Clarence A. Syverton

CLARENCE A. SYVERTSON

1926–2010

Elected in 1981

"For outstanding contributions in aerospace engineering, sound guidance of research and technology programs, and innovative institutional guidance."

BY WILLIAM F. BALLHAUS, JR., AND GLENN BUGOS

CLARENCE A. SYVERTSON, or "Sy" to his friends, was an extraordinary engineer and leader. He was a pioneer in hypersonic aerodynamics, both theoretically and experimentally, and led one of America's great research institutions.

Syvertson was a native of Minneapolis, born January 12, 1926. He earned his bachelor's degree in aeronautical engineering (with distinction) from the University of Minnesota in 1946, served as a private for a year in the U.S. Army Air Corps, and then earned a master's degree in 1948. Sy kept in touch with his friends at the university and throughout his career mentored its graduates. The University of Minnesota awarded him an Outstanding Achievement Medal in 1982 and an honorary doctorate in 2004.

Syvertson arrived at the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics (NACA) in 1948 as an aeronautical research scientist in Harvey Allen's high-speed research division. At Ames he joined a famous group of aerodynamicists who extended aeronautics beyond the supersonic and into the hypersonic regime. As a NACA aerodynamicist, Sy matched his theoretical insights on hypersonic airflow with brilliant experimental work. In 1951, after three years at Ames, he became assistant chief of the 10-

by 14-inch wind tunnel branch. This was the first hypersonic tunnel at Ames, capable of speeds varying from Mach 2.7 to 6.3. His early research on asymmetric nozzle contours of variable Mach number proved critical to the design of new hypersonic wind tunnels for NACA. He developed a new aerodynamic theory of second-order shock expansion that was used to predict the stability of slender vehicles flying at hypersonic speeds, including missiles and rockets like the Polaris and Aerobee. The American Institute of Aeronautics and Astronautics (AIAA) Lawrence Sperry Award in 1957 recognized the value of Sy's early work on hypersonic flows.

As a successor to that tunnel, Sy and Alfred Eggers designed the 3.5-foot hypersonic wind tunnel, capable of tests between Mach 5 and 14. The tunnel was a blow-down one, with air heated through a pebble bed heater to prevent liquefaction. Sy became chief of that branch in 1959, as the tunnel became the center of heat transfer studies for reentry vehicles, including the Apollo capsule. The aerothermodynamics database for detailed Space Shuttle design was later compiled in this tunnel, and more than a quarter of all wind tunnel testing done for the Space Shuttle was done there. With his colleagues in this tunnel, Sy did early sketches of some vehicles that the National Aeronautics and Space Administration (NASA) still hopes to build, such as hypersonic skip gliders, direct-to-orbit spacecraft, and hypersonic transports. Sy and Eggers did work underlying the design of the XB-70 *Valkyrie*, an experimental bomber capable of Mach 3, as well as the M2 lifting bodies, the research precursors to the Space Shuttle orbiter. His work on the M2 was recognized with a 1964 NASA Inventions and Contributions Award. With Eggers he also wrote an influential chapter on hypersonic flow for the *Handbook of Engineering Mechanics* (New York: McGraw-Hill, 1962).

In 1963 he established and led the Mission Analysis Division, an elite think tank located at Ames but organizationally part of the NASA Headquarters Office of Advanced Research and Technology. Sy's group defined future aircraft and space missions for NASA as well as the long-term research needed to achieve those goals. There he continued refining concepts

for hypersonic flight and did early studies of a human mission to Mars, focusing on atmosphere entry and landing. Sy was a natural engineer. He loved to build model railroads and, even at home to relax, he built a model town with a railroad running through it.

Syvertson joined the ranks of Ames senior leadership in 1966, soon after Harvey Allen became director. As director of astronautics, Sy led much of the center's research in the physical sciences relevant to space travel. His purview included development of spacecraft, hypersonic aircraft, and thermal protection systems for reentry vehicles, as well as sophisticated facilities in which to test them. He also had managerial responsibility for basic research into spacecraft structures, thermal and gas dynamics, space science, and planetary atmospheres, including the success of the Apollo Lunar Surface Magnetometer and other spaceborne instruments.

In 1969, newly arrived Ames Director Hans Mark tapped Sy to serve as his deputy director. Soon after, though, from 1970 to 1971, Sy took a detail to Washington, D.C., to serve as executive director of the Civil Aviation Research and Development Policy Study, in the Office of the Secretary of Transportation. This study examined the economic, social, and environmental contexts of civil aviation—including aircraft noise, congestion, air traffic control, and airport capacity—and set the agenda for aviation research in NASA and around the nation. The report was hailed as a milestone in national policy for civil aviation research, and Sy was awarded NASA's Exceptional Service Medal in 1971.

Back at Ames, Sy took care of institutional management, while Hans jetted back and forth to Washington to open new research venues for the center. It was a time of rapid change for the center, as Ames pushed into new areas of expertise in computing and the life sciences and built alliances with new types of partners. As a leader, Syvertson was renowned for his ability to build consensus—to take opposing points of view and find common ground to allow compromise. "Sy embodied the best of Ames," remembers his friend Jack Boyd. "He was

a brilliant scientist, an innovative leader, who assembled a dedicated and motivated staff and left them free to forge ahead."

When Mark departed Ames on July 7, 1977, Syvertson became acting center director. In April 1978, NASA Administrator Robert Frosch flew to Ames to remove "Acting" from his title and Syvertson became the center's director. Today, the main auditorium at NASA Ames has been named in Sy's honor, in part because he appreciated the community-building value of scientific talks, and on that day the room erupted in a standing ovation when Frosch announced Sy's promotion. Sy brought new energy to the center's programs, and the center continued to blossom as a world-class research organization. He directed the choice of engineering opportunities of national significance. He expanded collaborative programs with the U.S. Army, U.S. Navy, Defense Advanced Research Projects Agency, and Federal Aviation Administration. In aeronautics, Ames people expanded their research into air traffic control; vertical-lift aircraft, such as XV-15 tilt-rotor aircraft and the RSRA X-wing; and other advanced rotorcraft. Ames provided comprehensive test support for the aerodynamics and thermal protection systems of the Space Shuttle.

In the space sciences, Ames prepared the Galileo probe for its journey to Jupiter, flew the Kuiper Airborne Observatory, and developed the telescope for the infrared astronomical satellite, a joint project of the Netherlands, Great Britain, and the United States. In 1981, NASA Headquarters consolidated the Dryden Flight Research Center into Ames, to help it operate more efficiently, and Syvertson managed both laboratories. The Numerical Aerodynamic Simulation Facility was designed while Sy was director, and it later grew into a supercomputing center of national significance. The 40- by 80-foot wind tunnel was updated and an 80- by 120-foot test section was added, making it the largest wind tunnel in the world. Ames expanded its research program in human factors and built the Manned Vehicle Systems Research Facility. The search for extraterrestrial intelligence became a key component of NASA's work in exobiology. It was a golden age of intensive

research, brilliant new ideas, and the energetic consolidation and expansion of the center's unique specialties.

Sy enjoyed a distinguished 35-year career at Ames, retiring in January 1984. In retirement he focused on educating the next generation of space explorers. He served as consulting professor at Stanford University and served on the boards of the National Space Club, the West Valley–Mission Colleges District, the California History Center at De Anza College, and United Way of Santa Clara County. Sy earned many awards for his service to NASA and to space exploration. He was elected a fellow of both the AIAA and the American Astronautical Society. He earned NASA's highest award—the Distinguished Service Medal—in 1984 and is a member of the NASA Ames Hall of Fame. His contributions to both aeronautical science and building Ames still resonate long after his departure. Those of us who were fortunate to work for him remember Sy as a great technical leader and an even better human being.

Sy died on September 13, 2010. His first wife, Helen, died in 1981, and he is survived by his wife JoAnn and his daughters Marguerite and Lynn Ann.