

# It IS Rocket Science

Though Karl Kachigan would humbly call himself a Dynamics Engineer, he was in fact a scientist of rockets.

He and his teammates wrote the rules and procedures on how to successfully build and launch missiles into space. Atlas missiles are considered to be the basis for American space exploration.

The Atlas launched America's first astronaut into orbit; sent the first probes to Venus, Mercury, Mars, Saturn and Jupiter; fueled the first lunar orbiters and landers; and was America's most successful commercial launch of communications satellites.

Text Ani Garibyan

**T**hough Karl is no longer with us, his son Kent Kachigan took me through his father's story. Karl's father was from Harput, Turkey and after a long journey, ended up in Carrollville, Wisconsin. Due to his management and multilingual skills, Karl's father became the foreman of a glue factory. He passed away when Karl was only 15.

Karl worked nights as a janitor and put himself through Marquette University, receiving an engineering degree in Dynamics. Upon graduating, Karl interviewed at Convair with Dr. Hans Friedrich. Hans and his counterpart Wernher von Braun (the "Father of Rocket Science") were lead engineers for Nazi Germany and developed



their V-2 missile and jet program. After the war, they emigrated from Germany to the United States to continue their work. Before digital calculators and computers, complex math was done via slide rule, and one of Karl's first duties was to check Hans' math with a slide rule. In 1952, Karl moved to San Diego to work for one of the masterminds of the modern day missile at Convair, which later became General Dynamics.

Upon joining the team, Karl began researching why liquid propellants would cause the missiles to go out of control. By the time he was 25, he and his team had already solved that problem. Kent recalled his older siblings helping their father with his experiments by walking around the house holding glasses of water. The vibrations from walking swayed the water, which in simple terms is the same thing that happens when a missile is launched. At the time, the nation's attention and funding were allocated to such projects. Everything about the project was highly secretive because of the space exploration competition between the United States and the Soviet Union. This competition was especially heated because the Soviet Union was already ahead in the race to space. The majority of U.S. satellites launched between 1965-1980 were delivered to space through the perfected Atlas missile. He would test every aspect two weeks before the launch. His procedures and standards continue to be used today. In the book, *Taming Liquid Hydrogen: The Centaur Upper Stage Rocket 1958-2002*, the authors write, "He [Karl Kachigan] produced a major paper in 1955 that described forced oscillation of a fluid in a cylindrical tank. Because Atlas had no rings inside the tank to dampen the oscillation of the liquid propellants, it needed baffles to prevent the propellant from sloshing. Kachigan's contribution to the problem of sloshing proved to be a major contribution to rocket theory."

Kent explains, "My grandfather was an excellent manager, being able to speak many languages. He was able to relate to people, and this he passed on to my father." It was said that Karl was able to ask straightforward questions without embarrassing anyone. One of his keys to success was being open. "He had an open door policy. If there was a laborer on the assembly line who said, 'I think this is wrong,' he would take it seriously. He didn't care where the answer came from, as long as it was correct," said Kent. From a young age, Karl was the head of the program, yet he remained humble. Kent explained that he never allowed himself to forget his past. His hardships allowed him to understand every employee, no matter their rank. At an anniversary event, there was a long line of people waiting to speak with Karl. Kent recalls one man coming up to his dad saying, "Mr. Kachigan, I don't know if you remember me, but you asked me 22 questions until I got one right, and from then on I engineered all of my projects in that fashion. After that, I never came unprepared."

There were no textbooks about engineering missiles when Karl and his teammates were constructing these missiles; they were true scientists. They had to test and fail in order to understand and perfect their product. They were pioneers in the field. Karl stopped launches if he found something out of place. He was a true perfectionist. Karl's leadership was written about in *Taming Liquid Hydrogen: The Centaur Upper Stage Rocket 1958-2002*, stating, "Kachigan's leadership helped shape the early General Dynamics Centaur culture. Several weeks before a launch, he sent a 'tiger team' to 'muck through' all the paper, look at all the hardware, and examine all the test procedures and analyze the data." It continues, "Though analytical and fair, he was universally respected for his ability to ferret out problems and make decisions under pressure."

The Atlas missile allows people to use Google Earth images, GPS navigation, and wireless communication, among other luxuries.

"He would always cross his fingers during every launch," said Kent. Once Karl snuck Kent, then in his 20s, into the base to sit in the control room and watch the launches. It is believed that Karl is the first civilian to receive "Public Service Award" from NASA. And yet, Karl Kachigan did not really have the intention to apply to college until one of his teachers pushed him to go. Karl had written, "I always felt that if Pa and Ma had not come to the USA, I would have become a shepherd with a good view of Mt. Ararat." After Karl Kachigan's death, there was an outpouring of letters and e-mails to his family expressing the profound influence he had in the lives of those who knew him. Dick Martin wrote, "Our space careers have been intertwined since 1952. I remember clearly in 1952 Hans Friedrich turning around after a

phone call and telling the four-person Atlas Dynamics Group with a pleased look on his face that he had just received acceptance of a job offer to a new graduate from Marquette University and telling us, 'I think this young man has great potential and will be an important addition to our little group.' He sure had that right."

Joe Neiberding, president of Aerospace Engineering Associates recalled, "Over the years, I worked a lot with your dad. I can honestly say that he was one of the best engineers I ever worked with. He made a significant contribution to the nation's space efforts." Larry Ross shared, "He was my role model for what an engineer should be – a remarkable blend of theoretical expertise and substantial down-to-earth common sense." Another letter read, "The opportunity to work for your dad was one of the main reasons I joined [General Dynamics] out of college." Martin Winkler wrote, "Karl really was the smartest guy in the room. He always listened patiently, he asked good and pertinent questions, and he never embarrassed anyone, even if at times they perhaps deserved it. And most of all, Karl made us all better engineers." ■