s degree in physics at UCLA in 1960 and 1961, respectively. After receiving his master’s, Cunningham was employed as a physicist by the Rand Corporation where he worked on problems with Earth’s magnetosphere as well as projects for the Department of Defense. As an astronaut, he played a key role in all aspects of piloted space flight including training, planning, system design, public relations, and program management. Cunningham then completed the Advanced Management Program at Harvard Graduate School of Business in 1974 and attained senior executive positions in several highly successful businesses over the course of the following decades. (http://www.jsc.nasa.gov/Bios/htmlbios/cunningham-w.html) accessed 2 October 2006.

Kurt H. Debus (1908–1983) earned a B.S. in mechanical engineering (1933), 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 1945-1950 the group worked at Fort Bliss, Texas, and then moved to the Redstone Arsenal in Huntsville, Alabama. From 1952-1960 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 ABMA 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 See “Debus, Kurt H.,” biographical file 000443, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

Charles J. Donlan (1916– ) served the United States government for nearly 38 years in NACA and NASA. After graduating with a bachelor of science in aeronautical engineering from MIT in 1938, he joined the research staff of NACA’s Langley Aeronautical Laboratory where he worked to improve aircraft
design, stability, and control. In 1958 Donlan was appointed Associate Director of the NASA Space Task Group at Langley to conduct Project Mercury. Three years later he became Associate Director of Langley until 1967 when he was made Deputy Director of the facility. The following year he was transferred to NASA Headquarters to become the Deputy Associate Administrator for Manned Space Flight. In addition to this, he was Acting Director of the Space Shuttle Program from 1970 until 1973. Donlan retired from NASA in 1976 and then worked as a consultant for the Institute for Defense Analysis where he studied military uses for the Shuttle for the next twelve years. His awards include the NASA Distinguished Service Medal and the NASA Medal for Outstanding Leadership. See “Donlan, Charles J.,” biographical file 000481, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.

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 Johns Hopkins (1916). Three further years later (1919) he earned his Ph.D. in physics and mathematics from the same institution even though he had been employed full-time in 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 the 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 by becoming its Assistant Director and then Associate Director during his final two years there. He then served as Director of the NACA from 1947-1958, after which he became Deputy Administrator of NASA under T. Keith Glennan and James E. Webb. See Richard K. Smith, The Hugh L. Dryden Papers, 1898-1965 [Baltimore, MD: The Johns Hopkins University Library, 1974] and “Dr. Hugh L. Dryden” (http://www.hq.nasa.gov/office/pao/History/Biographies/dryden.html) accessed 23 October 2006.

Donn F. Eisele (1930–1987) served as the command module pilot during the Apollo 7 mission in 1968. He earned a bachelor of science degree from the United States Naval Academy in 1952 and a master of science degree in astronautics from the Air Force Institute of Technology in 1960. Prior to his selection as an Apollo astronaut, Eisele served as a project engineer and experimental test pilot at the Air Force Special Weapons Center at Kirtland Air Force Base, New Mexico. After he retired from both the Air Force and the space program in 1972 he became the Director of the U.S. Peace Corps in Thailand. Eisele finished his career working in private industry back in the United States. (http://www.jsc.nasa.gov/Bios/htmlbios/eisele-df.html) accessed 3 October 2006.
**F**

Maxime A. Faget (1921–2004) was an aeronautical engineer with a B.S. from LSU (1943), joined the staff at Langley Aeronautical Laboratory in 1946 and soon became head of the performance aerodynamics branch of the pilotless aircraft research division. There, he conducted research on the heat shield of the Mercury spacecraft. In 1958 he joined the Space Task Group in NASA, forerunner of the NASA Manned Spacecraft Center that became the Johnson Space Center, and he became its assistant director for engineering and development in 1962 and later its director. He contributed many of the original design concepts for Project Mercury’s piloted spacecraft and played a major role in designing virtually every U.S.-crewed spacecraft since that time, including the Space Shuttle. He retired from NASA in 1981 and became an executive for Eagle Engineering, Inc. In 1982 he was one of the founders of Space Industries, Inc. and became its president and chief executive officer. See “Maxime A. Faget,” biographical file 000602, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.

**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. “Gagarin Vostok 1 (1961),” biographical file 745, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.

John H. Gibbons (1929– ) headed the Office of Technology Assessment under Congress for fourteen years before becoming President Clinton’s science advisor and head of the White House Office of Science and Technology Policy in 1993. He received a Ph.D. in physics from Duke University in 1954. See “Gibbons, John,” biographical file 5237, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

Robert R. Gilruth (1913–2000) was a longtime NACA engineer working at the Langley Aeronautical Laboratory from 1937–1946, then as chief of the pilotless aircraft research division at Wallops Island from 1946–1952, who had been exploring the possibility of human spaceflight before the creation of NASA. He served as Assistant Director at Langley from 1952–1959 and as Assistant Director (piloted satellites) and head of Project Mercury from 1959–1961, technically assigned to the Goddard Spaceflight Center but physically located at Langley. In early 1961 Glennan established an independent Space Task Group (already the group’s name as an independent subdivision of the Goddard Center) under Gilruth at Langley to supervise the Mercury program. This group moved to the Manned Spacecraft Center, Houston, Texas, in 1962. Gilruth was then director of the Houston operation from 1962–1972. See, Henry C. Dethloff, “Suddenly Tomorrow Came . . .”: A History of the Johnson Space Center (Washington, DC: NASA SP-4307, 1993); James R. Hansen, Engineer in Charge: A History of the Langley Aeronautical Laboratory, 1917-1958 (Washington, DC: NASA SP-4305, 1987), pp. 386-88.
John H. Glenn, Jr. (1921– ) was chosen with the first group of astronauts in 1959. He was the pilot for the 20 February 1962 Mercury-Atlas 6 (Friendship 7) mission, the first American orbital flight. He made three orbits on this mission. He left the NASA astronaut corps in 1964 and later entered politics as a senator from Ohio. See Lloyd S. Swenson, Jr., James M. Grimwood, and Charles C. Alexander, This New Ocean: A History of Project Mercury (Washington, DC: NASA SP-4201, 1966) and (http://www.jsc.nasa.gov/Bios/htmlbios/glenn-j.html) accessed 23 October 2006.

Nicholas Golovin (1912–1969) served on the staff of the White House Office of Science and Technology from 1962 to 1968, during which time he played an antagonistic role towards NASA and the decision to use the lunar orbit rendezvous mode to achieve a piloted lunar landing. Born in Odessa, Russia, but educated in this country (Ph.D. in physics, George Washington University, 1955) he worked in various capacities for the government during and after World War II, including for the Naval Research Laboratory, 1946–1948. He held several administrative positions with the National Bureau of Standards from 1949 to 1958. In 1958 he was chief scientist for the White Sands Missile Range and then worked for the Advanced Research Projects Agency in 1959 as director of technical operations. He became a Deputy Associate Administrator of NASA in 1960. He joined private industry before becoming, in 1961, the director of the NASA-DOD large launch vehicle planning group. He joined the Office of Science and Technology at the White House in 1962 as a technical advisor for aviation and space and remained there until 1968 when he took a leave of absence as a research associate at Harvard and as a fellow at the Brookings Institution. Obituaries, Washington Star, 30 Apr. 1969, p. B-6, and Washington Post, 30 Apr. 1969, p. B14.

A. J. Goodpaster (1915–2005) 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.

Edward Z. Gray (1915– ) worked for Boeing Co. from 1943–1963 as a design engineer for the Boeing jet aircraft series as well as the DynaSoar and Minuteman programs. He held a number of positions in systems engineering management, the last one being as development program manager of advanced space systems. He served on numerous committees for the government and aerospace industry, including the NASA research advisory committee on structural loads in 1958–1959, of which he was chairman. In 1963 NASA appointed him to the directorship of its advanced piloted missions programs. He worked in that position through 1967, transferred to a position as assistant to the president of Grumman Aircraft Engineering Corp. from 1967–1973, and then returned to NASA as Assistant Administrator for industry affairs and technology utilization. By 1978 he had assumed a position as director of government/industry affairs. In 1979 he joined Bendix Corp.’s aerospace-electronics group as director of systems development. See “Edward Z. Gray,” biographical file 000871, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.
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 3; backup command pilot for Gemini 6; and had been selected as commander of the first Apollo flight carrying three crew members at the time of his death in the Apollo 1 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); (http://www.jsc.nasa.gov/Bios/htmlbios/grissom-vi.html) accessed 23 October 2006.

James C. Hagerty (1909–1981) was 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.


Donald F. Hornig (1920– ), a chemist, was a research associate at the Woods Hole Oceanographic Lab, 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 Lab, 1949–1957, and also serving as associate dean and acting dean of the graduate school from 1952–1954. He was Donner Professor of Science at Princeton from 1957–1964 as well as chairman of the chemistry department from 1958–1964. He was a special assistant to the president of the U.S. for science and technology from 1964–1969 and president of Brown University from 1970–1976. See Gregg Herken, Cardinal Choices: Science Advice to the President from Hiroshima to SDI (New York: Oxford University Press, 1992).

John C. Houbolt (1919– ) was an aeronautical engineer who helped conceptualize and was the primary advocate for the idea of lunar orbit rendezvous. He received both bachelor and master of science degrees in civil engineering from the University of Illinois in 1940 and 1942, and a doctorate in technical sciences from the Swiss Federal Institute of Technology in 1957. He first joined NACA as an aeronautical engineer in 1942 before serving in the Army Corps of Engineers from 1944 to 1946. In 1949, back at Langley, he was appointed Assistant Chief of the Dynamic Loads Division where he pursued research problems in aeroelasticity in application to aircraft and space vehicles. In 1961 Houbolt was named Chief of the Theoretical Mechanics Division at Langley where he successfully argued the case of lunar orbit rendezvous to the NASA Administration. He left NASA in 1963 to work as a senior vice president and consultant for a private research firm,

**J**

**Lyndon B. Johnson** (1908–1973) was President of the United States from 1963–1969. Johnson was elected to the House of Representatives in 1937 and served until 1949. He was a senator from 1949-1961 and then Vice President of the U.S. from 1960–1963 under Kennedy. 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, then later 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 *The Johnson Years: Vietnam, the Environment, and Science*, Robert A. Divine, ed. [Lawrence: University of Kansas Press, 1987], pp. 217-53; and 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.)

**K**

**John F. Kennedy** (1916–1963) was President of the United States, 1961–1963. In 1960 John F. Kennedy, a Senator from Massachusetts between 1953 and 1960, ran for president as the Democratic candidate with 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 25 May, 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).

**George 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 Eisenhower administration. He later served on

**James R. Killian** (1904–1988) was president of the Massachusetts Institute of Technology between 1949 and 1959, 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 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).

**Kenneth Kleinknecht** started his career in 1942 at the Lewis Research Center after graduating from Purdue University with a B.S. in mechanical engineering. In 1951, Kleinknecht transferred to the Flight Research Center in Edwards, CA. After NASA formed, he then transferred to the Manned Spacecraft Center in Houston in 1959. Before being named the manager of the Mercury project, Kleinknecht was active in the National Air Races, served as supervisor for a number of avionics tests at Lewis, and was the head of the Project Engineering Station for the X-1E. Additionally, Kleinknecht served as the Advanced Projects Management Officer on the X-15 project and as the Technical Assistant to the Director of the Manned Spacecraft Center. Source: “Kenneth Kleinknecht” biographical file 001205, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.

**Christopher C. Kraft, Jr.** (1924– ) was a long-standing official with NASA throughout the Apollo program. He received as B.S. in aeronautical engineering from Virginia Polytechnic Institute in 1944 and joined the Langley Aeronautical Laboratory of the National Advisory Committee for Aeronautics (NACA) the next year. In 1958, still at Langley, he became a member of the Space Task Group developing Project Mercury and moved with the Group to Houston in 1962. He was flight director for all of the Mercury and many of the Gemini missions and directed the design of Mission Control at the Manned Spacecraft Center (MSC), redesignated the Johnson Space Center in 1973. He was named the MSC Deputy Director in 1970 and its Director two years later, a position he held until his retirement in 1982. Since then he has remained active as an aerospace consultant. See "Kraft, Christopher C., Jr.,” biographical file 001237, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.

**Nikita Khrushchev** (1894–1971) was premier of the USSR 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 U.S. 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. 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); and Robert A. Divine, *Eisenhower and the Cold War* (New York: Oxford University Press, 1981) for further information about him.

**Joachin P. Kuettner** (1909–) served as Chief of the Mercury-Redstone project at NASA’s Marshall Space Flight Center. Born and raised in Germany, he earned a doctorate in law from the University of Breslau at the age of 21 and a doctorate in physics and meteorology from the University of Hamburg in 1939. During World War II, Dr. Kuettner served as a test pilot and later as the head of a flight test department for advanced airplanes such as the piloted version of the German V-1. He came to the United States in December 1948 and joined the Air Force Cambridge Research Center. Here he was in charge of geophysical flight research using jet aircraft and high-altitude sailplanes. He then worked for the Army Ballistic Missile Agency as Director of the agency’s efforts in Project Mercury from 1958 until he transferred to NASA and Marshall Space Flight Center two years later. After Mercury-Redstone, he was put in charge of the Saturn-Apollo Systems Integration at Marshall. Over his long career, Dr. Kuettner published many papers in the fields of aeronautics, meteorology, and astronautics and holds numerous awards from several different countries.

**James A. Lovell, Jr.** (1928–) flew on four space flights and was a member of the first crew to circle the Moon. He was selected in the second group of astronauts in 1962 and flew in the Gemini 7, Gemini 12, Apollo 8, and Apollo 13 missions, thus making him the first person to fly twice to the Moon. Following his graduation with a bachelor of science degree from the U.S. Naval Academy in 1952, Lovell received his flight training and was later assigned as a test pilot at the Naval Air Test Center in Maryland. A graduate of the Aviation Safety School of the University of Southern California, he also served as a flight instructor and safety engineer with Fighter Squadron 101 at the Naval Air Station, Oceana, Virginia. In addition to the four missions in which Captain Lovell flew, he also served as backup pilot for Gemini 4, backup Commander for both Gemini 9 and Apollo 11. In 1971, he was named Deputy Director of Science and Applications at NASA’s Manned Spacecraft Center in Houston. In addition to these duties, he was appointed by President Lyndon B. Johnson to serve as a consultant for Physical Fitness and Sports and was later made Chairman of the Council by President Nixon. Lovell retired from the Navy and NASA in 1973 to accept a position as Senior Executive Vice President in the Bay Houston Towing Company. Among his many honors are the Presidential Medal for Freedom, the NASA Distinguished Service Medal,

George M. Low (1926–1984), a native of Vienna, Austria, came to the U.S. in 1940 and received an aeronautical engineering degree from Rensselaer Polytechnic Institute (RPI) in 1948 and an M.S. in the same field from the same school in 1950. He joined the NACA in 1949 and at Lewis Flight Propulsion Laboratory he specialized in experimental and theoretical research in several fields. He became chief of piloted space flight 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 in 1970–1971. He retired from NASA in 1976 to become president of RPI, a position he held until his death. In 1990 NASA renamed its quality and excellence award after him. See “Low, George M.,” Deputy Administrator file 004133, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC and “George M. Low” (http://www.hq.nasa.gov/office/pao/History/Biographies/low.html) accessed 23 October 2006.

Charles W. Mathews (1921–2001) was NASA’s Associate Administrator for Applications from 1971 until 1976. After earning a B.S. in aerospace engineering from Rensselaer Polytechnic Institute in 1943, he immediately joined the engineering staff at the National Advisory Committee for Aeronautics Langley Research Center. Here he conducted research on supersonic flight, automatic control devices and systems for use in the interception of enemy bombers, and piloted spacecraft studies. In 1958, Mathews became chief of the NASA Space Task Group Operations Division and was responsible for the overall operations of Project Mercury. Upon the successful completion of the Mercury program, he was named Gemini Program Manager at the Manned Spacecraft Center in 1963. Following Gemini’s success, Mathews was made the Director of the Skylab Program in 1966 and moved to NASA Headquarters. Two years later he became the Deputy Associate Administrator for Manned Space Flight. He retired from the organization in 1976 after thirty-three years of government service. See “Mathews, Charles W.,” biographical file 001443, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

Owen E. Maynard (1924–2000) was responsible for the conceptualization and design of the lunar module used in the Apollo program. After serving in the Royal Canadian Air Force in World War II, Maynard earned a degree in aeronautical engineering from the University of Toronto while working on and eventually designing aircraft at Avro Canada. He joined NASA in 1959 to work on the Mercury program and first became involved with Apollo the following year. Maynard was one of the early supporters of the lunar orbit rendezvous method and became the chief of engineering for the lunar module in 1963. He served as chief of the systems engineering division in the Apollo Spacecraft Program Office from 1964 to 1970, at which time he left NASA to work in the private sector.

**James A. McDivitt (1929– )** commanded the Gemini 4 and Apollo 9 missions and was the program manager for Apollo 12 through Apollo 16. He earned a bachelor of science in aeronautical engineering from the University of Michigan in 1959, graduating first in his class. Before he was selected by NASA as an astronaut in 1962, McDivitt served in the U.S. Air Force and flew 145 combat missions during the Korean War. He is a graduate of both the USAF Experimental Test Pilot School and the USAF Aerospace Pilot Research course, after which he served as an experimental test pilot at Edwards Air Force Base, California. He left NASA and retired from the Air Force with the rank of Brigadier General in 1972 to work in leading executive positions in various private firms. McDivitt’s awards include two NASA Distinguished Service Medals, four Distinguished Flying Crosses, and four Honorary Doctorates in science and law. See (http://www.jsc.nasa.gov/Bios/htmlbios/mcdivitt-ja.html) accessed 2 October 2006.

**George E. Mueller (1918– )** was Associate Administrator for the Office of Manned Space Flight at NASA Headquarters, 1963–1969, where he was responsible for overseeing the completion of Project Apollo and of beginning the development of the Space Shuttle. He moved to the General Dynamics Corp., as senior vice president in 1969, and remained until 1971. He then became president of the Systems Development Corporation, 1971–1980, and its chairman and CEO, 1981–1983. He was for a number of years the President of the International Academy of Astronautics and a founder of Kistler Aerospace. See “Mueller, George E.,” biographical file 001520, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

**Homer Newell (1915–1983)** earned his Ph.D. in mathematics at the University of Wisconsin in 1940 and served as a theoretical physicist and mathematician at the Naval Research Laboratory from 1944–1958. During part of that period, he was science program coordinator for Project Vanguard and was acting superintendent of the atmosphere and astrophysics division. In 1958 he transferred to NASA to assume responsibility for planning and development of the new Agency’s space science program. He soon became deputy director of space flight programs. In 1961 he assumed directorship of the office of space sciences; in 1963, he became associate administrator for space science and applications. Over the course of his career, he became an internationally known authority in the field of atmospheric and space sciences as well as the author of numerous scientific articles and seven books, including *Beyond the Atmosphere: Early Years of Space Science* (Washington, DC: NASA SP-4211, 1980). He retired from NASA at the end of 1973. “Newell General,” Deputy Administrator file 4493, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.

**Richard M. Nixon (1913–1994)** was president of the United States when the first man landed on the Moon, serving 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 in 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 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.

**Warren North** (1922– ) earned a B.S. from the University of Illinois in 1947. From then until 1955 he was an engineer and test pilot for the Lewis Laboratory. From 1956-1959 he served as assistant chief of the aerodynamics branch at Lewis. He then transferred to NASA Headquarters, where he took part in early planning for Project Mercury, including the selection and training of the seven Mercury astronauts. He moved in 1962 to the Manned Spacecraft Center (later the Johnson Space Center), where he headed the division responsible for training the astronauts for the Gemini rendezvous and docking operations and the Apollo lunar landings. He continued to work in the fields of astronaut selection and training until he retired in 1985 as special assistant to the director of flight operations in planning space shuttle crew training. (“Warren North,” biographical file 001608, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.)

**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, and confirmed by the Senate on March 20, 1969. During his leadership the first seven piloted Apollo missions were flown, in which 20 astronauts orbited Earth, 14 traveled to the Moon and four walked upon its surface. Paine resigned from NASA on September 15, 1970 to return to the General Electric Co. in New York City as Vice President and Group Executive, 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 spokesman 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 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” that included a rationale for exploring and settling the solar system and outlined a long-range space program for the United States. See Roger D. Launius, “NASA and the Decision to Build the Space Shuttle, 1969–72,” *The Historian* 57 (Autumn 1994): 17-34 and “Thomas O. Paine” (http://www.hq.nasa.gov/office/pao/History/Biographies/paine.html) accessed 23 October 2006.

**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

Milton Rosen (1915– ), an electrical engineer by training, joined the staff of the Naval Research Laboratory in 1940, where he worked on guidance systems for missiles during World War II. From 1947 to 1955, he was in charge of Viking rocket development. He was technical director of Project Vanguard, the scientific earth satellite program, until he joined NASA in October 1958 as Director of Launch Vehicles and Propulsion in the Office of Manned Space Flight. In 1963 he became senior scientist in NASA’s Office of the Deputy Associate Administrator for Defense Affairs. He later became Deputy Associate Administrator for Space Science (engineering). In 1974 he retired from NASA to become executive secretary of the National Academy of Science’s Space Science Board. (“Milton W. Rosen,” biographical file 001835, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC; see also his The Viking Rocket Story [New York: Harper, 1955].)

Julian Scheer (1926–2001) served as NASA’s Assistant Administrator for Public Affairs from 1963 until 1971. He began his career in 1939 as an apprentice for a chain of weekly newspapers in his native Richmond, VA and went on to serve in the Merchant Marines during World War II and later in the U.S. Naval Reserve. Scheer earned a bachelor’s degree from the University of North Carolina in 1950 and worked as the university’s Assistant Director of Sports Information until he joined NASA in 1962 as a consultant. As NASA’s missions progressed in the 1960s they attracted unprecedented public and press attention, creating ever-increasing demands for instantaneous information in every form. Under Scheer’s direction, NASA anticipated and planned for the press needs in connection with Apollo piloted flights, including a worldwide communications network for disseminating television pictures live from the Moon on Apollo 11. His Public Affairs program received several national awards, including the 1970 University of Missouri School of Journalism Special Achievement Award which cited the NASA program “for its outstanding, almost inconceivable, contributions to journalism technology.” His personal awards include NASA’s Exceptional Service Medal in 1968 and the Distinguished Service Medal in 1969. See “Scheer, Julian,” biographical file 001902, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC.
Walter M. Schirra, Jr. (1923–2007) was one of the original seven astronauts chosen by NASA in 1959. He became the fifth American in space in 1963 when he piloted the Mercury 8 mission. Schirra earned a bachelor of science degree from the United States Naval Academy in 1945. As a Navy pilot he flew 90 combat missions over Korea and was awarded the Distinguished Flying Cross and two Air Medals for his service. He then attended the Naval Air Safety Officer School at the University of Southern California and completed test pilot training at the Naval Air Test center in 1958. Schirra was the only person to fly in America's first three space programs—Mercury, Gemini and Apollo—logging over 295 hours in space. In 1969 he was awarded three separate honorary doctorates in astronomical engineering, science, and astronautics. See “Schirra, Walter M. Mercury Flight,” biographical file 001915, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC and (http://www.jsc.nasa.gov/Bios/htmlbios/schirra-wm.html) accessed 23 October 2006.

Harrison H. Schmitt (1935– ) occupied the lunar module pilot seat as a scientist-astronaut on Apollo 17. Schmitt conducted the longest and most productive lunar exploration of the Apollo program during this mission, spending twenty-two hours exploring the surface of the Moon and bringing back the largest lunar sample to date. He earned a bachelor of science degree from the California Institute of Technology in 1957 and a doctorate in geology from Harvard in 1964. Before joining NASA in 1965, Schmitt worked with the U.S. Geological Survey’s Astrogeology Center at Flagstaff, Arizona, where he was project chief for lunar field geological methods. While at this position, he was among the USGS astrogeologists that instructed NASA astronauts during their geological field trips. In 1974, after assuming additional duties as Chief of Scientist-Astronauts, he was appointed NASA Assistant Administrator for Energy Programs. Dr. Schmitt left NASA in 1975 to run for the United States Senate and subsequently served a six-year term in his home state of New Mexico. In 2005 he became chair of the NASA Advisory Council. See “Schmitt, Dr. Harrison (Jack) thru A-17,” biographical file 001925, NASA Historical Reference Collection, NASA History Division, NASA Headquarters, Washington, DC and (http://www.jsc.nasa.gov/Bios/htmlbios/schmitt-hh.html) accessed 3 October 2006.

William C. Schneider (1923–1999) joined NASA in June 1963 and was the Gemini mission director for seven of the ten piloted Gemini missions. From 1967 to 1968, he served as Apollo mission director and the Apollo program’s deputy director for missions. He then served from 1968 to 1974 as the Skylab program’s director. After that, he worked as the Deputy Associate Administrator for Space Transportation Systems for almost four years. From 1978 to 1980, he served as the Associate Administrator for Space Tracking and Data systems. He received a Ph.D. in engineering from Catholic University. See “Schneider, William C.,” biographical file 001927, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

Russell L. Schweickart (1935– ) served as lunar module pilot during the Apollo 9 mission in 1969, during which he tested the portable life support backpack which was subsequently used on the lunar surface explorations. He earned a bachelor of science degree from the Massachusetts Institute of Technology in 1956 and then served as a fighter pilot in the Massachusetts Air National Guard until 1963. He then returned to MIT as a graduate student and research scientist
at the school’s Experimental Astronomy Laboratory, earning a master of science degree in 1963. That same year, Schweickart was selected by NASA to be in the third group of astronauts and fly in the Apollo program. After Apollo he served as backup commander for the first Skylab mission in 1973 and assumed responsibility for the development of hardware and procedures associated with erecting the emergency solar shade and deployment of the jammed solar array wing following the loss of the Skylab vehicle’s thermal shield. Schweickart finished his career at NASA serving as the Director of User Affairs in the Office of Applications in Washington, DC. (http://www.jsc.nasa.gov/Bios/htmlbios/schweickart-rl.html) accessed 3 October 2006.

David R. Scott (1932– ) was selected as one of the third group of astronauts in 1963 and flew in the Gemini 8, Apollo 9, and Apollo 15 missions. He graduated near the top of his class at West Point with a bachelor of science degree and then chose to commission into the Air Force. He completed pilot training at Webb Air Force Base, Texas, in 1955 and was assigned to the 32d Tactical Fighter squadron stationed in Netherlands until 1960. Upon completing his tour of duty, Scott returned to the U.S. to study at MIT where he earned a master of science degree in aeronautics and astronautics as well as an engineering degree in aeronautics and astronautics, both in 1962. After leaving the astronaut corps in 1972, he was named Technical Assistant to the Apollo Program Manager at Johnson Space Center. He retired from the Air Force in March 1975 with the rank of Colonel and over 5600 hours of flying time. In that same year, Scott was appointed Director of Dryden Flight Research Center where he remained until he left NASA for private business ventures in 1977. Recently, Scott was the technical consultant to the 1998 HBO miniseries From the Earth to the Moon. See “Scott, David R. (Post – NASA),” biographical file 001958, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC and (http://www.jsc.nasa.gov/Bios/htmlbios/scott-dr.html) accessed October 3, 2006.

Robert C. Seamans, Jr. (1918–2008) was born on October 30, 1918, in Salem, Massachusetts. He attended Lenox School, Lenox, Massachusetts; earned a bachelor of science degree in engineering at Harvard University in 1939; a master of science degree in aeronautics at Massachusetts Institute of Technology (MIT) in 1942; and a doctor of science degree in instrumentation from MIT in 1951. Dr. Seamans also received the following honorary degrees: doctor of science from Rollins College (1962) and from New York University (1967); doctor of engineering from Norwich Academy (1971), from Notre Dame (1974), and from Rensselaer Polytechnic Institute (RPI) in 1974. In 1960, Dr. Seamans joined NASA as Associate Administrator. In 1965, he became Deputy Administrator, retaining many of the general management-type responsibilities of the Associate Administrator and also serving as Acting Administrator. During his years at NASA he worked closely with the Department of Defense in research and engineering programs and served as Co-chairman of the Astronautics Coordinating Board. Through these associations, NASA was kept aware of military developments and technical needs of the Department of Defense and Dr. Seamans was able to advise that agency of NASA activities which had application to national security. Seamans left NASA in late 1967; in 1969 President Nixon named him Secretary of the Air Force. He subsequently became the first Administrator of the Energy Research and Development Administration. For further information on Robert C. Seamans, Jr., see his autobiography, Aiming at Targets (Washington, DC: NASA
Joseph F. Shea (1926–1999) served NASA as Deputy Director of the Office of Manned Space Flight at Headquarters in Washington, DC, and as manager of the Apollo spacecraft program in Houston. He earned bachelor’s degrees in both engineering and mathematics and a master’s and doctorate degree in engineering mechanics, all at the University of Michigan. Shea worked in numerous positions in private companies, including Space Program Director at the Space Technology Laboratories in California, Advance Systems R & D Manager with General Motors, and Military Development Engineer with the Bell Telephone Laboratories. Shea officially retired from NASA in 1993 after his health began to fail him. He also was Senior Vice President for Engineering at Raytheon Co. from 1980 until his death in 1999. See “Shea, Joseph F.,” biographical file 2007, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

Alan B. Shepard, Jr. (1923–1998) 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 due to 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 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); (http://www.jsc.nasa.gov/Bios/htmlbios/schirra-wm.html) accessed 23 October 2006.

Hugh S. Sidey (1927–2005) was a top reporter for Time and Life magazines during the Kennedy Presidency. He graduated from Iowa State University with a bachelor’s degree in 1950 and immediately began working with numerous publications such as the Omaha World-Herald and the Free Press. He would later author a biography of President Kennedy entitled John F. Kennedy, President. See Who’s Who in America, 1966-1967 (Chicago, IL: Marquis, 1966).

Abe Silverstein (1908–2001), 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) to 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 Glennan arrived at NASA, Silverstein was on a rotational assignment to the Washington headquarters as Director of the Office of Space Flight Development (later, 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 space flights of Project Mercury and
to 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; “Silverstein, Abe,” biographical file 002072, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

**Donald K. Slayton** (1924–1993) was named one of the original seven Mercury astronauts in 1959, but was relieved of this assignment following the discovery of a heart condition in August of that same year. Instead he assumed the role of Director of Flight Crew Operations in 1963, bringing upon himself the responsibilities of directing the activities of the astronaut office, the aircraft office, the flight crew integration division, the crew training and simulation division, and the crew procedures division. Born and raised in Sparta, Wisconsin, Slayton joined the Air Force after high school and earned his wings in 1943. As a B-25 pilot with the 340th and 319th Bombardment groups, he flew a total of 63 combat missions over Europe and Japan. Upon completion of his tour of duty he attended the University of Minnesota, earning a bachelor of science degree in aeronautical engineering in 1949. He then worked for two years as an aeronautical engineer with the Boeing Aircraft Corporation until he was recalled to active duty in 1951 with the Minnesota Air National Guard. After his second tour of duty, he attended the USAF Test Pilot School in 1955 at Edwards Air Force Base, California, where he subsequently served as a test pilot until 1959. Slayton resigned from the Air Force in 1963 to fully devote himself to his duties at NASA. In 1972, following a comprehensive review of his medical status, he was finally restored to full flight status and certified eligible for piloted space flight. Two years later he made his first space flight as Apollo docking module pilot of the Apollo-Soyuz Test Project, logging over 217 hours in space. Slayton retired from NASA in 1982 and founded a company to develop rockets for small commercial payloads. ([http://www.jsc.nasa.gov/Bios/htmlbios/slayton.html](http://www.jsc.nasa.gov/Bios/htmlbios/slayton.html)) accessed 16 October 2006.

**Charles P. Sonnett** (1924– ) served as chief of NASA’s Lunar and Planetary Sciences from 1960–62. He earned a bachelor of arts degree in physics from the University of California at Berkeley in 1949 and a masters and Ph.D. both in Nuclear Physics from the University of California at Los Angeles in 1951 and 1954, respectively. From 1954 to 1960 he was the Senior Staff Head of the Space Physics Section of Space Technology Laboratories while at the same time lecturing in the U.C.L.A. department of engineering. In 1962 Dr. Sonnett became the head of the Space Sciences Division at Ames Research Center, where he oversaw research for the nation’s space program in the areas of geophysics, interplanetary and planetary physics, planetary sciences, astronomy, and astrophysics. See “Sonnett, Dr. Charles P.,” biographical file 002160, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

**Edward Teller** (1908–2003) was a naturalized American physicist born in Hungary who made important contributions to the development of both fission-
and fusion-type bombs. As a member of the advisory committee of the AEC, he advocated the hydrogen bomb as a U.S. tactical weapon, arousing a great deal of controversy. He also spoke publicly about Sputnik as showing that the Soviets were beginning to gain a lead on the U.S. in the fields of science and technology. Among other works on Teller, see the view of the insider, Herbert York, *The Advisors: Oppenheimer, Teller, and the Superbomb* (San Francisco: W. H. Freeman, 1976). For one perspective on Teller’s more recent and still controversial activities in the world of science and defense technology, see William J. Broad, *Teller’s War: The Top-Secret Story Behind the Star Wars Deception* (New York: Simon & Schuster, 1992).

**Albert Thomas** (1898–1966) (D-TX), a lawyer and World War I veteran, had first been elected to the House of Representatives in 1936 and served successively until 1962. In 1960–1962 he was chair of the independent offices subcommittee of the House Appropriations Committee and thus exercised considerable congressional power over NASA’s funding. “Thomas, Albert,” biographical file 002295, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

**Howard W. Tindall** (1925–1995) was an expert in orbital mechanics and a key figure in the development of rendezvous techniques for Gemini and lunar trajectories for Apollo. He was directly responsible for planning all ten of the Gemini missions at the Manned Spacecraft Center in Houston. Tindall received a bachelor of science degree in mechanical engineering from Brown University in 1948 and subsequently joined the National Advisory Committee for Aeronautics at Langley Research Center that same year. He moved to Houston in 1961 to assume mission planning responsibilities in the Flight Operations Directorate for Gemini. He gained popularity within the organization for his irreverently written “Tindallgrams” which captured the details of complicated aspects of key flight problems. In 1970, Tindall was appointed deputy director of Flight Operations, and in 1972, he became director. He retired from NASA in 1979 after thirty-one years of service. See “Tindall, Howard W., Jr.,” biographical file 004812, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

**Cyrus Vance** (1917–2002) 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 as Secretary of the Army, 1962-1964. He was Deputy Secretary of Defense, 1964–1967. He served as Secretary of State for President Jimmy Carter in the latter 1970s. See “Vance, Cyrus R[oberts],” *Current Biography 1977*, pp. 408-11.

**Robert B. Voas** (1928— ) was part of the first Space Task Group in 1958 and helped to conceptualize the criteria for the selection of astronauts. He earned a bachelor of arts, master of science and Ph.D. in psychology from the University of California in Los Angeles, as well as a bachelor of philosophy degree from the University of Chicago. Voas served in the United States Navy where he reached the rank of lieutenant and logged about three hundred hours in jet aircraft. After being assigned to NACA in 1958, Voas went on to serve as Training
Officer for project Mercury and later proposed the selection process for the Gemini astronauts. See “Voas, Robert B.: Biography,” biographical file 002449, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.

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 the development of 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); “Wernher von Braun,” (http://history.nasa.gov/sputnik/braun.html) accessed 23 October 2006; “Marshall Space Flight Center (MSFC),” (http://history.nasa.gov/centerhistories/marshall.htm) accessed 23 October 2006.

W


Caspar W. Weinberger (1917–2006), 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 he 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.

Edward C. Welsh (1909–1990) 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. See “Welsh, Dr. Edward C.,” biographical
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 chaired a transition team report on the space program 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).

Edward H. White, Jr. (1930–1967) piloted the Gemini 4 mission during which he carried out the first extra vehicular activity. He graduated with a bachelor of science degree from the United States Military Academy in 1952 and then was commissioned into the Air Force. Following his flight training, he was stationed in Germany for three and a half years with a fighter squadron, flying F-86’s and F-100’s. White then returned to the United States and earned a master of science degree in aeronautical engineering from the University of Michigan in 1959. That same year he attended the Air Force Test Pilot School at Edwards Air Force Base, California, and was later reassigned to Wright-Patterson Air Force Base in Ohio as an experimental test pilot with the Aeronautical Systems Division. He was named a member of the second group of astronauts selected by NASA in 1962. After piloting Gemini 4 and serving as backup command pilot for Gemini 7, he was named as one of the pilots for the Apollo 1 mission. Lieutenant Colonel White died on January 27, 1967 in the Apollo spacecraft flash fire during a launch pad test at Kennedy Space Center, Florida, and was posthumously awarded the Congressional Space Medal of Honor. See “Edward H. White, II,” (http://www.jsc.nasa.gov/Bios/htmlbios/white-eh.html) accessed 30 October 30, 2006.

Walter C. Williams (1919–1995) earned a B.S. in aerospace engineering from LSU in 1939 and went to work for the 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 Dryden Flight Research Facility. In September 1959 he assumed associate directorship of the new NASA Space Task Group at Langley, created to carry out Project Mercury. He later became director of operations for the project, then associate director of the NASA 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 1975-1982 he served as chief engineer of NASA, retiring in the latter year. See “Williams, W.C.,” biographical file 002618, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.
Charles H. Zimmerman (1907– ) was handpicked by Robert R. Gilruth to serve on the first Space Task Group in 1958 and served as Director of Aeronautical Research in NASA's Office of Advanced Research and Technology from 1962-1963. He received a B.S. in electrical engineering from the University of Kansas in 1929 and joined the staff of the National Advisory Committee for Aeronautics in that same year. He spent the next 33 years of his life in government and private industry developing and improving new aircraft. Zimmerman earned a master's degree in aeronautical engineering from the University of Virginia in 1954 and two years later was the recipient of both the Alexander Klemin Award of the American Helicopter Society and the Wright Brothers Medal of the Society of Automotive Engineers. See “Charles H. Zimmerman,” biographical file 002882, NASA Historical Reference Collection, History Division, NASA Headquarters, Washington, DC.
## Index

### A

Abbey, George, 695  
Abelson, Philip, 415  
AC Electronics, 708  
Ad Hoc Committee on Man-in-Space, 389  
Ad Hoc Committee on Space, 390  
Ad Hoc Mercury Panel, 177–92  
Ad Hoc Working Group on Apollo Experiments and Training, 617  
Adams, John B., 764  
Advanced Manned Missions Program, 40  
Advanced Research and Technology, Office of, 288, 640  
Advanced Research Projects Agency (ARPA)  
  - cooperation with NASA on spaceflight program, 11–12, 74–77, 82–89, 441  
  - creation of, 52  
  - Man in Space Committee, 441  
  - MISS program support, 10  
  - MRS-V Committee, 441  
Aeromedical Field Laboratory, Holloman Air Force Base, 141  
Aeronautical and Space Research, Office of, 441  
Aerospace Medical Laboratory, Wright Air Development Center, 15, 141, 151, 155, 157  
Agena rockets  
  - cost of, 264  
  - docking maneuvers with, 38, 255–56, 261, 373; GT-6 mission, 46, 345, 346, 373; GT-8 mission, 47, 345, 357–62; GT-10, 372; GT-11, 372  
  - engines for, 383–84  
  - payload capabilities, 461  
  - procurement of, 256  
Agnew, Spiro, 436, 738  
Agriculture, U.S. Department of, 673, 679, 680, 681, 683, 743  
Air Crew Equipment Laboratory, 164, 169  
Air Force, U.S.  
  - Ballistic Missile Division, 164, 165, 242  
  - Flight Test Center, 164  
  - Hawkeye program, 465, 469  
  - Manned Orbiting Laboratory, 41, 286–87, 376  
  - Mercury program liaison to, 11  
  - Mercury program, opposition to, 295  
  - MISS program, 9–10, 9n25, 76, 77–79  
  - Space Systems Division, 243  
  - Titan III development, 253  
  - X-20 Dyna-Soar program, 7, 52, 66–67, 80, 84, 442–43, 469  
Air Lubricated Free Attitude (ALFA) Simulator, 166–67, 199  
Air Research and Development Command (ARDC), 152  
Aldrin, Buzz (Edwin E., Jr.)  
  - Apollo 8, 696  
  - Apollo 11: assignment to, 432; declaration for agriculture and customs, 736–
Index

37; lunar surface activities, 434, 775–79; mission report, 765–84; words said on lunar surface, 728
biographical information, 45, 45n142
Gemini XII (GT-12), 372
nickname of, 45
rendezvous and docking procedures development, 45–46
Alexander, Martin, 742
Allen, H. Julian, 5–6, 50–51, 53
America, 439
Ames, M. B., Jr., 440, 441, 443
Ames Research Center
Apollo program: lunar surface information, robotic missions for, 560;
rendezvous approaches study, 401, 495
director of, 388
Interagency Committee on Back Contamination membership, 673
research at, 5, 50, 444–45, 460–61
Anders, William A.
Apollo 8, 430–31, 691, 696
Apollo mission cancellations, 751
biographical information, 785
National Aeronautics and Space Council position, 750
Anderson, Clinton P.
Apollo 1 (204) fire review, 423, 654, 661–65
criticism of Apollo program, 414
quarantine procedures and back contamination, 665–66, 682–84
Webb, relationship with, 423, 424
Anderson, Melvin S., 122
Apollo, Project
all-up testing, 413–14, 608–9, 610–12
Apollo 1 (204) fire, 422–24, 651–65
Apollo 4, 712, 720
Apollo 5, 720
Apollo 6, 712, 720
Apollo 7, 428, 429, 692, 698–99, 703–4, 706, 712, 720
Apollo 8, 427–31, 685, 692–718, 727, 735–36
Apollo 9, 431, 718
Apollo 10, 431–32, 718
Apollo 11: Command Module activities, 774–75; declaration for agriculture and customs, 736–37; EVA during, 432, 433–34, 721–26, 766, 775–79;
flight crew assignment, 432; landing and recovery, 434, 767, 783–84; lunar landing, 433; lunar landing site selection, 432; Lunar Module descent, 773–74; lunar samples, 434, 738, 740, 743, 744–46, 766, 778–79; mission report, 765–84; quarantine procedures, 408, 434, 666, 683–84, 767, 784; rendezvous and docking, 434, 767, 781–83; schedule for, 718, 720; success of, 739–40, 751–52; symbolic activities, 432–33, 727, 730–35; televised coverage from lunar surface, 432, 724, 725, 766, 778; training for, 432;
words said on lunar surface, 433, 434, 726–29
Apollo 12, 434, 435, 743, 744–46, 751–52
Apollo 13, 434, 435, 743, 745, 746–47
Apollo 14, 434, 435, 750
Exploring the Unknown

Apollo 15: cancellation of, 438, 750–51, 760; lunar samples, 439; mission planning, 434; stamp cover incident, 21, 21n70; success of, 439, 750
Apollo 16, 434–35, 437, 439, 750, 754–60
Apollo 17, 434–35, 437, 438–39, 750, 754–60
Apollo 18, 434–35, 754
Apollo 19, 434–35, 438, 750–51, 754, 760
Apollo 20, 434–35, 436
Apollo Logistic Support System, 616–18
Apollo Lunar Exploration Office, 724
Apollo Programs Office, 413
Apollo Spacecraft Program Office, 382–83, 413, 424
Apollo Systems Office, 203
approval for, 388–89, 390
astronauts: contamination of moon by, 408, 677–78; pilot role of, 452; qualification of, 406; quarantine procedures and back contamination, 408, 435, 665–66, 668, 672, 675, 678–84; selection of, 229, 406, 432, 558–59; spacesuits for, 381, 453; survival equipment, 381–82; training of, 382
budget for, 391–92, 395, 547, 750–51, 753–60
cancellation of missions, 434, 436–37, 438, 749–64
Command Module: design of, 452, 540; development of, 537; function of, 451, 465–66, 503; Phillips report on North American Aviation, 629–39; procurement plan, 503–4; quarantine procedures, 683–84; Reaction Control System, 385; schedule for, 629
communication systems, 454
contamination of moon, 408, 665, 666, 677–78
cost of, 389, 413, 456, 458, 470
criticism of, 414–15, 603–7
earth-orbital flights, 451
engineering focus of, 438, 739
extravehicular activities (EVA): during Apollo 11, 432, 433–34, 721–26, 766, 775–79; development of through Gemini program, 44, 295, 379; life support system testing, 431
facilities for, 395–97, 512–20
flight crew assignments, 432
funding for, 277, 390, 409–10, 411, 415, 588–603, 605, 607
Gemini program as support for, 44, 48, 278–82, 295, 376, 378, 379, 382–84
landing and recovery, 434, 452, 767, 783–84
launch and flight operations, 380
launch facilities, 396–97
launch vehicles: booster program, 526–29; development of, 461–65; fuel for, 396, 398, 483, 487–88; recovery of, 464–65; selection of, 398–99. See also Saturn rockets
life support system, 431
Lunar Module: ascent engines, 383–84; contract award for, 405; design and development of, 382–84, 467, 538; landing site selection, 407–8, 432, 560, 561, 563–66; Lunar Landing System, 466; problems with, 427; propulsion system, 536–37; quarantine procedures and back contamination, 683–84; rendezvous and docking requirements, 378; rendezvous radar, 426, 688–90
lunar samples, 434, 439, 670, 672–73, 676, 738, 740, 744–46, 766, 778–79
lunar surface information, robotic missions for, 407, 559–62, 646–48
management of, 122, 399–400, 412–14, 422
Manned Lunar Working Group Task Force report, 458–71
as memorial to Kennedy, 419
mission control operations: development of through Gemini program, 380–81; mission control center for, 397, 566–68
mission mode: comparison of modes, 578–85; delay in selecting, 398–99; direct ascent mode, 401, 404, 494, 540; dispute over, 404–5; Earth Orbit rendezvous (EOR), 401, 404, 494, 497, 500, 521, 539–40; Lunar Orbit rendezvous (LOR), 494, 497–98, 500, 520–44; lunar surface rendezvous, 498, 500; survey of vehicle systems, 494–501; White House objection to LOR, 403–6, 568–88
mission module: design of, 453; function of, 451–52
mission objectives, 451
mission sequence and designations, 424–25, 428, 692, 694, 697, 700, 710, 718
naming of, 389, 449, 450
objectives of, 277
Orbital Space Laboratory, 466; function of, 503; procurement plan, 503–4
origins of, 388–90
overruns in Gemini program and, 40
priority of, 409–12, 416, 562–63, 588–603
progress on, 400, 544–47
propulsion module, 454; design and development of, 452–53, 466; function of, 451, 453, 503; Launch Escape Propulsion System, 466; Mission Abort Propulsion System, 466; procurement plan, 503–4
quarantine procedures, 408, 408n26, 434, 435, 665–76, 683–84, 740–49, 767, 784
rationale for, 479
reentry vehicles, 50–51, 537
rendezvous and docking: Apollo 11, 434, 767, 781–83; development of through Gemini program, 45–46, 345, 378
review of, 413, 416, 608, 609–10
risks and failure concerns, 429, 702–6, 710
scientific activities for, 406–7, 558–59
scientific value of, 392, 438, 760–64
Service Module, 503–4, 536–37, 629–39
Skylab vs., 751–53
spacecraft: astronaut control of, 452; contamination of moon by, 408, 666, 677–78; development of, 382–84, 461, 465–69; electrical power supply, 383; equipment installation, modular, 249; fuel cells, 708–9n1; heat and capsule design, 50; heating problems, 461; maneuvering capabilities, 249; modular concept of, 451–53, 456–57, 503–4; oxygen atmosphere, 654–55; problems with, 421; procurement plan, 398, 501–12; quarantine procedures and back contamination, 666, 671; radiation considerations, 454–55, 468; systems development for, 453–54
success of, 273, 439, 739–40, 750, 751–52
timeframe for missions, 455–56, 466, 469–71
weightlessness issues, 454–55, 468
workforce responsible for, 471
Apollo 204 Review Board, 422–23, 651–61
Apollo Achievement Awards, 733
Apollo Applications Program, 376, 422, 639–46, 688
Apollo Lunar Surface Experiments Package (ALSEP), 722–25
Apollo Telescope Mount, 643, 752
Arabian, Donald D., 377–84, 699
Aristarchus, 408n26
Armstrong, Neil A.
   Apollo 8, 696
   Apollo 11: assignment to, 432; declaration for agriculture and customs, 736–37; lunar surface activities, 434, 775–79; mission report, 765–84; words said on lunar surface, 433, 434, 728, 729
   biographical information, 785
   Gemini VIII (GT-8), 47, 345, 357–62
   test pilot experience of, 14n47
Army, U.S.
   Army Ordnance Missile Command (AOMC), 117–20
   astronaut selection from, 135–36
   Army Ballistic Missile Agency (ABMA), 28–29, 117–20
   Army Ordnance Missile Command (AOMC), 117–20
   Arnold, Earl H., 742
Atlantic Missile Range, 142, 144, 164, 397
Atlas rockets
   abort sensing and implementation system (ASIS), 182
   Atlas-Agena vehicles. See Agena rockets
   Atlas-Centaur vehicles, 40, 274, 461, 483
   Gemini program use of, 256
   Mercury program use of, 12, 33, 126, 210
   MIS program, 76–77
   priority status of program, 563
   reliability analysis of missions, 186
   reliability of, 29–30, 183, 184
   rocket recovery system, 442
   weight-carrying capacity of, 25, 27
   WS-117L program, 83–84
Atomic Energy Commission, 376
Atwood, Leland, 423, 629, 630, 708
Augerson, William S., 127, 133–35, 136, 153, 785
Autoneutronics, 55–58
Auxiliary Flight Research Station (AFRS), 4, 49. See also Pilotless Aircraft Research Division (PARD)
AVCO, 60–62, 551
Aviation Medical Acceleration Laboratory, 168
Bagby, John, Jr., 673, 680
Baikonur Cosmodrome, 425
Bailey, Glenn F., 511
Barclay, Brigadier General, 117
Bass, Manuel N., 763
Batdorf, S. B., 75, 86, 117, 120–21
Bay of Pigs, Cuba, 393
Bean, Alan, 435
Beckner, John B., 53, 511
Beeler, De E., 440, 445–46, 448
Beeson, Paul, 177–92
Beil, W. John, 177–92
Bell, David, 409–10, 588, 593, 598, 600
Bell, E. Barton, 52, 70
Bell Aerospace Systems, 550
Bell Aircraft, 7, 52, 67–69
Bellcomm, 710, 724
Bergen, Bill, 695, 709
Berkner, Lloyd, 392, 471–74
Bermuda flight tracking center, 180
Berry, Charles A., 294, 673, 742
B.F. Goodrich Co., 164
Biemann, Klaus, 742
Big Joe flight, 241
Bioastronautics Support Unit (BOSU), 364
Bird, John D., 530
Bland, William M., Jr., 122
Blasingame, Paul, 708
BMES, 563
Boeing Airplane Company
   Apollo 8, 708, 709
   Apollo spacecraft proposal, 506, 550
   booster decisions and, 543
   Dyna-Soar contract, 443
   Lunar Orbiter program, 564
   Saturn V production, 663
   work schedule at, 591
Bolender, 693, 695
Bond, Aleck C., 122
Bonney, Walter, 17
Borman, Frank
   Apollo 8, 430–31, 691, 696, 718, 727, 735–36
   Apollo 204 Review Board, 422–23, 652–53, 654, 655, 657–61
   Gemini IV (GT-4), 268
   Gemini VII (GT-7), 46–47, 345–57
Bothmer, Clyde B., 608
Bourgin, Simon, 726, 729
Boushey, General, 87
Boyer, William J., 122, 123
Brackett, Ernest W., 501–2
Brooks Air Force Base, School of Aviation Medicine, 138, 139, 140
Brown, Allan H., 673, 742, 748
Brown, C. E., 49
Brown, George, 396
Brown & Root, 396
Brundin, R. H., 214–28
Buckley, John, 673
Budget, U.S. Bureau of
   National Space Plan recommendations, 479
   space program review, 409, 419, 419n51, 588, 618–24
Buglia, James J., 80–81
Bundy, McGeorge
   astronaut activities guidelines, 237–38
   biographical information, 785
   mission mode decision, 405, 569, 570, 585
Bunker, George, 58–59, 708
Burke, Walter, 275, 708
Bush, Vannevar, 415, 603–7
Byrnes, Martin A., 514

C

Califano, Joseph A., Jr., 283, 285
California Institute of Technology, 559
Callaghan, Richard L., 236–38, 786
Cameron, A. G. W., 763
Campagna, I. Edward, 514
Canary Islands flight tracking center, 180
Cape Canaveral (Cape Kennedy)
   Apollo 1 (204) fire, 422
   Apollo program, complete systems at, 610
   Bioastronautics Support Unit (BOSU), 364
   firing pad restrictions, 446
   Kennedy visit to, 419
   launch facilities at, 397
   Mercury program: launches from, 121, 160; medical monitoring at, 187;
      mission control center for, 397, 566; readiness of, 180; training at, 165, 170;
      work schedule, 482
   mission control center, 397, 566, 567
   visitors to, 755
   work schedule at, 483
Capsule Coordination Group Meetings, 166
Carpenter, Malcolm Scott
   biographical information, 786
   departure of, 231
   MA-7 flight of, 34, 230–36, 248, 252
   press conference to introduce astronauts, 18
   specialty area assignment, 25, 166
visits with Russian cosmonauts, 149–51
Casey, Frank, 559–62, 564
Castro, Fidel, 393
Centaur, 40, 274, 461, 483
Central Intelligence Agency, 425–26, 685–87
Cernan, Gene, 432, 439
Cesaro, Dick, 76
Chaffee, Roger, 422, 651, 652
Chamberlin, James A., 204, 510, 549
Chance Vought Aircraft, Inc., 506, 550, 551
Chilton, Robert G., 122, 511
Chrysler, 541–42, 590, 708
Clagett, A. A., 549
Clark, John, 140
Clauser, Milton U., 177–92
Cocke, Earl, 284
Collier’s, 2, 6
Collins, Michael
Apollo 11: aboard Columbia, 434, 774–75; assignment to, 432; declaration for agriculture and customs, 736–37; mission report, 765–84 biographical information, 786
Columbia, 434
Commerce, U.S. Department of, 376
Committee on Science and Astronautics, 277, 513
Conley, Stu, 708–9n1
Conrad, Charles “Pete,” 372, 435
Convair Astronautics, 29, 64, 76–77, 164, 165. See also General Dynamics-Astronautics
Cooper, Leroy Gordon, Jr.
biographical information, 786–87 circumlunar mission proposal, 204 Faith 7 flight, 34, 239, 248, 250, 252 press conference to introduce astronauts, 18 public image of astronauts, 20 specialty area assignment, 25, 26, 166 visits with Russian cosmonauts, 149–51
Crane, Robert, 441, 442
Cuban Missile Crisis, 570, 612
Cunningham, Walter, 429, 787
Curran, John M., 512

D

Damm, Gustave J., 742, 748–49
David, Edward E., Jr, 749, 750, 751–53
Day, LeRoy E., 278, 279–81
Debus, Kurt H.
Apollo 8, 693, 694, 696, 698, 717 biographical information, 787 launch facilities search, 397
Launch Operations Center head, 397
LOR concept, 587
Defense, U.S. Department of (DOD). See also Advanced Research Projects Agency (ARPA)
accidents, contingency plans for, 363–67, 369
Apollo 8, 709, 710
Apollo program review, 416
astronaut activities guidelines, 238
contract monitoring, 662
DX priority status, 137, 563
Large Launch Vehicle Planning Group, NASA-DOD, 398, 399, 521, 523
LOR concept, 587
Manned Orbiting Laboratory, 286–87, 376
Manned Space Flight Experiments Board, 642
Master Urgency List, 137
medical aspects of spaceflight, 187, 188
Mercury program responsibilities of, 179, 242–43, 244
MISS program, 10
National Space Plan recommendations, 479
robotic missions of, 388
space race with Soviets review, 393, 478
support from, importance of, 376
workforce, 376
Discoverer project, 165, 189, 563
Disher, John, 413, 441, 457, 608, 609–10
Doe, Bruce, 763
Donlan, Charles J.
biographical information, 787–88
Mercury program astronaut selection, 15, 16, 127, 136
Space Task Group membership, 122, 179
Dornbach, John E., 564
Douglas, W. K., 168
Douglas Aircraft Company, Inc.
Apollo spacecraft proposal, 506, 550, 551
booster decisions and, 543
Saturn V production, 663
work schedule at, 591
Downhower, Walter J., 494–501
Draper, Stark, 708
Drew, Russ, 750, 751
Drewry, Colonel, 117
Dryden, Hugh L.
Apollo program: management of, 400; schedule for, acceleration of, 593–95, 601; spacecraft contract, 547
biographical information, 788
EVA on GT-4, 44, 292, 293–96
illness and death of, 44, 420
manned satellite program, 86
Mercury program: animal payloads, 141; astronaut activities guidelines, 229;
DX priority status for, 137; funding for, 146
MIS program, 72, 74–80, 120
MISS program, 9, 10
NACA position, 86
NASA budget approval, 392
NASA position, 391
space race with Soviets meeting, 393
DuBridge, Lee, 750, 751
Duke, Charles, 439
Dyna-Soar, 7, 52, 66–67, 80, 84, 442–43, 469

E

Eagle, 433–34
Echo satellites, 484
Eckles, Howard H., 673, 680–81, 742
Edwards, Gardner, 153
Edwards Air Force Base, 49, 160, 440
Edwards Flight Test Center, 165
Eggers, A. J., Jr.
  aerodynamic heating, 50–51
  Joint Manned Satellite Panel, 86, 87
  rendezvous approaches study, 494–501
  Research Steering Committee on Manned Space Flight, 440, 444–45, 448
  spacecraft concepts, 53
  spaceflight research review, 444–45
Eglinton, Geoffrey, 764
Ehricke, Krafft A., 64
Eisele, Donn F., 429, 788
Eisenhower, Dwight D.
  Apollo program approval, 390
  human spaceflight study, 389
  human spaceflight views of, 145, 389, 415
  Mercury program: astronaut selection, 13, 127, 136, 175; DX priority status
    for, 137; funding for, 145–47
  NASA budget approval, 392
  National Aeronautics and Space Act, 10
  Soviet Union strategy of, 145
Ellington Air Force Base, 681
Emme, Eugene, 608
England, Anthony W., 763
Engle, Joe, 439
Enos, 33, 140–41, 241
Environmental control simulator, 167
Escher, William J. D., 494–501
Evans, Bob, 708
Evans, Lew, 699
Evans, Ron, 439
F-1 engines
Apollo program launch vehicles, 390, 396, 399, 462–63, 496, 542, 570
building of, 522
funding for, 476
payload capabilities, 464
technical problems with, 412, 420–21
testing facility, 397
Faget, Maxime A.
Apollo 204 Review Board, 652–53, 657–61
Apollo spacecraft design, 403
biographical information, 26, 789
Joint Manned Satellite Panel, 12, 86, 89
lunar landing mission goal, 388, 440, 447
Mercury program: circumlunar mission proposal, 204; discussion of, 443;
   Redstone missile procurement, 117; spacecraft design, 8, 25, 26, 80–81
MIS program, 72, 74–77, 120
Research Steering Committee on Manned Space Flight, 440, 443, 447, 448
Source Evaluation Board, 510, 549
Space Task Group, 122, 388
Faith 7, 34, 239, 248, 250, 252
Favorite, Frank G., 742, 748
Feigert, Paul, 735–36
Ferri, Antonio, 69
Field, Edison M., 122, 230
Finger, Harold B., 709, 717
Fishman, Alfred P., 177–92
Flanagan, Peter, 750, 751
Fleming, William, 400–401, 521, 526
Flemming, Secretary, 140
Fletcher, James C., 437, 749, 750, 753–60
Flickinger, Don, 136, 152
Flight Readiness Board, 174
Flight Research Center (NACA/NASA), 14n47
Florida State University, 681
Forest, Casey, 67–69
Frau Mauro, 435
Freedom (space station), 4
Freedom 7, 31
Friendly, Alfred, 237
Fryklund, Verne C., Jr., 616–18
Fulbright, William, 415

G

Gagarin, Yuri
   ABC appearance of, 205–7
   biographical information, 789
spaceflight by, 30, 82, 177, 391, 392, 612
visits with NASA astronauts, 43, 149
Gamble, Allen O., 127
Garland, Benjamine J., 80–81
Gast, Paul, 742
Gavin, Joe, 699, 709
Geer, E. Barton, 652–53, 657–61
Gemini, Project
- accidents, contingency plans for, 43, 363–70
- Apollo program support from, 44, 48, 278–82, 295, 376, 378, 379, 382–84
- astronauts: capabilities of, 381; crew safety, 43; equipment for, 381–82; flight experience, 382; honoring following missions, 43, 288–91; loss of, contingency plans for, 43, 363–70; pilot role of, 48, 267, 280, 381; rendezvous and docking role of, 45–46; selection of, 229; space rescue plans, 42–43, 283–88; spacesuits for, 39, 271, 381; survival equipment, 381–82; training of, 259, 260, 294, 382, 384
- celebrations following missions, 43, 288–91
- challenges faced by, 39–40, 45
- circumlunar mission proposal, 40, 272–73, 274
- communication systems, 383
- conclusion of, 371, 372, 385
- cost of, 40, 264
- crew size, 257
- development plan for, 38, 253–64
- duration of missions, 46–47, 257, 260, 372, 374–75
- experiments, medical, 41, 279
- experiments, scientific and technological, 48, 372
- extravehicular activities (EVA): Apollo program support from, 44, 295, 379; equipment for, 39, 271–72, 293; GT-4, 39, 44–45, 268, 291–96, 297; mission planning, 270, 279; objectives of, 269–70; opposition to, 44, 292; program plan for, 39, 268–72; public reaction to, 295, 296; risks of, 44, 293, 294–95; spacecraft modifications for, 39, 268, 272; success of, 297, 298, 372, 375, 379; task assignments, 270–71; training for, 294
- funding for, 253
- Gemini III (GT-3): corned beef sandwich issue, 21, 297; mission objectives, 279; success of, 42, 294, 296–98; White House reception following, 43, 290
- Gemini Information Director, 364
- Gemini IV (GT-4): altitude chamber testing approval, 292; celebrations following, 43, 290; debriefing following, 298–344; EVA during, 39, 44–45, 268, 291–96, 297, 298–344, 375; length of mission, 374; mission objectives, 41, 279, 295–96; success of, 296–98
- Gemini IX (GT-9): mission objectives, 41, 280; rendezvous and docking during, 373
- Gemini IX-A, 373, 375, 378
- Gemini V (GT-5): EVA during, 294, 296; landing accuracy, 372; length of mission, 372, 374; mission objectives, 41, 279
Gemini VIII (GT-8): attitude control challenges, 47, 345, 357–62, 373; mission objectives, 41, 47, 280; rendezvous and docking during, 46, 345, 379

Gemini X (GT-10): EVA during, 375; mission objectives, 41, 280; rendezvous and docking during, 46, 372, 378, 379

Gemini XI (GT-11): altitude record, 372; EVA during, 375; mission objectives, 41, 280; rendezvous and docking during, 46, 372, 378

Gemini XII (GT-12): EVA during, 372, 375; mission objectives, 41, 281; rendezvous and docking during, 46, 378

Guidance systems, 280, 383

Landing procedures: accuracy of, 372; controlled landings, 258–59, 379–80; parachute system, 40; paraglider design, 37, 39–40, 262

Launch and flight operations, 378–79, 380

Launch vehicles: challenges of, 383; success of, 373; Titan II, 38, 39, 253, 255–56

Management of, 122

Mercury compared to, 267–68

Mission control operations, 380–81

Mission objectives, 37, 257–59, 266–67, 278–82; accomplishment of, 372–73, 377–84; by mission number, 41, 278–81

Naming of, 38

Operational proficiency, 375–76

Program summary, 370–85

Project Office, 256

Purpose of, 38, 256, 374, 377

Reentry maneuvering envelope, 263

Reentry vehicles, 50–51

Rendezvous and docking: Agena as target vehicles, 38, 255–56, 373, 383–84; Aldrin’s contributions to, 45–46; astronaut control during, 45–46; engines of target vehicles, 383–84; GT-6 and GT-7 missions, 46, 345–57, 375; guidance systems, 280, 383; maneuvers for, 258, 261; mission objectives, 41, 257–58, 259, 280; procedures and tools for, 45–46; propulsion systems and, 378–79; success of, 45, 46, 297, 298, 345, 372, 375, 378–79

As research and development competition, 376–77

Routine nature of spaceflight, 43

Spacecraft: abort system, 267; Apollo program support from systems development, 382–84; astronaut control of, 48, 267, 280, 381; design of, 37–39, 203, 253, 260–63; development of, 256; EVA, modifications for, 39, 268, 272; fuel cells, 37, 39, 267, 383; heat and capsule design, 50; maneuvering capabilities, 249, 258, 267; modular systems for, 38, 39, 249, 259; oxygen atmosphere, 654; paraglider design, 37, 39–40, 268; range control, 268; redundant systems, 43, 288

Success of, 48, 370–73, 384–85, 420

Television system for flights, 211

Timeframe for missions, 37, 262

Unsuccessful missions, 373

Weightlessness issues, 294, 381

Workforce responsible for, 376

Gemini Familiarization Package, 266–68
General Dynamics-Astronautics
   Apollo spacecraft proposal, 506, 550, 551, 553–55, 557–58
   Gemini launch vehicle procurement, 256
   launch vehicle development, 243

General Electric Corporation
   Apollo 8, 708, 709
   Apollo spacecraft proposal, 506, 550, 551, 553–55, 557, 558
   automated checkout equipment production, 663
   Mark 2 reentry vehicle, 5–6
   Paine as executive at, 428
   Radio-inertial Guidance System, 76

Gibbons, John H., 789

Gilruth, Robert R.
   accidents, contingency plans for, 367
   Apollo program: Apollo 8, 427, 691, 692, 693–94, 696, 698, 699, 701–2, 710, 717; Apollo 11, 729; cancellation of missions, 434; Command Module design, 540; LOR concept, 402, 587; procurement plan, 501–12; risks and failure concerns of Mueller, 429, 702–6; scientific activities on lunar surface, 616–18; scientific value of, 438, 739–40; spacecraft design, 540
   biographical information, 789
   Flight Readiness Board, 174
   Gemini program, 275, 292, 293–96
   Joint Manned Satellite Panel, 12, 86
   Manned Spacecraft Center director, 522
   Mercury program: animal payloads, 138–39; astronaut activities guidelines, 228–30; astronaut integration with capsule, 26; astronauts, public image of, 20–21; astronauts, selection of, 136; Atlas reliability, 29; circumlunar mission proposal, 204; contributions of, 122; launch vehicle research, 5, 7–8; MA-6 postlaunch telegram, 214–28; management of, 120, 243; management success of, 122; Manned Spacecraft Center expansion and success, 35; naming of, 124–25; oversight of building spacecraft, 27, 147–48
   Mercury-Redstone program termination, 209–10
   MIS program, 120, 121
   PARD leadership of, 4
   Redstone ballistic missile procurement, 117–20
   Source Evaluation Board, 549
   Source Selection Board, 126
   Space Task Group, 12, 121–23, 179, 399

Glenn, John H., Jr.
   biographical information, 790
   circumlunar mission proposal, 204
   Friendship 7 flight, 33–34, 241; debriefing following, 223–28; equipment failure, 248; landing bag problem during, 34, 216, 220; pilot role of, 33–34, 247–48; postlaunch telegram, 214–23; scientific observations, 251–52
   popularity of, 34
   press conference to introduce astronauts, 18, 19
   public image of, 34
   specialty area assignment, 25–26, 160, 166
   training of astronauts, 22, 158–61
   visits with Russian cosmonauts, 149–51
Glennan, T. Keith
Apollo program, approval for, 390
Joint Manned Satellite Panel, 86
Mercury program: animal payloads, 138–40; approval for, 12, 120;
funding for, 145, 146; management of, 120–21; naming of, 124, 128; press
conference to introduce astronauts, 17–18
NASA budget planning, 441
Space Task Group, 12
Goddard, Robert H., 1
Goddard Space Flight Center
Apollo program, 455
director of, 388, 440
readiness of, 180
research at, 461
Space Task Group relocation to, 395
work schedule at, 483
Goett, Harry J., 388, 440
Gold, Thomas, 407, 646–48, 762
Golovin, Nicholas
biographical information, 790
departure from NASA, 404, 569
NASA-DOD Large Launch Vehicle Planning Group, 398, 521, 523
PSAC position, 404, 569
Goodpaster, A. J., 145–47, 790
Goodyear Aircraft Corporation, 65–66, 506, 550
Gordon, Richard F., Jr., 372, 435
Gray, Edward Z., 40, 272–73, 274, 790
Gray, Wilbur H., 512
Great Society program, 420
Grissom, Virgil I. “Gus”
Apollo 1 (204) fire, 422, 651, 652
biographical information, 791
character of, 35
circumlunar mission proposal, 204
Gemini III (GT-3), 43, 290, 297
MA-7 pilot debriefing, 230
press conference to introduce astronauts, 18
specialty area assignment, 26, 166
suborbital flight by, 32–33, 33n103, 207–9, 241
visits with Russian cosmonauts, 149–51
Grissom Bugs, 35
Grumman Aircraft Engineering Corporation
Apollo 8, 709
Apollo spacecraft: contract award, 405; problems with, 421, 424; production
of, 424, 663; proposal, 507, 550, 551
guidance systems, 280
Gwinn, Bill, 708
H

H-1 engines, 396, 527
Hage, 693, 694, 695, 696, 697, 699
Hagerty, James C., 205–7, 791
Haise, Fred, 432, 435, 696
Hall, Eldon W.
   Manned Lunar Working Group Task Force, 457
Hall, Lawrence B., 674, 742
Ham, 30, 140, 188
Hammack, Jerome B., 122
Hammersmith, John, 274, 278, 281–82
Hartgering, James B., 177–92
Haskens Laboratory, 681
Hatley, Shirley, 123
Hawkeye program, 465, 469
Haxo, Francis, 681
Health, Education, and Welfare, U.S. Department of, 683, 743
Heaton, Colonel, 77, 78
Heaton, Donald, 401, 521, 523, 525, 526
Heat-sink concept, 6
Heberlig, Jack C., 123
Heinemann, Edward H., 177–92
Helgeson, Bob P., 717
Helsley, Charles E., 763
Hendrickson, Douglas E., 511
Hess, Wilmot N., 674
Hessberg, Rufus R., 742
Hicks, Claiborne R., Jr., 123
High Energy Astronomy Observatory, 757, 758, 759
High Speed Flight Station (HSFS), 440, 445–46
Hingham Air Force Base, 512, 520
Hjornevik, Wesley L., 510, 514, 549
Hodge, John, 298
Holloman Air Force Base, 140, 141
Holmes, D. Brainard
   Apollo program: funding for, 409, 588; LOR concept, 402, 521, 587; management of, 400, 414; priority of, 409, 410, 588; resignation from, 412; robotic missions for lunar surface information, 407; schedule for, acceleration of, 593–94, 595
   biographical information, 791
   Gemini program: funding for, 253; naming of, 38
   MA-6 postlaunch telegram, 214–28
   Webb, relationship with, 409, 410, 588
Horner, Richard, 141
Hornet, U.S.S., 434, 767
Hornig, Donald F., 177–92, 389, 404, 568, 570–73, 791
Houbolt, John C., 401–2, 520, 521, 522–30, 538, 791–92
House of Representatives, U.S.
Apollo 1 (204) fire review, 654, 655
Science and Astronautics, Committee on, 277, 438, 513, 655, 662
Houston, Vincent, 717
Hughes Aircraft Company, 551
Human spaceflight
  catching-up efforts, Soviet achievements and, 51–52
  military support functions of, 2
  MISS program, 9–10, 9n25, 9n29
  NACA's research and plans, 5–8, 49
  perceptions about, 1, 6, 51
  schedule proposals, 57–58
  scientific value of, 392, 415, 471–74
  studies of at Langley, 49, 71–72
  support for, public relations campaign for, 1–2
U.S.-Soviet cooperation, 391, 416–19, 753
U.S.-Soviet rivalry, 36, 82, 83, 145–47, 204, 212, 390, 392–93, 410–11, 416, 598
Von Braun's plan for, 3–4
Humphrey, Hubert H., 149, 429
Humphreys, James W., Jr., 742
Hyland, Lawrence A., 177–92

I
Interagency Committee on Back Contamination, 408, 435, 665, 666–76, 679–81, 683–84, 744
Interior, U.S. Department of, 673, 680–81, 683
International Business Machines, 663, 708
International Space Station, 4
Intrepid, U.S.S., 231
Irvine, Jack, 75
Irwin, James, 21n70, 439

J
J-2 engines
  alternatives to, 528
  Apollo program launch vehicles, 399, 496, 542, 570
  building of, 522
  development of, 461, 464
  payload capabilities, 464
James, Lee, 694, 696, 698, 707, 717
James, Lieutenant Colonel, 117
Jeffs, George, 652–53
Jet Propulsion Laboratory (JPL)
  landing site selection, 561, 564–66
  mission objectives of, 559
  rendezvous approaches study, 401, 495
  Research Steering Committee on Manned Space Flight, 440
robotic missions supervised by, 407, 559–62
spaceflight research at, 446–47
Johnson, Caldwell C., Jr., 511
Johnson, George W. S., 494–501
Johnson, Lyndon B.
  Apollo program: Apollo 1 (204) fire, 422, 651; Bureau of Budget review, 618; facilities for, 396, 512–20; review of, 416
  biographical information, 792
Gemini program: GT-4, success of, 44–45; meeting astronauts following missions, 43, 288–91; report on success of, 296–98
Great Society program, 420
housing for astronauts, 20
Mercury program: astronaut activities guidelines, 237; support for, 145
National Aeronautics and Space Council chair, 393, 478
post-Apollo options, 421, 639
presidency of, 419
Southeast Asia trip, 394, 479
space race with Soviets review, 393–95, 478–79, 485–90
space rescue plans, 42–43, 283–88
U.S.-Soviet cooperation, 419
Vietnam War, 420
Webb appointment to NASA, 391
Webb resignation request, 429
Johnson, Roy
  Joint Manned Satellite Panel, 86
  MIS program, 11, 75, 81–85
Johnsonville Centrifuge, 159–60, 167, 188, 190
Joint Chiefs of Staff, 9, 9n29
Joint Manned Satellite Panel
  establishment of, 12
  minutes of meeting, 86–89
  preliminary specifications for satellite capsule, 12, 89–116
Jones, Edward, 25
Jupiter, 126, 757, 758

K

Kallio, R. E., 742
Kantrowitz, Arthur, 60–62
Kartveli, Alexander, 69
Kaula, William M., 762
Kavanaugh, Lawrence, 398
Kaysen, Carl, 625–29
Keeling, G. F., 664
Kemmerer, Walter W., Jr., 673, 742
Kennedy, John F.
  Apollo program: announcement of, 501–12; Bureau of Budget review, 409, 588, 618; funding for, 409–10, 412, 588–603; LOR concept, dispute over, 403–6, 568–88; as memorial to, 419; priority of, 409–12, 562–63, 588–603; review of, 416; schedule for, acceleration of, 411–12, 588–603
  assassination of, 419
  astronaut activities guidelines, 236–38
astronaut selection, 175–77
Bay of Pigs incident, 393
biographical information, 792
Cape Canaveral visit, 419
human spaceflight views of, 390–91
Inaugural Address, 391
lunar landing commitment, 400, 401, 458
lunar landing promise of, 35, 203–4, 390n4, 395, 414, 547
NASA budget approval, 392
National Space Plan approval, 395
space preeminence goal, 411, 412, 598–600
space race with Soviets, 392–95, 474–93
United Nations speech, 417–18, 612, 613
U.S.-Soviet cooperation, 391, 416–19, 612–16, 627
U.S.-Soviet rivalry, 390, 392–93, 410–11, 416, 598
visits with Russian cosmonauts, 149
Kennedy Space Center, 381, 724
Kerr, Robert, 391, 414
Khrushchev, Nikita, 392, 417, 418, 419, 612, 613, 615–16, 793–94
Killian, James R., 10, 72, 79–80, 793
Kistiakowsky, George, 145–47, 389, 792–93
Klein, Harold P., 673
Kleinknecht, Kenneth
Apollo 8, 695, 699
biographical information, 793
circumlunar mission proposal, 275
EVA attempts, 39, 268
Source Evaluation Board membership, 549
Kolenkiewicz, Ronald, 123
Komarov, Vladimir, 430, 686
Koppenhaver, James T., 502, 511, 549
Kraft, Christopher C., Jr.
Apollo 8, 427, 694, 695, 696, 698, 699, 707, 717
biographical information, 245, 793
Carpenter, attitude toward, 231
Gemini program: GT-4 role of, 298; GT-6 and GT-7, rendezvous between, 346
Manned Spacecraft Center director, 231
Mercury program: astronaut integration with capsule, 24; program review, 36–37, 245–52
Senior Flight Director role, 245
Space Task Group membership, 123, 245
Kranz, Gene, 298
Kuettner, Joachin P., 147–48, 203–5, 794

L

L-115 engines, 528
Laika, 6
Laitin, Joseph, 346–47
Lake Champlain, U.S.S., 192
Lambright, W. Henry, 422
Lang, Dave W., 511, 549
Lange, Oswald H., 549
Langley Field, 166, 169, 170
Langley Research Center (Langley Memorial Aeronautical Laboratory)
aeromedical experts at, 127
Instrument Research Division, 71
LOR concept, 530–35
Lunar Orbiter program, 407, 564
lunar surface information, robotic missions for, 407, 560
manned-satellite program studies, 49, 71–72
paraglider design development, 37
research at, 460–61
Space Task Group, 12, 120, 121–23, 395
spacecraft research at, 443–44
Theoretical Mechanics Division, 71
Langseth, M. E., 762
Launch Complex 39, 397
Launch Operations Center, 397, 538, 587
Lauten, William T., Jr., 123
Leary, F. J., 152–53
Lee, John B., 123
Leonov, Alexey, 44, 292
Lewis Laboratory, 167, 169
Lewis Research Center, 12, 388, 401, 445, 460–61, 495
Liberty Bell 7 (MR-4), 32–33, 33n103, 207–9
Life magazine, 16, 20, 35, 236
Lilly, William E., 639–46
Ling, Donald P., 177–92
Little Joe flights, 126, 138–40, 142, 143, 144, 186, 241
Livesay, Norma L., 123
Livingston, Robert B., 177–92
Lloyd, Bill, 213, 237
Lockheed Aircraft Corporation
Agena rockets, 256, 346
spacecraft design proposal, 62–63, 507, 550, 551
Loftin, Laurence K., Jr., 440, 443–44, 448, 494–501
Long, Frank A., 652–53
Long Range Objectives Committee (NASA), 441
Lord, Douglas R., 177–92
Los Alamos National Laboratory, 411, 589
Lovelace, Dr. Alan, 87, 136
Lovelace Foundation, 15, 153, 155, 157
Lovell, Bernard, 417
Lovell, James A., Jr.
Apollo 8, 430–31, 691, 696
Apollo 13, 435
biographical information, 794–95
Gemini IV (GT-4), 268
Gemini VII (GT-7), 46–47, 345–57
Gemini XII (GT-12), 372
Low, George M.
Apollo program: Apollo 7, 706; Apollo 8, 427, 430, 690, 691–702, 706–10, 717, 718–20; Apollo 11, 433, 726–29; Apollo 20, 436; cancellation of missions, 436–37, 749–53; LOR concept, 402; Lunar Module rendezvous radar, 426, 688–90; management of, 413, 424; mission schedule, 610–12, 718–20
Apollo Spacecraft Program Office duties, 424
biographical information, 125, 795
departure from NASA, 691
Gemini program, 264–65, 275, 384–85
Joint Manned Satellite Panel, 12, 86
lunar landing mission: goal of, 388–90, 440, 447; Manned Lunar Working
  Group Task Force, 389, 392, 457–71
Manned Space Flight presentation, 388–89, 449–57
Manned Spacecraft Center assignment, 413
Mercury program: animal payloads, 13–40; astronaut selection, 15, 135–37; naming of, 124–25; priority of, 137–38; status report, 125–27
MIS program, 120
MRS-V Committee membership, 441
NASA positions of, 125, 436, 750
Research Steering Committee on Manned Space Flight, 440, 447, 448
Skylab vs. Apollo, 751–53
Source Evaluation Board, 510, 549
Source Selection Board, 126
Lowe, Nancy, 123
LR115 engines, 496
LR-119 engines, 464
Lunar and Planetary Missions Board, 724, 750
Lunar and Planetary Programs Office, 406
Lunar Artifacts Committee, 727. See also Symbolic Activities Committee
Lunar Exploration Office, 738
Lunar Geology Investigation (LGI), 722–25
Lunar Orbiter program, 407, 564
Lunar Receiving Laboratory, 408, 666, 668, 679–81, 743, 747, 767
Lundin, Bruce T.
  booster program, 442
  lunar landing mission goal, 388, 440, 445
  rendezvous approaches study, 401, 494–501, 521, 523, 525
  Research Steering Committee on Manned Space Flight, 440, 441, 442, 445, 448
  spaceflight research review, 445
MacDougall, George F., Jr., 123, 511
MacGregor, Ian D., 762
Magin, Betty F., 123
Malley, George, 653
Man in Space Committee (ARPA), 441
Management and Budget, Office of, 437, 750, 751
Management Council, 608, 610
Mandel, Adrian, 673, 743
Man-in-Space Soonest (MISS) program, 9–10, 9n25, 9n29
Manned Lunar Working Group Task Force, 389, 392, 457–71
Manned Orbiting Laboratory (MOL), 41, 286–87, 376
Manned Satellite Project
development of, 9, 9n25
experiments, aeromedical, 87
funding for, 9, 9n29, 11, 76, 83, 121
Joint Manned Satellite Panel: establishment of, 12; minutes of meeting, 86–89; preliminary specifications for satellite capsule, 12, 89–116
personnel for, 76
priority of, 11, 81–84
public relations issues, 121
renaming of, 123–25
responsibility for, 9–10, 72–80
spacecraft: booster design, 84; design of, 7–8, 50–51, 52–71, 80–81; reusable, 3, 4, 80
status report, 125–27
Manned Space Flight and Public Affairs, Office of, 371
Manned Space Flight Network, 380
Manned Space Flight, Office of (OMSF), 402, 406, 535, 539, 544, 559, 617, 674, 725, 742
Manned Spacecraft Center (MSC)
accidents, contingency plans for, 367, 369–70
Apollo program: all-up testing, 609; Apollo 11, 724; direct ascent mode, 540; EOR concept, 539; landing site selection, 561; LOR concept, 403, 521, 538–39, 585, 587; lunar surface information, robotic missions for, 560; mission control center for, 397, 566–68; mission schedule, 611; reentry vehicle design, 538; rendezvous approaches study, 402–3; scientific activities on lunar surface, 617
Apollo Spacecraft Program Office, 382–83, 413, 424
creation of, 229, 396
expansion of, 35
Gemini program, 274, 275
Interagency Committee on Back Contamination membership, 673–74, 742–43
landing site selection, 564
Lunar Exploration Office, 738
Lunar Receiving Laboratory, 408, 666, 668, 679–81, 743, 747, 767
purpose of, 380
Space Task Group relocation to, 35, 229
spacesuit support facilities, 381
success of, 35
Trajectory Analysis, 564
Mark 2 reentry vehicle, 5–6
Mars exploration, 3, 4, 436
Marshall Space Flight Center (MSFC)
Apollo program: all-up testing, 414, 609; Apollo 11, 724; EOR concept, 403,
521, 539–40: launch vehicle development, 399; LOR concept, 403, 535–44, 585, 587; LOR concept, dispute over, 404–5, 569; mission schedule, 611; rendezvous approaches study, 401, 402–3, 495

Gemini program, 274
Kuettner’s role at, 203
launch operations management, 397
reliability analysis, 187
research at, 461
Saturn schedule, acceleration of, 603
S-IC booster test stand, 542
training at, 165
work schedule at, 483, 486

Martin Company
Apollo spacecraft proposal, 507, 547, 550, 551, 553–56
Gemini program, 275, 276
launch vehicle development, 256
launch vehicle procurement, 256
space rescue plans, 284, 288
spacecraft design proposal, 58–59
Titan III program, 555

Martin Marietta, 708
Martin-Bell, 443
Mason, Brian H., 762
Mason, John A., 743
Massachusetts, 396, 512, 519–20
Massachusetts Institute of Technology, 604, 708
Masursky, Harold, 764
Mathews, Charles W., 511, 549, 795
Matthews, Charles F., 123, 268–72, 275, 522, 540
May, Ralph W., Jr., 441, 494–501
Mayall, N. U., 764
Maynard, Owen E., 377–84, 559–62, 564, 795–96
McAdam, Robert, 153
McCord, Thomas B., 764
McDivitt, James A., 796
Apollo 9, 431
Gemini IV (GT-4): altitude chamber testing approval, 292; celebration following mission, 43; debriefing following, 298–344; EVA during, 39, 44, 268, 299–344
visits with Russian cosmonauts, 43, 149
McDonald, Gordon, 709
McDonnell Aircraft Company (MAC)
Apollo 8, 708
Apollo spacecraft, 507, 550, 551, 553–55, 557, 558, 576
couch molding by, 164
Gemini program: circumlunar mission studies, 274, 275, 276; development plan for, 38, 253–64; Gemini Familiarization Package, 266–68; spacecraft development, 204, 256; spacecraft procurement contract, 256
Manned Satellite Project spacecraft, 8, 64–65
Mercury spacecraft: cost of, 26–27, 27n85; design of, 89; development of, 24, 26–28; oversight of building of, 27, 147–48; oxygen atmosphere, 28, 28n89, 183; reliability analysis, 181; spacecraft training for Mercury Seven, 165–66 reliability analysis, 186
work schedule, 482
McDonnell Procedure Trainer, 167, 169
McElroy, Neil H., 137
McGuire, T. F., 152
McKay, David S., 764
McNamara, Robert, 283, 285, 394–95, 478–79, 490–93
Meinschein, Warren G., 763
Meissner, Rolf, 762
Mercury, Project
animal payloads, 26n83, 33, 138–45, 188–89, 190, 241
astronauts (Mercury Seven): activities guidelines for, 228–30, 236–38; character of, 35–36; civilians as astronauts, 175–77; duties of, 129; ethical issues, 20–21, 236–38; evaluation of, 15, 15n54, 151–58; family lives of, 19–20; honoring following missions, 43; invitation to apply for position, 14, 127–33; life support for, 251; media access to, 161, 238; medical concerns about, 187–98; national symbols status of, 21–22; pilot role of, 23–26, 33–34, 247–48, 249, 252; press conference to introduce, 16–19; pressure suits, 164, 251; propaganda use of, 22, 31, 34, 149–51, 205–7, 212–14; public appearances by, 34, 43, 228–30; public image of, 19–22, 34; qualification of, 14, 130–31, 175–77; radio transmissions of, 212–14; role in capsule development, 160; salary of, 128, 133; selection of, 13–16, 14n47, 127, 135–37, 163, 173–75; spacecraft design role of, 24–26; specialty area assignments, 22, 25–26, 160, 166; training of, 22, 36, 133–35, 158–72, 180, 244; visits with Russian cosmonauts, 149–51
Big Joe flight, 241
celebrations following missions, 43, 288–89
committee reviews of, 177–92, 389
components of, 178–79
conclusion of, 36, 239
cost of, 36, 244, 456, 595
description of, 128
discussion of, 443
experiments, aeromedical, 250–51
discussion of, 443
discussion of, 443
funding for, 26–27, 27n85, 145–47
Gemini compared to, 267–68
landing procedures and regions, 184, 189, 222; landing bag problem, 34, 216, 220
launch vehicles: development of, 242; fuel for, 29; funding for, 126; procurement of, 12, 117–20, 126; reliability of, 29–30, 183, 184, 187, 189; types of, 28–29, 241. See also Atlas rockets; Redstone ballistic missiles
lessons of, 36–37; review by Kraft, 245–52; review by Williams, 239–45
Little Joe flights, 126, 138–40, 142, 143, 144, 186, 241
management of, 12, 120–23, 242–43
media coverage of, 161, 238, 288–89
medical aspects, 187–89, 190–91

Mercury-Redstone missions, 203, 241; MR-1, 30, 241; MR-1A, 30; MR-2, 30, 140, 142, 179, 180, 183, 188; MR-3, 173–75, 188, 189, 190; MR-4, 32–33, 33n103, 207–9; MR-BD, 183; termination of, 209–10

MISS program and, 10
mission control center for, 397, 566
mission objectives, 450, 459
naming of, 12, 123–25, 128
opposition to, 295
orbital flights, 33–37, 230; Carpenter's flight, 34, 230–36, 248, 252; communication during, 179, 180, 211–14, 226, 227, 228, 233, 234, 236, 249; Cooper's flight, 34, 239, 248, 250, 252; Glenn's flight, 33–34, 214–28, 241, 247–48, 251–52; propaganda value of, 211–14; radio transmissions during, 212–14; Schirra's flight, 34, 248, 249, 252; scientific experiments, 251–52; television system for, 211–12; total hours of, 245, 246
priority of, 12–13, 137–38, 563
purpose of, 16, 178, 239, 246
recovery operations, 32, 33n103, 180, 184, 208–9, 244
reentry vehicles, 5–6, 8, 50–51
review of by Ad Hoc Mercury Panel, 177–92
risks and reliability issues, 180–87, 190–92
space rescue plans, 287
spacecraft, 147–48; Apollo program support from, 469; astronaut control of, 23–26, 33–34, 247–48, 249, 252; automatic stabilization and control system (ASCS), 183, 197, 200, 226–27, 228, 232, 280; circumlunar mission proposal, 203–5; cost of, 26–27, 27n85; customization of, 164–65; design of, 7–8, 24–26, 247; development of, 26–28, 239–40, 246–47; equipment installation, modular, 249; escape mechanisms, 185; failures with no backup, 185–86, 248; fire hazard, 185; heat and capsule design, 50; manuals for, 165–66; oversight of building of, 27; oxygen atmosphere, 28, 28n89, 183, 251, 654; procurement of, 126; redundant systems, 184–85, 248; reliability analysis, 186–87; reliability issues, 181–84, 250; role of astronauts in development of, 160; specifications for, 89–116; specifications of finished capsule, 28; testing, 127; weight of, 25, 27
suborbital flights, 30–33; Ad Hoc Mercury Panel report, 177–92; animal payloads, 138–45; astronaut selection, 173–77; Grissom’s flight, 32–33, 33n103, 207–9, 241; propaganda use of astronauts’ experiences, 31, 205–7; Shepard’s flight, 31, 192–203, 241, 394, 395, 478, 479; termination of program for, 209–10
success and accomplishments of, 34, 377, 390
timeframe for missions, 26, 36, 240–41
tracking flights, 36, 180, 244–45, 249
weightlessness issues: orbital flights, 225–26, 228, 250–51; simulation training, 155, 160–61, 168–69, 172; suborbital flights, 31, 202, 203
work schedule, 482
workforce responsible for, 12, 121–23, 243–44
Mercury Mark II capsule, 37–39, 253–64. See also Gemini, Project
Merritt Island Launch Area, 397
Meyer, Andre J., 511
Michoud, Antoine, 397
Miller, George, 438, 513, 654, 655, 760–64
Miller, N. Philip, 514
Minuteman ICBM program, 137, 412, 563
Mission Analysts Division, 288
Mission Control Center-Houston, 297–98, 364
Mississippi Test Facility, 397, 542
Mitchell, Edgar, 435
Mitchell, Willis B., 377–84
Mondale, Walter, 423
Moon exploration. See also Apollo, Project
Frau Mauro, 435
Gemini program proposal, 40, 272–73, 274
life on the Moon, 408, 408n26
lunar orbit simulation, 280
Mercury program proposal, 203–5
NASA’s long-range plan and, 4, 388–90
public opinion about, 1
Sea of Tranquility, 432, 560, 561
Soviet program for, 425–26, 430, 685–87, 692
support for, 1–2, 388–90, 440–48
U.S.-Soviet cooperation, 416–19, 417n46, 612–16
U.S.-Soviet rivalry, 277–78, 650
Von Braun’s plan for, 3
Moore, Forrest, 20
Moore, Patrick, 408n26
Morehead Planetarium, 168
Morrow, Tom, 708
Moyers, Bill, 42, 283, 285–87, 347
Mrazek, William A., 117, 511
MRS-V Committee (ARPA), 441
Muehlberger, William R., 762
Mueller, George E., 796
Apollo program: all-up testing, 413–14, 608–9, 610–12; Apollo 1 (204) fire, 422; Apollo 7, 706; Apollo 8, 427, 428, 430, 691, 692, 695, 697, 699, 709–16; Apollo 10, 431; Apollo 11, 721–26, 730–35; Lunar Module rendezvous radar, 426, 689; management of, 412–14, 423, 608–12; Phillips report on North American Aviation, 423, 629; risks and failure concerns, 429, 702–6; schedule for, 650; scientific value of, 438, 739–40
Gemini program: circumlunar mission proposal, 273, 274; EVA on GT-4, 293–96; GT-6 and GT-7, rendezvous between, 346–47; summary conference, 374–77
Saturn V production termination, 687–88
Muhly, William C., 123
Multi-Axis Spin Test Inertia Facility (MASTIF) device, 167, 169
Murrow, Edward R., 211
Myers, Dale, 695, 749, 750

N

Nagy, Alex P., 38, 264–65
NASA-Industry Apollo Executives Group, 412
National Academy of Sciences
  astronaut selection, 406–7
  Interagency Committee on Back Contamination, 435, 673, 683
  quarantine procedures and back contamination, 408, 665, 678–81
  Space Science Board, 388, 392, 408, 471–74, 616, 617, 740–49, 750
National Advisory Committee for Aeronautics (NACA)
  Flight Research Center, 14n47
  human spaceflight research and plans, 5–8, 49, 79
  MIS program, responsibility for, 9–10, 72–80
  missile research, 4–5
  review board for research, 49
National Aeronautics and Space Act, 10, 79, 393
National Aeronautics and Space Administration (NASA)
  accidents, contingency plans for, 43, 363–70
  Advanced Research and Technology, Office of, 288, 640
  Apollo 204 Review Board, 422–23, 651–61
  Apollo program review, 416
  astronaut activities guidelines, 238
    of Budget review, 409, 419, 419n51, 588, 618–24
  civilian control of, 10–11
  cooperation with ARPA on spaceflight program, 11–12, 74–77, 82–89, 441
  creation of, 52, 82
  DOD support for, 376
  earth orbit simulation, 280
  Flight Research Center, 14n47
  Gemini program development, 38, 253–64
  Interagency Committee on Back Contamination, 408, 435, 665, 666–76,
    679–81, 683–84, 744
  Large Launch Vehicle Planning Group, NASA-DOD, 398, 399, 521, 523
  Long Range Objectives Committee, 441
  long-range plan (1959), 2, 4, 388, 392
  Lunar and Planetary Programs Office, 406
  lunar landing mission: contracting procedures, 489–90; cost of, 394, 478,
    481, 486; fuel for, 483, 487–88; goal of, 388–90, 440–48; Manned Lunar
    Working Group Task Force, 389, 457–71; work schedule for, 482–83
  Manned Orbiting Laboratory, 41
  Manned Space Flight and Public Affairs, Office of, 371
  Manned Space Flight Experiments Board, 642
  Manned Space Flight, Office of (OMSF), 402, 406, 535, 539, 544, 559, 617,
    674, 725, 742
manned-satellite program, responsibility for, 79–80
medical aspects of spaceflight, 187, 188
Mercury program management, 242–43
Mercury program workforce, 244
Mercury-Redstone program termination, 210
Merritt Island Launch Area purchase, 397
Mission Analysts Division, 288
National Space Plan recommendations, 394–95, 478–79, 490–93
post-Apollo planning, 421–22, 639–46
Program Planning Committee, 441
Reliability, Office of, 502
reliability analysis, 181, 186–87
Research Centers, 460–61
Research Steering Committee on Manned Space Flight, 388, 440–48
site survey team, 514–20
Source Evaluation Board. See Source Evaluation Board
Source Selection Board, 126
Space Exploration Program Council, 389–90
Space Flight Centers, 461
space race with Soviets review, 393–94, 478, 479–84
space rescue plans, 42–43, 283–88
Space Science and Applications, Office of, 640, 674, 742
Space Science Steering Committee, 558–59
Space Sciences, Office of, 616–18
Space Task Group. See Space Task Group
Symbolic Activities Committee, 432–33, 730–35
tasks assigned to, 388
workforce, 376, 420
National Aeronautics and Space Council (NASC)
Anders as chair, 750
creation of, 137, 393
disagreements with NASA, 137
Johnson as chair of, 393, 478
priority status of Apollo program, 562–63
space race with Soviets review, 478
National Astronomical Observatories, 642, 643
National Defense Education Act, 52
National Intelligence Estimate, 426, 685–87
National Orbital Rescue Service, 284
National Press Club, 513
Naval Medical Acceleration Laboratory, 71–72
Naval Medical Research Institute (NMRI), 169
Naval School of Aviation Medicine, 169
Navy, U.S., 244
Neill, Arthur H., 674
Neustadt, Richard, 390
New Orleans, LA, 397
Newell, Homer
Apollo 8, 430, 709, 710, 717
biographical information, 796
quarantine procedures and back contamination, 666, 683–84
scientific value of Apollo, 438
Nicks, Oran, 457
Nike-Zeus, 563
Nimbus satellites, 484
Noa, U.S.S., 228
North, Warren J.
biographical information, 797
Joint Manned Satellite Panel, 86
Mercury program: astronaut selection, 127; MA-7 pilot debriefing, 230;
Redstone missile procurement, 117
MIS program, 120
Research Steering Committee on Manned Space Flight, 441
North American Aviation
Apollo spacecraft: building of, 522; contract award to, 398, 547; evaluation of,
553–55, 556–57; problems with, 421, 424; production of, 663; proposal, 507,
550, 551
booster decisions and, 543
criticism of, 423
direct ascent mode studies, 576
management of, 423–24
Rocketdyne Division, 165, 522
Saturn S-II program, 555
Saturn V production, 663
work schedule at, 591
North American Rockwell, 708, 709
Northrup, 7, 52, 66–67
Nova
acceptance of, 525
Apollo program launch vehicles, 399, 400, 401, 494
development of, 399, 442, 462–64
direct ascent mode, 400
features of, 396, 521
launch facilities for, 396–97
lunar landing operations, 499, 529
recommendations against, 402–3, 540–44

Oberth, Hermann, 80
O’Connor, E. F., 664
Oppenheimer, Carl, 681
Orbiting Solar Observatory, 752, 758, 759
O’Sullivan, S., 763
O’Sullivan, W. J., 49
P

Pacific Missile Range, 483
Page, Lincoln R., 762
Paige, Hilly, 708
Paine, Thomas O.
  Apollo 8, 428, 430, 691, 692, 696, 697, 698, 699, 703, 709, 710, 716–18
  Apollo 11, 729
  biographical information, 428, 797
  NASA position, 428, 429, 432
  quarantine procedures and back contamination, 665, 678–79, 681
  resignation of, 436, 750
  Saturn V production termination, 436
Papine, J. J., 764
Paris International Air Show, 43
Park, A. B., 673, 680
Parsons, John F., 514
Patterson, Herbert G., 123
Patterson, William H., 64
Pegasus spacecraft, 644
Petrone, Rocco A., 693, 694, 696, 698, 707, 717
Philco-Ford, 708
Phillips, G. Briggs, 674
Phillips, Samuel C.
  Apollo 1 (204) fire, 422
  Apollo 7, 698–99, 706
  Apollo 8, 427, 428, 430, 690, 691, 692, 693, 694, 696, 697, 699–700, 701–4,
    707–8, 709, 710–16, 717
  Apollo 11, 432, 721–26, 727, 729
  Apollo Programs Office assignment, 413
  biographical information, 797–98
  North American Aviation review by, 423, 424, 629–39, 661–64
Phinney, Robert A., 763
Pickering, John E., 674
Piland, Joseph V., 674
Piland, Robert O., 510, 511, 549
Pilotless Aircraft Research Division (PARD), 4–5, 49
Pioneer spacecraft, 758, 759
Polaris ICBM program, 137, 563
Pratt & Whitney, 708–9n1
Preacher, Brooks C., 510
President's Science Advisory Committee (PSAC)
  Apollo 8, 709, 710, 717
  Apollo Applications Program, 640
  Bioastronautics Panel, 575
  human spaceflight study, 389
  human spaceflight views of, 472
  LOR concept, 585
  Mercury program review, 177
  Space Vehicle Panel, 404, 569, 574–75
Program Planning Committee (NASA), 441
Project Apollo. See Apollo, Project
Project Astronaut, 124–25, 128
Project Gemini. See Gemini, Project
Project Mercury. See Mercury, Project
Project Sure Fire, 384
Prospector flights, 468
Proton launch vehicle, 426, 430, 687
Provasoli, Luigi, 681
Public Health Service, U.S., 673, 674, 679, 680, 681, 683, 743
Purser, Paul E., 117–20, 123
Putt, Donald L., 9

R

Radio Corporation of America, 550
Randolph Air Force Base, 141
Ranger flights
missions for lunar surface information, 407, 467, 485, 498, 559–62, 564, 565
schedule for, 467, 485
technological advancements from, 468, 493
Redstone ballistic missiles
abort sensing and implementation system (ASIS), 182
cost of, 126
development of, 28–29
Mercury-Redstone missions, 203, 241; MR-1, 30, 241; MR-1A, 30; MR-2, 30,
140, 142, 179, 180, 183, 188; MR-3, 173–75, 188, 189, 190; MR-4, 32–33,
33n103, 207–9; MR-BD, 183; termination of, 209–10
payload capabilities, 126
procurement of, 12, 117–20
reliability of, 183, 184, 187, 189
Rees, Eberhard F. M., 664, 694, 717
Reid, H. J. E., 49
Republic Aviation Corporation, 7, 52, 69–70, 507, 550
Research Steering Committee on Manned Space Flight, 388, 440–48
Reston, James, 19
Reynolds, John, 764
Rice University, 35, 396
Ricker, Harry H., Jr., 123
Right Stuff, The, 24–25, 24n79, 32
Robert, Frank C., 123
Robinson, Marvin, 214
Robotic explorers, 3–4
ROBO-type glider, 7, 52, 67–69
Rocketdyne Division, North American Aviation, 165, 522
Rollins, Joseph, 123
Romick, Darrell, 65–66
Roosa, Stuart, 435
Rosen, Milton, 399, 441, 442, 798
Rover program, 476–77, 547
Ruby, William W., 750, 762
Ruppe, Harry O., 494–501

S

Sagan, Carl, 743
Salinger, Pierre, 237–38, 393, 474–76
Salmon, E. E., 743
Sam, 138, 140
SAMOS, 563, 564
Sartor, Ronelda F., 123
Saturn rockets
  assembly plant for, 397
  C-2: features of, 521; lunar landing operations, 523; lunar surface rendezvous, 498; manned lunar mission use of, 462, 463–64; payload capabilities, 461–62, 496
  C-3: features of, 521; lunar landing operations, 499, 523, 526, 532–33; payload capabilities, 496, 526–27
  C-4, 533
  C-8, 522, 540–44
development of, 390n5
Gemini circumlunar mission proposal, 40, 274
launch facilities for, 396–97
lunar landing operations, 499
Michoud plant, 397, 541–42
payload capabilities, 442, 461–62, 484
priority status of program, 563
Saturn I (C-1), 522; cancellation of missions, 413; lunar landing operations, 532–33, 534, 536; mission objectives, 420; payload capabilities, 461; refueling operations, 462; work schedule, 482
Saturn IB (C-1), 522; Apollo Applications Program, 641, 645; circumlunar mission study, 40, 274; mission objectives, 420; mission schedule, 413; testing of, 608, 611
Saturn IC, 542
Saturn II, 542, 555
Saturn V (C-5), 522; Apollo Applications Program, 641, 645, 688;
development of, 277–78, 390n5, 399, 536; direct ascent mode, 540; funding for, 602–3; LOR concept and, 403, 537–38; Phillips report on, 423, 629–39; production of, 663; production termination, 421–22, 436, 687–88; schedule for, 421, 591–92, 602–3, 608, 611, 629, 649–51; technical problems with, 412, 420–21, 426–27; testing of, 424
value of, scepticism about, 390, 390n4
workforce responsible for, 543
Saulman, Ernest, 673
Scheer, Julian
  Apollo 8, 717
  Apollo 11, 433, 726–29, 735, 738
biographical information, 798
  Gemini missions, celebrations following, 43, 288–90
Scherer, Lee, 738
Schirra, Walter M., Jr.
  Apollo 7, 429
  biographical information, 799
  Gemini VI-A (GT-6), 46, 345–57
  Gemini VIII (GT-8), 358
  neck dam work for Grissom, 209
  orbital flight of, 34, 248, 249, 252
  press conference to introduce astronauts, 18
  specialty area assignment, 26, 166
  visits with Russian cosmonauts, 149–51
Schmitt, Roman A., 762
Schneider, William C., 278, 279–81, 696, 698, 799
Schoemaker, Eugene, 763
Schonfeld, Ernest, 764
School of Aviation Medicine, Brooks Air Force Base, 138, 140
School of Aviation Medicine, Randolph Air Force Base, 141
Schubert, Gerald, 764
Schurmeier, Harris M., 441, 446–47, 448
Schweickart, Russell L., 431, 799–800
Science and Technology, Office of, 418, 569
Science and Technology Advisory Committee (STAC), 709, 717, 724
Scott, David R.
  Apollo 9, 431
  Apollo 15, 21n70, 439
  biographical information, 800
  Gemini VIII (GT-8), 47, 345, 357–62
Scripps Oceanographic Institute, 681
Sea of Tranquility, 432, 560, 561
Seamans, Robert C., Jr.
  Apollo program: Apollo 1 (204) fire review, 422, 651, 652–53, 654, 655, 657;
    launch facilities for, 397; management of, 400, 413, 423; mission control
    center location, 566–68; mission mode decisions, 400–402, 521, 522–30;
    Phillips report on North American Aviation, 423; procurement plan, 501,
    502–12; review of, 413, 608; schedule for, acceleration of, 593, 596–98, 601;
    spacecraft contract, 547
  biographical information, 800–801
  Gemini program: approval for development plan, 253; circumlunar mission
    proposal, 273; EVA for GT-4, 291, 292–96; GT-6 and GT-7, rendezvous
    between, 346; naming of, 38, 264–65; review of, 370, 371–73
  on Holmes, 409
  Manned Lunar Working Group Task Force report, 458–71
  Mercury program, 228–30, 237
  on Mueller, 412
  NASA budget approval, 392
  NASA positions of, 391, 420
  resignation of, 424, 428
  Webb, relationship with, 424
Seitz, Frederick, 665, 678–81
Senate, U.S.
Aeronautical and Space Sciences Committee, 277, 391, 414, 423
Apollo 1 (204) fire review, 651–52, 654, 655
criticism of Apollo program, 414–15, 604
Foreign Relations Committee, 415
Phillips report on North American Aviation, 423, 424, 661–65
quarantine procedures and back contamination, 408, 665–66, 682–84
Sencer, David J., 673, 743
Shapley, Willis H.
Apollo 8, 709, 717
Apollo 11 symbolic activities planning, 432–33, 726, 727, 729, 730–35
Apollo Applications Program, 639, 640
schedule for Apollo program, acceleration of, 593
Shea, Joseph F.
Apollo 1 (204) fire, 424, 664
Apollo program management, 400, 413
astronaut selection, 406, 558–59
biographical information, 801
LOR concept, 402, 403, 520, 521, 535
LOR concept, White House objections to, 403–4
Manned Spacecraft Center assignment, 413
resignation of, 424
Shepard, Alan B., Jr.
accidents, contingency plans for, 367
Apollo 14, 435
as Astronaut Office chief, 367
biographical information, 801
press conference to introduce astronauts, 17, 18
propaganda use of, 31, 205–7
public image of, 31
specialty area assignment, 25, 166
suborbital flight by, 31, 192–203, 241, 394, 395, 478, 479
visits with Russian cosmonauts, 149–51
Shultz, George, 750, 751
Sidey, Hugh S., 393, 474–76, 801
Siepert, A. E., 126
Silver, Leon T., 762
Silverstein, Abe
Apollo program, naming of, 389
biographical information, 801–2
Manned Lunar Working Group Task Force, 457–58
Mercury program: animal payloads, 141; astronaut selection, 136, 173–75;
naming of, 123–25; television system for Mercury-Atlas flights, 211–12
MIS program, 120, 121
Skopinski, Ted H., 563–66
Skylab program
Apollo Applications Program, 421, 639
astronauts for, 406
budget for, 436, 749, 750
Saturn V launch vehicle, 421
scientific value of, 437, 751–53
space rescue plans, 284
Slayton, Donald K. “Deke”
  accidents, contingency plans for, 367
  Apollo 8, 427, 694, 696, 698, 699, 707
  Apollo 11, 734
  as Astronaut Office head, 23
  biographical information, 802
  circumlunar mission proposal, 204
  as Director of Flight Crew Operations, 229, 367
  flight crew assignments, 432
  pilot role of astronauts, 23
  press conference to introduce astronauts, 17, 18
  specialty area assignment, 26, 166
  suborbital flight by Shepard, 196
  visits with Russian cosmonauts, 149–51
Slobodki, Lawrence B., 742
Smiley, Gerry, 709
Smith, Margaret Chase, 654
Sonnett, Charles P., 406–7, 559, 764, 802
Sorensen, Theodore
  Apollo program: mission mode decision, 406; progress on, 400, 544–47
  astronaut activities guidelines, 237
  oral history interview, 625–29
  space race with Soviets meeting, 475
U.S.-Soviet cooperation, 416–17, 612, 627
on Webb appointment, 391, 629
Soulé, Hartley A., 49
Source Evaluation Board
  Apollo spacecraft, 398, 506, 508, 547–58
  Business subcommittee, 511–12, 551–53
  membership of, 502, 507–8, 510–11
  Mercury spacecraft, 26
  Technical subcommittee, 511, 551–53
Source Selection Board, 126
Soviet Union
  animal payloads, 191, 468
  cosmonauts: training of, 13; visits with NASA astronauts, 43, 149–51
  EVA by, 44, 268, 292, 293, 294
  Gagarin’s flight, 30, 82, 177, 391, 392, 612
  lunar fly-by mission of, 277
  lunar landing program, 417, 417n46, 418, 425–26, 430, 685–87, 692
  satellite launches, 6, 51
  space race against, 392–95, 474–93
  successes in space by, 82
U.S.-Soviet cooperation, 391, 416–19, 417n46, 612–16, 753
Soyuz spacecraft, 426, 430
Space Exploration Program Council (NASA), 389–90
Space Flight Development, Office of, 441
Space General Corporation, 550
Space Science and Applications, Office of, 640, 674, 742
Space Science Board, 388, 392, 408, 471–74, 616, 617, 740–49, 750
Space Science Steering Committee, 558–59
Space Sciences, Office of, 616–18
Space Shuttle, 4, 436, 437, 757
Space station. See also Freedom (space station)
  importance of, 460
  NASA plan for, 2
  U.S.-Soviet cooperation, 753
  Von Braun's plan for, 3
Space Task Group
  animal payloads, 141, 144
  Apollo program: procurement plan, 502, 505, 506; responsibility for, 399
  creation of, 12
  future of space exploration, 436
  medical aspects of spaceflight, 187, 190–91
  membership of, 122–23
  Mercury program: management of, 120, 121–23; Mercury Seven, training
  of, 165–66; Mercury-Redstone program termination, 210; spacecraft
  development, 126, 177, 185, 447
  reliability analysis, 186–87
  relocation of, 35, 229, 395
  responsibilities of, 179, 242–43
  workforce, 243–44
Space Technology Laboratories, 165, 412, 550, 551, 576
Spacecraft. See under Apollo, Project; Manned Satellite Project; Gemini, Project;
Mercury, Project
Spaceflight. See human spaceflight
Spizizen, John, 742, 748
Sputnik I, 6, 51
Sputnik II, 6, 51
Staats, Elmer, 593
Stafford, Thomas P., 46, 345–57, 432
Stans, Maurice, 72, 73–74
State, U.S. Department of, 363, 365
Stearn, Jacquelyn B., 123
Stockdale, James B., 159
Stoner, George, 709
Storms, Harrison A., 177–92, 423
Stosick, Arthur, 75
Strang, Charles F., 652–53, 657–61
Strass, Kurt, 441, 447
Strobell, J. D., Jr., 764
Surveyor flights
  missions for lunar surface information, 407, 467, 498, 560, 565, 646–48
  technological advancements from, 468, 493, 498
Swigert, Jack, 435
Symbolic Activities Committee, 432–33, 727, 729, 730–35
Syvertson, Clarence, 54
Taylor, C. L., 719
Taylor, Gerald R., 743
Taylor, Paul D., 123
Teague, Olin E.
  Apollo 1 (204) fire review, 654, 662
  Gemini circumlunar mission proposal, 40–41, 273, 277–78
Teller, Edward, 9, 650, 802–3
Thomas, Albert
  Apollo program facilities, 396, 512
  biographical information, 803
  dinner for, 419
  U.S.-Soviet cooperation, 418, 612, 613–14
Thompson, Floyd L.
  Apollo 1 (204) fire review, 422, 651, 652–53, 654, 655, 657–61
  Apollo 8, 717
  Space Task Group, 123
Thompson, T. W., 762
Thor, 126
Tindall, Howard W. “Bill,” 426, 688–90, 803
Tindallgrams, 426, 689
TIROS satellites, 484
Tischler, Adelbert O., 52–71, 413, 608, 609–10
Titan II ballistic missiles
  cost of, 264
  as Gemini launch vehicles, 38, 39, 253, 255–56
  pogo effect, 39
  priority status of program, 563
  procurement of, 256
  success of, 373
Titan III ballistic missiles, 253, 275, 555
Titov, Gherman, 149
Tobias, Cornelius, 177–92
Treaty on Peaceful Uses of Outer Space, 433, 731
Trimble, George, 58–59
Truax, Robert, 76
Truszynski, Gerald M., 717
Turnock, James, 674

U

Ulrich, George E., 764
United Aircraft, 708
United Nations, 417–18, 427–28, 612, 613, 692
University of Iowa, 407, 616, 617
University of Michigan, 290, 291
University of Pennsylvania, 673
Urey, Harold C., 646–48, 763
U.S. Air Force. See Air Force, U.S.
U.S. Army. See Army, U.S.
U.S. Department of Defense. See Defense, U.S. Department of (DOD)
U.S. Information Agency, 211

V

V-2 ballistic missile, 2
Van Allen, Dr., 576
Van Bockel, J., 358
Van Dolah, Robert, 654, 655, 657–61
Vance, Cyrus, 42, 283, 285–87, 803
Vanguard program, 51, 83, 137, 556
Vega, 446, 447
Venus, 686
Vietnam War, 420
Viking, 757
Vishniac, Wolf, 673, 679–81, 742
Voas, Robert B.
  biographical information, 803–4
  Mercury program: astronaut selection and training, 127; astronaut training,
    22, 161–72; MA-6 pilot debriefing, 223–24; propaganda value of, 212–14
Vogel, L. W., 291–92, 293–96
Vogeley, Arthur W., 530
Von Braun paradigm, 3–4
Von Braun, Wernher
  advocacy role of, 2–3
  Apollo program: all-up testing, 414; Apollo 8, 427, 694, 696, 697, 717; EOR
    concept, 521; launch vehicle development, 399; LOR concept, 403, 521,
    535–44, 587; LOR concept, dispute over, 404–5; schedule for, 421, 649–51
  biographical information, 147, 804
  character of, 649
  Gemini circumlunar mission proposal, 273
  liquid fuel propulsion systems, 398
  Mercury program: circumlunar mission proposal, 203–5; Mercury-Redstone
    program termination, 209–10; Redstone missile procurement, 29, 117;
    spacecraft design ideas, 80; spacecraft oversight, 27, 147–48; visit with
    Mercury Seven, 160
  reputation of, 147
  rocket and missile development, 2
  Saturn rocket development, 390n5
  space exploration plan of, 3–4
  space race with Soviets review, 394, 478, 485–90
  space rescue plans, 283

W

Wallops Island, Virginia, 4n9, 49
  Little Joe flights, 138, 142, 143, 144
  work schedule at, 483
Warner, Jeffrey L., 763
Wasrik, U.S.S., 348
Wasson, John, 763
Waterman, Alan, 471
Watkins, Julia R., 123
Watkins, Shirley, 123
Watson, Marvin, 288–91
Webb, James E.
  Anderson, relationship with, 423, 424
appointment of to NASA, 391, 629
biographical information, 391, 804
Congress, relationship with, 424, 662
Holmes, relationship with, 409, 410, 588
Johnson, meeting with, 429
Mercury program: astronaut activities guidelines, 229–30, 236–38; MA-6 postlaunch telegram, 214–23; propaganda use of astronauts’ experiences, 205–7
NASA budget approval, 392
National Space Plan recommendations, 394–95, 478–79, 490–93
North American Aviation, management of, 423–24
post-Apollo planning, 422
resignation of, 429
Saturn V production termination, 421–22, 687–88
scientific value of human spaceflight, 392, 471–74
Seamans, relationship with, 424
Soviet lunar landing program, 425
space preeminence goal, 411, 412, 598–600
space race with Soviets meeting, 393
success of, 422
U.S.-Soviet cooperation, 417, 418–19
Weeks, Michael, 64–65
Weinberger, Caspar W., 437, 749, 753–60, 804
Welsh, Edward C.
  Apollo program, 593
  biographical information, 804–5
  space rescue plans, 283, 284, 286, 287
Western Electric, 243
Wetherill, George, 763
Whitbeck, Phillip H., 511
White, Edward H., Jr.
Apollo 1 (204) fire, 422, 651, 652
biographical information, 805
Gemini IV (GT-4): altitude chamber testing approval, 292; celebration
following mission, 43; debriefing following, 298–344; EVA during, 39, 44,
268, 297, 298–344
visits with Russian cosmonauts, 43, 149
White, George C., Jr., 653, 657–61
White, S. C., 230, 511
White, Thomas D., 77–79
White Sands, NM, 397
Wickham, Paul, 177–92
Wiesner, Jerome B.
Ad Hoc Committee on Space, 390
Apollo program: funding for, 412, 601–3; LOR concept, 403–5, 568–85; LOR
concept, dispute over, 404–5, 569; mission mode decision, 406; progress on,
400, 544–47; schedule for, acceleration of, 411–12, 588, 589, 593, 598, 601–3
biographical information, 805
civilians as astronauts, 175–77
science advisor role of, 390
scientific value of human spaceflight, 392, 471–74
space race with Soviets meeting, 393, 475
space transition team chair, 472
spaceflight in response to Soviet launch, 31, 175–77
U.S.-Soviet cooperation, 418, 612, 613, 614–16
Webb appointment to NASA, 391
Williams, John J., 653, 657–61
Williams, Walter C.
biographical information, 805
circumlunar mission proposal, 204
Joint Manned Satellite Panel, 86, 87
MA-6 postlaunch telegram, 214–23
Mercury program review, 36, 239–45
Source Evaluation Board chair, 507, 510
Space Task Group membership, 179
spaceflight review board, 49
Wilson, Charles L., 151–58
Wise, Donald, 438
Wolman, William, 502
Wood, Clotaire, 72, 77, 78, 120
Wood, John, 763
Wooley, Bennic C., 743
Worden, Alfred, 21n70, 439
Wright Air Development Center, Aerospace Medical Laboratory, 15, 141, 151,
155, 157
Wright Air Development Division, 168, 169
WS-117L program, 83–84
X

X-20 Dyna-Soar program, 7, 52, 66–67, 80, 84, 442–43, 469

Y

Yardley, John F., 27, 275
Yeager, Chuck, 210
York, Dr., 75, 76–77, 146, 471
Young, John D., 511
Young, John W.
  Apollo 10, 432
  Apollo 16, 439
  Gemini III (GT-3), 21, 43, 290, 297
Youngquist, Roberson, 75, 86

Z

Zimmerman, Charles H., 49, 123, 126, 806
Zond, 426, 430, 692
The NASA History Series

Reference Works, NASA SP-4000:


Exploring the Unknown

Management Histories, NASA SP-4100:


Project Histories, NASA SP-4200:


SP-4207 not published.


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


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


Monographs in Aerospace History, NASA SP-4500:


No monograph 28.


Electronic Media, NASA SP-4600:


Conference Proceedings, NASA SP-4700:


Societal Impact, NASA SP-4800:
