

Ground Control to Major Tom...

*You can listen to, and even contact,
the International Space Station with your FM transceiver*

Steve Ford, WB8IMY

An astounding number of active amateurs own 2-meter FM transceivers. These may be handheld rigs, mobile radios or desktop transceivers that include VHF capability. If you're part of the FM multitude, chances are you're using the radio to chat through local repeaters, or perhaps enjoy a direct (simplex) conversation or two.

But did you know that you could use that same radio to make contact with the International Space Station?

Hams in Space

No doubt you've heard of the International Space Station, often referred to by the acronym *ISS*. It's that huge complex of crew habitats, laboratories and solar arrays that's cruising about 250 miles above the planet. It streaks over your rooftop several times each day. It is so big, you can actually see it when conditions are favorable. Go to the Heavens Above Web site at www.heavens-above.com and create a free account. Once you've registered and entered your approximate location, the site will generate a list of upcoming "visible" passes. During the best passes the Space Station appears as a bright star moving across the sky. It is an impressive sight.

As hams we can do much more than simply gape at this amazing spacecraft. In fact, AMSAT, ARRL, NASA and space agencies in Japan, Russia, Canada and Europe have teamed up to create *ARISS*: Amateur Radio on the International Space Station. Thanks to the ARISS project, there is an Amateur Radio station aboard the ISS. The station operates primarily on 2 meters and with several watts of output power its signal is surprisingly loud. The height of its antennas helps a bit, too!

The main ARISS mission is to support educational events that involve contacts with the ISS crew, but that doesn't stop the astronauts and cosmonauts from using the equipment to

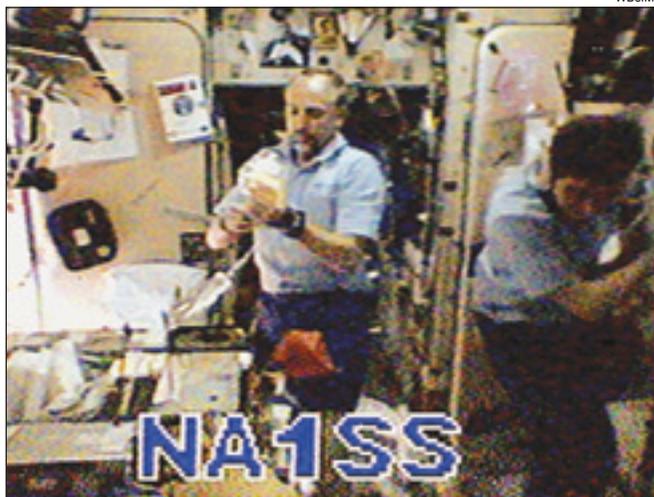
make random contacts. The ARISS station also functions as a packet radio repeater, or occasionally as an FM voice repeater. At other times you may hear the sounds of Slow Scan TV transmissions as well.

Try Listening First

When you're exploring a new aspect of Amateur Radio, it's best to spend some time listening before you do anything else. The same is true for the ISS.

Of course, the Space Station isn't available 24/7. Think of it as a cosmic bus that only shows up at certain times. Just like terrestrial transportation, the trick to "getting aboard" is determining when it will arrive in your neighborhood.

Go to the AMSAT-NA Pass Prediction Web page at www.amsat.org/amsat-new/tools/predict/. Select the ISS from the drop-down menu, then enter either your grid square or your approximate latitude and longitude. Click the PREDICT button and you'll see a list of upcoming ISS passes for your area. Pay particular attention to the "Maximum Elevation" column in the resulting chart. You want to look for elevations of about 40 degrees or more. This will place the station high in your local sky (90 degrees is the maximum — directly overhead at its highest approach).



An SSTV image of Richard Garriott, W5KWQ, received on 2 meters.

When you check the start times (AOS or *Acquisition of Signal*) and end times (LOS, *Loss of Signal*), you'll realize that you have, at best, only a 10-minute window of opportunity. This is due to the fact that the station orbits at such a low altitude, relatively speaking.

Pick a pass time and get your radio ready. Set your FM receive frequency to 145.800 MHz and turn off the squelch. If the ARISS station is on the air, you'll start hearing signals not long after the ISS pops over the horizon. If you've picked a high-elevation pass, you should hear strong, full-quieting signals within a few minutes. If you hear nothing, switch to 145.825 MHz where you may pick up digital activity.

One important note concerning antennas: If you're using a handheld transceiver with a typical "rubber duck" antenna, you may only hear activity for a minute or so at the station's highest elevation. These antennas were never intended for satellite work, so they tend to be pretty dreadful for this application. You'll enjoy much better results if you can attach the rig to a full-sized antenna such as a telescoping whip, J-pole or groundplane. I've had good success with ordinary mobile antennas as well.

But What Will You Hear?

The type of activity you'll hear depends on the station's operating schedule. If there is a spacecraft docking or a spacewalk taking place, you'll hear nothing at all. The ARISS station is usually off the air at these times. It is also off the air when the crew is doing certain experiments or installing new equipment. Except for scheduled school contacts, getting on the radio is a leisure break for the crew, so activity can vary quite a bit.

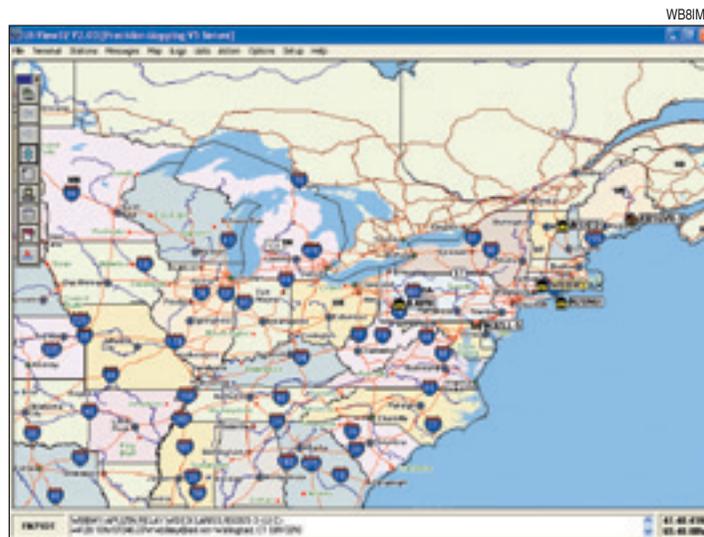
It is difficult to keep up to date with the ever-changing ARISS operations. One of my favorite ways of staying on top of things is to regularly visit the ISS Fan Club Web site at www.issfanclub.com. Reports about the status of ARISS operations are available right on the home page. With a glance you can see which mode is active and a mouse click will reveal a list of reports with details about what individual hams have heard (and when).

Slow Scan Television (SSTV)

Personally speaking, I get excited when the crew decides to send images from the ISS. There is something about receiving pictures



Commander Mike Fincke, KE5AIT, makes FM voice contacts from the International Space Station.



Several APRS stations appeared on this map as the Space Station made its way over the Eastern United States. Their packet bursts were relayed through the ISS digital repeater on 2 meters.

directly from the Space Station that almost makes my hair stand on end. As with many other ARISS transmissions, SSTV also takes place on 145.800 MHz. ARISS images are overlaid with the call sign NA1SS.

Most FM transceivers have an external speaker or headphone jack. To catch a glimpse of these amazing images, all you have to do is attach an audio cable between this jack and the LINE or MIC input of your computer sound card. The sound card will convert the analog FM signal to digital data. There is free software available that will decode the data and display the images on your computer monitor. If you are a *Windows* aficionado, try *MMSSTV* at <http://mmhamsoft.amateur-radio.ca/mmsstv/>, or the multimode program *Ham Radio Deluxe* at www.ham-radio-deluxe.com (the *Digital Master 780* module) or *MultiPSK* (http://f6cte.free.fr/index_anglais.htm).

Whichever program you choose, be sure to select the Robot 36 mode when receiving ISS images. Depending on signal strength, the

images may be noisy, but they are still a thrill to see.

APRS Via Space Station

The ARISS packet repeater is commonly used for relaying APRS (Automatic Packet/Position Reporting System) signals. These bursts of data contain the locations of the APRS transmitting stations along with other information. At the receiving end, APRS software decodes the data and displays the station positions as icons on computer-generated maps.

When the ISS is over North America, APRS stations transmit to the repeater on 144.490 MHz and receive on 145.825 MHz. The call sign of the ARISS digital repeater is RS0ISS-3.

To do justice to the topic of APRS, I'd need to burn through many more *QST* pages. Instead, I'd recommend you pick up a copy of the *ARRL VHF Digital Handbook*.

Voice Operations

If you're lucky enough to find an ISS crewperson on the air, they'll be transmitting on 145.800 MHz, but they will be listening on 144.490 MHz. So, you'll need to configure your transceiver accordingly. Most FM rigs will allow you to store split-frequency configurations in memory channels. The best thing to do is create a dedicated "ISS" memory slot that you can access quickly when needed.

If the ARISS voice repeater is active, it usually operates in crossband mode, listening on 437.800 MHz and retransmitting on 145.800 MHz, or vice versa.

Whether it is an individual crewperson or the FM repeater, remember that users have just 10 minutes or less to make contact. This means that conversations must be *very* short to give everyone a decent chance. The crew tends to operate in "contest mode," giving out signal reports and little more. Don't attempt to engage them in conversation unless they initiate it. And if you're operating through the ISS repeater, keep your own contacts as brief as possible.

And finally, yes, the ISS crew does QSL! Hams in the United States can send their cards to ARRL Headquarters with a self-addressed, stamped return envelope. Mail your card to:

ARRL Headquarters, ARISS QSL, 225 Main St, Newington, CT 06111-1494

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