Executive Comment

Fifty-Years in Space and Satellite Communications

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I am pleased and honored to provide an Executive Comment to the Japan Space Review. I retired from the Space and Advanced Communications Research Institute of the George Washington University in 2008, and am now enjoying full retirement. My wife and I have moved from the Washington, DC area to Virginia Beach, Virginia where we live next to the ocean. Please allow me to highlight my wonderful career of over 50 years in space and space communications.

I joined the Army Security Agency in 1956 and was a junior member of the Army's space tracking team waiting for Sputnik 1 when it came over the horizon on October 4, 1957. I was actively involved in the first day of space. I left the military in 1959 and entered as a student to Georgetown University. In early 1967, I left the university and joined Comsat as an assistant to the technical vice president. It is noteworthy that my close friend, Joe Pelton, continued his studies for Ph.D in the university. Then he joined Comsat in 1968 while still working on his Ph. D thesis.

My first day at Comsat I met Dr. Wilbur Pritchard, the first director of Comsat Laboratories who invited me the following day to an all-day review of digital technologies. While Dr. Pritchard was the chair of the 12-hour meeting, Dr. Tadahiro Sekimoto, an Intelsat technical specialist from NEC assigned to Comsat Labs, was the digital expert.

Later in 1967, Dr. Burt Edelson retired from the Navy and became the deputy director of the Labs, and its director in 1972. He became my mentor, boss and best friend. In 1970, Dr. Edelson asked me to come to the Labs and work directly for him. I was honored.

Dr. Edelson asked me to manage the complete technology development program. My job was to get components and systems out of the R&D stage into operational products and services. I recognized a large gap between the Lab system and an operational system. I closed this gap with tightly monitored experiments and demonstrations with potential operational customers. Thus began a continuous series of demonstrations of solar cells, batteries, momentum wheels, digital components and communications throughput experiments. Since Comsat/Intelsat, by their organizational framework, were not manufacturers, it was easy to get the space manufacturers to work with us. Many times after successful demonstrations we would license the technology, or often we would just give it away, as it would increase the efficiency of the global system that was our ultimate goal. Often I could see gaps in the synergy of our technologies. We were making 2/3rds of a product but we lacked the final 1/3 that would make it operational. The Intelsat R&D program, then run by the Labs, gave me the opportunity

to fund research in areas to fill gaps. Thus, we funded challenging research projects with KDD, NEC and Fujitsu Labs to name only a few.

In a Comsat Corp. R&D meeting in 1967, the company was asking the Labs for more research on 30-meter Earth terminals. I asked if there was to be any research on small terminal development and was told, not for many years. However, Dr. Pritchard started a low-budget program in 1968. Also in 1968, I had an assignment to assist the US government in placing the first, small (5m) antenna in 1969 in Antarctica. When I got to the Labs in 1970, I was given responsibility for a larger program in small terminal development. In less than two years, under the engineering leadership of Joachim (Kim) Kaiser we had developed a 2.4m terminal and added full mobility tracking and demonstrated it on the ocean liner Queen Elizabeth 2 while crossing back-and-forth over the Atlantic. The next year we put the terminal on the Hospital Ship HOPE as it traveled to and moored in Brazil. When the HOPE ship returned to the US in 1974, it docked in Norfolk, Virginia a large Navy base. Dr. Edelson invited some of his Navy friends, who were now Admirals, to visit the ship and see the terminal. One of the Admirals said the three 64kb/s channels in our small, $25,000 terminal, had more throughput than the entire communications on his large aircraft carrier across the harbor. This quickly led to the Comsat/Navy successful Marisat global satellite system in 1976 that then led to Inmarsat.

Comsat Labs, now, had a number of 2-5m terminals that we demonstrated around the world, from the inner-jungles of Brazil to the icy-slopes of Spitsbergen, Norway. The small terminals allowed us to go directly to the parking lots of companies to conduct experiments and demonstrations. These demonstrations lead to a number of firsts: the first high-speed (155Mb/s) facsimile of complete Dow-Jones newspaper pages, the first mainframe computer-to-computer high-speed satellite transmissions from IBM-US to IBM-France. In 1976, during our US bicentennial, we demonstrated the first mobile TV satellite truck that now is used at all sports and news events.

Our small-terminal research program called for a 1m terminal by 1976. We ended up with a 1.2m dish mounted on a TV camera tripod with a 20W transmitter, power supply and three 64 kb/s channels all weighting less than 65kgs. We could carry the terminal around in a small van. I chose to use this new terminal to help all humankind and started a disaster mitigation demonstration with the Red Cross. I look the terminal to actual disasters where the presence of reliable communications resulted in the savings of many lives. I wrote a technical paper promoting a global disaster mitigation satellite system and presented the paper at the International Astronautical Conference (IAF) in 1977 at Prague, Checkoslovakia. While the system was never fully realized, most countries purchased small terminals that were compatible with Inmarsat and Intelsat satellites.

At the IAF conference in Prague, I had lunch with the chairman of a space safety committee who was complaining that the committee was loosing its goal. I mentioned I had been planning a search and rescue (SAR) satellite system, which they can make their new goal. I was invited to give a presentation on my plan, to the committee in an hour. Quickly writing one page of notes, I presented a plan of low-cost satellites initially working with inexpensive transmitters carried by pilots and seamen that can be turned-on by hand or activated in a crash. The satellites will triangulate ones position and send it to a SAR center that can start a search effort if required. My plan was enthusiastically accepted by the committee, especially delegates from the Soviet Union and Canada, with their large open areas and by maritime countries Japan and Norway. The SARSAT system was then (better) designed, satellites built and operational by 1982.

In 1980, Dr. Edelson and I left the Labs together. He became the associate administrator of NASA for science and applications. He started the "big five" science exploration satellites, the Mission to Planet Earth program and the ACTS communications satellite. I stayed at Comsat Headquarters until 1984 primarily in the Arabsat program. Then, I worked on the ACTS program as a consultant and became the director for the launch, testing and demonstration of the U.S. military's first "smallsat."

In 1990, Dr. Edelson was planning to leave NASA and asked me to join him in founding a new university research center for satellite communications. Our Institute for Applied Space Research was chartered in 1991 by The George Washington University (GWU).

Dr. Edelson wanted to broaden our cooperation with Japan. He called his close friend Dr. Sekimoto of NEC who agreed to help. Both received good government approvals and the Japan-US Science, Technology & Space Applications Program (JUSTSAP) was established. From the beginning, outstanding leadership was provided by Takaji Kuroda of NEC and Takashi Iida of NICT. I believe the high-speed ACTS experiments were outstanding early experiments with Naoto Kadowaki and Yoshiaki Suzuki (then) of NICT providing good direction. The JUSTSAP Program continues to provide space cooperation between the two countries

I took a leave of absence in 1998 to start an Internet company that within one year had the fifth fastest search engine in the world. My company received the patent for "clicking on a highlighted word or phrase and being taken back to a database for more information." Two Japan companies were planning to invest and IBM was in the process of acquiring my company when the Internet "bubble" broke in 2001. I closed down my company and returned to the GWU Institute.

Prof. Joe Pelton, who was at the Univ. of Colorado, joined our Institute in 1995. We conducted research for NASA, other organizations and nations, including Japan's CRL/NICT. Prof. Edelson's untimely death in early 2002 was very hard on the Institute. Prof. Pelton provided new leadership, but the spark was gone. Both Prof. Pelton and I retired in 2008 and closed the Institute.

Again, I am now retired and live by the ocean. I am taking graduate university courses in religion and psychology to keep my mind active. I am pleased with my career, primarily in satellite communications. The many good programs and friends I established in Japan are a highlight of my career.