K9YA Telegraph

Robert F. Heytow Memorial Radio Club

Volume 10, Issue 3, March 2013

IGY

Part I: Amateur Radio's Role, 1957 - 1958

Philip Cala-Lazar, K9PL

The most important result of the International Geophysical Year is that demonstration of the ability of peoples of all nations to work together harmoniously for the common good. I hope this can become common practice in other fields of human endeavor.

President Dwight David Eisenhower, June 30, 1957

The President's statement reflects amateur radio's Part 97.1: Basis and purpose. Not only in enhancing international goodwill via phone patches that provided a voluntary noncommercial radio service to distant research bases, but also in their cooperative efforts with hams of many nations. Participating amateurs contributed to the advancement of radio; during IGY they worked with renowned scientists to improve the amateur service by advancing skills in both the communications and technical phases of the art. Thanks to the positive publicity provided by the mass media, many non-hams were sufficiently intrigued to investigate the service and eventually join our ranks expanding the existing reservoir of trained operators, technicians and electronics experts.

"immense undertaking"

Overview

With a gestation originating in the early 1950s, the 18-month International Geophysical Year 1957-1958 grew to include the participation of more than an estimated 5,000 scientists from 67 countries and included the successful launching of the first artificial earth satellites and the establishment of scientific research bases at the South Pole. This mid-20th century IGY continued the cooperative spirit of the International Polar Year, 1882-1883 and the Second International Polar Year, 1922-1923.

Dr. Lloyd Viel Berkner, ex-9AWM, president of the International Council of Scientific Unions, and who first proposed the IGY in 1950, presented an overview of the immense undertaking that was the IGY to a symposium of the American Association for the Advancement of Science held in Atlanta, Georgia.

His outline included four main goals:

1. Track satellites including the U.S.'s Explorer and Vanguard and the Soviet's Sputnik.

2. Provide "moral support" to personnel stationed at U.S. Antarctic bases via phone patches.

3. Observe and report VHF DX propagation.

4. Assist in the notification of special event alerts.

The breadth of this propagation research included: Vertical Incidence Soundings… Fixed Frequency Back Scatter… Sweep Frequency Back Scatter… Oblique Incidence Back Scatter… Naturally Occurring Terrestrial Radio Noise… Whistlers… Sporadic E Reflection at Oblique Incidence… Radio Star Scintillation and Ionospheric Drift… and Absorption.

Continued - IGY on Page 6

Inside This Issue...

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Continued - IGY from Page 1

Who Better Than Hams?

What better group than amateur radio operators could be recruited to form a cadre of reliable monitors and reporters to collect and record the coming avalanche of scientific data? Hams were organized, trained, technically minded and skilled, familiar with log keeping, easily identifiable and maintained a long tradition of working with government and private entities on scientific endeavors. With that in mind, the ARRL recruited amateur observers under a U.S. Air Force contract. Point man for the U.S.A.F. was Dr. Wolfgang Pfister of the Air Force Cambridge Research Center. Mason F. Southworth, W1VLH, was named to collect and analyze the data for the ARRL.

KC4USN

The International Amateur Radio Union requested volunteers from its member countries to join the Propagation Research Project (PRP). Other volunteers were targeted via a mailing list comprising contributors and operators appearing in *QST*'s "World Above 50 Mc." column, those operating Official Experimental Stations and hams listed in the *VHF/UHF Directory*.

QST April 1957
PRP - A Progress Report

The program's eight hundred registered participants were obliged to report, twice monthly, stations worked and heard "via ionospheric propagation modes above 50 Mc." They were also asked to note and report operating and listening periods when no DX was heard. These were known as "'positive'" and "'negative'" reports.

> *"adventurous but stable"*

Of transequatorial scatter, participants noted anomalous openings, i.e., at times when north-south path openings were unexpected. Other propagation modes monitored were sporadic-E skip, auroral and meteor scatter, and F2 openings, "both conventional skip and the back-scatter variety."

In that month's "Strays" Dartmouth College posted it had "IGY Jobs" available in northern Quebec performing ionospheric research. In addition to technical knowledge and experience what was also needed was, "An adventurous but stable personality for whom a period of 18 months in a small isolated community in a sub-Arctic climate would prove an interesting and challenging experience."

It wasn't all serious business for amateur radio; there were many opportunities to work some rare DX. The May 1957 *CQ* article, "VK's … Australians in Antarctica" noted that 11 VKØ licensees stationed at the Macquarie, Davis and Mawson bases were "keen to work as many countries and stations as their spare time from scientific projects will allow."

IGY Amateur Radio Snapshots

The New York Times, July 9, 1957
14 Men to Dispute 150,000 Penguins

The staff of the ionospheric and weather research camp established at Antarctica's Cape Hallett awaited the return of the flightless birds. In September both groups would again compete for space when the penguins returned to their breeding grounds at the start of the antipodean spring. Via radio link the camp's medical officer, Dr. Juan J. Tur said, "with a touch of bravado," "We are waiting for them." The "…radio contact was made through the facilities of Jules Madey [K2KGJ], an amateur radio operator in Clark, N.J."

U.S. Antarctic Stations

"The installation of and use of amateur radio facilities at each station has proved to be of great importance to station morale." To these stations the FCC assigned the following callsigns: Little America, KC4USA; Byrd, KC4USB; Amundsen-Scott, KC4USN; Ellsworth, KC4USW; Wilkes, KC4USK; Hallett, KC4USH; and NAF McMurdo, KC4USV. Gear at all U.S. stations included Collins KWS-1 transmitters and Collins 75A-4 receivers. Operating modes were "CW, voice, and single sideband. Provisions are made for coupling-in radio teletype if desired."

The New York Times, August 18, 1957
I.G.Y. Team to Test Long-Range Radio

Kenneth Bowles of the national Bureau of Standards Laboratory announced a program to investigate ionospheric forward scatter. He described the phenomenon: *When high-powered radio transmissions are beamed at the lower ionosphere, an "electric blanket" of air starting forty miles above the earth, small but useful amounts of radio energy are known to bounce back.* Further, he stated it was caused by, "…turbulence and the effects of meteors."

"Mr. Bowles said radio amateurs from Canada to South America would participate by reporting on their reception of the scatter signals." It was hoped research

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in this area would contribute to more reliable communications, especially that concerning civilian aviation.

***QST*, August 1957**
N.B.S. Equatorial Region V.H.F. Scatter Research Program for the I.G.Y.

Research into ionospheric scattering was a shared endeavor between scientists and hams of the Americas. The National Bureau of Standards built high power (variable between 3 kW and 20 kW) VHF stations in the city of Arequipa located in southern Peru, OA3AAE, and near the port city of Antofagasta in northern Chile, CE8AE. These stations beamed signals northward and radio amateurs were asked to supply signal reception reports. Their signals, on 49.490 Mc and 49.900 Mc, respectively, were focused by 1,000-foot long rhombic antennas. A third station, located at Huancayo in Peru's central highlands, OA3AAF, ran 50 watts on 49.880 Mc through a Yagi antenna. (*K9YA Telegraph* readers with long memories will recall S.L. Seaton, 3BWL, of the non-magnetic yacht *Carnegie* [May 2010 issue] was posted to Huancayo in 1929 [June 2010 issue] to install radio equipment to communicate with Watheroo, Western Australia and Washington, D.C. and install gear of his design to investigate the Kennelly-Heaviside layer.)

Project Moonbeam

Project Moonbeam was established as part of the Naval Research Laboratory's (NRL) Project Vanguard to track satellites by radio and optically. Amateur radio operators and amateur astronomers were integral to Project Moonbeam, indeed, it had been designed anticipating their participation. It could not have existed without them. The project's optical tracking system was co-designed by Dr. J. Allen Hynek, later founder of the Center for UFO Studies.

"Poor Man's" Minitrack"

Amateurs were asked to tape record the transmissions of orbiting U.S. and U.S.S.R. artificial earth satellites. To assist them monitor recently launched satellites, plans for the Mark II Minitrack satellite tracking system were included in the September 1957 *QST*. Developed by the NRL's Roger Easton, his Mark II, aka, the "Jiffy" or "Poor Man's" Minitrack was a simplified, less costly version of the Minitrack system used by professionals. That same issue also featured the translation of a satellite primer by V. Vakhin originally published in the Russian amateur periodical *Radio*.

From the 1957 U.S. government publication, *Project Vanguard Report No. 21: Minitrack Report No. 2: The Mark II Minitrack System*:

Using radio-frequency phase-comparison techniques by means of hybrid junctions, the Mark II later became the nucleus of "Project Moonbeam," a program sponsored by Project Vanguard to encourage radio hams and their organizations to build their own stations and participate in tracking satellites.

There were two forms of the Mark II, known, respectively, as the "simple" and the "advanced." The amateurs who joined Project Moonbeam used only the simple form. Costing about $5,000 [estimated at $1,000 by other sources] *to erect as against twice that much for the advanced Mark II, this arrangement consisted of two matched antennas in an extended base array, a receiver, and oscillograph. Passage of the artificial earth satellite produced a pattern of reinforcement and cancellation, successively, of the signals received at each antenna. These were recorded as a pattern of peaks and nulls. A difficulty in interpreting these records, even where satisfactory time signals were recorded in an auxiliary channel, was in determining which null corresponded to the time of the passage of the satellite through the principal plane of the antenna array. In general these ambiguities were resolved at the Vanguard satellite computing centers by references to the data received at the prime Minitrack stations operated by professionals.*

JPL Microlock Antenna

***QST*, September 1957**
Mark II Minitrack Base-Line Components

Antenna construction plans for the Mark II Minitrack satellite tracking system. Built to contend with the rigors of "wind and weather," the system's eight-element, high-gain antenna was named its most expensive component; it must provide "a broad beam in direction so a large number of satellite transits can be recorded."

The primary system for tracking the satellites by radio and recording their telemetry was a "picket fence" of Minitrack stations manned by professionals. The supporting Moonbeam program used its Mark II version and a similar system developed by hams at the Jet Propulsion Laboratory and known as "Microlock." Originally designed to receive Soviet satellite signals

CONTINUED - IGY ON PAGE 8

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CONTINUED - CONAN BARGER FROM PAGE 3

War was declared on Japan on December 7, 1941 and Germany on December 11, 1941.

The FCC, with a worldwide staff of 528 worked at top efficiency. Nazi radio nets numbering 10 to 15 were monitored during cipher traffic of five and six digits. The Japanese stations sent messages in Kana code. (Kata-Kana–73 syllables each with a sign of its own and assigned a Roman equivalent. Ref. *The Code Breakers,* by David Kahn, editor.) ■

CONTINUED - IGY FROM PAGE 7

on 40 Mc, Microlock was later modified for America's Explorer I and Vanguard I satellites with their 5 Mw, 108.03 Mc tracking system signals. Both Minitrack and Microlock employed phase comparison techniques.

The New York Times, September 10, 1957
'Hams' Will Track Earth Satellites

Hams, as participants in the "Moonbeam" program, used "an especially designed receiver… to pick up valuable information on the course and position of satellites launched in the current International Geophysical Year." The receivers were designed to be built from plans, and with technical assistance, provided by the Naval Research Laboratory. They were simplified versions of the type used by "scientists in following the satellite in its orbit around the earth. Estimated cost of this receiving gear was $1,000 as projected and built by "interested amateur radio groups."

Its steep, for the time, cost: $7,990 ($39,950 using the $5,000 figure above) in 2011 dollars ("relative real price" based on the CPI from 1957 to 2011). ■

Hyperlinks

The *K9YA Telegraph* contains both internal and external hyperlinks. An internal link may take you to another page where an article continues. An external link, can take you to another Web site or document. Here are two examples how we may link to the *Morse Telegraph Club.*

http://www.morsetelegraphclub.org/

If you click on any part of a URL or within the bounding box surrounding text, a new window will open and whisk you away to the club Web site.

If you're using a PDF reader application other than Adobe Reader, make sure links are turned on in your application's options.

CONTINUED - A WORK IN PROGRESS FROM PAGE 2

and space enough for one prototyping shield. Holes were drilled in one end of the case for the jacks and the pushbutton. The pushbutton was added later, and placed in the top of the case. Power for the Arduino keyer is either from the USB connector on my shack computer, or from an external "wall-wart" power supply for the Arduino. Alternatively, it can be driven from four AA cells, which I have done for field portable work.

The case, Arduino micro controller, and prototyping board can be obtained from a variety of sources. The remaining components were either from my junk box, or the local Radio Shack, who also carry the Arduino. The total cost for all components, including the Arduino microcontroller, was comparable to most commercial keyers. In addition, the interface design becomes a convenient test bed for all sorts of experimentation in the future, such as a Hellschreiber interface, as the Hellschreiber signal is an on-off keying protocol.

A side benefit to the project is that I have a nice code practice oscillator in the event I don't connect the keyer to a transmitter! However, in the interest of domestic tranquility, I suggest the audio output jack be the switching kind, so as to disconnect the piezoelectric speaker when the headphone amplifier is connected.

Have fun! ■

Ham Lingo

DICK SYLVAN, W9CBT

LIGHTHOUSE TUBES WERE USED FOR VHF/UHF APPLICATIONS IN THE 1940S

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IGY

Part II: Amateur Radio's Role, 1957 - 1958

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QST, December 1957
"Operating News"
A reminder that the IGY year started July 1 and there was still time to take part in the Propagation Research Project. Participants needed to possess the ability to "operate and make v.h.f. notations with fair observing consistency." Those participating were entitled to receive the monthly publication, *PRP News*.

The New Yorker, December 28, 1957
Even the urbane *The New Yorker* magazine rustled up an item about phone-patches. Example described, calls from Carl Ecklung, an IGY scientist stationed in Antarctica, to Chappaqua, N.Y. via local dentist and ham, Dr. Paul Z. Haus, W2VH.

"…strange popping noises."

_CQ_, January 1958
Cleveland's St. Joseph High School radio club was quite adept at plotting Sputnik I and recording its signal as it orbited the earth. The club's members developed a schedule of its passes. Listening to the satellite's 40 Mc signal for eight days, the young hams assessed and analyzed the signal's propagation, Doppler effect, and range (3,600 miles) and found no evidence of skip.

The New York Times, January 12, 1958
Polar Bear Adds to Arctic's Dark
Ursine happenings at "Drifting Station A," situated on a large ice floe "435 miles from the North Pole," the northernmost U.S. IGY base. There, a crew member interviewed via an amateur radio link stated it "was 'very warm' at the time—29 degrees [F] below zero." That is compared to a recently recorded 59 degree below zero temperature that caused "the ice to make strange popping noises."

A polar bear and her cub were reported to have "Perhaps in a playful mood…" torn up electrical cables and caused outages of half the base's runway lights. Fortunately for the bruins, hunters abandoned their pursuit when they found the "extreme cold had congealed the oil in their guns making them inoperative."

The New York Times, February 1, 1958
Facts About Army's Jupiter-C Rocket
On November 8, 1957 the U.S. Army launched a Jupiter test rocket to carry the Explorer I satellite into orbit. Aboard the satellite was an instrumentation package designed to record: the satellite's skin and internal temperatures, cosmic dust erosion and cosmic ray data. The artificial moon transmitted on 108.03 MHz with 5 mW of power; "its signal can readily be received by amateur radio operators."

Khrushchev Gets Answer in Space
Soviet party chief Nikita Khrushchev announced he was "waiting for the American and other satellites to join them and to form a commonwealth of satellites." The 184 lb Sputnik (Wanderer) satellite, launched October 4, 1957, was joined by the 21.5 lb American satellite, Explorer I launched January 31, 1958.

Continued - IGY on Page 7

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Continued - IGY from Page 1

The article noted the large audience listening on ordinary shortwave receivers heard Sputnik's high frequency signals on 20.005 Mc and 40.002 Mc, while Explorer's signals on 108.03 Mc required an "uncommon sort of receiver."

The New York Times, January 1, 1959
Science Assays Vast I.G.Y Gains

Observing the reflection of signals from distant stations it was discovered that disturbances in the F-region move like gigantic "waves" several thousand miles long. The progress of these waves were monitored along their paths.

Some 550 amateur radio operators throughout the world reported on signal strengths from many stations at various hours. More than 9,600 punch cards were required each month to record the data received.

The New York Times, January 4, 1959
Rocket Believed Radioing Data On an Unannounced Frequency

A recently launched Russian satellite was reported transmitting on an "unannounced frequency."

A Hawaiian tracking station reported monitoring a signal on 70.4 Mc, this was before the launch of the new satellite was known. The signal heard was not on one of the four previously announced frequencies and confirmed by RCA's program radio department as a "steady signal of varying pitch."

The satellite was launched after the close of IGY so it was not subject to the rules requiring IGY participants to reveal all frequencies used.

"On the Ultra Highs"

Ham Edward Tilton [Ed Tilton, W1HDQ, *QST*'s "On the Ultra Highs" and "The World Above 50 Mc" columnist from 1939-1960, frequent article contributor and book author] of Canton, Conn. said that of the frequencies used by the U.S.S.R., "the three frequencies in the general range of 20 megacycles should be received almost continuously throughout the world. The other frequency is much higher, however, and can only be heard on the side facing the receding rocket." Other frequencies employed by the Soviets included: 19.997, 19.995 and 19.993 Mc.

***QST*, November 1959**

In a letter addressed to the ARRL, the executive director of the National Academy of Sciences Natural Sciences Council, Hugh Odishaw, again commended amateur radio operators for their services rendered providing communications between scientists at the South Pole and "their families and friends at home." Attached to his letter was a list of 36 call signs of hams especially cited for their relay work. He also noted this list was only "partially complete and there are many more who have had a part in this significant contribution to the IGY Antarctic program."

Jules Madey, K2KGJ

Of the many hams involved in IGY phone-patch operations one, a 17-year-old New Jersey high school student, clearly stands out. Jules Madey, K2KGJ, licensed since 1954 and with a 110-foot tower in the family home's backyard, was the preeminent runner of phone-patches to U.S. Antarctic bases. Jules and his younger brother, John, also an amateur radio operator, "rigged up a radiofax machine, allowing them to transmit scientific data as well as photos." Quoting Jules, "A typical 8x10 photo took about 20 minutes to send in those days."

Jules Madey, K2KGJ
Photo: W2JSN

Antarctica's Madey Ridge, "…trending NW from Mount Moffat along the N side of Berquist Ridge in the Neptune Range, Pensacola Mountains," was named to honor his service.

Looking Back

Amateur radio's participation in the International Geophysical Year is certainly one of the most notable events in the service's 100-year history. Government agencies actively sought to recruit the large number of amateur radio operators thought essential for its many planned projects to succeed.

Some thirty years earlier a relatively few, now legendary, hams achieved their efforts to span the Atlantic Ocean with their signals. Then, in 1957, as the space age dawned, thousands of amateur radio IGY participants, including not only those officially enrolled to collect and report data, but also those caught up in the spirit, spun their receiver dials hoping to hear, for the pure joy of hearing, the pips, peeps and squeaks emanating from the first American and Russian satellites. It was a very busy, visible and productive time for the amateur radio service.

For more about hams' early involvement in the Space Race see: *K9YA Telegraph*, September 2007, "We Like Ike."

Continued - IGY on Page 8

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Volume 10, Issue 4

CONTINUED - CONAN BARGER FROM PAGE 5

That was their last broadcast.

The wind up of World War II was at hand. Germany was out of the picture and Japan was on the run. Our efforts at Shinda were concentrated on Japanese transmitters, round the clock vigilance. Our west coast units had better reception from Japan, but we at Shinda had our hands full locating and monitoring clandestine stations. Our Hellschreiber circuit to and from Puerto Rico was in constant use.

The complete surrender of Japan was inevitable. The supreme commander of the Pacific, General Douglas MacArthur, was pounding Japan with increasing force.

On April 18, 1945 our nation was in great sorrow. One of America's greatest presidents, Franklin Roosevelt, was dead--only 83 days after he had been unanimously elected for his fourth term.

Harry S. Truman immediately took office. President Truman fully realized the heavy burden placed on him. He soon made plans to put an immediate end to the war that had caused so much destruction throughout the world.

An atom bomb was dropped on Hiroshima on August 6, 1945. Three days later, August 9, 1945, another was dropped on Nagasaki. On August 10th Japan came to the peace table and on the 14th they accepted the Allies' terms.

Both Japan and Nazi Germany realized the intensity, determination, and integrity of the Sleeping Giant. ■

Ham Quips

DICK SYLVAN, W9CBT

DICK LIKES TO DRAW UPON OLD RADIOS TO CREATE NEW CARTOON IDEAS!

CONTINUED - IGY FROM PAGE 7

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