Space Shuttle *Columbia* Calling All Radio Amateurs

Will NASA Astronaut W5LFL, the first ham in space, put you in his STS-9 log?

By Bernie Glassmeyer,* W9KDR, Peter R. O'Dell,** KB1N and Roy Neal,*** K6DUE

Electrifying excitement is building rapidly as word is spread around the world of the official NASA approval of Owen Garriott's bid to become the first Amateur Radio operator in space. On September 30, the Space Shuttle *Columbia* will, if all goes according to plan, lift off the launch pad at Cape Canaveral, Florida, carrying a specially built 2-meter fm transceiver. Dr. Garriott will establish two-way communications with as many amateurs as he can while he circles the globe.

All Amateur Radio operators will have an equal chance to work W5LFL from *Columbia*, but his operating time will be limited. It will be impossible for everyone who would like a QSL card from space to complete a two-way contact, since Owen will be allowed a total of only six hours of operating (one hour per day). Before delving into the mechanics of this historic event, let's look at it from a public information standpoint.

You and the Press

You don't have to make a contact to participate in this history-making event. Simply monitoring the operation and passing up-to-the-minute information to your local media will enable you to become involved personally. But if you do make a QSO, so much the better. As Rich Moseson, N2BFG, of the CBS-TV program "In the News," explains, "A local person actually talking to an astronaut could easily be front-page stuff in a newspaper or a near-to-lead story on a radio or TV newscast." Rich also points out the other side of the coin: "No reporter or editor can cover a story he or she doesn't know about."

It's not too early to set up an appointment with your local news reporters or editors. Make your arrangements now. This is the first major national story about Amateur Radio that doesn't involve a catastrophic event. Let's make the most of a perfect opportunity to promote the Amateur Radio Service.

Dr. Owen Garriott, W5LFL (left), and Bernie Glassmeyer, W9KDR, discuss some antenna-mounting possibilities inside the Space Shuttle Trainer at the Johnson Space Center in Houston. (*NASA photo*)

Begin by making a survey of your local media; in addition to the obvious daily newspapers, radio stations and TV stations, remember the not-too-obvious things such as company newsletters, cable-TV stations and weekly "shoppers." Send the ARRL Public Information Coordinator (ARRL Hq.) a list of the reporters/editors you will be in contact with, including the type of an organization they represent. We'll send you a Press Information Kit explaining what the Garriott mission and Amateur Radio are all about. You can pass these kits on to these reporters and editors when you contact them. (This should be done at least several weeks before the launch.)

The next thing is to think about your station, the image it presents to the "uninitiated" public and what you can do to make the most favorable impression on visitors. First of all, it just makes good sense to tape-record everything on a mission like this. You should experiment now to determine the best method of hard-wiring the recorder into your station. (There are too many variables to give you a "universal" interface, but start with some 1-kΩ isolation resistors.)

The next thing to consider is what your station is going to look like to the outsider — particularly one with a camera. Ask unlicensed members of your family how it looks to them. If you have an instant camera, take a few photos and go over the prints carefully. (You don't have to dispose of the box of surplus RTTY gears you bought at the hamfest; honest. Just hide them.) Dispose of clutter until your station conveys an image of "professionalism."

Suppose you are trying to work the Shuttle and a reporter asks you a question; what would you do? The best bet is to team up with at least two other hams. Two can keep track of the station equipment and operations, watch the clock and, generally, double-check each other. The third should act as spokesman for the team. The spokesman should be completely familiar with the station and its operation, because he or she will need to answer questions about what is going on. (You'll also need a second set of handouts for the reporters who cover the story. ARRL Hq. will provide these to the people who make the advance contacts we suggested.)

This is a once-in-a-lifetime opportunity for the local ham to be a part of a national story — and it's a story that doesn't involve pain and suffering. Make your preparations early. *Do it now!*

Preparing for W5LFL's Flight

How can you have the best chance to work W5LFL aboard the Orbiter? Completing a two-way contact is going to take some advance preparation — and some luck!

Starting on day three of the nine-day mission, Dr. Garriott will provide about one or two hours advance notice of his intention to operate the Amateur Radio transceiver. He will announce this to Mission Control on the Orbiter's normal air-to-ground frequency. The announcements will then be disseminated through AMSAT nets, WIAW bulletins and a special "900" telephone number that will be announced before launch.

Operation will be limited to a maximum of about one hour per day, when no other flight activities (or sleep periods) are

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Table 1
STS-9 Operating Frequencies

Space to Earth: 145.510 to 145.770 MHz
Earth to Space: 144.910 to 145.470 MHz
(20-kHz steps)
All operations will be F3.

This range of frequencies will allow operation from most parts of the world. Although some frequencies fall on some repeater inputs and outputs, operation through repeaters is not planned.

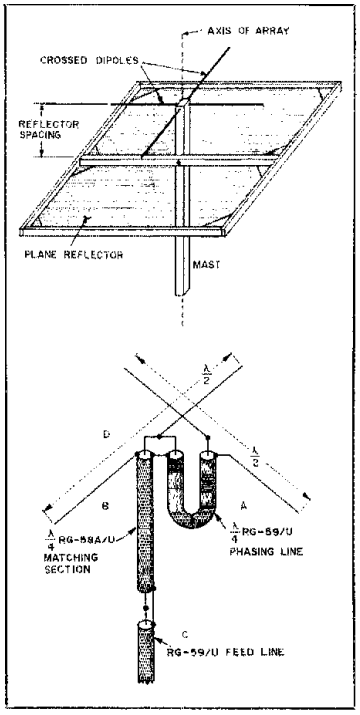

Fig. 1 — Dimensions and connections for the turnstile antenna. The phasing line is 13.3 inches of RG-59/U coax. A similar length of RG-58/U cable is used as a matching section between the turnstile and the feed line.

Table 2
STS-9 Orbital Parameters

Period: 90 minutes
Altitude: 155 nautical miles (250 km)
Inclination (angle measured north from equator): 57°
Increment (equator degrees that the earth turns during one complete spacecraft orbit): 22°

This data, with an equator-crossing time and coordinate (in degrees, west longitude) after launch, will "plug in" to most computer or calculator programs.

scheduled. Orbit numbers and ground tracks for potential Amateur Radio operations are being prepared and will be identified prior to flight.

As the Orbiter approaches the portion of the ground track where Amateur Radio operations are planned, Owen will call and listen on alternate minutes. He will transmit continuously for one minute, beginning on the even minutes, and will receive continuously for one minute, beginning on the odd minutes. Be sure to synchronize your station clock to WWV, plus or minus two seconds.

The transceiver will have the capacity to transmit and receive on channels 20-kHz apart within the planned operating range shown in Table 1. Discrete downlink (space to earth) frequencies and uplink (earth to space) frequencies will be announced before the flight.

During a typical even-minute transmission period, Dr. Garriott will identify a geographical area or call district that he will listen for. He will also announce the frequency range and, as time permits, describe crew activity or views of the earth.

During the odd-minute receive period, Dr. Garriott will scan the announced uplink frequencies for call signs from the designated area only. To establish contact, you will send your full *call sign only*, repeating it several times during the scanning period.

During the next transmission period, on the even minute, Dr. Garriott will acknowledge all call signs he has heard during the scan period. No other report will be needed; call-sign identification constitutes a two-way contact. This procedure will give more operators a chance to make a contact. If time permits, some stations may be called on for short transmissions to fill the time period.

How to Track the Orbiter

Maximum communication time as the Shuttle passes directly over your QTH is eight minutes. Accurate timing is essential, so calibrate your clock to the most accurate time standard available to within two seconds. Orbital information will be updated daily on the "900" number, on AMSAT nets and on W1AW bulletins.

Tracking with the OSCARLOCATOR is possible, but you will need to make a simple modification: You can modify your existing OSCAR 7 or OSCAR 8 overlay by tracing the full-size ground track and range circle shown on page 79. Use a permanent-ink fine-point pen, like the Pilot SC-UF, to trace your curve, and you're all set.

Those who have computer tracking programs will also be able to track the Orbiter. The elements needed for most programs are shown in Table 2. If you have a computer or programmable calculator and need a program, write to AMSAT Software Exchange, Box 27, Washington, DC 20044.

Equipment You'll Need

Making a 2-meter contact will not require an elaborate station setup. Actually, it will take less than is required for normal OSCAR-type contacts. AMSAT and ARRL recommend around 40 W of output power to a turnstile antenna (see Fig. 2) to have the best chance of being heard. Construction details are available in recent editions of *The Radio Amateur's Handbook* and *The ARRL Antenna Book*. Most 2-meter nbfm equipment will be able to make the earth-to-space connection. Dr. Garriott will be running only 5 W to a loop antenna, and it will be interesting to see how little power it takes to make a contact.

Operating procedure and timing will be key factors in getting your call sign in the W5LFL log.

Since the planned operation calls for separate listen and transmit periods, you won't need special split-frequency capability. Having the exact frequencies of operation, you can simply monitor the space-to-earth frequencies during the even minutes and switch to the earth-to-space frequency of your choice for your transmission.

Do not try to track the Shuttle with azimuth and elevation control unless you have precision, computerized equipment; with only a few minutes of access time, you'll find it almost impossible, especially if your antennas have a narrow beamwidth. If you use a gain antenna, we recommend the old, reliable "Arm-strong Rotator" method — holding the antenna and aiming it by hand for best reception.

QSL Cards for All

Specially designed QSL cards will be available to everyone who sends a reception report of the Amateur Radio operation from Space Shuttle *Columbia*. Pass the word to your nonamateur friends so they can monitor on scanners, or let them listen in on your receiver so they can qualify for the special QSL. Send all reception and confirmed contact reports to ARRL, STS-9, 225 Main St., Newington, CT 06111 USA.

Operation Protocol

The first attempt to communicate with the Space Shuttle will present a challenge to most Amateur Radio operators. Beyond the achievement of being in the right place at the right time is another challenge: public relations. The public at large may have a little trouble relating to a cold piece of electronics hardware orbiting the earth, but they can relate to a human aboard the Space Shuttle. What we do and how we conduct our operations can bring more prestige to Amateur Radio and promote international goodwill.

If we can keep this historic event simple and remember our rules of diplomatic etiquette, we will have a better chance of gaining future Space Shuttle Amateur Radio opportunities. Join in the fun of this operating "Event of the Decade." QST