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Biographical Appendix

A

Spiro T. Agnew (1918-1996) was elected vice president of the United States in November 1968, serving under Richard M. Nixon. He served as chair of the 1969 Space Task Group that developed a long-range plan for a post-Apollo space effort. *The Post-Apollo Space Program: Directions for the Future* (Washington, DC: President's Science Advisory Council, September 1969) developed an expansive program, including the building of a space station, a space shuttle, and a lunar base, as well as a mission to Mars (the last goal had been endorsed by the vice president at the time of the Apollo 11 launch in July 1969). President Nixon did not accept this plan, and only the Space Shuttle was approved for development. See Roger D. Launius, "NASA and the Decision to Build the Space Shuttle, 1969-72," *The Historian* 57 (Autumn 1994): 17-34.

Edward C. Aldridge, Jr. (1938-), spent his entire career in the aerospace community as a corporate and governmental official. He served as under secretary and then secretary of the Air Force during the Reagan administration. Before then, he was educated at Texas A&M University and the Georgia Institute of Technology, entering the Department of Defense (DOD) as assistant secretary for systems analysis from 1967 through 1972. He then went to LTV Aerospace Corporation for a year. In 1973 he was named as a senior management associate in the Office of Management and Budget (OMB) in Washington. Returning to DOD in 1974, he served as assistant secretary for strategic programs until 1976. He then moved back to private industry until reentering government service with the Air Force in 1981. See "Aldridge, Edward C.," biographical file, NASA Historical Reference Collection, NASA History Office, NASA Headquarters, Washington, D.C.

Anatoliy P. Aleksandrov (1903-) was a senior member of the of the Soviet Union's Academy of Sciences throughout much of the 1950s and 1960s and served as its president from 1980 to 1986. A physicist, Aleksandrov was born in the Ukraine and educated at Kiev State University. He was heavily involved in research on the physics of dielectrics and studies of the properties of compounds having high molecular weight. See "Aleksandrov, Anatoliy, P.," biographical file, NASA Historical Reference Collection.

Robert F. Allnut (1935-) was a longtime NASA employee throughout the 1960s and 1970s. Born in Richmond, Virginia, and educated at Virginia Polytechnic Institute (now known as Virginia Tech) and the George Washington University Law School, Allnut joined NASA in 1960 as a patent attorney. He then worked as a attorney with the Communications Satellite Corporation and as NASA's assistant general counsel (patents). In 1967 he was named as assistant administrator for legislative affairs; later, he was a member of the Apollo 13 Accident Review Board. He left NASA in 1983 to become legal counsel to the U.S. Committee for Energy Awareness. He became executive vice president for the Pharmaceutical Manufacturers Association. See "Allnut, Robert F.," biographical file, NASA Historical Reference Collection.

William A. Anders (1933-) was a career U.S. 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 XI and lunar module pilot for Apollo 8. Having resigned from NASA and the Air Force (active duty) in September 1969, he became executive secretary of the National Aeronautics and Space Council. He joined the Atomic Energy Commission in 1973 and became the chair 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 of operations for Textron, Inc. Anders retired as chief executive officer of General Dynamics in 1993, but he remained chairman of the board. See "Anders, W.A.," biographical file, NASA Historical Reference Collection.

Clinton P. Anderson (1895-1975) (D-NM) was elected to the House of Representatives in 1940 and served through 1945, when he was appointed secretary of agriculture. He resigned from that position in 1948 and was elected to the Senate, where he served until 1973. See *Biographical Directory of the United States Congress, 1774-1989* (Washington, DC: U.S. Government Printing Office, 1989).

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

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

J. Leland Attwood (1904-) was a long-standing official of North American Rockwell, Inc. He began work as an aeronautical engineer for the Douglas Aircraft Corporation in 1930, and he moved to North American in 1934. He became assistant general manager in 1938 and was named North American's first vice president in 1941. He became president in 1948 and served continually until 1970, when he retired. (The company eventually became known as North American Aviation.) See "J.L. Attwood," biographical file, NASA Historical Reference Collection.

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

B

George Ball (1909-1994) served as under secretary of state from 1961 to 1966. See *Who's Who in America, 1978-1979* (Chicago: Marquis Who's Who, 1978); NASA Headquarters Library, Washington, DC.

Richard J.H. Barnes was director of the International Affairs Division of the Office of External Relations at NASA throughout much of the 1980s. He had been a longtime NASA official, first coming to the agency in 1961 to work on international programs. See "Barnes, Richard J.H.," biographical file, NASA Historical Reference Collection.

Arnold O. Beckman (1900-) received his Ph.D. from the California Institute of Technology (Caltech) in 1928 and became an inventor and manufacturer of various analytical instruments. He became chairman emeritus of Caltech's Board of Trustees in 1981. See *Who's Who in America, 1996* (New Providence, NJ: Marquis Who's Who, 1995).

James E. Beggs (1926-) served as NASA administrator between July 10, 1981, and December 4, 1985, when he took an indefinite leave of absence pending disposition of an indictment from the Justice Department for activities taking place prior to his tenure at NASA. This indictment was later dismissed, and the U.S. attorney

general apologized to Beggs for any embarrassment. His resignation from NASA was effective on February 25, 1986. Prior to NASA, Beggs had been executive vice president and a director of General Dynamics Corporation in St. Louis. Previously, he had served with NASA in 1968-1969 as associate administrator for the Office of Advanced Research and Technology. From 1969 to 1973, he was under secretary of transportation. He went to Summa Corporation in Los Angeles as managing director of operations and joined General Dynamics in January 1974. Before joining NASA, he had been with Westinghouse Electric Corporation, in Sharon, Pennsylvania, and Baltimore, Maryland, for thirteen years. A 1947 graduate of the U.S. Naval Academy, he served with the Navy until 1954. In 1955, he received a master's degree from the Harvard Graduate School of Business Administration. See "Beggs, James E.," biographical file, NASA Historical Reference Collection.

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

Lloyd V. Berkner (1905-1967) was involved in most of the early spaceflight activities of the United States in some capacity. Trained as an electrical engineer, he was at first interested in atmospheric propagation of radio waves, but after World War II he became a scientific entrepreneur of the first magnitude. He was heavily involved in the planning for and execution of the International Geophysical Year in 1957-1958, and he served in a variety of positions in Washington where he could influence the course of science policy. See "Berkner, Lloyd V.," biographical file, NASA Historical Reference Collection.

Henry E. Billingsley (1906-) was appointed NASA's director of the Office of International Cooperation in January 1959. Previously, he had served in the Navy in World War II; he later joined the Department of State. See "Henry E. Billingsley," biographical file, NASA Historical Reference Collection.

Richard M. Bissell (1909-1994) was a Central Intelligence Agency (CIA) official who was the deputy director for plans during the Bay of Pigs incident. He also was involved in various reconnaissance programs such as the U-2 airplane. See Evan Thomas, *The Very Best Men* (New York: Simon and Schuster, 1995); Richard M. Bissell, *Reflections of a Cold Warrior* (New Haven, CT: Yale University Press, 1996); CIA History Office, Washington, DC.

Anatoli A. Blagonravov (1895-1975) was head of an engineering research institute in the Soviet Union. As Soviet representative to the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) in the early 1960s, he served as a senior negotiator, along with NASA's Hugh L. Dryden, for cooperative space projects at the height of the Cold War in the early 1960s. He worked in developing infantry and artillery weapons in World War II and on rockets afterward. See "Blagonravov, A.A.," biographical file, NASA Historical Reference Collection.

Nancy W. Boggess was a scientist at the Goddard Space Flight Center working on the Cosmic Background Explorer (COBE) spacecraft in the latter 1980s and early 1990s. See "Miscellaneous NASA," biographical file, NASA Historical Reference Collection.

Herman Bondi was director general of the European Space Research Organization from 1967 through the early 1970s and the organization's transformation into the European Space Agency. A British citizen, Bondi later served as science advisor to the minister for energy. See "Biography, Foreign Miscellaneous, A-D," file, NASA Historical Reference Collection.

Roger M. Bonnet (1938-) of France became director of scientific programs for the European Space Agency (ESA) in 1983. Previously, he had been director of the Stellar and Planetary Laboratory of the French National Scientific Research Center and chair of ESA's Space Science Advisory Committee from 1978 to 1980. See "ESA Names New Scientific Chief," *Defense Daily*, January 27, 1983, p. 144.

Walter F. Boone was an admiral, who, after retiring from the Navy, became the NASA's deputy associate administrator for defense affairs. He held this post until retiring from NASA in 1968. See "Boone, Walter F.," biographical file, NASA Historical Reference Collection.

Frank Borman (1928-) was the commander of the December 1968 Apollo 8 circumlunar flight. He had been chosen as a NASA astronaut in the early 1960s and had been on the Gemini VII mission in 1965. After leaving the astronaut corps, he became president of Eastern Airlines. See Andrew Chaiken, *A Man on the Moon: The Voyages of the Apollo Astronauts* (New York: Viking, 1994); Frank Borman, with Robert J. Serling, *Countdown: An Autobiography* (New York: William Morrow, 1988).

Robert R. Bowie (1909-) was the deputy director and then director of the Policy Planning Staff at the Department of State from 1953 to 1958. Afterward, he became a consultant to the Department of State. From 1966 to 1968, he returned to the State Department to serve as a counselor. Biographical information from the *Biographic Register of the Department of State, 1957*, Department of State History Office, Washington, DC.

Ernest W. Brackett joined NASA in 1959 as director of procurement, after a lengthy career as an attorney (1925-1942) in Utica, New York, an Army Air Forces officer (1942-1946), and a civilian in the Department of the Air Force (1946-1959). He served as director of NASA procurement until 1968, during the Apollo era, and was appointed chair of the Board of Contract Appeals in 1968. Later, he served as chair of the Inventions and Contributions Board, before retiring from NASA in 1972. See "Brackett, Ernest W.," biographical file, NASA Historical Reference Collection.

Willy Brandt (1913-1992) was chancellor of the Federal Republic of Germany from 1969 to 1974. See "Brandt, Willy," obituary section, *Current Biography Yearbook 1992*, p. 628, from obituary, *New York Times*, October 9, 1992, p. A23.

Wernher von Braun (1912-1977) was the leader of the so-called "rocket team" that 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. 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).

Leonid I. Brezhnev (1906-1982) was first secretary of the Communist Party of the Soviet Union between 1964 and 1982 and the Soviet leader during the entire official lunar program. He was responsible for the development of a succession of Soviet space stations built in the 1970s. See "Brezhnev, L.I.," biographical file, NASA Historical Reference Collection.

Geoffrey A. Briggs was director of the Solar System Exploration Division at NASA Headquarters throughout the 1980s. Educated in high-energy physics at the University of Virginia, Briggs became involved in the space program in 1967, working at Bellcomm, Inc., and at the Jet Propulsion Laboratory, where he was principal investigator on the Mariner Mars 1971 imaging team. He also worked on the Viking Orbiter imaging team and was leader of the Voyager imaging team. See "Briggs, Geoffrey A.," biographical file, NASA Historical Reference Collection.

Detlev W. Bronk (1897-1975), a scientist, was president of the National Academy of Sciences, 1950-1962, and a member of the National Aeronautics and Space Council. He also was president of Johns Hopkins University, 1949-1953, and Rockefeller University, 1953-1968. See "Bronk, Detlev," biographical file, NASA Historical Reference Collection.

Overton Brooks (1897-1961) (D-LA) was elected to represent Louisiana in the House of Representatives for twelve successive terms since 1937. He became chair of the House Committee on Science and Astronautics in January 1959 and was reappointed to this position in 1961. See "Brooks, Overton," biographical file, NASA Historical Reference Collection.

Wilber M. Brucker (1894-1968) was secretary of the Army between 1955 and 1961. An attorney, he had also held a number of important government positions, including governor of Michigan (1930-1932), prior to becoming secretary. Brucker had served with the Army in World War I. After leaving federal service, Brucker returned to his law practice in Detroit. See William Gardner Bell, *Secretaries of War and Secretaries of the Army: Portraits & Biographical Sketches* (Washington, DC: Center of Military History, 1982), p. 140; *New York Times*, October 29, 1968, p. 41.

Percival Brundage (1892-1981) was deputy director and then director of the Bureau of the Budget, 1954-1958. Thereafter, he worked in a series of business and financial positions.

McGeorge Bundy (1919-1996) was a professor of government before serving as the national security advisor to Presidents Kennedy and Johnson, 1961-1966. See *Who's Who in America, 1996* (New Providence, NJ: Marquis Who's Who, 1995).

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

C

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

Eugene A. Cernan (1934-), a career naval aviator, was chosen by NASA to enter the astronaut corps in the third group, in 1963. He served as the pilot of Gemini IX upon the death of a prime crew member. He was also backup pilot for Gemini XII, backup lunar module pilot for Apollo 7, lunar module pilot for Apollo 10, backup commander for Apollo 14, and commander for Apollo 17 (becoming the eleventh American to walk on the Moon). Thereafter, he served as deputy director of the Apollo-Soyuz Test Project before resigning from NASA and the Navy on July 1, 1976, to become executive vice president-international at Coral Petroleum, Inc., in Houston. Later, he headed the Cernan Corporation in Houston. See "Eugene A. Cernan," biographical file, NASA Historical Reference Collection.

Robert H. Charles (1914-) became a special assistant to the NASA administrator in 1963, with responsibility for working with industry to accomplish Project Apollo. He was especially involved in the creation of incentive contracting mechanisms at the agency to reward exceptional performance by contractors. Previously, he had been an executive with the McDonnell Aircraft Corporation. After remaining with NASA for a short time, Charles became assistant secretary of the Air Force, where he was involved in the development of the C-5A total procurement package contract of the mid-1960s. He left that position in 1968 to return to industry. See "Biography, NASA Miscellaneous, Ch-Ci," file, NASA Historical Reference Collection.

William P. Clements, Jr., served as deputy secretary of defense from 1973-1977. He also was governor of Texas from 1979 to 1983 and from 1987 to 1991. See *Department of Defense Key Officials* (Washington, DC: Historical Office, Office of the Secretary of Defense, 1995).

William J. (Bill) Clinton (1946-) became president of the United States in 1993. Previously, he served as governor and attorney general of Arkansas.

Charles W. Cook served during the 1970s and 1980s as deputy under secretary and deputy assistant secretary of the U.S. Air Force in the Office of Plans, Policy and Operations of Space Systems. He also worked in the Office of the Secretary of Defense as director for defensive systems and served in positions in the Advanced Research

Projects Agency, the Central Intelligence Agency, and various aerospace companies. Since retiring from formal government service in 1988, Cook has worked as a consultant to the Institute for Defense Analyses, ANSER, the Defense Science Board, and several other aerospace organizations in areas related to U.S. and foreign space activities.

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

Edgar M. Cortright (1923-) earned an M.S. in aeronautical engineering from Rensselaer Polytechnic Institute in 1949, the year after he joined the staff of Lewis Flight Propulsion Laboratory. He conducted research at Lewis on the aerodynamics of high-speed air induction systems and jet exit nozzles. In 1958 he joined a small task group to lay the foundation for a national space agency. As soon as NASA was created, he became chief of advanced technology at NASA Headquarters, directing the initial formulation of the agency's meteorological satellite program, including the TIROS and Nimbus projects. After becoming assistant director for lunar and planetary programs in 1960, Cortright directed the planning and implementation of such projects as Mariner, Ranger, and Surveyor. He became deputy director and then deputy associate administrator for space science and applications in the next few years. In 1967 he was deputy associate administrator for manned space flight. In 1968 he became director of the Langley Research Center, a position he held until 1975, when he went to work for private industry, becoming president of the Lockheed-California Company in 1979. See "Cortright, Edgar M.," biographical file, NASA Historical Reference Collection.

Laurence C. Craigie (1902-1994) was a career Air Force officer and the first U.S. military jet pilot in 1942 when he flew the Bell XP-59. A graduate of the U.S. Military Academy at West Point, in 1923 he went into the Army Air Corps and became a pilot. In World War II, he served in a variety of weapons development programs, as well as in a combat role in North Africa and Corsica. After the war, he directed the Air Force's research and development programs, serving as deputy chief of staff for development, 1951-1954, and commander of Allied Air Force in southern Europe before his retirement following a heart attack in 1955. See "Lieut. Gen. Laurence Craigie, 92; First Military Jet Pilot for the U.S.," *New York Times*, March 1, 1994.

Malcolm R. Currie (1927-) was trained in physics and electrical engineering at the University of California at Berkeley and served in the U.S. Navy from 1944 to 1947. After military service, he returned to school to complete his Ph.D. In 1954 he joined Hughes Research Laboratories, eventually serving as director, before becoming vice president of Hughes Aircraft from 1964 to 1969. He then worked for Beckman Instruments, Inc., but in 1973 President Nixon appointed him director of Defense Research and Engineering in the Department of Defense, where he served until returning to Hughes in 1977. See "Currie, Dr. Malcolm R.," biographical file, NASA Historical Reference Collection.

D

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

James H. Douglas, Jr. (1899-1988), was secretary of the Air Force, 1957-1959, and deputy secretary of defense, 1959-1961. Trained as an attorney, Douglas practiced most of his career in Chicago but served as fiscal assistant

secretary of the treasury, 1932-1933, and under secretary of the Air Force, 1953-1957, before serving as Air Force secretary. At the conclusion of the Eisenhower administration, Douglas rejoined his old law firm, Gardner, Carton, Douglas, Chilgren & Waud. See "Miscellaneous Department of Defense (DOD)," biographical file, NASA Historical Reference Collection.

Charles Stark (Doc) Draper (1901-1987) earned his Ph.D. in physics at the Massachusetts Institute of Technology (MIT) in 1938 and became a full professor there the following year, when he founded the Instrumentation Laboratory. Its first major achievement was the Mark 14 gyroscopic gunsight for Navy anti-aircraft guns. Draper and the laboratory applied gyroscopic principles to the development of inertial guidance systems for airplanes, missiles, submarines, ships, satellites, and space vehicles—notably those used in the Apollo Moon landings. See John Noble Wilford, "Charles S. Draper, Engineer, Guided Astronauts to the Moon," *New York Times*, July 27, 1987, p. 2; Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1990), especially pp. 64-94; C. Stark Draper, "The Evolution of Aerospace Guidance Technology at Massachusetts Institute of Technology, 1935-1951: A Memoir," in R. Cargill Hall, ed., *Essays on the History of Rocketry and Astronautics*, Vol. II (Washington, DC: NASA Conf. Pub. 2014, 1977), pp. 219-252.

Hugh L. Dryden (1898-1965) was a career civil servant and an aerodynamicist by discipline who had also begun life as 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 University (1916). Three years later, he earned his Ph.D. in physics and mathematics from the same institution, even though he had been employed full time by 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 bureau's aerodynamics section. 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 of Standards 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 to 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: The Johns Hopkins University Library, 1974); Michael H. Gorn, *Hugh L. Dryden's Career in Aviation and Space*, Monographs in Aerospace History #5 (Washington, DC: NASA, 1996).

Lee A. DuBridge (1901-1994), a physicist with a Ph.D. from the University of Wisconsin (1926), became director of the radiation laboratory at the Massachusetts Institute of Technology after an academic career capped by a deanship at the University of Rochester, 1938-1941. He was president of the California Institute of Technology between 1946 and 1969, when he resigned to serve as presidential science advisor to Richard Nixon. He had been involved in several governmental science advisory organizations before taking up his formal White House duties in 1969 and serving in that capacity until 1970. See "Lee A. DuBridge," biographical file, NASA Historical Reference Collection.

Allen W. Dulles (1893-1969), brother of President Eisenhower's more famous secretary of state, served as director of the Central Intelligence Agency (CIA) from 1953 to 1961. See "Miscellaneous Other Agencies," biographical file, NASA Historical Reference Collection.

John Foster Dulles (1888-1959) served as secretary of state under President Eisenhower, 1953-1959. See "Miscellaneous Other Agencies," biographical file, NASA Historical Reference Collection.

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

E

Burton I. Edelson (1926-) was NASA's associate administrator for space science and applications between 1982 and 1988. He earned his B.S. from the U.S. Naval Academy in 1947 and served for 20 years in the service. He then returned to school and received a Ph.D. from the University of California at San Diego in 1969. Thereafter, he worked with the Communications Satellite Corporation for 14 years before arriving at NASA. See "Edelson, Bert I.," biographical file, NASA Historical Reference Collection.

Raymond Einhorn was a former General Accounting Office auditor who joined NASA in 1960 as its director of audits. He served in this position throughout the 1960s. See "Assorted NASA Officials," biographical file, NASA Historical Reference Collection.

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

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

F

Konstantin Petrovich Feoktistov (1926-) worked as a spacecraft engineer and cosmonaut. As a cosmonaut, he flew on the Voskhod 1 mission in 1964 and was also flight director on the Soyuz 18/Salyut mission in 1975. See *Who's Who in Russia and the New States* (London: J.B. Tauris and Co., 1993).

Peter M. Flanigan (1923-) was an assistant to President Nixon on the White House staff, 1969-1974. Previously, he had been involved in investment banking with Dillon, Read, and Company. He returned to business when he left government service. His position in the White House involved him in efforts to gain approval to build the Space Shuttle during the 1969-1972 period. See "Miscellaneous Other Agencies," biographical file, NASA Historical Reference Collection.

James C. Fletcher (1919-1991) was born on June 5, 1919, in Millburn, New Jersey. He received an undergraduate degree in physics from Columbia University and a doctorate in physics from the California Institute of Technology. After holding research and teaching positions at Harvard and Princeton Universities, he joined Hughes Aircraft in 1948 and later worked for the Guided Missile Division of the Ramo-Wooldrige Corporation. In 1958 Fletcher co-founded the Space Electronics Corporation in Glendale, California, which after a merger became the Space General Corporation. He was later named systems vice president of the Aerojet General Corporation in Sacramento, California. In 1964 he became president of the University of Utah, a position he held until he was named NASA administrator in 1971, serving until 1977. He also served as NASA administrator a second time, for nearly three years following the loss of the Space Shuttle *Challenger* in 1986 until 1989. During his first administration at NASA, Dr. Fletcher was responsible for beginning the shuttle effort. During his second tenure, he presided over the effort to recover from the *Challenger* accident. See Roger D. Launius, "A Western Mormon in Washington, DC: James C. Fletcher, NASA, and the Final Frontier," *Pacific Historical Review* 64 (May 1995): 217-41.

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

John S. Foster, Jr. (1922-), is a physicist who served as director of Defense Research and Engineering from 1965 to 1973, when he moved to the private sector. He has served on a number of scientific and technical government advisory boards. In 1995, he was the chair of a NASA federal laboratory review team. In 1992, he served on the Vice President's Space Policy Advisory Board that reviewed U.S. space policy after the cold war. See "Foster, John S., Jr.," biographical file, NASA Historical Reference Collection.

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

Arnold W. Frutkin (1918-) was deputy director of the U.S. National Committee for the International Geophysical Year in the National Academy of Sciences when NASA hired him in 1959 as director of international programs, a title that changed in 1963 to assistant administrator for international affairs. In 1978 he became associate administrator for external relations, a post he relinquished in 1979 when he retired from federal service. During his career, he had been NASA's senior negotiator for almost all of the important international space agreements. See "Arnold W. Frutkin," biographical file, NASA Historical Reference Collection.

G

Charles A. Gabriel served as U.S. Air Force chief of staff between 1983 and 1986 and was the highest ranking uniformed official in the service. See "Miscellaneous DOD," biographical file, NASA Historical Reference Collection.

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. See "Gagarin, Yuri," biographical file, NASA Historical Reference Collection.

Thomas S. Gates (1906-1983) was a businessman who served as secretary of the Navy and then, from 1959 to 1960, as secretary of defense. See Office of the Secretary of Defense Historical Branch, Department of Defense, Washington, DC; *Who's Who in America, 1972-1973* (Chicago: Marquis Who's Who, 1972).

Roswell L. Gilpatric (1906-) is a retired attorney who served as deputy secretary of defense from 1961 to 1964. See *Who's Who in America, 1996* (New Providence, NJ: Marquis Who's Who, 1995).

Robert R. Gilruth (1913-) was a longtime NACA engineer working at the Langley Aeronautical Laboratory, 1937-1946, then chief of the Pilotless Aircraft Research Division at Wallops Island, 1946-1952, who had been exploring the possibility of human spaceflight before the creation of NASA. He served as assistant director at Langley, 1952-1959, and as assistant director (crewed satellites) and head of Project Mercury, 1959-1961—technically assigned to the Goddard Space Flight Center but physically located at Langley. In early 1961, T. Keith Glennan established an independent Space Task Group (already the group's name as an independent subdivision of Goddard) under Gilruth at Langley to supervise the Mercury program. This group moved to the Manned Spacecraft Center in Houston in 1962. Gilruth was then director of the Houston operation from 1962 to 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 February 20, 1962, Mercury-Atlas 6 (*Friendship 7*) mission, the first American orbital flight, making three orbits. 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).

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

Daniel S. Goldin (1940-) became the ninth NASA administrator in April 1992 and immediately began to earn a reputation as an "agent of change" by bringing reform to America's space agency. In addition to implementing many management changes, Goldin negotiated with his Russian counterpart, Yuri Koptev, the head of the Russian Space Agency, to construct an international space station with a partnership involving fourteen nations. Before coming to NASA, Goldin was vice president and general manager of the TRW Space & Technology Group in Redondo Beach, California. During a twenty-five-year career at TRW, he managed the development and production of advanced spacecraft, technologies, and space science instruments. Goldin began his career as a research scientist at NASA's Lewis Research Center in Cleveland in 1962, where he worked on electric propulsion systems for human interplanetary travel. See "Daniel S. Goldin," biographical file, NASA Historical Reference Collection.

Nicholas E. Golovin (1912-1969), born in Odessa, Russia, but educated in this country (Ph.D. in physics at George Washington University in 1955), worked in various capacities for the government during and after World War II, including 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 deputy associate administrator at 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. See his obituaries, *Washington Star*, April 30, 1969, p. B-6, and *Washington Post*, April 30, 1969, p. B14.

Mikhail S. Gorbachev (1931-) became leader of the Soviet Union in 1985 and restructured the nation, presiding over the demise of the communist state and the end of the cold war in 1989. In the process, he opened negotiations with the United States for significant international cooperation in space exploration. See Thomas G. Butson, *Gorbachev: A Biography* (New York: Stein and Day, 1985); "Gorbachev, Mikhail Sergeyevich," biographical file, NASA Historical Reference Collection.

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

Richard W. Gutman (1921-) is a retired auditor and accountant who worked at the General Accounting Office (GAO) on defense and international programs. From 1968 to 1972, he was deputy director of the Defense Division, and when he retired from GAO in 1981, he was the director for the Defense Programs Planning and Analysis Staff. See *The GAO Review* (Fall 1968, Summer 1978, and Spring 1982) GAO's *Office of Personnel Management: Professional Staff Register*, entry for Gutman dated September 30, 1970. This information was obtained from the GAO Law Library, Washington, DC.

H

George H. Hage (1925-) was associated with Project Apollo in the 1960s. After completing his B.S. in electrical engineering from the University of Washington, he went to work for the Boeing Company in 1947. He was involved in the development of the Bomarc and Minuteman missile systems, and in 1962 he went to the Minuteman assembly and test complex in Florida in 1962. From there he took charge of Boeing's reconnaissance efforts, and in 1968 he came to NASA Headquarters as deputy director of the Apollo program. Soon afterward Hage returned to Boeing, and in 1973 he was appointed president of the Aerojet Solid Propulsion Company. See "Hage, George H.," biographical file, NASA Historical Reference Collection.

James C. Hagerty (1909-1981) had been on the staff of the *New York Times* from 1934 to 1942, the last four years as legislative correspondent in the newspaper'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. See "Miscellaneous Other Agencies," biographical file, NASA Historical Reference Collection.

Grant L. Hansen (1921-) was an engineer in the aerospace industry before serving as assistant secretary of the Air Force for research and development from 1969 to 1973. See *Who's Who in America, 1996* (New Providence, NJ: Marquis Who's Who, 1995).

George Haskell (1940-) is a British physicist who has worked for the European Space Agency (ESA) since 1972. From 1972 to 1987, he worked in ESA's space science planning office, and from 1987 to 1992, he served as the liaison officer for scientific use of the space station. He has also served as associate dean and vice president for academic affairs of the International Space University. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

Walter Hedrick (1921-) was an Air Force brigadier general who was involved in space systems throughout the 1960s. In 1967, he became the Air Force's director of space, deputy chief of staff, research and development. See U.S. Air Force biography, June 15, 1969, for Brigadier General Walter R. Hedrick, Jr., History Office, Air Force Materiel Command, Wright-Patterson Air Force Base, OH.

Richard C. Henry was a career U.S. Air Force officer involved in the development of space systems during the last part of his service. He was commander of Air Force Space Division in Los Angeles between 1978 and 1982 and vice commander of Air Force Space Command for almost a year, 1982-1983, retiring as a lieutenant general. See *Aerospace Daily*, February 9, 1983, p. 232.

Earl D. Hilburn (1920-) was trained in physics and mathematics at the University of Wisconsin and worked for more than twenty years in the electronics and aerospace industry before accepting a position at NASA in 1963 as deputy associate administrator. In that post, he was responsible for industry affairs, helping maintain liaison with the far-flung corporations involved in the production of NASA space hardware. In 1966 he left NASA and became president of Western Union. See "Hilburn, Earl D.," biographical file, NASA Historical Reference Collection.

Noel W. Hinners (1935-) was trained in geochemistry and geology at Rutgers University, the California Institute of Technology, and Princeton University. He began his career in 1963 with Bellcomm, Inc., working on the Apollo program, and he arrived at NASA Headquarters in 1972 as the deputy director of lunar programs in the Office of Space Science. From 1974 to 1979, he was NASA's associate administrator for space science. He also served as director of the Smithsonian Institution's National Air and Space Museum, 1979-1982, and as director

of the Goddard Space Flight Center in Greenbelt, Maryland, 1982-1987. He then became associate deputy administrator of NASA before leaving the agency in 1989 to join the Martin Marietta Corporation as vice president of strategic planning. See "Hinners, Noel W.," biographical file, NASA Historical Reference Collection.

John Hodge (1929-) began a distinguished career at NASA in 1959. He worked in the area of flight control at the Langley Research Center and the Johnson Space Center until 1970. In 1982 he became director of the Space Station Task Force at NASA Headquarters. He then took on a series of increasingly responsible positions dealing with the Space Station, culminating with him being named associate administrator for operations, space station, in 1986. See "Hodge, John," biographical file, NASA Historical Reference Collection.

Valerie Hood (1945-) is a lawyer specializing in space law who has worked for the International Affairs Branch of the European Space Agency since 1976. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

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

H.C. van de Hulst of the Netherlands served as president of the Committee on Space Research (COSPAR).

J

Lee B. James (1920-) was a career Army officer, trained at the U.S. Military Academy at West Point and the California Institute of Technology, who was assigned to the Army Ballistic Missile Agency at Huntsville, Alabama, in 1956. In 1960 he became deputy director of the Army's newly formed Research and Development Division. In 1962 he was assigned to the Marshall Space Flight Center and the next year became deputy director of the Apollo program at NASA Headquarters. In 1968 he returned to Marshall to head the Saturn Program Office and retired from the Army as a colonel. Only a year later, he was elevated as the director of the overall program office at Marshall. James retired from NASA in 1971 and accepted a faculty position at the University of Tennessee Space Institute in Tullahoma. See "James, Lee. B.," biographical file, NASA Historical Reference Collection.

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

Caldwell C. Johnson was a longtime NASA official who held a number of positions in the Apollo program at the Manned Spacecraft Center in Houston in the 1960s. He started work at the Langley Memorial Aeronautical Laboratory in Hampton, Virginia, in 1938 and worked in a variety of aeronautical engineering activities. He moved to Houston with the Space Task Group in 1962. He retired from NASA and became chief of design for Space Industries, Inc., in Texas. See "Johnson, Caldwell C.," biographical file, NASA Historical Reference Collection.

John A. Johnson (1915-), after completing law school at the University of Chicago in 1940, practiced in Chicago until 1943, when he entered military service with the Navy. From 1946 to 1948, he was an assistant for international security affairs in the Department of State. He joined the office of the general counsel of the Department of the Air Force in 1949 and served until October 7, 1958 (for the last six years as the general counsel), when

he accepted the general counsel position at NASA. In 1963 he left NASA to become director of international arrangements at the Communications Satellite Corporation. The next year, he became a vice president of COMSAT, and, in 1973, senior vice president and then chief executive officer, retiring in 1980. See "Johnson, John A.," biographical file, NASA Historical Reference Collection.

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

Roy W. Johnson (1906-1965) was named director of the Advanced Research Projects Agency for the Department of Defense in 1958, serving until 1961. Previously, he had been with the General Electric Company. He was a strong proponent of exploiting space for national security objectives. See "Roy W. Johnson Dead; First U.S. Space Chief," *Washington Post*, July 23, 1965.

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

Vincent L. Johnson (1918-) was a longtime NASA official, joining the agency in 1960 after working as an aerospace engineer with the Navy since 1947. He managed the Launch Vehicle and Propulsion Programs Division at NASA Headquarters and had primary responsibility for the program management of Scout, Delta, and Centaur launch vehicle development. He retired from NASA in 1974, after having served as deputy associate administrator for space science. See "Johnson, V.L.," biographical file, NASA Historical Reference Collection.

Charlie Jonas (1904-) (R-NC) served in the U.S. House of Representatives from 1953 to 1973. See *Biographical Directory of the United States Congress, 1774-1989* (Washington, DC: U.S. Government Printing Office, 1989).

John Erik Jonsson (1901-1995) was an engineer and businessman who chaired the board of Texas Instruments, Inc., from 1958 to 1966. He later became the mayor of Dallas. Biographical information from the Corporate Archives Office of Texas Instruments, Inc., Dallas, TX.

K

William C. Keathley arrived at NASA's Marshall Space Flight Center in 1966. He served as the project manager for the Apollo Telescope Mount experiments that were flown on Skylab and as chief of the Skylab Optical Telescope Assembly project. In 1977 he was named manager of the Space Telescope Project (later named the Hubble Space Telescope). See *Marshall Star*, March 16, 1977, p.4, from the Marshall Space Flight Center History Office, Huntsville, AL.

Estes Kefauver (1903-1963) (D-TN) served in the U.S. House of Representatives from 1939 to 1949 and in the U.S. Senate from 1949 to 1963. He ran unsuccessfully as Adlai Stevenson's vice presidential choice in 1956. See *Biographical Directory of the United States Congress, 1774-1989* (Washington, DC: U.S. Government Printing Office, 1989).

M.V. Keldysh (1911-1978) was trained in physics and mathematics at Moscow University (where he received a Ph.D. in 1938) and became the chief theoretician of Soviet cosmonautics in the 1960s. He had previously served many years in a variety of positions at the Central Institute of Aerohydrodynamics, Moscow University, and the Steklov Mathematical Institute. He was vice president (1960-1961) and then president (until 1975) of the Soviet Academy of Sciences. See "M.V. Keldysh, Soviet Scientist, Dies," *Washington Post*, June 27, 1978.

Edward M. (Ted) Kennedy (1932-) (D-MA) has been a longtime Democratic member of the Senate from Massachusetts who was first elected in 1962.

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

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

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

Nikita S. Khrushchev (1894-1971) was premier of the Soviet Union from 1958 to 1964 and first secretary of the Communist Party from 1953 to 1964. He was noted for an astonishing speech in 1956 denouncing the crimes and blunders of Joseph Stalin and for gestures of reconciliation with the West in 1959-1960, ending with the breakdown of a Paris summit with President Eisenhower and the leaders of France and Great Britain in the wake of Khrushchev's announcement that the Soviets had shot down an American U-2 reconnaissance aircraft over the Ural Mountains on May 1, 1960. Then in 1962, Khrushchev attempted to place Soviet medium-range missiles in Cuba. This led to an intense crisis in October, following which Khrushchev agreed to remove the missiles if the United States promised to make no more attempts to overthrow Cuba's Communist government. Although he could be charming at times, Khrushchev was known for boisterous threats (extending even to shoe-pounding at the United Nations) and was a tough negotiator, although he believed, unlike his predecessors, in the possibility of Communist victory over the West without war. For further information about him, see his *Khrushchev Remembers: The Last Testament* (Boston: Little, Brown, 1974); Edward Crankshaw, *Khrushchev: A Career* (New York: Viking, 1966); Michael R. Beschloss, *Mayday: Eisenhower, Khrushchev and the U-2 Affair* (New York: Harper and Row, 1986); Robert A. Divine, *Eisenhower and the Cold War* (New York: Oxford University Press, 1981).

James R. Killian, Jr. (1904-1988), was president of the Massachusetts Institute of Technology (MIT) between 1949 and 1959, but he was on leave between November 1957 and July 1959 to serve 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. In 1965 he began working with the Corporation for Public Broadcasting to develop public television. Killian described his experiences as a presidential advisor in *Sputnik, Scientists, and Eisenhower: A Memoir of the First Special Assistant to the President for Science and Technology* (Cambridge, MA: MIT Press, 1977). For a discussion of PSAC, see Gregg Herken, *Cardinal Choices: Science Advice to the President from Hiroshima to SDI* (New York: Oxford University Press, 1992).

V.A. Kirillin (1913-) was educated as a physicist and worked in thermodynamics. He was deputy chair of the Council of Ministers (in the early 1960s) and chair of the State Committee for Science and Technology (1965-1980) for the Soviet Union. He was stripped of his position in 1980 after the ascension of Leonid Brezhnev as head of the Soviet Union. See "Biography, Soviet, Miscellaneous (K-O)," NASA Historical Reference Collection.

Henry A. Kissinger (1923-) was presidential advisor for national security affairs from 1969 to 1973 and secretary of state (under Presidents Richard Nixon and Gerald Ford) thereafter until 1977. In these positions, he was especially involved in international aspects of spaceflight, particularly the joint Soviet-American flight, the Apollo-Soyuz Test Project, in 1975. See "Kissinger, Henry," biographical file, NASA Historical Reference Collection.

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

Yuri N. Koptev (1940-) became general director of the Russian Space Agency. Trained as an engineer, he began work in 1965 at NPO S.A. Lavochkina, as head of the organization for spacecraft design. Beginning in 1969, he served in administration and eventually was appointed as senior engineer to the deputy minister at the design bureau. See "Koptev, Yuri N.," biographical file, NASA Historical Reference Collection.

Christopher C. Kraft, Jr. (1924-), was a long-standing official with NASA throughout the Apollo program. He received a B.S. in aeronautical engineering from Virginia Polytechnic University 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, NASA Historical Reference Collection.

L

Edwin (Din) Land was president of the Polaroid Corporation and a member of the Purcell Panel that assessed spaceflight capabilities for the U.S. government in 1957-1958.

Harold R. Lawrence was assistant director of NASA's Office of International Programs. He resigned in 1960 to take a job at the Jet Propulsion Laboratory. See T. Keith Glennan, *Correspondence Files*, NASA Historical Reference Collection.

Theo Lefevre was the Belgian minister who served as chair of the European Space Conference, which was a policy-level organization created to coordinate European responses to U.S. positions on space issues. Lefevre led the European delegation in negotiations with the United States concerning launch assurance and post-Apollo cooperation during the early 1970s.

Curtis E. LeMay (1906-1990) was a career Air Force officer who entered the Army Air Corps in the 1920s and rose through a series of increasingly responsible Army Air Forces commands during World War II. After the war, LeMay built the Strategic Air Command into the premier nuclear deterrent force in the early 1950s. He also served as deputy chief of staff, 1957-1961, and chief of staff, 1961-1965, of the U.S. Air Force. He retired as a four-star general in 1965 and ran for vice president with independent candidate George C. Wallace in 1968. See Thomas M. Coffey, *Iron Eagle: The Turbulent Life of General Curtis LeMay* (New York: Crown Pub., 1986).

Reimar Leust (1923-) is a German theoretical physicist who held a variety of prestigious academic and advisory council posts before serving as director general of European Space Agency from 1984 to 1990. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

Robert B. Lewis was a longtime government official who joined NASA in 1961 as director of financial management. He served until 1965, when he left the agency to return to the Office of the Secretary of Defense. See "Miscellaneous NASA," biographical file, NASA Historical Reference Collection.

Russell Long (1918-) served as a U.S. senator from Louisiana from 1948 to 1987. See *Biographical Directory of the United States Congress, 1774-1989* (Washington, DC: U.S. Government Printing Office).

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

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

Glynn S. Lunney (1936-) was a longtime NASA official. Trained as an aeronautical engineer, he came to the Lewis Research Center near the time of the creation of NASA in 1958 and became a member of the Space Task Group developing Project Mercury the next year. He worked on the Apollo program in a series of positions, including manager of the Apollo Spacecraft Program in 1973 and manager of the Apollo-Soyuz Test Project at the Johnson Space Center in Houston. Thereafter, he managed the development of the Space Shuttle and served in several other NASA positions. Lunney retired from NASA in 1985 and became vice president and general manager, Houston Operations, for Rockwell International's Space Systems Division. See "Lunney, Glenn S.," biographical file, NASA Historical Reference Collection.

M

Harold Macmillan (1894-1986) became a British member of Parliament in 1924, foreign secretary in 1955, and then prime minister from 1957 to 1963. See "Macmillan, (Maurice) Harold," *Current Biography Yearbook 1987*, p. 637.

Frank J. Malina (1912-1981) was a young California Institute of Technology Ph.D. student in the mid-1930s when he began an aggressive rocket research program to design a high-altitude sounding rocket. Beginning in late 1936, Malina and his colleagues started the static testing of rocket engines in the canyons above the Rose Bowl, with mixed results, but a series of tests eventually led to the development of the WAC-Corporal rocket during

World War II. After the war, Malina worked with the United Nations and eventually retired to Paris to pursue a career as an artist. See "Malina, Frank J.," biographical file, NASA Historical Reference Collection.

Vittorio Manno (1938-) is an Italian physicist who was a senior scientist at European Space Agency's Science Directorate from 1972 to 1989. From 1989 to 1995, Manno served as the scientific attaché at the Italian Embassy in Vienna. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

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

Robert T. Marsh, a general in the Air Force, was commander of the Air Force Systems Command from 1982 to 1984. See "Miscellaneous DOD," biographical file, NASA Historical Reference Collection.

John J. Martin was educated as a mechanical engineer, receiving a Ph.D. from Purdue University in 1951. He joined North American Aviation in 1951 and moved to the Bendix Corporation in 1953. In 1960 he joined the Institute for Defense Analyses and in 1969 moved to the staff of the President's science advisor at the White House. During 1973-1974, he served as the associate deputy to the director of the Central Intelligence Agency. He then was deputy assistant secretary of the Air Force for research and development, 1974-1976, before returning to Bendix. He became a NASA official in 1984, as associate administrator for aeronautics and space technology at NASA Headquarters, before returning to industry in 1985. See "Martin, Dr. John J.," biographical file, NASA Historical Reference Collection.

Sir Harrie S.W. Massey (1908-) was Quain professor of physics at University College in London and chaired the British National Space Research Committee in the early 1960s. He was the leader of a team of British scientists responsible for the selection of the experiments and instruments for the S.51 satellite project, a British-American cooperative effort begun in 1959 to launch individual instruments into space for scientific purposes. See "Biography, Foreign Miscellaneous, I-M," biographical file, NASA Historical Reference Collection.

James A. McDivitt (1929-) was a career Air Force officer, retiring as a brigadier general, who was chosen as a NASA astronaut in the second group selected, in 1962. He served as command pilot of the Gemini IV and commander of the Apollo 9 missions. He also managed the Apollo Spacecraft Program at Johnson Space Center from September 1969 to August 1972; he then resigned from NASA and the Air Force. Starting in 1975, he joined Pullman, Inc., in Chicago and then served as vice president, president of Pullman Standard, and executive vice president, in that order. He resigned from Pullman on January 31, 1981, to become vice president of strategic management for Rockwell International in Pittsburgh. He then became senior vice president of government and international operations for Rockwell International in Washington, D.C. See "McDivitt, James A.," biographical file, NASA Historical Reference Collection.

Frank B. McDonald (1925-) began a career with NASA in 1959 as head of the Energetic Particles Branch in the Space Science Division at the Goddard Space Flight Center in Greenbelt, Maryland. Thereafter, he served as project scientist on nine NASA satellite programs. In 1982 he became NASA's chief scientist, serving until 1987 when he returned to Goddard as associate director/chief scientist. See "McDonald, Dr. Frank B. (Chief Scientist)," biographical file, NASA Historical Reference Collection.

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

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

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

W.J. Mellors headed the Washington, D.C., office of the European Space Agency.

Clark B. Millikan (1903-1966) was a pioneer researcher in aerodynamics and guided missiles. With a Ph.D. in physics from the California Institute of Technology (Caltech), he was the son of Nobel Prize-winning Robert A. Millikan. He was appointed to the faculty of Caltech in 1928 and later became director of the Guggenheim Aeronautical Laboratory at the institute. He was enormously important in fostering rocket technology, both at Caltech and elsewhere, and he served as chair of the Guided Missile Committee for the Department of Defense during the late 1940s and early 1950s. See "Clark B. Millikan of Cal Tech Dead," *New York Times*, January 3, 1966.

Erwin Mitchell (1924-) (D-GA) served as a congressman from 1958 to 1961. He chaired the House Subcommittee on Patents and Scientific Inventions, which was under the Committee on Science and Astronautics. See *Biographical Directory of the United States Congress, 1774-1989* (Washington, DC: U.S. Government Printing Office, 1989).

Brooks Morris (1913-) was an aerospace engineer who worked as a manager of quality assurance and reliability at the Jet Propulsion Laboratory from 1961 to 1981. See *Who's Who in Aviation and Aerospace*, U.S. edition (Boston and New York: National Aeronautical Institute and Jane's Publishing Company, Ltd., 1983).

Donald Morris was a former Foreign Service official who joined NASA in 1967. Morris served as deputy assistant administrator for international affairs and then became deputy associate administrator for applications-management in 1976. In 1977 he was detailed to the President's Committee on Science and Technology. See "Assorted NASA Officials," biographical file, NASA Historical Reference Collection.

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

Robert Murphy (1894-1978) was a career Foreign Service and State Department official. He served as deputy under secretary of state for political affairs and then as under secretary in the 1950s. Biographical information from the *Biographic Register of the Department of State, 1959*, Department of State History Office, Washington, DC.

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

N

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

Homer E. 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 to 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 developing the new agency's space science program. He soon became deputy director of spaceflight programs. In 1961 he assumed directorship of the Office of Space Sciences, and 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. See "Newell, Homer," biographical file, NASA Historical Reference Collection.

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

O

Gerald D. O'Brien was assistant general counsel for patent matters at NASA between 1958 and 1965, when he was appointed an assistant commissioner of patents by President Lyndon B. Johnson. Previously, he had received a B.S. in electrical engineering at the U.S. Naval Academy and a law degree in 1940 from American University's Washington College of Law. He then served in the Navy as patent advisor to the National Defense Research Council during World War II. After the war, he became patent counsel of the Bureau of Ordnance, Department of the Navy, from 1946 to 1958. See "O'Brien, Gerald D.," biographical file, NASA Historical Reference Collection.

Henk Olthof (1944-) is a Dutch physicist who has worked at the European Space Agency since 1977. From 1977 to 1986, he was responsible for the secretariat of the Astronomy Working Group. Since 1986, Olthof has served as the head of space station and platforms for scientific users at the European Space Research and Technology Centre in the Netherlands. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

P

Edgar Page (1935-) is an Irish physicist who specialized in cosmic ray research while at the European Space Research Organization from 1965 to 1975. He then became head of the European Space Agency's Space Science Department. Beginning in 1986, he has served as the science coordinator for the Ulysses spacecraft mission. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

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. He was nominated as NASA's third administrator on March 5, 1969, and confirmed by the Senate on March 20, 1969. During his leadership, the first seven Apollo crewed missions were flown, in which twenty astronauts orbited the Earth, fourteen

traveled to the Moon, and four walked on its surface. Paine resigned from NASA on September 15, 1970, to return to the General Electric Company 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 the National Commission on Space to prepare a report on the future of space exploration. Since leaving NASA fifteen years earlier, Paine had been a tireless spokesperson for an expansive view of what should be done in space. The Paine Commission took most of a year to prepare its report, largely because it solicited public input in hearings throughout the United States. The report, *Pioneering the Space Frontier*, was published in a lavishly illustrated, glossy format in May 1986. It espoused a "pioneering mission for 21st-century America"—"to lead the exploration and development of the space frontier, advancing science, technology, and enterprise, and building institutions and systems that make accessible vast new resources and support human settlements beyond Earth orbit, from the highlands of the Moon to the plains of Mars." The report also contained a "Declaration for Space," which included a rationale for exploring and settling the solar system and outlined a long-range space program for the United States. See Roger D. Launius, "NASA and the Decision to Build the Space Shuttle, 1969-72," *The Historian* 57 (Autumn 1994): 17-34.

Frank Parker (1916-) was assistant director of Defense Research and Engineering at the Department of Defense from 1959 to 1961. This information is from the Office of the Secretary of Defense Historical Branch, Department of Defense, Washington, DC.

Robert J. Parks (1922-) was a longtime employee at the Jet Propulsion Laboratory (JPL), arriving there in 1947 after completing his education at the nearby California Institute of Technology. Closely associated with robotic planetary exploration, he worked on the Mariner, Ranger, and Surveyor programs. He served as JPL's planetary program director in the 1960s and then became JPL's associate and finally deputy director. See "Parks, Robert J.," biographical file, NASA Historical Reference Collection.

Kenneth S. Pedersen (1939-) served in numerous government agencies—the Office of Equal Opportunity, the Department of Commerce, the Atomic Energy Commission, and the Nuclear Regulatory Commission—prior to coming to NASA in 1982 as director of international affairs. In 1988 Pedersen was appointed as NASA's associate administrator for external relations, serving until 1990, when he left NASA to accept an academic appointment at Georgetown University. See "Pedersen, Kenneth S.," biographical file, NASA Historical Reference Collection.

Charles J. Pellerin, Jr., was a longtime NASA official who began his career at the Goddard Space Flight Center as he was completing his Ph.D. in physics from the Catholic University of America in 1974. The next year he moved to NASA Headquarters, where he managed the development and integration of scientific instrumentation for flight on the Space Shuttle. In 1983 he was named director of astrophysics in NASA's Office of Space Science and Applications, and in 1992, he was appointed as deputy associate administrator for safety and mission quality, serving until 1994. See "Pellerin, Charles J., Jr.," biographical file, NASA Historical Reference Collection.

Boris N. Petrov (1913-1980) was a leading Soviet scientist whose later years were devoted to space exploration. As a senior academician for the Soviet Academy of Sciences, Petrov chaired the Inter-Cosmos Council, which promoted cooperation in space among eastern European nations during the height of the cold war, 1966-1980. See "Boris Petrov, 67, Soviet Expert on Automation, Space Research," *Washington Post*, August 27, 1980; Kenneth W. Gatland, "Boris Petrov," *Spaceflight* 23 (January 1981): 29.

Franklyn W. Phillips (1917-) graduated from the Massachusetts Institute of Technology in 1941 with a degree in mechanical engineering. He then worked at the Langley Aeronautical Laboratory, later moving to Lewis Flight Propulsion Laboratory, where he conducted research on aircraft engine materials and stresses. In 1945 he became a member of the NACA director's staff and served as administrator for a variety of NACA research programs in aircraft engines and aircraft and missile structures and loads. In October 1958, he became special assistant to T. Keith Glennan, NASA's first administrator. He relinquished that position in January 1959 to become acting secretary of the National Aeronautics and Space Council, but in February 1960, he returned to his position as Glennan's assistant. He continued in that job under James E. Webb until 1962, when he became director of NASA's new northeastern office. In 1964 he became assistant director for administrative operations at the new

NASA Electronics Research Center in Cambridge, Massachusetts. This information is from background summaries of top NASA staff, NASA Historical Reference Collection.

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

William H. Pickering (1910-) obtained his bachelor's and master's degrees in electrical engineering and then a Ph.D. in physics from the California Institute of Technology before becoming a professor of electrical engineering there in 1946. In 1944 he organized the electronics efforts at the Jet Propulsion Laboratory (JPL) to support guided missile research and development, becoming project manager for Corporal, the first operational missile JPL developed. From 1954 to 1976, he was director of JPL, which developed the first U.S. satellite (Explorer I), the first successful U.S. circumlunar space probe (Pioneer IV), the Mariner flights to Venus and Mars in the early to mid-1960s, the Ranger photographic missions to the Moon in 1964 and 1965, and the Surveyor lunar landings of 1966 and 1967. See “Pickering, William H.,” biographical file, NASA Historical Reference Collection.

Kenneth S. Pitzer (1914-) was a chemist who served as director of the Atomic Energy Commission from 1949 to 1951. From 1961 to 1968, he served as president of Rice University. From 1964 to 1965, Dr. Pitzer also served on NASA's Science and Technology Advisory Committee, and in 1965, President Lyndon Johnson appointed him a member of the President's Science Advisory Committee. Biographical information from University Relations Office of Rice University, Houston, TX.

Herman Pollack (1920-1993) was a State Department official for 28 years before retiring in 1974. He served as the department's director of international scientific and technological affairs for ten years before retiring. See obituary, *Washington Post*, April 14, 1993, p. C6, in “Biography, Other Agency Miscellaneous, N-Z,” file, NASA Historical Reference Collection.

Richard W. Porter was an electrical engineer who worked on missile programs with the General Electric Company before working on Earth sciences programs at the National Academy of Sciences. In 1964 he was the academy's delegate to the Committee on Space Research (COSPAR). See “Assorted Government Officials,” biographical file, NASA Historical Reference Collection.

Thomas Power (1905-1970) was an accomplished pilot who served as a general during World War II. As chief of staff to General Curtis LeMay, he was one of several top planners of the atomic bombing of Hiroshima and Nagasaki. After World War II, Power served as the commander of the Air Research and Development Command, which developed early missiles. He served as commander of the Strategic Air Command from 1957 to 1964, when he retired. See “Power, Thomas,” biographical file, NASA Historical Reference Collection.

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

Q

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

J. Danforth (Dan) Quayle (R-IN) served as a senator before becoming George Bush's vice president from 1989 to 1993. As vice president, he chaired the National Space Council and had significant involvement with the development of the space station, Space Shuttle replacement options, the Space Exploration Initiative, and NASA management.

Erik Quistgaard was the director general of the European Space Agency from 1980 to 1984, overseeing the Ariane rocket's development and Spacelab's many contributions to space science. See "Quistgaard, Erik," biographical file, NASA Historical Reference Collection.

R

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

Felix Michael Rogers (1921-) was an ace fighter pilot who became an Air Force general. He was deputy chief of staff for development plans at the Air Force Systems Command and also served with the United Nations Military Armistice Commission in Korea. After working as the commander of Air University at Maxwell Air Force Base, he became commander of the Air Force Logistics Command. See U.S. Air Force biography, November 1977, for General Felix Michael Rogers, History Office, Air Force Logistics Command, Wright-Patterson Air Force Base, Dayton, OH.

William P. Rogers (1913-) was chair of the presidentially mandated blue ribbon commission investigating the *Challenger* accident of January 1986. It found that the failure had resulted from a poor engineering decision—an O-ring used to seal joints in the solid rocket booster that was susceptible to failure at low temperatures, introduced innocently enough years earlier. Rogers kept the commission's analysis on that technical level and documented the problems in exceptional detail. The commission, after some prodding by Nobel Prize-winning scientist Richard P. Feynman, did a credible job of grappling with the technologically difficult issues associated with the accident. See *Report of the Presidential Commission on the Space Shuttle Challenger Accident, Vol. I* (Washington, DC: U.S. Government Printing Office, June 6, 1986).

Dean Rusk (1909-1994) was a Rhodes scholar who studied philosophy, politics, economics, and law. After teaching government and international relations and serving in the military in World War II, Rusk joined the State Department in 1946. He held increasingly responsible positions, culminating in his appointment as secretary of state in 1961. He served as secretary for eight years, through the entire Kennedy and Johnson administrations. He was a strong supporter of U.S. involvement in Vietnam and also presided over U.S. foreign policy during the Bay of Pigs incident and the Cuban missile crisis. See "Rusk, Dean," biographical file, NASA Historical Reference Collection.

S

Ronald Z. Sagdeyev (1932-) was one of the leaders of Soviet space science from the 1960s through the 1980s. He was involved in virtually every lunar and planetary probe of the Soviet Union during this era, including the highly successful Venera and Vega missions. He also advised Soviet leader Mikhail Gorbachev on space and arms control at the 1986 Geneva, 1987 Washington, and 1988 Moscow summits. In the late 1980s, he left the Soviet Union

and settled in the United States, where he headed the East-West Science and Technology Center at the University of Maryland at College Park. See Roald Z. Sagdeyev, *The Making of a Soviet Scientist: My Adventures in Nuclear Fusion and Space From Stalin to Star Wars* (New York: John Wiley, 1995).

James R. Schlesinger (1929-) served in numerous governmental positions during the 1960s and 1970s. After a career at the University of Virginia, 1955-1963, and the RAND Corporation, 1963-1969, he worked for the Bureau of the Budget/Office of Management and Budget, 1969-1971. He also served as chair of the Atomic Energy Commission, 1971-1973, and secretary of defense, 1973-1975. In 1977 he was appointed head of the newly created Department of Energy. See "Schlesinger, James," biographical file, NASA Historical Reference Collection.

Bernard A. Schriever (1910-) earned a B.S. in architectural engineering from Texas A&M University in 1931 and was commissioned in the Army Air Corps Reserve in 1933 after completing pilot training. Following broken service, he received a regular commission in 1938. He earned an M.A. in aeronautical engineering from Stanford in 1942 and then flew 63 combat missions on B-17s with the 19th Bombardment Group in the Pacific Theater during World War II. In 1954, he became commander of the Western Development Division (soon renamed the Air Force Ballistic Missile Division), and from 1959 to 1966, he was commander of its parent organization, the Air Research and Development Command, renamed Air Force Systems Command in 1961. As such, he presided over the development of the Atlas, Thor, and Titan missiles, which served not only as military weapon systems but also as boosters for NASA's space missions. In developing these missiles, Schriever instituted a systems approach, whereby the various components of the Atlas and succeeding missiles underwent simultaneous design and test as part of an overall "weapons system." Schriever also introduced the notion of concurrency, which has been given various interpretations but essentially allowed the components of the missiles to enter production while still in the test phase, thereby speeding up development. He retired as a general in 1966. See Jacob Neufeld, "Bernard A. Schriever: Challenging the Unknown," *Makers of the United States Air Force* (Washington, DC: Office of Air Force History, 1986), pp. 281-306; Robert L. Perry, "Atlas, Thor . . .," in Eugene M. Emme, ed., *A History of Rocket Technology* (Detroit: Wayne State University Press, 1964), pp. 144-160; Robert A. Divine, *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite* (New York: Oxford University Press, 1993), p. 25.

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

Robert C. Seamans, Jr. (1918-), had been involved in aerospace issues since he completed his Sc.D. degree at the Massachusetts Institute of Technology (MIT) in 1951. He was on the faculty at MIT's Department of Aeronautical Engineering between 1949 and 1955, when he joined the Radio Corporation of America as manager of the Airborne Systems Laboratory. In 1958 he became the chief engineer of the Missile Electronics and Control Division. He then joined NASA in 1960 as associate administrator. In December 1965, he became NASA's deputy administrator. He left NASA in 1968, and in 1969, he became secretary of the Air Force, serving until 1973. Seamans was president of the National Academy of Engineering from May 1973 to December 1974, when he became the first administrator of the new Energy Research and Development Administration. He returned to MIT in 1977, becoming dean of its School of Engineering in 1978. In 1981 he was elected chair of the board of trustees of the Aerospace Corporation. See "Seamans, Robert C., Jr.," biographical file, NASA Historical Reference Collection; Robert C. Seamans, Jr., *Aiming at Targets* (Washington, DC: NASA SP-4106, 1996).

Frederick Seitz (1911-) was trained in mathematics and physics at Stanford and Princeton Universities and worked at a variety of corporations, laboratories, and government organizations throughout his career. He served on the National Defense Research Committee from 1941 to 1945, was a consultant to the secretary of war in 1945, served as director of the atomic energy training program at Oak Ridge from 1946 to 1947, was a science

advisor to the North American Treaty Organization (NATO) from 1959 to 1960, and was a faculty member of several universities during his career. In 1962 he was elected president of the National Academy of Sciences, and he was reelected to a six-year term in 1965. In 1968 he left the academy to become president of Rockefeller University in New York City and served until his retirement. See "Seitz, Frederick," biographical file, NASA Historical Reference Collection.

Eduard A. Shevardnadze (1927-) was a reform leader of the Soviet Union along with Mikhail Gorbachev in the late 1980s. He was heavily involved in the transformation of the nation from a Communist state to one built on capitalism. Serving in a variety of senior positions, he negotiated with the United States for international cooperation in space, including the building of a space station in the 1990s. See Eduard Shevardnadze, *The Future Belongs to Freedom* (New York: Free Press, 1991).

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

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

Walter D. Sohler (1924-), a graduate of Columbia Law School, had worked for the Central Intelligence Agency (CIA) and the Air Force before joining NASA in 1958 as assistant general counsel. He became deputy general counsel in 1961 and general counsel in 1963. He left NASA in 1966 to become a partner in a New York law firm. See "Sohler, Walter," biographical file, NASA Historical Reference Collection.

Thomas P. Stafford (1930-), a career military officer who retired as a lieutenant general in the U.S. Air Force, was chosen by NASA in the second group of astronauts, in 1962. He served as the backup pilot for Gemini III and the pilot for Gemini VI. He became command pilot for Gemini IX upon the death of a prime crew member and was the backup commander for Apollo 7, the commander of Apollo 10, and the commander of the Apollo-Soyuz Test Project. He resigned from NASA on November 1, 1975, to become commander of the Air Force Flight Test Center, at Edwards Air Force Base in California. He was promoted to Air Force deputy chief of staff for research and development in March 1978. He then retired from the Air Force in November 1979 and became executive vice president of commercial sales and finance for American Farm Line in Oklahoma City. He also worked as a consultant with Defense Technology in Oklahoma City and thereafter as vice chairman of Stafford, Burke and Hecker, Inc., in Alexandria, Virginia. He joined the Spectrum Information Technologies Technical Advisory Board in 1993. See "Stafford, Thomas P.," biographical file, NASA Historical Reference Collection.

Homer J. Stewart (1915-) earned his doctorate in aeronautics from the California Institute of Technology (Caltech) in 1940, joining the faculty there two years before that. In 1939 he participated in pioneering rocket research with other Caltech engineers and scientists, including Frank Malina, in the foothills of Pasadena. Out of their efforts, the Jet Propulsion Laboratory (JPL) arose, and Stewart maintained his interest in rocketry at that institution. He was involved in developing the first American satellite, Explorer I, in 1958. In that year, on leave from Caltech, he became director of NASA's Office of Program Planning and Evaluation, returning to Caltech in 1960 in a variety of positions, including chief of the Advanced Studies Office at JPL from 1963 to 1967 and professor of aeronautics at Caltech itself. See "Stewart, Homer," biographical file, NASA Historical Reference Collection; Clayton R. Koppes, *JPL and the American Space Program: A History of the Jet Propulsion Laboratory* (New Haven, CT: Yale University Press, 1982), pp. 23, 32, 44, 47, 79-80, 82.

Vladimir S. Syromiatnikov (1934-) was educated at Bauman Technical University in Moscow and went to work for RKK Energia of Kalingrad after graduating in 1956. He was the designer of one of the most successful pieces of space hardware used by the Soviet Union, the docking collar used to link two spacecraft together. It was adapted for use in the Apollo-Soyuz Test Project in 1975 and has been successful in more than 200 dockings of Soviet/Russian missions. It will be used aboard the International Space Station being constructed at the end of the twentieth century. See "Vladimir S. Syromiatnikov, Russian Docking System Engineer," *Space News*, February 12-18, 1996, p. 22.

T

Brian Taylor (1940-) joined the European Space Agency (then the European Space Research Organization) in 1967 as a staff scientist. In 1971, he became the head of the High Energy Astrophysics Division and then, in 1984, the head of the Astrophysics Division. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

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 he was chair of the independent offices subcommittee of the House Appropriations Committee and thus exercised considerable congressional power over NASA's funding. See "Thomas, Albert," biographical file, NASA Historical Reference Collection.

Shelby G. Tilford was a NASA scientist in the late 1980s and early 1990s in the Office of Space Science, for which he was director of Earth sciences. In 1992 he was appointed acting associate administrator for Mission to Planet Earth and served until 1994. See "Tilford, Shelby," biographical file, NASA Historical Reference Collection.

Holger N. Toftoy (1903-1967) was a career U.S. Army officer and an expert in ordnance who was responsible for bringing the German "rocket team" under the leadership of Wernher von Braun to the United States in 1945. He became commander of the Redstone Arsenal in Huntsville, Alabama, in 1954 and worked closely with von Braun's team in the development of the Redstone and Jupiter missiles. In the aftermath of the first successful Sputnik launch in 1957, he persuaded the Department of Defense to allow the launch of the first U.S. Earth-orbiting satellite aboard the Jupiter missile; the result was the orbiting of Explorer I on January 31, 1958. He also held a number of other positions in the Army; he was the head of the Rocket Research Branch of the Chief of Ordnance in Washington, D.C., and the commander of the Aberdeen Proving Ground in Maryland. He retired from the Army in 1960 with the rank of major general. See "Maj. Gen. Holger Toftoy Dies; Leader in U.S. Rocket Program," *New York Times*, April 20, 1967, p. 41.

H.S. Tsien (1909-) was a Chinese national who received a Ph.D. in aeronautics in 1939 from the California Institute of Technology (Caltech) and worked on the development of rocket technology at his alma mater through World War II. He was on the faculty of the Massachusetts Institute of Technology from 1946 to 1949, when he returned to Caltech. In the 1950s, his loyalty to democratic institutions was questioned, and he was deported from the United States to the People's Republic of China. There, he was largely responsible for the development of intercontinental ballistic missile rocket technology, especially the "Long March" launch vehicle. See Iris Chang, *Thread of the Silkworm* (New York: Free Press, 1996).

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

V

James A. Van Allen (1914-) was a pathbreaking astrophysicist best known for his work in magnetospheric physics. Van Allen's January 1958 Explorer I experiment established the existence of radiation belts—later named for the scientist—that encircled the Earth, representing the opening of a broad research field. Extending outward in the direction of the Sun approximately 40,000 miles, as well as stretching out with a trail away from

the Sun to approximately 370,000 miles, the magnetosphere is the area dominated by Earth's strong magnetic field. See James A. Van Allen, *Origins of Magnetospheric Physics* (Washington, DC: Smithsonian Institution Press, 1983); David E. Newton, "James A. Van Allen," in Emily J. McMurray, ed., *Notable Twentieth-Century Scientists* (New York: Gale Research Inc., 1995), pp. 2070-72.

Hoyt S. Vandenberg (1899-1954) was a career military aviator who served as chief of staff of the U.S. Air Force between 1948 and 1953. He was educated at the U.S. Military Academy at West Point and entered the Army Air Corps after graduation, becoming a pilot and air commander. After numerous command positions during World War II, most significantly as commander of Ninth Air Force, which provided fighter support in Europe during the invasion and march to Berlin, he returned to Washington and helped with the formation of the Department of Defense (DOD) in 1947. As Air Force chief of staff, he was a senior official at DOD during the formative period of rocketry development and the work on intercontinental ballistic missiles. See Phillip S. Meilinger, *Hoyt S. Vandenberg: The Life of a General* (Bloomington: Indiana University Press, 1989).

W

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

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

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

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

James F. Whisenand (1911-) was trained as an aeronautical engineer at the University of Illinois and entered the Army Air Corps in 1934. Serving in a variety of command and staff positions, including in combat in World War II and Korea, he served as special assistant to the chair of the Joint Chiefs, General Nathan F. Twining, beginning in 1957 as a major general. See "Biography, DOD Miscellaneous, N-Z," biographical file, NASA Historical Reference Collection.

Gordon P. Whitcomb (1940-) is a British engineer who began his career working on automatic landing systems for civilian aircraft. In 1974 he joined the European Space Research Organization to work on spacecraft system design. Currently, he is the head of the European Space Agency's Future Science Projects Office. See "Miscellaneous Foreign," biographical file, NASA Historical Reference Collection.

Thomas D. White (1901-1965) was a career Air Force officer who served in a succession of increasingly responsible positions until his retirement in 1961. He was director of legislation for the secretary of the Air Force between 1948 and 1951, deputy chief of staff for operations from 1951 to 1953; vice chief of staff from 1953 to 1957, and chief of staff from 1957 to 1961. See "White, T.D.," biographical file, NASA Historical Reference Collection.

Clay T. Whitehead was a White House staff assistant during the Nixon administration between 1969 and 1972. He was heavily involved in space policy associated with the decision to build the Space Shuttle and post-Apollo planning for NASA. See Roger D. Launius, "NASA and the Decision to Build the Space Shuttle, 1969-72," *The Historian* 57 (Autumn 1994): 17-34; Roger D. Launius, "A Western Mormon in Washington, D.C.: James C. Fletcher, NASA, and the Final Frontier," *Pacific Historical Review* 64 (May 1995): 217-41.

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

Lynette (Lyn) Wigbels is the assistant director for international programs on the Global Learning and Observations to Benefit the Environment (GLOBE) program. She joined NASA's International Affairs Division in 1979 and developed the space station agreements covering cooperation with Europe, Japan, and Canada. She has also held several other policy and internationally related positions at NASA. Biographical sketch from Lyn Wigbels and "Wigbels, Lyn," "Miscellaneous NASA Officials," biographical file, NASA Historical Reference Collection.

Y

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

Boris N. Yeltsin (1930-) became leader of Russia in the immediate post-Cold War era in the early 1990s and carried even further democratic reforms than had his predecessor, Mikhail Gorbachev. One of his principle objectives was closer ties to the West, and under his leadership, the international partnership to build a space station came much closer to reality. See "Yeltsin, Boris N.," biographical file, NASA Historical Reference Collection.

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