



JAMES J. SPILKER JR.

1933–2019

Elected in 1998

“For spread spectrum technology, communications theory, and the global positioning systems.”

BY ANDREW MYERS

SUBMITTED BY THE NAE HOME SECRETARY

JAMES JULIUS SPILKER JR., a central figure in the technical development of the Global Positioning System (GPS) and an adjunct professor of aeronautics and astronautics at Stanford University, died September 24, 2019. He was 86.

Spilker made many technical advances during his long career, but he may be best known for developing the GPS coarse/acquisition (CA) signal in the 1970s, which is today the gateway for all the estimated 4 billion users of GPS. Likewise, his delay-locked loop process, developed in the early 1960s, became essential to GPS accuracy.

He was born August 4, 1933. By his own estimation, he was a sickly child: febrile, technically blind without thick eyeglasses, and shy of 5 feet tall in high school. His mother raised him alone working as a secretary in San Francisco.

Though a bright student in high school, Spilker did not at first apply to college, thinking his mother lacked the financial resources to pay for it. Eventually, however, he found his way into College of Marin, a community college in Northern California. There, two of his science teachers spotted his technical talents and helped him transfer into Stanford University’s undergraduate program in 1953. He went on to earn his BS, MS, and PhD degrees in electrical engineering at Stanford, where he became an expert in transistor electronics

and communications theory. He earned his doctorate in 1958, just one year after the Russians launched the Sputnik 1 satellite.

His first job out of college was with Lockheed Research Labs in Palo Alto, where he invented the delay-locked loop process, an optimal receiver for tracking satellites. "It produced the finest accuracy and that technology...has been in use for GPS for many, many, many years," he said in an oral history recorded in 2018 for the Institute of Electrical and Electronics Engineers (IEEE).

Throughout the 1960s, he authored or coauthored key papers on signal timing technologies that later made possible the precise tracking of satellites necessary for triangulating a user's position on the ground. He then joined Ford Aerospace to help build a multisatellite communications system for the military. In 1973 he and two Ford colleagues cofounded Stanford Telecommunications, Inc., building the company from 3 employees to 1300 by the time it was acquired for some \$500 million in 1999—all, Spilker proudly noted, without the aid of a single dollar of venture capital.

He was always quick to dispense credit to those who worked with him and helped him along the way. "That was not my doing," he would say. "I happened to be the leader for much of that time, but this was a team effort of...wonderful, wonderful people that I will value forever."

He believed his mission in life was to serve others and use his engineering talents to solve the world's pressing engineering problems. In fact, he said, "Engineering technology is the necessary catalyst for world-changing benefits to humanity." He often cited Mother Teresa as a role model.

It was in the early 1970s that Bradford W. Parkinson approached Spilker about collaborating on the original GPS architecture. At the time it was strictly a military project, but the two men always set their sights on civilian applications, where they knew their work would have the most far-reaching effect on society. "We all recognized that the ultimate main market for this type of technology was not military, it was commercial," Spilker said in the IEEE interview.

Spilker focused his efforts on improving both the accuracy and the economics of GPS. He understood from the first that cost would be a key factor in broad acceptance and worked hard to make the technology affordable. In 2018 he imagined himself back in 1978 looking 40 years into the future: “You’d say one word...[:] Magic.” GPS chips now cost “just a few cents.”

Spilker and Parkinson coauthored *Global Positioning System: Theory and Applications* (American Institute of Aeronautics and Astronautics, 1996), the standard text for GPS. And Spilker’s popular textbook *Digital Communications by Satellite* (Prentice-Hall Information Theory Series, 1977) has seen 10 printings, including one in paperback.

In 2001 Spilker joined Parkinson at Stanford as a consulting professor of aeronautics and astronautics. In 2005 he cofounded the Stanford University Center for Position, Navigation, and Time, where he continued to work on satellite navigation. In 2012 he and his wife, Anna Marie, a real estate broker and investor, made a gift of \$28 million to name the James and Anna Marie Spilker Engineering and Applied Sciences Building and to establish a permanent professorship in the Stanford School of Engineering.

Spilker was elected to the National Academy of Engineering, the Air Force GPS Hall of Fame, and the Silicon Valley Engineering Hall of Fame, and was a life fellow of the IEEE and a fellow of the Institute of Navigation. He also shared the Robert H. Goddard Memorial Trophy (2012), presented to “the GPS Originator Team,” and in 2015 he won the IEEE Edison Medal.

In 2019 he was honored, along with Parkinson and industry engineers Hugo Fruehauf and Richard Schwartz, with the Queen Elizabeth Prize for Engineering (QEPrize) for their pioneering work in the development of GPS. One of the world’s most prestigious engineering accolades, the prize came with a £1 million honorarium to be shared among the recipients. Spilker donated his share to the Stanford School of Engineering, a testament to his ever-generous spirit.

“Jim Spilker was a technical giant, as his many accomplishments and awards attest,” said Jim Plummer, former dean of

the Stanford School of Engineering. “But he was also someone who cared very deeply about the next generation, about education, and about finding ways for universities to more effectively tackle the big problems we face today. He was a champion of interdisciplinary research teams. He was a very valuable advisor to me when I was dean and always had thoughtful and often unexpected ideas on how to tackle both opportunities and problems. I will greatly miss him.”

“An era is passing,” said friend and colleague Brad Parkinson. “Jim made so many contributions to GPS—the signal, the original monitor stations, and the books that propagated his great knowledge to the next generations. He was always a very positive and creative contributor to the world of position, navigation, and timing. We will miss him, but hold him as a wonderful example of engineering and of Stanford graduates.”

In his spare time Spilker was something of a fitness enthusiast, and won awards in bodybuilding and sprinting in his 50s and 60s.

He is survived by his wife of 44 years, Anna Marie, of Half Moon Bay, California; their children Leslie (Bruce) Dudley, Mark (Karen) Spilker, David (Arlene) Spilker, and Sharon (Bob) Scripps; 12 grandchildren; and 3 great-grandchildren; as well as Merry, his German shepherd, and two rescue cats, Siam and Tiger.

