



## Receiving Astronaut Air-To-Ground Voice Communications

**S**pace shuttle air-to-ground communication is transmitted on one of two designated S-band frequencies. Because the S-Band voice is digitized, it is unintelligible. When the orbiter is above the horizon, air-to-ground voice on the UHF band can be heard either on 259.7 MHz or 296.8 MHz. Also, when the astronauts are performing an extravehicular activity (EVA), or spacewalk, the space-to-space communications are on 279.0 MHz.

To hear communications on these frequencies, it will, of course, be necessary to know if and when the space shuttle or International Space Station will be above the horizon at your location. Unless you are near a NASA tracking station, you will hear only the “downlink,” or one side of the conversation, which will be the space shuttle astronauts talking to ground controllers. This may be ascertained via the Internet by going to: <http://spaceflight.nasa.gov/realdata/sightings/>.

On International Space Station missions, the space shuttle’s orbital inclination is 51.6 degrees, meaning astronaut air-to-ground voice communications may be heard as far north as Newfoundland and as far south as the Falkland Islands in the South Atlantic.

The space shuttle and International Space Station on-orbit communications are conveyed through the Tracking and Data Relay Satellite (TDRS) system, which uses S-band, K-band and Ka-band. This is encoded and

also transmitted digitally, so it is not possible for a home satellite system to receive air-to-ground voice or television from TDRS.

During space shuttle missions and during launch countdowns of expendable vehicles, some amateur radio organizations retransmit the audio from NASA Television, the air-to-ground voice communications or the countdown’s launch conductor. As examples, near NASA Kennedy Space Center, an amateur radio transmitter located south of Cocoa, Fla., retransmits the audio on VHF frequency 146.940 MHz, and a transmitter on Merritt Island broadcasts on UHF at 442.6 MHz.

The amateur radio club at NASA Johnson Space Center in Houston retransmits audio on 146.640 MHz, and the club at NASA Goddard Space Flight Center in Greenbelt, Md., retransmits audio on frequency 147.450 MHz. The signals can be received for about 25 miles.

The amateur radio club at Goddard (WA-3NAN) also retransmits the air-to-ground communications during space shuttle missions on short-wave frequencies. The best reception on each frequency will vary based on the time of day. The frequencies are:

- 3.860 MHz
- 7.185 MHz
- 14.295 MHz
- 21.395 MHz
- 28.650 MHz

Transmitters of various powers on other frequencies are provided by local amateur radio organizations in cities around the country. A list of amateur retransmissions of audio or video/audio from NASA television is available on the Internet at <http://amsat.org/amsat/sarex/shutfreq.html>.

Some space shuttle missions also carry amateur radio transmitters called SAREX (Shuttle Amateur Radio Experiment). As the schedule permits, amateur radio operators can have their call sign confirmed directly by an astronaut. When the flight crew is busy, a "computer packet module" will automatically transmit a computer message.

For further information on the SAREX program frequencies, write the American Radio Relay League, 225 Main Street, Newington, CT 06111, or call 860-594-0200.

An amateur radio system is also on the International Space Station and is occasionally used by the astronauts. It broadcasts on 145.800 MHz. When the astronauts are not transmitting, a packet module serves as a relay for the computer messages of amateur operators on the ground.

During all space shuttle flights, air-to-ground voice (both uplink and downlink) and video from both the orbiter and the

International Space Station are transmitted on NASA television. Since the signal is digitized, a digital decoder is necessary to receive it on a home satellite receiver.

In the continental United States, transmission is via a C-band satellite transmission on AMC-6, Transponder 17C, (4040.0 MHz) using an MPEG-2 digital signal with audio on 6.8 MHz. This is a geostationary satellite with an orbital location of 72 degrees West.

AMC-6 can be received in all 50 states and much of Canada, Mexico and the Caribbean. While the space shuttle is in orbit, this system is always broadcasting.

Most major cable television companies carry NASA television, either full time or on a time-shared basis. NASA television is also available on a continuous basis on commercial direct satellite-to-home broadcast systems, including Direct TV on Channel 376 and the Dish Network on Channel 213.

Also locally, an amateur television transmitter in Cocoa, Fla., retransmits NASA television during space shuttle missions on 421.250 MHz. This can be received with a normal cable-ready television set using an external antenna and tuning to Channel 57. The signal can be received for about 20 miles.