An exciting new era in amateur radio is about to begin—the era of AMSAT PHASE III OSCAR satellites.

The AMSAT PHASE III satellite program promises a continuing demonstration that amateur radio is at the forefront of modern technology. PHASE III satellites will routinely provide reliable communications over paths of up to 11,000 miles (18,000 km) for 17 hours each day. You can think of them as a resource equivalent to a new band.

The cost of these PHASE III satellites is a projected $250,000. Commercial satellites of similar performance would cost nearly $10,000,000.

Your help is needed to put these PHASE III OSCAR satellites in orbit.

Your valued, tax-deductible contribution can be as small as one of the 5000 solar cells needed. A handsome certificate will acknowledge the numbered cells you sponsor for $10 each. Larger components of the satellites may also be sponsored with contribution acknowledgements ranging to a plaque carrying your name aboard the satellites. Call or write us for the opportunities available.

Your membership in AMSAT is important to the satellite program, and will give AMSAT a stronger voice in regulatory matters concerned with satellites. At $10 per year or $100 for life, you will be making a most significant contribution to the satellite program and the future of amateur radio. You will also receive the quarterly AMSAT newsletter.
FROM THE EDITOR

AN APOLOGY

The American Radio Relay League is now handling the distribution of all QSL cards, report forms, publicity, photos and information on the new AMSAT-OSCAR 8 spacecraft. Write ARRL OSCAR Operations, 225 Main St., Newington, Connecticut 06111 U.S.A. Telephone (203) 666-1541. AMSAT Area Coordinators may also contact ARRL directly for AMSAT supplies and materials.

AMSAT-OSCAR 8 INFORMATION

Current plans are to operate the spacecraft in Mode A during the week and Mode J during weekends. Wednesdays are reserved for pre-arranged experiments by the local group only, with scheduling handled by Bernie Glassmeyer, W3PRD at ARRL HQ. It will take a few weeks to determine more exact orbital parameters of the spacecraft. Thus, all data published to date including that in this newsletter should be regarded as provisional.

Stay tuned to the AMSAT Nets for up-to-date information. We expect that AMSAT will publish an orbital calendar on AMSAT-OSCAR 8 to be available through Skip Reymann, N6PAJ around the end of May (see the announcement on page 23).

PHASE III COMMUNICATIONS CHANNELS

When the first Phase III spacecraft becomes operational, a whole new world will open up to radio amateurs. For the first time, reliable communication paths will be open for point-to-point and multi-point contacts. Conventional contacts are subject to on-channel and adjacent-channel spill-over interference. The advantages of using the Phase III satellite for "nets" or "roundtables" will soon be noticed by the users, and it is expected that these new types of contacts will form a common use of the satellite. One possibility might be to reserve four specific channels for SSB net use. These channels could be at the top of the SSB section of the downlink passband and spaced 5 KHz apart. Thus, stations using the channels (A, B, C and D where A is the highest frequency channel) would be guaranteed QRM-free links (no adjacent spill-over and no on-channel) for network communications. The remainder of the SSB passband would be available for regular random frequency contacts. Channel A could also be used as a calling channel, with stations moving off frequency once contact is established. Nets would share the channels on a time of day basis, similar to current HF usage. The allocation of times and channels to nets would be handled by the operations side of AMSAT. If you have any comments on the reservation of channels on the Phase III passband, why not write in and share them.

Joe, G3ZCZ
MODIFICATION OF THE SATELLITE III
FOR USE WITH OSCAR-8

BY KAZ DESKUR, K2ZRC

The original Satellate I was designed for AMSAT-OSCAR 6 and 7 and is not directly applicable for AMSAT-OSCAR-8. The device can, however, be easily modified for A-O-8 or any other satellite traveling in a virtually circular orbit by following the instructions in this article.

Although only pre-launch orbital parameters of A-O-8 were known when this was written, the expected deviation from the predicted orbit is most likely to be so slight that the accuracy of the Satellate should not be affected to any appreciable degree. The modification of the Satellate is a project lasting no more than one hour.

The parameters used are:

- **PERIOD** - 102.76 min.
- **INCLINATION** - 99 degrees
- **ALTITUDE** (average) - 872 km; 542 miles

**MODIFICATIONS**

1. Scale #1, "THE MAP", and Scale #2, "THE EQUATORIAL CROSSING TIME", need no changes. They are applicable for any satellite.

2. Scale #3, "INDEX SCALE", must be modified to represent equatorial progression of (7/4) degrees which for OSCAR 8 is 102.76/4 × 7.7 degrees.

**Procedure:**

Line up 0 degrees longitude on the equator of the map against No. 1 index mark of Scale #3 as shown on Fig. 1. Draw a new set of index marks separated 25.7 degrees apart. (For this purpose, use Table I.) Since Scale #3 is dark, it is recommended that you use a light background. Self adhesive circles work very well.

**TABLE I**

<table>
<thead>
<tr>
<th>INDEX#</th>
<th>DEGREES</th>
<th>INDEX#</th>
<th>DEGREES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.0</td>
<td>9</td>
<td>205.6</td>
</tr>
<tr>
<td>2</td>
<td>25.7</td>
<td>10</td>
<td>231.3</td>
</tr>
<tr>
<td>3</td>
<td>51.4</td>
<td>11</td>
<td>257.0</td>
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<tr>
<td>4</td>
<td>77.1</td>
<td>12</td>
<td>282.7</td>
</tr>
<tr>
<td>5</td>
<td>102.8</td>
<td>13</td>
<td>308.4</td>
</tr>
<tr>
<td>6</td>
<td>128.5</td>
<td>14</td>
<td>334.1</td>
</tr>
<tr>
<td>7</td>
<td>154.2</td>
<td>15</td>
<td>359.8</td>
</tr>
<tr>
<td>8</td>
<td>179.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Scale #4, "PRECISION TIME SCALE", will not be used. (Precise period must be known to make this scale accurate).

4. The new earth track will be superimposed on the existing transparent slider.

**Procedure:**

Line up the reference line of the "old" OSCAR 7 track against 340 degrees longitude on the equator. (See Fig. 2) Starting at 0 degrees longitude and 0 degrees latitude, "eyeball" the positions of the time marks on Fig. 2 and duplicate them on the slider. Make sure that the slider doesn't move during this operation. Time marks are spaced at 2 min. intervals. If more accuracy is desired, use Table II.

5. Azimuth-Elevation Overlay

The existing overlay can be used unmodified with the following exception: The elevation range must be read 10 DEGREES LOWER. Namely, the 10 degree range of OSCAR 7 will become 0 degrees elevation (limit of accessibility) of A-O-8; 20 degrees on the existing overlay will correspond to 10 degrees; 30 degrees will equal 20 degrees; etc. (See Fig. 3).

Using this procedure, the error will be no greater than 1.6 degrees which is a lot less than most antenna rotators can resolve. The maximum error is at 6 degrees angle (11.6 degrees) which causes the circle of accessibility of A-O-8 to be 110 miles (178 km) further out than the 10 degree circle on the existing overlay. (This corresponds to about two thicknesses of the line.)

6. To adapt the Satellate for other satellites, use the following formulas:

- **Equatorial progression:**
  - Separation between index marks = P/4 degrees
  - Where P = Period of the satellite in minutes.

Add the reference line extending the 0 degrees meridian about 1/8 inch into the index scale.

Probably the best pen for this job is a popular marking pen sold in most art stores under the brand name of "SHARPIE", manufactured by Sanford's. It won't rub off, is very water-resistant, but it can be removed very easily with nail polish remover.

**TABLE II**

<table>
<thead>
<tr>
<th>Time</th>
<th>After</th>
<th>DEG</th>
<th>LAT.</th>
<th>LONG.</th>
<th>After</th>
<th>DEG</th>
<th>LAT.</th>
<th>LONG.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>26</td>
<td>81.0</td>
<td>102.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6.3</td>
<td>1.6</td>
<td>30</td>
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<td>138.6</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
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<td>6</td>
<td>20.7</td>
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<td></td>
<td></td>
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<tr>
<td>8</td>
<td>27.6</td>
<td>6.7</td>
<td>34</td>
<td>59.9</td>
<td>172.6</td>
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<td>176.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>41.3</td>
<td>11.3</td>
<td>38</td>
<td>46.4</td>
<td>179.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>48.1</td>
<td>13.8</td>
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<td>54.9</td>
<td>17.0</td>
<td>42</td>
<td>32.7</td>
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<td></td>
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<tr>
<td>18</td>
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<td>21.3</td>
<td>44</td>
<td>25.9</td>
<td>186.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>68.1</td>
<td>25.0</td>
<td>46</td>
<td>19.0</td>
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<tr>
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<td>74.1</td>
<td>29.6</td>
<td>48</td>
<td>12.1</td>
<td>190.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>79.1</td>
<td>34.1</td>
<td>50</td>
<td>5.2</td>
<td>191.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>79.1</td>
<td>34.1</td>
<td>52</td>
<td>-1.7</td>
<td>-193.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b.) Earth track time marks are normalized to start at 0 degrees longitude and 0 degrees latitude and are calculated with the following formulas:

\[
\begin{align*}
\text{Latitude } \varphi &= \arcsin \left( \frac{(\sin i) \sin \varphi}{P} \right) \\
\text{Longitude } \lambda &= \arccos \left( \frac{\cos \left( \frac{360 \varphi}{P} \right)}{\cos \varphi} \right) \times \frac{T}{4}
\end{align*}
\]

Where:  
- \( i \) = Inclination  
- \( P \) = Period in minutes  
- \( \varphi \) = Latitude  
- \( \lambda \) = Longitude  
- \( T \) = Time after equatorial crossing in minutes

c.) Elevation circles

Distance in great circle degrees from the location of the tracking station to the subsatellite point at angle of elevation \( E \):

\[
B = \arccos \left( \frac{R}{(R + h) \cos E} \right) - E
\]

Where:  
- \( B \) = Distance to the subsatellite point from the location of the tracking station  
- \( R \) = Radius of the earth (6,371 km; 3960 m)  
- \( h \) = Average altitude of the satellite  
- \( E \) = Angle of elevation  
- \( \varphi \) = Great Circle degree = 111.2 km; 69.1 miles

CALL FOR PAPERS

Amateur Computing 78 Microcomputer Festival will be held July 22-23 at the Sheraton National Motor Hotel, Arlington, Virginia. Those interested in presenting a paper, participating in a panel discussion, displaying an amateur computer system or sponsoring a tutorial should submit a letter of intent along with a one-page abstract or outline by April 15 to John Wall Miller, Program Chairman, 6921 Pacific Lane, Annandale, VA. 22003, telephone (703) 256-5702. Authors will be provided with instructions for preparation of camera-ready papers which are due by June 1.

Especially welcome will be topics concerning amateur radio (satellite) applications of microcomputers.

Information on Amateur Computing 78 may be obtained by writing AMRAD, Box 682, McLean, VA. 22101 or by telephoning John Wall Miller (703) 256-5702.

The 1978 ARRL Technical Symposium will be held on Saturday, September 16, 1978 at the Tysors Corner Ramada Inn, Falls Church, Virginia in conjunction with the National Capital DX Association’s EXPO 78. This American Radio Relay League technical symposium is managed by the Amateur Radio Research and Development Corporation (AMRAD) and sponsored by the Northern Virginia Amateur Radio Council (NOVARC).

Previously unpublished papers are invited on all technical subjects relating to amateur radio. Prospective contributors are asked to forward informal summaries along with a photo of the author and a one-page bio sketch of the author’s amateur/electronic background by July 15. Manuscripts are due by August 15. Please write or call: Paul Pinaldo, W4RI, 1524 Springvale Ave., McLean, VA. 22101, (703) 356-8918 evenings or weekends.
THE TAILORED HELICAL

By Domenic M. Mallozzi, NIDM
156 Gray Street
Providence, R.I. 02909

When the author was looking for a new antenna to replace his old one, (A dipole over a reflector) for Mode B uplink, the helical came to mind. The author had four basic requirements for his new antenna:
1) Wide beamwidth (greater than 90 degrees)
2) Gain of 6 to 9 dbi
3) Non-critical construction and matching
4) Wide bandwidth - for use in 432 transmitting and 435 reception with no significant decrease in performance

The wide beamwidth was required so no rotor was necessary for approximately 8 to 10 minutes of useful signal per orbit. The only aiming required is to point the antenna at the correct elevation for the pass. Because the available amateur books and magazines showed no such helical, I turned to Kraus' Antennas (McGraw-Hill: New York; 1956). Chapter 7 of this book could be called the Helical Bible. The author was particularly intrigued by Fig. 7-35 (p. 211) which shows the effect of circumference on polar radiation patterns and table 702 (p. 213) which gives helical design formulas. After referring to these items, I became convinced that a circumference of less than one wavelength was necessary. After a couple of weeks of fooling around with the charts and a calculator, I came up with the design for my helical. The circumference of the helical was to be 0.8 wavelengths, spacing between turns of 0.25 wavelengths and 3 turns. This would yield a beamwidth of 75 degrees and a gain of about 8.5 dbi. An added benefit was that the quarter wave matching section required was 75 ohms, not the odd value required to match a 50 ohm line to the 140 ohm feedpoint of a one wavelength circumference helical. This means a piece of RG59 could be used rather than having to build a special coax matching section.

The accompanying diagram gives the dimensions. To get the Right Hand Circular Polarization needed for Mode B, you wind the helical in a clockwise direction from the feedpoint out as described by DaMaw (QST; Nov. 1965, pgs. 20-25 & 170). As for mechanical construction, I leave that to the builder, just remember no metal inside. The helix should, as much as possible, be an air wound coil. Also, as suggested by Belew, the conductor is 1/4 inch copper tubing. This can be purchased at automotive parts stores, hardware stores, plumbing suppliers, or at Sears.

The author has found this antenna to be quite good. I use it with a transmitter that has 5 to 15 watts output and uses twenty feet of RG9 feedline. This results in ERP's of 35 to 100 watts. The antenna site at ground level when in use: the only aiming being point it at the midpoint of azimuth and elevation for the orbit. It has a wide enough beamwidth that it gives about 10 minutes use per pass with no reorientation.

The antenna requires no precision mechanical work and therefore can be built with your normal household tools. Good luck with your tailored helical and drop me a line when you get it up to tell me how it works.

Thanks to WB1FDY and WA1NWW for help in getting materials for a prototype and to N1AI for reading the manuscript for technical clarity.

CALCULATED POLAR PATTERN

NOTES:
1) TOTAL TUBING REQ'D 60' (1.52 M)
2) CALCULATED GAIN 8.5 dbi
3) CALCULATED BEAMWIDTH 75°
4) TO MATCH 50 ohm LINE, REQUIRES 75 ohm QUARTER-WAVELENGTH TRANSFORMER

OSCAR 7 ORBITAL PREDICTIONS
BY POCKET CALCULATOR

Part II

By Bill Ralston, WA6KKB

The following program for an HP-25 Hand calculator was not written as a sequel to the program described by JARW in the December issue of the AMSAT NEWSLETTER but is a logical progression. The program serves as a substitute for the OSCAR locator (available from AMSAT and ARRL) in calculating azimuth and range for an OSCAR pass anywhere in the world.

The program is described in Table 1. A detailed description was omitted in the interest of conserving space.

To use, the program should be keyed in, and the registers initialized to the values in Table 2. Register 0 is the longitude of the ascending node, expressed in degrees west. This value will have to be changed for every orbit. The range calculated by the program will be in the same units as register one is stored, either kilometers or miles. The value should be the radius of the satellite orbit from the center of the earth. Register 2, the inclination of the orbit should be measured as shown in Fig. 1.

To run the program:
1) Enter time after equatorial crossing
2) R/S
3) Read azimuth (north = 0, east +, west -)
4) x 2
5) Read approximate range
6) Return to step 1 for new time, or change R0 for new pass

The program will work for any satellite (A-O-D, RS, Phase III) if the correct constants are stored in the registers. Southern Hemisphere stations should store 90-degree of OTH in register 4.

The program will be fairly accurate for one or two orbits, but for best accuracy, you should use the longitude and time of the ascending node of the orbital pass you are calculating. The program will also work for descending passes; re-member to use the ascending node, though.

The program will also work on an HP-25C or HP-29C without change, and any HP programmable calculator with only slight modification of the program.

Best of luck using the program, and, of course, if anyone has any improvements (especially how to include an elevation calculation) I would appreciate hearing.

Bill Ralston, WA6KKB
1492 Oak Grove Circle
Santa Ana, CA 92705
A REAL TIME TRACKING SYSTEM FOR AMATEUR RADIO SATELLITE COMMUNICATION ANTENNAS

By John L. DuBois
Dytron Inc.
241 Crescent St.
Waltham, MA 02154

Introduction:

This paper describes a hardware-software system for pointing an antenna at a polar orbiting satellite such as OSCAR-7 and automatically tracking it during a pass.

The program is written in Basic and performs all computations necessary for tracking once given the pass equator crossing time and longitude.

The system described uses a $100$-bus microcomputer operating with BASIC. Specific hardware is described consisting of A/D conversion and parallel output for interface with antenna azimuth and elevation rotators. The system requires a real time clock in the computer and a commercially available $100$-bus clock board is used in the example.

Background and Objectives:

There have been a number of good articles (1,2,3) written on the subject of computing the track of low altitude polar orbiting satellites such as OSCAR-7 and NOAGA-5 for amateur radio purposes. There have also been several ingenious circuits published (4,5) for pointing appropriate antennas at the satellite track from pre-programmed media such as tape cassettes or paper tape.

The obvious question, however, in view of the current explosion of microcomputer applications between doing the track computations and managing the pointing hardware all by microcomputer has not yet, to the author's knowledge, appeared in the amateur literature. This is such an appealing application after one has experienced the need for six arms in trying to track a satellite pass, tune the receiver, see it to the desired frequency with the transmitter, and log the last QSO, that it was tackled very shortly after getting up an operational microcomputer system.

A review of the literature in amateur publications quickly turned up a wealth of ideas for software. The article by Henson in February, 1977, 73 Magazine is an excellent reference and, in fact, forms the basis for most of the orbital calculations in this program.

The material available for hardware, on the other hand, is not very helpful unless one intends to exactly duplicate a particular pre-programmed tracking circuit. Since the effort and cost involved in building one of these devices is a significant fraction of that necessary to assemble a small microcomputer and the result is specialized to only one purpose, it seems desirable to put the labor and money into a "micro".

At this point, it was necessary to make some choices relating to the specific hardware to be involved at the antenna end of the system. The data transfer necessary between the antenna-rotator system and the microcomputer is the current position and the movement commands. In order to simplify the interface hardware, a type of azimuth and elevation rotator was chosen which controlled the motor by independent SPT switches (through one side of each rotator shaft indicated position with an isolated potentiometer coupled to the rotor shaft). These are the Kenpro Model KR-400 and KR-500 for azimuth and elevation respectively. The essential part of the rotator schematic is shown in Figure 1. Other types can of course, be used with the interface board described, but in some cases, a little ingenuity may be necessary to obtain the variable DC voltage output from the indicator mechanism.

The signal, then, which is read to indicate azimuth and elevation, is a DC voltage fed from the shaft coupled potentiometer. Control commands to the rotators are issued by simple contact closures for CW, CCW, up and down connected in parallel with the rotator's manual controls. This provides a convenient method for overriding the computer position commands.

A similar set of choices was necessary for the software. (The microcomputer was not open for choice, it was already in operation and not likely to be replaced.) The general specification for the program was that it require only an input only equator crossing time and longitude for a desired pass and that it perform all other necessary calculations internally, commanding the rotators to point the antenna appropriately.

This left two loose ends, real time and orbital constants. It was decided to write separate programs for each satellite of interest, differing only in the fixed orbital constants.

Real time operation was a little stickier. It was finally decided to put a hardware clock in the computer because it would simplify applications in other amateur radio programs such as RTTY. Although the BASIC program is customized to a particular hardware clock (Commedek Model CL-2400) other schemes for deriving real time can of course be used.

At this point, it was necessary to decide on a hardware interface board to "read" the rotators and issue direction commands. The approach chosen called for a combination multiplexed A/D input and a parallel output relay contact per pass. Since only 2 passes do not exist among the many $8-100$ bus accessory boards, it was decided to design one to do the job efficiently rather than use up two chassis slots with separate boards or modify an "almost right" board.

Interface Board:

The interface board (6) was designed specifically for position readout from antenna rotators and for issuing direction commands to those rotors. Several features, however, give it wider application while serving as an antenna controller.

A 3½ digit BCD A/D converter with full scale reading of $1.999$ volts is provided. Input to the converter comes from an 8 position multiplexer under program control. Up to 8 separate analog inputs may be read but two of these will normally be antenna position, leaving 6 for signal strength, transmitter output, etc.

There are 6 parallel output relays which may be individually latched on or off under program control. Normally, 4 of these will be used for rotator commands: up, down, CW and CCW. This leaves 2 free for transmit-receive switching, etc. Contacts are rated at 28 VDC, 250 Ma. maximum and external slave relays should be used if the rotator switch requirements exceed this.

In addition, there are 2 direct outputs and 1 direct input to the 8255 PPI available. The outputs will only drive LMA, however, and must be buffered for TTL compatibility. The input is directly TTL compatible. Potentiometers allow full voltage from the rotator circuits to be set to 2.000 volts at the A/D converter input. This program assumes that 0 degrees elevation is represented by 0 volts and 90 degrees by 1.000 volts. Azimuths of 180 degrees are assumed to be 0 volts and 180 degrees to be 2.000 volts.

Appropriate modifications should be made to other rotator indicator circuits to obtain these voltages.

Software:

The BASIC used is TDL 12K Super BASIC version 3.0.

After initializing orbital constants, the program loads an assembly language routine which loads the CL4433 A/D converter on the interface board. It is then in assembly instead of BASIC solely for speed. Most BASIC would not be fast enough to read all BCD output digits on the same conversion cycle thus leading to erratic results.

The program then gives an opportunity to slew the antenna to any desired position for testing or whatever purpose is in mind. Next the option is for tracking the pass or else just printing the az-el pointing coordinates at intervals. The program is useful for manual tracking before the rotator hardware is built or connected. The next option is for pre-AOS and post-LOS tracking when the satellite is beyond the maximum angle of observation. It leaves the elevation to 0 (attenuation through the earth would be rather high) but tracks the proper azimuth for attempting over the horizon DX.

If the tracking mode has been selected and the satellite has not yet come over the local horizon, the program waits until it does. Then at intervals of real time set, the current azimuth and elevation are computed and the antenna is
positioned at those angles. Care has been taken to account for the possibilities of the track passing through the rotator stops at 180 degrees. If the track reaches one of these limits, the program stops and slows the antenna so that the desired azimuth is reached from the complementary side of the stop and tracking continues from that point.

After each antenna update, the current time, coordinates, range to the satellite and doppler shift are printed on the console. The doppler shift computation assumes the uplink and downlink frequencies of OSCAR 7, mode B, and is not accurate for ranges beyond the maximum observation angle.

Note that alignment errors in the antenna mounting can be easily corrected in the program (assuming that you can figure out the error). One such correction appears in the elevation routine of the program.

Two features of the BASIC used which may not correspond to other extended BASICS are the formatting strings for the PRINT USING statement and the procedure, for calling the assembly language routine. Users should check these areas especially when translating to other dialects of BASIC.

Conclusions:

The results of this effort have been generally regarding. The console display is a great aid to timing QSOs and looking for particular targets. With the NOAA satellites the system permits almost completely automatic picture acquisition.

Two negative features have turned up however, one of minor importance and the other a GREAT HARRY MONSTER! The minor problem is that for some orientations of the antenna array, the angular dynamics of the antenna-mast load interact with the control algorithm to produce a persistent oscillation of a few degrees beyond the dead band. This would be easily eliminated by a proportional control algorithm instead of "bang-bang" but the effect is so infrequent that it has been ignored.

The other situation is that awful spectre of DX operation on OSCAR at low elevations is a weak signal affair and the last thing one wants is spurious signals. RTTY generation by typical hobby microcomputers is intensive within a hundred feet or so over the entire amateur spectrum. The author's system was no exception. A great deal of effort was put into shielding and "head-choking" almost-all lines exiting the computer case with only partial success. On the OSCAR-7 mode B downlink at 145.925 to 145.975 MHz numerous birdies are still present and they are modulated by the various operations of the program, often obscuring desired stations. Additional shielding and RTTY tracing is obviously needed.

This problem could become serious inhibition to more widespread and successful application of microcomputers in amateur radio. It is hoped that this situation can be tackled by one of the numerous clever individuals in our hobby and some effective remedies found.

References:

6. The interface board described is available in PC board or assembled and tested form from the author at: Dytron Inc., 241 Crescent Street, Waltham, MA 02154, or through the Group Purchase Project.

Editor's Note:

The full text of the article was published in the proceedings of the Second West Coast Computer Fair in San Jose, California (P.O. Box 1579, Palo Alto, CA 94302). It included software listings in DBC-BASIC and Assembly Language.

By the time that you are reading this, the PC card will be modified so as to contain an on-card time of day clock circuit based on a 3.5 MHz Color TV Xtal, and have provisions for battery backup power (to the clock only) to avoid the necessity of resetting the clock each time the computer is powered up.
AMSAT-OSCAR 8 LAUNCHED

By Joe Kasser, G3EKR/W3

A-0-D became AMSAT-OSCAR 8 on Sunday, March 5, 1978. A "textbook" launch fired Landsat-C and its passengers into orbit from the Vandenberg Air Force Base in California, 551 million feet into the launch window. Radio amateurs around the world followed the launch sequence in real time by means of the AMSAT Launch Day Operations Nets activated by W3M, WA3HAN and others. The voice of Will Webster, WB2TNK operating from WA3HAN at the Goldsboro Space Flight Center in Maryland echoed around the world as he relayed the launch and subsequent phases of the orbit injection sequences. Such was the level of interest, that several times no signals were present on 14280 KHz for periods ranging up to 90 seconds at critical points in the mission sequence. These periods of silence on 14280 KHz took place right in the middle of the ARRL DX Phone Contest. Hundreds of stations checked into the nets, many more called in or just monitored the activity.

The flight of the launch vehicle was followed, the ejection of Landsat noted, and additional orbit correction burns noted when ORS was deployed. Then, WA3HAN announced that OSCAR was free. 14280 KHz was silent; then G2BVN called in with the first report of telemetry reception from the AMSAT-OSCAR 8 spacecraft. Minutes later, W4FDH reported the first American reception of signals. Stations reporting reception of the telemetry on the first two orbits included: VE6SN, G8BKE and N6SD.

W3M/P reported one frame of telemetry when the satellite was well below his horizon. DL3XK telephoned Washington, D.C. with telemetry data. Early telemetry showed that the spacecraft was spinning at the gentle rate of 1.3 RPM. It was then decided to extend the 10 meter antenna on the first pass overheard the Eastern U.S.A. that night. Interest was high; everyone was available and the net opened up on 3850 KHz. Randy, VE3CAT, the Command Station, relayed the sequence of events as he sent the commands to the spacecraft and the "beep, beep, beep" of telemetry was heard by many listeners, relayed on 3850 KHz, as well as on 435.095 KHz as the antenna deployed.

The initial telemetry data as reported by Roy Stevens, G2BVN, was: time: 00:01:00, date: 03/05/78, data: 39 459 556 604. During the first few orbits, the spacecraft stabilized. It should be noted that stations reporting from the U.S.A. indicated that Channel 6 was showing counts of the order of 601-603, yet stations in Europe were reporting 610-623, showing that signals were present in the uplink passband in Europe.

Roy Stevens, G2BVN operating at W5SBN.

EYE-WITNESS ACCOUNT OF THE LAUNCH OF AMSAT-OSCAR 8

by James Eagleson, WB6JNN

We enjoyed watching OSCAR 8 go up Sunday morning, March 5 at Vandenberg. N6TX, Paul Schub and I went down Saturday in caravan with Walt Reid, WA8SH and Nick Marshall, WEGLO. Got word at the Landsat briefing that the weatherman said "Go" (the weather outside to the contrary) but the city of Santa Maria thought their dam was too full and let some water out threatening the telemetry station. When the buses arrived the next morning to take us to the site, we all breathed a sigh of relief!

 weren't so happy upon arriving at the base to see only a din outline of the vehicle some two miles distant. First it was fuzzy with about a 500 foot ceiling. We fully expected to see the thing lift off three rocket lengths into the air before it disappeared into the clouds.

We got through the 15 minute hold (at which time N6TX breathed a sigh of relief since that's where the countdown for OSCAR 7 stopped when the launch was scrubbed the last time he went down), and then we noticed that the clouds were opening a bit in the direction of the wind. Maybe we'll see something after all!

T-minus-five and counting, the "patch of blue" opened up into sky-to-sky blue and at lift-off we had perfect visibility later on the part of the rocket. At the second stage cut-off, a second "patch" opened up the third stage, 20 miles tall. After losing the thing in the distance, we re-boarded the buses, left the base, and ran into rain and overcast within one mile of leaving Vandenberg. Our road to Goldsboro, NC, and Space Flight Center in Maryland echoed around the world as he relayed the launch and subsequent phases of the orbit injection sequences. Such was the level of interest, that severe times no signals were present on 14280 KHz for periods ranging up to 90 seconds at critical points in the mission sequence. These periods of silence on 14280 KHz took place right in the middle of the ARRL DX Phone Contest. Hundreds of stations checked into the nets, many more called in or just monitored the activity.

Yours Sincerely, Peter Whatmough, G8BBP

Dear Editor:

I found your article on AMSAT-OSCAR D Spacecraft most informative and look forward to trying out Mode J.

I've been regularly listening to OSCAR passes (Mode A) and have heard more and more stations every pass. Still waiting to print up a suitable SWL card for confirmations. Hearing OSCAR has gotten me excited enough to start working on some uplink equipment. Hope to be on there soon.

I'd like to say that, since I don't have Mode B receive capability, I don't look forward to the new schedule. I hardly get chances to listen, now with less Mode A passes, I've hardly gotten to listen to anything. I hope this is for the best, but it would seem to encourage more usage on Mode B, since OSCAR is in that more often.

Lastly, would like to add my compliments to those who volunteer people. If they keep abusing the satellite, by the time get set up, the satellite is unfriendly.

Many thanks for the FR newsletter and EBN's soon on OSCAR.

Bill Ralston, W6KXBC

(R5-OSCAR and A-0-8 should provide sufficient Mode A ---Joe).
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UPDATE ON THE PERPETUAL ORBITAL COMPUTER PRINTOUTS FOR OSCAR

By Bill Johnston, N5KR (ex-WB5CNC)

Since the appearance of the original article in the September 1975 AMSAT Newsletter, the perpetual printouts have been mailed out to OSCAR users around the world. These have been about equally divided between U.S. and foreign names, and new requests still arrive daily. Due to the increasing number of questions 7 receive concerning availability of the printouts, and the increasing numbers of OSCAR users, it seemed appropriate to bring everyone up-to-date.

In answer to the most common question -- yes, the printouts are still available, though the cost has increased by about 25 cents, due to two postage rate increases. If you already have one of the perpetual printouts, you don't need another one unless your time is worn out. The printout is good for the life of AMSAT-OSCAR 7, and for any other satellite with the same orbital inclination and period (e.g., several existing weather satellites, and AMSAT-OSCAR 6 while it was still active); the printout can continue to be used for any future satellites put into this same orbit.

To review, the printout consists of 80 to 100 pages (the exact length depends upon your station's latitude and longitude) with a series of tables based on the longitude of the equator crossing (ascending node). There is a separate table for every possible equator crossing point, in one-degree increments.

You start out by obtaining the time and longitude of equator crossing for the pass you're interested in (this is found in monthly tables published in the various ham magazines, or in more elaborate form from the W6PAJ booklet). Then you go to the table in the printout that corresponds to that equator crossing longitude. (If no table is present for that longitude, that means the satellite will not be in view of your station on that pass.)

The table consists of a series of entries giving the time, azimuth, elevation, and range parameters at one-minute intervals throughout the pass. The time that is listed is the number of minutes after equator crossing, and you simply add this to the time of equator crossing to get the exact time of day associated with those particular azimuth and elevation figures.

For example, let's suppose you go to the W6PAJ calendar, or to one of the ham magazines, and find that the equator crossing is at 88 degrees longitude at 16:21 GMT. You then go to the perpetual printout and look up the table for equator crossing at 88°. Suppose the first entry in that table has a time of 6 minutes, an azimuth of 144 degrees, and an elevation of 1 degree. You just add the 6 minutes to the equator crossing time of 16:21 to get the exact time of 16:27 GMT. So at exactly 16:29 GMT, the satellite will be at an azimuth of 144 degrees and an elevation of 1 degree, as viewed from your station. Should a time appear in the table as a negative number, that means you subtract it from the equator crossing time instead of adding it.

Anyone who would like a printout for his own station will need to send the following:

1. Name and mailing address.
2. Town that you want the printout computed for. If less than 10,000 population, please include latitude and longitude, or carefully describe location.
3. Payment to cover the cost of generating and mailing the printout, as follows:
   $3.30 by 4th class mail, worldwide.
   $4.00 by First Class mail, U.S.A., Canada, Mexico
   $5.00 by Air Mail, worldwide.
   IRC's (new series only) may be substituted at the rate of 10 cents per IRC.

Send the above to:

Bill Johnston, N5KR, 1808 Pomona Drive, Las Cruces, New Mexico 88001, U.S.A.

A lot of people have written to me about printouts for future satellites, and I would like to elaborate on that subject just briefly. As mentioned previously, any satellites put into the same orbit as AMSAT-OSCAR 6 and 7 would use the existing OSCAR 6/7 perpetual printout. A satellite placed in any other circular orbit would use its own perpetual printout. There are indications that all four of the Soviet RS series satellites will have the same orbital characteristics (though considerably different from AMSAT-OSCAR 7), so a single perpetual printout could be made for all of them. Since OSCAR 8 is in a different orbit than OSCAR 7, it requires its own perpetual printout. These printouts will be available about the first of April, and the cost will be the same as described above.

Unfortunately, other satellites in non-circular (i.e., highly elliptical) orbits do not lend themselves to this type of perpetual printout. The reason for this is that the apogee and perigee progress around the earth, and a pass with a given equator crossing longitude will not have the same azimuth and elevation angles as a pass with the same equator crossing longitude, say four months later.

In any case, perpetual printouts for OSCAR 7 and 8 will continue to be available and the availability of printouts for future satellites will be reported in the AMSAT Newsletter. If you have any specific questions, please be sure to enclose a self-addressed stamped envelope.


PHASE III FUNDING STATUS REPORT

By John Shev, N4QQ

Hardware costs for the Phase III project are expected to be in the neighborhood of $250,000 for two satellites. A complete Phase III satellite requires:

- 2400 Solar Cells at $10/each = $24,000
- 12 Battery Cells at $200/each = $2,400
- 1 Kick Motor = $1,000
- 2 Transponders at $5,000/each = $10,000
- 2 Comsat Computers at $8,000/each = $16,000

TOTAL $62,400

A viable Phase III program requires at least 2 complete satellites ready at any launch date, the unused backup hardware available for a later launch.

We have passed the first milestone in our fund-raising campaign. As of February 8, 1978, donations have been received for 2,617 solar cells and 36 battery cells. Thus, we have three hundred solutions for the first Phase III satellite and three complete battery systems. According to the last regional tally, submitted by Larry Fabke, WH6MUP, who handles printing and distribution of solar cell certificates, contributions have been received from all 50 states, all Canadian provinces and over 42 foreign countries. A significant number of the contributors are non-amateurs, testifying to the universal appeal of the amateur satellite program.

All contributors to the Phase III program receive a handsome certificate, acknowledging the exact numbered component sponsored. Contributors of $1,000 or more will be honored by having their name inscribed on a plaque to be placed onboard the first Phase III satellite. A partial list of those names to be inscribed on this plaque includes:

- AT Division of Cutler-Hammer
- Sea-DOX Association
- Dayton Amateur Radio Association
- Personal Computing, Inc.
- West Allis Radio Amateur Club, Inc.

Our thanks also must be offered to QST, Ham Radio, QST and World Radio News for their generous donation of space publicizing AMSAT Phase III and our contribution program. Not only has their exposure been instrumental in our solar cell campaign, but also in soliciting new AMSAT memberships.

We have made a significant start. However, more contributions, both large and small, are needed.
OSCAR ACTIVITY IN SOUTH AFRICA

By Gregory Roberts, ZS1BI

OSCAR activity in South Africa, like in many other parts of the World, has shown a dramatic growth since the launch of OSCAR 7. Prior to this, few stations had operated on OSCAR 6 and very few two way contacts beyond the coastline. In fact, with my first QSO via satellite-OSCAR 7 January 1975, I established the first ZS1 (Cape) to ZS6 (Transvaal) contact on 2W with ZS6D. This is about 1000 kilometres and is now regarded as the minimum one can expect to get. An idea of the growth can be had from the number of operators heard and worked in each year.

<table>
<thead>
<tr>
<th>Year Ending</th>
<th>Mode A</th>
<th>Mode B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>1975</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>1976</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td>1977</td>
<td>21</td>
<td>27</td>
</tr>
</tbody>
</table>

Fortunately, from the QRM point of view, a good percentage of these are heard infrequently and currently there are about a dozen operators, most of them operating mobile or during the forthcoming launches of A00D and the VS satellites, a big increase is expected.

South Africa is not particularly well situated for DX contacts and most of the contacts are confined to the six ZS divisions. From time to time, DX does appear and these stations are much in demand by those stations capable of working DX. A large number of stations try with the minimum of equipment, make a few contacts and are then disappointed that they do not get the more distant stations. Those that have bothered to improve their ten metre reception find that there is more activity.

Starting towards the east, the first major land mass is Australia. Calculations for DX are possible and news items appearing in the bulletin ZS7/31 suggest that operators have made a special effort to work VK but no luck so far. It would appear that many VK operators are concentrating on the work the western passes. Continuing closer to home, the next bit of land is Antarctica and to date, only one QSO has been received from there, namely ZJ1RL at the Showa Base. This station was operational on mode A for a short while but because of losses in the satellite, it appears that this station had problems working ZS and the only confirmed contact was between ZJ1RL and ZS1BI.

The next continent is South American and once the first contact was made by PY26N and ZS1BI on mode A and B, it then became an easy contact and several ZS stations have worked PY and LY on both modes. ZS stations that have achieved confirmed two way contacts are ZR1AT (Z is the prefix for a class of licence that allows operation on 2M or higher, hence on mode B), ZS2BD in East London and ZS1BI in Cape Town. All have produced OSCAR contacts, ZS1BI from the South Island, and ZR1RMW on the Falkland Island copies ZS stations, but no two way QSO yet as VP8 is a little slow in getting fully operational. ZDR was heard several times, but no ZS two way contact was made as ZDR abandoned OSCAR after only a few passes.

Northwards is the vast continent of Africa, but because of the technological level of this area, OSCAR contacts are rather rare and the vast majority have been the results of foreign operators to the continent; i.e., missionaries and doctors, or others temporarily located in Africa because of salt mine work. OSCAR stations have appeared in Senegal (6W2KZ), Ivory Coast- many in this case as a result of the fine work done by OM Ruch, T22EF who has now moved to PY land. Ghana was active for a short while, as was Cameroon, Kenya, Sudan, Zambia, Rhodesia, Uganda, and Togo. Contacts northwards out of Africa are somewhat difficult on account of the Southern Hemisphere effect. Things are even more difficult because few northern stations operate mode B. However, the record ZS DX contact was made on mode B between 6B1CD and ZS1BI, about 7885 km. ZS6BNT has been the only ZS station to work Italy- mode B, and ZS6HS has worked Israel on mode A. ZLFAAM at the top of the Red Sea has been heard on mode B by ZS2BD, ZS6HS and ZS2BD. India has been heard by ZS6JW but no two way QSO to date as the Indian station spent all the available time in calling CQ (in CW) and not listening for replies. With a bit of mumbling, it should be easy for ZS5 and ZS6 land to get India. Several DX stations report having heard various ZS stations, e.g. Gibraltar, Sultanate of Oman and Israel report copying ZS1BI on mode A, but a two way contact is virtually impossible.

Despite this lack of real DX, several ZS stations are working for various OSCAR awards and to date, the African stations have won the OSCAR 1000 award, namely ZS6JX, ZS1BI and T22EF. The following additional stations are not too far away from achieving this award, namely ZS6HS, ZS6JW, ZS5JF, ZS6BOQ and ZS2BD.

All active OSCAR operators in ZS receive computer printout data for their individual locations. This information includes rise and set times, as well as beam. Special DX bullets arrange the time to be contacted for a given time. This program was written by ZS1BI in Fortran and is run on a Data General Nova 1220 computer. Input data is NASA two line orbital elements and any satellite orbit can be handled, including the Phase III type, as eccentricity and drag, for example, are strictly taken into account.

Most of the communication place on sab with some cw. RTTY and SSTV are very infrequent and ZS6BNT and Z53HM are the only ones achieving a two-way SSTV contact. FM is never used and the "no operation" on Wednesdays is well observed. High power operation is infrequent and the major stations run rigs like the Yaesu FT220, FT221, Multi 2000, Multi 2700, etc. On mode B, the most common transverter is the Microwave modules unit. One or two stations do operate in excess of about 500 W ERP, but their operation is infrequent and I have become somewhat unfriendly with the high power users as I have dared to tell them that they are running too much power. Generally, the cooperation is good and I do not think that other world-wide OSCAR users need worry about poor operation here in South Africa.

Publicity for OSCAR, and AMSAT, is provided in several ways. OSCAR is a very frequent subject of conversation on the two metre FM and SSB nets and generally excellent coverage is given to amateur space communication. The WFP net is held every Saturday at 1100 GMT on 14,280 MHz on USB and ZS1BI is net control station. Attendance fluctuates between four and a dozen, but there are many listeners as can be judged from the correspondence received. Additional publicity is provided by the South African Radio League publication "Radio ZS" where news items appear from time to time. A quarterly newsletter, averaging about 10 A4 sized pages, called "OSCAR ZS" is prepared by ZS1BI and is sent to most active OSCAR ZS users, as well as several in South America. Copies are also sent to AMSAT, AMSAT UK, AARL, VEORH and to the SARL.

All in all, amateur satellite communication is in a healthy state here in South Africa. As far as we can tell, the future to the Phase I satellites. We only hope that we will be able to penetrate the QRM and high power levels used by European stations. Judging from the stories I've heard, we can expect many problems in this direction-why is it that European stations find it necessary to run excessive power? We here in South Africa have never found it necessary.

AMSAT-OSCAR 8 ORBITAL DATA CALENDAR

In cooperation with AMSAT, Skip Reymann, W6PAJ is publishing an AMSAT-OSCAR ORBITAL PREDICTIONS Calendar containing all orbits of the new AMSAT-OSCAR 8 satellite for the reminder of 1978. It should be available by the end of May.

The orbital calendar is available postpaid for $5.00 U.S. funds or 3 IRC's ($3.00 to AMSAT members, and free on request to AMSAT Life Members). Overseas orders will be airmailed. Orders and payments should be in U.S. Currency to: AMSAT-OSCAR, Box 374, Dimas California 91713 U.S.A. Orders may also be charged to VISA or Master Charge. (Be sure to provide your account number, expiration date and other information on your charge card).

Important - To speed up handling of your order, please include a gudded, self-addressed label.

Proceeds from the orbital calendar benefit AMSAT.

For those still without an AMSAT-OSCAR 7 orbital calendar, a new printing is expected to be available shortly from Skip Reymann. Prices and ordering information are the same as for the OSCAR 8 calendar.

AMSAT South African Area Coordinator
P.O. Box 9, Observatory, 7935
South Africa
and indicate the information on the note previously stamped on the front of the SASE; therefore, please check your envelope when you receive it from the bureau.

Right after the envelopes are filled, I type up a brief bulletin to all AMSAT Net Control send with all of them. However, you by listening to the AMSAT Net's you'll find out when the bureau mailing occurs.

So much for what goes on at the AMSAT-OSCAR QSL Bureau. Now for a few side notes. About once each quarter, I will notify all of the AMSAT Nets, the calls of stations with QSL cards on file, but without an SASE. As there could be up to two weeks by the time the information is collected and then received at the Net Control station, you might have already just sent an SASE to the bureau. In any event, if you have any questions about the bureau, or what you think you should on file, please drop a note to the bureau and I'll be happy to bring you up-to-date. Another use for the date stamp on the QSL cards is to tell me how long cards have been in the bureau. After the card has been on file for a year, and no attempt has been made to claim the card despite notification by the bureau, the "old" cards will be destroyed.

An important point to remember, is that you should put only one call sign on each SASE. The only exception to this will be the case of a QSL Manager for a DXpedition; N0MAC for example, will include PPR cards in his QSL cards, and W6GFL and W6GDC cannot be on the same SASE. If you update your call sign, or change calls, please send a new SASE for the new call sign. If you move QTH's, feel free to send a new address label for your current SASE's so that the new address can be added. When you send money for forwarding DX cards, please send U.S. currency; non-U.S. stations, only, are permitted to send IRC's to cover forwarding postage.

Another suggestion: do not run your SASE through a postage meter. There is a fine print rule in the U.S. Postal regulations that prevents an envelope run through a postage meter in one area, to be mailed from another area; as strange as this seems, it is fact as confirmed by personal experience and by a ham associated with the postal department.

I have tried to touch upon the basic operation of your AMSAT-OSCAR QSL Bureau. The bureau is here for all the users of the OSCAR satellites and will handle any amount of QSL cards that you wish to send. By the way, we will return any card sent that is for a contact on any band other than via OSCAR. So far the traffic averages about 1,000 to 1,200 cards per month, but will handle more. Let us all get in the habit of telling the stations we work via the satellites to QSL via the AMSAT QSL BUREAU!

HP 67/HP 97 OREIT PROGRAM

By Roy Welch, W6DL
AMSAT QSL Coordinator, Missouri

The program will run in either of two selectable modes: Real Time and Batch modes. When run in Batch mode, the program will display Azimuth and Elevation of ground station coordinates to an orbiting satellite such as OSCAR 7 and A-O-D. The program will remain stable until the R/S Key is depressed. The program will then select a time two minutes later and display new coordinates. The Batch mode is for use when one wishes to make listings of AZ/EL information for various equatorial crossings.

The Real Time mode allows one to enter the longitude of the Northbound (ascending) and Southbound (descending) satellites and current clock time and current clock time, respectively. The program will then begin to display current AZ/EL coordinates and update them for new coordinates at one minute intervals. Calculation takes about 21 seconds. The remaining 29 seconds of each minute are used to output (logging). This mode is useful in that it eliminates the pre-orbit AZ/EL pencil labor. Either mode can be used with clock time input or the simple "minutes after NNN" approach to set the time factor.

I will be glad to furnish a copy of the documentation to anyone sending me a SASE (large size please) to 908 Dutch Mill Dr., Manchester, MO. 63031. I will also answer any questions concerning the program.

I've got another program already written and tested for the Phase III elliptical orbits, but don't have it documented yet.

P.S. I will also record on the program a blank program card if one is sent with the SASE.
UPDATE

There was no mailing in January. This was due to lack of time. The basic hardware and software have now been completed and two prototypes built. One uses a full hardware front panel and was shown in the last Newsletter. The second has no front panel controls at all except for an I/O port, Boot and Reset Switches.

ANSWERS TO COMMONLY ASKED QUESTIONS

1. The hardware uses the S-100 Bus. If you have an S-100 Bus System, hardware should work without any changes. If you do not have an S-100 Bus or an 8080 based microcomputer and you want to use project hardware, you will have to take care of any hardware modifications.

2. The only software that we have available is that which is announced in this publication.

3. We cannot design your system for you. Designing by mail for people with technical abilities that we know nothing about does not work. A computer is expensive. We’d rather not get into a position where we recommend an expensive investment that will not work because of a misunderstanding. Join a local microcomputer club and get the help you need there. Then, for economical reasons, get your hardware and software at discount prices via the GPP.

AMS-80

The AMS-80 debugging routine and I/O handlers is now available for release. It is currently at version 5.7. It is a comprehensive program and comes in two sections — standard and custom. The standard section is the same in everyone’s system. The custom section contains the command table and I/O routines for the system. If you wish to obtain AMS-80, see the GPP update section for details, but you must supply us with your I/O device driver routine(s) if you wish us to program them for you. We can program 1702A and 2708’s or supply a paper tape in object format, as well as the paper listings.

SYSTEM DESIGN

The AMS-80 project is designed as a hardware-software system. If you already have a computer, AMS-80 software can be overlaid on it easily. If you have another 280 or 8080 system, the software will still run, if you use AMS-80 as your I/O controller and driver. If you do not have a system, you can put one together using GPP parts. You will need two circuits that are not standard as follows:

1. MEMW generate

2. JUMP ON RESET to FOOO (hex).

Circuitry to implement these functions are shown below and can be built up on a wire-wrap or a 10-2 card. Some S-100 cards available have these features and may be used. You can assemble as large or small a system as time and finance permit; but once you are up, you can do things with it.
Also available are: Basic boards, with or without clocks, in kit or wired form. S-100 edge connectors with spacing for IMSAI, WT-1, Thinkertoys, e tc. Boards (but NOT Altair). Specify if you must have wire-wrap, otherwise we will ship either wire-wrap or solder tail at our discretion. 1702A's --- Intel, AMD etc., prime and virgin. 2708's --- Signetics, Intel, etc. prime. 2102A's --- Prime, 450nS. 2102A's --- Prime, 250nS. TI tin-plated solder tail sockets in 8, 14, 16, 22, 24, 28 and 40 pins.

For ordering information, send an SASE to:

Computer Project-GPP,
c/o T. Clark, W3NNI
6388 Guilford Rd.,
Clarksville, Md 21029

Amsat operating awards

Each year for the past three years, AMSAT has introduced a new satellite operating award. Awards currently available are the AMSAT Oscar Award (AOA), the Oscar Sexagesimal Award (OSA), and the newly created Oscar Century Award (OCA). The objective, in all cases, is to establish and confirm two-way QSOs with different stations via any amateur radio satellite. The basic counting QSO-elements are as follows: US states, Canadian call-areas, and other countries. The AOA, OSA, and OCA certificates are issued for 20, 60, and 100 QSO-elements, respectively. In addition, endorsements are available for the AOA in 10 QSO-element intervals ranging from 30 to 90. (To date only three OCA's have been issued, recipients being G3GR, W2CZV, and W3NNI.) Interchangeably, the AOA can be obtained by establishing and confirming two-way amateur radio satellite QSOs with 6 Australian call-areas and two other countries, or with 8 different Japanese call-areas and four other countries, or any other requirements as specified by the AMSAT Board of Directors. Generally QSL cards or other written confirmation of contacts must be submitted to verify the QSO-elements claimed. However, in lieu of such QSL cards, applicants may submit a list of contacts confirmed by the awards manager of their national amateur radio society or AMSAT affiliate organization. Approximately 80% of QSO credit may be claimed for AMSAT issued awards and endorsements. All contacts must be made from the same QTH, i.e., within an area of 40 km (25 miles) from any given location. The awards are free to all AMSAT members, so be sure to specify your membership number upon application. However, sufficient postage must be supplied for the return of QSL cards. A service charge of one US-dollar ($1) is required for the AOA, $2 for the OSA, and $5 for the OCA, for all non-AMSAT members.

All awards are available from AMSAT Awards Manager, PO Box 27, Washington, DC, 20044, USA; alternately the AOA and 10 element endorsements may be obtained from any of the following area award managers: DC9DX, F6BEG, GBKLO, OZ1WL, SP9OH, VK5EI, and ZL2GR.

AMSAT award status 31 Dec 1977

The following stations have qualified for AMSAT operating awards. Have you?

OSCAR SEXAGESIMAL AWARD

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YOU... AND AMSAT PHASE III

An exciting new era in amateur radio is about to begin—the era of AMSAT PHASE III OSCAR satellites.

The AMSAT PHASE III satellite program promises a continuing demonstration that amateur radio is at the forefront of modern technology. PHASE III satellites will routinely provide reliable communications over paths of up to 11,000 miles (17,700 km) for 17 hours each day. You can think of them as a resource equivalent to a new band.

The cost of these PHASE III satellites is a projected $250,000. Commercial satellites of similar performance would cost nearly $10,000,000.

Your help is needed to put these PHASE III OSCAR satellites in orbit.

Your valued tax-deductible contribution can be as small as one of the 5000 solar cells needed. A handsome certificate will acknowledge the numbered cells you sponsor for $10 each. Larger components of the satellites may also be sponsored with contribution acknowledgments ranging to a plaque carrying your name aboard the satellites. Call or write us for the opportunities available.

Your membership in AMSAT is important to the satellite program, and will give AMSAT a stronger voice in regulatory matters concerned with satellites. At $10 per year or $100 for life, you will be making a most significant contribution to the satellite program and the future of amateur radio. You will also receive the quarterly AMSAT newsletter.

Editor: Joe Kasser, G3EZE, 11532 Stewart Lane, Silver Spring, MD 20904, U.S.A. Telephone: (301) 622-2194.

Subscription Price: $6.00 per year, inseparable from $10.00 membership dues.

Opinions expressed by contributors do not necessarily reflect those of AMSAT.

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Copy Deadline for next issue is 1 Aug. 1978

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Administrative Assistant: Martha Saragovitz

COVER PICTURE

The OSCAR poster now available from ARRL Headquarters is shown by the lovely Norma Moran who used to type the Newsletter.

INTRODUCING MARTHA - AMSAT'S ADMINISTRATIVE ASSISTANT

If you've had occasion to telephone the AMSAT Washington office in the past several months and been greeted by a friendly female voice, then chances are you know of Martha Saragovitz, AMSAT's Administrative Assistant.

Martha joined AMSAT fulltime in January after ten years as a Supervising Teacher with the Head Start Program. She has helped significantly to reduce the burden of paperwork on AMSAT's volunteer and paid staff. Martha's responsibilities include handling the large volume of AMSAT mail, and processing of membership renewals, life membership and follow-up notices. She also does most of the AMSAT bookkeeping and accounting, and also AMSAT typing, including the typing and distribution of AMSAT Newsletters.

A native of Washington where she has an apartment near Dupont Circle, Martha describes her interests this way: "I enjoy the ballet, theatre, travel and reading. I hope to continue to use my background in education by doing volunteer work."

MAILING OF NEWSLETTERS

We hope everyone has been receiving their AMSAT Newsletters on time and in good shape. Unfortunately, with ever increasing postage costs, it now costs 75¢ to airmail a Newsletter to Europe or South America, and 86¢ to send one to Africa, Asia or the Pacific. By comparison, it only costs 65¢ to send one Newsletter to one of our members in the United States. Our postage bill for the March Newsletter was around $800, nearly all of which paid for our members overseas.

As a result of these escalating costs, the AMSAT Board is taking another look at whether we should revert to sea-mail for sending Newsletters overseas at a cost of about 4¢ to 5¢ per copy. For those preferring to receive their Newsletter by airmail, we would probably request a contribution of another 5¢ per year. This is now done with many other magazines.

Members are invited to comment on this proposal. Wouldn't $3,000 a year trimmed from our postage bill be better spent for Phase III spacecraft hardware?

AMSAT POSITION OPENINGS

AMSAT has openings beginning this summer for one fulltime aerospace engineer and one fulltime aerospace technician to work on the AMSAT Phase III spacecraft project. A good practical background in construction of electronic subsystems is required, including good mechanical design ability.

Assignment will be at the new AMSAT-OSCAR Spacecraft Laboratory at the Goddard Space Flight Center, with possible short-term assignments in support of AMSAT-Deutschland in Marburg, Germany and the Phase III-A launch team in Koror, French Guiana.

Please contact Perry Klein at AMSAT Headquarters if you know of someone qualified who might be interested.
**TWO METER TRANSMITTER FILTER FOR MODE "J"**

By Joe Reisert, WJZR
17 Mansfield Drive
Chelmsford, MA 01824

Many OSCAR 8 Mode J users have been experiencing receiving difficulties due to a large number of birdsies appearing on the 435.1 - 435.2 MHz downlink when they are transmitting between 145.8 and 146 MHz on the uplink. This is most often due to overloading and intermodulation in the 70 cm converter due to the proximity of the third harmonic of the uplink transmitter (viz. 437.7 - 438 MHz).

There is very little that can be done to the receiving converter without using elaborate filters and high dynamic-range circuitry. However, most of the birdsies can be eliminated by properly filtering the output of the two-meter transmitter to minimize any third harmonic output.

In my case, I could detect about a dozen such birdsies varying from just above the noise to 20 - 30 dB over the noise. Operation on the 435.10 - 435.2 MHz downlink was almost impossible. Then I added a simple (see Figure 1) 5 element half-wavelength type of low-pass filter on the two-meter transmitter (a homebrew transistor amplifier operating class B with 40 watts maximum output). There was an immediate improvement with only two weak and three moderate (10 - 15 dB over the noise) birdsies. Needless to say, the results were dramatic.

The filter used is not an ordinary low-pass type. It exhibits the characteristics of a to 2 dB ripple Chebyshev design over the 135 - 150 MHz band. The cutoff frequency is typically 250 - 275 MHz, and attenuation is greater than 10 dB on the second harmonic (292 MHz) and greater than 50 dB at 438 MHz. Therefore, this design is only recommended for two-meter use.

**Construction:**

For optimum performance, the filter should be built into a shielded box as shown in Figure 2. Double-sided printed circuit board is recommended as a suitable ground plane and also eases soldering to C1 and C3 easier. Note that solder should flow on both edges of C1 and C3 for lowest loss and VSWR. Also provide a ground strap between J1 and J2 to the top side of the printed circuit board as shown. This will further reduce harmonic output.

**Operation:**

Tuneup is simple since the filter has a broad bandpass. First set C2 to minimum capacitance and place the filter between the transmitter output and a power output or VSWR meter. With the transmitter tuned to 146.0 MHz, increase the capacitance of C2 until power output is maximum. Caution: do not exceed 50 watts output (more than enough for OSCAR 8 Mode J operation) since the components are not rated for higher power levels. Retuning for 144 MHz operation should not be necessary as the filter bandwidth is quite broad.

If you are fortunate enough to have access to a spectrum analyser, you can tune C2 for minimum output at 438 MHz. This, however, may cause additional loss at 146 MHz. If so, the transmitter output circuit may be readjusted to compensate for the mismatch.

**Performance:**

The 435.1 to 435.2 MHz spectrum will be much cleaner when using the described filter on your two-meter transmitter. Always use the least possible transmitter power, since this will also lower the third harmonic level. Additional separation between the two-meter and 70 cm antenna should also help.
A NEW TRANSPLIER FOR AMATEUR SATELLITES

By Piero Moroni, ISTOJ
Via Cossadera 10
50129 Firenze, Italy

FOREWORD

A group of amateurs, ISFILN, ISKEK, IS8XXN, and ISTOJ have designed and built a breadboard of a transponder which is an improvement over those now used aboard AMSAT OSCAR 7 and 8. The Italian Amateur Radio Association (A.R.I.) has financed the work. A transponder of this type will be flown from Sicily to Spain this August aboard a balloon at a height of 49,000 meters. The main drawback of the AMSAT OSCAR 7 and 8 transponders is that the receiver AGC is derived from the transmitting section output level. Thus the signals arriving at the satellite from the strongest stations are using most of the transmitter available power, while the weaker stations are relayed with a "down in the noise" signal. Relaying all stations at the same power is the ideal state. Amateurs have always worked to improve their signals and it is very difficult to realize that for satellite work, one should decrease the output power when receiving one's own relayed signal at good signal strengths. With INAGE III OSCARs receiving an entire hemisphere at the same time, the situation will be even worse.

The new transponder uses this basic idea. If we divide the bandpass into a certain number of independent amplifiers, each with its own AGC, a very strong station going through one amplifier will take the same amount of output power as a weak station going through the adjacent amplifier.

![Figure 1 System Block Diagram](image)

**DESCRIPTION**

The block diagram is shown in Figure 1. The received signal, in our case 144 MHz, is amplified and down-converted to the I.F. value 10.7 MHz. Here are three identical amplifiers centered at 10.677, 10.688 and 10.700 MHz. The amplifier passbands are determined by crystal filters; their bandpass curves are shown in Figure 2. The amplifier schematic diagram is shown in Figure 3. The input signal is amplified by a transistor loaded in such a way as to present the specified impedance to the crystal filter. The source follower FET separates the filter from the following stage, whose input impedance changes with the AGC level. AGC action is obtained by forward biasing these two transistors. The AGC circuit employs a PNP rectifier and DC amplifier, followed by an emitter follower. The diode on the PNP emitter gives the delay threshold. Each amplifier has exhibited the following performance:

- Gain: 67 dB
- AGC threshold: -77 dB
- AGC dynamic range: 50 dB
- Output level, above the AGC threshold: -10 dB

![Figure 2 Bandpass Characteristics](image)

**PERFORMANCE**

The complete transponder has been tested in the configuration shown in Figure 7. The outputs of two signal generators summed by a two-way combiner, were applied to the input; its output was connected, through a 30 dB attenuator, to a spectrum analyser. The output frequencies of the two generators have been adjusted to fall in the passband of two amplifiers. Then the output levels of the transponder were recorded with different generator output signals, as shown in the following pictures.

Figure 6 Shows two -109 dBm signals at the transponder input at 144.174 and 144.211 MHz. The output signals are respectively +6 and +8 dBm and operation is below the AGC threshold.

Figure 7 The generator frequencies are now 144.184 and 144.2 KHz and they fall in two adjacent I.F. amplifiers. The first generator output is -109 dBm, the second is -99 dBm. The corresponding outputs are +13 and +20 dBm.

Figure 8 With the same frequencies as above, the first generator is still at -109 dBm and the second one at -79 dBm. The outputs are respectively +8 and +19 dBm. The input difference of 30 dB is reduced to 15 dB; the first amplifier AGC is not yet activated.

Figure 9 Same frequencies as above. Both generator outputs are -99 dBm, to have the AGC working in both amplifiers. The outputs are respectively +19 and +20 dBm. Third order intermodulation distortion products are about 30 dB below the PEP.

![Figure 3 Amplifier Schematic Diagram](image)

![Figure 4 Up-converter Schematic Diagram](image)
CONCLUSION

We believe that a transponder using this principle could give improved performance over that of the existing OSCAR transponders. We would like to thank MISTRAL of Sermoneta (Latina), who built (at no cost) the adjacent bandpass crystal filters for the I.F., and ARS-Electronics (IWSAIP) of Scandicci (Firenze) who donated some of the components used in the circuits.
AN INEXPENSIVE AMSAT-OSCAR MODE "J" RECEIVER PREAMPLIFIER

By Joe Reisert, W1JR
17 Mansfield Drive
Chelmsford, MA 01824

Introduction

Now that AMSAT-OSCAR 8 has been launched, many users are discovering that their receiving converters lack sufficient sensitivity (have poor noise figures) to hear the Mode J signals. Most of this deficiency can be overcome with a low-noise preamplifier added ahead of the existing receiving converter. Such a unit, which is inexpensive, easy to build and will compete quite favorably with more expensive devices and circuits will be described herein.

Preamplifier Description

This article will not dwell on the AMSAT-OSCAR 8 Mode J output, etc. Suffice it to say that a reasonable 435 MHz antenna gain of 10 -15 dB, a feedline loss of 2 - 3 dB maximum, and a noise figure of less than 3 dB should be sufficient for most operation. A lower noise figure will further improve performance, but a point will be reached when it will no longer be "cost-effective".

The preamplifier to be described is an inexpensive version of the "Ultra Low-noise UHF Preamplifier" (Ref. 1), a unit which has been used worldwide, especially on 70 CM EMG. The original circuit used a $46.00 transistor which is no longer available but yielded a 1.25 dB typical noise figure with 15 - 16 dB gain. By making a few small circuit changes, a less expensive transistor can be used. The Motorola MRF 904 costs approximately $2.00 and in the modified circuit will yield a typical gain of 12 dB with a noise figure of 1.75 dB. The Motorola MRF 901 (and probably the MRF 911) now cost approximately $1.50 and will yield a typical gain of 14 dB with a similar noise figure. The latter device used to cost between $6.00 and $9.00.

Looking at the circuit in Figure 1, you will note the similarity to the original circuit; the zener diode biasing, hot carrier diode input protection and the simple matching. The MRF 901 and MRF 904 transistors did not require any input inductor for noise figure matching. By using an output network as shown, the gain on these devices was increased and the frequency response was shaped for a broad (350 - 450 MHz) peak response, but with essentially 0 dB gain at 144 MHz (the original circuit had almost a flat response from 20 - 450 MHz).

As in the original article, the preamplifier should be constructed with the components as shown. Failure to use the hot carrier diode (do not substitute germanium or silicon switching diodes) will increase the noise figure and could lead to destruction from stray RF or electrical discharge. A simplified RF choke is also shown. The 5.0 pf output capacitor is tailored with the 20 ohm resistor and L2 for peak performance at 420 - 450 MHz and substitution of other values is not recommended if adequate gain and stability are to be attained.

Note the lead configuration on the MRF 901 and 904. Do not ground these devices with extremely short leads. The extra lead inductance as shown will improve stability and input VSWR and will be described in detail in a forthcoming article. Other transistors may be used, but the author will not guarantee similar performance. Don't forget the 0.1 mH bypass on the +12 volt line since it bypasses any stray RF (such as a local RF tx transmitter) which could lead to catastrophic burnout.

Construction

The preamplifier should be built into a small (2¼" X 1¼" X 1¼") shielded box such as the Pomona 2417 type. Since extremely low noise figure is not required, BNC coaxial fittings are usable but "UHF" or "BNC Phono Jacks" are undesirable. Use of a double-sided printed circuit board held to the box cover with the coax connectors is recommended for construction. Additional details are provided in the original reference.

Performance

From the response of those who have duplicated this preamplifier, the improvement in reception is overwhelming. Generally speaking, no additional filtering is required. However, if you live in a high RF environment such as UHF television transmitter etc., an input filter may be required and the one in the original article is recommended. Also, never use a power supply which also serves as a source supply for relays since the spikes can destroy the transistor.

One final note: If correspondence with the author is required, an SASE or IRC's with a minimum of questions would be appreciated if an answer is desired.


INEXPENSIVE 70 CM LOW-NOISE PREAMP WITH MRF901 OR MRF 904

Ref: Ham Radio Magazine, March 1975
Gain: 12 - 14 dB Typical
Noise figure: 1.75 ± 0.25 db

C1 = 50 pf dipped Mica
R2 = 20 ohm, 1/4 Watt
C2 = 5.0 pf dipped Mica
CR1 = Hewlett Packard 5082 - 2810 or equivalent hot carrier diode
CR2 = 6.2 volt zener diode, 1N4735 or equivalent
L1 = Deleted
L2 = 3T #24 on 1/10" TD Space Wire diameter
RFC1 = 0.47 mH Mytronics decoupler or 1ST #32 AWG enamel covered copper wire on 1/10" TD spaced wire diameter

Notes: 1 Mount transistor as shown in Figure A with leads just touching pc board (see text).
PHASE III PROGRESS REPORT
By Jan King, W3GEY

Considerable progress has been made on the satellite and ground equipment; however, all of us are beginning to understand and appreciate the problems associated with developing a spacecraft some five times more complex than AMSAT-OSCAR 7. It's really quite a big project. The following is a summary of our progress and problems to date.

ESA/AMSAT and ARIANE

On March 22, 1978 the European Space Agency (ESA) conducted a payload interface meeting involving launch operations as well as integration of Phase III to the vehicle. It was mandatory that AMSAT send a U.S. representative. The meeting was held in Toulouse, France and Karl Minter, DJ4EC and myself attended. Many of the detailed interfaces to the ARIANE vehicle were discussed and many safety items relating to our kick motor (as could be expected) were reviewed in detail. I am happy to report that AMSAT's scheme for firing the motor and for "keeping it safe" while on the launch vehicle were accepted by ESA. This is important because other proposed schemes would have cost AMSAT several thousand extra dollars and would have increased the satellite weight by about 3kg. ESA announced during the meeting that there is some chance that the launch could be advanced by one month, to November, 1979. This would make an already tight development schedule even tighter.

During the visit to ESA, Karl and I were able to see a considerable amount of hardware. Perhaps the most impressive to me was the one-third scale model of the upper stage of the ARIANE rocket for launch test flight L02, including all the satellites. A complete scale model of Phase III was mounted at its appropriate place on the side of the larger mock-up. A message I came away with from this meeting is that ESA is not taking any chances. No launch vehicle is going on schedule and based on the things I saw, it's going to be reliable.

Phase III Ground Stations and USPS

Ground operations for the Phase III launch are far more demanding than those needed for Phase II satellites. For this reason, ground equipment needs to be finished well ahead of the satellite. Since Randy Smith, VE3BAT, will be away on extended leave during the first part of the Phase III-A mission, John, W6LER and Ron Dunbar, W8FBN, together will be prime command and telemetry stations for Phase III. Randy will join us in his return. Located approximately 200 miles apart, Ron and John will have a truly redundant system. Each ground station can back up the other. In fact, each can control the others station from his own location via telephone or radio link. The Minnesota team expects to complete their ground station checkout by this fall and begin a one-year training period in preparation for the launch. Included will be several simulations of the launch day.

In order to facilitate writing software for the new spacecraft, Karl, DJ4EC, has developed a high-level language software for the RCA CPR-1802 processor and the 8080's which will be used at the ground stations. This language, known as I.P.S. (for a German acronym) is a structural language which means language available to its members as a part of Phase III package which will also include printed-circuit boards needed for demonulating the engineering beacon telemetry and interfacing to a microprocessor, as well as needed documentation. We still have a way to go before this can be done.

Ron, W8FBN, recently went to Germany (taking along and bringing back an 8080 system) to visit Karl and complete needed documentation to interface IPS to the 8080 system he and John, W6LER, are using. This visit also served to bring Ron up to speed on all the engineering details on the Phase III spacecraft.

AMSAT-OSCAR Spacecraft Laboratory

On May 5, 1978 NASA and AMSAT signed a contract to jointly pursue a project that will allow AMSAT to construct our new Phase III satellites. In return, AMSAT will demonstrate to NASA visitors our approach to low-cost aerospace construction. The facility, about 700 square feet in area, includes an integration area, an assembly laboratory, a much-needed storage area for high reliability components, and an office area. The building should be ready in August and will be dedicated at our Annual Meeting on October 14th.

Phase III Spacecraft

A) Structure - More than any other part of the spacecraft, the structure has undergone an evolutionary process. After a number of preliminary concepts were discarded and two different models were built, a structure known as the ETU (Engineering Test Unit) was built in West Germany. The structure was then sent to the U.S. where a "dummy" kick motor and wooden modules were installed to simulate the flight spacecraft. In December of 1977 the ETU was sent to Cal. Tech. Jet Propulsion Lab in California where it was subjected to vibration qualification tests at levels specified for the ARIANE vehicle. While the structure passed the tests successfully, a number of changes were suggested by the test results. These changes are now being incorporated into the final design and materials are being ordered in preparation for assembly of the flight structures (two will be built). In the meantime, the ETU was returned to AMSAT-DL for inclusion of engineering model electronic modules. The completed ETU will then be sent to ESA for further testing starting in September of this year.

B) IUH - of the electronic systems in Phase III, the Integrated Housekeeping Unit (IUH) is the most tested and ready for flight. The IUH which contains the COSMAC microprocessor has been tested at the prototype level for many thousands of hours. The command decoder and telemetry encoder schemes have been tested in prototypes with CDP-1801 COSMAC while located at a remote repeater site (60 miles distant from the control site). The results (in terms of bit error rate) are extremely close to the theoretically predicted performance. With the ever-improving technology in CMOS devices, it now will be possible to fly 16K of RAM memory in the flight IUH instead of the originally-planned 2K of memory. Features have been added to the IUH to allow range measurements to be made via the command and telemetry links, and to allow retransmission of the results of range measurements from one command station to another, again via the IUH.
C) Power Subsystem - AMSAT is presently working with NASA and NOAA to obtain 48 battery cells from the T701 satellite program (enough cells for several spacecraft). In addition, some 10,000 solar cells may also be obtained from the same source. While the cost of the cells is itself high, even if the cells are donated the cost of the cover slips and fabrication will still amount to approximately $1/cell. (Those members who sponsored solar cells take note - at $10.00 per cell (assembled) it's a bargain!) We should know the prospects of obtaining this leftover hardware by the time you read this.

The battery charge regulator (BCR) for Phase III is very similar to that flying in AMSAT-OSCAR 8. Although A-O-8's BCR is less sophisticated than that for Phase III, it verifies the concept of converting power from 28 volt solar arrays to a 12-14 volt battery system which is the same for both satellites. In Phase III, the BCR and all other DC-to-DC converters will be contained in a single power module.

D) Attitude Control Subsystem - The concept that makes Phase III so different from previous satellites is that it has an "active" attitude control system. This difference is quite profound. While former satellites were mere "boxes with electronics inside", this spacecraft is a robot which can be instructed to assume any attitude we choose in space under remote control and it can tell us when it gets there. We have one constraint with our robot though: it wants to spin about one axis. In fact, with the IHU, we may store nearly any number of motions of the spin axis for execution at a later time or under a certain set of conditions.

The components for this system have now all been selected. One "eye" of the robot is similar to a sun sensor used previously on another NASA mission. This sensor tells the spacecraft where the sun is in relation to the spin axis and when the sun passes by one of the three arms. The second "eye" is an earth sensor which gives the relationship of the earth to the satellite at various points in the orbit. The earth sensor is being developed by DJ42C with components provided by Leitz, a West German optics manufacturer. The force applied by the satellite to cause it to obtain the proper attitude is via interaction of the earth's magnetic field with a large magnetic torquing coil network aboard the spacecraft. Most of the electronics required in this subsystem is to interface these components with the IHU. Many of the logic operations which were once handled by discrete logic controllers can now be performed by the software. A prototype of the torquer coil assembly and the earth sensor are now being assembled in West Germany.

The remaining component in the attitude control system is a fluid damping system: it consists of small tubes partially filled with a viscous fluid, and will stop any nutation (wobble) of the spin axis in a matter of seconds. Prototypes of these tubes have been built and tested and are being incorporated into the IHU.

E) Transponder - The 50-watt version of the 70cm to 2M transponder is still in broadcast at AMSAT-DL. Werner Reis, DJ2JK, has completed the design of the front-end and I.F. stages and is working on the lowing down on the power levels required for the uplink. Unfortunately, with its current problems, it is presently apparent that the first Phase II spacecraft (Phase III-A) will carry both frequency combinations as had originally been hoped for. The 70cm-to-2M transponder was chosen for development first because it provides better link performance. The 2304 MHz S-Band beacon is likely to be dropped for the same reason and because no allocation can be assured until the 1979 World Administrative Radio Conference.

One particularly continuing problem associated with the transponder has been solved. Until recently it was not possible to find a good quality crystal filter with a bandwidth of 350 kHz. AMSAT members have approached the Japanese firm which provided the filter for the A-O-8 Mode C transponder regarding this problem and they can provide a 350-KHz bandwidth filter to AMSAT specifications.

F) Antenna Subsystem - The antenna system is indeed a very critical system to proper Phase III performance and more work needs to be done in this area. A computer model for predicting antenna patterns for Phase III has been developed by Tom Clark, W3IFA, and W3BIK. With this model, we can predict that one antenna system at the end of the arms could not be used on two meters as well as 70cm. It is now felt that a separate 70cm antenna will be placed along the spin axis of the spacecraft on the end opposite the motor. A one-third scale model of Phase III was recently constructed by Bill Hodsk, W2UDD, so that detailed antenna pattern measurements could be made. These measurements are planned to take place in the next few months at NASA so that flight antennas may be built from this data.

Summary
To date, I feel we have made reasonable progress on Phase III, particularly considering the many other activities in which AMSAT has been involved. We have, however, a long way to go and not much time is left. I would like to personally thank all those who have so generously donated to the Phase III effort and those who have offered their technical help. For those in the latter category, please be patient. Very little of the design information for "production" of the flight electronics has been released by AMSAT-DL. Much of this documentation is expected very soon and we will try to give some work to everyone.

BOOK REVIEW: HR REPORT
By Perry Klein, W3PK

For those not familiar with it, "HR Report" is a four-page weekly newsletter published by the Ham Radio Publishing Group, publishers of "Ham Radio Magazine" and "Ham Radio Horizons." It's mailed each week via first class mail to subscribers in North America and via air mail to overseas subscribers. We mention "HR Report" here because of its substantial coverage of AMSAT-OSCAR activities. Each week it includes a page of news or so for AMSAT news. This will come as no surprise, as the editor is none other than Joe Schroeder, WB4UV, AMSAT Area Coordinator, AMSAT Life Member, and an avid OSCAR satellite user. Joe checks into the 3850 KHz AMSAT nets each Tuesday evening (held at 0100, 0200 and 0300 UTC Wednesday through Saturday) and a good source of the latest satellite information, in addition to the usual "HR Report" appearance in subscribers' mailboxes the following Monday, a mere six days later!

AMSAT has been criticized by some as not communicating efficiently with our members. Since the "AMSAT Newsletter" is only published quarterly and relatively few members can participate in the AMSAT nets, "HR Report" certainly fills a need in support of the satellite program. Issues typically include reference orbits for AMSAT-OSCAR 8 and the latest OSCAR DX information. Here's a sample of satellite news from the May 12, 1978, issue (No. 201) of "HR Report":

(Continued on Pg. 31)
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AMSAT REPRESENTATION AT THE IARU REGION 1 CONFERENCE
AT MISKOLC-TAPOLCA, HUNGARY

By Pat Gowen, G3IOR

Our members will need no introduction to the work and planning performed by the International Amateur Radio Union, which has been acting on behalf of the interests of the world community of Radio Amateurs so successfully for so many years.

What may be less well known is that IARU Region 1 has been supporting the AMSAT-OSCAR programme also, by a regular input of much needed financial support, and by my acting as a Region 1 Secretary, G3YVS, as is a keen and active member of both AMSAT-USA and AMSAT-UK.

As normally only national societies could be directly represented, but, thanks to the Radio Society of Great Britain, I was invited to attend the conference April 24-28 in my capacity of both Chairman of AMSAT-UK and as a director of AMSAT by being accepted as a member of the EGEB delegation, so that papers on satellite matters could be presented and adequately discussed. Thus, it transpired that four papers dealing with the needs of OSCAR users were contributed through the medium of our National Society for inclusion in the agenda to be discussed at the North-Wing Hungary venue, where the Magyar Rádióamateur Szövetség were our hosts.

As yours truly had booked an early flight, which are so much cheaper during the week, to cut the costs to a minimum, it transpired that armed only with an杭/QTHA dictionary, two suitcases mainly of literature and some Hungarian currency, arrived at Budapest Airport, to try to find a means of getting to Miskolc-Tapolca which is close to the CA-OK border. Let it be said at this point that the Hungarian language bears no relationship whatsoever to any other European tongue, as there is no Latin, Tuononic, Serbian, Croatian or other root. It soon became apparent that smatterings of English, French, German, Sorbo-Croat, Italian and Spanish were of no value, but by some incredible luck the Railway station, correct ticket office, the right ticket, correct time and platform hence train, and allowing point were found, and the Hotel Jeno soon after. The full and tragic story could be related at a future date. Being well known, after a series of room changes, we settled in till the following day to meet arriving guests.

Delegates were present from VE, W, 7X, A9, 1, 3A2, LI, OK, OE, DL, YO, 4EX, TP, EE, KA, SN2, LA, OE, SP, P, DM, LX, DA, G, OH, SM, ON, HB, and PA, filling the entire hotel, and much lobbying went on.

The meeting was opened with a superb speech by Mr. Dezso Horn, Deputy Minister of Telecommunications of the Hungarian Peoples Republic, who welcomed the delegates with a speech that made one feel very proud to be a radio-amateur, and very much at home in Hungary.

The second speech was made by Mr. Butler, Deputy Secretary General of the ITU, who also involved with the ITU, who also made aware of AMSAT and the OSCAR programme, and having just returned from a visit to the satellite station of RGSBME at the Technical University of Budapest where he was impressed by a demonstration of a faultless orbit and being 'off the cuff' to his carefully prepared speech his appreciation of the work being performed by amateurs in our programme. Worth quoting is "...it is the duty of radio-amateurs to see that the enormous possibilities of space communication reach the general public..."

That same afternoon, the Committees started in earnest, and one of the first papers to come up was M/T 32, a long paper dealing with the needs of amateur satellites for further bands, and an increase in the present allocation of 125kHz. The two meter band to allow for the enormous increase in both the number of users and for future satellites, those with increased coverage and time available. After much deliberation, it was due to the competing interests of repeaters in the band which were well represented, the decision was deferred until after related subjects of future bandwidths, bandplans, RTTY specific frequencies, etc. had been covered also.

The need for a space allocation from 144.350 to 144.450 MHz to permit utilization of the 436-438 MHz section of the currently available band with freedom on-board or earth-station harmonics met with virtual assent, due, it was felt, to the greater representational interest of the current heavy employ of this section in Europe.

Of the topics covered by the one hundred and seven papers presented and discussed, AMSAT was included in sixty-two of them, and commented upon thirty-five. As the two committees were meeting at the same time in separate rooms, not all the papers could be covered by one individual, but those that were tied so that adequate representation was possible. Thus, we had opportunity to comment upon additional frequencies for space communication, exclusive bands, evaluation of facilities in existing bands, congestion, bandplans, linear and normal repeaters and their allocation, UHF band planning, becoming as related to OSCAR, individual space allocations on other bands, a proposal for the standardization of locator systems, sporadic E results and plans, ethics and practice for satellite communications, observation service, satellite band planning, OSCAR News service by RGSBME, EME data, Aurora forecasting, emergency services in many, many other related subjects in which the voice of the amateur satellite fraternity was both needed and appreciated.

To avoid my possible mis-interpretation due to optimism, I quote the actual wording of the official minutes on those matters affecting our mutual interest:

"Recommendation B. 2 m. band plan - Amateur Space Service.

In view of the important public relations aspects of amateur satellite activity which calls for the widening of the frequency band allocated to the space service in the 2 m. band, the following temporary measures are recommended for the coming three years:"

1. The radio-amateur satellite service will be allowed to use the band 145.8 - 146 MHz for OSCARS currently planned.

2. That although the two-meter band-plan will retain R.8 and R.9 as repeater output channels, no further repeaters should use these channels and temporary shut-down of existing repeaters should be encouraged. Where this is not possible, repeater and satellite users should make every effort to coordinate operations to minimize mutual interference.

It is expected that space allocations for higher frequencies will be allowed at WARC '79 and that future amateur satellites will move to higher frequencies where wider bandwidths will be possible."

"Recommendation H - TV Repeaters.

That concern was shown about W. German TV repeaters being operated in the 2 m. band, DARC is urged to adhere to the Region 1 band-plan, and co-ordinate the move of these repeaters and other activity to higher bands."

"Recommendation I - World Wide Location Fixing System.

That Region 1 consults with Regions 2 and 3 in order to look into the possibility of adopting a world-wide location fixing system. Also that in the meantime the QTH locator system continue to be used in Europe."

"Recommendation L - Observation Service.

That the councils of all national societies look into the possibility of the formation of a National Observation Service aimed at maintaining high operating and technical standards on the bands above 30 MHz."

"Recommendation M - OSCAR Band Planning.

Region 1 supports AMSAT's band plan proposals and recommends that publicity be given in all national society magazines to the OSCAR band planning proposals contained in M/T 30. (M/T 30 was the bandplan as recently published in OSCAR NEWS and the AMSAT Newsletter as drawn up by G3IOR and G3ZC/W3 with its reasoning and justification.)"

"Recommendation N - OSCAR Ethics and Practices.

That publicity be given, probably on an annual basis, to the correct ethics and practices (M/T 31) for satellite operating and to look into the possibility of setting up a nominal monitoring panel with reporting of OSCARS, in order to take direct action on those who do not observe the internationally agreed rules. Further, it is recommended that each national society should (a) write to offending amateurs in its own country (members or not) to point out the correct ethics and practices.

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expected of them, and (b) to report directly to other national societies any apparent infringements of the established ethics and practices emanating from that country."

"Recommendation 0 - OSCAR News Bulletins

That all Region 1 societies contribute information for the OSCAR News Bulletins transmitted from the Technical University of Budapest on 146.8, RTTY, and CW each Wednesday."

"Recommendation 0 - 2 Meter Beacons

That there should be no beacons in the CW section of the VHF/UHF bands.

All existing beacons should be moved to the beacon sub-band under the coordination of RSGB's."

Those quoted are those affecting OSCAR and the AMSAT programme directly. There are more that relate to our operations on an indirect basis also, but the inclusion of all the detail would need a comprehensive book.

Certainly, the amateur radio movement has been considerably aided by the deliberations and decisions of the conference, and the results will help our community at WARC '79. Distinct from the official capacity of the many meetings, our field was also aided by the many discussions held with the representatives of the many countries present, in helping to further acquaint them with the aims and ambitions of AMSAT and the OSCAR programme in the amateur radio satellite service that has opened a new and valuable field to the amateur-radio movement.

I would like to thank RSGB and AMSAT for their financial assistance to my travel and accommodation, the IARC for their support and consideration and for all the work and planning that went into the productive meeting, and the radio amateurs of Hungary whose hospitality and friendship were boundless.

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS

**THE AMSAT 80 COMPUTER PROJECT**

By Joe Kasser, G3ECZ

**Update**

The documentation of AMS-80 took a little longer to prepare than was expected, but it is ready now and available.

The new OR-1 board by Cybercom is available. It contains a Baudot circuit and some kluge area that can be used for MFM. It is recommended for front panel-less designs. It takes about 30 minutes to build the board.

An Azimuth, Elevation, Range and Doppler program for AMSAT-OSCAR's 7 and 8 is available in North Star Basic. It was written by Tom N3WI/WA3LMN and is yours if you send a North Star Compatible floppy disc and self-addressed stamped envelope to W3JMI.

Two prototypes have been constructed and are working. One, pictured last time, has a hardware-front panel, the second has none.

Now that the basic hardware is complete, work will begin on the software. The future is wide open.

Further issues of the Newsletter will carry group purchase plan updates but cannot carry prices. For full details send an SASE to Tom Clark, W3JMI, 6388 Guilford Road, Clarksville, Maryland 21029.

The AR-1 Amateur Radio Interface

We have developed a prototype RTTY interface card for the S-100 bus. It contains a modified ST-5 and AR-2. The modifications make it suitable for meter or scope use, inside the main frame. The card also contains an 8251 USART and a programmable baud rate generator, based on a separate crystal, but giving rates of 45.3, 50, 75, and 110 bauds. The card is also suitable for interfacing a mouse code sign to the computer. The cost of the board and documentation would be about $30.00, if ten or more people show interest. How about it? If you would like the card drop a qsl to G3ECF or W3JMI now.
WHERE DO WE GO FROM HERE?

By Ray Soifer, W2HS
66 Waldron Ave.
Glen Rock, NJ 07452

AMSAT-OGCAR 8 has been successfully launched, tested and turned over to ARRL. The bulk of AMSAT-OGCAR 8 will now go into the Phase III program. This is the It's from the end of the line that we must begin to take all that we have learned from the operation of the three Phase II satellites which could help to insure the success of the Phase III.

Of the three satellites utilizing Mode A transponders, and thus directly comparable, most users would agree that AO-6 was the best from the standpoint of downlink signal strength in everyday operation with 10 to moderate uplink power. Yet, neither its input sensitivity nor its power output, in the single-signal condition, was superior to the others. The evaluation tests of AO-6 proved, to our satisfaction, that this disparity resulted from the AGC characteristics of the newer satellites under loaded conditions. Specifically, their AGC action takes hold at too low a level and degrades sensitivity too greatly. As an example, measured downlink signals from AO-8 from W2HS were at least 20 dB lower during heavily loaded conditions than with very light or no loading.

Such a system, far from encouraging low power operation, actually accomplishes the reverse, as users resort to higher power to maintain reliable communication under heavy loading. Since users cannot predict the consequences of high power operation by others, they try to leave their own high power on at all times. As a further test, a friend of ours aimed 15 kW BEP at AO-8 during a recent pass over the midwestern USA, only to find that its downlink signal, while strong, was a full 6-unit weaker than several others. Obviously, not all the super-power users are in Europe! We always thought that the purpose of OGCAR was communication with low power and simple antennas.

This reminds us very much of the early evolution of HF SSB. Twenty years ago as K2QHM, we literally worked the world on twenty-meter SSB with twenty watts PEQ to a dipole, by participating in the then-common round-table and waiting our turn. Try doing that on twenty meters today! Propagation hasn't gotten worse, it's just that the competition and crowding have, and with them many of the operating habits.

Now, think of Phase III. In its passband of 150 kHz, it can at best accommodate a small fraction of the projected number of users if they attempt to transmit simultaneously. As has been pointed out by KH6BC, G3ZCI and others, neither shipboard nor propagation paths are providing a good margin of safety from crowding and mutual interference. If Phase III is ever to justify its considerable cost in effort and money, something has got to be done about power levels and operating habits. With a higher threshold, a 15 AO-6, would help by reducing desensitization. The AGC should be split among several sub-bands, so that a concentration of users in one sub-band would not affect the sensitivity of others. We are not dreaming, but wonder if it would be possible to incorporate some sort of adaptive filter which would automatically seek out and notch the strongest signal in any sub-band?

Second, now is the time to begin encouraging round-table and net operation via Phase III. The passband should be fully channelized, with a firm rule of no more than one station transmitting on any channel at once. So-called "emcee" and "list" operation by DX stations, while unpopular with some on the HF bands, would certainly seem to be in order for Phase III, to eliminate virtual talkovers. It appears virtually certain, to us at least, that failure to maintain strict operating discipline via Phase III would be catastrophic for all concerned.

A final "lesson learned" from Phase II operation has to do with communication. During the life of AO-8, numerous calls could be heard on VOX, on QSOs, on the net and on the net, not one of those calls was ever heard by us checking into an AMSAT net. Even some Area Coordinators who do not operate HF or who do not regularly check in do not get word of the scheduled activities. Numerous users have little or no contact with AMSAT activities.

*The author served on the AMSAT Board of Directors from 1972 to 1974.*

Dear Joe:

The December 1977 Newsletter contains a copy of a letter sent to you by Marvin Berry, W8RLM in which he inquired about building a solid state CW rig, etc.

Sure, there are lots of schematics in QST issues going back for many years, but the easiest way to get a small compact solid state rig is by investing very little in the kits manufactured by VHF Engineering. The kits are easy to assemble and anyone with a third grade education should be able to understand and follow the assembly instructions.

Whether you operate Mode A or B, high power is not needed as long as you have a half way decent antenna. A Mode B station consists of the TX-432 transmitter accompanied by their PA-432 amplifier. The output on 432 is about 114 watts on CW, with reasonably short runs of coax, the loss using RG-8 will still allow you an ERP of 80 watts with a 10 dB antenna.

For receiving, I'm utilizing my SB-102 receiver with a Hamtronics 2 meter antenna and preamp in front. It works beautiful. What is even better about using the VHF Engreg. units is the price. The entire set-up for Mode B operation, except the SB-102, is under $100.

To my way of thinking, that's the only way to go if funds are of a prime consideration. For those individuals desiring to operate Mode B, the cheap way, this is the way to go.

I enjoy getting the newsletter with all the latest info on the computers, as well as on OGCAR and the RS series. Keep up the good work, Joe.

Respectfully,
W. Vern Hajek, K6UGS

(Did you modify the TX-432 for VOX capability? If so, won't you share the technique? — Joe)

Dear Sir:

Here is a list of stations worked during the June 1977 QRQ tests:

BJ4CT
DL3EX
DL9GEA - 2 QSO's
DM2GUL
G3RD
OK3CDI - 4 QSO's
W4KG

QRQ tests are very interesting! On the first day I heard not many stations, but all stations were running QRQ and I was pleased to hear an amazing strong return signal from my 10 watts ER. On the contrary, on the second day I was not listening on the third day, many normal high power stations were coming through again and it was hard to work QRQ.

Best 73,
Enrico Masetti, IS IT
Dear Joe:

From the 26th Sept. to 1st Oct. there was held in Caracas, a North American Telecommunications Exhibition organized by the U.S. Embassy. About 100 different U.S. manufacturers of communication equipment, including ham radio equipment showed their products. The Embassy also was nice enough to offer the local radio club a free booth and so we managed to have all kinds of ham equipment operating. The most attractive exhibit was a complete mode "A" and "B" rig and giving live demonstrations. We handed out about 500 Spanish versions of an AMSAT application form and a bulletin giving some rough information about AMSAT and the OSCARS. Up-to-date, we have already received 5 new applications, and hopefully, there will be much more very soon.

Best 73,
Edgar Muller, YV5Z

Hi Joe:

First, let me say that I've been an OSCAR 6 and 7 fan since ear this year. The bug bit me. My membership in AMSAT is very recent, yet I hope it will be lengthily one.

The Newsletter makes reference to the use of computers at home. Joe, I work with computers all day long and I for one, cannot go home and play with more computers. Certainly their use in the home some day soon will be prevalent, but for now, I would prefer making calculations manually. Besides, the price of a computer is still prohibitive to my pocketbook.

The proposed Band Plan sounds like a feasible move, but I tend to wonder how well CW and SSB stations can and will work together in the mixed mode section, especially on mode 3 operation. For some reason, I think this section of the band will become a battle ground between the CW and SSB operators, one trying to outdo the other. Hopefully, I'm wrong about this. It might not be a bad idea to plan restruction of the band with each mode having a specific segment just in case hostilities do develop in the mixed mode portion.

Being strictly mode A CW, to date no SSB station has even acknowledged my call. This leads me to believe that SSB stations don't wish to be bothered with copying CW for whatever their reason. Thus my query about mixed mode operation.

(continued on next page)

Another item worth mentioning regarding the Newsletter is an idea I came up with in publishing short articles and pictures of OSCAR operators, shack and antennas. This practice was adopted by the Northern Calif. DX Club about 2 years ago, allowing members to learn a little about fellow members. Do you feel such an item is to be practical in the AMSAT Newsletter? Something to ponder over.

Finally, my compliments to W6ER for his article "Farewell Old Friend". Was very nicely edited and also expresses my feelings.

Tnx & 73's,
Vern, KE6US

Dear AMSAT:

I wholly support the proposed Satellite Band Plans in Sept. 77 AMSAT Bulletin. I have been pushing for this, especially on 27B, for some time to have the weak signal CW boys a QRM free section void of SSB, etc.

73,
Joe, W7JR

Dear Joe:

I have read through the Newsletter with interest; especially page 31 with the list of new life members. It shows that some amateurs are the importance of the satellite program. The day should come when AMSAT will be a bigger and more important part of amateur radio than the ARRL.

The financial situation is interesting. The Newsletter indicates that solar cells and batteries have been financed to the extent of about $20,000. If the first $100 from each new life member is put out at 8% interest, six percent will have to be re-invested to take care of inflation and that leaves only 25 to take care of postage and service to members. It doesn't help much on the program. A lot more has to come from somewhere.

This brings me to a personal problem. I gave AMSAT $200 last year and again this year an additional $200. Actually, I have been planning to contribute this amount each year. If 1500 other amateurs were to do the same thing the program would have $300,000 a year. Fifteen hundred amateurs out of over three hundred thousand is a small percentage. That kind of money should be forthcoming it would seem to me. In the face of a situation like this, the contributor begins to wonder a little.

We all want something, be it an inner glow from helping along a good cause or from anticipation of enjoying the satellites as they are placed in orbit. While it may be worth thousand bucks to some to have their names inscribed on a plaque on the Phase II T1 satellite, I have heard it is cold out there and have always assumed I can make it to a much warmer place free of charge.

At the age of 76, I don't get around as much as I used to and my only first-hand contact with the satellite program is through an occasional letter to one of you fellows on the front lines. I am drawing blanks. There is a hell of a temptation to retire to the sidelines and join the rooting section.

73,
George Hatherell, K6LK

Dear Joe:

First to tell you about the fun we had here in HB following the take-off of AO6. The 2 meter relay worked for hours during the evening of March 5th. Carried away by the excitement some even listened to AO7 for the first time! There was so much information coming through, that at some points one thought that about five different satellites had been launched! The most valuable information would have been to hear live information on the AMSAT frequency 14280 MHz, but there was either bad propagation conditions, or the net was somewhere else. The said freq was there, but nobody on. Apart from a cleaner who said to reserve the place for AO8 news. Anyway the bird is up and flying, congrats and thanks to all who helped! The same day I sent a dozen FDC envelopes from Geneva to Turin with early flight pioneers from Switzerland as stamps. All the best, Joe, and thanks for your fine effort.

73,
Ted Vogel, HB9OP

Dear Sirs:

Boy! Did I goof this morning!

Got on the air, mode A, and called CQ - no response! This was OSCAR 7 N-S Orbit 14006.

Two hours later - while occupied on something completely different, "it suddenly dawned" - that this was Wednesday, and that general QSOs are a no-no, and that Wednesday is reserved for experimental use only.

Sorry that I put a signal on, and hope that I didn't disrupt anything! I will be more attentive to what day it is!

Respectfully,
Howard Randall
W7SHE

[Image of a card with a stamp and text]
Dear Joe:

The AMSAT booth at the Tropical Ham-boree, Miami, Florida held on January 21-22 was manned by Walt Dixon, W4DNW and Nick Laub, W4CA. The interest shown was very great and the number of memberships signed up and contributions taken exceeded expectations. A goodly number of booklets, "Getting To Know OSCAR" sold quickly, indicating the increased interest in space communications.

General public exposure was good with Channel 7 News in Miami, devoting a portion of their newcast to live coverage of the AMSAT booth showing models of OSCAR 7, A-O-D and Phase III satellites. Along with that, Walt Dixon, Area Coordinator spoke about the advantages of space communications for the general public.

Nick Laub, W4CA, escaping from the sub-zero temperatures in Northern Minnesota, was on hand to handle some of the questions from the many interested new-comers to space communications via amateur satellites. Nick says, "-- you may as well be down here in the warm weather when you can't track OSCAR because of frozen rotators, but come Spring look out!"

The photograph shows the booth with Walt Dixon (left) and Nick Laub (right). The poster is available from ARRL for $1.00 handling charge.

Nick Laub, W4CA

Dear Sir:

I received a 'message' today (1-22-78) from Bernard Glassmeyer of the ARRL in response to a letter I wrote him reporting the reception I made of OSCAR 7 7:16 p.m. local time 1-2-78 (orbit number 1473). I was very glad to be informed that I did in fact hear and copy telemetry from OSCAR. I was also somewhat amazed at the "personal touch" of Mr. Glassmeyer's letter. I was not expecting any such attention or recognition.

Your club and OSCAR as well as the ARRL have really sparked an interest in me to finally (after 14 years of listening) go for my Ham license. I will be taking my test within a month. I really am interested in taking part in OSCAR communications.

Thank you very much!

Roger Yurek

Here's $10 to buy a photovoltaic cell for OSCAR 8. I'm not a member of AMSAT and I'm not a ham, but thanks to John Mess of Sun Valley, ID, who loaned me copies of QST and HR Horizon, I learned of the successes of the OSCAR program, Great! This $10 comes from 60 pounds of aluminum collected in the Wood River Valley, north of Ketchum.

Dusty Miller

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Dear Joe:

Despite my harangue in Newsletter etc., the following stations were all on OSCAR 7 Mode "A" this evening, Wednesday, January 18, 1978, an experimental day: HBBNO (QRO CW), SPPAO (CM) OSSIL (CM), DL0G2 (SBB), DCS97 (SSEB), DL028 (CW), DL6AD (CW), EABKL (CW), OMKIN (CM), DUBGH (SSEB), EM0NRC (SSEB), an unidentified RTTY station, and guess who...EJ4AH! He is one of your coordinators, gets the Newsletter, and we send him a free "OSCAR News" so there is no excuse whatsoever! I suggest you send him a rocket for being so ---y irresponsible. We have several EJ's in AMSAT-UK who might set a better example. Grrrr---!!

73's

Pat, G3IOR

Dear Sirs:

I became active on OSCAR 7, node 8, almost two years ago, using a home brew tracking system with an analog processor. The system performed beautifully and allowed me to contact about all active node 8 amateurs within a few months. Then everything was just repetition and I gave up. However, with the advent of Phase III, I want to be ready for the new phase satellite as soon as it is launched.

To use my home brew analog computer which I used for satellite tracking, I needed a set of computer runs, giving me antenna direction and elevation from my QTH for all possible orbits, in intervals of 10° equator crossing. After some searching, I managed to get all the formulas and wrote the computer program that gave me the wanted printouts.

With my friend, ONSIF, we have decided to change the analog tracking system into a microprocessor tracking system, using a tape to store all tracking information for all orbits.

Yours Truly,

John A. Develderee, ON4UN
Poeldstraat 215
9220 Merelbeke
Belgium

Dear CI

Enclosed is my membership renewal. I have received numbers 1, 2 and 3 of the AMSAT Newsletter -- not 4. The Newsletter is important but should be thicker, longer and published more often. One criticism I have of OSCAR literature in general is the lack of good circuits for 432 MHz rigs. Some of us want better machines than a simple transverter, but even in transverters the technical data is not good. Antenna data is adequate, but here, too, much improvement would produce more and better signals on the transponder.

73 and count on my continued support.

Paul, W7QKI

EXPRESS
When my father, WA6JUD, suggested we take a trip to Europe, the first thought that came to mind was to go to one of the rare and exotic countries I could activate for the first time (ZA? SY1?). Well, by the time we were boarding the plane, I had a brand spanking new ICOM 211 under my arm, an Echo 70 and 30-watt amplifier in my luggage, and a funny looking tube that looked like it could hold a four-element two-meter beam and ten-element 70-cm beam. We had licenses in most of the countries we would visit but would have to pick up the ZAJ tickets in person. In W6, Europeans were never heard on OSCAR. I had heard from G3JOR and W3JTJ about the state of the European passes; actually they were far understating the truth (more on that later).

The first stops were England and Ireland. In Germany we picked up our new Mercedes 300D and were on our own. The first operation was from the home of DJ6RX on Mode A. Needless to say WA6TUF/DL was quite a popular call on the band (I once had a pileup on a DL repeater that lasted over an hour).

The first operation from our car on Mode B using the planned setup took place in the second week (the latter part of August) in Liechtenstein as WA6TUF/MM. Unfortunately, it was an experimental day, but I thought that there would be few forgetful folk on that I could work. There was an Italian and an FC6, but I could not work either. The equipment proved itself very satisfactory, in three passes, only one contact was made. In order to make the next B day from ZAJ, we spent all Thursday driving from Vaduz to Monte Carlo, about 550 miles through 5 countries (We had to go through Northern Italy, got stuck on the Italian tollways with no Lisa and lost in Geneva looking for a bank at 3:00 when they all close at 2:30).

Now comes the fun! We arrived in Monaco too late to pick up the licenses for the Friday morning passes. By 11:00 the next day, we located the office. Now there was a minor problem. In order to get the tickets, we had to have a station address in Monaco which we didn't have since our hotel was about fifteen miles away. In the face of this little hitch, we told them we were staying at the Holiday Inn. Now there was another little problem, the head of the telecommunication who signs the licenses was away and would not be in until late that afternoon since they needed a lock to sign the licenses until morning. We were told to come back at 4:30 and something might be done. (The woman at the office could "buckle the blonde" so this cute blonde prevailed--so to speak for us). Well, the sightseeing took us until 5:15. When we arrived, the woman appeared a bit prodded, and was babbling incoherently mentioning Holiday Inn every couple of sentences. I gathered that she had called the hotel and was told to come over, no license. Now we had to find a hotel room in Monte Carlo at 5:15 Friday afternoon, impossible you might say, nearly so. I went back to the office as Dad walked around looking for a room for one night. Our room was checked over, and listed on the forms. At 5:55, (the office closed at 6:00) Dad came huffing into the office with hotel slip. A few frantic calls later we were handed a piece of paper with the calls and told that we could operate now and pick up the licenses on Monday. Well, I was now ZAJJB and had 30 minutes until the first pass to find a place to set up. An American waiter told us of an ideal place; there was an area of landfill right on the water; it was perfectly flat, about five square acres or more. My college roommate was with us and he shortly became very proficient at setting up the antennas.

The first pass was 12716, and the first contacts were SP9DH, G3JOR, OK3CDI and DL8GSA. The next two passes netted sixteen more contacts; my goal for the weekend was to work thirty different stations.

Now I'll talk about the problems of European Mode B operation. To put it mildly, it sounded like the low end of 20 during a contest on a Sunday morning. The biggest problem was the lack of high-power stations. The last time I was there was one French station who uses a full EMNE array and a Kilowatt; many stations sounded just as bad. Next, is the problem of the large number of VHF stations only stations who don't know a dash from a dot of CW, thereby QRMming all the CW stations. I always started at 145.940 MHz, but always ended up at .930. The other problem was the many stations who worked me several times, one QSL station kept on calling even though I told him on SSB that he was already in the log. There was also the distressing problem with the European stations not listening; the band was almost one solid QSO. Consequently, on the last overhead pass I worked only one station. No USA stations were worked because of the very high mountains that surround the country. One station was heard, and that was W1MR. I didn't quite reach my goal, only 28 different stations were worked.

Continued from Page 22

Phase III, by its very nature, will require far greater cooperation from its users than Phase II if it is ever to prove successful. Ways must be found to reach the mass of potential users who do not now read this Newsletter. Active collaboration with all ZARU Societies, and possibly regulatory agencies as well, will be required. We need operating discipline with teeth.

A few years ago, we found in an old issue of QST an article which pretty well summed up the present feelings about OSCAR and Phase III. It was called "Potent QRM" by T.O.M. (Hiram Percy Maxim) and appeared in January, 1917. Maybe the time has come to take the Wouff Hong down from its perch on the wall in Newton and.....
The graph below is an update for AMSAT-OSCAR 8 similar to the one that was published in Volume V #2 Newsletter, June 1973 for AMSAT-OSCAR 6.

\[ \begin{align*} a + b + c &= 180^\circ \\
\cos c &= \frac{a^2 + b^2 - 2ab \cos c}{2ab} \]

\[
\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}
\]

SOLVE FOR \( c \) (slant range) and \( \angle \)
\[ \angle \text{ in degrees} \times 69 = \text{distance along surface in statute miles.} \]

(Continued from Page 15)

THE RUSSIAN "RS" AMATEUR satellites are now reported due to be launched before the end of this year and are to be inserted into "high altitude" orbits. W2WPN, Net Control station for various AMSAT nets, is shut down while Goddard SpaceFlight Center facilities are being refurbished. W1KM and others are filling in.

AMSAT's New Building at Goddard is now going forward following signing of a formal contract last week. The new AMSAT facility is to be ready in 16 weeks, in time to be dedicated at the AMSAT annual meeting at Goddard on October 14.

OSCAR 8's Orbital Data is now so refined that its change in period due to gravitational drag has been determined. The formula is 103.218386 ± 1.171 x 10^-7N, where \( N \) is the orbit number, with the shift in longitude 25.80870162 ± 2.325 x 10^-7N per orbit. This calculates out to a decrease in period of about 60 microseconds per orbit or about .0001 minute per week, at which rate OSCAR 8 should fall back into the atmosphere in about 2300 years.

Next Week's OSCAR 8 Reference Orbits are:

<table>
<thead>
<tr>
<th>Date</th>
<th>Orbit</th>
<th>Equatorial Crossing Time</th>
<th>Longitude</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>981</td>
<td>01:02E</td>
<td>54.8°E</td>
<td>A (QRP)</td>
</tr>
<tr>
<td>16</td>
<td>995</td>
<td>01:07E</td>
<td>56.1°E</td>
<td>A</td>
</tr>
<tr>
<td>17</td>
<td>1009</td>
<td>01:12E</td>
<td>57.4°E</td>
<td>X</td>
</tr>
<tr>
<td>18</td>
<td>1003</td>
<td>01:18E</td>
<td>58.8°E</td>
<td>A</td>
</tr>
<tr>
<td>19</td>
<td>1037</td>
<td>01:23E</td>
<td>60.1°E</td>
<td>A</td>
</tr>
<tr>
<td>20</td>
<td>1051</td>
<td>01:29E</td>
<td>61.4°E</td>
<td>J</td>
</tr>
<tr>
<td>21</td>
<td>1065</td>
<td>01:34E</td>
<td>62.7°E</td>
<td>J</td>
</tr>
<tr>
<td>22</td>
<td>1079</td>
<td>01:39E</td>
<td>64.1°E</td>
<td>A (QRP)</td>
</tr>
</tbody>
</table>

G3IHR worked Pakistan for his 103rd satellite country. JW9CM has been heard on Mode B around 14570 and is supposed to be on Mode A, active weekends only. 8P6KS has been worked on Mode A around 29485 - QSL to 8EG6L. Other Mode A catches are XG4NO on 29470, PGTX on 29450, and O4AsR on 29450.

The publishers of "HR Report", in cooperation with AMSAT, are offering subscriptions to AMSAT members only for $17.00 per year for U.S., Canadian and Mexican members, and $33.00 per year to members overseas, including air mail. This represents a $1.00 discount from their regular rates which applies only until July 31. "HR Report"'s address is Greenville, N.H. 03046, U.S.A. and they can take orders by Visa or Master Charge. Be sure to specify your AMSAT membership number and that you heard about this arrangement in the "AMSAT Newsletter".

The following data were used to compute the graph:

- Period = 103.229 min. = \( P \)
- \( h_t = 205.82 \cdot \frac{P}{2} / 3 = 3963 \) (earth radius in miles)
- \( h_t = 566.5 \) miles
An exciting new era in amateur radio is about to begin. The era of AMSAT PHASE III OSCAR satellites.

The AMSAT PHASE III satellite program promises a continuing demonstration that amateur radio is at the forefront of modern technology. PHASE III satellites will routinely provide reliable communications over paths of up to 11,000 miles (17,600 km) for 17 hours each day. You can think of them as a resource equivalent to a new band.

The cost of these PHASE III satellites is a projected $250,000. Commercial satellites of similar performance would cost nearly $1,000,000.

Your help is needed to put these PHASE III OSCAR satellites in orbit.

Your valued, tax-deductible contribution can be as small as one of the 5000 plus solar cells needed. A handsome certificate will acknowledge the numbered cells you sponsor for $10 each. Larger components of the satellites may also be sponsored with contribution acknowledgements ranging to a plaque carrying your name aboard the satellites. Call or write us for the opportunities available.

Your membership in AMSAT is important to the satellite program, and will give AMSAT a stronger voice in regulatory matters concerning satellites. At $10 per year or $100 for life, you will be making a most significant contribution to the satellite program and the future of amateur radio. You will also receive the quarterly AMSAT newsletter.
EDITORIAL

By Joe Kasser, G3ZC

PARDON MY FRENCH

This issue of the Newsletter contains an article written in French. AMSAT is an organization growing both domestically and internationally. As such, much of our membership is overseas. Reflecting this changing pattern of membership, it is the intention of this Editor to include, from time to time, articles written in languages other than English, preferably French, German or Spanish. To prospective authors in those languages please supply a typed manuscript because it is difficult enough to work on a handwritten manuscript in English, let alone a foreign language. Also, please supply a brief summary of the article written in English. Use the F10K article in this issue as your guide.

VOTE!

AMSAT is a membership organization. Recently, several members have expressed opinions and comments that clearly reflect dissatisfaction with the organization, particularly satellite operating policies. It is clearly up to the directors to respond. This issue contains the ballots for the annual election. It is up to you to vote for the directors of your choice. Your vote does count, so if you do not plan to attend the meeting, be sure to put your vote in the mail. Make your voice count.

If you would like to run for the Board of Directors next year, the bylaws state that candidates must be nominated by a member society. If you feel strongly about our organization and its policies, let us hear from you, on the nets, in the Newsletter and the election campaign.

CALCULATOR PROGRAMS

The last few issues of the Newsletter have carried articles about calculator programs for computing OSCAR orbit data. In the future, we plan to announce their availability, rather than publish them in full.

AREA COORDINATOR UPDATE

Please make the following changes to the list published in the March issue:

USA - Utah - delete W7ZC (see page 15).
ITALY - note change of address for AMSAT-IT as follows:
AMSAT-ITALIA - c/o Domenico Marini IRCVS, V.A. De Gasperi 97
80059 Torre del Greco (Napoli) tel (081) 881-8144.

OSCAR INFORMATION
(Northern Hemisphere)

Compiled by Chuck Doran, W3JPT

<table>
<thead>
<tr>
<th>MODE</th>
<th>UPLINK</th>
<th>DOWNLINK</th>
<th>BEACON</th>
<th>DOWNLINK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mod.</td>
<td></td>
<td>Mod.</td>
</tr>
<tr>
<td></td>
<td>OFFSET-kHz</td>
<td></td>
<td>OFFSET-kHz</td>
<td></td>
</tr>
<tr>
<td>7A</td>
<td>145.85-145.95</td>
<td>LHC</td>
<td>USB</td>
<td>29.4-29.5</td>
</tr>
<tr>
<td></td>
<td>432.125-432.175</td>
<td>RHC</td>
<td>USB</td>
<td>145.975-145.925</td>
</tr>
<tr>
<td>8A</td>
<td>145.85-145.95</td>
<td>LHC</td>
<td>USB</td>
<td>29.4-29.5</td>
</tr>
<tr>
<td>7J</td>
<td>145.9-145.0</td>
<td>RHC</td>
<td>USB</td>
<td>435.1-435.2</td>
</tr>
</tbody>
</table>
A pulse generator at a fixed frequency (period = 30 milliseconds) modulates the SSB transmitter. These pulses I₁ are received by the satellite transponder and come back in the receiver with a slight delay proportional to the distance (r₁). In order to make the measurement of this delay easier, we display in the vertical input of a scope:

- The pulses I₁ which modulate the transmitter
- The pulses I₂ coming from the receiver
- The pulses I₃ generated in the pulse generator with a known delay from the pulse I₁ according to the value of the shift potentiometer.

The determination of the distance is made by tuning the shift potentiometer in order to have I₂ and I₃ on the same vertical line of the scope. The reading of the value of the shift potentiometer gives the distance directly when the potentiometer has been calibrated.

Principe (voir Figure 1)

Un générateur d’impulsions (fréquence fixe période = 30 ms) module l’émulateur BLU. Les impulsions captées par le satellite parviennent au récepteur avec un certain retard fonction de l’éloignement. Pour mesurer commodément ce retard on applique à l’entrée de l’oscilloscope:

les impulsions I₃ ayant modulées l’émulateur
les impulsions I₃ captées par le récepteur
les impulsions I₃ présentant un retard ajustable par rapport aux impulsions I₁.

Le mesure de la distance consiste à faire coïncider sur l’écran les impulsions I₃ avec l’aide du potentiomètre décalée. On lit alors directement sur ce dernier précisément étaillonné la distance à laquelle se trouve OSCAR.

Schema (voir Figure 2)

Les transistors T₁ et T₂ constituent un multivibrateur astable à partir duquel on obtient les impulsions I₂ par différentiation à l’aide du réseau résistance-capacité (47 kΩ / 4700 pF). L’impulsion negative obtenue est à la fois appliquée au modulateur de l’émulateur BLU et mise en forme par les transistors T₄ et T₅ afin de pouvoir être appliquée à l’oscilloscope.

Les impulsions I₃ sont également obtenues à partir de T₁, T₂ à l’aide de T₃, T₄ suivant un type de montage bien connu des télécommandistes. Le décalage des impulsions I₃ par rapport à I₂ est réglable à l’aide du potentiomètre P₃. Les impulsions I₃ sont mises en forme par T₅ et T₆ pour être appliquées à l’entrée de l’oscilloscope.

Les impulsions I₃ captées par le récepteur, sont appliquées à l’oscilloscope par l’intermédiaire du transformateur TRE.

Réalisation (voir Figure 1)

Elle est faite sur un circuit imprimé et ne présente aucune difficulté particulière. Le type de transistor n’est pas critique (PC182 ou BC170 ou equivalents). La consommation étant faible (environ 5 mA sous 9V), l’alimentation est autonome (2 piles de 4.5 V, en série).

Etalonnage

On procèdra à l’ajustage de la fréquence du multivibrateur (ajustage de la fréquence à 33.3 Hz soit une période de 30 ms) en prenant la fréquence du secteur 50 Hz comme référence. La valeur de cette fréquence (33.3 Hz) conditionne la gamme à la mesure de la distance à laquelle se trouve le satellite est possible sans ambiguïté. Avec F= 33.3 Hz la mesure peut être faite entre 0 km et 300 000 km (30 x 10⁷) = 4500 km ce qui est amplement suffisant pour les satellites AMSAT-OSCAR 7 et 8.

(Continued on Pg. 9)
MODIFYING THE ICOM IC202 FOR RECEIVING LOWER SIDEBAND

By Michel L. Allas, P1OK
41 Avenue Joffre
Gayny 93220, France

The modifications to be described were made to an ICOM IC202 to allow the reception of signals from AMSAT-OSCAR 7 mode B (SSB signals, 145.950-146.000 MHz).

Introduction

The original circuit in the IC202 is shown in Figure 1, the modified circuit is shown in Figure 2. In the USB position, the BFO oscillates at 18.6985 MHz (crystal X1 is grounded through C62 + C63 as transistor Q17 is saturated). In the LSB position, as transistor Q7 is at cut-off, crystal X1 is connected to ground through C61 + C62 and the 3-30 pf trimmer. This trimmer has to be adjusted in order to make the BFO oscillator at a frequency of 10.705 MHz. It can be set up using a frequency meter or by listening to the signals coming from AMSAT-OSCAR 7. The switching between USB and LSB is done by the function switch. The light in the S meter can also be removed if desired as shown in Figure 2.

Construction

The modifications can be made without removing the printed circuit board. Locate the BFO, remove its top cover by cutting the two-pin base. Next, cut the base lead of Q17 and the leads to C62 as shown in Figure 1. Solder the new components in place. (See Figure 2) Alignment should cause no problems. The only thing to do is to adjust the 3-30 pf trimmer in the LSB position to the correct value by receiving an LSB signal and adjusting it for best readability. After modification, the set will operate as before except that in the CW position there will be no more shift between the receive and transmit frequencies.

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IS THIS THE FUTURE?

By Joe Kasser, G3CZ

Two pressing problems limiting amateur satellite operation at this time are the availability of spectrum space and the use of excessive power on the existing satellite uplinks.

All the existing and proposed amateur satellite communication transponders utilize the amateur two-meter band, in which there is only 150 kHz (145.80-146.00 MHz) agreed upon in band plans for amateur satellites. This allocation is getting crowded. With only AMSAT-OSCAR 7 and 8 in orbit at this time, there are already many cases of QRM occurring between the users of each transponder when those uplinking to one satellite unintentionally interfere with those listening to the downlink of the other. When the Soviet RS OSCAR spacecraft and the AMSAT Phase III spacecraft fly, these problems will be even worse.

In 1979, there will be a World Administrative Radio Conference at which the spectrum will be assigned to the various worldwide user services including radio amateurs. It is thus important that the amateur satellite service demonstrate its intent to utilize all the frequencies allocated or they may be lost. Currently, a 2304 MHz beacon is orbiting the earth above the AMSAT-OSCAR 7 spacecraft, but permission to activate it has not yet been obtained from the various licensing authorities because 2304 MHz is not yet a frequency allocated to the amateur satellite service.

At the IARU Region I meeting in Hungary earlier this year, an attempt by AMSAT to request extra frequency assignments in the 144-146 MHz worldwide two meter band for space communications was not successful because the whole band is heavily populated in Region I, something that I can confirm from personal experience.

There is thus no additional space at two meters for future spacecraft transponder links except possibly for geostationary amateur satellites stationed over Region 2. Since the design lead-time for spacecraft is long (even for amateur ones) and must be thought of as on the order of 2 to 4 years, the 70 cm band will probably be as crowded when post-Phase III satellites are flown as two meters is today. It is thus necessary to look for new frequencies for spacecraft to be built after the two Phase III prototypes.

The second major problem facing the amateur satellite service is the use of excessive power by a link power minority of the satellite users. It is this minority of users who spoil the satellite operation for others.

It is too late to make any changes to the transponders on the first Phase III spacecraft and still meet the launch schedule. It is thus a long lead-time that inhibits improvement on Phase III many of the changes suggested by AMSAT members based on their personal experience gained from operating via AMSAT-OSCAR 6, 7 and 8. Spacecraft are built for reliable operation. There is no way to return a circuit or replace a component once the spacecraft is in orbit, thus all designs must be thoroughly tested prior to launch.

Consider the mechanics involved in amateur satellite communications. A user (or station) accesses a satellite and communicates with other ground stations all within range of the satellite at any time. Such operation requires some skill and is slightly more complex than conventional HF communications. Thus, each user interfaces his ground station to the satellite, at satellite, i.e., the satellite receives a user's signal directly.

Suppose the interface between the user and the satellite were moved from up in space to down on the ground in the following manner. Users would transmit their signals on the ground to a "gateway" earth station transponder or repeater that would uplink to the satellite. These gateway earth stations would be set up, one in each major city by a local AMSAT group and would be maintained by them. This way AMSAT could provide the communications capability whereby one radio amateur relaxing by his or her swimming pool in Los Angeles could communicate with a friend riding the bus to London, each using walkie-talkie equipment, their signals being relayed through their local gateway earth stations to a satellite. The space segment uplink and downlink would be in the microwave band assigned to the amateur space service, while the ground segment between the gate-
A SIMPLE MIND TACKLES "OSCAR FOR SIMPLE MINDED BASICS"

By D.K. (Ken) Hargrove, W4DQF
1525 Cardinal Road
Orlando, FL 32803

A couple of weeks after acquiring my Radio Shack TRS-80 LEVEL 1 computer, I was looking around for suitable programs and came across "Oscar for Simple Minded Basics" by Dave Jones, WAZXJL, in the AMSAT Newsletter (December 1977). After making suitable adjustments for my location, the program worked fine on my machine.

Success went to my head; I became ambitious and decided to add some frills. Thanks to the spadework done by Dave, I rode on his coat tails to further successes.

I set, and accomplished, the following goals: choice of OSCAR 7 or 8; display in UTC or local time; display of only those orbits within range; approximate AOS time for morning passes; AOS and EQX are not significantly different at my location on evening passes.

The program, as written, is valid only for my location. Using a Satellabe or OSCAR Locator for reference, the following program lines should be modified for a different location: 370 thru 410, and 440 thru 480. Lines 105, 30010, and 30040 may be modified according to your local time zone.

Lines 550 and 590 establish the time interval between successive displays and can be varied to suit your needs.

The AOS is within ± 3 minutes for my location. It could be further refined, and also added to the UTC display.

The program uses about 1.3K of memory. I am sure it will run on other BASIC machines, but it might require inserting "LET" and "THEN" in the appropriate places. Their use is usually optional in LEVEL 1 BASIC.

Since upgrading to a LEVEL II TRS-80 I have converted this program to LEVEL II. There are a couple of minor changes necessary; a SARE will get you the information.

I am sure the program can be made more elegant, but at this point I have temporarily run out of ambition. Good Luck, and thank you Dave.

(Continued from Pg. 5)

On effectuons ensuite l'étalonnage du décalage d'impulsion. Cette opération est faite à l'aide de l'oscilloscope par mesure sur l'écran de la position de l'impulsion 13 par rapport à l'impulsion 1, en fonction de la valeur du potentiomètre P1. Ce dernier est doté d'un démultiplicateur (rapport 1/3) pour faciliter la lecture.

Décalage 13/1, en ms.

<table>
<thead>
<tr>
<th>Distance OSCAR station (en km)</th>
<th>30</th>
<th>26.6</th>
<th>23.3</th>
<th>20.0</th>
<th>16.6</th>
<th>13.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3500</td>
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<td>2500</td>
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<td>1000</td>
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<td>500</td>
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<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Valeur approximative de P1 (KM). P1 = 5.200 K.

Utilisation

On rappporte le générateur à l'émetteur au récepteur et à l'oscilloscope.

On mesure le retard introduit par la chaine émission/reception en opérant en boucle fermée c'est à dire en mettant l'émetteur et en captant les signaux par le récepteur. On observe un décalage entre la 13 et 1, qui est de l'ordre de 1 ms. Ce décalage sera retranché des décalages observés lors des mesures faites avec le satellite.

Lors du passage du satellite on détermine le retard de l'impulsion 13 par rapport à l'impulsion 1, en maeanurant le potentiomètre P1 de façon à synchroniser 13 et 13. On lit directement sur le potentiomètre P1, la distance à laquelle se trouve le satellite (voir tableau 1). Pour une orbite donnée, si l'on détermine les distances D3 et D1, à 2 instants 13 et P1 ainsi que les directions correspondantes (direction de l'antenne d'émission) il est possible de retrouver les caractéristiques de l'orbite (longitude et heure de passage à l'émetteur). Pour les détails des calculs on se reporterà à l'ouvrage: Specialized Communications Techniques p. 177 à 179 de l'ARRL.

L'auteur reste à la disposition des amateurs pour tous renseignements complémentaires.

OSCAR DX-PEDITION TO NAVASSA ISLAND

Dates: November 25 to December 2, 1978

AMSAT-OSCAR 7 Mode B 145.930 MHz CW
145.945 MHz SSB

Call Sign: W2HK/KPL

QSL via W2FC (ex W2TC) Randy Rowe, 3237 Connecticut Drive, St. Charles, MO 63301


8

563 FORMS TO 5000 NEXTV
560 6001LB3
178 PRINTI, Printer (UNC, "MIN", "MIN. INT. 3", "SEC. L-", "INT. G/100000", "DS/"
581 PRINT PRINT PRINT
580 FOR Y=1 TO 50 NEXTV
469 GOTO 118
995 END
50000 OKE
68398 Timer 1
46850 IF Fx=XS=64
45850 IF D=13 THEN 123
45850 IF D=0 THEN 113
45850 PRINT "AOS: ", AOS, " EQX: ", EQX
45850 PRINT "TIME: ", TIME, " L: ", L
45850 PRINT PRINT PRINT

(Continued from Pg. 5)
PERPETUAL ACQUISITION COINCIDENCE PRINTOUTS
FOR AMSAT-OSCAR 7 AND 8

By Bill Johnston, N5KR
1808 Pomona Drive
Las Cruces, New Mexico 88001

One of the most troublesome problems encountered in using the AMSAT-OSCAR satellites is in determining exactly when, and on what passes, two different stations can simultaneously access a particular satellite, and therefore establish communications with each other. There are several graphical and computer aids that can tell you where the satellite is with respect to your own station, but if there is some specific location you want to contact you will have to draw accessibility circles as well as the satellite track on a map and figure out when the satellite will pass through the area of overlap. The result can be a real eye-opener, and will quickly reveal why some stations, though no more distant than others, are much more difficult to contact.

Over a period of time, quite a few people asked me if I could come up with a computer solution for the problem, and a few years ago I wrote a computer program which uses an electronic plotter to draw a set of custom maps with built-in accessibility plots (elevation circles and azimuth radii). The end product was a very handy device, consisting of two maps and twenty overlays, and it yielded a lot of useful information. Unfortunately, since the finished maps were printed on photographic paper and the overlays were prepared on large sheets of photographic film, it was comparatively expensive. Worst of all, I had to do all of the photographic processing by hand in the bathroom. Consequently, I prepared these for only a few people before abandoning the system in favor of one based entirely on computer printouts.

The system I decided upon is based on the perpetual orbital printouts that have been in use for several years (see "AMSAT Newsletter", September 1975 and March 1978), and for lack of a better name I’ve called it a "perpetual acquisition coincidence chart." Given any two locations and a specific satellite, the computer program will generate a printout all times and passes when the two locations can simultaneously access that satellite. No other times or passes are included.

Figure 1 shows a small extract from a perpetual acquisition coincidence printout based on using OSCAR 8 between Washington and Atlanta. Its method of use is extremely simple and is identical to that of the regular perpetual orbital printout. Since this is described in the two articles cited previously, it won’t be repeated here. The printout gives the time, azimuth, elevation, and range data from both locations.

Obviously, a different printout is necessary for every different pair of locations and every different satellite. Nevertheless, for those who regularly work through OSCAR to stations in a particular area, or for those who are trying to contact a difficult location for an award, the printout is an excellent solution.

Although the cost of the computer time remains relatively constant, the physical size of the printout varies enormously, depending upon the relative locations of the two stations. Consequently the cost of postage to mail them will vary considerably. As a practical matter, I have had to simply guess at the average total cost, and have set the price the same as that for the regular orbital printouts.

If you would like an acquisition coincidence printout, you will need to send the following:

1. Name and mailing address.
2. The satellite for which the printout is to be made.
3. The two locations. The first one you list will be in the left column, the second one in the right column. For any location under 10,000 population, please give latitude and longitude, or describe carefully with respect to other nearby towns.

ACQUISITION COINCIDENCE FOR 0-8

WASHINGTON, D.C.
38 54N 77 1W

EU CROSSING AT 46 00E
TIME AZ EL RNG
MINS DD DU KM
7 17 3 3146 7 100 -1 328
8 111 7 2860 N 94 1 342
9 105 10 2602 9 87 3 320
10 96 13 2442 10 80 5 313
11 86 16 2176 11 71 6 295
12 74 18 2050 12 62 7 273
13 61 19 2011 13 53 7 245
14 47 18 1949 14 45 6 219
15 36 16 1818 15 26 5 235
16 26 13 1782 16 20 3 315
17 16 10 2538 17 22 1 290
18 12 6 2542 18 16 0 357

EU CROSSING AT 46 00E
TIME AZ EL RNG
MINS DD DU KM
33 45N 84 24W

4. Cost as follows:
$3.50 via fourth class mail, worldwide
$4.00 via first class mail, USA, Canada, Mexico
$5.00 via airmail, worldwide

Send the above to:
Bill Johnston, N5KR
1808 Pomona Dr.
Las Cruces, New Mexico 88001

Fig. 1 -- A small extract from a Perpetual Acquisition Coincidence Printout.
ANNOUNCEMENT OF AMSAT ANNUAL MEETING

The tenth AMSAT Annual Meeting will be held at 8:00 P.M. on Saturday, October 14, 1978 at the NASA Goddard Space Flight Center Employee Recreation Center in Greenbelt, Maryland.

In accordance with the AMSAT Bylaws, ballots for the election of three Directors and two alternate Directors will be counted at this meeting. The terms of the following Directors will be expiring as of this meeting: Tom Clark, W3WI; Pat Goss, G3JBR; and Richard Zwirko, K1HTV.

The agenda, in addition to the election and regular business, will include:

AMSAT Annual Report
AMSAT-Canada SYMCA Project Progress Report
AMSAT Phase III Progress Report
AMSAT-OSSAR 7 and 8 Operations

Results of election of Directors

This year, we will be dedicating our new AMSAT-OSSAR Spacecraft Laboratory located at the Goddard Space Flight Center Visitor Center at 3:00 P.M. This will be an opportunity to see satellite hardware and ground support equipment, followed by a tour of the NASA Goddard Space Flight Center.

For those coming from out of town, let us know, and we will try to arrange for you to be hosted by Washington area AMSAT members.

DIRECTIONS TO THE NASA GODDARD EMPLOYEE RECREATION CENTER:

Take the Baltimore-Washington Parkway to the Greenbelt Road exit (Rt. 193), and take Greenbelt Road east 1.5 miles to Soil Conservation Road. Continue east on Soil Conservation Road onto the wooden Goddard Recreation Center building.

There will be an AMSAT dinner before the meeting at 6:00 P.M. at the Goddard Employee Recreation Center. Please let us know if you can join us so that we can firm up reservations.

The 146.25/85 AMSAT repeater will be available for talk-in before the dinner and the meeting.

CANDIDATES TO BOARD OF DIRECTORS

The following are brief biographical sketches of the candidates.

Thomas A. Clark, W3WI

Clarksburg, Maryland

Nominated by Central States VHF Society. AMSAT Life Member LM-84, first licensed in 1952. An experimenter, active in VHF/UHF from Colorado in 1959. Was President of U. of Colorado ARC and Boulder ARC; holds BPE, WAS, WAC. Was Colorado PAM and Asst. Sec. in late 50's. Currently, main activities relate to AMSAT and WARC.

Has been serving as Director and Executive Vice-President of AMSAT, and alternate AMSAT representative to Amateur Satellite Service Council. Responsible for generating orbital data for the AMSAT-OSSAR 7 and 8 orbital calendars published by WS1AJ. Involved in WARC amateur satellite preparations and member of FCC WARC Advisory Committee on Amateur Radio. Coordinating AMSAT portable satellite terminal project. Developed computer model of Phase III antenna and involved in computer hardware and software for AMSAT OOSAR Spacecraft Laboratory at the NASA Goddard Visitor Center.

Employed by NASA Goddard Space Flight Center as head of effort in Very Long Baseline Interferometry to study Quasars to make ultra-precise geophysical measurements. Serves on numerous professional committees in astronomy and radio astronomy. Also Associate Professor of Astronomy at University of Maryland.

Patrick J. A. Gowen, G3JBR

Norwich, Norfolk, England

Nominated by Lockheed ARC and RSGB. AMSAT Life Member LM-225, licensed since 1952. Chairman, U. of East Anglia Radio Club. Founder member East Anglian DX Contest Club (G4ANT). Active in Field Day and Raynet (emergency communications). WAS, DXCC 330 confirmed, worked over 105 countries via OSSAR. Interested in chasing DX on difficult frequencies, propagation, aerial development, and above all, satellite communications techniques.

Has been serving as Director of AMSAT for the last two years and represents AMSAT at the IARU Region I Conference in Hungary earlier this year.

Founder and Chairman of AMSAT-UK. Active on A-0-7 and A-0-8, using files power on 78. Past editor of UK "OSSAR News," and lecturer on OSSAR and AMSAT (over 100 talks given).

Employed as Chief Technician at U. of East Anglia in biophysical research and teaching. Electrophysiological investigation of plants and animal systems.

Ambition to spread international interest of amateurs in AMSAT, and to spread interests of AMSAT internationally.

Earl P. Shelton, W8HS

Washington, D.C.

Nominated by Naval Research Laboratory ARC, AMSAT Life Member LM-103, first licensed in 1955, now Extra Class. Interests include satellites, EMS, coherent CW, DX, and contests. Holds WAC, WAS, DXCC, and six satellite certificates including OSSAR-WAS. Organised and taught amateur radio training classes at NRL and Prince George's College; past President, N4L ARC.

Presently serving as AMSAT Secretary, Awards Manager and Alternate Director. Also responsible for updating and maintaining AMSAT OSSAR users directory (with input from WB2KDN). Wrote and distributed OSSAR AE/EL calculation routine (Newsletter, March 1976).

Professionally, heads the Phase Transformation Section, Cryogenics and Superconductivity Branch, Naval Research Laboratory. Also Associate Professor in Engineering at George Washington University and Research Associate in Chemical Engineering at the University of Maryland.

Richard Zwirko, K1HTV

Meriden, Connecticut


Has been serving as AMSAT Director and Vice-President for Operations. Responsible for scheduling experiments and coordination of telecommand operations for AMSAT-OSSAR 6 and 7, and of OSSAR 8 up until its transfer to ARRL. Also responsible for appointment of AMSAT Area and Country Coordinators. Served as telecommand station operator at Talcott Mountain VHF Society during first year of AMSAT-OSSAR 6. Has also been an AMSAT bulletin station.

Employed as broadcast technician at WIC FM, Hartford, Connecticut.

THE BALLOT FORM IS ON PAGE 23

VOTE  VOTE  VOTE
MINUTES OF THE BOARD OF DIRECTORS MEETING, 09 JUNE 1978

A meeting of the AMSAT Board of Directors was held during the evening of 09 June 1978 in the Conference Room of Building 42 of NASA Goddard Space Flight Center, Greenbelt, MD. The meeting was chaired by Perry Klein, W3PK, and lasted for about 5 hours. The following people were in attendance:

Tom Clark, W3UL
Dick Daniels, W4PUJ
Martin Davidson, K2URC
Bernie Glassmoyer, W9CDB
John Henry, VE3INM
Jay Holladay, W6EIJ
Jan King, W3GKY
Perry Klein, W3PK
Earl Skelton, N3ES
Randy Smith, VE3AT
Bill Tyman, W3KQ
Will Webster, WB7MC

Items discussed and action taken were as follows:

1. Banking Resolutions:
   - It was decided to empower AMSAT with the capability of establishing savings accounts with Jefferson Federal Savings & Loan, Pirreto Federal Savings & Loan, and any other savings institution for the purposes of investing AMSAT funds. Separate action of the Board on each specific savings account will no longer be necessary.

2. Hewlett-Packard Donations:
   - It was agreed to acknowledge, with a letter of thanks, the recent donations, by Hewlett-Packard, of several pieces of electrical equipment to AMSAT, including a Model 8640B signal generator, a line printer, and other miscellaneous test gear.

3. Postage for Newsletter Mailings:
   - Prompted by the significant elevation in postal rates, the following resolution was agreed upon with regard to future mailings of AMSAT Newsletters: (1) Life Members will continue to receive the Newsletter on the same basis as currently in effect. (2) Newsletters will be sent to Regular Members as 2nd-class mail, unless an additional remittance is paid to cover the additional postage for 1st-class or air handling. In the latter case, the amount of the necessary remittance for 1st-class service to Regular Members would be left as an administrative decision with the understanding that (a) there is no strong objections from the membership in response to the line-item relating to this which will appear in the renewal notice in the September Newsletter, (b) that the new procedure will not begin until 1979, and (c) the required remittance will only reflect the actual postal cost involved, i.e., an AMSAT profit should not be realized through this action.

4. SYMCOM-IV and AMSAT-Canada:
   - Extensive discussions were held with regard to provision of an amateur radio transponder package to Hughes Aircraft Corp. By a Canadian satellite group for installation on the forthcoming SYMCOM-IV geostationary satellite scheduled for launching in 1980. Favorable commentary was offered regarding the technical details of the transponder, which is a joint project of the Amateur Satellite Association of Canada (AMSAT-Canada). Considerations were given to existing relations between ARRL and CARF as well as the proposed band-plan for the SYMCOM-IV unit. Recommendations were made in support of a 1296 or 172 MHz uplink and suitable 70 cm downlink - so called Mode M. Following extended discussions of various aspects of the SYMCOM-IV project, the following resolutions were drafted and adopted by the Board:
     (a) To accept the proposal of AMSAT-Canada to affiliate with AMSAT.
     (b) AMSAT-Canada is to be commended for its initial efforts and is empowered and encouraged to proceed with the development of a transponder for the SYMCOM-IV mission with funding assistance to be provided by AMSAT in an amount not to exceed $12,000 (U.S. dollars). It is understood that such funds will be provided on an as requested basis to AMSAT-Canada and that said funds are to be applied for in terms of their disbursement, pending favorable disposition by the ASBC. Moreover, it is understood that the hardware developed with such funds shall be considered the property of AMSAT.

The address for AMSAT-Canada is: Box 7306, Vanier, Ontario, K1L 8E4, Canada.

5. ASBC Representation:
   - It was agreed that AMSAT representation to the ASBC shall remain as: Perry Klein, W3PK, and Dick Daniels, W4PUJ, with Tom Clark, W3UL, as designated alternate, and Jan King, W3GKY, as technical consultant.

(Continued on Pg. 15)

6. AMSAT-OSCAR Spacecraft Laboratory:
   - Funding was approved, not to exceed $1,500, to cover the cost of graphic expenditures for display functions and other interior refurbishments for the AMSAT-OSCAR Spacecraft Laboratory. Approval of the name, "AMSAT-OSCAR Spacecraft Laboratory," was also given.

7. WARC-79:
   - Extensive discussions were held regarding the official AMSAT response to the 7th and 8th Notices of Inquiry of the F.C.C.

8. AMSAT Employees:
   - (a) It was agreed that AMSAT establish a policy of sick-leave allocation of 4 hours per 2-week pay period which can be accumulated, but not redeemable upon termination of employment.
   - (b) It was agreed to acknowledge the superior level of performance of AMSAT's Administrative Assistant.

(Continued from Pg. 7)

way and the user would be on any VHF band the local AMSAT group decided upon. They could use, for example, 144, 220, 435 or 1296 MHz. They could use 80, 40, 20, 15 or 10 meters, because the gateway earth station would transform the ground signals to the modulation format used in the spacecraft transponder uplink and downlink, which need not be the same as those used by the gateway user stations. A micro-computer at the earth station would also take care of any satellite tracking and antenna pointing requirements.

This type of service would link amateurs living in cities, but would be of little use to amateurs in rural areas or lesser developed countries. Since all the gateway earth stations would be sponsored by AMSAT groups, they can all be built to a standard specification much in the same way as INTELSAT specifies could be loaned to other countries for durations of emergencies, or taken out to rural areas from time to time. It is also possible that rural stations could tie into a gateway via a terrestrial VHF repeater.

This article has suggested one possible solution to the problems of high power use on OSCAR and the shortage of frequencies from satellite use. The author would welcome your comments and thoughts on the subject.

Silent Key

David Middelton, W7ZC

AMSAT lost a friend and a valuable Area Coordinator when Dave Middleton W7ZC suffered a fatal heart attack on 10 June 1978. Dave had been an active radio amateur for 50 years and had published many articles in QST, 73, CD and World Radio. Dave had joined AMSAT in 1969 and was one of our earliest supporters.

Dave was one of the originators of the solar cell sponsorship idea, having suggested that AMSAT could raise funds by selling shares in the spacecraft.

Dave will be missed by AMSAT and his many friends in all the other aspects of amateur radio that he was active in.

Dave Middelton, W7ZC
The Amateur Radio Interface Board as described last time is almost ready and should be deliverable in 30 days or so.

The AMSAT-80 machines are going to standardize on Northstar compatible floppy discs as the prime means of media exchange.

Kansas City Cassettes and Paper Tape will follow a close second.

AMSAT-80 is now available with lots of documentation. We will put it into FROM (1708 or 1702) for you.

If you wrote in and have not yet received a reply, this is it. If you have sent in an order, the latest prices and information will be sent to you. If not, send an eager to W3YWI.

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS

**Update**

Got June Newsletter and would like to comment on "Where Do We Go From Here" by W2RR.

My suggestion was that we start building better and smarter satellites. Note that I did not say bigger and more expensive. Looking back now at all eight OSCAR satellites, what was one of their common short-comings? POWER. And how was it solved in the next $/C? Bigger solar arrays and more batteries to store power, making for bigger and more expensive satellites. But our "birds" are not supposed to be a flat city cost plus percentage construction project. So how about copying something professional satellite builders have been practicing for over 10 years and the 2 meter FM bunch also has put into operation many years ago: Nicad battery re-conditioning to erase the memory effect and restore the batteries to almost new power storage capacity. The OSCAR 7 & 8 satellites enter night time periods several times a year. OSCAR 6 would still be alive today if battery re-conditioning could have been done! The process is no simple and inexpensive: deep discharge and recharge about 3 or 4 times in succession is all that is needed. The deep discharge can be done very easily by disconnecting the battery involved from the rest of the circuitry and placing a low charge resistor across its terminals. Do one battery at a time. Is this too difficult for us to do? Even if flying with one battery only, this can be done by stored command. Just because a satellite is 3 years old should not constitute reason to help it along to its final resting place in the sky.

**435 MHz Filter for Use with AMSAT-OSCAR 8 Mode J**

A common problem with operation in AMSAT-OSCAR 8 Mode J is desensitization of one's 435 MHz receiver from the third harmonic of the two-meter uplink transmitter. A low-cost 435 MHz bandpass filter has been developed and proven successful in eliminating this problem.

Construction details of the filter have been written up and are available for an eager (see and IRC's) from Bernie Glassmeyer, W9DRP, Satellite Coordinator, ASRL, 225 Main Street, Newington, Conn. 06111.

While reading the Phase III Progress Report by WQHY, I was wondering if any consideration is being given to substituting a false sun and earth pulse in case either sensor should fail. Final attitude fine tuning could be done by varying the magnetic torque coil assembly. Several NASA spacecraft launched during the past 10 years have suffered sensor failure. Those with proper contingency planning are still in operation today. The others died with their sensor failures. Is this too difficult for us to do?

Much is also being written about the high power abuse on the uplink. Instead of using AGC to control the whole uplink band spectrum or 3 sub-bands (as is recently being proposed), why not install some form of hard limiting or compression circuitry? Overly strong signals will be clipped and can't be copied on the downlink, i.e., no QSO. Or compress the spectrum equally so that the little fella can also get on for a chance. The sub-band plan sounds fine, except when each sub-band gets occupied by a high power station. Writing a letter to an offender or putting his call in your Letters and Comments section. Most hams know where 25, 150, 195, 43 and 44, etc. are located. Some of the stamps are small to start with and virtually impossible to read without a magnifying glass. I rather read more letters to the editor-you! Or am I older past my years and fail to see the beauty?
Hi Joe,

Regarding the Phase III channelization idea, I tend to go along with such a provision, however I do feel that some of the die-hard QRMers will present problems. As on OSCAR 6, 7 and also on AO-8, the bandplan is not being adhered to by a surprising number of stations. Sideband stations occupy a goodly portion of the CW band or segment. Here a feeling the same thing could happen with Phase 3. The overall idea of the bandplan for nets, roundtables, etc. is a great idea.

I've noticed that when AO-8 is on a longitude path of about 1250 or more west, usually late evenings in California, very few stations are using AO-8's. A couple of nights in a row I've called CQ on CW never with a single reply. It makes me curious. California, Oregon and Washington stations should access AO-8 with very respectable signals. Using 15 watts output and a vertical "J" antenna, I have no problem even when AO-8 is that far west.

Also, are there any KB7's on AO-8? Never even heard one yet.

Thanks and 73's

Vern, KB6UGS

Dear Joe,

Please find enclosed photos of the University of Surrey command station taken during the launch of AO-8. Photo 1 shows the tracking aerials for 137, 145, 435 and 1296 MHz, and the paraboloid used for 10 GHz Amateur color TV - mounted on a 35 ton modified Bofors gun mount. Maximum slew rate is 60°/sec but kept down to 100°/sec for tracking purposes. The maximum pointing resolution is 0.05° under manual control or ±1° under automatic control. The mount is driven by two 300 39 amp. d.c. motors with a solid-state proportional + integral control loop. The aerials are immediately above the command station.

Photo 2 was taken just after the launch of AO-8 during a series of command and communications experiments carried out at DOS/AMSAT. Two of the three terminals on the University's main 1CL 1605 computers can be seen on the left. This facility enabled us to obtain rapid Ag/El predictions for AO-8 and to analyze Doppler measurements (taken on the Eddystone 958 + Digital readout (*1 Hz) at the far right), providing updated orbital parameters. Telemetry trend analysis was also carried out on-line. The uplink communications equipment (TS700G) and downlink (Eddy, 958) can be seen underneath the AO-8 command encoder (the panel at the far right). The command power amplifier is above the encoder. The tracking was carried out by an on-line MINIC computer, and the auto-command system (the left panel). The serial control panels may be seen in the centre, below the C.O.T.V. monitor.

Operators involved during the launch activities were: G3YDQ, G4EDW, G4CWR, G4SUY, G1FJX, G6MHE, G6MLO and G6SDF.

Early telemetry from AO-8 on 435.1 MHz was received by G1LLD and relayed to K1EU and Goddard immediately by 21 MHz by G10S. The 435 MHz beacon was heard at AMS for about 8 seconds following ejection but it was very weak and the telemetry was not decodable. Confirmation of AO-8 command acceptance by AO-8 came on orbit 962 although the beacon was still weak.

Best 73,

Martin Sweeting, G3YDQ

Dear Joe:

My copy of the Newsletter (Volume 10 No. 2) arrived this morning (26 June 1978) thank you.

Naturally I would like to receive the next edition as quickly as possible.

Nevertheless, I would agree that $3000 per year would be better spent on Phase II spacecraft.

James Thompson, G3LIV

Dear Joe:

something else worth mentioning is that the TX-432 can also be used on 432 MHz by merely changing the crystal and returning all the stages. One loses roughly half a watt, but the one-watt output is still enough to drive their 430-435 MHz amplifier to full output. Here I'm thinking in terms of using the unit to access the next new bird, Phase 3B.

Hope this sufficiently answers your question about the VXO arrangement on the TX-432.

73's

Vern Hajeck, KB6UGS

P.S. Found out recently that Matsronics, 182 Belmont Rd., Rochester, N.Y. 14612 has a fair supply of various VHF & UHF kits at comparable prices worth looking into.

12 Canada

Best 73,

Martin Sweeting, G3YDQ

UOS-AMSAT

Dear Joe:

In reference to your question in the most recent Newsletter about the VXO provision in the VHF Engineering TX-432, one can use individual crystals (15 MHz) available through VHF Engineering. For my unit, I acquired the 200-2 crystal deck which is nothing more than 10 crystal sockets and a rotary switch. This crystal deck is designed for use with all their transmitters. One can choose the crystal frequencies needed for whatever portion of the band.
Dear CMs:

Since a single letter to just one of you may yet hang up in the files—for months—thousand's being sent to all. My last letter, somewhat in the same vein, was in the ARRL NW Section Coordinator evoked no response from either ANSAt or ARRL. Perhaps this will score better.

As an early ANSAt Life Member and one who would like to see the Radio Club to become "Club 1M #2"---it is my opinion that the satellite program is in deep trouble, that this is not recognized by the officers because they are "too close" to it to realize that it is time to take a hard look at it from the general membership point of view.

The following may seem verbose but it is the only way I can present the background for the questions which bug me--and I suspect are bugging many other members.

After 44 years of active ham radio (including 4 years as ARRL Director) I feel fairly well acquainted with the statistically average ham. He is only "sidly" technical. He is rather good at operational techniques. As the "state of the art" progresses, he is slow to give up familiar ground for anything "new" if the change is not too costly or radical, but give it a tentative tryout. If it proves satisfying and practical, he can only be a zealous promoter of the new "art." If turned off, he may be just as zealous in the opposite direction.

When 0-6 flew, we finally had the type of satellite that satisfied this "average" ham. Relatively low cost and not too much technical knowledge was required. Those who tried it out soon became good salesmen for satellite communications—and ANSAt.

With 0-7, he was a bit unhappy about the Modena. Consequently, more ERP was required but by this time was becoming more familiar with VHF so a move to receiver pre-amps and power amps was only a slight step along the way. The more technical knowledge was started to take advantage of Mode B. Since this required greater technical proficiency and/or commitment many of the original users, and practically all of the neophytes, removed themselves from Mode A.

As 0-6 was dying and 0-7 got into trouble, many "dropped out". Multi-mode 2-M was tried for a while and there was a brief surge of new-comers which ended with the death of 0-6.

This AM SAt really interested in increasing the number of satellite users—or is it more concerned with limiting the users? The present program seems to point to that latter.

Final comment: While in this letter I am voicing only my own opinions, I know for a fact that our local coordinator, Walt Dixon, W4DNN, also feels strongly that the program is falling--and not for lack of his dedicated promotion! Personally I am ready, willing and able to use the present time, effort and cash—but not in the direction it is now going. When the program goes back to full membership participation instead of full membership financing for a select few to participate then I will take another look at my contributions.

73,
Charles J. Bolvin, K4KQ

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Dear Joe,

Please permit me the space to answer Peter, GBEFF, whose letter appeared in the March Newsletter, apparently criticizing his own mis-interpretation constituted from some of my comments in "Powers That Be" that you published in the December 1977 issue.

I hasten to re-assure Peter that at no point did I suggest that "B" licensees were inferior in technical knowledge, examination ability, professional competence, personality, or indeed any other context that he may have assumed.

The only "superiority" to "do things in Radio" for the full licensees comes directly from the fact that the additional Morse examination necessary for a license to transmit Morse and operate on any amateur band below 144 MHz has been sat and passed, thus freeing the operator from the self-imposed restrictions that result from this limited license.

To realize these difficulties, I present the following obvious facts:

(1) Despite its use of VHF, "OSCAt" is in fact a DX band, with all the problems of overcrowding, competition, mixed mode operation and with the additional difficulty of QAC attenuation caused by those who have powerful full license "DXability" learned early in the game, particularly on the HF bands, i.e., the American Novice stations, can be a great advantage on a weak station has to contend with the presence of powerful stations on a small band to effect any worthwhile QSO’s.

(2) The use of CW as an amateur communications medium when long haul QSOs’s are being affected is very valuable on OSCAt for the following reasons:

(a) less use of valuable bandwidth
(b) Greater readability for a much smaller signal.
(c) Vastly superior readability by using narrow filters at the recieving end.
(d) Far less affected by blocking, fading, splatter, etc.
(e) Far less power needed to maintain a solid QSO thus saving the battery.

(f) Possibility of flexibility in international contacts of the "language" used.
(g) Ability to QSO those, as in many developing countries, who can only afford a simple CW rig, or build one with little technical aid.

(3) That for reasons of general coverage, it is necessary to hold the highest possible and assistive "ANSAt Nets" on the HF bands, thus placing a great handicap on those who are not so equipped, and who may not by the very nature of their license contribute to them. Thus, operational schedules, limitations on operating times, topical relevant information can be missed by the VHF only operators.

(4) Codestore messages are in Morse Code, which may not be understood and gained from by those unable to read code. This is typical 12 w.p.m. Morse test needed for the full amateur license.

It is very noticeable on OSCAt that many of the successful stations are CW and SSB operators, and that there are many more new operators on CW than on SSB. It is also very evident that in the main it is the VHF Phone only stations who cause most of the problems of blocking, off-schedule operation, simply,
Dear Joe,

Having been a member of AMSAT for over five years there are a couple of points that I would like to make about the AMSAT-UK Newsletter. "Down Under", for the want of a better term, we rely heavily on the Newsletter for information. Therefore, I would fully endorse the proposal to pay for my Newsletter to be airmailed (irrespective of being a Life Member) to ensure that the news is up-to-date. Secondly, I have found the lack of minutes of Board Meetings in the last two issues a little disconcerting. Perhaps they have been deleted for a good reason; however, I always found them informative and have personally missed them. Perhaps an abbreviated form in the future may be considered. However, your efforts are tremendously appreciated for an excellent in-house magazine.

In conclusion, I would like to appeal to any member of AMSAT who is currently plotting OSCAR 8 channel one telemetry to establish spin rate and attitude, etc. and would like to compare notes. I would be greatly appreciative of hearing from you.

To date, I have observed some interesting points which may or may not prove to be something of substance in times to come. My interest in OSCAR 8 is a carry over from OSCAR 7 RTTY telemetry from which I have been able to analyse and appreciate but have well the magnetic stabilisation works on our "birds".

Colin J. Hurst, VK3HI
8 Arndell Road
Salisbury Park,
S. Australia 5109

Sincerely,

Pat G Owen, G3IOR

CORRECTION TO AMSAT-OSCAR 8 REFERENCE ORBITS

AND WS6PAJ ORBIT CALENDR

The equatorial crossing times for AMSAT-OSCAR 8 published in the June "AMSAT Newsletter" and in the WS6PAJ Orbital Prediction book have been accumulating errors of several minutes, and we have worked out the following correction factor that should be applied.

Corrected equatorial crossing time = T + 0.00205N minutes, where T is the published equatorial crossing time and N is the orbit number.

For example,

Oct. 6, 1978 Orbit 3006, 1842:30 UTC at 321.60 W
add the correction factor 0.00205 x 3006 = 6.15 minutes to give 1848:39 UTC

The reason for the error is confusion between AMSAT-OSCAR 8 and the second stage of the Delta launch vehicle. The two objects are in similar orbits, and were very difficult to tell apart from radar tracking data during the first few months following launch.

AMSAT NEWSLETTER SEPTEMBER 1978

Don't forget to separate BALLOT and RENEWAL APPLICATION before mailing.

BALLOT SHEET

Vote for up to three (3) candidates and mail to AMSAT, Elections Secretary, P.O. Box 27, Washington, D.C. 20044 U.S.A. Ballots must be received by October 14, 1978.

IMPORTANT: Be sure to include your name, member number and ZIP code (or country if located outside the U.S.) on your ballot mailing envelope, so that your ballot can be validated.

( ) Tom Clark, W3NJZ
( ) Pat G Owen, G3IOR
( ) Earl Skelton, N3ES
( ) Richard Zvirk, K1MTV

MEMBERSHIP RENEWAL NOTICE

AMSAT Newsletter Sept. 1978

Please complete form and mail to AMSAT as soon as possible.

Name ____________________________ ARRL Member?

Call __________ License Class __________ ZIP or Postal Code _________

Street ____________________________ City __________ State ____________ (Country)

Membership Number ________ or, check here if you are applying for new membership

Please indicate here if you have made one or more contacts on AMSAT-OSCAR 6,7 or 8

Mode A ______ Mode B______ Mode J______ Would you be willing to accept an AMSAT assignment in a technical area? ______ an administrative area?

Individual membership dues for January-December 1979.$15.00

(Add half the dues for subscription to the quarterly "AMSAT Newsletter")

**Include $3.00 here if airmail delivery of AMSAT Newsletters is desired (in North America, include $1.50 for First Class mail.)

Affiliated Member Society dues for January-December 1979 ($20) ______

Life Membership (donation of $100 or more) ______

An AMSAT-OSCAR satellite pin is provided to new life members

A-O-7/6/8 Combined Orbit Calendar for 1979 ($3 each) ______

(Provided free to Life Members on request)

Life Member Society (donation of $200 or more) ______

Contribution toward AMSAT Phase III Satellite (Solar cells may be sponsored at $10.00 per cell, battery cells at $250.00) ______

Other ______

TOTAL AMOUNT ENCLOSED $____

(Please make your check or money order payable to "AMSAT" in U.S. funds.
We also welcome payment by VISA or MasterCharge. Please give your account number and expiration date.)

*NOTE: Members outside the U.S. may send their AMSAT dues to their national organization: AMSAT-AL, AMSAT-France, AMSAT-Italiana, JAMSAT, AMSAT-Mexico, AMSAT-Nederland, AMSAT-UK, or N1ZP. Swiss dues can be paid in Swiss francs. Members in countries with currency restrictions may send IRC's ($ 3 IRC's per $1.00).

**AMSAT Newsletters will be sent via Second Class and Surface Mail unless additional postage is included. Life members receive their Newsletters by First Class or Air Mail.
An exciting new era in amateur radio is about to begin... the era of AMSAT PHASE III OSCAR satellites.

The AMSAT PHASE III satellite program promises a continuing demonstration that amateur radio is at the forefront of modern technology. PHASE III satellites will routinely provide reliable communications over paths of up to 11,000 miles (17,700 km) for 17 hours each day. You can think of them as a resource equivalent to a new band.

The cost of these PHASE III satellites is a projected $250,000. Commercial satellites of similar performance would cost nearly $10,000,000.

Your valued, tax-deductible contribution can be as small as one of the 5000+ solar cells needed. A handsome certificate will acknowledge the numbered cells you sponsor for $10 each. Larger components of the satellites may also be sponsored with contribution acknowledgments ranging to a plaque carrying your name aboard the satellites. Call or write us for the opportunities available.

Your membership in AMSAT is important to the satellite program, and will give AMSAT's stronger voice in regulatory matters concerned with satellites. At $10 per year or $100 for life, you will be making a most significant contribution to the satellite program and the future of amateur radio. You will also receive the quarterly AMSAT newsletter.

AMSAT
P.O. Box 27
Washington, D.C. 20044

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Please return the mailing label portion of your Newsletter to us and note the corrections. Thank you.
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Editor: Joe Kasser, G3ECZ; 11332 Stewart Lane, Silver Spring, MD 20904, U.S.A. Telephone: (301) 622-2194.

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Membership Chairman: Robert W. Balcom, W3PK
Larry Martin, W1IBO (Asst.)
Office Manager: Martha Saragovitz

COVER PICTURE
G3ECZ (seated) explaining certain suspicious movements in space to G3WRI in the shack of G3WRI.

EDITORIAL

Voices raised in protest seem to be a common denominator in many groups and organizations these days and AMSAT is no exception. The Letters and Comments pages in this Newsletter reflect the increased flow of communication between the members and this Editor. Any organization should serve the needs of its members. AMSAT is such a unique and diverse group that it is difficult to establish those needs without input from the members. A few active members have communicated their desires and AMSAT headquarters has realized that the growth of the organization has modified it and changes are in progress. The first of these can be seen as the change in the bylaws in the way that candidates for election to the Board of Directors are nominated. More changes will follow. If you have any suggestions do not hesitate in advising us of them. Your suggestion will be given the consideration that it deserves.

On the subject of organization. The March issue of the Newsletter will carry the Country/Area Coordinator and Net information. If you are a net controller or a coordinator, please verify your net still meets (day, time and frequency), or advise of new ones and if you are a coordinator, likewise send in a note confirming that you wish to continue in your position.

The "Is This The Future" column in the last Newsletter seems to have had a universal negative response. Nobody seems to want to make satellite communications easier. Does anyone agree with the concept? It should be pointed out that the gateway approach would not constitute the only approach. Phase II satellites are being built by organizations other than AMSAT. The ARL is very keen on Mode A transponders. In fact, you can thank them for OSCAR-8. If it were not for their insistence on a Mode A replacement for OSCAR-6, OSCAR-8 would probably not be in orbit at this time. The use of computers in amateur radio opens a new era of communications capability. Did anybody read the articles in the November 1978 and January 1979 issues of Byte Magazine?

Synchronous orbits, Phase III orbits, Phase II orbits all lie in our future, but just as conventional amateur radio contains a myriad of different interests (such as 75 meter phone, 160 meter DX, VHF propagation, etc.) the satellites of the radio amateur space service will, in the future, provide different areas of interest. If you want the challenge of doing things the hard way, you'll have it. If you want reliable point to point communications capability, you'll have it. If you want to tinker with terminals, gateways or computers, you'll be able to do it providing you support the program. We've come a long way since the launch of OSCAR-1 back in 1961, and we are going a lot further in the years ahead.

The best part of being an editor is reading the comments sent in by the readers. You may not get a timely reply, but your letters will be read, so keep them coming.

Joe, G3ECZ

NOTICE OF PROPOSED AMENDMENT TO THE AMSAT BYLAWS

The AMSAT Board, at its October 15 meeting, approved a change in the Bylaws to permit the nomination of directors by five regular voting AMSAT members. Previously, only Member Societies could nominate directors, not individual members.

Comments on this proposed Bylaws change are invited. According to Article VIII of the Bylaws, changes in the Bylaws shall require approval of two-thirds of the directors. Notice of an amendment which has received such approval shall be circulated to the membership. The amendment shall take effect thirty days after mailing of said notice, unless written objection is received from at least ten percent of the membership.
"RS", THE AMATEUR RADIO SATELLITES OF THE SOVIET UNION

By Pat Gowen, G3JOR

On October 26, 1978, at 0650 42 minutes UTC, the USSR launched the research satellite COSMOS 1045 from Plesetsk. Accompanying it were the first Soviet built amateur radio communications satellites, "RS1" and "RS2", Radio-amateur-sputniki, or Radio-amateur Satellites, the initial letters conveniently forming a call in the prefix block allocated to the Soviet Union.

AMSAT and its devotees have keenly been looking forward to these satellites ever since the building of the hardware by G3CR, U3DJV, U3DSU, U3SUU, U3SMN and other members of the Russian Satellite Group, and its early testing from a 16th floor residential apartment as published in the October 1975 issue of Radio (1). During the lead up to the actual launch, a series of articles also appeared giving basic information required to work through the transponder, calculate the orbit period, and explain the fundamental parameters (2). It was not until a period of 10 minutes after the pass, that it was assumed that the satellite would be carried aloft piggy-back with one of the USSR's "METEOR" Weather satellites, although it was secretly hoped by many that a launch of one of the "METEOR" satellites into a highly elliptical high North Perigee might come about to provide a much needed "2 to 16" DX Satellite.

Possibly the first surprise came when the International Frequency Registration Board circular No. 1273 was published on 12 July 1977 when the planned satellite network was indicated, which portended something better than a simple unit (3). An even bigger surprise came to your author when the first audible orbit came over his NNR horizon at 2012 UTC on 26 October, although it was not realized at that time that it was in fact descending in the evening. Ears, "S"-meters, back-to-front beam ratios, high angle ducting were all suspected until the obvious was identified during the progress of the pass. Despite the lack of knowledge of where the beam was pointing, what the frequency relationship was, the TCA doppler, recording TLM, measuring the pass-band width, by some miracle G3JOR and G3FIS managed to work the first, a 30 minute pass on CW, 437 MHz, 13470, and exchange 4/579 on CW, and 47 on SSB. With surprises in vogue, the pass finally went out, apparently to 2137 UTC... an access period of 16 minutes! This gave a 16 minute access overhead longest pass on AMSAT-OSCAR 8, and even much greater than the maximum of 22 minutes possible with the AMSAT-OSCAR 7 spacecraft. Obviously, "RS" was a very much higher orbit than that which was originally expected, and relationship between beam direction, apparent elevation and doppler shift rate confirmed the findings.

Immediately, the first task was to get the news across to AMSAT, but not a soul could be roused in "W" through the satellites and the AMSAT-WX telephone remained masked. (As it happens-home-from-work time in the U.S.A.). Luckily, a group including a third district "W" permitted my invasion of their net on 14 MHz and the news of the occasion and the forthcoming orbit was put over the AMSAT Washington repeater.

It soon spread like wildfire for many USA stations were in evidence on the following orbit some two hours and five minutes later, and contacts were effected with both New England and Florida. Now Florida is extreme eastern United States, and only workable for a maximum of one minute even via OSCAR 7. This time we were in there with mutual access for five minutes...nothing but we had a really high orbit, though I still thought it might be elliptical at the time;
The spacecraft can switch to a high speed C/TLM format, which appears at first sight to be composed of some sixty-five channels, probably two runs of 30 with five indicators, but much more research needs to be done on this format as yet.

"RS2" is stated to be an identical spacecraft, with virtually the same orbital characteristics. It was tested out up to orbit 16, and found to be functioning well, although slightly less sensitive than RS1. RS2 is now a backup, and will only be brought into use if necessitated by the state of RS1.

The basic characteristics of the satellite(s) are as follows, with the source used given in case of differences:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Altitude</td>
<td>1706 km</td>
<td>G3IOB</td>
</tr>
<tr>
<td>Apogee</td>
<td>1688 km</td>
<td>(AMSAT ex NASA)</td>
</tr>
<tr>
<td>Perigee</td>
<td>1724 km</td>
<td></td>
</tr>
<tr>
<td>The current points of apogee and perigee are not yet known.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended power uplink: 50-100 mW. (RS3A) 1 watt e.r.p. gives a 599 return. All users are asked to run that power which gives no more downlink strength than the 26,400 MHz beacon. QRO loading will cause loss of transponder.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uplink</td>
<td>145.870 - 145.915 MHz. (CW LF end, SSB HF end according to IARU and AMSAT recommendations) No FM. Avoid QRM on beacon at HF end. (G3IOB)</td>
<td></td>
</tr>
<tr>
<td>Downlink</td>
<td>29.350 - 29.395 MHz corresponding to above uplink. (G3IOB)</td>
<td></td>
</tr>
<tr>
<td>Inclination</td>
<td>82.556°</td>
<td>(RS3A)</td>
</tr>
<tr>
<td>Period</td>
<td>120.389433 minutes. (RS3A)</td>
<td></td>
</tr>
<tr>
<td>Increment</td>
<td>30.227°/orbit (RS3A)</td>
<td></td>
</tr>
<tr>
<td>Daily period advance on previous day: 4 minutes 40.392 seconds. (G3IOB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily incremental advance on previous day: 2.724° further West. (G3IOB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Source</td>
<td>Solar Cells. (NB. This will be worth watching to see if &quot;catastros&quot; occurs due to radiation damage from the intense Van Allen radiation belt that the RS satellites are in.) (RS3A NB=G3IOB)</td>
<td></td>
</tr>
<tr>
<td>Antennas</td>
<td>Inverted &quot;V&quot; for two metres, (\frac{3}{4}) for 10 metres. (RS3A) (Another surprise, as the satellite has no stabilization other than that which will occur naturally due to braking in the Magnetosphere due to stray eddy currents, and ion friction). Yet the satellite is reasonably independent of either uplink or downlink polarization and seems remarkably free from deep fading.</td>
<td></td>
</tr>
</tbody>
</table>

Problems: At this time, with the MUF well above 29.4 MHz, daylight passes can be a problem, as often the downlink may be very weak, or even attenuated out completely when at low post horizon angles due to the densely ionized layers through which the signal has to pass. The same layers have brought forth a number of very strong harmonics in the downlink band, notably TASS and RADIO MOSCOW. The spread of the E and the modulation obliterate the attenuated signal as negative doppler takes it closer in frequency to the QRM, and as the beam approaches the unwanted source, LOS is often premature. Hopefully these difficulties are short-lived, as the hours of daylight are decreasing fast now in the Northern Hemisphere, and less attenuation to the needed signal and an increasing amount to the unwanted will occur.

A larger problem is the unaware user. RS is designed with the USER limit of 5 watts maximum input for technicians on the twenty metre band in mind, hence its superb sensitivity. 10 mW, from a hand held has been heard via the transponder on a quiet pass, but it is a very different story when unskilled operators as yet...
unaware of the requirements are attempting to use it. 10 watts e.r.p. will block the ALC system, and render all signals, including the beacon, totally unreadable. If sustained, the transponder will revert to beacon mode, and once out of range of the Soviet command station, cannot be put on again until the next pass.

Possibly the greatest threat of all is that some amateurs, contrary to the internationally agreed IARC band plans, are employing channels within the 145.800 - 145.999 space band for simplex FM QSO's. Most of these are using powers well above that required to switch the satellite, and at the very least occupy the entire band with noise when 145.875 and 145.900 are used. They are very difficult to identify, as the passband will either be blocked off or shut off altogether when they are present. The only answer is for constant monitoring of the space section of the band to identify the intruders and to report them to their national society, who will take action as agreed at the last IARC Conference, and affect their removal to the band allocated.

In the past two weeks, RS 1 has already been used to give contacts to stations over 5,000 miles apart with less than 1 watt e.r.p. at mutual horizons and an interesting new concept has been brought to amateur radio, where one is obliged to modify existing commercially manufactured two-metre transmitters in order to REDUCE one's power to a degree which permits two-way mutual contacts to take place, and to use simple omni-directional antennas in place of multi-element directive arrays.

The Soviet Union Satellite Group has already started work upon a further satellite, and are anxious to have reports, results and telemetry input from world users in order to justify the launch of the next RS satellite. These should be sent to:

Moscow Radio Club
Box 88
Attn: RS3A
Moscow, USSR

They will be greatly appreciated. Our congratulations to the designers, builders, launchers and all involved in the highly successful RS 1 which has now joined the International Amateur Satellite series.

Finally, I would like to acknowledge the help and aid of the following who have given of their time and effort to help produce the information in this article: DL3EJK, G2BNV, G3AJL, G3LDI, G3MOC, G8QR, G8YPO, G8LWW, G3CCD, G3YJO, G3MDL, G604D, G9POG, GAA3CR, U8JACV, W5HJM, G3MTV and Geoff Perry of the Kettering Satellite Group.

REFERENCES:

(1) "RADIO" No. 10, October 1975. Article by S. Budin, UB5UN and F. Fokkel, UB5MN.

(2) e.g., "RADIO" No. 9, September 1977. Article by V. Dobrohanisky.


(4) TASS 5-11 of 1103 UTC, 27 October 1978. "RADIO 1, RADIO 2 and COSMOS-1045 SATELLITES".

U.S.S.R. RADIO SATELLITE AWARDS

Prizes will be awarded for Radio satellite contacts, for QSO's after 1416 Moscow standard time October 26, 1978, when the Radio transponder was first turned on. Applications go to Satellite Communication Committee of the RSR U.S.S.R., Central Radio Club, 88 Volokolamskoye Shosse, 123362 Moscow, U.S.S.R. (or for foreign applicants: P.O. Box 88, Moscow, U.S.S.R.) The first ten amateurs from each continent and the first sixty from the U.S.S.R. to make radio contacts will receive Central Radio Club metals. Amateurs contacting ten different stations this year will receive a certificate of the Radio Sport Federation and the Central Radio Club. For 25 contacts, a certificate of Radio magazine will be issued. Those completing 100 QSO's will receive autographed photos of the constructors of the on-board equipment. Repeater QSO's are permitted compiled up to fifty percent of the total, provided different orbits are used. Special versions of the existing R-10, R-40, R-100 and W-100 awards will be issued for Radio satellite contacts.

SWITCHING ANTENNA POLARIZATION THE EASY WAY

By Ross W. Forbes, WB6GFJ
Manager, AMBAT-OSCAR QSL Bureau
Box 1, Los Altos, CA 94022

The attached is a copy of the schematic of my switching control for 145 MHz.

The control allows me to switch from any of the following positions:

1. VERTICAL POLARIZATION
2. HORIZONTAL POLARIZATION
3. RIGHT HAND CIRCULAR
4. LEFT HAND CIRCULAR

Parts required include:

3 - female chassis mount coax connectors
2 - DPDT switches
1 - chassis approx. 6"x6"x6"
about 5 feet of RG-59/U coax
about 5 feet of RG-8/U coax

While the parts I used were not designed for VHF or UHF, I find the control works very well on both transmit and receive. Especially on Mode B, if you've never been able to change receive polarization, you have a wonderful surprise in store. While some stations have designed their control for various degrees of polarization, this simple diagram will provide you with a new element to control fade on Mode B receive. My diagram is a modification of a design provided by John Pronko, W2KN, Northern California AMBAT Coordinator.

antenna #1
to transmitter

1/4λ of RG-59/U (75Ω)

1/4λ of RG-58/U (50Ω)

Length A to B = 1/4-wavelength RG-59/U
Length A to C = 1/4-wavelength RG-59/U
Length C to D = 1/4-wavelength RG-58/U
Length XMT to E = Any length of RG-59/U or RG-8/U
Length F to G and B to H are RG-58/U but must be equal
Length I to Antenna 1 and J to Antenna 2 is any length of RG-8/U and must be equal
52 and 54 are DPDT
4-wavelength velocity factor used is 13.355
RECEPTION OF 70CM SIGNALS FROM SATELLITES
SUMMARY OF RESULTS MARCH TO OCT., 78

By John Branean, GM8OKQ

Introduction
The launch of OSCAR 8 disappointed many amateur satellite users when its mode J transponder produced only weak variable downlink signals. For six months the writer has monitored signals from this satellite in an effort to find reasons for this. From time to time this has involved comparisons with 70 cm signals from other satellites notably P76 and OSCAR 7A.

Equipment
The receiving system uses a Lunar low noise pre-amplifier, Microwave Modules 435/29 transmitter, feeding an FT 102E receiver as IF and has a measured equivalent noise temperature of 130° K. Antennas used provide 28° beamwidth in elevation and azimuth with provision for switching polarisation in vertical, horizontal and clockwise, anti-clockwise modes. The receiving site is at Saline in Fife Scotland at 56° 12' N, 3° 36' W at 110 metres above sea level with horizons generally clear down to 1° EL except to the east and north-east where the horizon rises to 3°.

Method
The satellites were tracked continuously in azimuth and elevation from beginning to end of each of 150+ orbital passes. Signal levels measured as dBs above receiver noise were recorded every half minute. In addition, brief records of signal levels were recorded for a further 300 orbits used for normal amateur communications.

Results
For convenience results are split up into a family of orbit types. Each orbit type covers roughly ±12.5° of EQX (Equatorial Crossing bearing).

Orbit EQX 160 °12.5° In 30% of orbits recorded signal rises quickly to 12 dBs above noise and then maintains this rough level until 1 minute before the end of the pass. In a further 30% the first half of the pass is at 12 dBs but as the satellite goes south of east, the signal drops into noise and stays there. In the remaining 40% of orbits of this type the signal rarely comes above noise.

The results obtained with AO8 and AO7 differ markedly from the results obtained with P76 traversing this area in the opposite direction two hours later in that P76 has strong signals nearly 100% of its passes. Similarly when AO8 and AO7 traverse this same area the opposite way in the early evening, they show much steadier strong signals. There is no day to day relationship or similarity between EQX 160 AO8 passes on successive days.

Conclusions
The effects are not weather/ atmosphere dependent in that they do not last more than two hours even when the weather is stable for days. The effects do seem to be time of day dependent, perhaps related to the position of the sun. The signal path is clearly more disturbed to the south than the north.

Orbit EQX 185 °12.5° Results similar to previous orbit but not as good overall. 20% good strong passes, 30% good to north, poor to south. 58% poor north and south. Signals at peak are higher than previous orbit in agreement with shorter slant range to satellite. Conclusions as for previous orbit.

Orbit EQX 210 °12.5° Some improvement over previous orbits in that 28% of passes have good strong signals throughout and a further 40% are strong but subject to fading when satellite is to west north-west azimuth 290°. Even remaining passes are strong to north but fade into noise as satellite travels south. Conclusions are again similar to first two orbits except fading to west north-west appears to occur on most satellite passes through over this geographical area whatever the time of day of the pass.

Orbit EQX 235 °12.5° Results and Conclusions very similar to previous orbit at EQX 210.

Orbit EQX 260 °12.5° The lowest elevation, highest latitude orbit of the day. The satellite passes well to the north, close to the pole. Signals are very consistent on all orbits examined at 4dB above receiver noise rarely disturbed by fading or flutter.
Orbit 285° More than 60% of these passes are consistently strong throughout. A further 25% have strong signals except to north north-west. Remaining 15% of passes never come out of noise.

Conclusion: This orbit and the one which follows it are the most consistent orbits for good signal levels on AO8 and AO7, but not P76 which traverses this area in the same direction 10 hours earlier often with poor signals.

Orbit 310° 80% strong signals throughout. A further 10% start only 3dB above noise in the east then become weaker. The remainder are strong east and northeast than only 3dB above noise to north.

Conclusion: This and previous orbit appear to occur at most suitable time of day and place for consistently good results. Poor results to north can usually be linked to aurora.

Orbit EQX 335° 40% strong throughout; 40% strong north, weak south; 12% strong south, weak north.

Conclusion: As satellite moves into lower more southern latitudes signals are again disturbed. Weak signals to north usually correlate with aurora.

Orbit EQX 360° The poorest orbit of the day; only 15% passes produce strong signals. 85% are in noise while satellite is south and, of these, a third stay in the noise to the north while the remaining two thirds come out of noise but suffer severe fading to the north.

Conclusion: The coincidence of the satellite's low latitude pass under an evening sun followed by transit of the regularly disturbed area to the north north-west of UK, results in a very poor orbit for communications.

Summary
1. The pattern of poor results to the south appears to be linked to the time of day and/or position of the sun. P76 ten hours ahead orbitally gets far less overall disturbance.
2. Good results to northeast also appear to be time of day linked. P76 is not as good ten hours earlier, so it is unlikely to be due to latitude.
3. Pronounced signal fading in area roughly bounded by 55 and 75°N, 10 and 30°W happens at all times of day. Fading rates of 2 to 150 cycles per min. suggest high electron density somewhere along line of sight.
4. Rotation of polarization has been searched for many times but only observed twice at the slow rate of 360° in 8 minutes. It may occur in the fast fading. Satellite spin effects on signal have not been noted though spin is clearly evident at 1 rev in 4.4 minutes from solar cell panel telemetry.
I have worked 25 countries with more than a dozen good solid QSOs into W1, W3, VE1, VE2, and VE3. Active stations are few and far between here, but those who do make the grade through the problems of consistent tracking with narrow beam antennas, low noise receiver front ends, receiver desensitizing on transmit, and cross mod product birefrings, have a rare experience awaiting them -- a satellite without alligators. One suggestion going the rounds here is that you should make Phase III just as difficult, then we won't get alligator problems there.

However, weak jokes aside, there is one feature of 8J which does give me concern and I think the attached monitoring reports show this feature plainly -- i.e., there is very little doubt that the free space loss nomograms, supposedly applicable to satellites, which are a featured item in most of the current handbooks, are a heck of a long way from the truth. For I believe it is evident that the weak signal downlink from 8J frequently has to contend with a very disturbed path from satellite to ground. At the moment, I am in no position to write the definitive monograph on just what produces this disturbance though it seems that at least two sources may be involved:

(1) The ionosphere -- which contrary to much published data, does not suddenly stop acting up as signal frequencies go above 40 MHz.

(2) The lower edges of the inner Van Allen belt -- which may perhaps come down into the OSCAR tracks over certain regions of the world, producing patches of high electron density in parts of specific OSCAR orbits.

These disturbances seem to affect all weak satellite signals I have looked at and are as bad on OSCAR 7A 70 cm beacon, as they are on Mode J. Even the stronger signals from P76 (Stanford Research Inst.) are regularly disturbed, as were the downlink signals from ATS 6 when it could be picked up in Europe on 860 MHz during the Indian SATE TV geostationary satellite experiments a couple of years ago.

I wonder what are the implications for Phase III?

The writer is grateful to DB9AX, DC5I, PELPE, PEPEAV, VE3HGN, W32HM and others whose fine signals have kept 8J active for this minor research.

MINUTES OF THE BOARD OF DIRECTORS MEETING, 15 OCT. 1978

A meeting of the AMSAT Board of Directors was held during the morning of 15 Oct. 1978 in the Conference Room of Building 2 of NASA Goddard Space Flight Center, Greenbelt, MD. The following people were in attendance:

John Brownrigg, W6SP
Tom Clark, WA1MV
Martin Davidoff, K2UUC
John Henry, VE2VQ (ex VE2DNN)
Jay Holladay, W6EUJ
Jan King, W3GEY
Perry Klein, W3FR
Martin Sweeney, G3YQQ
Will Webster, WB2THC
Rich Swift, K5FHV

Items discussed and action taken were as follows:

1. Proposed Changes to AMSAT Bylaws

   a) The Board endorsed a motion to revise the bylaws pertaining to nominating candidates for the board of directors to add the following method for entering nominations -- Candidates for the board of directors may be nominated by obtaining endorsement signatures from five regular voting AMSAT members. Comments on this proposed change are solicited from the membership so that the proposal can be acted on in time for the 1979 elections.

   b) The Board also endorsed a motion to allow Board members not in attendance to vote on important issues by telephone. The rationale is that some Board members do not live in the metropolitan D.C. area and therefore are unable to attend many meetings due to transportation costs. Before this change is passed the laws of the District of Columbia (AMSAT is incorporated in D.C.) must be checked.

   c) It was pointed out that the bylaws have not appeared in the AMSAT Newsletter for a number of years. It was the consensus of the Board that the Newsletter Editor be directed to include the bylaws in an early issue.

2. National Association of Publishers (SNAP) Membership

   Perry Klein proposed that, as the publisher of the AMSAT Newsletter, we join the national publishing group known as SNAP and reported that William Dunkerley, WAZIBN, had offered to contribute the membership fee. The proposal was accepted by the Board.

3. Amateur Satellite Service Council Items

   The text of a draft proposal to ASSC from AMSAT concerning (1) the use of Phase III satellites for WIAA bulletin and traffic handling and (2) a request to ARRL of continuing financial support was informally discussed.

4. SYMCART Project

   John Henry discussed the SYMCART transponder under construction by the AMSAT-Canada group. Hardware is progressing on schedule. However, launch status is uncertain due to recent changes in launch plans and priorities of the government and commercial agencies concerned. These changes are being closely monitored.

5. U.K. Scientific-Educational Satellite Proposal

   Martin Sweeney, representing AMSAT-UK and the University of Surrey, England, presented a proposal for a Phase IT satellite to be constructed and financed by a consortium of British groups. The satellite would differ from previous OSCARs in that it would place greater emphasis on scientific experiments of interest to radio amateurs. AMSAT agreed to endorse the project fully and to assist in identifying a suitable launch in the 1981-1982 time frame.

6. Region 1 (Europe and Africa) Experiment Coordination and Information Dissemination

   In response to a suggestion by Pat Goven, G3LOR, it was agreed that responsibility for scheduling AMSAT-OSCAR 7 experiments and disseminating OSCAR information to Region 1 users be turned over to AMSAT-UK.
7. Phase III Travel Funds

Jan King reported that a meeting has been scheduled for Oct. 27, 28, and 29 for those working on critical aspects of Phase III-A flight hardware and ground support systems. Travel funds for this meeting were authorized by the Board.

Jan also reported that the European Space Agency might require the presence of an AMSAT representative for a launch site test in Kourou, French Guiana scheduled for Nov. 20, 1978. Travel funds for one person to attend this meeting, if necessary, were authorized.

8. Proposed AMSAT-Oscar College Scholarship Program

Will Webster presented a proposal by D.L. Barr Sr., (W5KU) "Sparky") and Keith Mason (W9VY) concerning an AMSAT-Oscar college scholarship program. The Board responded very favorably to the idea. However, because of the severe shortage of help in the Washington area, personnel here must concentrate on producing flight hardware (i.e., satellites). Therefore, we can't offer much organizational assistance. If Sparky and associates would care to produce a detailed proposal and develop the scholarship program, the Board anticipates enthusiastically endorsing it. Any program should, of course, be coordinated with other amateur radio efforts along similar lines (e.g., Foundation for Amateur Radio Scholarship Program) so as to best serve amateur radio and the amateur satellite program.

9. FAR Membership

The Board designated Will Webster as AMSAT Trustee to the Foundation for Amateur Radio (FAR).

10. AMSAT Participation in WARC

The ITU has formally invited AMSAT to attend the 1979 WARC in an observer status (ten weeks beginning Sept. 24, 1979). The possibility of participation was discussed. Items included — the high cost, which would represent AMSAT, the importance of the WARC on the future of the radio amateur satellite program, etc. No conclusions were reached.

11. Personnel and Office Furniture

As Phase III-A enters the flight hardware construction stage it becomes necessary to hire technical personnel. The Board approved the hiring of two employees — Marie Harr (Marie previously worked on OSCARs 6, 7 and 8) and Clarke Greene, K1JX (Clarke worked on OSCAR 8). The Board also authorized the expenditure of $600 total for furniture at the N.C. AMSAT office (this includes $300 already spent).

12. Election of Officers for 1978-79

All current officers were re-elected.

Ron Dunbar and a prototype AMSAT-GOLDM 80. Photo G3EC2

Karl Meinter developing IPS software at his home. Photo G3EC2

AMSAT ANNUAL MEETING - 14 OCTOBER 1978

By Art Feller, W4AAT

Ninety-one AMSAT members and their guests attended the Annual Meeting held at the Goddard Employee Recreation Center on 14 October 1978. The meeting was chaired by Dr. Tom Clark, W5WMI.

First order of business was a brief review of the past year's activities:

- The OSCAR 8 spacecraft was successfully launched on 5 March 1978. Participating in the effort were AMSAT, ARRL, JAMSAT, AMSAT Deutschland and AMSAT Canada.
- A new laboratory facility was dedicated earlier in the day on the grounds of the Goddard Space Flight Center Visitor Center. NASA has provided the building whereas AMSAT will endeavor to provide staffing during hours the Goddard Visitor Center is open to the public.
- The AMSAT staff was to be increased by a full time engineer and technician for the Phase III project sometime in November.
- Work on the Phase III spacecraft has proceeded particularly in the following areas: prototype construction, integration with the launch vehicle, the attitude sensor, transponder and the on board computer.
- AMSAT-Canada is in the process of reorganizing. (See additional information in this article.)
- AMSAT-UK has been acting as an information service for amateurs in Europe and Africa. They are also considering a new package for launch. (See a discussion of this later in this article.)
- Finances were reported: solar cell contributions: totalled $29,000 in 1977 and $13,500 so far in 1978 for a total of about $42,500. AMSAT now has about $12,000 in the bank including Life Member Reserves from approximately 1,000 Life Members.

AMSAT-Canada expects to become a Federal Corporation shortly according to John Henry, W2VYU (formerly W2DVM). AMSAT-Canada is also preparing hardware for a geostationary launch opportunity sometime in the early 1980's. John described how a 31 page proposal was prepared between 3 January and 28 March of this year. The first flight qualified hardware is expected to be ready by late 1978. The exact transponder configuration has not been set yet. There are 20 individuals in Canada working on the project, three quarters are licensed amateurs. These twenty have divided themselves into appropriate groups. Project Meetings are held on Monday nights.

AMSAT-UK has been developing the idea of an amateur scientific research satellite according to Martin Sweeting, G3YUO. The project began eight months ago at the University of Surrey. Ideas for appropriate kinds of payloads are solicited. So far, these ideas have been considered: a magnetometer experiment; HF propagation experiments in the 20, 15 and 10 meter bands; beacon on 10 and 24 GHz; various educational ideas; other ideas include the slow scan camera for cloud and land photographs. Currently, AMSAT-UK is working from its own material resources. But, ideas are welcome from all quarters. Specific launch opportunities around 1983 are being sought.

Election results for the AMSAT Board of Directors were announced by Dick Cotton, WBDX. 252 valid ballots were cast with the results:

Tom Clark, W5WMI 252
Pat Gowan, G3IOR 180
Earl Skelton, KE3E 129
Rich Zwiko, K1PVT 162

Tom, Pat and Rich will serve as Directors with Earl as an alternate.

Phase III progress was reported by Jan King, W3GBY. Vibration tests were begun on 12 October in Toulouse, France. Under test was the technology capsule, a full scale model of the Ariane L02 Payload, including the Phase III engineering test unit. Tests have gone well on what has been considered to be the worst axis for vibration data. The Phase III spacecraft has undergone more vibration testing than OSCAR 6, 7 and 8 combined.

Engineering prototypes of the transponders have been OK'ed except for the final amplifier which is now being tested in Frankfurt.

17
Two flight quality IF crystal filters have been received from AMSAT. These filters have a 180 KHz bandwidth.

Jan reported that it may be possible to obtain leftover flight spare parts from the ITOS program. These parts include 10,500 solar cells with cover slips and mounting hardware, 48 Hi-cad cells (worth about $40 each), and one sun sensor assembly. Final approval was expected soon.

Design of the earth sensor assembly is proceeding in West Germany with some help from the Leitz Corporation.

Dick Jansson, W44PAE has completed a major thermal design program. Structural design of the Phase III has been completed and has tested out very well.

A high level language for use by ground stations known as Interpreter for Processor Structures (IPS) has been developed to work with English and German mnemonics by DJ4PAE. Specific definitions of the work to be done by ground stations are underway in Duluth, Minneapolis and Washington.

No flight hardware is on hand yet in Washington for the Phase III project.

Computer standards have been set up so that anyone working on Phase III and other related projects can reasonably certain that programs will run on all machines set up according to the AMSAT standard. Check with the standard developers W3IW, G3ZCV/W3 and V83DAT/W6.

The main problem remaining in the Phase III project, according to Jan, is time. The current schedule calls for a launch on 3 December 1979. As a result, some compromises have been made in the spacecraft design. There will be no S-band beacon since it is not certain that such a beacon will be authorized. A transponder approach will be used -- 435 to 145 MHz -- but with a 180 KHz passband. We should consider the first Phase III spacecraft to be a prototype for following projects, according to Jan.

In closing, Jan thanked W44PAE for his donation of a scope cart for the laboratory. AMSAT needs donations of chairs, tables, desks and hand tools to be used in the laboratory.

Rich Zvirko, K1HTV reported on operation of AMSAT-OSCAR 7. A spacecraft emergency was declared for the four year old OSCAR 7 last month. Problems first showed up in the switching during the summer. As of September OSCAR 7 began losing telemetry - all 0's or all 1's would be transmitted. Apparently one computer driver of the upper half of the battery has shorted out so that the normal 11 to 14 volt power supply is now delivering about 10 volts. The -1.5 volt regulator which drives the telemetry encoder needs a minimum of about 11 volts to function properly - hence, the problem. The possibility of CMOS degradation is considered to be unlikely as the source of any problems since the circuitry is reasonably well shielded within the spacecraft. For the near future, Rich says that the command stations and OSCAR 7 on the air. The schedule will be as shown below. However, Mondays (UTC) will remain as QRG days. Command stations have been instructed as follows: if the satellite falls into Mode B, then switch to Mode A. If there is a switch into Mode C, then leave it in that mode.

Bernie Glassmeyer, W9KDR reported from the ARRL on the operation of OSCAR 8. All in all -- very smooth. The spacecraft is operating within normal tolerances in all respects.

On other matters from the ARRL, a slide show about OSCAR 8 is now available from the League. A phonograph record has been prepared for inclusion as a pullout in "QST." This magazine is an "O" for Sputnik. Yester year, "O" was junior high schools. The record is designed to provide space information to the OSCAR satellites. 500,000 copies of the record have been distributed to about 200,000 members. It is estimated that the record will be heard by some 2 million students. Copies of the record may still be available from Xerox Educational Publications in Middletown, CT.

A 10-meter version of the IAMU receiver has been made for receiving the Mode A transmitters. This is a direct conversion receiver which can be made for about $75 a copy.

A "Mode J Club" has been suggested by some at League Headquarters to stimulate interest in Mode J operation. The operation might be fashioned after SMIRK now functioning on 6-meters. Larry Roberts, W9MRC, has volunteered to handle certificates.

Newsletter editor, Joe Kasser, G3ZCV, mentioned that he needs material for the Newsletter. Virtually everything submitted gets printed. The better the material submitted -- the better the Newsletter.

An open forum conducted by Tom Clark, W3IW, followed the reports. To open the discussion, Tom read a letter from F4KQ which appeared in the September issue of the AMSAT Newsletter. The principal subject was communication between AMSAT and AMSAT members. A summary of comments follows:

- K1HTV (Vice-President, Operations) suggested that area coordinators try to get to know the satellite operators in their areas better.
- W6SP suggested that better use be made of the various nets.
- K9WW thought that lists of operators in each area would be useful for the area coordinators. Area coordinators should also make a better effort to attend local hamfests. 2-meter SSP nets have proven to be helpful in Ko's area. W9WW runs an AMSAT net on a repeater in the Chicago area.
- K4GHT pointed out that Mode A type transponders are the "feeder node" to keep new people coming into the OSCAR programs. Setting up is low cost and the transition from HF operation to satellite operation is easier to Mode A than any other mode.
- W27MNC said that if we want funds to produce satellites, AMSAT had better pay attention to settling the problems of people who supply the money. K4KQ's sentiments are shared by many people who check into the nets. The money comes from donations and dues.
- K2IIR discussed briefly problems with the AMSAT QSL bureau. He suggested that users send extra stamps and money to help expedite handling of cards with no envelopes.
- W3IWAI said that he would be proposing a change in the method used to nominate candidates for the AMSAT Board of Directors. He will suggest that a petition of 5 full members be acceptable for nominating candidates in addition to nominations from member societies.
- W4XO said that we should make more extensive use of the KISS system ("keep it simple, stupid"). Some people are overwhelmed by all the things one needs to know on the amateur satellites. Key people should make a point of spending time on the air for questions and discussions.
- W8LII noted that only a few people in the AMSAT organization do the work, a small number give unfavorable criticism and most are complacent. We should not be concerned. Communication can be a problem with a 7-meter receiver. People have to ask for information which is readily available.
- W3GSE felt that we should maintain a core of about 18 people perhaps with another core group working on another project. The current main group is trying to achieve the best possible communications satellite and to challenge the users to advance the communications art.
- G3ZCV mentioned the Newsletter -- more input will yield more Newsletter. Is the Newsletter being read? Joe also mentioned the idea of ground based interfaces to future amateur satellites so that equipment now normally used for terrestrial communications might be used with orbiting transmitters. On nets, Joe asked whether the current schedule for Wednesdays UTC was the most convenient for everyone.
- Other general comments were directed from the floor. One noted that the 75-meter nets are conducted on 3650 KHz - in the advanced band segment. Thus, it limits the number of people who can check in. W3IW suggested that the nets were primarily used for the outflow of information so the band segment is not important. That was challenged by several who thought that participation should be considered equally as important. Others mentioned that the QRM level in the general segment is too high to conduct the net.

The subject of satellite official observers was brought up briefly. Some criticized the idea as "big brotherism." It was pointed out that IAMU Region I recently adopted a resolution recommending that the member national societies implement CO programs.

Finally, K1HTV suggested that a channel be set aside near each beacon frequency to be used for ground information nets.

The meeting was adjourned in favor of a more relaxed and informal break shooting session.
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**AMSAT-OSCAR 7 and 8 ORBITAL DATA CALENDAR NOW AVAILABLE**

In cooperation with AMSAT, Skip Reymann, W6PAJ, has again produced an AMSAT-OSCAR ORBITAL PREDICTIONS CALENDAR containing all orbits of the AMSAT-OSCAR 7 and 8 satellites for 1979.

The orbital calendar is available to members postpaid for $3.00 U.S. funds or 20 IRC's and free on request to AMSAT Life Members. Overseas orders are airmailed.

From outside the U.S.A., payment may be made by international postal money order, or by checks made out in U.S. funds, or by U.S. currency. Send orders to AMSAT or to:

Skip Reymann, W6PAJ
P.O. Box 374
San Dimas, CA 91773 U.S.A.

Orders may also be charged to VISA or Master Charge. (Be sure to provide your account number and expiration date on your charge card).

**Important** - To speed up handling of your order, please include a gummed, self-addressed label.

Proceeds from the orbital calendar benefit AMSAT.

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**SATellite AND Orbit DETAILS**

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**OSCAR 7**

**OSCAR 8**

**Perigee**

JAN: 114.964877 minutes

Longitude progression: 28.735287

**OSCAR 7**

103.229068 minutes

25.808287

**OSCAR 8**

Feb: 114.964867

28.735250

Mar: 114.964858

28.735751

Apr: 114.964866

28.735242

May: 114.964836

28.736720

Jun: 114.964826

28.737642

Jul: 114.964816

28.737668

Aug: 114.964805

28.737690

Sep: 114.964795

28.737712

Oct: 114.964783

28.737739

Nov: 114.964773

28.737869

Dec: 114.964764

28.737882

25.807035
Dear Joe,

First, I would like to compliment you on a fine publication. I thoroughly enjoy all of it (can’t read French tho).

However, I take exception to your comment - "It is too late to make any changes...Phase III...", that sounds exactly as if it came from our U.S. Congress, i.e., "If we have this money committed and available, let's spend it!"

Within the last month, I have decided that I am not going to invest in a satellite station. My reasoning is the same reason that I don't operate much 20 m SSB. That is that there are too many amateurs who simply cannot operate with low power.

It appears to me that Phase III is headed for obsolescence about one week after launch unless some sort of AOQ or other signal control is employed. I do not have the technical ability to know what is best, but lead-time be damned. If the machine won't work, why build it?

At my QTH, I do not have VHF capabilities and have found that Mode A is simply not usable for reception with nominal station and antenna. I have completely stopped trying to listen on 10 m, because I know now that I'm wasting my time.

I will, however, eagerly await and read each copy of the Newsletter. Sincere good luck in whatever you decide to do.

73,
Bill Rechtold
N86R, 1M-642

P.S. I am not enclosing my ballot because all of the nominees are presently managing AMSAT and I think that is a poor recommendation.

Dear Joe:

I would like to suggest that an article be printed in the Newsletter explaining what AMSAT is, and who everyone is that is in charge at AMSAT. There must be enough new members in AMSAT who would appreciate knowing more about our organization. Also, I wonder how many members are aware of how few AMSAT employees are actually paid employees. It is very easy for us to believe that because QRP, 73, Ham Radio, the ARG, etc., are paid employees, that the same applies to AMSAT.

Probably most satellite users would be surprised to know that most of us volunteer our time for free.

73,
Ross W. Forbes
WB6GKJ

(If it is written, it will be published — Joe)

Dear Perry:

I have just received my Sept. issue of AMSAT Newsletter and read the letter sent in by Charles Bolwin, KB4KQ. He raises several points which I feel deserve a prompt and public answer, preferably in the next issue of the AMSAT Newsletter. In particular, the points regarding experimental days and results of these experiments and the A-O-8 mode J on both weekend days is most important.

I sincerely hope to see a prompt answer to all AMSAT members.

73s
Kenneth Price
KF1FD

Only a few words to salute you from Puerto Rico.

Recently, I became member of AMSAT. Days ago, I received AMSAT Newsletter. Members were invited by you to comment in relation to the problem of cost in postage.

I understand perfectly the problem. However, in my personal opinion, I think the AMSAT members have to assume responsibilities and protect our organization in any matters affecting our membership, etc. It is fair enough, that if the postage cost go higher, that AMSAT membership go higher too.
Dear Joe,

I have made a C-60 cassette tape of AMSAT-OSCAR 8 launch day activities containing edited tapes of W3NAN and a bit of W1AW on launch day, including launch prep, launch, tracking, orbital insertion, telemetry reports, and then the evening AMSAT net, with W3NAN, K1NTV, VE3SAT, etc., and the decision to deploy, the SAT patch of the deploy command, replay of his tape and W9 tape of deploy, and the SAT phone patch of the 10M ON beacon command. This is not a "professional" tape, but the audio quality is fair, and anyone interested can obtain one from me for $2.75. This includes $2.34 for my expenses and the rest for my trouble. If I get a large response, the cost to me may be reduced to $1.50 and profits amount to very much, will send some to AMSAT. The price includes first class postpaid mailing. The address is: Ham Data Systems PC Drawer DV Colby, KS 67701

73,
Bruce J. Frahm, W9BJ
AMSAT

I joined your organization at this year's Dayton Hamfest. I am interested in the AMSAT-80 Computer Project. Any information that you can send to me, such as which Newsletter back issues have info., would be appreciated.

William Goodwin, WB8BER
(Send an eate for the latest update. All Newsletters since Sept. 1977 are of interest. See Byte Magazine, Nov. 1978 as well. - Joe)

Dear Joe,

As a service to those who are calculating their own satellite data, I suggest that you in each number of the Newsletter publish orbital data for our OSCARs together with one reference orbit with high accuracy so it can be used for long term predictions. Remember also that lots of members won't or can't buy the orbit calendar. If the correction notice on page 22 of issue No. 3 had been completed with orbital data, it would have been much more valuable. At times when the conditions in the 20 meter band are bad, it is almost impossible to get the ARRL bulletins through! This has been the situation in my shack for a long period now.

So please let the next issue of the Newsletter contain the information requested.

73, Lennart Arndtsson SM5CF, Sweden

Dear Joe:

Certainly glad we have you with those broad shoulders on your own. In brief, I more than say "AMEN" to Chuck's letter (K4RJ), Pat's (C2QR) and mine--the similar ones in the Newsletter. Perhaps you can in Dec. issue give us an answer to WHY there has been very little indication of positive action resulting from these member comments.

Being a retired old man trying to keep going on Social Security and my past laurels, I cannot make the coming Board of Directors Meeting. PLEASE DO stand up for me, and in fact, many dedicated OSCAR users and get some positive results for us. Let's not wait for another "Farewell Old Friend" before stopping the misuse of OSCAR and PROPSAT, let's scrub Phase III until IT CANNOT HAPPEN AGAIN. We have other back issues and AMSAT's backing is not going to be worth as much as an old wooden nick.

Oh yea—also, WHY cannot members petition for Directors? Under present bylaws as I understand, nominations are not open to the members. So perhaps that is why so few in the past have VOTED!

73's
Lowell G. Croydale WS5CY, LM-33

P.S. Have talked to lots of members on the air and via long distance about many of these questions. There is a great big question mark all around. Now of all times, ARRL's rejection not withstanding, we need "CO" and bulletins every OSCAR pass plus facts via W1AW bulletins which are a lot of ARRL propaganda for our present misfit OSCAR 8. There are plenty of other OSCAR and DCC members using OSCAR to cover every pass without putting the great burden on men like W1WW, W2CN, W3TV, etc. One more addition, for your information, like many former demonstrators for the last year I've stopped demonstrations having had OSCAR let me down at two last fall. Trying now for another success story at the Eighth Annual Explorer Air Show--Will and the others have all the dope.

Dear Joe:

Acquisition Coincidence printouts described by NSKR in the Sept. Newsletter are undoubtedly the most accurate way to determine what orbits will permit contact with a specific DX location. A very good approximation is possible with any pocket calculator that will perform trigonometric functions, however, for those willing to take the time. A programmable model helps of course.

Consider two locations A and B as shown in Fig. 1, with overlapping circles of acquisition. Any orbit passing through the area of overlap should permit the two stations to communicate. A good indication of the orbits of interest can be found by calculating the equatorial crossing longitude of the orbits that would pass through points P and Q or X and Y; which pair applies depends on whether the line AB is more nearly East-West or North-South. Once the limiting equator crossing points are established, any of the programs that give time, azimuth, and elevation can be used to work out the data for the desired schedule.

My program for the Texas Instruments TI-59 is in two parts -- 690 program steps to establish the limits, and 573 to calculate the tracking data from the full period orbit. A sample of the result is enclosed. If anyone wants the programs they can have the complete package in return for a check -- $8.00 payable to me, or $15.00 made out to AMSAT.

73,
Fat Shreve WBORG

Note: Running time on the TI59 is less than 10 minutes for each pair of cities A and B.

a) Line AB basically East-West. Points P and Q establish limits

b) Line AB basically North-South. Points X and Y establish limits. X' and Y' points where orbit crosses X and Y cross equator
Dear Joe,

I read with great interest the article "Is This The Future?" in the Sept. issue of the newsletter.

I understand there are a number of problems facing satellite operation in the near future and I for one am not capable of solving them at the present time.

Your "Gateway" idea seems to follow rather closely along the path of another innovation where signals are transmitted from one end of the country to the other via microwaves with people on both ends sitting in the comfort of their living rooms talking to each other. They called it the LONG DISTANCE TELEPHONE CALL. Now, the only difference being people using the phone usually know each other. Notice I didn't mention the call as costing money being a difference because the "Gateway" stations would also cost money.

There is one item in the article that did not mention, that being the eroding of the element of creation and experimentation this would bring about which to me is what amateur radio is about. The "Gateway" stations are nothing more than what is already in use on 2 meters namely repeaters. There is nothing challenging about accessing a repeater.

If the "Gateway" idea were to come to pass and be put into use, the biggest contribution we as hams would have to put all my gear on the market and try to stimulate the economy and buy new curtains for the house.

73's
Dave Kushner
WACEU

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Dear Joe,

You yourself said that such an operation of satellite usage as we do it now requires "skilled" and that is "more complex" than the typical "static" leaving the technical work to a select few to run the earth "gateway" stations doesn't help those who want to increase their technical and operating skill. We've got to try to forward no matter what obstacles confront us. As far as I'm concerned, "Gateway" earth stations is not a step forward.

While the alternatives to anything else are almost non-existent, we can possibly learn to live with the present situation with a few changes.

One possible answer overlooked is the launching of the space shuttle within the next two years. With regular access to orbiting craft via the space shuttle, anything new or innovative in design could be put into orbit in much less time. In fact, it's even possible that some of our satellites could be recycled, thus saving us much time and money. Consider the possibility of the space shuttle launching in orbit a new satellite, while at the same time plucking any OSCAR 6 or 7 out of orbit for a battery replacement or circuit change.

Of course, this doesn't give us any new frequencies, but maybe the combination of the "gateway" plus a recycled satellite systems could lighten the load a bit.

After all, it also wouldn't be fair to eliminate those in the rural areas who use the satellites, while amateurs in the major cities would have daily access to the spacecraft through their local earth station.

And the idea of taking the earth stations out to the country occasionally to serve those out there would still be insufficient because there will always be those somewhere who won't be close enough to work into the system.

Continuing daily access to orbiting satellites would work well to serve everybody who's interested.

Sincerely and 73's
J. Craig Castor, AA6PY

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Dear Joe:

In view of the recent criticism of AMSAT and the Board of Directors, it seems important to let you know what AMSAT has done for ham radio, rather than what they have not done and to point out that those dissenting may not be in the majority.

The AMSAT Board of Directors and others involved in the AMSAT organization on a volunteer basis have excelled in their unselfish work in providing the average ham with a means of satellite communications. My first OSCAR contact was with a 25 year old receiver with a ten meter OSCAR bandspread of one eighth of an inch and a home brew 5 watt transmitter.

The Board of Directors have had to make many important decisions and in retrospect nearly all have proven to have been the correct ones.

WP9P has an AMSAT telephone in his home so that he can answer questions and complaints, on his own time, concerning OSCAR. He has done an outstanding job in Administration as well as his design work, testing and assisting in the launch of the OSCARs.

W5IWI has compiled the necessary statistics concerning OSCAR 6 and orbital predictions that are less than a minute off after a year, and he will soon provide us with the same reliable data for OSCAR 8. He has worked hard with the fund raising projects which allows AMSAT to plan for the future. He has also made many personal appearances explaining present and future satellites to those interested.

W3GEY, in addition to his design, construction, testing and assisting in the launch of the OSCARS, has devoted many hours to his OSCAR articles which were published in QST. He has also made many personal appearances explaining present and future satellites to those interested.

K1TV has organized and kept the AMSAT Area Coordinators informed about OSCAR and he has spent much of his free time in assuring OSCAR will be operating properly. The AMSAT Area Coordinators have worked hard at no small amount of time and expense to inform us about OSCAR.

WB2TMC has capably handled the Tuesday night and Sunday AMSAT nets for some time now and is handling the bulletin to OSCAR users and accepting complaints. He has also made personal appearances promoting OSCAR.

G3IOR represented AMSAT at the TARU Conference this year and has been consistently an excellent OSCAR user. He has contact over 150 countries via the satellite.

G3ZCX with help from W3HUC has put together an informative, interesting and educational newsletter which we receive 4 times a year.

VE3EAT spent nearly 6 years in time consuming commanding and care of OSCAR 6, 7 and 8. He has always been willing to listen to and answer questions concerning commanding and telemetry.

W6CG and W6ELZ did a fine job in assisting in the commanding of OSCAR 6.

W4DQG helped build, test and assist in the launch of the OSCARs. He and WB8KQV furnished AMSAT with telemetry reports for nearly 6 years.

W1NU and W3BMC have faithfully broadcast bulletin via the satellites for some time.

W4CY has done an excellent job with the Mid Continent Net as have W6CG and W6DMW with the West Coast Net.

N3ES has carefully inspected the QSL cards sent in for awards and made the awards to those qualifying.

AMSAT has provided the hams with satellites which have been used effectively for millions of QSOs and offers 3 operating achievement awards. The OSCAR Award, the Sexagesimal Award and the Century Award, to encourage users to try to improve operating technique and knowledge. The ARRl also offers 3 awards. The Satellite DX Award, W.A.S. Award and the Satellite DXCC Award. W2RKA recently received the DXCC Award Number 1.

W2GN was recently honored for 5 years of coordinating operational bulletins. W1FVI of the ARRl in cooperation with N3EGI has spent much of his free time in assuring OSCAR will be operating properly.
hundreds of OSCAR demonstrations in our schools, W9JU has proposed an AMSAT sponsored scholarship for a deserving high school student.

Remember this has been all volunteer work with no pay. It takes a dedicated person to take the job and I give them my vote of THANKS and wholehearted support.

The above hardly points to an organization which is trying to limit the number of OSCAR users, but just the opposite.

I am in favor of Mode B, 2 out of 3 days, because OSCAR 7 is accessible with lower power and local line noise is less on 2 meters. Some users have suggested all Mode B operation because of the better transponder on 2.

The difficulty in commanding OSCAR 7 after the recent lightning strike at V3HNB indicates that another command station would be beneficial. It should be in the deep Southeastern part of the USA or possibly in the Virgin Islands for early access. The problem is to find a responsible volunteer capable and willing to devote countless hours to commanding year after year.

73,
Keith Mason, N7VI

Dear Joe, G3ZEC:

My copy of the Newsletter has yet to arrive but I always enjoy reading it when it does arrive.

I've been an AMSAT member for several years and a Life Member for a couple years. I enjoy the letters and comments section and wish to help those who complain about not hearing KH6's on OSCAR.

May I help those who need Hawaii.

OSCAR users needing Hawaii should look for me crystal controlled on 432.142 CW only. I try to make all 108 degree passes for Western USA DX. I will also make CW or SSB skeds for Mode A and soon on Mode J—Ask SACE to my address will bring details. Those using NS6K's "Acquisition Coincidence for OSCAR 6, 7 or 8" should know that NS6K is located at 21 degrees 25 North (21.407500) and 157 degrees 48 west (157.820800). Write for a sked today to reduce grumbling.

I hope that helps one and all. Keep up the good work and don't let the AMSAT program sag. Dedicated people are out there counting on good management direction. Don't let us down.

Warm alohas, and make sure AMSAT'ers that come to Honolulu contact me and let us know you're in town and eyeball confirmed. Anyone interested in working OSCAR's from my QTH remember to contact me here, just outside Honolulu. Please no late night calls. Agreed?
73's
L. Roger Wical, KH6
"Bloomin' Zipper Flipper"
43-601 Luluku Road
Kane'Ohe, Oahu Hawaii
96744 Oceania

The Signal Generator at KH6RF

W3KF:

Thank you for your letter informing me that my membership as $15/5 has expired, hopefully you still know me as NJ-522/I! (at least I'm still on the mailing list) One point worried me in the June Newsletter that was your proposal to revert to seamail for overseas mail—please don't. The main reason for joining AMSAT was to receive your newsletter—information fresh from the horses mouth—contribution to the space program was secondary. I suspect many members would agree. To receive the newsletter 2 months after it is published is pointless.

I note also that at least I can charge contributions to AMSAT to my credit card, thank you. This saves me applying to the Bank of England to send money overseas, which means a one month delay in getting automatic permission and $3.00 in fees.

So in order to get my newsletter on time and to help Phase III, please charge $50 to my credit card.

73,
Robert B. Goddis
G5GCI

Dear Joe:

I've thoroughly enjoyed my membership in AMSAT this past year and the nuggets in the Newsletter. I didn't start getting acquainted with OSCAR except for listening, until this summer and I'll tell you I got as big a thrill out of my first OSCAR contact last July as I did out of my first cross-town wireless contact with a Ford coil powered spark gap in about 1919.

I had decided that I wanted to help the program by becoming a Life Member -- and then the cold water. The suggestion in Sept. Newsletter that "gateway" stations handle all uplink signals. Well, out here in the sticks that is no good. It would eliminate my participation and that of many others like me. I'm 75 miles from the nearest town of any size (7,000 people) and Dubois is only about 1,000 with one ham - me. However, I believe in the good sense of you people who have designed and flown the birds so successfully and am sure that an alternative and better solution to the uplink power problem will be worked out. So here's my check for a life membership.

The suggestions of K3PNL in the "Letters" in Sept. seek a more generally acceptable approach to the uplink power problem.
I also find a great deal of sense in the views of K4KU, same issue, although I don't necessarily agree with his concluding statement. He does express, in part at least, some of my sentiments.

By the way, what's with OS? Is it control station problems or technical ones? I haven't heard anything from it on several passes lately when it was scheduled for Mode A. For the present A is the only mode I can operate (will fix that soon) so I miss it a lot when it fails to come up.

I get my current info from H.R. reports as I can't hear the nets. H.R. reports is doing a good job, too.

73's
Lyle W. Mabbot
W7RMF

Maine is a nice state to live in, but when it comes to OSCAR interest, I have yet to meet another ham who uses the satellite so it is very hard to acquire first hand information on what equipment works and what does not.

An idea might be to have members write in and describe their equipment and publish a list of the most proven setups. Of particular interest to me is antenna designs and amplifiers for 432. So far my equipment is all home brew, so any information along these lines would be appreciated.

Through a sharing of technical information we could all learn something and improve our signals as well.

73's,
Alexander N. Gish, III
W0ELR

I wish to reinforce W7ONI's comments which appeared in the June Newsletter.

I do also feel the Newsletter needs more technical articles especially concerning OSCAR 7 mode B and 8 mode J. I hear quite a few hams on these modes so what are they running for rigs?

---

Dear Joe

In response to your column entitled "Is this the future", a few comments from my point of view.

Using your suggested concept of a ground station would be reason for me to cease Oscar operation. The reason being, I enjoy making my own calculations, doing my own tracking and working directly thru Oscar. Using a ground station would be like a 2 meter repeater. Certainly, it would solve the problem of excessive power usage into Oscar, but there are other limitations imposed which have to be weighed against the good points. Some of these limitations would be that 1. many operators living outside of major cities and obstructed by high terrain would not have access to the ground station. 2. With as many FM Repeaters on 146 and 446 on every available mountain top on the west coast, the ground station would fall victim to intermod either from other repeaters or from other nearby Public Communication Services. 3. The cost of local groups establishing ground stations would be somewhat steep, some smaller groups not being able to afford such expenditures. 4. Oscar could not be readily used with handheld units for emergency use when out of range of a ground station.

Joe, I could mention many more deficiencies for this concept, but for what purpose? If the prime objective is to discourage the use of high power, why not consider a more economically feasible method such as what Fred Siebert-M3FEL touched on in the Sept. 78 Newsletter. Incorporating some some sort of compressor or limiter which would cancel a high power signal into the transponder and not be heard on the output would seen much more desirable. Such a method would only discriminate against the offenders. Why punish many for the ill deeds of a few?

Joe, the first Phase III can no longer be modified at this late stage, but it is never too late for the Board of Directors and the membership to decide on what measure of control to incorporate in future satellites. Such a decision must be made now, or should have been made over a year ago. The problem at that time existed, however, I believe everyone was merely hoping it would go away by itself. Unfortunately, this won't happen.

Such are all the comments I have for this time. Have a happy holiday Season Joe.

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With Respect,
W. Vern Hajek, KB6GS
ANSAT Member #515

Clark Straw, N5XX of Hewlett-Packard recently donated a Hewlett-Packard Model 9871 Character Impact Printer for use with ANSAT's new computer system at the ANSAT-OSCAR Spacecraft Laboratory. Receiving the donation on behalf of ANSAT were Ferry Klein M3PP (center) and Tom Clark W3JWI (right).
AMSAT CANADA PROGRESS REPORT
10 OCTOBER 1978

The newest member in the AMSAT team became a full affiliate at the June 9, 1978 Board of Directors meeting.

The immediate goal of AMSAT Canada is to prepare flight qualified modules for geostationary launches in the early 1980's.

Originally formed as a study group in January 1978, some 20 licensed amateurs and supporters from seven major aerospace firms and Canadian Government departments in and around the Ottawa/Montreal area formed the expertise to develop a proposal for consideration by a leading aerospace company of a Synchronous Amateur Radio Transponder (SYNCRAT) on their experimental bus.

The reception of the proposal by both AMSAT and the aerospace company resulted in the formation of AMSAT Canada, fully affiliated, supported and in coordination and cooperation with AMSAT (U.S.). AMSAT Canada filed for formal incorporation, September 1978.

Utilizing the expertise available to the group, in developmental, research and operating fields of space communications, the group completed conceptual design studies and has begun the fabrication of an engineering module which is predicted for completion by the end of 1978.

Using the experience and knowledge of other groups, AMSAT Canada has been formed in two segments, Administration and Project. This allowed for uninterrupted project activity backed up by a team of Administrative support individuals whose duties include those associated with budgeting, management information, etc. The project teams are thus able to focus their expertise in well defined areas.

The project sector consists of one or several members of various expertise and disciplines as needed and form the following project teams:

1. System: Configuration, design evaluation, problem solving
2. Rx Converter: Input filter coaxial, down-converter, multiplier
3. IF Stages: Various bandwidth and special discriminators, radar clipping, AGC control
4. TX Converter: Up-converter, filters, high power amplifier, output switching
5. Multiplier Chains: Support to receiver and transmitter converters
6. Processor: High stability and low spurilt oscillator design
7. Power Supply: Internal housekeeping, fault locating, telemetry processing, CMOS system redundant
8. Control and Switch: Dual voltage output, eclipse surge protection, failproof design, redundancy
9. Assembly: Internal power protection and isolation
10. Qualification: Commercial location, testing and measurements
11. DOC/FCC (AMSAT): Space environment and testing available
12. Administration: Liaison done by senior management under direction of the Board of Directors

Minutes, insurance, supplies, membership, secretarial, Treasury, information, corporate duties, etc.
During the month of August, we began to notice an abnormal drop of the A-O-7 bus voltage when monitoring telemetry channel 3A. By the end of August, many other strange things began to happen in the spacecraft when in Mode B. The entire telemetry string on both Monitor 1 and HTT went sour, meaning lines of numbers were copied, indicating on-board problems. Since we had no telemetry at all, it was difficult to determine what had happened. When a switch to Mode A finally occurred, the telemetry began to make sense at times so some light could be shed on what was occurring. During the next few weeks a spacecraft emergency was declared while tests were run. The problem seemed at first to be voltage related so we tried to pinpoint the cause. The -10 volt switching regulators were changed by ground command with inconclusive results. We ran a telotype test, dwelling on the battery bus channel and A-O-7 jumped into Mode B, with the result being a set of meaningless zeros on that channel. The satellite developed a pattern of staying in Mode B for 24 hours which indicated that the on-board clock was alright. But after switching back to Mode A, the 2-10 meter transponders would stay on for only 2 or 3 orbits and then switch back to Mode B for another 24 hour period. This made things even more difficult because of extreme Mode B command problems inherent in the spacecraft.

After a number of weeks testing, the Mode A band was lifted but the Mode B prohibition continued until Oct. 12th when it was determined that normal use of Mode B would probably not do any extreme damage to the spacecraft.

The consensus of opinion of the AMSAT technical crew seems to be that one cell in the upper half of the battery is acting strangely. Sometimes indications are that the cell is completely no good while at other times it seems to bounce back. However, this occurs only while in Mode A when the load is lighter. We don't expect the cell to do us much good with A-O-7 spending most of its time in "B". When the Mode B transponder was designed, the final P.A. devices used limited us to a 11 volt bus. Since the negative 10 volt regulator requires about 10.7 volts minimum, it doesn't take much more than one bad cell to result in loss of the regulator, which in turn causes loss of telemetry.

If this condition remains or gets slightly worse, we will lose all telemetry data, however the A-O-7 transponders should continue to function as well as they have been during the first four years.

AMSAT gratefully acknowledges donations of $100 or more from the following new life members:

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<td>LA-986</td>
<td>Enrico Carozzi, Z2DBC</td>
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AMSAT-1978 ANNUAL REPORT
October 14, 1978

This report summarizes AMSAT's tenth year of activity. AMSAT, officially incorporated on March 3, 1969 will mark its tenth anniversary on March 3, 1979.

Highlights of 1978

AMSAT achieved several milestones during 1978. The first was the successful launch by NASA of the AMSAT OSCAR 8 satellite on March 5, 1978. The satellite is now in regular operation under the auspices of the American Radio Relay League (ARRL) for school use as part of the OSCAR education program. The satellite construction itself was a team effort by ARRL, the Japan AMSAT Association (JAMSAT), AMSAT-Deutschland Project OSCAR, Canadian AMSAT members, and AMSAT.

The second milestone was the establishment of a new AMSAT-OSCAR Spacecraft Laboratory at the NASA Goddard Visitor Center and office facilities for AMSAT use. We are using the facility for Phase III spacecraft construction and testing, and at the same time it will serve as a "craftsmen on exhibit" showcase for visitors to Goddard Space Flight Center. Already Hewlett-Packard, Tektronix, KLM and several individual AMSAT members have donated equipment for the new laboratory.

With the acquisition of a condominium apartment in Washington near the Capitol, AMSAT now has expanded office facilities available for AMSAT's administrative functions.

Also during 1978 AMSAT quadrupled its full time staff with the addition of a full time Administrative Assistant, a Phase III Project Engineer, and a Phase III Aerospace Technician. All are helping to reduce the workload for our many volunteers.

AMSAT-Deutschland made significant progress on the Phase III spacecraft design and prototype construction. Vibration tests were completed on the spacecraft structure and prototype, in both the U.S. and France. Design work progressed particularly on the spacecraft/launch vehicle interface, the attitude sensor and control systems, and the transponder.

The Japan AMSAT Association (JAMSAT) completed their work on the AMSAT-OSCAR 8 Mode J flight transponder and power regulator, and after launch of OSCAR-8 it developed and subsystems. The prototype hardware is progressing well for inclusion on a Shuttle-launched commercial communications satellite as part of the spacecraft payload.

AMSAT-UK continued to be active in serving as a source of information to OSCAR users, particularly in Europe and Africa. AMSAT-UK members at the University of Surrey set up for telecommanding of the new AMSAT-OSCAR 8 satellite, and this same group is now considering constructing an OSCAR spacecraft themselves.

AMSAT membership continued to grow and now stands at 3,955 members (985 life members) in 75 countries. During the past year, we developed a complete list of membership and are now in the process of converting it to a floppy-disc storage system for our membership records which will be handled by our new AMSAT microcomputer system. This system will also assist in spacecraft testing and ground support, and for video display/graphic presentation at the new AMSAT-OSCAR Spacecraft Laboratory.
"CARIBE 78" DX-PEDITION

By Alex, W1CDC and Mac, WAI2SM

"Caribe 78", now history, still lingers on in the memories of two people, "Alex" Kasevich, W1CDC and myself, Bob "Mac" Gregor, WAI2SM. After a year of careful planning, the Caribe 78 team arrived in Dutch Sint Maarten, Netherlands Antilles on the 29th of July and started to set up to cover 40 through 10 meters on HF, 6 meters, 2 meters and 70 centimeters covering VHF, UHF and OSCAR.

The following morning, PJ8USA finally got onto the satellites with Alex at the key and Mac as set-up and antenna man. During the week that followed we managed to log a total of 50 OSCAR QSOs despite bad weather and power failures. On Friday evening, PJ8USA satellite station logged its last satellite QSO and tied the ribbons on PJ8USA to move onto the highlight of Caribe 78, the island of Montserrat, British West Indies.

After two brief, but enjoyable stops - the first on the island of St. Kitts and the second, the island of Antigua - we arrived on Montserrat. The task of setting up to get on the air was done smoothly and by morning on the 7th of August VP2MBC was on the air logging HF and satellite contacts quicker than you can say "OSCAR".

After two weeks of operating and sightseeing, the Caribe 78 team arrived home safely with its fourteen pieces of checked baggage comprised of: suitcases, antennas, and souvenirs.

The total contacts logged were:

- 3215 HF
- 105 Satellite
- 6 two-meters
- 1 six-meters

Now the chore of QSL cards is suddenly upon us!

P.S. "Caribe 79"? Check the DX news in your favorite ham radio magazine.

PERPETUAL ORBITAL PREDICTION PRINTOUTS
AVAILABLE FOR RS-1 AND RS-2

By Bill Johnston, N5KR

Perpetual orbital prediction printouts of the same type supplied for AMSAT-OSCAR's 6, 7, and 8, are now available for the Soviet amateur radio satellites, Radio-1 and Radio-2 (RS-1 and RS-2). These printouts are computed for the user's exact station location, and consist of a series of tables of data, with a separate table for every possible longitude of equator crossing, in one-degree increments. (No table is printed for crossings which do not result in a pass usable from the user's location.) Within each table is the time after equator crossing, plus azimuth, elevation, and range of the satellite, repeated at every one minute interval of time. Given the time and longitude of equator crossing, one simply refers to the printout table for that longitude for a complete listing of antenna pointing data at every one-minute interval of time. These printouts have been described in previous issues of the AMSAT Newsletter (September 1975, March 1978, September 1978), so further elaboration is not necessary here.

As before, the printouts are good for the life of the satellites and never become obsolete. Additionally, since both RS-1 and RS-2 have essentially the same orbital characteristics, one printout serves for both of them. The printout for OSCAR 8 is different, of course, as is that of OSCAR 7.

The orbits of RS-1 and 2 are somewhat higher than had been announced last year, but this has the advantage of giving a few extra minutes of communications on each pass. This also results in the printouts being about 15 to 20 percent larger than the ones for OSCAR 7, so there is a slight additional cost in producing and mailing them.

To obtain a printout, you will need to send the following:
1. Name and mailing address.
2. Town that you want the printout computed for. If less than 10,000 population, carefully describe location.
3. Payment to cover the cost of generating and mailing the printout, as follows:
   $4.50 via 4th class mail, worldwide.
   $5.50 via First Class mail, USA, Canada, Mexico
   $6.50 via Air Mail, worldwide.

(The OSCAR 7 and 8 printouts remain at $4.00, $5.00, and $6.00, respectively, each.)

Send the above to:
Bill Johnston, N5KR
1808 Pomona Drive
Las Cruces, New Mexico 88001

OSCAR 8 PINS

New OSCAR 8 pins are expected shortly. If you have become a Life Member within the last several months and did not receive your OSCAR pin, please let us know. As soon as the shipment arrives, we will start mailing out pins.

If you are an "old" Life Member and wish the new OSCAR 8 pin, they are available for a donation of $5.00 or more.
AMSAT-80 COMPUTER PROJECT UPDATE
By Joe Kasser, G3EZX

Several new items have been added, including memory cards by Seattle Computer Products.

The AR-1 RTTY Card has been in hold for months now. It is 99% taped and holding. If nothing happens soon, all cheques will be returned. Please hold off on that item. We're sorry but circumstances have intervened.

AMS-80 is about to go into revision 5.8. This incorporates interfaces to Northstar software, changes the ASCII to BAUDOT conversion to reflect military usage and improves the USER instructions.

For the latest information, send an SASE for the flyer to:
Tom Clark, W3JMI
6380 Guilford Rd.
Clarksville, MD 21029

CALL FOR PAPERS - DAYTON HAMVENTION

K.O. Learner, K9PWM is again arranging the space communications session at the Dayton Hamvention, to be held April 27-29 this year. We would welcome suggestions and volunteers for papers and speakers at the session. Please contact K.O. at 4012 South Hardon Rd., Kokomo, Ind. 46901 (telephone 317-453-2947) immediately.

Look for the AMSAT booth at Dayton!

MEMBERSHIP RENEWAL NOTICE AMSAT Newsletter Sept. 1978

Please complete form and mail to AMSAT as soon as possible.

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Membership Number______ or, check here if you are applying for new membership

Please indicate here if you have made one or more contacts on AMSAT-OSCAR 6, 7 or 8

Mode A____ Mode B____ Mode J____. Would you be willing to accept an AMSAT assignment in a technical area? ____ an administrative area?

Individual membership dues for January-December 1979 .................. $10.00
(Approx. half the dues are for subscription to the quarterly "AMSAT Newsletter")

**Include $3.00 here if airmail delivery of AMSAT Newsletters is desired in North America, include $1.50 for First Class mail.) .....

Affiliated Member Society dues for January-December 1979 ($20) ........... $

Life Membership (donation of $100 or more) ....................................$

An AMSAT-OSCAR satellite pin is provided to new Life Members

A-0-7/A-0-8 Combined Orbit Calendar for 1979 ($3) ....................$
(Provided free to Life Members on request)

Life Member Society (donation of $200 or more) ............................$

Contribution toward AMSAT Phase III Satellite (Solar cells may be sponsored at $100 per cell, battery cells at $200) ..................$

Other ..................................................$

TOTAL AMOUNT ENCLOSED $

(please make your check or money order payable to "AMSAT" in U.S. funds. We also welcome payment by VISA or Mastercharge. Please give your account number and expiration date.)

**Note: Members outside the U.S. may send their AMSAT dues to their national organisation: AMSAT-OSCAR, AMSAT-France, AMSAT-Italiana, JAMSAT, AMSAT-Mexico, AMSAT-Nederland, AMSAT-UK, or AMSAT Swiss dues can be sent to HB9OP. Members in countries with currency restrictions may send IRC's (3 IRC's per $1.00).

**AMSAT Newsletters will be sent via Second Class and Surface Mail unless additional postage is included. Life members receive their Newsletters by First Class or Air Mail.