Between a Rock and Outer Space: Interview with OSCAR Pioneer Lance Ginner

Interviewed by David Hartzell, NØTGD, hartzell@gmail.com, Project OSCAR

Recently, I sat down with Lance Ginner, K6GSJ, one of the original Project OSCAR members who helped design and fly the first amateur satellites. Overlooking Silicon Valley from his house in the Portola Valley hills of Northern California, we discussed the amazing set of events that defined the early days of amateur satellites. Over forty years ago, a unique set of individuals, Lockheed, the United States Air Force and the national security needs of the United States contributed to the successful launching of the amateur satellite community, which thrives today in many forms. Here is Lance's story.

NØTGD: How did you get involved with Project OSCAR?

K6GSJ: I started work at Lockheed Missiles and Space Company in Sunnyvale, CA in January 1960 as an "A" Technician. I was 21 years old. I worked in the Agena A and B space vehicle checkout complex and I was initially responsible for designing and building test aids to facilitate final systems checkout of the satellite prior to its shipment to Vandenburg Air Force Base for launch.

The following year I went to a salaried position and was a test conductor in satellite subsystems and systems level checkout. It was at this time I became aware of Project OSCAR through Chuck Townes, K6LFH, (SK) and Nick Marshall, W6OLO, (SK), both of whom worked at Lockheed.

My career at Lockheed for the next five years or so was primarily in the area of satellite systems checkout for a variety of space vehicles following the Discoverer series of satellites. I then moved more into the payload and classified program areas in more of an engineering capacity.

NØTGD: How did you contribute to the various OSCARs launched?

K6GSJ: I was directly involved in OSCAR 1 through 8 in one capacity or another. Chuck Smallhouse, W6MGZ, and Al Diem designed and built the transmitters for both OSCAR 1 and 2. Ed Beck, K6ZX, designed the "hi" keyer. I took the RF and keyer modules and did the internal satellite wiring to the batteries and deployment switch. As part of my normal duties at Lockheed, I was able to see the integration of the OSCAR 1 satellite with the Discoverer 36 Agena B satellite. I worked with Nick Marshall in the qualification of the OSCAR 1 satellite. We performed vibration, shock and temperature testing of the satellite "after hours" at the Lockheed Palo Alto Research Laboratories. OSCAR 1 was launched on December 12, 1961, being the first stand-alone "sub-satellite" that was deployed from a larger spacecraft in orbit. OSCAR 2 was launched only six months later on Discoverer 43.

NØTGD: In your mind, what were the most challenging aspects of the first few OSCARs?

K6GSJ: Getting the early OSCAR satellites approved for launch was a highly political process. I was a 21 year-old just starting out in the field and was tremendously impressed by the talents of the OSCAR Board of Directors. The challenges the board faced in obtaining the permissions from the various government agencies and Lockheed were enormous. We had to keep in mind that ejectable sub-satellites were unknown at this time, and convincing the various agencies that this "honor" should go to a "home built" satellite with no official credentials was seen as a big risk. A premature release of the OSCAR satellite would keep the Agena satellite from deploying its booster adapter and would be a catastrophic end to the main mission. There were numerous meetings with government and military representatives (including many well-connected hams). These discussions and the creation of the OSCAR "White Paper" helped establish the political and technical credibility we needed to obtain launch permission. The bureaucratic efforts probably exceeded those required to build the satellite.

There were certainly technical risks in the space hardware. In 1961, there were no transistors that would put out any real power at 144 MHz. We ended up using a prototype Fairchild part that was not even on the market. In those days, you did not have someone saying, "you can't do it that way", because no one had ever done it before!

After the launch of OSCAR 2, there was long period of trying to decide what to do next. The concept of a translator satellite (OSCAR 3) was developed by Ed Hilton, W6VKP, (SK) and Don Norgaard, W6VMH, (SK). The production of an in-band 2-meter linear translator (including antennas) in a shoebox-sized container was a very tough technical challenge. Again we were confronted by the lack of adequate RF components that operated at 144 MHz and that could provide the tight filtering that was required to minimize desensitization between the input and output frequencies.

We had a launch opportunity in March 1965 on a classified mission, which made it a challenge to interface with the rest of the OSCAR group and builders as I was the only one in the organization with the proper security clearances. We designed a new satellite structure to take advantage of more available space and the unique mounting and ejection structure. Solar arrays were not available in any quantity and we had to go to a space-qualified silver-zinc primary battery for power. I hand carried OSCAR 3 in my car to Vandenberg Air Force Base and assisted with the mounting of it to the main spacecraft.

I think OSCAR 3 was the high point of my OSCAR experience because I was almost solely responsible for the design of the satellite enclosure, ejection mechanism and launch coordination. The electronics design and construction efforts of Ed Hilton and Don Norgaard were truly state of the art at the time. I learned a great deal from both of them.

NØTGD: I'm sure things didn't always go as planned. What didn't go right?

K6GSJ: At the time of the OSCAR 3 launch, I was in charge of a small "off the books" tracking station that we had about a mile away from the main Lockheed facility. We had a 17-foot dish on a WWII SCR-584 radar pedestal along with a small command link antenna off the side of the dish. I was monitoring the countdown and launch activities. The launch date/time were classified but the Project OSCAR group needed to be prepared. I set up several launch rehearsals beforehand to allow Project OSCAR to establish the communications paths to disseminate information to the ham community regarding orbit and tracking information for OSCAR 3. It just so happened that one of these rehearsals turned out to coincide with the actual launch on March 9, 1965. While observing the launch from the small tracking station and listening to the launch commentary, we got a report

that the deployment switch for the OSCAR 3 satellite showed "deployed". If this were true, then the entire mission was going to fail as the OSCAR would wedge between the Agena space vehicle and the booster adapter and keep it from separating and performing the final rocket burn to orbit.

The next few minutes were the worst of my life. If the telemetry was correct then that would be last of the OSCAR program (and probably my career as well) as I had designed the deployment mechanism and "certified" the spacecraft was qualified. Fortunately the separation was successful and later investigation found that the separation indicator switch on the Agena side of the interface had been misadjusted prior to launch.

Then there was OSCAR 4, a Phase III bird intended to be in a geosynchronous orbit, but the third stage of the Titan 4 didn't fire. This put the third stage with seven other payloads, including OSCAR 4, into an elliptical high-earth orbit. The resulting 22,000 x 100 mile, 9.5 hour orbit was totally unexpected. We were fortunate in that Amateur Radio operators did acquire the OSCAR 4 signal. Based on the orbit period, we were able to construct user visibility projections by using a large Earth globe and stiff wire scaled elliptical loop that was representative of the orbit. Masking tape markers were placed at approximate hourly orbital time intervals and an alligator clip was used to indicate the position of the satellite on the orbital loop. By standing on a tall stepladder, looking from behind the alligator clip towards the globe, we could "eyeball" the relative position on the globe based on multiple ham operator signal acquisition and loss times. For the first 24 hours or so the Air Force and various other payload vendors would call us to get an estimate of where their satellites were. We were fortunate in having a wide observer base and the ability to quickly react to unusual circumstances. (Ed. – Just another case where Amateur Radio has added value to the larger community. What a fantastic bit of information!)

The TRW radio club in Los Angeles built OSCAR 4. I was involved in the launch coordination with TRW and the Titan 4 contractor. The story of how OSCAR 4 got the opportunity for a ride to synchronous orbit is a classic. The Titan IIIC launch system was just being qualified and the press had been having a field day when they found out that the boosters were being tested with a payload of sand to qualify the booster lift capability. What made it even worse was that it was not even Florida's sand, but for some reason had to be imported from out-of-state!

Embarrassed, the Air Force put out a plea for payloads they could fly as part of the test series. While the risk to payloads was high, as the Titan system was still in development, there were many organizations including Project OSCAR that wanted to take advantage of the opportunity. The problem we had was that we were given less than a year to design, test and integrate a suitable ham satellite. OSCAR 3 was in its final testing phases and fortunately, at this time the TRW radio club came to the rescue. They were able to put together a satellite using "spare" parts and solar panels from other missions.

NØTGD: Were you familiar with the primary payload of the Discoverer missions?

K6GSJ: Yes, I was familiar with the primary payload, as it was my day job. We (Lockheed) were building and launching the first ever spy satellites known as CORONA and OSCAR was along for the ride.

The recovery of the CORONA film capsules was still a significant technical challenge at the launch of Vehicle 1119 (Discoverer 36). Once we established technical credibility with the successful launch of OSCAR 1 and 2, subsequent Air Force launch efforts were much easier. I was fortunate to have the security clearances necessary to facilitate integration of later OSCARs with more classified launches.

There is a very good book that describes the history of the Corona spy satellites that I would encourage anyone to read: Eye in the Sky: The Story of the Corona Spy Satellites, edited by Dwayne A. Day, John M Logsdon and Brian Latell.

NØTGD: Did you think that an organization like AMSAT would evolve out of your early efforts?

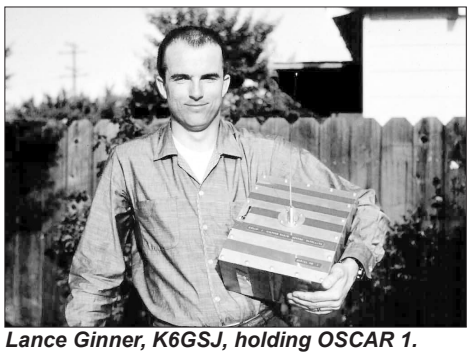
K6GSJ: OSCAR activity slowed after a very active five years (1960-1965) and the launch of four satellites. During this time, a group from Australia wrote to us asking for assistance in building their satellite. I provided design guidance with regard to the space-frame "envelope" based on the possibility of another launch opportunity similar to OSCAR 3. The Australians did deliver a satellite, which became OSCAR 5. We did not have another launch opportunity and the satellite went into storage.

It was then I met Jan King, W3GEY, along with Perry Klein, W3PK, Dick Daniels, W4PUJ, and many others from the then-developing AMSAT organization. AMSAT spearheaded the ultimately successful drive to find a NASA launch opportunity for the OSCAR 5 satellite. Jan, in concert with the Australians, brought the satellite up to launch readiness for a successful flight on January 23, 1979. I had enormous respect for Jan's talents and dedication. It was very clear then that AMSAT would be successful. Project OSCAR then provided space-quality parts and some space frame and equipment enclosures for several of the early AMSAT spacecraft.

I have wonderful memories of the early years and relish having met such talented and dedicated people in the Project OSCAR and AMSAT organizations.

NØTGD: Lance, thanks for your time. I know many others will appreciate and enjoy reading about your experiences with the early days. 73!

Interviewer's Notes: *In the late 1990s, President Bill Clinton declassified the CORONA intelligence gathering program, including technical material and over 900,000 photos. CORONA and its follow-on programs helped close the perceived missile gap during the cold war with the Soviet Union. It also helped establish the precedence and technology needed for various forms of space-based earth monitoring, and OSCAR was along for the ride. After Project OSCAR, Lance became involved with the deployment of FM repeaters in the Bay Area, moving into microwave experimentation. He retired from Lockheed in 1996 after a long, distinguished career working on various space-related projects. Don't miss your chance to meet or become reacquainted with Lance at this year's AMSAT Symposium, being held in the San Francisco Bay Area this October. See www.amsat.org for more details.*



Lance Ginner, K6GSJ, holding OSCAR 1.