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The spirit of adventure lies buried in every man's soul. Strike the spark and ignite the soul and the impossible is accomplished. So it was on December 12, 1901 on a chill, Newfoundland morning. The first self-proclaimed radio amateur, Guglielmo Marconi, bent intently over his crude receiving instruments and heard the letter "S" transmitted across the stormy Atlantic Ocean, from a station in Cornwall.

The spirit of adventure again made its mark sixty years later on December 12, 1961. The locale this time was an experimental aerospace base on the border of the Pacific Ocean. A group of radio amateurs saw launched into orbit the first amateur radio space satellite. Born in a burst of flame, the 10-pound, home-made beacon satellite transmitted to the world that the spirit of adventure and quest that drove Marconi down the road of history was still goading the radio amateur in his eternal search after the mysteries of nature. This is the story of a small portion of that quest.

Sixty Years of Radio Amateur Communication

Marconi to the Oscar Satellite

BY WILLIAM I. ORR,* W6SAI

FEBRUARY, *1959: The radio amateur gazed thoughtfully for a moment at the white paper in his typewriter. Suddenly his fingers sprang into action and the keys flashed the fateful words, "Currently being tested is a solar powered six- to two-meter transistor repeater which could be ballooned over the Southwest. Can anyone come up with a spare rocket for orbiting purposes? . . . 73, Don, W6TNS."*[1] *He slapped the page from the typewriter, setting in motion a chain of events that conclusively proved that truth is indeed stranger than fiction.*

The local time is 0200 on a cold, starless 1961 December morning. The location is Vandenberg Air Force Base, California. It is a cheerless, predawn moment. Inside the reinforced block house, the combined USAF and contractor crews are busy at work. The block house walls are lined with TV monitoring screens. Along one side is the launch control console. Communications, radar and propellant monitors are on; talkers and other intercommunications people are at their stations. The key personnel are locked in unison by a single communications net. All wear headsets and microphones so that they can use their hands freely. A complex network permits several simultaneous conversations. The outpouring of this network culminates in a teletype transmission to the Program Director located 170 miles away in Inglewood, California. The RTTY channel springs to life and begins to clatter: . . . FM 6565TH TEST WING VAFB CALIF TO SSD LOSA CALIF THIS IS A CONTINUOUS MESSAGE. . . . R MINUS 500 AND COUNTING. . . .

In the cold night illuminated by a thousand lamps, the Agena-Thor aerospace vehicle sits on the reinforced launching pad. Known as Discoverer XXXVI, this intricate, calm, sophisticated spire of brute power awaits the command to hurl itself into space. From it will eject man-made satellites, orbiting the earth hundreds of miles above. One of these will be of great interest to the radio amateur. It is Oscar.

Of the thousands of readers of Don Stoner's article, none was struck more forcibly than Fred Hicks, W6EJU, of Campbell, California. An old-timer in the communications game, Fred was now employed by a large missile contractor in the San Francisco bay area. Fred had been present in the blockhouse at Vandenberg for the first six Discoverer

* Project Oscar Association, Box 183, Sunnyvale, California.

[1] "Semiconductors" *CQ*, April; 1959, page 84.

. . . T MINUS TEN AND STILL COUNTING. . . . Tension builds up as moment of launch nears. (Left to right): Capt. Turner (USAF); Bill, W6SAI; Ray, W6MLZ; Dos, WØTSN; and Chuck, K6LFH. Chuck talks to Oscar Control Center, WA6GFY, to make sure that traffic net to South Pole is ready for acquisition of Oscar as it passes on initial revolution. (Photo: USAF)

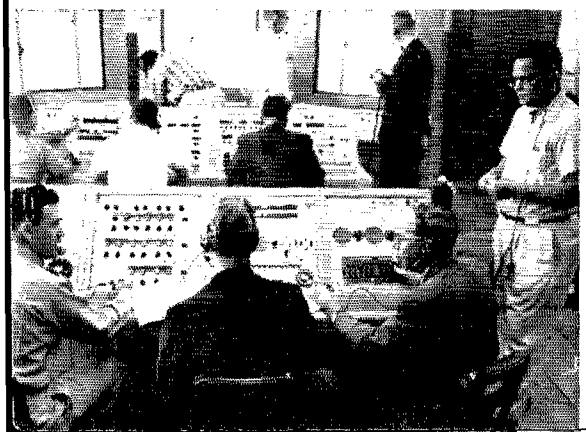
launches. To Fred goes all credit for grasping the true nature of Don's message, and interpreting it in terms of the full spirit of amateur radio.

Fred dropped the magazine on his desk, pushed aside a cup of coffee and reached for the telephone. He dialed a number and listened to the automatic stepping switches go through their complicated dance in the earpiece of the instrument. "Hello, Chuck? . . . Hey, buddy, did you read Don Stoner's article this month? . . . Well, he said in effect that the radio hams could build a satellite if they could only find somebody to launch it for them. . . ." The voice on the phone crackled. "Right! That's what I was thinking. Why don't you drop Don a line and get this thing organized? . . . If old K6LFH and W6EJU and their buddies can't do the job, why, nobody can!" Fred chuckled to himself as he hung up the phone. Chuck was right. Why not *build a ham satellite? The idea wasn't so crazy after all. A lot could be learned from such a device. The satellite would . . . it would . . . well . . . Fred suddenly realized that such a simple, beguiling idea could not be defined and would entail a lot of work and planning to even begin to be coherent. Obviously it was a fine project for a club, or group of hams. One ham couldn't handle this "brainbuster." As H. P. M., The Old Man, might have said, "It was an idea without a handle to grab it." . . . Truly, W6EJU was blessed with the spark of adventure.*

The count down begins at R minus 500 minutes and is divided into more than twenty tasks. More than 1500 separate instructions must be given from the launch console before the vehicle is ready for the great voyage into space. Guidance checks, polarity and phasing checks, vehicle erection, re-check of destruct systems, orbital electronics and control checks, propellant tank checks, telemetery operational checks, and satellite operational checks must go on in infinite, precise detail. The voice of the teletype chatters endlessly. . . .

. . . R MINUS 350 AND STILL COUNTING. . . .

Vandenberg control and tracking station pin-points the Discoverer as it races in orbit around the earth at 18,000 miles per hour. Oscar satellite follows its own orbit at approximately same speed as the parent satellite. Orbital data is plotted on boards at the rear of the room from the acquisition and control consoles in the foreground. (*Photo: Lockheed*)



13 October, 1959

"Dear Don:

"I remember you wrote an article for CQ some time ago that described a small transistorized two-meter station, and appealed for 'anyone with a space vehicle, please?' . . . Though I do not hold out any too much hope for this, I will do my best to interest certain parties . . . please send me the exact weight of the installation and space it occupies. . . . Actually, the 'Discoverer' is ideally suited to such a ham project. I will sound out the local hams . . . look for me on 14,285 kc . . . 73 and I certainly hope we can pull this off! . . . Fred, W6EJU."

The die was cast. The spark of adventure had found fuel and was burning brightly. The fateful letter was on the way; was in the mail. It would start a thousand minds dreaming and planning, and the concept would eventually involve high level decisions in the U. S. Government. Now, at this moment in time it was a gossamer; a fancy that might be lightly discarded as a mere exercise of the imagination. (After all, why not? Would not a homemade satellite be yet another convincing proof that amateur radio was indeed in the public interest, convenience, and necessity? At the very least it would be a self-educational program, introducing the great body of amateurs to space communications. Of course.)

Bob Herrin, K4RFP/6 (Launch Operations Manager), was listening on the count down net in the communications and control laboratory, at the launch site. He joshed a few words with other technicians and engineers, intent upon their tasks. The package had been carefully placed into its egg-crate shaped compartment in the Agena second stage of the immense vehicle a few days earlier. Soon the package would fall into line in the check-off procedure that was now running at a rapid pace. Would the antenna erect itself? Would the squib fire the spring that would place the 10-pound satellite into a free orbit of its own? Would the compact, transistorized beacon spring into life, as it had done thousands of times in the shacks of the builders? Or would Oscar I merely become a footnote in the history pages of amateur radio? . . . R MINUS 180 AND HOLDING FOR FIFTEEN MINUTES chattered the teletype.

Bob looked up and his heart jumped. Even though he was an old hand at the launching game, the sound of the "hold" announcement never failed to affect him. "I hope it's only a technical hold," he wished to himself as he continued with his duties. He noticed that the black sky was breaking in the East. Daylight was near. It was always easier in daylight, for some reason. . . . R MINUS 180 AND RESUMING COUNT. . . .

15 October, 1959

"Dear Fred:

"To say I was elated to receive your letter would be the understatement of the year. However, before

I allow myself to get too excited, I am going to submit a proposal to you and see what happens. . . . As you say, I hope we can pull (or is it push) this thing off. Best regards, Don."

The radio amateurs seated around the conference table grinned as Fred, W6EJU, Chairman, read the message. The first meeting of the Oscar Committee was about to be called to order. There were: Chuck Towns, K6LFH; Bernie Barrick, W6OON; Stan Benson, K6CBK and Nick Marshall, W6OLO. These amateurs are the trail-blazers into space in the year 1959!

In Los Angeles, Don Stoner had many conversations with Ray Meyers, W6MLZ, and Henry Richter, W6VZT. Gradually a concept of a suitable radio satellite package was being pounded out. The phone bill between W6TNS and W6EJU began to grow to alarming proportions, supplemented by sideband schedules on 7 Mc. Don suggested that the rapidly growing group of hams be called the Oscar Association: Orbital Satellite Carrying Amateur Radio! A natural name. So was Oscar born in spirit.

At 7 A.M. Bill, W6SAI, rolled over in bed in the BOQ at Vandenberg Air Force Base, California. He reached across and shook Chuck, K6LFH, awake. "0700 local time," he said as Chuck turned his face to the wall and tried to go back to sleep. "We meet the press at 0800, and go to the pad at 1000. Today we'll either be heroes or tramps!" Chuck sat up in bed and looked at his watch. "The count down started at about two A.M." he said. "They must be down to about R minus 180 by now."

. . . R MINUS 180 AND COUNTING. . . . CLEAR AREA TO LOAD FUEL . . . CHECK LOG TO DETERMINE FINAL ULLAGE REQUIREMENTS. . . .

The tension in the block house was quietly growing. A charged atmosphere punctuated by short commands and remarks served only to emphasize the quick passage of time. The sun would rise in a few moments and the air was growing warmer. A cool, mild breeze was coming in from the Pacific and the sky, which was not yet red, was a flat steel color. An Air Police helicopter hovered briefly by the launching site then slanted away on some mysterious mission, its huge rotor chopping the air. The Discoverer stood waiting, a white tall spire, gleaming dully in the faint light of dawn, yet bathed on all sides by spotlights. Soon it would burst into space.

21 October, 1960

"Federal Communications Commission:

We thank you for your comments regarding our proposed Oscar program and will attempt herein to clarify our objectives. . . . The former Oscar Committee has been reorganized as the Project Oscar Association . . . the Board of Directors have approved the project plans . . . the proposed satellite will be transmitting in the 2-meter amateur band, and will be electronically keyed . . . it will have a restricted life of perhaps 20 days. . . .

Ready to go! Oscar completes its qualification tests with flying colors! At final check-out are: (left to right): Gail Gangwish; Nick Marshall, W6OLO; Don Stoner, W6TNS; Chuck Towns, K6LFH; and Fred Hicks, W6EJU.

Fred H. Hicks, W6EJU, for Project Oscar."

26 September, 1960

"Dear Mr. Hicks:

This will acknowledge receipt of your letter regarding Project Oscar. . . . It appears that, with the exception of the requirement for positive control of the transmitter by the station licensee, you may be able to meet the other rule requirements in question . . . you realize that this project must receive the sanction of the other government agencies before final approval could be granted. . . . Ben F. Waple, Acting Secretary, FCC."

By now the Oscar Association had grown to the point where items of hardware could be built and tested for the proposed satellite. Project volunteers had been assigned jobs and an Oscar mailing list was created. Because of the press of business, W6EJU turned the chairmanship of the Oscar program over to Mirabeau ("Chuck") Towns, K6LFH, to implement and carry on the ultimate dream of having an amateur radio station in orbit about the earth. For it was only a dream. . . .

"Really, Mr. Towns. I admit the idea has some merit to it, but I do not see what earthly good it would do to have a bunch of amateurs engage in such an effort. After all, the government has spent millions of dollars in establishing exotic tracking stations . . . really, now, let's be serious for a moment. . . ."

Bill, W6SAI, looked dully at the plate of congealed eggs and the cup of cold coffee. "To heck with breakfast," he said to Chuck. "I'm too excited to eat." The other amateurs were equally elated: Don Stoner, W6TNS, who had been invited to the launch to see his dream come true; Goodwin L. Dosland, WØTSN, President of ARRL; and Ray Meyers, W6MLZ, Director of the Southwestern Division, ARRL. Absent because of illness was Harry Engwicht, W6HC, Director of the Pacific Division, ARRL. Two hundred miles to the north Fred, W6EJU, now acting as Operations Director, and the complete Oscar Tracking network were standing by, waiting to flash word of Oscar orbit to waiting radio amateurs. "Let's get the show on the road," said

"Dos", reaching for his overcoat. "It's almost ten minutes to eight and we have to attend the pre-launch press meeting."

The radio teletype chattered its endless song. . . .

R MINUS 150 AND COUNTING. . . . CLEAR AREA TO LOAD OXIDIZER. . . . CHECK ULLAGE REQUIREMENTS BEFORE ZEROING FLOW METER. . . .

10 November, 1960

"John Huntoon, ARRL

As I have mentioned to you, a proposal has been made to place an amateur satellite in orbit, using a future space vehicle as a 'piggy-back' carrier . . . a need exists for strong, amateur leadership from a group that represents a majority of the amateurs, rather than a small, local club. I believe that the only organization that can truly represent the amateur in this matter is ARRL. Without ARRL sponsorship, the amateur satellite program will wither and die . . . 73, Bill, W6SAI."

In the meantime, Oscar had enlisted additional support. George Jacobs, W3ASK, Propagation and Space Communications Editor of CQ, had volunteered to be the Washington, D. C., contact man for Project Oscar. George spent many hours discussing the project with sympathetic officials of the FCC and the State Department. He tried to discover what conditions must be met by such a unique undertaking in order to receive approval from key government officials, some of whom had only a hazy concept of the ideals and dreams of the radio amateur. George worked in close collaboration with John Huntoon, General Manager of ARRL. Finally, in the early spring of 1961, after a trip to Hq. by K6LFH and W6SAI for a conference with League officials, the ARRL adopted Project Oscar, granting its endorsement to the project and providing important, vital backing in the name of the amateurs of the United States.

The launch site was atop a scrubby sand dune in a far corner of Vandenberg AFB. A jolting Air Force bus crossed innumerable sand dunes and washes, carrying the amateurs and reporters who would soon observe the launch. Dry brush dotted the rough landscape. Suddenly, the Discoverer atop the launch pad was visible on the horizon. It stood majestically alone, surrounded by lesser objects that emphasized its size. It was a clear white, with the motto "United States" emblazoned on it. A single plume of evaporating liquid oxygen curled lazily from one side. There was no movement about the vehicle, and the area seemed deserted and asleep. The bus, loaded with newspaper, radio and TV reporters and the group of radio amateurs ground to a halt atop a small plateau about five hundred yards from the launch site. The riders dismounted and slowly walked to a clear spot from which the Discoverer rocket was in clear view. At one corner of the plateau stood a small gasoline generator, a communications truck, a table with a battery of telephones, and a portable loud speaker plugged into the base communications system.

. . . R MINUS 80 AND STILL COUNTING. . . .

The Air Force Thor booster, standing on the launching pad had completed the touchy fueling operation in which thousands of pounds of RP-1 (a souped-up version of aircraft jet fuel) and LOX (liquid oxygen) had been pumped into it. On top of the booster, the 25-foot long Agena brought the total height of the satellite-vehicle combination to 81 feet. The sun was climbing higher in the sky and the wind had died down now, and the site was clear and warm.

. . . R MINUS 50 AND STILL COUNTING. . . . TANK PRESSURES CHECKED. . . . DESTRUCT SQUIBS ARMED. . . . RECORDERS ARE ON. . . .

"Why do you employ an 'R' count instead of a 'T' count?" asked W6SAI of Captain Barbato (USAF), the Public Information Officer.

"The R-count is in minutes and is used up to about minus ten minutes. At that time we switch to the T-count, which is run in minutes or seconds," explained the Captain. The communications truck gave notice from the Missile Flight Safety Officer that the range was clear, and that it was clear to launch.

31 July, 1961

"Secretary of State, U. S. State Department:

The American Radio Relay League, the national nonprofit membership association of amateur radio operators, requests the cooperation of the Department of State concerning space communication and experimentation by radio amateurs. A group of skilled radio amateurs on the West coast, which is incorporating as the Project Oscar Association, has designed and constructed communications equipment suitable for launch into orbit. The Association is nonprofit and is entirely noncommercial and nonmilitary. It is affiliated with and has the full support of the American Radio Relay League . . . an informal session was held in Washington recently, with the following results:

Directors of the Project Oscar Association. Left to right: Fred Hicks, W6EJU; Bill Orr, W6SAI; Harley Gabrielson, W6HEK; Tom Lott, VE2AGF/W6; Chuck Towns, jr., K6LFH (Chairman); B. Barrick, W6OON; Dick Esneault, W4IJC/W6; Harry Workman, K6JTC; and Nick Marshall, W6OLO. Not present at the time the photo was taken were Stan Benson, K6CBK; Jerre Crosier, W6IGE; Harry Engwicht, W6HC; and M. K. Caston, WA6MSO.

a) Air Force representatives stated that Project Oscar has been approved by HQ AFSC for incorporation in the Discoverer series of launchings, subject to coordination with other interested government agencies . . . it is our hope that the information contained herein will be sufficient to enable the Department of State now to undertake the procedure outlined and agreed to at the meeting — i.e., to solicit the formal concurrence of the several agencies concerned in this matter so that the project may go forward . . . (signed) John Huntoon, General Manager, ARRL."

Simultaneously, the Project Oscar Communications link was being organized under the direction of Tom Lott, VE2AGF/W6. It was desired to have early acquisition of the Oscar satellite by a responsible party, so various amateurs were contacted at the South Pole bases by Captain David Veazey, W4-ABY USN, Assistant for Communications, Special Projects Office. Dave promised to arrange a suitable amateur tracking station to be set up on the Antarctic continent by the KC4 hams to flash back word of Oscar, once it achieved orbit.

The crowd at the Discoverer site had grown to a small army. General Francis H. Griswold, K3RBA, Director of the National War College, Washington, D. C., had arrived. In addition, a group of scientists from California Institute of Technology had heard of the launch, and had interrupted their important work to watch the world's first home-made amateur radio satellite hurled into orbit.

. . . T MINUS 30 AND COUNTING. . . . REPORTING WILL BE BY EYEBALL AND F.M. RADAR AFTER LIFT-OFF. . . . TERMINAL COUNT WILL START AT T MINUS 11 MINUTES. . . . GUIDANCE LOCK ON COMPLETE. . . . BTL READY AND STANDING BY FOR LAUNCH. . . . RANGE GREEN. . . . T MINUS 20 AND COUNTING. . . .

The sky had clouded over and a slight overcast settled down above the poised bird. "Do you require a clear sky for launch?" asked Ray, W6-MLZ. "No," replied the Public Information Officer. "This overcast won't affect the launch."

Now the news service wires were open, and Chuck, K6LFH, placed a long distance call to the Oscar control center, WA6GFY. Was everything ready in Sunnyvale? . . . Good. . . . Good. . . . South Pole link through W4ABY and KC4-USB is open. . . . W6EJU at the other end of the land line queried as to the exact time of launch. . . . "Sorry, Fred, can't announce the time until after lift-off. . . ." Fred laughed, "I can tell from the sound of your voice it will be within a *very* few minutes," he said. As if to verify his words, the communications speaker over Chuck's shoulder blared into the telephone, "T minus 16 and counting!!!"

15 September, 1961

"John Huntoon, ARRL.

Reference is made to your letter of July 31, 1961, requesting the cooperation of the Department of State concerning space communication and experimentation by radio amateurs, specifically with respect to 'Project Oscar'.

"In reply I am pleased to inform you, after consultation on this subject with other interested agencies of the Government, that the Department perceives no objection to the carrying out of Project Oscar. . . . For the Secretary of State: Edwin M. Martin, Assistant Secretary."

T MINUS 14 AND COUNTING. . . . ONE MINUTE UNTIL START OF TERMINAL COUNT. . . . TERMINAL COUNT WILL START ON MARK. . . . MARK. . . . PHASE ONE PROCEEDING NORMAL. . . . PHASE ONE COMPLETE. . . . PHASE TWO PROCEEDING NORMAL. . . .

Don, W6TNS, plugged his tape recorder into the a.c. outlet on the portable generator. Bill, W6SAI, climbed atop a sand dune immediately behind the plateau. The Air Force men looked to their recording cameras and the babble of voices on the press telephones rose in pitch. The Air Police helicopter scooted overhead, looping about the press area, and inquisitively shot behind a sand dune. The pulsating beat of its rotor could be heard above the noise of the preparations.

. . . The teletype pounded on in a relentless beat. . . . PHASE FOUR PROCEEDING NORMAL. . . . ORBITAL STAGE TLM AND BEACON BEING VERIFIED. . . . FUELING COMPLETE. . . . MAIN SAFETY RECEIVERS INTERNAL. . . . PHASE FOUR COMPLETE. . . . PHASE FIVE PROCEEDING NORMAL. . . .

Suddenly 'Dos,' WØTSN, laughed out loud.

"What's so funny, Dos?" asked Don. "The incongruity of the situation just struck me," said Dos. "Here I am, a radio ham and an attorney, on a launching pad in California! It's 14 below zero in Minnesota and a judge and jury are in recess until I return! Who would imagine I'd be here today watching Oscar fly?"

Who indeed? There were many doubters and some who had damned the project with faint praise. Many times the future of the Oscar Project looked black, as some insurmountable road block loomed ahead. The support of interested amateurs was great comfort in such moments:

PAØVF: It is with much interest that amateurs in the Netherlands were reading of Project Oscar . . . we thank you for your kind information. . . .

GM3NQB: . . . those with whom I have talked are tremendously interested. . . .

VU2NR: . . . I would be quite happy to make any kind of observations required in regard to Oscar . . . good luck!

LU9HAT: . . . please send me information. . . . I am a member of the local amateur satellite observers' group. . . .

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