

## ~ George J. Linde ~ 1941 - 2012

**George J. Linde**, a long-time member of the Radar Division, died January 17, after a long illness, which he battled courageously. His family endured the Nazi occupation and then fled to Germany when the Soviet Army invaded in 1944. During the difficult years after WWII, the family was sent to a Displaced Persons camp in Augsburg, Germany, where George attended elementary school. In 1950, the camps were closed and the residents were resettled into communities all over the world. The Linde family found sponsorship to settle in Hutchinson, Minn.

After showing an early interest in engineering, George attended the Institute of Technology at the University of Minnesota where he received a BSEE with Distinction in 1965. He worked for one year at the IBM Corporation at Rochester, Minn., before joining the Radar Division at NRL in 1966.

While at NRL, he earned a MSEE from the University of Maryland in 1971.

George made contributions to many significant radar projects over his 41 years with the Radar Division. Early on he became the principal investigator for the experimental Reflect-Array Radar used to validate new concepts which ultimately led to the specifications for the Aegis SPY-1 radar. He was also a member of the team that developed and demonstrated a new Low Probability of Intercept radar system.

He helped design and demonstrate radar concepts for the secure landing of aircraft aboard Navy carriers and was the principal investigator for a project to develop and demonstrate ECCM techniques for Navy radars. He was principal investigator for the development and demonstration of a Surface Search Image-While-Scan radar for continuous surface surveillance and ISAR imaging of targets of interest.

A large part of George's career at NRL in the 1980s was devoted to his assignment as the principal investigator for the SENRAD radar being installed at NRL's Chesapeake Bay Detachment (CBD). SENRAD was a revolutionary new radar concept for future air-surveillance radars, developed at NRL with industry support. This radar featured a very wide bandwidth of 850-1400MHz, which made the radar resistant to enemy jamming, allowed the use of wideband waveforms for target imaging and classification, reduced multipath effects over water, and made it possible to implement a novel type of height finding. After the work on SENRAD became declassified, a detailed paper on its design and performance characteristics was published in 2001 in the *IEEE Transactions on Aerospace and Electronic Systems* in a paper co-authored with **Dr. Merrill Skolnik** and **Keith Meads**.

In 1995 George became the systems engineer and principal designer for the WARLOC radar, the world's highest power 94 GHz radar, later to be sited at CBD. The Gyro-Klystron tube for the radar, which provides more than 80kW of peak power and 10kW of average power, was developed in a joint program with the NRL Electronic Science and Technology Division. His contributions included the overall radar design, the system integration into two trailers, and years of research in many areas



George J. Linde.

of millimeter-wave radar phenomenology. This research included propagation effects, sea clutter reflectivity, inverse synthetic aperture imaging, and the discovery of a new phenomenon, which he named "airspikes," thought to be caused by intense pockets of refractive index fluctuation. His work on WARLOC resulted in the Radar Division of NRL acquiring a world-class capability in the technology and phenomenology of millimeter radar.

George retired from NRL in 2007 but continued



his association with the Radar Division working part time, initially as a re-employed annuitant and later as a contractor.

At his retirement luncheon, a letter was read from Dr. Merrill Skolnik, former Superintendent of the NRL Radar Division. The following quotes from this letter speak for themselves:

"There are many different kinds of radar engineers – from those who philosophize about radar to those who build it, operate it or maintain it (usually all different people) and all those in between. But I consider you to be the classical kind of real radar engineer who creates a new type of system that never existed before."

"...You are truly what a radar engineer should be: one who can start with just an idea and create something important that didn't previously exist,

then utilize this radar to understand what it can do, and then to convey this knowledge to others."

Over the years George received four Alan Berman Research Publication Awards, the NRL Award of Merit for Group Achievement for the High Power W-band Gyro-Klystron Amplifier and WARLOC Radar Development, and the NRL Technology Transfer Award. He authored or co-authored 32 published papers and 21 NRL reports.



In addition to his work in the field of radar George devoted much of his spare time to some unique and interesting hobbies. He was a master woodworker and built many pieces of furniture, as well as elaborate computer-designed bowls, using wood from a cherry tree in his yard that he cut and seasoned.

He had an avid interest in astrophotography and spent many night hours, usually in the cold winter months, photographing the night sky from an observatory he built on his property. He had a particular interest in the photography of nebulae and galaxies where exposure times of hours are often required. These photographs grace the walls of his home and were used on Christmas cards sent to friends and relatives. He was an avid runner all his life and traveled to witness a number of world class track events including the 1972 Olympics. George also had been President of Our Savior's Lutheran Church at Bryans Road, MD, where he was intimately involved in the day-to-day affairs.

George and Beverly, his wife of 46 years, greatly enjoyed traveling in the United States, as well as to Canada and Europe. His preferred method of travel was always by car, and he insisted that everyone must travel coast-to-coast by car at least once in a lifetime. Together George and Beverly did it a number of times. George and Beverly also owned a large motor yacht named *Impatience*, which they used to cruise along the Potomac and the Chesapeake Bay on weekends and vacations.

George will be sorely missed by his colleagues at NRL, not only for his technical expertise, but for his dry Minnesotan humor and unassuming manner. His was a life well lived. ♦

~ written by Robert Crisler, Mai Ngo,  
and Vilhelm Gregers-Hansen