



H. E. Sheets

HERMAN E. SHEETS

1908 – 2006

Elected in 1967

“For ship and submarine design.”

BY STEVE LEVINSON

SUBMITTED BY THE NAE HOME SECRETARY

HERMAN ERNST SHEETS, emeritus professor and chairman of the Department of Ocean Engineering, University of Rhode Island, died April 22, 2006, surrounded by his family at his home in Groton, Connecticut. He was 97 years old. Sheets had long, distinguished careers as an inventor, engineer, manager, university professor, department chair, and consultant to industry and government.

Born in Dresden, in the Kingdom of Saxony, on December 24, 1908, Sheets (birth name Chitz) was educated in Germany and Czechoslovakia; he earned his Diplom-Ingenieur in mechanical engineering from Technical University in Dresden, highest in his class of 1934. He then graduated in 1936 from Charles University-Technical University, in Prague, with a Doctor of Technical Sciences degree in applied mechanics and the award for excellence. He began his career designing fans, pumps, and steam turbines for Erste Bruenner Maschinen Fabrik in Brno, Czechoslovakia.

Although he was baptized a German Lutheran, Sheets' Jewish descent forced his departure from Czechoslovakia in 1939 just ahead of the German army. He emigrated to the United States, sponsored by maternal relatives in this country. He then obtained and sent visas to his parents in 1940, but it was too late for them to escape. Years later he learned that they had been deported from Dresden to Riga where they perished.

Offered a position at MIT, the entrepreneurial Sheets decided instead to join a small Midwestern engineering firm, Chamberlin Research Corporation. In 1942, when the company began manufacturing washing machines for the U.S. Army, Sheets, by then a U.S. citizen, joined the St. Paul Engineering Company where he developed hydraulic machinery and valves, including valves for the Manhattan Project. In 1944, the Manhattan Project transferred him to the Elliott Company in Jeannette, Pennsylvania, where he worked on the development of pumps (for the fluids for which he had designed and built valves at St. Paul Engineering) and compressors (including the first supersonic compressor). The Manhattan District Project awarded him a citation in 1945 for his work on gaseous diffusion.

Sheets left Elliott in 1946 for Goodyear Aircraft Company, where he engineered rockets, until Booz-Allen recruited him for General Dynamics in 1952 as chief scientist-engineer for the new nuclear submarine program at its subsidiary, Electric Boat (EB) Company. There he created and led a state-of-the-art laboratory for which he recruited a staff of scientists and engineers, including Dr. Yost Van Woerkom, Dr. Lester Chen, Dr. Bjorn Lund, Allan Anderson, Kurt Lawrence, and Agnes Summers, the first woman engineer at EB. He continued to tap the talents and resources of men with whom he had worked at St. Paul Engineering (Ralph Jones and Evan Johnson), Elliott (Dr. Andrew Vazsonji and Dr. Judson Swearingen), and James G. Wenzel, Lockheed Marine Systems Group.

Under Sheets' direction, EB launched the Nautilus in 1954 and the Sea Wolf in 1955. In 1959, the Nautilus made a historic undersea voyage from the Pacific to the Atlantic via the North Pole. In 1960, the Triton circumnavigated the globe submerged for 84 days. In 1962, EB completed the first Polaris submarine—the George Washington—with a missile-firing range of 1,200 miles and a capacity of 16 nuclear-tipped missiles. In 1969, EB launched the Narwhal, a submarine that used a natural convection reactor, which eliminated noisy pumps and made it the quietest and stealthiest vessel in the fleet.

Dr. Edward H. Heinemann, an aeronautical engineer and vice president of engineering at General Dynamics Corporation,

a leading influence on Sheets and a prominent supporter, nominated him to the National Academy of Engineering in 1967.

At Erste Bruenner in Brno, Czechoslovakia, Sheets had invented and patented the slotted-blade fan, and the Czech company had generously given Sheets the world rights to the patent. Because of its quiet operation, the fan (also known as the vane-axial fan) eventually found its way into U.S. Navy submarines. Sheets continued to improve upon the original design at EB and in retirement; he obtained new patents as late as 1988 and 1991. Probably one of the least known weapons of the cold war, fans are crucial for air circulation in the confined space of an underwater craft. The new cylindrical device was much quieter than the earlier fan, and on U.S. submarines, where stealth was considered more important than speed or the ability to dive deep, quietness was next to godliness.

Another variant of Sheets' invention was a fan that operated at 24,000 revolutions per minute in the very tight confines of a jet fighter. However, in actual operation, the fan encountered some serious problems. First, it generated a lot of noise, although this was tolerable in a jet fighter. However, it also had a short operating life, and when it failed, it failed abruptly putting the aircraft and pilot at extreme risk.

The pilot had to be alerted that the bearings were about to fail far enough in advance to land the plane safely and have a new fan installed. Sheets discovered that about two hours before the bearings failed, an electric current imposed across the lubricant film underwent a change that could be measured. Thus, by maintaining an electric current, the pilot had a two-hour warning that the fan would fail, enough time to reduce the fan requirements and/or land the plane.

With the specific goal of keeping EB profitable and its engineers and skilled workers employed and loyal between submarine contracts, Sheets set to work developing and selling EB specialties, including vane-axial fans for electronic package cooling and for use in marine and commercial heating and ventilating systems and electronic spot-cooling fans; ball valves and actuators (low- and high-pressure ball valves and a three-position hydraulic-valve actuator); vibration-measuring

equipment (a vibra-force analyzer, an automatic 1/3-octave band analyzer, and a dynamic vibration absorber); and industrial control systems for hot- and cold-strip steel mills. Also under Sheets' direction, EB produced systems designed to control the tilt of radio telescopes and systems to regulate the air velocity in supersonic wind tunnels, as well as controllable-pitch propellers for tugs and fishing boats and a hovercraft. In addition, Sheets came across a patentable welding process invented by two EB welders; he obtained a patent for them and arranged for the royalties to be paid to them.

Other notable projects were the all-aluminum *Aluminaut*, financed by the Reynolds Company, and a series of small one- and two-man submersibles for commercial exploration and research (the *Asherah* and *Star 1,2, and 3*), funded by General Dynamics. The latter led to the Navy-financed NR-1 nuclear-powered research submarine. Sheets' lab was directly involved in two projects, AUTECH (Atlantic undersea test and evaluation center) and the NR-1. AUTECH was a pair of deep-diving, two-man, battery-powered submersibles that were larger and more sophisticated versions of the *Star* vessels. NR-1 was ostensibly an oceanographic research vessel, but it could also be used for other purposes. However, Sheets' main interests were in furthering oceanographic research and diversifying EB's products and interests.

Immediately after his retirement from EB, Sheets joined the Board of Technical Audit Associates, founded by Frank Jewett, Jr., and also began consulting for General Electric Corporation in Cincinnati, Ohio, and Lynn, Massachusetts, on the testing, development, and installation of gas turbines in ships LM2500, LM1500 and LM5000. He was also offered full professorships by MIT, the University of Texas, and the University of Rhode Island (URI), which was closer to home. He attributed these offers to his membership in NAE. With three children still in local schools, Sheets decided to accept the offer from URI. Just a few months later, in 1970, his wife Norma died. Sheets was department chairman at URI until his mandatory retirement at 70 in 1979.

Sheets' first major project at URI was the construction of a building to house the recently created Department of Ocean Engineering; the building, on the Naragansett Bay Campus, included a tow tank. He was particularly proud of having completed the task without asking for money from the university or the Rhode Island legislature. Years later, under the leadership of then chairman Dr. Malcolm Spaulding, the university refurbished the building and named it after Sheets. Spaulding credits Sheets' managerial skills for the success of the country's first ocean engineering department.

After his second retirement in 1979, Sheets became principal scientist for Analysis and Technology, Inc., in Stonington, Connecticut. The next year he met Paulann H. Caplovitz, an assistant attorney general of New York, who had retained him as a consultant to evaluate the apparently negligent disabling of the Indian Point 2 nuclear power plant on the Hudson River. Sheets married her two years later and brought her and her two young children, Abigail and Gideon, from New York to Groton. By then, Sheets' six children were grown, educated, and launched. Sheets concentrated all his energy and devotion on work and his family. He confided to his second wife that his greatest satisfaction was when his children, grandchildren, and stepchildren returned home for visits.

After leaving Analysis and Technology in 1984, Sheets worked for a number of specialized marine-related or fan companies in the area, including Ship Analytics, Sonalysts, Epoch Engineering, General Systems Solutions, Inc., and EGG-Rotron Corporation. He retired a third time in 1994 at the age of 84 to focus on projects that occupied him until shortly before his death in 2006. These projects included the application of cold war/space age technologies to commercial products, such as ultrasonic washers and microwave dryers; an "underwater (cylindrical) sail" (based on Flettner's concept) for yachts and submarines; and residential wind turbines. He read his last professional paper in 2003 to the Society of Naval Architects and Marine Engineers, when he also filed his provisional and last patent application for his underwater sail.

Sheets was a tireless contributor to professional societies—the American Society of Mechanical Engineers, American Association of the Advancement of Science, American Institute of Aeronautics and Astronautics, Society of Naval Architects and Marine Engineers, American Society of Naval Architects and Marine Engineers, Marine Technology Society, and Pi Tau Sigma. He also served on committees and boards for the Department of the Navy, NAVSHIPS Shipbuilding Industry Advisory Committee, 1963–1968; the Secretary of the Navy’s Oceanographic Committee, 1968–1977; the NAE Committee on Ocean Engineering, 1966–1968 and Marine Board 1968–1976; the National Research Council Maritime Research Board, Ship Design, Response, and Load Criteria Advisory Group, 1976–1979; and National Research Council Maritime Transportation Research Board, Ship Research Committee, 1979–1982; the Congress of the United States Office of Technology Assessment, Consultant on Renewable Ocean Energy Sources, 1977–1978 and on Ocean Thermal Energy, 1980; and U.S. Department of Energy, Ocean Systems Branch, 1979–1982. In addition to his 26 patents, Sheets authored or co-authored 45 professional papers and seven books.

Sheets combined Old World manners and American informality in a charming way. A reserved but kind man with a droll sense of humor, he could be coaxed into telling stories from his working life that had the shape of little dramas accented with touches of the ridiculous. He began each day by reading the comics, especially his favorite, “Snoopy.” Winner of the all-Saxony decathlon competition in 1929, Sheets remained physically active all his life; despite two hip replacements, he swam weekly until a month before he died.

Sheets is survived by his wife, Paulann H. Sheets, Esq., six children, Lawrence E. Sheets, St. Paul, Minnesota; Michael R. Sheets, Poughkeepsie, New York; Arne H. Sheets, Novato, California; Diana E. Sheets, Ph.D., Champaign, Illinois; Elizabeth J. Sheets, Los Angeles, California; Karn Sheets Ryken, Chelmsford, Massachusetts; and two stepchildren, Abigail P. Caplovitz, Esq., Shelter Island, New York; and Gideon P. Caplovitz, Enfield, New Hampshire; and seven grandchildren.

