The AMSAT® Journal

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Volume 37, Number 1 **January/February 2014**

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AMSAT Announcements

2014 Dayton Hamvention®
May 16-18 2014

Join your fellow satellite operators and builders at amateur radio's premier gathering. AMSAT will feature live satellite demonstrations, the AMSAT Forum, the annual AMSAT/TAPR Friday night banquet, and a 30x30 foot indoor display area. We will be showing the latest AMSAT technology featuring the Fox-1 satellite being readied for launch. You can stock up on the latest AMSAT products and join up or renew your membership.

ARRL Centennial, Hartford, CT
July 17-20

AMSAT will help the ARRL celebrate their 100th anniversary with a satellite workshop, a booth and forum during the convention. The workshop will provide a "soup to nuts" overview of working the amateur radio satellites to get new operators on the air. Also planned is an overview of the Fox-1 class satellites is also expected along with an overview of AMSAT and how the organization is helping "to keep amateur radio in space." Work is underway to schedule an ARISS contact in in conjunction with the Connecticut Science Center during the convention.

AMSAT's 45th Anniversary

AMSAT-NA 2014 Symposium is planned to be held in the Baltimore-Washington area. The exact dates and location will be announced later this year.

Watch for the latest news of these events in the AMSAT News Service Bulletins!

AMSAT's Mission

AMSAT is a non-profit volunteer organization which designs, builds and operates experimental satellites and promotes space education. We work in partnership with government, industry, educational institutions and fellow Amateur Radio societies. We encourage technical and scientific innovation, and promote the training and development of skilled satellite and ground system designers and operators.

AMSAT's Vision

Our Vision is to deploy satellite systems with the goal of providing wide-area and continuous coverage. AMSAT will continue active participation in human space missions and support a stream of LEO satellites developed in cooperation with the educational community and other amateur satellite groups.

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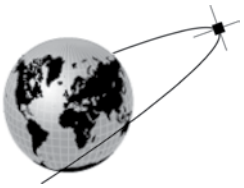
The AMSAT Journal (ISSN: 1407-3076) is published bi-monthly (Jan/Feb, Mar/Apr, May/Jun, Jul/Aug, Sep/Oct, Nov/Dec) by AMSAT-NA, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703. Telephone: 301-589-6062, fax: 301-608-3410. Periodicals postage paid at Silver Spring, MD and additional mailing offices.

Postmaster: Send address changes to *The AMSAT Journal*, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703.

The AMSAT Journal staff is always interested in article submissions. Whenever possible, submissions should be sent via e-mail to journal@amsat.org using plain text or word processor files; photos or figures in TIF, GIF or JPEG formats. Kindly do not embed graphics or photos in your manuscript - we prefer receiving those as separate files. AMSAT-NA reserves the right to select material for *The AMSAT Journal* based on suitability of content and space considerations. The editors of this publication are volunteers giving freely of their talents, time and efforts to produce *The AMSAT Journal*.



Happy New Year! I trust the holiday season, despite the unusually brutal winter weather across much of the United States, was an enjoyable and rejuvenating time for everyone.

As we start 2014, this is a good time to look forward towards several milestones and highlight some of the upcoming events of the coming year for AMSAT. I will also make some suggestions as to how our membership can help the organization, particularly if you're not currently involved.

Looking Forward: Fox-1

We continue to focus on the completion of Fox-1, AMSAT's first cubesat. The satellite is scheduled to fly on the NASA ELaNa (Educational Launch of Nanosat)-XII mission currently scheduled for December 2014 from Vandenberg AFB. We're committed to completing the satellite by June for delivery to SRI International. SRI is serving as the "launch integrator", receiving the cubesats that are assigned to this mission and installing them in the Poly-Picosatellite Orbital Deployer, or "PPOD" that will house them during launch. They will deliver the PPODs to the United Launch Alliance team that will install the PPODs on the launch vehicle. As these cubesats are secondary to the primary launch (a National Reconnaissance Office flight), the actual launch date is dependent upon the status of the primary satellite and the needs of the primary customer.

Our engineering team is pushing to complete the flight boards and prepare the satellite for testing. Our satellite payload providers, Virginia Tech (camera) and Vanderbilt's Institute for Defense Electronics (radiation experiment) are expected to deliver their flight boards by March for integration into the flight unit.

When launched, Fox-1 is expected to have an orbit of 780 km x 470 km at 64 degrees of inclination, providing outstanding coverage with an expected lifetime of 11 years.

AMSAT has received a coordination letter from the IARU Satellite Advisor regarding the frequencies to be used by Fox-1. Thanks to Drew Glasbrenner, KO4MA (AMSAT VP-Operations) for completing and submitting the application on AMSAT's behalf.

We're still awaiting word concerning Fox-1B/RadFxSat assignment to a launch mission. We've requested a 450 km x 660 km orbit.

ARRL Centennial Convention

2014 marks the 100th anniversary of the American Radio Relay League. By now, you've probably heard that the ARRL National Centennial Convention will take place at the Connecticut Convention Center in Hartford, CT the weekend of July18-20, 2014. AMSAT will have a booth and forum during the convention and we're pleased to recognize this significant milestone for the ARRL as well as take this opportunity to further enhance AMSAT's visibility within the amateur radio community.

In addition, there will be "workshops" or "training tracks" scheduled on Thursday, 17 JUL covering a variety of topics, such as digital modes, DXing, etc. Individuals will register for the "training track" and pay a registration fee that will help cover the expenses of providing the workshop. AMSAT has agreed to present a "satellite workshop" that will provide an opportunity for a number of individuals to take advantage of a one day course immersion into satellite communications.

At this point the AMSAT team giving the workshop consists of E.Mike McCardel,KC8YLD, Patrick Stoddard, WD9EWK, Tony Monteiro, AA2TX and Barry Baines, WD4ASW. The goal of the workshop is to provide a "soup to nuts" overview of working the amateur radio satellites, covering all pertinent areas such as satellite tracking, radios, rotors and antennas, working various modes through the satellites, telemetry overview, operating practices, and discussion of the various satellites in service at the time of the Centennial. An overview of the Fox-1 class satellites is also expected along with an overview of AMSAT and how the organization is helping "to keep amateur radio in space."

As the AMSAT workshop is part of a variety of workshops being given that day, there will be a lunch break where all of the registrants of the various workshops will eat lunch together, hear a presentation by a lunchtime speaker and then return to their workshops. ARRL will provide space for the workshop, publicity, and handle registrations.

We are also hopeful that an ARISS contact can be arranged in conjunction with the Connecticut Science Center that is next door to the Convention Center. AMSAT and ARRL are working together to support the contact. It is too soon to determine whether this will be a "direct contact" using amateur equipment at the Museum, or a "telebridge" using a gateway station. The decision will be based in part on the potential timing of the contact the weekend of the Convention versus the orbital footprint of the International Space Station.

While the Dayton Hamvention remains the premier amateur radio gathering, the ARRL Centennial Convention offers a unique opportunity to celebrate the longevity of amateur radio and the ARRL in New England. I hope you will consider attending the Convention and supporting AMSAT's activities. As details develop, we'll be passing them along.

Volunteerism

We all take pride in AMSAT's significant accomplishments of the past 44 years, which were accomplished by volunteers. Our only employee is Martha Saragovitz, our office manager in Silver Spring, MD. The entire AMSAT leadership team as well as our various "movers and shakers" are

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Apogee View - continued from page 3 ...

all volunteers. It is clear that managing an all-volunteer organization is fundamentally different than an employer-employee organization. One doesn't "hire" or "fire" volunteers. Volunteers define for themselves the amount of time they will dedicate as volunteers as well as the areas of interest that attracts them. There are higher priorities (family, employment, church, etc.) that often pull them away from volunteering for AMSAT or may prevent them from accomplishing agreed upon deadlines or goals. There is also the possibility of burnout, where volunteers tire of the ongoing volunteering and decide to pull back. Clearly, AMSAT recognizes the unique characteristics of an all-volunteer organization and tries to set goals/expectations of our organization that takes into account the potential "turnover" of our volunteers. Such is life of an all-volunteer, not-for-profit scientific and education organization.

We have a terrific team of people who are working within the organizational structure. Our Engineering team is working hard on completing the Fox-1 satellite. Our revamped Field Operations team represents AMSAT at hamfests and club presentations as well as serves as local "ambassadors" of AMSAT within their communities. Our AMSAT News Service and *AMSAT Journal* teams are working hard to publish weekly bulletins and bi-monthly magazine; both are top notch. Likewise, our information technology team over the past 18 months first revamped the AMSAT Store and then the AMSAT website, installing more robust and easier-to-manage systems. We have volunteers who stepped forward to manage and man AMSAT's Dayton Hamvention presence and carry out our annual Space Symposium. Indeed, we take the time at AMSAT Annual Meeting to recognize those who have made significant impacts on AMSAT. Our dedicated volunteers indeed have made a difference for AMSAT.

I also know that there are members who operate independently of AMSAT to give satellite talks and encourage people to get on the satellites. To the extent that these efforts result in building awareness within the amateur radio community of satellite communications and encourage newcomers to work the satellites, a big THANK YOU!

The bottom line is that each individual decides for themselves how much time/energy to devote to support of amateur radio in space, whether through AMSAT or perhaps on their own. Some people like to operate "solo", that is, outside of AMSAT. We're appreciative of these efforts, though I believe this energy is best channeled through the AMSAT structure that encourages a more coordinated effort. I ask that each AMSAT member decide for themselves what they can do to help build the organization and to provide direct support in this effort. Membership recruitment is the key area where we need your assistance.

As I've noted previously, one of our concerns is a slow erosion in overall AMSAT memberships that has significant long-term financial implications. A "mild" reduction in current membership levels can result in not receiving enough membership dues to cover our annual operating expenses, such as Martha's salary, office rent and utilities, printing costs of the *AMSAT Journal*, etc. We're close to the point where we are not able to cover these expenses based on membership dues. This could force us to dip into our reserves to pay for day-to-day operations. Our financial cushion (reserves) will allow AMSAT to continue, but we do not want to use our investments to be diverted to paying for items formerly covered by memberships. We need a turnaround in membership to ensure the long-term viability of AMSAT.

That's where our current membership, including those not actively involved in AMSAT activities, can provide significant help: TALK UP AMSAT!

AMSAT's future is dependent in part on our ability to retain and build membership. The best advertising for any organization is based upon "word of mouth" where a member who is familiar with the organization's purposes and recent history can personally share that information to a potential member as well convey their enthusiasm. Local club members, people you interact with on the local repeater or see at a hamfest are potential candidates for joining AMSAT, particularly if you're already aware of their interest in satellites. Take a moment to "talk up AMSAT", suggest that they join by using the AMSAT Store or calling Martha to join (301-589-6062), and follow up later to see if that person has indeed become a member. Your personal attention and encouragement can help to provide a positive impression of AMSAT. Please help us to rebuild our membership base and be prepared to renew when your membership is expiring.

Regulatory Matters
Experimental Licensing

The FCC in March 2013 released a Public Notice, "Guidance on Obtaining Licenses for Small Satellites" that outlines the criteria for small satellite owners to seek an "amateur radio satellite license" for their satellite, or to seek an "experimental license". Experimental licenses may be granted by the FCC for operation in any spectrum, including the amateur radio satellite bands. An experimental license allows satellite as operation without an amateur radio license, meaning that the purpose and operation of such a satellite need not meet amateur radio satellite requirements, such operation by a licensed amateur radio operator, the need to adhere to the non-pecuniary interest criteria, the ability to encrypt or use undisclosed data protocols, or where the purpose of the satellite is scientific research under governmental or commercial contract.

As we've seen, a number of cubesats in the past were licensed as amateur radio satellites where basic scientific research by a university or education institution was the purpose of the mission and the amateur radio satellite bands were used. These satellites have a properly licensed amateur radio operator as the control op, but it may be the case that the individual involved is a graduate student (who may be on stipend associated with the science mission of the satellite) or perhaps a university employee, such as a professor who is involved with the science mission.

The FCC Policy Notice stipulates that an applicant for an experimental license seeking to operate in the amateur radio satellite bands must seek frequency coordination with the IARU Satellite Advisor just as an amateur radio satellite licensee must do so.

The potential ramifications of having a number of experimentally licensed satellites operating in the amateur radio satellite service bands from a regulatory perspective is a concern, since it could be construed as "precedent" for non-amateur operations in the amateur satellite bands and perhaps endangering the primacy of amateur satellite operations of these frequencies. The IARU has expressed concerns about the number of experimental satellite applicants using amateur satellite spectrum, particularly with regard to the two-meter portion. At the 2013 AMSAT Space Symposium in Houston, the IARU Satellite Advisor announced that effective July 1, 2014, the IARU would no longer coordinate experimental satellites in the two meter band due to limited capacity.

Until the Policy Notice was released, most university cubesat projects were unaware of the availability of the experimental license. Not being familiar with the details of satellite licensing, a number of individuals involved with university cubesats have now simply assumed that they're expected to file for experimental licenses given that the Policy Notice defined the eligibility of an amateur radio license as "Amateur radio transmissions are primarily for the purpose of exchanging messages with other amateur stations, and our rules prohibit "communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer…"". However, university cubesat managers may not recognize the subtle differences in licensing.

For example, experimental licensees must operate on a non-interference basis to the primary and secondary users of a band. Should an amateur station complain of interference from an experimental licensee and that complaint is filed with the FCC by a US citizen or the national authority of the country making the complaint, the experimental satellite is expected to shut down the next time a control operator can command it. If the same satellite were licensed as an amateur radio satellite, it could continue to operate even with an interference issue. Experimentally licensed stations cannot communicate with other license categories, so that an amateur radio station cannot control an experimental licensed satellite or operate through it. Most importantly, experimental licenses are only issued by the United States for control operation over the US,

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An Internet Remote Station

John Papay, K8YSE/7
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One of the most often asked questions about satellites is what antenna works best for the least amount of money. At first, all of my operating was on the FM birds using an Arrow hand held antenna and an FM dual band mobile rig still installed in my truck. That was fine when the weather was warm, but as time went on the weather deteriorated and made operating outside less desirable. A fellow ham gave me a 2 meter 14 element KLM with polarity switching and along with a 40 element KLM UHF antenna purchased at a hamfest. A permanent station was constructed using a 30' tower next to the house. These antennas are excellent performers and have netted many grids for me. And the weather was never a problem again.

Soon after this antenna project was completed, work began on making this station remotely accessible over the Internet. With each successive year, more remote capability was added for both satellite and HF communications. If you chase grids and don't want to miss any when you are not at home, the remote capability makes a lot of sense.

Recently, I acquired a manufactured home in Mesa, Arizona (Figure 1). Immediately I started thinking about building a remotely accessible satellite station there. My idea was to make the antenna system blend in so big antennas were out of the question. I didn't want to build antennas due to time constraints so my thoughts returned to where I started with the Arrow antenna. Many also use the ELK log periodic antenna for portable operation. The discussion of the pros and cons of each antenna are not unlike those associated with two well known manufacturers of automobiles here in the United States. I have tried both (antennas and cars) and have my preferences. But, the requirements for the Arizona station leaned toward the Arrow antenna because polarity switching would be simpler with an antenna that had separate ports for VHF and UHF.

Figure 1: Showing the antenna system relative to the home. The idea was to make this blend in with other TV antennas. Antennas are 15' above the ground and about 3' above the roofs.

Figure 2: Showing the Extended Arrow antennas along with preamps and coax relay boxes.

The Alaskan Arrow/Mega Arrow Antenna

I had heard about the Extended Arrow antenna, also known as the Alaskan Arrow or the Mega Arrow and thought I might want to use that antenna for the new station. The Alaskan Arrow has 4 elements on 2 meters and 10 elements on UHF. The boom is about 53" long instead of the normal 38" on a standard Arrow (Figure 2). I purchased two standard Arrow antennas and then ordered the longer boom and the extra elements to make my own. The Alaskan Arrow may be a standard offering soon so you would not have to build it from parts.

I wanted independent VHF and UHF vertical and horizontal polarization (V-V, H-H, V-H, H-V), so coax relays purchased at Dayton were installed in 4" x 4" x 2" plastic weatherproof electrical boxes. These relays had TNC connectors and required 28 VDC to operate. This was not a problem at the base station since a simple wall transformer would provide the necessary power. Each relay switches between vertical and horizontal polarization on either VHF or UHF. The antennas are end mounted at opposite ends of the cross boom in opposite polarities (Figure 3).

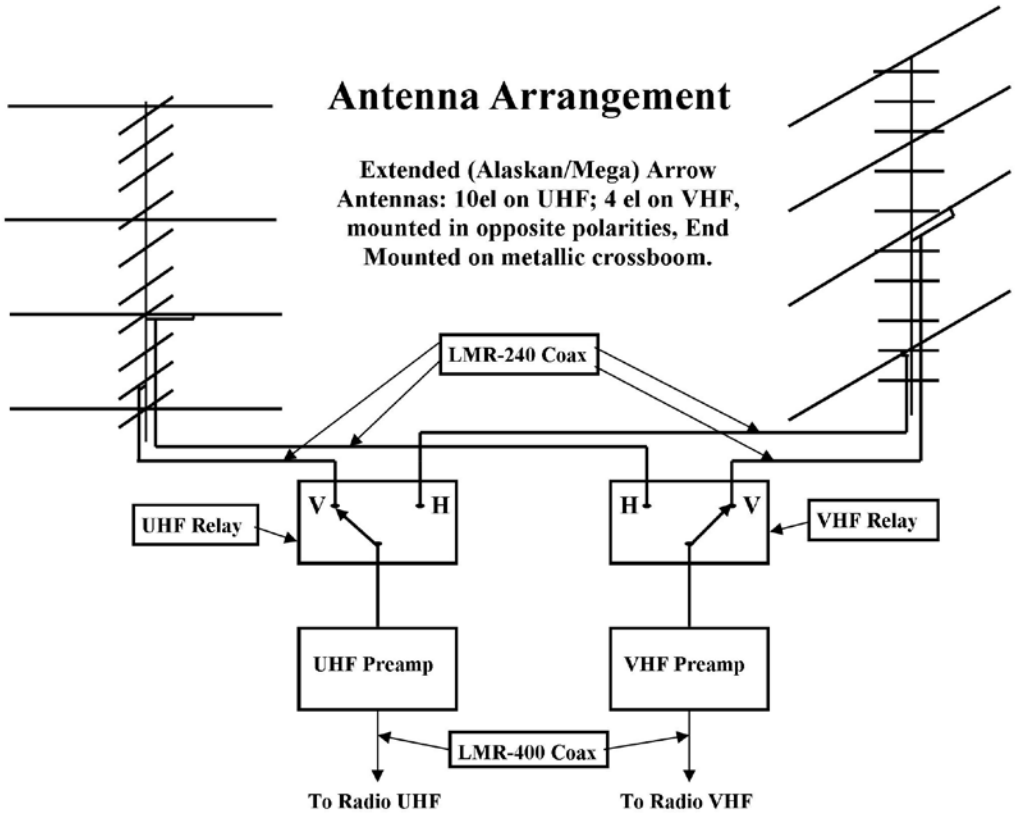


Figure 3: Antenna switching arrangement

If Elk antennas were used, two duplexers would be required so that both horizontal and vertical polarization would be available in all combinations. This would certainly work but would require extra hardware and weatherproof boxes. The Arrow made more sense for this application. Mounting was also simpler with the Arrow since they could be end mounted on a metallic cross-boom. (Figure 5)

High quality compression fitting BNC connectors were selected for the antenna connections since they would be reasonably waterproof. The TNC connectors in the relay boxes are crimp type since weather exposure was not a factor there (Figure 6). The coax from the antennas to the relay boxes is LMR-240. If this coax is used, connectors with center pins large enough to accept the larger center conductor of the LMR cable are required. They are available from many ham radio stores. Stainless #8 lock washers were used on each element so that vibration would not cause them to loosen. Lubricant was used on all threads to prevent corrosion as well. You think about all these things when you know you'll be 2000 miles away for months at a time. It's not as much of a problem as launching a satellite where you can never touch it again physically, but you don't want something to fail because you didn't take the time to prevent bad things from happening in the first place.

The output of the relays go directly into the Landwehr preamps that are also mounted on the boom. Compression fittings on the electrical boxes insure a watertight enclosure, however, two drain holes were drilled so that any moisture that entered could escape.

A standard Yaesu G5500 rotor was used along with an LVB Tracker. The tracker was set up for serial operation since ports were available on the computer. The mast is a 2-1/2" diameter aluminum tube that was originally part of a commercial loop type antenna. The bottom section is 12' long and the top section slips into the bottom section to extend the height. I settled on only 15' in order to minimize potential wind damage. Fifteen feet gets over the roofs by a few feet and that is all that is needed to work down to the horizon. LMR-400 coax is used for the main run into the shack which is only around 25' or so.

Internet Considerations

One concern when operating remotely is the status of the rotator. The SDX program on SatPC32 indicates what the program is sending to the LVB Tracker, but it doesn't tell you if the rotator is actually turning. Erich, DK1TB, wrote an SDX program for the Labjack U12 that would give rotator feedback, but after building the interface, the Labjack failed after a few days. Hence, the LVB Tracker was placed into service. My son Doug, KD8CAO, quickly wrote a program to interrogate the LVB Tracker and give actual position information. It was tested and debugged over the Internet from Michigan to Arizona and in 30 minutes, we had something that worked. Although the LVB Tracker supports the Yaesu protocol, it did not appear to support left/right/up/down commands, so buttons to perform that movement on screen could not be implemented. Hopefully that part of the protocol can be implemented in the future. Remember that when operating remotely, the only thing you can do is what is provided for on the computer screen. You cannot see or touch the equipment.

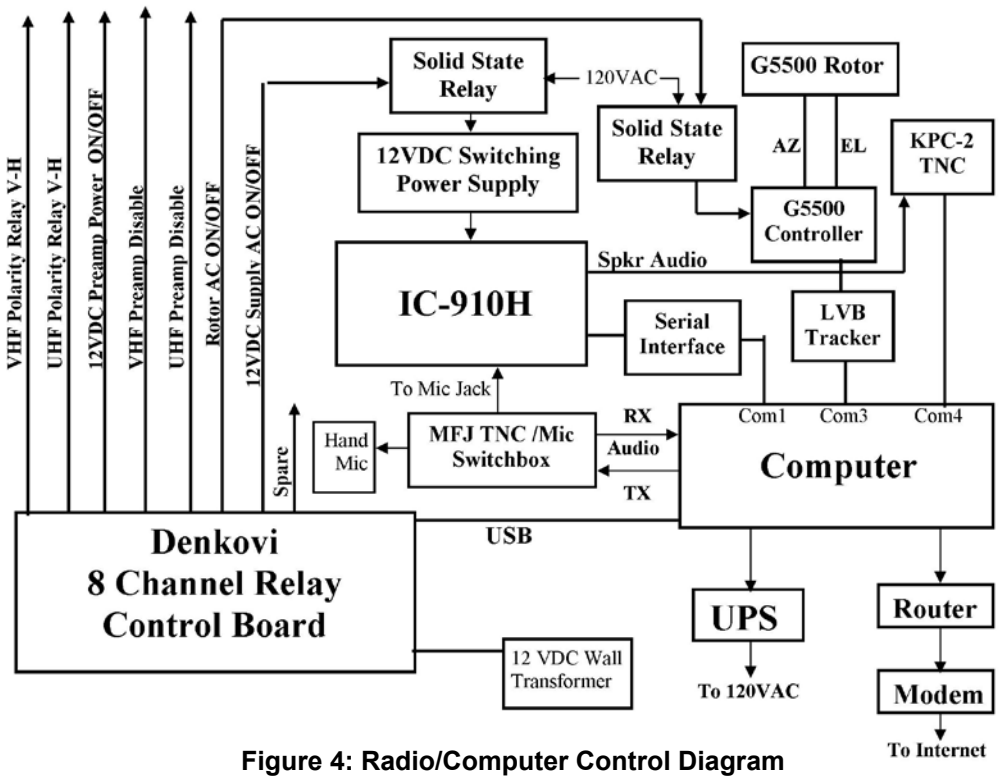


Figure 4: Radio/Computer Control Diagram

Auxiliary Control Relays

Although SatPC32 now controls the PTT on many radios, there are other functions that you will want to control remotely. The ones implemented in my station include independent polarity switching on UHF and VHF, independent preamp activation, and AC power on/off for the rotator and the radio (Figure 4). There are many USB/serial relay boards available on the internet that will allow this type of control. The one chosen here was made by Denkovi in Bulgaria and is available in an ebay store. It has 8 SPDT relays on the board and is controlled via a USB port (Figure 6). Denkovi provides software to address the relays although you can write your own if desired. The newest version of SatPC32 now gives you the option of setting a PTT timer so that if you do lose control, the radio will not continue to transmit. Both the TS2000 and the IC-910H have PTT timers that can be set to 3 minutes. This would be the second line of defense in case of loss of control during transmit. Normally I leave the radio and rotor power on, however, both units can be switched off using solid state relays controlled by the Denkovi board. The 12 volt relays on the Denkovi board are powered through a separate 12 volt wall transformer that stays on all the time.

UPS Backup Power

A power outage can wreak havoc on your remote station. It is important to utilize a UPS on your computer and the router/modem so that power interruptions don't cause a failure that you cannot recover from remotely. I have set the basic input/output system (BIOS) in the computer to power the computer back on after an extended power outage that exceeds the UPS run time. This should allow the modem to reconnect and control to resume. It's always a good idea, however, to have someone who can access the equipment and get things going again should the recovery fail.

Computer Radio Control Programs

It is desirable to be able to control other functions of the radio such as audio levels, power output, noise blanker, and squelch. The Kenwood ARCP2000 program will control every function that is available on the front panel of the radio and it is used on my home station. Unfortunately, there is no program for the IC-910H that is as functional. Ham Radio Deluxe will work but it apparently does not support viewing both UHF and VHF frequencies simultaneously. DXLab can control the IC-910H and will display both frequencies at the same time. If you want to control other functions, command strings must be programmed into the software. You will become very familiar with how the radio is controlled once you start creating those commands. Having a separate control program will allow your radio to be used for non-satellite communications as well.

It is possible to have two software programs controlling the radio over a single serial port. Eterlogic makes a program called Virtual Serial Port Emulator (VSPE) which allows SatPC32 and the Kenwood ARCP2000 to control the radio at the same time. It is free for WinXP but since Microsoft requires a license in Vista and above, a small fee is charged but is well worth the expense. VSPE works with DXLab and SatPC32 controlling the IC-910H as well.

Remote Control Software

Logmein software is used to remote control a Dell Optiplex 745 Core2 duo business computer. These machines are very reliable and well suited for continuous operation. A 2 port serial card and a PCI audio card were added. The serial ports are used to control the radio and the LVB tracker. The audio card was dedicated to the remote audio, leaving the onboard audio for computer/ internet audio when operating locally. The onboard serial port is used on the KPC2 TNC. There are other remote control programs like Teamviewer that are free for non-commercial use. Each has their pros and cons. Try them and choose the one that works best for you.

Skype is used for the audio and is set up to automatically answer calls originating from the contact list. Skype is very reliable and works through firewalls in almost any environment. The only problem with any type of digital audio is the way it handles noise. Phones and computers regard noise as undesirable so sometimes you will hear almost nothing when you first connect. But if there are voices or CW, the audio comes active and the quality is fairly good. Audio isolation transformers are used to prevent ground loops and hum between the radio and the computer. Don't overlook this very important piece of hardware. Speaker audio was taken from the IC-910H microphone jack, which is active even if there is a connection in the external speaker jack. Transmission audio is fed into the microphone jack as well, but care must be taken to avoid short-circuiting the 8 volts which is used to power the preamp in the hand microphone. A MFJ TNC switchbox was used to make switching between the local microphone and internet audio a simple push of a button.

It's desirable to have a TNC connection in line just in case you want to decode some AX25. An old KPC2 was set up for packet reception only via the external speaker jack. It is configured to work with Alogger, a program that will process APRS packets and upload them to a server. This is used to gate APRS packets from the ISS when active.

SatPC32 is used to tune the radio when operating on a linear bird. I like the 500 Hz up/down buttons for scanning the band quickly. Once you get close, the 100 Hz buttons can be used to fine tune. Doppler control is very important when operating remotely. Make sure your values of the Keplerian elements are up-to-date or are

Figure 5: Photo showing the UHF Polarity relay box and the UHF preamp mounted on a panel attached to the cross boom. This arrangement minimizes the loss between the antenna and the preamp.

Figure 6: Antenna Coax Relay mounted in a weatherproof plastic electrical box. Relay has TNC connectors and is powered by 28VDC. Compression fittings are used to prevent water from entering the box. Separate boxes are used for the VHF and the UHF elements so all combinations of linear polarity are available (H-H, V-V, H-V and V-H).

no more than a few weeks old. Actually the computer clock is the most critical setting since just a few seconds of error will cause an undesirable shift in frequency when the satellite is high overhead and the Doppler is changing rapidly. I use a program called Nettime to set the clock every hour. This program tracks how much error there is and will give you an idea of how often the clock requires updating.

Although Skype is somewhat full duplex, it considers your transmission audio coming back down from the satellite as "echo." The software cancels this echo so you don't hear yourself. Actually this is a good thing because if you could hear yourself, the internet delay would be intolerable and you would not be able to talk without getting very confused. The downside is that you have to find another way to ensure you are talking and listening on the same frequency. Once you set your uplink calibration in SatPC32 on AO-7 and FO-29, it will remain fairly constant. I have discovered that the Dutch transponder on VO-52 and the new FUNcube-1 transponder require adjustment from pass to pass and even during the pass, especially with FUNcube-1.

Uplink Calibration

One way to adjust your uplink calibration is to use a program that sends audio CW from the remote computer. Since the tone originates from the radio computer, It will not be considered "echo" and you should hear it coming back down from the satellite. The uplink calibration can then be adjusted by ear or by using a program that reads the audio frequency of the tone on the downlink. Stay away from the center of the passband when making these adjustments so you don't interfere with others on the bird. The audio CW program can also be used to make CW contacts. An unplanned contact was completed with R1AO on AO-7 Mode B back in 2012 while operating my station in Cleveland remotely from Florida using this technique.

Computers, Smartphones, Audio Devices

A laptop or desktop computer is preferred when connecting to your remote station. (Figure 7). A large screen will enable you to see everything clearly even with many windows open (Figure 8). Logmein and Teamviewer have smartphone apps that will work but the small screen size can make it very difficult to both see the detail and tune the radio. An external mouse really makes it much easier to operate remotely.

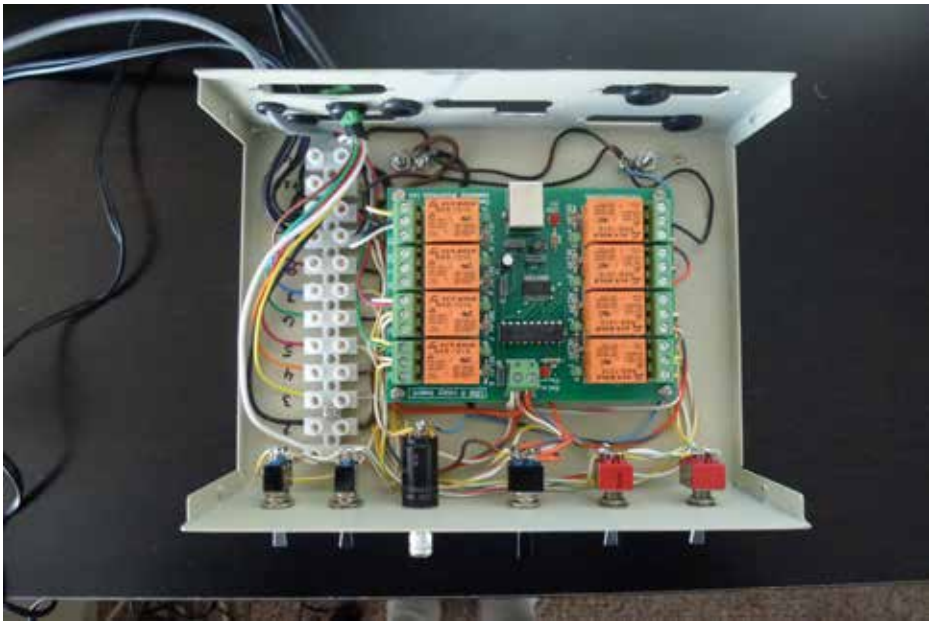


Figure 6: Denkovi USB relay control board used to control functions such as polarity, preamp, radio/rotor AC power etc. Software is provided to customize the control/appearance on the screen. Switches can be used when operating locally.

Figure 7: A complete station that can be operated locally or remotely and is XYL (W8ZJB) approved. The 12 VDC switching power supply and UPS are under the desk.

Wired or Bluetooth headsets work great for Skype audio. You can control your station on a laptop and use your smartphone with a Bluetooth headset to access Skype. Alternately, you can do it all on the laptop or only use the smartphone if you have no other choice.

Internet Bandwidth

If you have a solid internet connection, either WiFi or wired, there should be little trouble in controlling your station from a remote location. A 3G smartphone connection will work with Logmein/Skype if there are just a few users sharing the cellular site. A 4G connection is ideal but not available everywhere. If your phone has a hotspot feature, a laptop can be used for easier operation. Wifi is available at most McDonald's and you can take advantage of that while you are traveling. But be prepared for situations where Internet service is unavailable. If you have to make a contact on a particular pass, have an alternate plan, if at all possible.

Final Considerations

Make sure your station is working perfectly before you start thinking about operating it remotely. If you are having issues when sitting in front of the radio, they will only worsen when trying to operate remotely. When making adjustments remotely, move to the extreme edges of the transponder so you don't interfere with other users. If things are not going right, analyze the situation before making drastic changes. Chances are that you are simply overlooking something simple. Be sure to implement the timers mentioned earlier so that your transmitter doesn't stay on should you lose control.

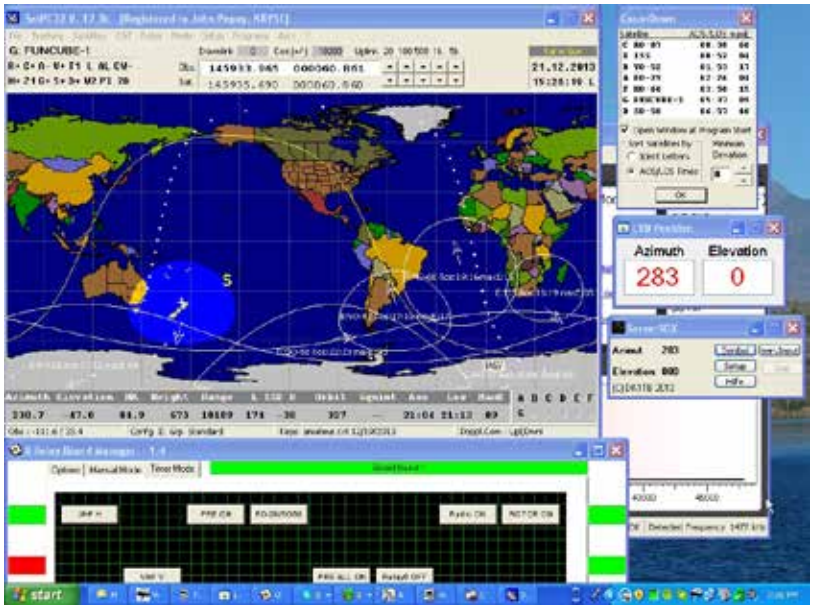
Operating remotely is like operating with one arm tied behind your back. There is a lot going on and the only feedback you get is what is on the screen and the audio in your ear. Practice and a cool head will insure that you can operate successfully. After a while you will be more comfortable and be able to make those difficult contacts. Remote operation isn't for everyone but if you are so inclined, you should be able to make it work. My techniques are certainly not the only ones that will work, but they should save some time and the frustrations of learning how to do it from scratch. Have fun!

Biography

John holds an Extra Class License and has been a ham for 52 years. He has a Bachelor's degree in Electrical Engineering from Case Institute of Technology, now Case Western Reserve University in Cleveland, Ohio. His career was in radio systems engineering and management with the Bell System/AT&T including 2-way, paging, mobile telephone, cellular and microwave. He has been an avid satellite operator for the past 6 years. His other current interests in ham radio include HF DXing. He has participated in three Pacific DXpeditions including Nauru, the Marquesas and Austral Islands in French Polynesia and most recently the first operation accepted for credit to Swain's Island, part of American Samoa. His website includes information for those starting out in satellites including a few thousand recordings of satellite passes as well as grid square maps from many of the active grid chasers. See:

http://www.papays.com/sat

He says that his greatest enjoyment now is working those making their first satellite contact because it takes you right back to the excitement of making your first contact.



(left) Figure 8: Screenshot of SatPC32, Denkovi control window, ServerSDX window and the window showing the actual position of the rotators (software written by Doug, KD8CAO). Funcube dashboard hidden in the background.

(right) Custom QSL card showing the Extended Arrow antennas with a colorful Arizona sunset in the background.

Apogee View - continued from page 4 ...

so there is no possibility of a foreign station being involved with the experimental satellite.

None of these restrictions were to apply if an amateur radio satellite license were issued, but of course such a satellite must be controlled by a licensed amateur radio operator.

The FCC stated to us that the interpretation making the rounds in the university cubesat community that ALL university cubesats are now expected to get experimental licenses is a misunderstanding; clearly, there is confusion in the university cubesat community about appropriate licensing and there are some 'grey areas' that need clarification.

Both the ARRL and AMSAT as well as the National Science Foundation have concerns about the current satellite licensing situation and the unintended consequences of the FCC Policy Notice in terms of having pure scientific missions developed by educational or not-for-profit organizations be viewed by universities as excluded as amateur radio satellite missions. In conjunction with the National Science Foundation, the ARRL and AMSAT had several conference calls in November 2013 and January 2014 to seek common ground on how best to approach the FCC on this matter.

We're fortunate that ARRL Chief Executive Officer David Sumner, K1ZZ attended the 2013 cubesat Developer's Workshop in San Luis Obispo, CA last April (shortly after the FCC released its Policy Notice) on behalf of the IARU and had a first hand opportunity to hear the presentations, meet with key personnel in the university cubesat community, and discuss frequency coordination and licensing concerns there. AMSAT Board Member and Corporate Secretary Alan Biddle, WA4SCA represented AMSAT at the conference and was involved in several of those discussions. Unfortunately, the FCC was not represented at the cubesat conference due to "sequester" budget concerns where travel was prohibited. Dave wrote about his attendance at the conference and the evolution of cubesats in general, and the evolving regulatory issues in a "It Seems to US" editorial in the July 2013 issue of *QST* (p.9).

AMSAT, ARRL and NSF agree on the following points which were presented to the FCC in a meeting in Washington, DC on 14 JAN 14. Representing AMSAT were Tony Monteiro, AA2TX, VP-Engineering and BoD member, and myself. Dave Sumner, K1ZZ represented the ARRL. We met with representative of the FCC's International Bureau (Satellite Licensing), the Office of Engineering and Technology (Experimental Licensing), and the Wireless Telecommunications Bureau (Amateur Radio). Unfortunately, a NSF representative was not available for the meeting due to scheduling conflicts:

continued on page 21 ...

Support AMSAT

New Version!

AMSAT is the North American distributor of **SatPC32**, a tracking program designed for ham satellite applications. For Windows 95, 98, NT, ME, 2000, XP, Vista, Windows 7.

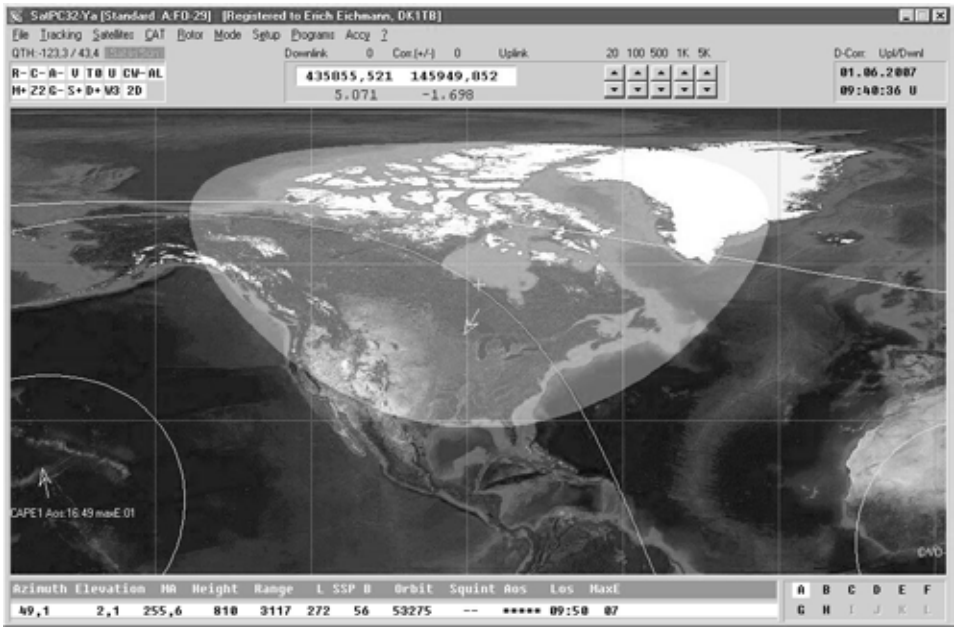
Version 12.8b is compatible with Windows 7 and features enhanced support for tuning multiple radios.

Version 12.8b features:

- SatPC32, SatPC32ISS, Wisat32 and SuM now support rotor control of the M2 RC-2800 rotor system.
- The CAT control functions of SatPC32, SatPC32ISS and Wisat32 have been expanded. The programs now provide CAT control of the new Icom transceiver IC-9100.
- The main windows of SatPC32 and SatPC32ISS have been slightly changed to make them clearer. With window size W3 the world map can be stretched (only SatPC32).
- The accuracy of the rotor positions can now be adjusted for the particular rotor controller. SatPC32 therefore can output the rotor positions with 0, 1 or 2 decimals. Corrections of the antenna positions can automatically be saved. In previous versions that had to be done manually.
- The tool 'DataBackup' has been added. The tool allows users to save the SatPC32 program data via mouse click and to restore them if necessary. After the program has been configured for the user's equipment the settings should be saved with 'DataBackup'. If problems occur later, the program can easily restore the working configuration.
- The rotor interfaces IF-100, FODTrack, RifPC and KCT require the kernel driver IOPort.SYS to be installed. Since it is a 32-bit driver it will not work on 64-bit Windows systems. On such systems the driver can cause error messages.To prevent such messages the driver can now optionally be deactivated.
- SuM now outputs a DDE string with azimuth and elevation, that can be evaluated by client programs. Some demo files show how to program and configure the client.

Minimum Donation is $45 for AMSAT members, $50 for non-members, on CD-ROM.
A demo version may be downloaded from http://www.dk1tb.de/indexeng.htm
A registration password for the demo version may be obtained for a minimum donation of $40 for members and $45 for non-members.
Order by calling 1-888-322-6728.

The author DK1TB donated SatPC32 to AMSAT. All proceeds support AMSAT.



AMSAT held its 31st Annual Space Symposium and Annual General Meeting and Board of Directors meeting in Houston, Texas from October 31 to November 4, 2013. A huge vote of thanks and congratulations are in order to the organizing team lead by Nick Lance, KC5KBO, Renee Lance, KC5VMA and Lou McFadin, W5DID, and members of the Johnson Space Center Amateur Radio Club, W5RRR, and the Clear Lake Amateur Radio Club, K5HOU for the successful Symposium.

The Symposium featured:

- AMSAT Board of Directors Meeting - October 31 - November 1
- 30th Annual 2012 AMSAT Space Symposium - November 1-2
- AMSAT Annual Group Meeting - November 2
- Field Coordinator's Annual Breakfast - November 3
- Tour of the Battleship Texas Museum - November 3
- Special Tour of the Johnson Space Center – November 4

Summary of the Board of Directors Meeting

The Board of Directors meeting on October 31 - November 1 was open to all AMSAT members. Full details of the Board's actions and department status will be documented in the released meeting minutes in a future issue of the AMSAT Journal. Here is a summary of the Board's discussions. These were also shared with all of the attendees at the Annual General Meeting on November 2 and are being made available to all members now via the Journal.

AMSAT's Board of Directors members were all present for the meeting, including a teleconference link for those unable to attend in person.

Election of AMSAT's Senior Officers was one the first orders of business completed by the Board. The following positions were voted upon and filled.

AMSAT President, Barry Baines, WD4ASW presented the 2013 President's Report. To focus the discussion on AMSAT's goals and accomplishments Barry reminded us of AMSAT's Mission and Vision designed to "Keep Amateur Radio in Space"

AMSAT Board Member	Term Expires
Tom Clark, K3IO, Clarksville, MD	2014
Lou McFadin, W5DID, Orlando, FL	2014
Gould Smith, WA4SXM, Knoxville, TN (teleconference)	2014
Barry Baines, WD4ASW, Westborough, MA	2015
Alan Biddle, WA4SCA, Franklin, TN	2015
Mark Hammond, N8MH, Coats, NC (teleconference)	2015
Tony Monteiro, AA2TX, N. Andover, MA	2015
(Alternate) JoAnne Maenpaa, K9JKM, Carpentersville, IL	2014
(Alternate) Steve Coy, K8UD, Beavercreek, OH (teleconference)	2014

AMSAT's Mission Statement

- AMSAT designs, builds and operates experimental satellites and promotes space education with a focus on coverage, availability, and leadership, training, and development of designers and operators in technical and scientific innovation.
- AMSAT conducts strategic partnerships with NASA, ARISS in the area of promoting amateur radio in Human Space Flight, and in education through universities and foundations in the area of LEO satellite projects.

AMSAT's Vision Statement

- Deploy satellite systems with wide area continuous coverage
- Participation in human space missions
- Support a stream of LEO satellites developed in cooperation with the educational community and other amateur satellite groups.

AMSAT Board Elects Senior Officers for 2013

The following Senior Officer positions were voted upon and filled:

Barry Baines, WD4ASW	President
Drew Glasbrenner, KO4MA	Vice-President Operations
Gould Smith, WA4SXM	Vice-President User Services
Tony Monteiro, AA2TX	Vice-President, Engineering
Frank Bauer, KA3HDO	Vice-President Human Spaceflight
Alan Biddle, WA4SCA	Corporate Secretary
Keith Baker, KB1SF/VA3KSF	Treasurer
Manager, Martha Saragovitz	Manager

These Senior Officer positions remained open at this time awaiting appointment:

Executive Vice-President

Vice-President Marketing

The following key leader positions filled by Presidential appointment included:

E.Mike McCardel, KC8YLD	Vice-President Educational Relations
Patrick Stoddard, WD9EWK	Director of Field Operations
Steve Belter, N9IP	Dayton Hamvention Operations
JoAnne Maenpaa, K9JKM	Editor AMSAT Journal
Lee McLamb, KU4OS	Editor AMSAT News Service
David Taylor, W8AAS	ARISS International Delegate
Maurice-Andre´ Vigneault, VE2VIG	ARISS International Delegate
Joe Fitzgerald, KM1P	IT Team Leader

Barry's President's Report was shared again with the membership during the annual general meeting. AMSAT's list of accomplishments for 2013 is impressive.

Fox Project on Schedule

Fox-1 is on schedule for delivery to CalPoly in May 2014 for a planned launch in November, 2014. As part of the engineering process, AMSAT has developed growing partnerships with other organizations such as Vanderbilt University and Virginia Tech, resulting in significant resources and flight hardware being made available. Partnerships with Virginia Tech have produced a camera to be flown on Fox-1. A new relationship with Vanderbilt University-ISDE has produced an experimental payload for Fox-1 and was key to the acceptance of the RadFxSat/Fox-1B cubesat into the NASA ELaNa program. AMSAT continues to look for opportunities to expand university relationships.

Fox-1 cubesat designers meet at the Symposium - (L-R) AMSAT Vice President Engineering Tony Monteiro, AA2TX has an eyeball QSO with Burns Fisher, W2BFJ; Phil Karn, KA9Q; and Douglas Quagliana, KA2UPW/5.

The Regulatory Environment

International Traffic in Arms Regulations (ITAR) continues to impact AMSAT's collaborative opportunities for on-going and future development of programs enabling our vision of "Keeping Amateur Radio in Space". Although new legislation regarding ITAR is pending, the current regulatory environment still considers AMSAT to be a munitions supplier. AMSAT continues careful compliance with ITAR regulations. Our organization is ensuring our capability to share technical and development issues with university partners and overseas AMSAT groups with compliance of the ITAR rules for placing our materials in the public domain. The Fox program materials have been published according to the public domain disclosure requirements with chapters included in both the 2012 and 2013 AMSAT Space Symposium Proceedings book.

In January, 2013 President Obama signed 2013 National Defense Authorization Act which included an amendment authorizing the President to reassign ITAR Category XV Satellites to the Department of Commerce Commerce Control List (CCL) under the Export Arms Regulations (EAR). AMSAT has submitted comments to the Directorate of Defense Trade Controls (DDTC) initial draft of rules removing certain satellites from Category XV of the U.S. Munitions List (USML). Comments were also submitted to the U.S. Department of Commerce Bureau of Industry and Security initial draft of rules creating new categories in the CCL for satellites being transferred from USML Category XV.

AMSAT-NA needs continue to monitor and lobby the new ITAR regulatory process. Barry Baines has appointed Peter Portanova, W2JV (ex-WB2OQQ) who has been instrumental in maintaining our contacts with both industry and legislative representatives. Additionally the ARRL has significant resources which may be available.

Educational Outreach

E. Mike McCardel, KC8YLD was appointed Vice-President Educational Relations by Barry Baines in September, 2013 to continue the work initiated by Mark Hammond, N8MH. The goals of AMSAT's educational outreach include:

- Reflects need for AMSAT to focus on education as justification for launches/placement of amateur equipment in space
- Evolving relationships with ARRL and NASA Education
- Build on the education team established within AMSAT

The education team is working on finding new opportunities to bring space communications to the classroom:

- Collaboration with ARRL Education's Teacher Institute Process
- Find ways to utilize the Science, Technological, Engineering and Mathematics (STEM) potential of FUNcube sats and Fox-1/1B
- Mark Spencer, WA8SME has developed some imaginative educational tools based on Fox-1 how does ARRL/AMSAT follow up?
- How do we encourage collaboration with university partners to expand into educational outreach?

30th Anniversary Year of Amateur Radio and Human Space Flight

ARISS continues to be an amateur radio success story. It is an international collaboration of the International Amateur Radio Union (IARU) and AMSAT groups based upon the success of the Shuttle Amateur Radio Experiment (SAREX) to provide one voice to NASA and the space agencies on the ISS.

ARISS school contacts provide support for STEM and are the basis for amateur radio on the ISS. By providing classroom exposure to space science and a unique experience of interacting directly with astronauts ARISS builds inspiration in STEM subjects/careers and amateur radio. To date, over 866 contacts have been completed since the first ARISS school contact in December, 2000.

AMSAT Vice President Human Spaceflight, Frank Bauer, KA3HDO and ARISS

International delegate Dave Taylor, W8AAS discussed the status of current and future amateur radio equipment on the ISS. The Ericsson HT is operational in the ISS Service Module. The digital HamTV, developed by AMSAT-Italia for the ISS, was discussed with emphasis on the differences in the DVB-S standard rather than analog TV. Conventional systems would not have an adequate link margin without unreasonably large ground station antennas, while the digital encoding should provide acceptable performance, with reception being handed off between stations. It was integrated with commercial components and will use S-band frequencies for downlink. The system will integrate with other ISS systems and use the exiting patch antennas. AMSAT-NA has been involved with developing the S-band beacon and ground station development, as well as ARISS education possibilities.

Budget and personnel changes have placed future operations in question. In particular, spending overruns could result in the cancellation of ARISS operations. There have been reductions in both manpower and programs, but ARISS still has solid support at NASA headquarters. Uncertainties in the federal budget are making planning difficult. There is a need to make the ARISS operation self-sustaining in order to insulate it from fluctuations in NASA and wider government funding and priorities.

AMSAT-NA Engineering

AMSAT Vice President Engineering, Tony Monteiro, AA2TX reviewed the rationale for obtaining launches through partnerships with educational institutions: cost. By partnering with educational institutions, it is possible to obtain launches at little or no cost while, at the same time, obtaining access to valuable resources. He briefly touched on our existing projects with both Virginia Tech and Vanderbilt University and the next phase projects being considered.

Tony then moved on the current engineering efforts, reviewing risk mitigation efforts and the current state of the testing and development of Fox-1 experiments, software, and hardware. He finished with a review of budget issues as well as the needed documentation and testing to be completed in the next few months. The 31st Symposium Proceedings feature multiple papers in the "AMSAT Fox Satellite Project" and AMSAT Fox-1 system engineering documentation – by the AMSAT Fox engineering team.

AMSAT User Services: Electronic Services

Joe Fitzgerald, KM1P discussed the technical issues and current status of the new AMSAT web site. He reviewed the reasons and benefits of migration of AMSAT on-line products to a commercial provider. Progress has been steady on the new web pages with excellent support from technical volunteers.

Alan discussed the AMSAT.org web site, possibly the most visible part of AMSAT in the 21st century. With the new web site, new web pages can be created and placed in minutes. Changes in the layout can be made in a few days. Features can be added via plug-ins while highly specialized functions, such as the tracking and pass prediction functions, require the availability of programmers with the required skill. Using the widely supported WordPress platform, new features can be easily implemented.

New technical and operating content is needed. The migration from the old site has shown how outdated much of the static content was. Over two-thirds of the items were obsolete. People in the areas of education, AMSAT history, operations, and so forth have been approached for updated content, with only minimal response to date. This is not a task which a single person can do well nor should be expected to fill. Without the efforts of others who have specialized knowledge, it will simply not be done. The full potential of the AMSAT web site will await the selection of a permanent webmaster and/or editor. (The two need not be the same.)

The new look and feel to the AMSAT.org website continues to evolve. Principal design and implementation were provided by Brent Salmi, KB1LQD and Bryce Salmi, KB1LQC, using the AMSAT design manual by Steve Kenwolf as reference.

Alan Biddle, WA4SCA reported that the AMSAT Store has been functioning with a small number of "stock boys" maintaining and updating store items. Frequent updates are provided by Martha.

The *AMSAT Journal*

Journal Editor, JoAnne Maenpaa, K9JKM reported that The *AMSAT Journal* was able to return to publication in December 2012 with the release of the November/December 2012 issue and has continued on schedule since.

All issues for 2013 were released on time largely thanks to the efforts of authors providing input and the dedication of the editorial team consisting of Bernhard Jatzeck, VA6BMJ, Mike Sedlak, K4ERA, James Howard, K3JPH, and Douglas Quagliana, KA2UPW/5. The Journal has a continuous need for articles on a wide range of satellite issues. An updated guide for potential writers is available on the AMSAT web site.

The *Journal* is one of the most tangible benefits of AMSAT-NA membership. In addition to the paper issue, development is in progress on a collected form on DVD for issues between 2003-2013 planned to be sold through the AMSAT Store. Electronic distribution will be an option but requires additional technical development on the AMSAT.org web site.

AMSAT News Service

For many the ANS is the voice of AMSAT. The editors are Lee McLamb, KU4OS, (senior editor), E.Mike McCardel, KC8YLD, and Joe Spier, K6WAO. They are always looking for any news which is related to the amateur satellite community. While the original format was developed for the packet bulletin board system, where it continues to be hosted, it is now made available via a range of newer electronic media around the world. The Weekly Satellite Report (WSR) was edited by James French, W8ISS for 10 years. James has decided it was time to step aside. Drew Glasbrener, KO4MA continues the evolution of the new format of the WSR.

AMSAT Field Operations

AMSAT Vice-President Field Operations, Patrick Stoddard, WD9EWK discussed his plans to revitalize the field operations, including developing a current list of area directors and develop new resources. These include implementing a replacement for the field services section on the old web site where information and presentations can be exchanged. Finally, as resources permit, he expects to make a calendar of events available so that people can both provide and locate presentations.

2014 ARRL Centennial

Barry reported that he is in conversation with the American Radio Relay League for satellite workshops and local presentation during the 2014 ARRL Centennial events. Watch for updates in the *AMSAT Journal* and the AMSAT News Service.

IARU Forum

Hans van de Groenendaal, ZS6AKV held the IARU Satellite Advisor Forum on Sunday morning. Hans alternates his forum yearly between the AMSAT-UK Colloquium and the AMSAT-NA Symposium. The meeting included a discussion concerning a change in IARU policy concerning frequency coordination in two meter band for satellites licensed by the FCC as "Experimental" rather than "Amateur Satellite Service." Effective July 1, 2014, the IARU will no longer coordinate frequencies for experimental satellites in the Amateur Satellite Service two meter band.

Bryan Klofas, KF6ZEO of the California Polytechnic State University pointed out that few of the 175 satellites being developed have 2 meter downlinks. Lou McFadin, W5DID pointed out that the 2 meter sub-band congestion issue would not go away in the near future.

In response to a question from Drew, KO4MA concerning the IARU's place in what is essentially a regulatory matter, Hans explained that the FCC considers the IARU to be better qualified to make decisions. By its very nature, the IARU takes an international view unlike the individual national organizations. Hans ended by asking AMSAT for more input. Barry replied that in the past, since AMSAT is not technically an IARU member, that information was not always passed in a timely manner. American IARU members need specific permission and instructions to share relevant data during the development of policy. Alan mentioned that there was a significant problem with other US satellite builders caused by the initial lack of accurate information on the new IARU policy. Hans finished by agreeing that more informal channels should be opened in the future.

During 2013, AMSAT endorsed the IARU Region 1 two meter proposal to allow satellite linear transmissions from 144.000-144.025 MHz. IARU Region 2 adopted the revised band plan/subject to Region 3 acceptance.

Goals and Expectations for 2014

Barry concluded his President's Report with a list of goals for the coming year:

- Focus on Project Fox Engineering: Deliver Fox-1

2013 AMSAT Symposium Presentations

Topic	Speaker
AMSAT Education and You	E. Michael McCardel, KC8YLD
Upcoming Amateur Radio Cubesats: The Flood has Arrived	Bryan Klofas, KF6ZEO
W5PFG/P: Observations from a Roving Operator	Clayton Coleman, W5PFG
Operating on Satellites from Cruise Ships-Lessons Learned	Allen Mattis, N5AFV
If JFK Was A Ham	Nick Pugh, K5QXJ
The Montgomery College Satellite Radio Rotator Project	David Bern, W2LNX
AMSAT's Internet Presence	Joe Fitzgerald, KM1P
Overcrowding of the Two Metre Satellite Band	Hans van de Groenendall, ZS6AKV
Using Amateur Radio Satellites in Education	Rafael Haag, PY23FF
WRAPS Portable Satellite Antenna Rotor	Mark Spencer, WA8SME
Cubesats in HEO-A Challenging Mission for AMSAT	Daniel Schultz, N8FGV
Fox Satellite Program Overview	Tony Monteiro, AA2TX
Coding and Modulation Design for AMSAT Fox-1	Phil Karn, KA9Q
Virginia Tech Cubesat Camera for Fox-1	Zach Leffke, KJ4QLP
The Fox-1 IHU and Telemetry Simulator or Making Good Use of Cheap Evaluation Boards	Burns Fisher, W2BFJ
Fox Experiments: Attitude Determination	Mark Spencer, WA8SME
Distributed Ground Station Network Receive Node Design	Zach Leffke, KJ4QLP
SA AMSAT Turns to Innovation for its Cubesat	Hans van de Groenendaal, ZS6AKV
FUNcube Dongle and SDR-Radio Console for Schools Support	Hector L. Martinez, CO6CBF
Fox Experiments-Exploring the Fox-2 Maximum Power Point Tracking System	Mark Spencer, WA8SME
A Brief Overview of the ARISS Program	Dave Jordan, AA4KN
Amateur Radio on the ISS (ARISS)-Interesting Times	Dave Taylor, W8AAS
Amateur Radio on Human Spaceflight Missions-30 Years	Frank Bauer, KA3HDO

The 2013 Symposium in Houston was organized by a team lead by Nick Lance, KC5KBO, Renee Lance, KC5VMA and Lou McFadin, W5DID. Members of the Johnson Space Center Amateur Radio Club,W5RRR, and the Clear Lake Amateur Radio Club, K5HOU supported operations all weekend. Shown in the photo are Renee Lance, KC5VMA and Carl Kotila, WD5JRD at the registration desk. (KB1SF photo)

- Prepare for Fox-1B follow-up
- Submit proposal for Fox-1C
- ITAR: Implementation of changes in 2014
- Continue to enhance educational partnerships
- Continue development on AMSAT's IT future
- Enhance website content
- Building awareness/support for AMSAT
- Reverse the membership trend
- Enhance the management team
- Find volunteers to fill key needs
- Examine aspects of succession planning

How You Can Help

Members were reminded of the many ways they can assist AMSAT's mission during 2014:

- Mission success breeds capital campaign success
- A record of accomplishment in AMSAT engineering and educational development
- Recognize that satellite projects are multi-year projects that require financial support each year
- Donate to our capital campaign for Project Fox and future opportunities in 2013 and beyond as you are able
- Use the existing and upcoming satellites—rebuild interest in amateur radio in space
- Write articles for the AMSAT Journal
- Volunteer your time and talent

AMSAT 2014 Symposium Planning

Barry reported that the next meeting will be held in the Baltimore-Washington area. The exact location and date is still being discussed, along with local support. Suggestions are being solicited.

The long tradition to provide an annual technical forum brought satellite enthusiasts from around the world to Houston, Texas. AMSAT is proud of the technical content of the papers presented reflecting on the inventiveness of our volunteers and the significant contribution of presenters to "advancing the radio art."

2013 AMSAT Symposium Proceedings	
Title	**Author**
Section A: SAREX / ARISS	
Amateur Radio on Human Spaceflight Missions — 30 Years	Frank H. Bauer, KA3HDO
Amateur Radio on the International Space Station (ARISS) Interesting Times: Nov 2012 – Oct 2013	Dave Taylor, W8AAS
A Brief Overview of the ARISS Program	David Jordan, AA4KN
Section B: AMSAT FOX Satellite Project	
Fox Satellite Program Overview	Tony Monteiro AA2TX
Coding and Modulation Design for AMSAT Fox-1 Telemetry	Phil Karn, KA9Q, Paul Williamson, KB5MU, Michelle Thompson, W5NYV
The FOX-1 IHU and Telemetry Simulator or Making Good Use of CheapEvaluation Boards	Burns Fisher, W2BFJ
Virginia Tech Cubesat Camera for FOX-1	Kevin Burns, KJ4SYL, Bill Clark, KK4EWQ, Mitch Davis, WQ3C, Zach Leffke, KJ4QLP
Section C: Satellites and Education	
AMSAT Education and You!	E. Michael McCardel, KC8YLD
Using Amateur Radio Satellites in Education: An Exciting Topic to Attract Students to Science and Engineering	Rafael Haag, PY3FF
Beyond the Grid Square - FOX Experiments: Part 1 Attitude Determination Experiment (Wobbler)	Mark Spencer, WA8SME
Beyond the Grid Square - FOX Experiments: Part 2 Exploring the Fox-2 Maximum Power Point Tracking System	Mark Spencer, WA8SME
Section D: User Equipment and Satellite Ground Systems	
WRAPS Portable Satellite Antenna Rotor	Mark Spencer, WA8SME
The Montgomery College Satellite Antenna Rotor Project	Daniel Albuquerque, Raymond Botty, KK4HDR, Jordan Deuser, Kyle Nathan, Dennis Ngo, David Bern, W2LNX
Side bar to: FUNcube Dongle and SDR - Radio Console for Schools Support	Hector L Martinez, CO6CBF
Distributed Ground Station Network Receiver Node Design	Zach Leffke, KJ4QLP
Section E: Amateur Radio Satellite Operations	
W5PFG/P: Observations from a Roving Operator	Clayton Coleman, W5PFG
Operating on Satellites from Cruise Ships – Lessons Learned on Nine Cruises	Allen F. Mattis, N5AFV
Section F: Future Satellites	
Overcrowding Of The Two Metre Satellite Band	Hans van de Groenendaal, ZS6AKV
SA AMSAT Turns to Innovation for its Cubesat	Hans van de Groenendaal, ZS6AKV
Upcoming Amateur Radio CubeSats: The Flood Has Arrived	Bryan Klofas, KF6ZEO
Cubesats in HEO - A Challenging Mission for AMSAT	Daniel Schultz, N8FGV
Section G: AMSAT Fox-1 Systems Engineering Documentation	
Systems Engineering Documentation; Satellite Concept of Operations; System Requirements Specification; Avionics System Design Specification; Attitude Determination Experiment Payload System Requirements Specification; IHU to Attitude Determination Experiment Interface Control Document; IHU to RF System Interface Control Document; IHU to PSU Interface Control Document; IHU to Battery Interface Control Document; IHU to Experiment 1 Interface Control Document; IHU to Experiment 4 Interface Control Document; Downlink Specification; IHU Software Architecture Specification	
Section H: AMSAT Fox-1 Mechanical Drawings	

In Conclusion ...

It is impossible to capture in words a gathering of the size and scope of an AMSAT Symposium. We will try to show as much as possible on a printed page with the photos included here for you to enjoy.

AMSAT thanks our prize donors for the 2013 Symposium. These were drawn during the Saturday evening banquet. Check over the prize listing and keep our sponsors in mind over the coming year.

Last, but certainly not least, we are impressed by the 2013 AMSAT awards citations. This outstanding list demonstrates how our dedicated volunteers make AMSAT the best ham radio club in the world!

A special highlight of the 30th anniversary of amateur radio involvement in human space flight included a Saturday evening banquet panel discussion moderated by Frank Bauer, KA3HDO and Lou McFadin, W5DID with Astronaut Owen Garriott, W5LFL who was the first astronaut to utilize amateur radio to communicate with personnel on the ground on STS-9 in November 1983. The presentations included a multimedia panel featuring Owen, Astronaut Bill McArthur, KC5ACR, and Tim Bosma, W6MU from the Santa Rosa ARISS telebridge station W6RSJ and other key individuals who initiated this amazing program. In the photo are (L - R) Tim Bosma, W6MU; Bill McArthur, KC5ACR; Owen Garriott, W5LFL; Lou McFadin, W5DID; and Bill Tynan, W3XO. (KB1SF photo)

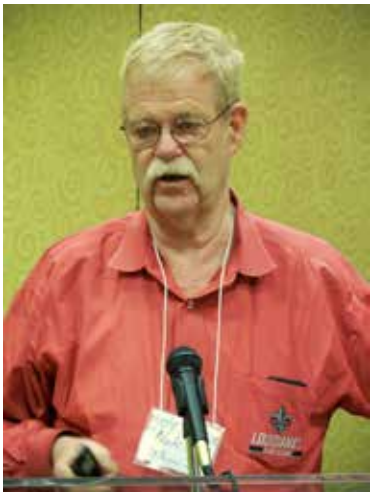
Thanks to Dan Schultz, N8FGV, the editor of the 400+ page 2013 Proceedings book. (KB1SF photo)

AMSAT Vice-President Human Spaceflight Frank Bauer, KA3HDO with Owen Garriott, W5LFL. (KB1SF photo)

Satellite operators at the Saturday evening banquet: (L - R): AMSAT Vice-President of Field Operations Patrick Stoddard, WD9EWK; Clayton Coleman, W5PFG; Hector Martinez, CO6CBF; Jerry Brown, K5OE; and Howard Long, G6LVB. (W5PFG photo)

AMSAT President Barry Baines, WD4ASW and AMSAT Vice-President Field Operations Patrick Stoddard, WD9EWK lead a discussion at the Sunday Morning Field Coordinators' Breakfast. Twenty-six attended the event with a mix of AMSAT Area Coordinators and others interested in AMSAT's efforts to promote the organization. Following food and introductions the discussion focused on suggestions to promote AMSAT. Patrick noted, "Many had good suggestions, prefaced with "Maybe AMSAT should .... ", to which they reached the conclusion that that "we are AMSAT", and we would be the ones needed to implement any of the suggestions. During 2014 the Area Coordinators predicted that the November launch of FUNcube-1 (AO-73) and the upcoming launch of Fox-1 later this year will provide many new opportunities for outreach. (KB1SF photo)

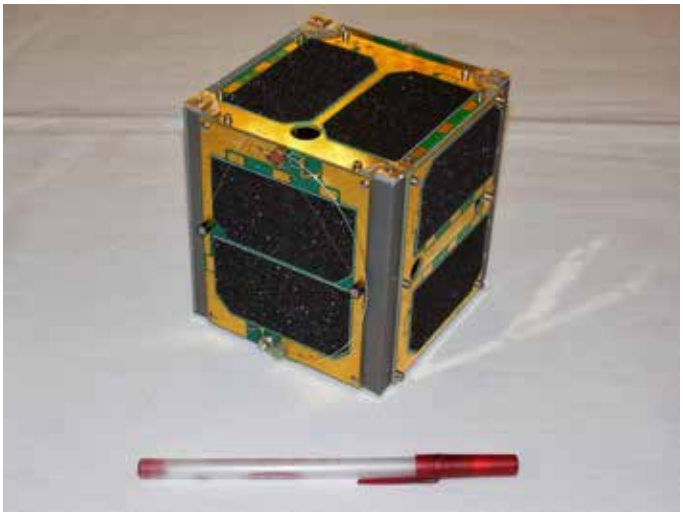
Mark Spencer, WA8SME drew a crowd with the WRAPS az-el antenna rotor prototype. You can also view a video of Mark's talk about the WRAPS rotator at the 2013 AMSAT Symposium on-line at: http://www.youtube.com/watch?v=K5Xx6K7tM0Y. The portable battery operated rotator system is built from commercial-off-the-shelf parts with simple hand tools without requiring extensive machine work. The chief target is for the ARRL Teacher's Institute and schools to take advantage of the STEM education opportunities utilizing telemetry data from FUNcube-1 and Fox-1 satellites. Amateur satellite operators have expressed extensive interest in this project also. Mark's article in the January, 2014 QST magazine describes the project in detail. (KB1SF photo)

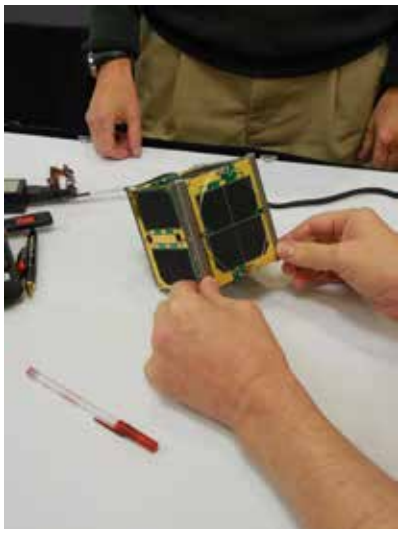


Nick Pugh, K5QXJ gave a presentation titled, "If JFK Was A Ham", reminding us of the 1960's goal of reaching the moon as applied to HEO amateur radio satellite projects. (KB1SF photo)

David Bern, W2LNX during his presentation about the Montgomery College Satellite Radio Rotator Project. (KB1SF photo)

Hans van de Groenendaal, ZS6AKV held the IARU Satellite Advisor Forum on Sunday morning. He gave a presentation, "Overcrowding of the Two Metre Satellite Band", based on IARU analysis of satellite band plans. Hans had a paper describing SA-AMSAT's KLETSkous cubesat. (KB1SF photo)





(top, left) Tony Monteiro, AA2TX displays the functional engineering model of the Fox-1 cubesat.

(top, center) Close up photo of the engineering model of the Fox-1 cubesat with solar cell panels in place (these are not the flight cells). The 2 meter antenna is the coiled wire on the front face. When on-orbit the 2 meter and 70 cm antennas will be deployed by a command from the ground which activates a heater to melt the fishing line holding the wire from the launch position.

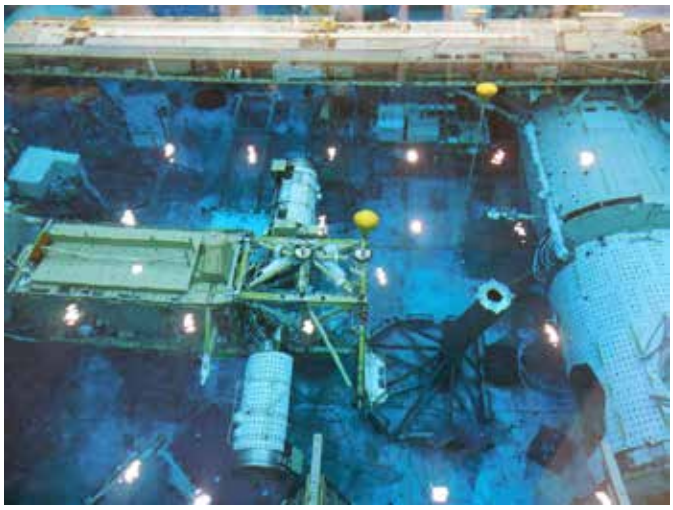
(left) The Fox-1 engineering prototype was powered up. It transmitted its voice beacon message on the 145.920 MHz downlink for everyone to receive on their HT.

(below) Burns Fisher, W2BFJ demonstrates powering up the Internal Housekeeping Unit (IHU) computer on the emulator board he adapted for the Fox-1 project. Software development can be cross developed in a Linux environment and then downloaded into the IHU for operation. (KB1SF photos)

(Photo,left) Hector Martinez, CO6CBF (center) receives his W4AMI Satellite Operator Achievement Award from Director AMSAT Awards Director Bruce Paige, KK5DO (right). Barry Baines, WD4ASW (left) offers his congratulations. This award is awarded for the submission of 1,000 satellite contacts on OSCAR-6 or later satellites. There is an endorsement for each additional 1,000 and a special certificate at 5,000 contacts. (KB1SF photo)

Special Events: Tours of the Battleship USS Texas and the Johnson Space Center

Sunday, November 3 featured a tour of the USS Texas Battleship Museum in Galveston Harbor. (N5AFV photo)



On Monday, November 4 AMSAT got a special tour of the Johnson Space Center. Above is a view of ISS modules for training at the Neutral Buoyancy Lab. (KB1SF photo)

Full-scale International Space Station modules for engineering testing and crew training. Also visible is a Soyuz crew capsule. (W5PFG photo)

ISS Mission Control in Houston. (W5PFG photo)

We were able to watch live on monitors in the Visitor Gallery in Mission Control as NASA Public Affairs Officer Kelly Humphries interviewed Frank Bauer, KA3HDO about amateur radio satellites and the ARISS Program. (KB1SF photo)

The interview can be seen on YouTube at:
http://tinyurl.com/KA3HDO-Interview

Apogee View - continued from page 11...

ARRL, AMSAT and NSF endorse the use of the Amateur Satellite Service by non-commercial, university cubesats. Use of the Amateur Satellite Service is mutually beneficial to the radio amateur and university communities since:

1. *It helps provide more satellites that amateur radio operators can use*
2. *It enables universities to engage the world-wide amateur radio community in gathering telemetry information from their satellites*
3. *It promotes awareness of amateur radio to university students and licensing of new operators as well as helping to develop the next generation of amateur satellite builders*
4. *It provides a natural opening for cooperation between amateur radio volunteers who can provide communications expertise and universities which often have limited knowledge in this area*
5. *It helps develop the future workforce in Science, Technology, Engineering and Math (STEM) fields*

As long as a university's cubesat is for educational and scientific (i.e. non-commercial) purposes, we do not believe operators of these satellites are in violation of the pecuniary interest rules for transmitting in the amateur bands. This would include students and faculty who are employed by the university since any time spent transmitting to a ham-radio satellite would clearly be incidental to their job much like other classroom teachers using amateur radio as an educational tool.

During the course of our conversation, it became more obvious to us that a broader concern being expressed was whether universities were using amateur radio solely for the purpose of forwarding telemetry to their primary ground station as a "convenience" with no other Amateur Radio involvement in the project.

On the other hand, a satellite that sends payload data during other portions of its orbit so that amateurs can receive, review and analyze the data as well as perhaps forward the received packets to a central server could be viewed as a more "engaging" of amateur radio operators and others (such as schools) and thus be more in keeping with traditional amateur radio activity.

We'll see what impact our interaction with the FCC may generate in terms of better understanding the appropriateness of university cubesats being licensed in the Amateur Radio Satellite Service vs. Experimental Licensing so that ARRL and AMSAT can advise university small satellite project managers. I am pleased that the ARRL recognizes the importance of university cubesat projects in terms for attracting the next generation of amateur radio satellite users and builders as well as the value of including scientific research as one of the justifications for amateur radio and "keeping amateur radio in space."

ITAR

We expect the Directorate of Defense Trade Controls (DDTC) as well as the Bureau of Industry and Security (BIS) to release revised proposed rules in the first half of 2014 regarding the transition of commercial satellites from ITAR (International Traffic in Arms Regulations) under DDTC/Department of State to the Export Arms Regulations (EAR) under the BIS/Department of Commerce. Back in July 2013, AMSAT submitted separate comments to both the DDTC and BIS regarding proposed changes that were released in May 2013. AMSAT asked the DDTC to confirm that amateur radio satellites will be transferred to the EAR, and asked BIS to classify amateur radio satellites separately from the broad term "commercial satellites." Such a separate categorization would allow amateur radio satellites to be treated differently than commercial satellites; specifically we've requested that free technical exchange with foreign nationals be allowed, eliminating the "deemed export" restrictions.

Once the revised rules are released for public comment, AMSAT will closely evaluate the potential impacts of the revisions and determine next steps as appropriate. Given the significant impact of these rules on our ability to re-establish technical collaboration with other AMSAT organizations, we are following this process closely. This is particularly important since AMSAT is an all-volunteer organization and as such, is not in position to follow employer-employee-based organizational relationships in the enforcement of governmental regulations. Based upon the challenges that we've had dealing with the DDTC on ITAR, as the only registered all-volunteer "munitions provider" (as defined by ITAR), AMSAT is truly a unique organization. The regulators are not comfortable with dealing with an all-volunteer organization and the roles/responsibilities of volunteers versus employees.

ARRL Posts Resources for Using Satellites in the Classroom

ARRL Education & Technology Program Director, Mark Spencer, WA8SME released "The Pragmatic Guide for Using the FUNCube Materials Science Experiment in the Classroom" to supplement the FUNCube Handbook, produced by AMSAT-UK. This publication provides practical advice to interested hams and classroom teachers on how to access and use the Materials Science Experiment (MSE) on-board the satellite.

There are six chapters included in the Guide:

1. A brief overview of MSE and a basic refresher of thermodynamics. Two different experiments included in the MSE, one using the thermally isolated aluminum bars mounted on one of the satellite faces, the other using four aluminum bars mounted as part of the satellite body in the corners of the cube. The data collected by the MSE is transmitted via a two-meter data link and decoded and displayed by an AMSAT-UK software package called the Dashboard.

2. Reception of the FUNCube telemetry using a typical VHF all-mode receiver including a simple interface circuit between the receiver audio and the sound card. A discussion of antenna requirements is included.

3. The third chapter presents an affordable Leslie's Cube experiment set up that can be duplicated in the classroom. The Leslie's Cube experiment allows students to explore the concept of emissivity and how that property affects the ability of a material to radiate heat energy (MSE is a space borne equivalent of the Leslie's Cube experiment).

4. The fourth chapter presents an inexpensive MSE In-class Simulator experiment to demonstrate the thermodynamics of heat absorption.

5. The fifth chapter presents a number of examples how to interpret the MSE data, and this is the most important section of the Guide.

6. The sixth chapter presents additional ideas and explorations that could be used in the classroom to take the FUNCube MSE to a whole new, and unintended level.

In addition to the FUNCube MSE Guide, the ARRL library of resources for teachers to explore satellite communications with students can be found on-line at:

http://www.arrl.org/classroom-library-satellite-communications

These classroom resources prepare students to understand and utilize live telemetry data that can be captured from orbiting satellites. The collection includes

- Satellite Antenna Rotor Simulator
- CubeSat Classroom Simulator
- Study Satellite "Wobble" Using Telemetry Data
- Managing Satellite Power: A Study in Maximum Power Point Tracking
- MAREA: Mars Lander Simulation
- Using FUNCube to do Materials Science in the Classroom
- Studying Satellite Rotation
- Satellite Tracker Interface
- ISS Minimalist Antenna
- ISS Minimalist Antenna, UHF Version
- Inexpensive Broadband Preamp for Satellite Work
- Inexpensive "WRAPS" Rotor for Satellite Work

LVB Tracker Box

- Reasonably priced and all profits go to AMSAT
- USB or serial interface
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- Built-in rotor interface cable with DIN connector
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Contact Martha at the AMSAT office 301-589-6062 to order.

The complete units will be built in groups, so get your orders in early. Units will be shipped as they become available.

Visit the AMSAT On-Line Store for details on the updated LVB Tracker Box: http://store.amsat.org/catalog

Minimum donations requested for various configurations:

1) Bare board - $20 + S&H – no parts kits available
2) Populated board, serial interface - $100 + S&H – no kit with USB unit, rotor cable and LCD available, we do have a parts list with recommended part numbers and sources.
3) Custom Ten-Tec Enclosure powder coat, silk-screened, drilled/punched - $50 + S&H
4) Complete unit - board, USB output, rotor cable, LCD, enclosure - $200 + S&H **our most popular

Documentation for the LVB Tracker can be found at: http://www.LVBTracker.com

Boards and complete units may be ordered from the AMSAT office at 301-589-6062 or from martha@amsat.org

KB1SF photo

Gerd Schrick, WB8IFM (shown in the photo) teamed with Keith Baker, KB1SF to staff the AMSAT display at the Fort Wayne, IN Hamfest. Both hosted the AMSAT forum talk to about Fox-1 and the current status of amateur radio in space. They gave out a lot of information to folks, including a couple of university satellite teams who were looking for rides to space for their experiments.

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- A specially designed AMSAT President's Club Donor's pin.

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❒ $300 one time

Core Donors contribute at least US $10 per month
Every **Core Donor** receives gifts of:

- A unique "AMSAT President's Club" certificate.
- A specially designed AMSAT President's Club Donor's pin.

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Choose where your contribution should go:

❒AMSAT-Fox Project ❒ARISS ❒Future Projects ❒General Fund

❒I prefer to make my donation in one yearly payment of $_____

Copy this form and send it with your information to: AMSAT, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910

THANK YOU!

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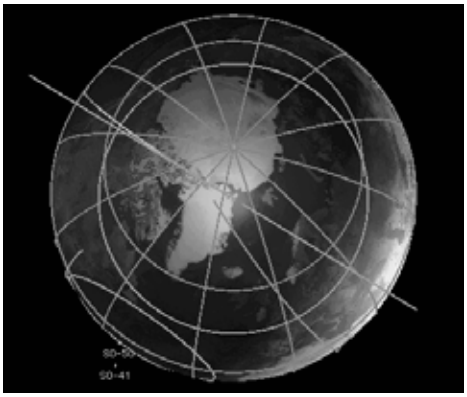
The premier Satellite tracking and station automation application for the Macintosh - OS 9 & OS X



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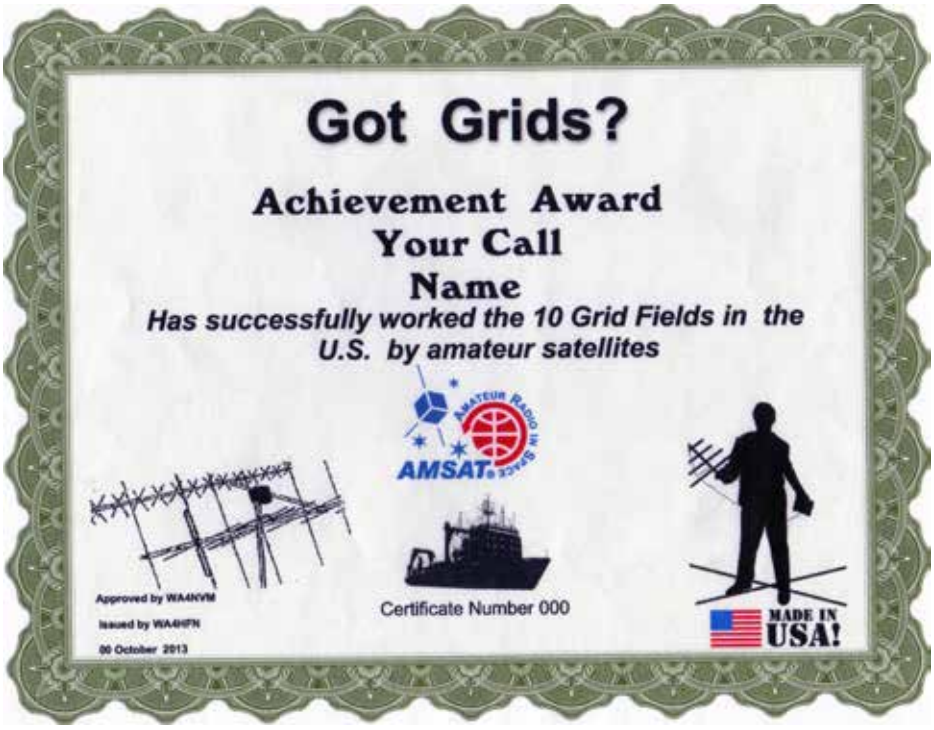
Star Comm Group Announces New "Got Grids? Award"



Effective January 1, 2014 your CW/SSB amateur satellite contacts can be used to earn the new Got Grids? award. To qualify you must log one contact in each of the 10 grid fields of the lower 48 United States: CN, CM, DN, DM, DL, EN, EM, EL, FN, FM. Only two-way contacts completed via a linear transponder satellite can be used for this award. This award will be effective January 1, 2014, all contacts must be made on or after this date.

The web page for this award can be found at:
http://www.starcommgroup.org/gotgrids.html

Send your log to Rick Tillman, WA4NVM or Damon Runion,WA4HFN for checking, along with your call, name, and current mailing address to either: **wa4nvm@comcast.ne**t or **wa4hfn@comcast.net**. This award is sponsored by the Star Comm Satellite Group so do not send your logs to AMSAT.

This award is free. If you would like to make a donations to the AMSAT satellite program please send it to: AMSAT, 850 Sligo Ave. Suite 600, Silver Spring. MD. 20910.

Full Circle - From Hearing W5LFL in 1983 to a Handshake in 2013

George Carr, WA5KBH, AMSAT Member 21199

Some weeks prior to the entry of Owen Garriott, W5LFL, into space aboard the spaceship Columbia, I knew I wanted to experience that part of amateur radio history. I began building and assembling my two meter station. By launch date, November 28, 1983, I had gathered and programmed my Yaesu 227R "Memorizer" two-meter radio and a homebrew turnstile antenna (see picture) that would lay on the lawn in the back of the house in Gladstone, Missouri.

In the run up to December, 1983, George "Georgie" Carr, age 5, helped his dad, WA5KBH, homebrew a turnstile antenna out of 1 x 2's and chicken wire to follow W5LFL. Within a few short years, he would pass his general and become KB5ILL.

On December 4 at 1855 UTC, I started listening and calling W5LFL. At 1908, I heard a very strong station on the calling frequency and my first instinctual reaction was, "Doesn't that local know what is going on? He should not be cluttering the frequency". (One must realize neither I nor perhaps many others knew what the signals from space would sound like or the signal strength.)

Yes, I did make an audio recording of the transmissions and parts of transmissions. Here is a sampling of Owen's audio:

"W5LFL and I am returning the call to K5 Oscar and I missed the last two letters. It's very hard to pick out the calls with the little, small headset that I've got, and the background noise that I've got in the spacecraft. However, your call signs are on my tape recorder and I'll be able to decipher it better when I get back on the ground. So several of your call signs are recorded and we just passed over Texas about a minute ago and we're traveling up the US at this time and W5LFL in the spacecraft Columbia is listening again for about 60 seconds for more calls to the spacecraft. W5LFL in the spacecraft Columbia standing by."

"There are several calls on phone and I'll be listening for several other calls as we travel down across the vast North American continent. I'll be tuning the band for another ninety seconds for those wanting to call W5LFL. Please come in."

"Roger roger roger. This is W5 lima foxtrot lima in the spacecraft Columbia."

"Foxtrot Lima. Crossing the snow line now in mid-US returning the call from W5FFM. W five foxtrot foxtrot Mexico and several others. And, I'll be tuning the band for other signals here as well. W5 lima foxtrot lima in the spacecraft Columbia, 250 kilometers above the US, coming down pretty close to my own hometown here if I can just pick it out on the map. But, hardly have time to run the rig and look out the window and record signals at the same time. W5 lima foxtrot lima will be tuning the band for another minute and a quarter."

"…delta papa mexico…W5LFL and I think we are about to get out of range here because your signals are getting fainter and I want to go on to other signals as well, but you certainly covered the spectrum there.. So W5LFL in spacecraft Columbia is calling CQ from other stations and tuning the band for other stations as well. And I'll be tuning the band for the next 60 seconds. Standing by."

"…N7ARE on cw. November 7 alpha romeo echo on cw and several other stations on phone. This is W5 lima foxtrot lima in the spacecraft Columbia…."

As I heard Owen refer to N7ARE on the tape, I looked him up to see if he was still a ham as I wanted to ask him of any remembrances he had of that cw contact. He is still active and responded this way:

"Thank you so much for the e-mail and memory of my contact. I remember very

	4 December 1983							
1855	W5LFL		QS	144	F3	10	1913	heard Owen at 1908 Mexico City, Shreveport, Detroit
	6 December 1983							
1429	W5LFL		QS	144	F3	10	1447	heard Owen at 1444 Pitts, KC, S. St Marie
2219	W5LFL		QS	144	F3	10	2231	heard at 2228, 2230 Z KC, Mobile
	10 December 1983							

Excerpt from logbook of WA5KBH logging the reception of W5LFL on December 4 and 6 1983 from QTH in Gladstone Missouri.

well the contact and those words from Owen. I was running 80 watts into a Cushcraft 13LB Boomer at 45 degrees elevation tracking the pass and using MCW (audio from a memory keyer) to reach Owen. Knowing he was a CW aficionado, I thought it my BEST chance for a contact. Turned out I was one of VERY few to have worked him cross-mode during the mission."

I did not succeed in having Owen acknowledge my calls to him; but, I did log the attempts.

In the event you can't read my logbook entries (see picture), on December 4, according to the log, I started listening for Columbia at 1855 UTC and heard W5LFL at 1908, making the notation that he gave his location over Mexico, Shreveport (LA) and Detroit. He was out of range at 1913.

On December 6, I began listening at 1429 and first picked him up at 1444. He reported he was over Pittsburgh (I presumed PA), Kansas City and Sault Sainte Marie. LOS at 1447.

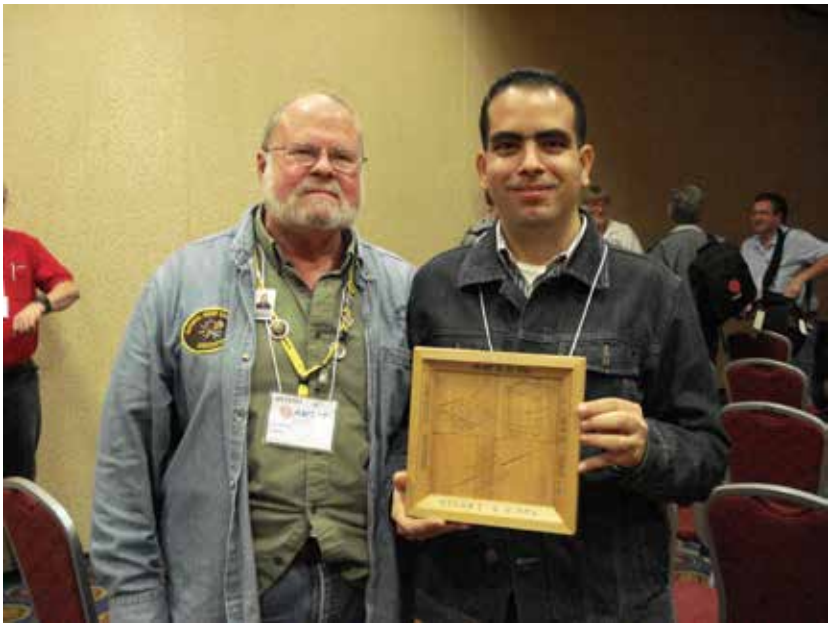
Later that day, I began listening at 2219 and I had AOS at 2228 and 2230. According to my logbook, that time, he reported being over Kansas City and Mobile (AL). He was LOS at 2231.

This exciting experience caused me to be very enthusiastic when some ten years later, I had the opportunity and geared up to work AO-10 and AO-13, that experience detailed in an earlier Journal article. I have been active on the hamsats ever since.

So, you can imagine the privilege I had when I met Owen Garriott, W5LFL, at the 2013 AMSAT Symposium banquet in Houston.

Full circle: From an attempt to work W5LFL in December 1983, resulting in WA5KBH only having a one-way QSO-meaning hearing Owen's voice several times as he crossed the USA---to the enjoyment of an eye ball QSO at the AMSAT Symposium on the evening of November 2, 2013.

This is the QSL I received from W5LFL.



(right) George Carr, WA5KBH, AMSAT Member 21199, met Hector Martinez, CO6CBF, AMSAT Member 38770, at the symposium. George is Hector's QSL manager. In appreciation to Hector for the grids he has given to George and beaucoup hamsat operators across the USA, George chip carved in basswood a quilt and was allowed to present it to Hector at the annual membership meeting. The frame has "HI" in Morse code to recall the CW transmission from Oscar 1. The AMSAT registered name, "73" and "Oscar 1…Fox". The quilt squares represent Oscar 1, Fox and Oscar 7.

AMSAT Thanks Our 2013 Prize Donors	
Company	**Prize Donation**
Kenwood USA Corporation	TS 2000 Transceiver
Flex Radio Systems	FLEX-1500 160-6M Transceiver
M2 Antenna Systems	SATPACK Satellite Antenna System - 144/EB432/Crossboom
Amphenol RF	Cable crimp tool and dies
PEET Brothers Company	ULTIMETER 2000 Ultimate Weather Station
Arrow Antennas	Arrow II Handheld Satellite Antenna and Roll Bag
Elecraft Inc.	XG3 Programmable RF Signal Source
Elk Antennas	(3) Five Element Dual Band Antennas (144/440 MHz)
West Mountain Radio	RIGblaster Plug & Play
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DX Engineering	(2) $50 Gift Cards
VIS Radio	Roll Up Antenna Bag & General Class Paperless Study Cards
ClampTite	CLT01 Clamp Tool
AES amateur Supply	(2) $25 gift certificates
MFJ Enterprises	(3) MFJ-1718S Flex Duck Antennas
	(2) MFJ-108B 24/12 Hour LCD Clock
	MFJ-1717SFZ 144/440 MHz HT Antenna
	MFJ-1714S Telescoping SMA HT Antenna
	MFJ-1811 Scanner Receiver Antenna
	ARRL Repeater Director
HRO Ham Radio Outlet	ARRL Satellite Handbook
QSL Man	250 Eyeball QSL Cards
Quicksilver Radio Products	(3) 4-Way Anderson Powerpole Splitters
MicroLog by WA0H	MicroLog Ham Radio Logging Program
Skycraft Parts and Surplus	Folding 2X Magnifier
	Screwdriver Set
	4 Ferrite Cable Clamps
	Triplet Professional Bit Set Autoloader
Ten-Tec. Inc	Q-Test Model QT-3800 Analog Meter
	(4) ACROBAT antenna connector and hangers
	(2) Ten Tec hats; (2) Ten Tec Mugs

(L - R) Drew Glasbrenner, KO4MA; Hector Martinez, CO6CBF; Patrick Stoddard, WD9EWK. (W5PFG photo)

(L - R) Hector Martinez, CO6CBF; Wyatt Dirks, AC0RA. (W5PFG photo)

(L - R) Wyatt Dirks, AC0RA ;Drew Glasbrenner, KO4MA; Patrick Stoddard, WD9EWK; Clayton Coleman, W5PFG. (KB1SF photo)

(left) The AMSAT prizes were drawn after the banquet presentation. The top three prizes were 1) Kenwood TS-2000 won by Anne Carpenter of Houston, TX. She directed that the transceiver be shipped to her mother, Nancy Makley, KC8GYW who was also at the banquet. 2) FlexRadio Systems Flex-1500 QRP SDR won by Jerry Buxton, N0JY of Granbury, TX. 3) M-Squared, Inc. antennas won by Lou McFadin, W5DID of Orlando, FL. (KB1SF photo)

2013 AMSAT Recognition Awards			
Category	**Call Sign**	**Name**	**Citation**
Engineering	K8SPN	Corey Abate	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Solar Panel PCB Design
Engineering	KN6ZA	Andrew Abken	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Component Machining
Engineering	N4DTV	Bryan Baker	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards
Presidential	KB1SF	Keith Baker	In recognition of your service to AMSAT as Treasurer, guiding it through its financial reporting and advising its board on financial matters
Presidential	KA3HDO	Frank Bauer	In recognition of your reinvigorating and guidance of ARISS through its new mission requirements and relationships with various partners
User Services	N9IP	Steve Belter	In recognition of your outstanding management of AMSAT's booth and volunteers at the 2013 Dayton Hamvention
Engineering, Presidential, and User Services	WA4SCA	Alan Biddle	For your work on Fox-1, co-chairing the 2013 Dayton Hamvention, contributing to "Getting Started" revisions, and handling of AMSAT IT issues
Engineering	KF5IDY	Jonathan Brandenburg	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Flight Software
Engineering	WA3OPY	Darell Brehm	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Crystal Engineering
Engineering	KJ4SYL	Kevin Burns	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Camera Card
Engineering	N0JY	Jerry Buxton	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project System Engineering
Human Spaceflight	WA5NOM	Gil Carman	In recognition of your outstanding support and dedication to ARISS and SAREX for over 30 years, especially ISS and Shuttle orbit prediction
Engineering	KK4EWQ	Bill Clark	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Camera Card
Engineering	AK2S	Don Corrington	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Test Equipment Development
Engineering	KF4KSS	Bob Davis	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Mechanical Design
Engineering	WQ3C	Mitch Davis	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Camera Card
Engineering	W2BFJ	Burns Fisher	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Flight Software
Engineering and User Services	KM1P	Joe Fitzgerald	In recognition of your contributions to AMSAT for Fox-1 Project Systems Administration and your work in updating AMSAT's Internet resources
Engineering	N2UO	Marc Franco	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards
Engineering	KB0G	Bdale Garbee	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project IHU Card
Presidential	KO4MA	Andrew Glasbrenner	In recognition of your service to AMSAT as a member of its Board of Directors (2007-2013) and for guiding its social media presence
Symposium	K5RG	Ken Goodwin	In recognition of your outstanding support of the AMSAT Symposium 2013 as the NASA Johnson Space Center Amateur Radio Club co-chairman
Engineering	W9EQ	Dan Habecker	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards

Category	Call Sign	Name	Citation
Presidential	N8MH	Mark Hammond	In recognition of your establishing relationships with the ARRL, NASA Education and others in support of AMSAT's education outreach
Engineering	K7UDR	Bryan Hoyer	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Battery Card
Education	KJ6VUC	Dale Hunzeker	In recognition of your outstanding contributions to education through amateur radio demonstrations and presentations
Engineering	KD1K	Dick Jansson	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Thermal Analysis and Design
User Services	VA6BMJ	Bernhard Jatzeck	In recognition of your outstanding contributions as an assistant editor for the AMSAT Journal
Human Spaceflight and Symposium	AA4KN	Dave Jordan	For supporting ARISS as school mentor and relaying contact information, and organizing AMSAT's 2013 Symposium and leading its prize committee
Engineering	N4TPY	Mark Kanawati	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Solar Panels
Engineering	KA9Q	Phil Karn	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Telemetry Downlink Design
User Services	WH6BSZ	Steve Kenwolf	In recognition of your outstanding support of AMSAT through timely and innovative graphics design
Engineering	WB4LNM	John Klingelhoeffer	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards
Engineering	K4OTZ	Taylor Klotz	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards
Human Spaceflight	IN3GHZ	Peter Kofler	In recognition of your outstanding leadership as ARISS operations team leader this past year and in helping to inspire the next generation
Symposium	KC5KBO	Nick Lance	In recognition of your outstanding support of the AMSAT Symposium 2013 as the Clear Lake Area Amateur Radio Club co-chairman
Engineering	NT6D	Chris Lee	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards
Engineering	KJ4QLP	Zach Leffke	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Camera Card
Engineering	KE8FP	Steve Lubbers	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Flight Software
Engineering	KD0OPN	Joshua Lynch	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Ground Software
Presidential and User Services	K9JKM	JoAnne Maenpaa	In recognition of your contributions to AMSAT as the AMSAT Journal's Editor-in-Chief and in expanding AMSAT's online information sources
Engineering	KB2GHZ	Mike McCann	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Flight Software
Education and User Services	KC8YLD	EMike McCardel	In recognition of your outstanding contributions to AMSAT as Associate Director of Education and AMSAT News Service Weekly Editor
Human Spaceflight and Presidential	W5DID	Lou McFadin	For your leadership of Ham TV and S-Band beacon design and the 2013 Space Symposium Committee, and over 30 years support of ARISS and SAREX
Human Spaceflight	VE3TBD	Steve McFarlane	Recognizing your leadership in coordinating and personally supporting the ARISS contacts across Canada during Chris Hadfield's mission
Engineering	N4HY	Bob McGwier	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Camera Card

Category	Call Sign	Name	Citation
Presidential and User Services	KU4OS	Lee McLamb	In recognition of your contributions as Senior Editor of the AMSAT News Service, which continues to enhance the amateur radio community
Engineering	N3YKF	Norm McSweyn	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Battery Testing
Presidential	AA2TX	Anthony Monteiro	In recognition of the continuing development of Fox-1 under your leadership and the acceptance of RadFXSat/ Fox-1B into NASA's ELaNa program
Engineering	KD7SQG	Keith Packard	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project IHU Card
Engineering	K4OZS	Larry Phelps	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Cards
Engineering	WB6DP	David Ping	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Antennas
Presidential	WB2OQQ	Peter Portanova	In recognition of your leadership in guiding AMSAT's meaningful impact on ITAR legislation
Engineering and User Services	KA2UPW	Douglas Quagliana	In recognition of your contributions to AMSAT in engineering for the Fox-1 Ground Software and as assistant editor for the AMSAT Journal
Human Spaceflight	N5VHO	Kenneth Ransom	In recognition of your phenomenal dedication and critical support to ARISS, especially given this past year's contract challenges
Engineering	NX5R	Bill Reed	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Flight Software
Engineering		Robert Reed	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Radiation Experiment
User Services	KB1LQD	Brent Salmi	In recognition of your outstanding contributions to AMSAT's engineering efforts and the re-design of AMSAT's web site
User Services	KB1LQC	Bryce Salmi	In recognition of your outstanding contributions to AMSAT's engineering efforts and the re-design of AMSAT's web site
Presidential		Martha Saragovitz	In recognition of your service to AMSAT as its heart and voice
Engineering	N2VAJ	Tony Scalpi	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project RF Crystal Engineering
Engineering and Symposium	N8FGV	Dan Schultz	For your support of AMSAT for the Fox-1 Project Test Equipment Development and organizing and preparing the 2013 Symposium proceedings
User Services	K4ERA	Mike Sedlak	In recognition of your outstanding contributions as an assistant editor for the AMSAT Journal
Engineering	W0RK	Kelley Shaddrick	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Battery Testing
Engineering		Brian Sierawski	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Radiation Experiment
Human Spaceflight	AG9D	John Spasojevich	In recognition of your outstanding support to ARISS through leadership in coordinating Echolink/IRLP feeds and school contact mentoring
Education	WA8SME	Mark Spencer	In recognition of your outstanding education contributions through amateur radio demonstrations, presentations, and projects benefiting Fox
Education and User Services	K6WAO	Joe Spier	In recognition of your outstanding contributions to AMSAT as Associate Director of Education and editor of the AMSAT News Service Weekly
Engineering	AK4PF	Andrew Sternberg	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Radiation Experiment

Category	Call Sign	Name	Citation
User Services	WD9EWK	Patrick Stoddard	In recognition of your outstanding contributions to the revision of AMSAT's publication "Getting Started with Amateur Satellites"
Human Spaceflight	AJ9N	Charlie Sufana	In recognition of your sustained service to ARISS and SAREX for 20 years, including school mentoring and operations team coordination
Engineering	N3AEA	Ron Tassi	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project MPPT Development
Human Spaceflight	W8AAS	Dave Taylor	In recognition of your leadership as ARISS Delegate, U.S. Executive team member, and tireless support of ARISS operations
Engineering	KB1UKV	Al Vasso	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Space Systems Analysis
User Services	VE4NSA	Stefan Wagener	In recognition of your contributions to AMSAT by developing the Fox-1 paper model and providing versions of it at the 2013 Dayton Hamvention
Engineering	AK4TX	Kevin Warren	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Radiation Experiment
Engineering	KC5CQW	Damon Wascom	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project PCB Assembly
Engineering	KF5TNK	Melanie Wascom	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project PCB Assembly
Engineering	W6DFW	Dan Welch	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Component Machining
Engineering	AK4RO	Robert Weller	In recognition of your outstanding contributions to AMSAT Engineering for the Fox-1 Project Radiation Experiment

Thanks From Hector, CO6CBF for Another Wonderful Symposium

I have had the highest honor to attend and speak in the last two AMSAT-NA Symposiums; honestly, it has been an amazing experience. What a wonderful Symposium! AMSAT Symposium is an outstanding source of knowledge, a special time to hear brilliant ideas from a large variety of satellite lover generations and of course, a great opportunity to spend a fantastic time together a lot of friends.

Once again, thanks very much to everybody who have made possible my trips in special to the AMSAT Board of Directors; Patrick, WD9EWK and Clayton, W5PFG. I have met "generosity" in many ways within AMSAT community! I wish to thank again everyone who have donated stuff to improve my satellite station. You guys have made everything easier for me! I really appreciate it!

I also convey a special thanks to the ARRL VEs which stepped up to assist the effort to set up a testing session during the last Symposium. I was able to earn my US call sign and I operated for first time on AO-7 mode B. Thank you guys!

73!

Hector, CO6CBF / KF5YXV

Hector with one of his two new Radio Shack all mode, ten meter radios.

The AMSAT Online Store is always open ...

http://store.amsat.org/catalog/

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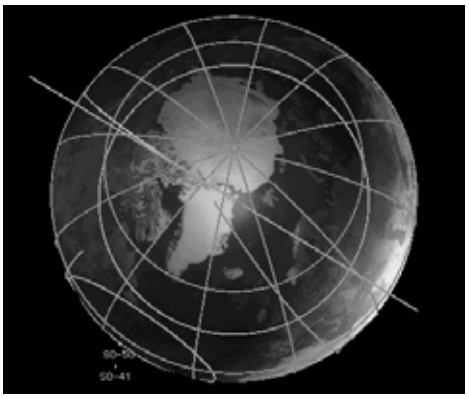

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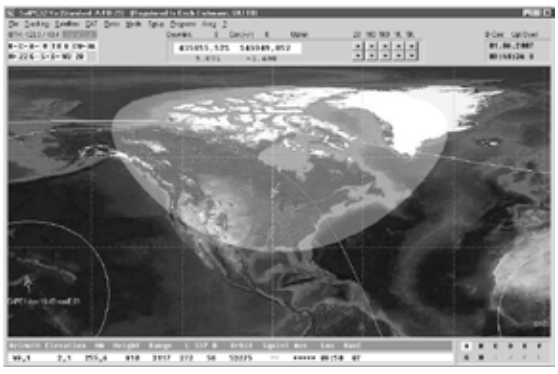

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