

SQUAKBOX

Issaquah Amateur Radio Club

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August 2007

A Simple Satellite Mobile QRP Station for the Beginner

AO-27, also known as EYE-SAT, was one of several amateur radio low-earth orbit satellites that hitched rides as secondary payloads on an Ariane V-59 rocket launched in September 1993. AO-27 is a small microsat class satellite that performs commercial functions and also acts as a part-time mode J FM repeater within the amateur radio bands. At present (August 1996), the satellite is configured to turn on its FM transponder for a fixed amount of time starting several minutes after it emerges from the Earth's shadow. AO-27 has a very sensitive re-

ceiver that will detect even a few watts from an HT.

My original satellite station was a Tempo S1 two meter HT, a 5/8 wavelength magmount, a homebrew quagi and a handheld scanner. I have improved upon the original quagi and replaced the scanner with a preamp, a downconverter and a Uniden HR2600 10 meter transceiver.

(Continued on page 3)

The Nature Of Disasters And Implications For Amateur Radio

Part 2 of 6, from a lecture presented at the Communications Academy, 2006

Lack of information - due to the widespread scope of a disaster, EVERYTHING is affected. As a result, there is a tremendous need to find out what roads are out and what roads are intact, what vital services are destroyed and which ones can easily be repaired, where the greatest number of casualties and evacuees are to be found and what buildings are intact for recovery use or have been destroyed. You basically need information on every single aspect of government and business and homes in an instant. Combined with communications failures, you are not going to get the information you need. [What ever you can see, it is never the whole picture.]

Misinformation - it is very, very easy for information to be misconstrued, rumors to be stated as facts

(Continued on page 2)



Also . . .

Last Meeting	2
Real QRO	5
RYYRYRY	5
Coming Events	6

August Program

Tiny QRP Radios

Doug Phillips N7RDP will give us a presentation and show-n-Tell of his tiny QRP radios.

Future programs are as follows:
Sept - Open
Oct - Open

There are openings for future programs. Contact John, KA7TTY, 392-7623 to volunteer.

At the last meeting . . .

July 11, 2007

President Del Marker, AC7QS, called the meeting to order at 7:30. Eleven members (including new member Ana M. Jimenez-Inman, KD7MUX) were present. Also attending was Marsha Barger, KE7MPI.

A motion was passed to accept the minutes of the last meeting.

Treasurer's Report: Petty Cash -- \$12.30, Checking -- \$1705.28.

Bruce Helbert, KG7OI, and Rod Johnson, WE7X reviewed our 2007 Field Day operations. Bruce's brief summary included the following points: with the exception of Pat Buller W7RQT(SK), the same people showed up this year as in past years:

- some guests came by
- the bands were bad
- the antennas were "sub-optimal"
- we made lots of contacts

we qualified for a bunch of bonus points.

Rod has made some discreet inquiries into changes in Senior Center policy relative to our club's use of the facility. He doesn't yet have anything to report.

Doug Phillips, W7RDP, and Rod told us about their experiences operating the "Salmoncon" QRP special event at Deception Pass. They used K7S as the call and had a chance to try out beta versions of the new Elecraft K3 transceivers.

Pete Petersen, WY7Z, told us Jack Dalton, W7EY, would be going into the hospital this month for a "full hip replacement." We wish Jack a speedy recovery.

There being no further business or presentation, Del adjourned the meeting.

73 de Peter -- AC7SB – S

E-Mail Elmer

Got a HAM radio question and can't find an Elmer to talk to? Just send your question by E-Mail to our E-Mail Elmer at:

IarcElmer@hotmail.com - Ed. - S

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Disasters Cont.

and honest mistakes to become absolute facts when dealing with a disaster. When massive amounts of information are required, it is easy for wrong information to slip in. Disasters are full of examples of "Wrong Information".

People die. While the emergency services deal with death on a daily or weekly basis, the sheer number of deaths can have a profound and traumatic effect on both responders and those affected. Emergency responders have trouble "switching gears" when faced with body parts and dozens or hundreds of casualties and the public is shocked to see bodies lying on the streets for days.

Emergency services and government will be equally affected. Fire halls are destroyed by tornados. City halls are flooded out. 911 centers collapse. While cases of emergency workers abandoning their posts are extremely rare, it is hard to respond to a disaster when

your fire truck is crushed and all the water mains have been broken.

Hospitals will be amongst the most affected. Hospitals are almost invariably affected by the disaster. Whether the disaster damages the building itself, the contents of the buildings are disrupted (few hospitals are earthquake proofed), or staff is unable to get to or from the hospital, the hospitals are the first to feel the effects. Hospitals are expensive

(Continued on page 5)

Satellite QRP Cont.

My whole station fits neatly into the trunk of the car, and easily sets up in less than five minutes. (See Photo 1) When necessary, everything except the quagi boom and 5/8 wavelength antenna can collapse down into a backpack or carrying case. The entire station runs off of batteries, which allows me to operate from just about anywhere. Since the very beginning I have tried keep everything as simple as possible, consistent with successful operations and good operating practice.

While AO-27's uplink receiver is very sensitive, the downlink is usually at the 600 milliwatt level. This means that a good low noise preamp with 15 to 20 dB gain, or at least a five element beam, is needed. I made my first AO-27 contact with a homemade five element quagi that I built from an article in the December 1987 QST. The first quagi was just thrown together. The boom was a wooden dowel. The reflector and driven element were #12 insulated solid copper wire supported by wooden dowel spreaders which were held in place with hot-melt glue. The directors were one-eighth inch welding rods secured to the boom with rubber bands. The quagi was pointed manually and fed a few feet of RG-8 connected to my Radio Shack Pro-38 scanner. It worked. For an uplink signal, I used my HT and a 5/8-wave antenna magmounted on my car. The antenna was is a commercial version, but the magmount was homemade. The HT put out about one and a half watts. Using the

quagi, scanner, two meter ht, and 5/8-wave, I worked six states in my first month of QRP mobile satellite operations.

Making your first contact on AO-27

Before you can make your first contact through any satellite, there are several pieces of information you will need to know: when the satellite is above your horizon, exactly where in the sky it will be, and when it will be available for use. The first and second are determined through satellite tracking and the third requires knowledge of the transponder schedule. You should also find out what your grid square is. This isn't really necessary, but just about everyone will ask you for it.

These days the way to track satellites is to use a computer with a satellite tracking program. Several tracking programs for various computers as well as the necessary up to date Keplerian elements are available from AMSAT at <http://www.amsat.org>. Any of the tracking programs will give all of the details necessary to access the bird: the exact time that AO-27 will be visible above the horizon, the compass direction to point the antenna (the azimuth) and how far above the horizon to tilt it (the elevation).

Once I started working stations on AO-27, I noticed some of the nice regular characteristics of its orbit: most of the passes are near lunch time, and on these passes it will always rise towards the north and set towards the south.

Whether the satellite track more to

the east or west depends on the particular pass. The transponder schedule for AO-27 has the mode J transponder active for these passes all the time. Less frequently, the transponder will also be active on the evening passes when AO-27 rises from the south and moves north. Compare this to RS-10 or MIR, whose schedule and directions vary greatly from month to month. It is relatively easy to follow AO-27 in its path across the sky once the signal is found. At the time indicated by the tracking program, point the antenna at the azimuth where the satellite should rise. You may need to adjust the antenna to obtain the best signal on the downlink. Try moving it left or right, up or down, or rotating it ninety degrees clockwise or counterclockwise. The important point is to aim the antenna for the strongest signal, using the exact azimuth heading as a rough guide only. Once the downlink has been acquired, adjust the antenna in azimuth, elevation and rotation as necessary to maintain the signal. It might take a few tries to get the hang of how to do this.

All satellite passes are not created equally. When I was using my original station with the scanner, I only tried to work AO-27 on those passes that would reach a maximum elevation of at least forty-five degrees. Lower elevation passes will place the satellite at a greater distance exceeding the capability of both the HT and the scanner. Passes earlier in the day will be more to the east and those later in the day will be more to the

Satellite QRP *Cont.*

west. You can use this to your advantage. For example, along the eastern coast of the United States, the earlier passes will place most of the satellite's footprint out over open ocean. This reduces the number of satellite stations which can access the transponder, but it also reduces the interference caused by other signals in the two meter band. Certain passes over the Atlantic include both the United States and England within the footprint for a few minutes. When combined, these features make the lower elevation earlier passes a favorite among some of the operators on the eastern United States.

As the satellite travels overhead, its signal will appear to change frequency. This phenomenon is known as the Doppler shift. In order to compensate for doppler on AO-27, lower the receiver's frequency gradually as needed. Start listening five to ten kilohertz above the actual downlink frequency of 436.8 MHz. Set the two meter FM transmitter to the satellite's uplink (145.850 MHz) and leave it there. The satellite will compensate for the doppler on the uplink. On FM, you want to listen for silence or a drop in the static level. This is your clue that you have the antenna pointed in the right direction and AO-27 is getting closer. Now wait until you can hear the downlink from AO-27. **DON'T TRANSMIT UNTIL THE DOWNLINK FROM THE SATELLITE CAN BE HEARD!** This is very important. The satellite **WILL** retransmit all the signals it hears. Some people transmit

without hearing the downlink and only succeed in disrupting the pass for everyone else who can. You might want to listen to two or three complete passes before you even try transmitting. When the satellite hears your signal you will hear your own voice on the downlink. This is normal, but might take some operators by surprise. Headphones or earphones are highly recommended. It's very easy for the sounds from the receiver to get into the microphone and distort your uplink signal. There will be times when the signal from the satellite appears to be rapidly switching polarity and times when the signal fades for short periods of time. This is normal. Just try to work around it.

Satellite contacts on low Earth orbit birds like AO-27 are usually short and contest style, especially on weekends when many stations are trying at the same time. On weekdays there are far fewer stations.

Assorted tips and tricks for working amateur radio satellites:

* I try to be ready for the pass five to ten minutes before the expected starting time. This allows adequate time for any last minute complications.

* During each pass I wrote down call signs, names and grid squares of every station that I heard that I didn't recognize. If I later worked one of those stations, I could use this information as a check that I had copied the QSO information correctly. I used a pre-printed list that contained the time,

azimuth and elevation along with room on the right hand side to write in callsigns, names and grids. This served as a quick log during the pass. The details were later entered into my logbook.

* I concentrated my efforts on improving the downlink. The uplink was easily obtained with just a few watts from my HT. The only problem is when it's captured (and denied to others) by stations running excessive power. As a beginner, I could not compete against the higher powered stations with large directional antennas, but I was able to make contacts when I dropped my callsign immediately after two other stations ended their conversation. I found that adding "QRP" or "mobile" to the end of my call makes me a more desirable contact.

* When working AO-27 mobile, I always brought two sets of keys and tried to find a good spot to set up my station. A great spot would have a perfectly flat horizon in all directions. Being on top of a hill was not necessary a good thing, especially if there was a radio tower on the hill with me. Strong signals from the tower could desense the receiver. I usually set up the components of my station on the trunk of my car in roughly the same positions. This minimized the confusion when looking for a particular knob, the microphone, log sheet, or whatever. Permanent stations don't have this problem.

* I didn't try to start off with a great station. I started simple. I got

(Continued on page 5)

Disasters Cont.

to build and many are kept longer than the average building because they are just too expensive to replace. As a result, they can be more fragile.

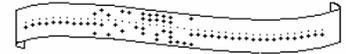
Things get worse. In emergencies, the arrival of the emergency services usually results in things getting better fairly rapidly. Casualties are taken to hospital, fires put out, bad people are arrested. In disasters, the limited resources of the emergency services and the fact that they have been affected as well usually results in a continuation of things deteriorating. When the fire truck is crushed and the water mains are broken, the arrival of the firefighters has no effect on the disaster and the situation continues to deteriorate.

Things get better or they get worse. Disasters never stay exactly the same. This means your response environment will constantly be changing and the situation you were in an hour ago may be completely different now.

Things will last much, much, much longer than you expect. There is a tendency for everyone to think that after an earthquake or a hurricane or any disaster that things will be cleaned up in a week or two. Months later, as society continues to struggle with rebuilding, they realize that the recovery will be years in the making.

This will be continued next month. - Tom Cox VE6TOX - Communications Academy, April 1, 2006, Burien WA - S

RYRYRYRY..



DE KA7TTY

Time to get this off to the printer. I cut this column down a little to fit the articles in and besides didn't have much to say. We had a great Field Day this year in spite of the band conditions. Hats off to Bruce KG7OI and Rod WE7X for another great event. I even got to play with PK31. What a kick. And what a crazy signal.

See ya at the meeting, John KA7TTY

A Real QRO Station

When radio pioneer Guglielmo Marconi constructed a station for the first two way radio communications between the United States and England, he didn't do things half way. We might imagine that he used a few primitive black boxes on a table and an aerial between the house and the barn, but he built more than that - far more.

On the site at Wellfleet, Massachusetts, he built a station that included a 2,200 volt AC generator which fed a transformer that stepped the voltage up to 25,000 volts. This was fed to a bank of 33 condensers (they didn't use sissy words like capacitor then) made from glass sheets and metal plates submerged in oil. From there the power went to two enormous fixed electrodes over three feet apart. A three foot diameter wheel turned at 2,100 RPM creating a spark that induced RF in an output transformer about six feet in diameter. When in operation the sound of the spark gap and rotating machinery could be heard five miles away!

The antenna system was sup-

Satelite QRP Cont.

it to work first and then made incremental improvements. This way I got on the birds sooner than if I had waited and tried to build a really terrific station. I also learned how well the various parts of the station worked, and this allowed me to know when a modification had improved or degraded the performance of the whole system.

* I noticed that there is sometimes a slight difference between the predicted azimuth for a pass and the actual azimuth which gives the best signal. In these cases, I just pointed the antenna for the best reception and adjusted it periodically.

* Improvements: a better receiver and a better antenna, but this will get you started. - AMSAT WEB, Douglas Quagliana, KA2UPW - S

ported by four 210 foot towers in a square pattern. A wire ran around the perimeter of the square and from that wire were hung 200 additional wires to form an inverted cone that ran down to the transmitter.

SQUAKBOX

This newsletter is published monthly for the members of the Issaquah ARC W7BI. Items for publication must be received by the 15th day of the month preceding publication. Send items to:

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Material may also be sent via E-Mail at w7bi@qsl.net.

The IARC is a nonprofit organization registered in the State of Washington and is affiliated with the American Radio Relay League (ARRL). Visit our WEB page at: <http://www.qsl.net/w7bi/>

Membership is open to anyone regardless of age, sex, race, national origin, religion, or amateur radio license status. Dues are \$20 per year for a family membership, free for those under 19 years of age.

A two-month courtesy mailing of this newsletter will be made to meeting visitors and others upon request.

Original material may be quoted without prior permission provided ISSAQUAH ARC SQUAKBOX is credited.

- Coming Events -

- **July 23, 2007** - Issaquah Ham Radio Support Group meeting, Police Station, Issaquah, talk-in 146.56 MHz at 7:00 PM, Meeting at 7:30 PM.
- **July 28, 2007** - Chehalis Valley Amateur Radio Society Hamfest. Lewis County Fair Grounds, Chehalis, WA. <http://cvars.org/swapmeet.htm> . Contact John Ellingson, K7OSK, k7osk@boatanchor.com .
- **August 1, 2007** - Monthly Issaquah ARC meeting. See July 11th for time and location.
- **August 11, 2007** - Radio Club of Tacoma Hamfest and Electronics Fleamarket. 9:00 a.m.- 2:00 p.m., Bethel Junior High School, 22001 38th Ave E., Spanaway, WA. www.w7dk.org
- **August 19, 2007** - Antique Radio Swap Meet. Puget Sound Antique Radio Association. 9 AM to 1 PM. Shoreline museum parking lot. N. 175th & Linden, Avenue, North Seattle. One block west of Aurora Avenue - one mile west of I-5, exit 176. Free admission. <http://www.eskimo.com/~hhagen/psara/swap.html>
- **August 27, 2007** - Issaquah Ham Radio Support Group - NO MEETING this month.

QRO Station Cont.

The station worked well and on January 18, 1903, it was used to accomplish the first U.S. - Eng-

land contact. (Marconi first accomplished cross-Atlantic communications in 1901 but that was

over a much shorter distance from Scotland to Nova Scotia.) - Pete Petersen WY7Z

NEXT MEETING: Wednesday, Aug 1, 2007 - 7:30 PM

Talk-in frequency: 146.56 MHz

FIRST CLASS POSTAGE
--- TIME SENSITIVE MATERIAL

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