AMSAT NETS

The following AMSAT Nets meet regularly to disseminate information to newcomers and to keep regular satellite users in communication with one another.

<table>
<thead>
<tr>
<th>Region</th>
<th>Day</th>
<th>Time</th>
<th>Frequency</th>
<th>Net Control</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA-East Coast</td>
<td>Wednesdays</td>
<td>0100 Z</td>
<td>3850kHz LSB</td>
<td>Net Control W3UN or W3AN</td>
<td>W3UN or W3AN</td>
</tr>
<tr>
<td>USA-Mid States</td>
<td>Wednesdays</td>
<td>0200 Z</td>
<td>3850kHz LSB</td>
<td>Net Control W7C4</td>
<td>W7C4</td>
</tr>
<tr>
<td>USA-West Coast</td>
<td>Wednesdays</td>
<td>0300 Z</td>
<td>3850kHz LSB</td>
<td>Net Control W7D9O</td>
<td>W7D9O</td>
</tr>
<tr>
<td>JA-Net</td>
<td>Mondays</td>
<td>1300 Z</td>
<td>3555kHz LSB</td>
<td>Net Control JA1ANG</td>
<td>JA1ANG</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>Sundays</td>
<td>1100 Z</td>
<td>14,280kHz USB</td>
<td>Net Control JA1ANG</td>
<td>JA1ANG</td>
</tr>
<tr>
<td>Western Europe</td>
<td>Sundays</td>
<td>1000 Local</td>
<td>3780kHz LSB</td>
<td>Net Control G3JBL</td>
<td>G3JBL</td>
</tr>
<tr>
<td>International</td>
<td>Sundays</td>
<td>1800 Z</td>
<td>14,280kHz USB</td>
<td>Net Control W2IM or W2IN</td>
<td>W2IM or W2IN</td>
</tr>
<tr>
<td>Africa-Europe</td>
<td>Sundays</td>
<td>1600 Z</td>
<td>14,280kHz USB</td>
<td>Net Control G3J0R</td>
<td>G3J0R</td>
</tr>
<tr>
<td>Africa Net</td>
<td>Saturdays</td>
<td>1100 Z</td>
<td>14,280kHz USB</td>
<td>Net Control T92EF</td>
<td>T92EF</td>
</tr>
<tr>
<td></td>
<td>Saturdays</td>
<td>1130 Z</td>
<td>21,280kHz USB</td>
<td>Net Control T92EF</td>
<td>T92EF</td>
</tr>
</tbody>
</table>

The following VHF frequencies are also in use:

- **London, England**: 144.2MHz USB, Net Control G8GCI, Sundays 1930 Local
- **Atlanta, Georgia**: 146.8MHz USB/CW, Net Control WA4DDH, Sundays 2000 Local
- **Washington, D.C.**: 146.25-85MHz FM, Net Control W3UN, Wednesdays 02:00Z
- **Los Angeles, Calif.**: 146.25-85MHz FM, Net Control W6CG, Daily

Bulletins of general interest to those interested in amateur satellites are transmitted regularly on OSCAR-6 reference orbits, at approximately 10 minutes after ascending Node. These bulletins are transmitted on a downlink frequency of approximately 29,490 kHz and can be received over most of Eastern North America.

Educational bulletins are transmitted regularly by AMSAT Educational Bulletin Stations in North America on even numbered weekdays of the year via the AMSAT-OSCAR 6 two-to-ten meter transponder. Those bulletins, addressed to schools, can be heard on 29.50 MHz during morning passes having equatorial crossings between 250° and 30° degrees W. Longitude.
THE $2.00 TURNSTILE

BY JOE KASSER, G3ZCZ

This antenna is cheap and simple, is made out of aluminium angle and plexiglass, requires no special tools, and anyone can assemble it in less than 30 minutes.

The same basic design may be used for both 145 MHz and 432 MHz.

The dimensions of the elements and the matching sections are different for each band of course, but the center section is the same.

Aluminum angle may be purchased in six foot lengths. If one such length is cut into four equal pieces, it is the correct size for the two-meter turnstile.

The center piece, shown in Figure 1, comprises a piece of plexiglass 1/4 inch thick and 1 inch square on a side. Four holes are drilled in each corner for mounting the elements and a center hole is drilled for mounting the whole thing to a mast. The holes can be measured and drilled 1/4 inch away from the sides of the elements can be placed into position and spot drilled using a drill press.

The elements are shown mounted to the center piece in Figure 2. A No. 4 bolt passes through the center piece and element. A washer is placed on the bolt below the plexiglass. A solder lug is placed on the bolt between the washer and the nut. The coax cable is soldered to the lug later.

The 70 cm antenna is made in the same way but with shorter elements. A reflector element can be placed beneath the driven element. The antenna can be fed in any manner that you wish, for circular or linear polarisation. One technique is to mount the antenna facing North-South and feed each dipole in a linear polarisation mode, switching antennas as necessary. A second technique is to use circular polarisation, but that has to be changed when going from receive to transmit via OSCAR.

RESULTS IN USE

Both the 432 and 145 MHz versions have been used to access the AMSAT OSCAR 6 and 7 spacecraft. The 432 MHz version was fed with 8 W of CW power and 599 signal reports were received. The 145.9 MHz version was fed with 50 W of CW power and signal reports of 569 were received.

For $2.00 and 30 minutes you can't go wrong.
A 70-CM LINEAR AMPLIFIER FROM A MOTOROLA T44

BY MATSON R. GABRIEL, JR., WB4ENX

Many satellite users would like to have a low-power amplifier for 70 cm that, when used with a moderate-gain antenna, provides suitable ERP for Mode B use. The following description tells how to modify the final 2C39 cavity amplifier from a Motorola T44 450 MHz FM unit for linear service. While I am not the originator of the conversion, I thought it would be of interest to many present and future Mode B users.

To make the 2C39 amp operate in linear service, one has to use grid biasing instead of the usual cathode biasing for triode tubes as one end of the input transmission link which is tied to the 2C39 cathode is at DC ground. Remember that in the 2C9 this cathode connection is also tied to one side of the tube's heater. We will also add switching to cut the 2C39 off during idle periods, plate current metering, and heater current adjustment. We will also have to add a means of blowing air through the cavity for cooling the tube. I used an adapter made from a piece of fiberboard and a PVC pipe fitting so that the hose from my blower can be attached. Some friends have mounted small blowers directly to the end of the cavity enclosure. Air flow should be towards the output end of the cavity.

When removing the cavity from the T44, save the RFC and 500 pf metal-clad bypass capacitor that are attached to the heater terminal as they will be used. Also leave the plate power lead leaving the cavity as long as possible (it is a pain in the neck to replace as the cavity has to be disassembled). Mount the cavity on a suitable chassis after cutting the chassis for proper fit. Suitable input RF connectors can be mounted to the chassis ends. It is best to mount a partition across the chassis to separate the input network from the output connection. The plate current meter should also be mounted in a shielded enclosure with feed-thru capacitors for input and output connections. I used a Radio Shack 0-1 ma meter with a nichrome wire shunt for a 0-200 ma full scale calibration.

(Continued from Page 4)

AMSAT OSCAR 6 BATTERY IN TROUBLE

BY RICHARD ZWIRKO, KIHTV

In early January it was noticed that a change for the worse in the condition of the battery of AMSAT OSCAR 6 took place. Telemetry indicates that we are getting on channel 3B (normal counts on channel 3B are slightly higher than normal counts on 3A by .2 volt) and at the same time the readings for channel 3A (V bus) are about 7 or 8 counts lower than normal. This indicates that one of the Ni-Cd cells in the upper half of the battery has failed. Because of this, it is believed that the battery will not charge at a great a rate as was possible before the failure. If the cell fails completely it will look like a diode. I am paralleling it, allowing the battery to be charged to some degree. How long this will last we don't know. Although only one cell appears to have gone bad, it is believed that other cells are close to being in the same condition and may also fail within the year.

Since AMSAT OSCAR 6 is in total sunlight at this time battery heat is a problem. Telemetry channel 3D indicates that the battery temperature is in excess of 57°C. We do not want to further aggravate the thermal problem so the operation schedule for this satellite will remain the same. Although the temperature inside rises and the bird is left on too much the battery voltage drops. I don't think the average AMSAT OSCAR 6 satellite communicator realizes how much the AMSAT OSCAR 6 command stations mean to the life of that particular bird. Without the millions of commands sent to it, AMSAT OSCAR 6 would probably have died already. Up to the present time the red line cut off point has been a channel 3A reading of 52. With the failure of one cell it has been decided that the point at which AMSAT OSCAR 6 should be immediately turned OFF will be a 3A count of 44.

Randy, VE3SAT, is now able to automatically load AMSAT OSCAR 7 Codestore via his modem. Please note that this is a very short notice. You can now expect telexes on very short notice much more than in the past because of this. Messages will appear on GMT Sundays on a regular basis. However, important messages might appear at any time during the week if needed so please keep an ear on the beacon frequencies of AMSAT OSCAR 7 on both modes.

(Continued on Page 5)
COST PERFORMANCE CRITERIA FOR EVALUATING PHASE III SATELLITES

BY MARTY DAVIDOFF, K2USB/C/3

This paper evaluates the cost effectiveness of Phase III spacecraft by calculating the yearly cost per user. This is accomplished by (1) specifying the channel capacity of a linear transponder used for SSB and CW and (2) estimating the total number of users which a Phase III spacecraft can adequately serve.

CHANNEL CAPACITY

Channel capacity (the number of simultaneous conversations which a transponder can accommodate) can be estimated in the following manner. Assume that only SSB and CW will be used and that a SSB signal requires a 2.5 kHz bandwidth and that CW requires 0.5 kHz. A 100 kHz transponder can accommodate 40 SSB channels or 200 CW channels or a combination of the two. A reasonable compromise might be 62.5 kHz for SSB and 37.5 kHz for CW. This results in 100 channels (25 SSB and 75 CW) or an average of one channel per kHz. Using a different averaging method for the SSB and CW channels, the arithmetic mean (120) or the harmonic mean (about 90) would only result in very minor changes in the following estimates.

MAXIMUM NUMBER OF USERS PER CHANNEL

Two methods for estimating the maximum number of users which a channel can support will be presented.

FM repeater clubs in the Washington, Baltimore area have demonstrated that single channel "open" repeaters supported by 200 members operate smoothly. Since all users are members, the actual number of users per channel is in excess of 200. The conclusion is: single channel FM repeaters are capable of supporting in excess of 200 users per channel.

Now consider the HF bands (80-10 meters). In the U.S., 3.3 MHz is assigned to amateurs. In other parts of the world the total amateur bandwidth is somewhere between 20 and 40 MHz. The policy of this paper is to use conservative estimates, so the 3.3 MHz figure will be applied to all amateurs. Using previous assumptions, this is equivalent to 10% 1.1 MHz channels. The world wide total is approximately 800,000 (QST, Vol. LIX, No. 1, Jan. 1977, p. 5). Assuming that about 75 percent of these amateurs are licensed to operate in the HF bands yields a figure of 600,000 amateurs licensed to use 3,300 channels. This results in approximately 200 users per channel. At times, the HF bands are very crowded, however, they are usable. The conclusion is: an HF channel is capable of supporting approximately 200 users.

The preceding analysis suggests that a Phase III channel will probably be able to support about 200 users.

PHASE III USER CAPACITY

The data previously developed suggest that a 100 channel (100 kHz) transponder will be capable of serving up to 20,000 users before severe overcrowding becomes a problem. This assumes, of course, that users cooperate during peak load periods.

Since the Phase III user capacity is an extremely important parameter in this paper, the figure arrived at should be checked. Consider the situation where the number of users reaches the maximum capacity figure of 20,000. The satellite will be available about 170 hours per week. Assuming only two-way CQ's, 50 percent of time listening - 50 percent of time transmitting, this results in just under two hours of satellite time per user per week. Taking into account roundtables (nets) and the fact that even casual rappers spend more time listening than transmitting probably brings the average figure closer to three hours per user per week. DX'ers, prefix hunters and state hunters normally spend a great percentage of their operating time listening. It's therefore conceivable that, even with the maximum of 20 users per channel, the average operating time per week is just under 30 hours per user per week. Since this is an average value, many users will no doubt be able to spend 10-15 hours per week operating through the satellite. While this number may seem small, remember that satellite operating time is only one aspect of amateur radio. Most amateurs will divide their time devoted to the hobby between HF operation, 2 meter FM, reading radio magazines, attending club meetings, constructing equipment, etc., as well as operating through satellites. Consequently the maximum capacity figure of 200 per channel appears reasonable.

It is interesting to speculate on the scenarios that may occur should crowding become a problem. One school of thought points out that a given amount of data can be transmitted much faster by SSB than by CW and that, at this time factor is taken into account, SSB is actually more efficient. However, this latter argument depends on users limiting themselves to essential information, a goal of questionable desirability. The purpose here is not to present these scenarios, or to discuss others which could produce similar results, but only to show that a number of options do exist should overcrowding become a problem.

COST ($) TO THE USER

Assuming a Phase III spacecraft cost of $200,000, a six-year lifetime, and 10,000 users (half capacity) results in a yearly cost per user of about $350. Even if only half of the actual users provide financial support to AMSAT, a yearly fee of $150 per user is quite reasonable. Based on these conservative estimates, it would appear that the current AMSAT membership fee can provide the income needed to support a growing satellite program.

ADDITIONAL CONSIDERATIONS

It should also be noted that a number of factors should contribute to lowering the yearly cost per user for future Phase III spacecraft. The factors include (1) transponder improvements resulting in increased bandwidth, (2) solar cell research which should result in a big decrease in this significant expense, (3) launch opportunities which will not require that AMSAT provide an apogee kick motor on the spacecraft, eliminating this expense.

The cost effective analyses discussed in this paper cannot be directly applied to Phase II (low-altitude) spacecraft, since the limited access time tends to concentrate users, requiring revision of the nominal channel capacity figure of 200 users per channel.

Here's also of interest to compare the yearly cost per channel of the transponder to be included in the first Phase III spacecraft with "typical" ground-based two-meter FM repeaters. The previous assumptions (spacecraft = $200,000, transponder = 100 channels, lifetime = 6 years) yield a yearly cost per channel for the spacecraft of about $350.

The electric and telephone charges alone for the local Baltimore repeater (WR3APM) equipped with telephone autopatch exceed $350 per year. It's very difficult to calculate "typical" capital costs of two-meter FM repeaters, but advertisements in amateur journals suggest that there is a market for commercial repeaters costing about $1,000. Repeaters using "surplus commercial strips" can also be expensive when the total costs, including 450 MHz links and commercial antennas, are taken into account. A very recent, a Phase III program using current technology can be financially self-supporting through AMSAT membership fees once the first satellite is launched. The calculations may be regarded as conservative in that (1) the value assumed for satellite user capacity can easily be raised by increasing the percentage of CW or roundtable operation, (2) the number of actual users is increased to 20,000 and, (3) the number of users assumed to be supporting the program financially (5,000) is only half the actual users. The yearly cost per user channel of 200 kHz transponder is, consequently, only $50 per year. The decrease for future Phase III spacecraft permitting a rapidly increasing Phase III program.

CONCLUSIONS

A 100 kHz Phase III satellite transponder can accommodate 20,000 users equipped for the uplink frequency. The cost of this program using state of the art technology can be financially self-supporting through AMSAT membership fees once the first satellite is launched. The calculations may be regarded as conservative in that (1) the value assumed for satellite user capacity can easily be raised by increasing the percentage of CW or roundtable operation, (2) the number of actual users is increased to 20,000 and, (3) the number of users assumed to be supporting the program financially (5,000) is only half the actual users. The yearly cost per user channel of 200 kHz transponder is, consequently, only $50 per year. The decrease for future Phase III spacecraft permitting a rapidly increasing Phase III program.
MINUTES OF THE AMSAT BOARD OF DIRECTOR'S MEETING 3 JANUARY 1977

The Board of Directors of the Radio Amateur Satellite Corporation (AMSAT) met in the Building 2 Conference Room, NASA/Goddard Space Flight Center, on 3 January 1977. The meeting was called to order at 8 p.m. by AMSAT President Perry Klein. The following persons attended:

AMSAT HQ members: Others present:
  Perry Klein, W3JK  Robert J. Carpenter, W30TC
  Thomas A. Clark, WA3JLD  Marty Davidoff, K2UHC
  Jan King, W2GCEY  Gary Teter, WJHUG
  William A. Tynan, WIXO  Charles Towns, K6JFN (Project OSCAR)
  Charles Dorian, W3JPT  John Browning, W6SP (Project OSCAR)

After a short discussion, it was unanimously voted to affirm the recommendation of the Investment Committee and liquidate the holdings in the Dreyfus Liquid Assets Fund and place the funds in various bonds and bond mutual funds.

Since all funds, except for Life Membership reserves, are now authorized to be available for salaries, the Treasurer was authorized to operate with a single checking account.

There was a discussion of the telephone expenditures, now running about $200 a month. The Treasurer had suggested direct-dialing where the 60c overhead for operator intervention was significant. The substantial use of telephones is a result of the world-wide participation in the design, construction, and control of the AMSAT satellites.

Jan will attend the European Space Agency coordination meeting in Toulouse on 18 January 1977 to make necessary preparations for the launch of Phase III. While Jan's work takes him to Europe frequently, AMSAT will have to bear the direct costs of this trip. It was felt that DJ4SC would probably come back to the U.S. with Jan on Jan 18 if traveling to Europe. Up to $1000 was authorized for each trip to cover transportation, etc.

It was voted to continue AMSAT membership in The Middle Atlantic FM and Repeater Club (TMARC), which is the local FM coordination organization in view of AMSAT's operation of WJ3AK as a Washington-area liaison repeater. This annual expense, presently $20, was authorized until further notice.

W3JLD proposed that AMSAT record itself as favoring the creation of an ARRL VHF Advisory Committee, and to offer to participate. This was approved.

The AMSAT response to the FCC Third Notice of Inquiry in Docket 2071, Preparation for the World Administrative Radio Conference, was discussed. The proposed response was approved subject to the addition of thanks for the various satellite bands proposed. Tyan and Klein will modify the response appropriately so that it will be ready to hand out at the WARC preparatory meeting 25 January.

Klein reported on recent discussions with persons at the FCC. There seems to be strong feeling there toward opening all 2 meters to repeater operation. Informal discussions were then undertaken toward the best approach to license the next spacecraft.

There was an extended discussion of possible future launch options. There seem to be a dozen or so, but there would require early preparation and some are less sure than others. In view of our limited resources, most remain interesting "backup" possibilities.

The priorities at present are:

AC-3 - Fall of 1977  Phase III on Arlone - December 1979
The SSUS-A and US on shuttle for second Phase III
Some sort of SYNCRAT - 1980 (synchronous satellite)

These priorities, which do not represent an immediate change, met with general approval.

Next there was a discussion of means for raising the funds necessary for Phase III. Clark pointed out four key factors:

- Increase membership numbers
- Solicit many small donations from hams
- Solicit several $1000 donations from hams
- Obtain large corporate donations

The main problem remains to find people to run the campaign. Tows suggested that perhaps Project OSCAR should act as the organization to obtain the large donations. Davidoff presented an analysis showing that if Phase III is successful, we could expect 40,000 people to each donate $10 a year by about 1981.

In order to get large donations, Towns pointed out that we need a presentation suitable for a lawyer showing the need, the purpose, and the tax conditions. Clark observed that front-end money on the order of $10,000 would be required to start a campaign. Dorain questioned who would take on overall responsibility. The general consensus was that the AMSAT board of directors could not escape this responsibility. Tyan commented that AMSAT should raise a substantial sum from small donations to convince potential larger donors that there is wide support.

There was then a further discussion of details of money-raising techniques. It was decided that the AMSAT& project would be the focus of the promotion. The meeting adjourned at 12:25 a.m.

Respectfully submitted,
Robert J. Carpenter, W30TC
Secretary

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100.00 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS:

LM-556 Alexander Schoening, DC7AS  LM-574 Richard Attwood, W7SCW
LM-557 C. Mickey Hicks, WA6SNC  LM-575 Ignacio Martinez, CEZMH
LM-559 John R. Heimer, DC2E  LM-577 Len Thaxton, W6HAR
LM-560 T. R. Rodgers, WB5UKT  LM-578 S. V. Munro, VECM
LM-561 J. D. Kir, WA3DGO  LM-579 Dr. V. W. Jensen, KY9E
LM-562 Ray A. Tell, W8NYC  LM-580 George Hartwell, KELK
LM-563 Michael J. Hill, FRADY/K6CTY  LM-581 Marshall Welch, Jr., W3BJ
LM-564 Philip Miller, 25MNM  LM-582 Warren Birkenhead, KH6CA
LM-565 Walter Holowatsenko, VE6AOG  LM-583 Morton A. Christgau, W8NBO
LM-566 Orlando Vallone, Jr., F2750Q  LM-584 Ralph Fielding, E2RAN/8
LM-567 W. Harline, VE2OFP  LM-585 Robert A. Wells, W5XO
LM-569 M. Mehlhauser, ELMTMD  LM-586 J. C. O'Connell, W3JK
LM-570 Frank S. Maynard, W4KYR  LM-587 David Liberman, K7YFU
LM-571 Robert B. Davidheiser, WA3PTL  LM-588 Dr. J. H. Dillon, KH6MV
LM-577-2 Rock Creek Amateur Radio Association, W3RCN
Silver Spring, MD

SATELLITE
Sophisticated multiscale circular slide rule orbit predictor as described in the newsletter and 73 Magazine, 77.95pp. Ham Radio, Greenville, NH, 03048.

AMSAT T-SHIRTS
100% polyester. A-O in living colour above the earth and AMSAT logo. $10.00 per proceeds to AMSAT. Available in sizes L, M, S, and a different size. $5.40p ($6.48p overseas) with AMA in reverse.

AMSAT-STICKERS
6mm SlIDE SETS
21 slides for talks and demo's. $5.40p ($6.48p overseas) with AMA in reverse.

AMSAT T-SHIRTS
"100% polyester. A-O in living colour above the earth and AMSAT logo. $10.00 per proceeds to AMSAT. Available in sizes L, M, S, and a different size. $5.40p ($6.48p overseas) with AMA in reverse."
SOUTHERN HEMISPHERE EFFECT - A RESPONSE

BY JOHN FOX, WA2ER

The following is in response to the numerous letters being received on what has become known as the Southern Hemisphere Effect.

AMSAT-OSCAR-7 is the first amateur radio satellite that has absolute control over all of its physical behaviors: nutation damping (wobble), attitude control and spin or rotation control about the Z axis. The result of the aforementioned is a very stable spacecraft. The end result is a very predictable antenna orientation at a given instant at a given location with a given equatorial intercept.

The physical parameters of the hardware of AMSAT-OSCAR-7 are such that the 29 MHz antenna had to be mounted in the same plane as the attitude control magnet (the Z plane). The attitude control magnet reacts to the magnetic field of the Earth by sensing the North and South magnetic poles. This configuration produces a “Tip Null” type of behavior. The 29 MHz downlink antenna for the time being will be most noticeable on passes that bring the spacecraft in or near zenith. For stations located in the northern hemisphere the ascending node passes from AOS to beyond TCA (publication point of 50° north latitude) will be quite weak. From this point to LOS the signal strength will increase. The same will be true for a descending node pass.

For stations located in the southern hemisphere, the south-bound node will be weakest from AOS to beyond TCA with signal level increasing from then till LOS. Again the same will be true for the north-bound node. The “Tip Null” effect can be best dealt with by using passes that are off to either side of the users by 1,290 miles (sub-orbit point) or better. One has to keep in mind that the 29 MHz antenna on OSCAR-7 is a linear antenna (dipole) and the radiation pattern will also be linear most of the time except for the effects of path propagation between the spacecraft and the receiving station. The ideal receiving antenna is a circular polarized antenna. At 29 MHz the physical size of a circular polarized antenna makes it prohibitive for most users.

The uplink antenna at 145 MHz should also be circular polarized. The input antenna on OSCAR-6 is circular polarized but is only circularized when the spacecraft is looking directly at you. Again this occurs only when the “Tip Null” is maximum or approaching maximum null. To eliminate the changing effects of the spacecraft’s 145 MHz receiving antenna a circular polarized transmitting antenna at the user’s end is required for optimum fade-free contacts. This is especially true for the users of AMSAT-OSCAR-6.

All of the antennas on AMSAT-OSCAR-6 are linear. The 29 MHz antenna is mounted perpendicular to the attitude sensing magnet. This allows the 29 MHz antenna to rotate about the attitude plane. This is just the opposite of the configuration aboard AMSAT-OSCAR-7. This configuration of the 29 MHz antenna allows only three “Tip Null” fades per 360° rotation about the attitude stabilizing plane. The 145 MHz input antenna goes from horizontal to vertical or vice versa, especially on zenith passes. Without a circular polarized antenna for your up-link antenna at 145 MHz you will have to contend with fades both from attitude changes of the 29 MHz antenna and from the 145 MHz input antenna of AMSAT-OSCAR-6.

To summarize, the AMSAT-OSCAR-7 “Southern Hemisphere Effect” is probably the result of the “Tip Null” created by the 29 MHz antenna being mounted along the same axis as the stabilization magnets in X-O-Y. The 29 MHz antenna on AMSAT-OSCAR-6 is mounted perpendicular to the stabilization magnet, and doesn’t appear to exhibit this effect. All uplink antennas for both spacecraft should be circularly polarized.

AMSAT-OSCAR-7 COLOR PHOTOGRAPHS

An artist’s rendition of AMSAT-OSCAR 7 in orbit above the earth is available as an 8 x 10" color photograph, in full color.

Order from Allam Bridges, WB4XVP, 2754 Pine Hill Dr. NW, Hennepin, CA 90144. Please make payment payable to "AMSAT". Price is $1.00 or 2 IAC’s. Please add $3.50 to U.S. orders for postage, and $1.00 if ordering from overseas for airmail postage. Proceeds benefit AMSAT.

If you do not live in the USA, you may obtain information about AMSAT from the following AMSAT representatives:

**AMSAT Affilite Organizations**

- **AMSAT-Mexico**
  - c/o D. Liberman, XEITU, Bosque de Sayula No. 22, Mexico, I.O., D.F., Mexico.

- **Japan AMSAT Association**
  - c/o H. Yoneda, JAIAG, 15-1305 Shinomura 2-Chome-26, Setagaya-ku, Tokyo 154, Japan.

- **WIA-Project Australis**
  - c/o D. Hall, VK3XWH, 3 Oliphant Court, Malgrave, Victoria, 3170, Australia.

- **AMSAT-Nederland**
  - c/o W. Dekker, PA6WLS, P.O. Box 87, Norwijk, 2460, The Netherlands.

- **AMSAT-Deutschland**
  - c/o A. Schoening, DC7AS, Maxmilliankorso 57, 1 Berlin 28, West Germany.

- **AMSAT-UK**

- **AMSAT-Italia**
  - c/o G. Giro, I3BMV, P.O. Box 372, 34106 Ystiele, Italy.

- **AMSAT-Canada**
  - c/o E. Welling, VE3H, 165 Catalina Drive, Scarborough, Ontario M1E 1B3, Canada.

**Overseas Country Coordinators**

- **Costa Rica**
  - Eric Roy, TIZRA, Box 661, San Jose, Costa Rica.

- **Peru**
  - Paul Wyco, OAVU, Casilla 2492, Lima 100, Peru.

- **Brazil**
  - Edmilo R. de G. FY7C, Caixa Postal 427, 58100 Campina Grande PB, Brazil.

- **India**
  - V. Subramanian, VU2UV, 159/1 Silver Oak Avenue, Hq. Tg. Command IAF, Hebbal-Bangalore, 560006, India.

- **Switzerland**
  - Ted Vogel, HB9OD, 186 Route de la Capite, 1222 La Capite, Geneva, Switzerland.

- **New Zealand**
  - Bruce Bowlings, Z/1LBB, Mason Street, Onerahi, Whangarei, Northland, New Zealand.

- **France**
  - Francon Gerard, F6BEG, 17 Rue du Chauffour, 15130 Arpajon-Sur-Cere, France.

- **Ivory Coast**
  - Hughes Rylands, TUIF, Douglas Aircraft Representative, AIRFRIC-Directie-Technique, Boite Postale 21017, Abidjan, Ivory Coast.

- **Seychelles Islands**
  - Billy Lane, VU9Q, Box 191, Mahe, Seychelles.

- **Romania**
  - Søl Ilanu, YO2IS, c/o YQ2 Radio Club, F. O. Box 100, 1900 Timisoara, Romania.

- **Poland**
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- **Ireland**
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- **Greece**
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- **Phillipines**
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- **South Africa**
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- **Venezuela**
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- **Chile**
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(Continued on Page 13)
HELP TO REVOLUTIONIZE AMATEUR RADIO COMMUNICATIONS

An exciting new phase in amateur radio is about to begin, one that will affect all of us. OSCAR satellites of the new AMSAT Phase III series will soon revolutionize long-distance amateur communications in the same manner that earth-bound repeaters have completely transformed local communications -- by dramatically increasing communications reliability while simultaneously reducing the cost and complexity of individual amateur stations. The first Phase III spacecraft, now scheduled for launch in 1979, will be available to most stations about 17 hours each day, and will make communications possible between stations separated by distances of up to 11,000 miles.

Amateurs interested in DX, rag chewing, contests and traffic handling will find Phase III satellites as easy to use as the standard ionosphere and their favorite band. AMSAT-Phase III spacecraft are being designed so that output powers of the order of 50 watts (CW or SSB) at 145 or 435 MHz and a small antenna resembling a TV antenna will usually outperform an HF band CW and tower-mounted beam. In effect, each satellite in the Phase III series will provide a new band with capabilities for worldwide contacts, usable by hundreds of amateurs at a time.

AMSAT-OSCAR's 6 and 7 have shown that long-lifetime amateur satellites are possible but, like all low-altitude satellites, they are greatly restricted in terms of range and access time, and they require accurate tracking. Phase III will eliminate these constraints.

But AMSAT needs your help to make Phase III a success. Hardware costs for the Phase III spacecraft are estimated at $200,000. (A government or commercial satellite providing similar performance would cost about $10,000,000.) While this figure may sound very large, once the system is operational the cost per user will actually be less than many of us are currently contributing to local repeater groups. In addition, individual users will find that their home station investment can be significantly decreased. With the rapid growth in amateur radio the question really is: Can we afford not to go ahead with the Phase III program?

What you can do to help:

1. Join AMSAT as a member for $10 per year in support of the Phase III satellite program, or become a life member for $100.
2. Volunteer your services for engineering design, construction, fund-raising and other Phase II/III activities.
3. Sponsor a piece of the action by sponsoring part of the Phase III satellite. Sponsor one or more solar cells ($10 each), battery cell ($200), solar panel ($2,000), transponder ($5,000), onboard microcomputer ($5,000), or a VHF/UHF motor ($2,000). Donations to AMSAT are tax deductible under Section 170 of the IRS code. Sponsors will receive a certificate suitable for framing, acknowledging their specific contribution. Contributors of $1,000 or more will have their names inscribed on a plaque included in the spacecraft orbiting around the earth.

Please send your contribution and membership dues to AMSAT, P. O. Box 27, Washington, D.C. 20044, U.S.A.

Invest in the future of Amateur Radio!

TO ALL MEMBERS: Photocopy this article and distribute it widely in your local area.

(Continued from Page 11)

AMSAT AREA COORDINATORS

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Kristjan Benediktsson, TF3KB, Barmahlid 55, Reykjavik

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AMSAT Area Coordinators are needed for the blank states indicated above. If you would like to volunteer to serve as an Area Coordinator, please contact Rich Zwikor, N6TV, AMSAT Vice-President, Operations, 36 Sweet Birch Drive, Meriden, CT 06450.
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Dear Sirs,

I am a relatively new amateur having had my ticket only eight months but since that time I have followed with great interest the activity on OSCAR 6 and to a lesser extent on OSCAR 7.

I purchased a two-meter rig in July and made some feeble attempts to attract other hams on OSCAR 6. This attempt was made from Yellowknife, NWT. In September I moved to Inuvik and thought my OSCAR days were over. I have a five-element beam set up on a rotating shaft inside my shack (I live in a metal-sided row housing "unit") and using my Kenwood TS-700A have made more than 60 contacts in 12 states, 3 provinces, and 2 countries.

The farthest south I have contacted so far is Kentucky (talking to K4OQ twice). During one of the passes while I was in contact with Hawaii, I was told that the pass I was talking on was for telemetry purposes and not open for general use.

Well, I wish to operate properly and not step on toes especially with the satellites. I was not aware of the tracking orbits or was aware of the messages being broadcast on OSCAR 6. For these reasons plus I wish to give support to AMSAT I would like to take out membership for my station. Enclosed is the $4.00 which I was told is the membership fee, but if more is required please let me know and I will forward the balance. In addition, I would be pleased to assist you with any tests or information. From my limited experience I have found no one living this far north and participating in OSCAR.

For the majority of the pass I find myself talking to no one until the satellite travels far enough for me to hear Japan. So far I have talked to 13 JA's with reports ranging from 5 to 5-9. I was told that an amateur should not hit the satellite with 100 watts or more. I must use that much power unless I co-phase two or more antennas but still keep getting 5-9 reports.

Sincerely,

Roy J. Galloway, VERTJ

Gentlemen:

First I would like to take this opportunity to thank you for your work with AMSAT. I don't believe people take your work for granted but they do often fail to express their appreciation.

If I may, I'd like to make some suggestions. Each of us has our own "bag" when it comes to amateur radio. Personally I'm an "appliance operator", an administrator, a certificate hunter, etc.

One thing I'd like to see is the expansion of the awards program. Some of this is suggested in consideration of OSCAR 8. Please remember, I'm not part of the administrative team so I have not heard pros or cons nor had the benefit of past "brain storming".

At any rate, why not increase the possibilities of the OSCAR beyond the 60 points? The 10 point steps are great but I believe we stop a little too soon for OSCAR 6 and 7 and definitely OSCAR 8. Maybe two horizontal certificates could be used, one for OSCAR and the second for endorsements 30 thru 100. Oh, here's a hint to consider. Maybe OSCAR should be unity with each sticker corner 10. I have my stickers in each corner of the inside square of the certificate. The obvious question from a non-AMSAT member is, "What happened to 10 and 20?"

A second approach would be to add endorsements to the OSCAR hexagonal award. The whole point is to offer a continuing challenge in obtainable steps.

Anyway, thanks, gentlemen. The technical aspects of OSCAR have been great, so has the operating. It's been your individual dedication that made it that way.

Sincerely,

Ed Mcke, WB9BQ
Dear Joe,

AMSAT-F can now be considered as a reality. I have found some people to help me and the French Association FEP will participate. Here is the project of organization:

1. AMSAT-F is a club inside the FEP and no dues will be asked to the members.
2. The FEP will subscribe to AMSAT as Life-Member and one-half to one page will be reserved in the monthly review "Radio-RéEE" for AMSAT news. (This was begun in November 1976.)
3. For the beginning, the tasks will be shared between FIDOF, FLOR, and me. FIDOF is the mail manager and transmits the quarterly newsletter to French hams. He receives also SASE from the members so as to send urgent news before the printing of the review (new schedules, launches, special tests or expeditions). FLOR is traffic manager and collects all information about the Contacts, scores, etc., through the satellites. As for me, I ensure the liaison with AMSAT-USA, especially as far as new memberships or renewals are concerned. I can also help in the organization of exhibitions giving information about amateur satellites.

Hoping that we will now be able to help AMSAT from France, I send you my best 73's.

Gerard Francon, F6BEC

Hi,

I have been trying to work a few on OSCAR 7 but have had crystal controlled at the bottom of the band should have a 75-700 here next week so will change all that. Have been trying to get some interest up here in Montana and have sent out 14 (to date) care packages consisting of the getting started in satellites and copies of OSCAR schedules, some WPTC getting ready to go and he is using the info as a teaching tool in his math and science classes in the school in Joliet, Montana. W7DUX is getting set up to go. He is in Wyoming. Both of these will be Mode A.

Will be putting on demonstration for Ryegate High School science class in the near future. The instructor was a ham years ago and is now on. He is studying to get back on with the good guys. If any of the gang wants Montana, drop me a card and I can schedule most evenings except Monday and Tuesday. I can also usually catch the descending pass around 1400 in the morning or am negotiating for a Motorola 450 TX strip, and if I can get it, will try some Mode B. It may be summer before that takes place though. I listen to the nets but usually can't be heard on 20, but still get the info OK. I will drop you a note later and report on any new ones here in the Treasure State.

73,
Harry A. Boylance, W7REY
P.O. Box 621
Harlowton, Montana 59036

Dear Joe,

The long waiting QSO with South Africa has been made. LUDYX from MAR DEL PLATA on the Atlantic Coast, worked 281B1 South Africa (SSB) using OSCAR 7 Mode B at 22105 GMT January 30, 1977. LUDYX was present in the shack. LTDJAT in Buenos Aires City briefly heard 281B1 but is not sure if the ZSL replied to his call. I listened from Mendota 1109 km away but heard nothing.

Argentina stations positively heard in QSO with OSCAR 7 Mode B:

L4J3AT - Buenos Aires City
L4U4EK - Buenos Aires City
L4U4AEF - Buenos Aires City
L5DDGU - Buenos Aires State
L4U3DA - Buenos Aires State
L6DDCA - Buenos Aires State
L7DDJZ - Buenos Aires State
L6DD8R - Buenos Aires State
L7DDJC - Buenos Aires State
L4UDYX - Buenos Aires State
L7J7EE - Buenos Aires State
L5U3EM - Buenos Aires State
L5UMAI - Mendoza State
L5UMBJ - Mendoza State
L7J7MS - Mendoza State
L7J7MA - Mendoza State

73
Gene, LUMMA

Dear Joe:

This is the first letter I have ever written to an editor.

First, I want to say I have been a ham since Dec. 15, 1930 and have had many thrills and pleasures from ham radio, but I believe that the 453 complete QSOs thru OSCARs 6 and 7, A and B since May 26, 1975 have given me the most satisfaction.

Some of my experiences have been quite frustrating but all have been educational.

I really get a warm feeling hearing such great signals from WJMM, KHFFV, WPTX, WA9YL, W6CC, and many others.

I extend my hearty congratulations to all of you who have done so much to make AMSAT a success.

73
Bob, WA4MI

Dear Perry:

I need some help from the AMSAT members to collect some data.

Another guy and myself are going to do some research into what effect the sun spots may have on our weather.

I have been very busy in amateur astronomy and we have received a grant for $10,000 to do some research on sun spots and weather. It appears that lots of work is being done in this area to see if sun spots do affect our weather.

I would like the following information from AMSAT members:

1. Information on Aurora such as date and time in GMT; length of Aurora; maximum distance worked; frequency used; if Aurora was heard on OSCAR signal, was Aurora seen visually; if so, how bright?
2. Information on weather the day following Aurora, such as type of clouds. Any newspaper clippings on weather in the area.
3. Any other information the members think I would use.

I would also very much like to hear from the members from the South land who do not get Aurora very often. If I can get help from the AMSAT members this will aid us a great deal in our work.

Hi Guys,

Sorry I haven't been more active. I've experienced a lot of time getting a Motorola 6800 system on the air. I know most of the "AMSAT MICRO'S" are 8085 oriented (or COSMAC) but if there are any members with 6800's, I'd be happy to exchange info with them.

Configuration:

Hardware: 6800, 8K RAM "MICRO", ASCII to Baudot converter, ASCII to keyboard TV output device (not up yet)

Bill Bennett, K7TM

P.S. This is a long term project so if members will send information whenever they get stuff we can use, we would be grateful.

Every day we will take a sun spot count with a telescope we are setting up for solar work.

Your help will be appreciated.

Best of 73's,

Dave Robinson, K7BB
1716 South 8th Street
Tacoma, WA 98405

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Dear Perry,

Greetings from Florida. Are pretty well settled except for yard work and ham radio. Because of my wife's illness before we left Mo, we did no norriang to speak of, just moved around about everything, so we've been going through things which has taken time.

Sent the GE Prog-Line instructions which I found when I got here. Hope they arrived OK and will be useful to someone who uses my unit the organization loaned me.

Just received my Sept. AMSAT X/L and in reading the editorial saw I'd missed voting for Board members. My June AMSAT arrived during the height of Bettie's illness and was just tucked away and got buried in the move. Look forward to reading about that transponder at the meeting on the 23rd.

Since I came in under the old $50 LM time period, I'll send along another $50 now as I'm not sure when I might do it again.

Look forward to the final decision on what is to be put aboard the I70S/NOAA - chase. 15-to-16 would probably get a lot more activity since existing gear can be used. 145.9-to-435.1 should also get considerable activity since building a receiver converter is easier than a tx on 435. Must get busy right after the first of the year and build a pre-amp for 10 M and then a tx for the up-link.

The AMSAT News Letter was a real treat to get off my duff and at least let you know I enjoyed my activities, though minor, with AMSAT and hope to get involved again.

73 to you, Tom, Jan, Bill and Joe.

Ed Post, WH3KD/4

Gentlemen:

Today I made my 1,000th QSO thru OSCAR 6 and OSCAR 7. No need to tell you that I enjoy the OSCAR program.

Many thanks.

R. M. Puller, W5HAC

P.S. Since so many of us do not have 432 gear, hope this will be considered in future OSCAR planning.

Dear Joe,

First, thanks for the good info in the Newsletter. It has really helped this beginner get started in OSCAR work. I am presently running Mode A QRP with a 4 el. Cushcraft yagi and am not getting thru but am still trying. Later in the works will be a VFO, Varactor tripler to 432 and a transverter, in that order. Parts hunting is particularly troublesome some down here but I generally am able to get thru a project albeit slowly. My present crystal puts (theoretically) the down-link sig on 29.510. I am using a Vanguard 10 M preamp and a HW10L or Yaesi FTDX401 for i.f.

My trouble is that I don't even know if my 4 el. yagi and 10 W CW will overcome the path loss. I realize that the QRP tests on Mode B proved the practicality of QRP there, but I don't have info on Mode A. Since I hear good sigs on down-link, I assume that it is my transmitting gear.

A listen to Mode B the other evening logged WASARN, W5SMV, WAGUAR (GAP?), VE7AAX, W7PTZ (Oregon), W7BFO, W7JUE, W7ID, W7JFB and others so that spurred me on to order parts for a 432 tripler. (Some of the listed calls may have been jotted down wrongly.) But it sure shows that we have complete coverage of the W- and southern VE-regions.

But enough of this rambling: am enclosing my $10.00 dues to extend membership. As attached mailer indicates, my membership shouldn't be up until next December but will extend anyway.

Many thanks and 73 for the holidays,

Horn Sefton, XFLSM

Dear Om:

After reading the last bulletin, I would favor the 4 orbits/day.

We need more articles on cheap equipment to get on OSCAR - A and B. I can't afford to do elaborate $600 to $700 rigs for two and could make kits.

Carl Verian, W2AVV

ERRATA

Antenna Beaming for an Eleven Hour Elliptical Polar Orbit

AMSAT Newsletter, December 1976

Page 5: Figure 1 shows the height in thousands of kilometres (not miles)

Page 11: Delete the parenthesis in equation (14)

Page 12: Insert $g$ to the first row in the small table bottom left. $g$ is used as a step-by-step angle to determine the circle of the range.

$$L = \arccos \left( \sin \theta \cdot \sin \phi \cdot \sin \alpha - \cos \delta \cdot \cos \phi \right)$$

The mistake was made when converting the originally used symbols to more redundant ones. $\alpha$ is the angle of max. range for a given position of the satellite originally it was used.

Please forgive me.

Omar DL3EX

All readers are asked to excuse these errors.

Thanks to Joe (and the type setter) for their help and for this excellent reproduction. But it will be the last time I use Greek letters.

Oscar Award Updates

OSCAR SEATAGE AWARDS RECIPIENTS

1. W6VCS 17. W4LBD
2. WJ4DK 18. G4CDH
3. W6QUB 19. K54QG
4. W7QX 20. W4ARL
5. W7PR 21. W4JUA
6. W5GZM 22. W4ARQ
7. W6GRS 23. DJ3RR
8. W4XJF 24. W5ERM
9. W6XZ 25. W4AII
10. W4CWS 26. W4BEN
11. W3IWS 27. W4BRR
14. W8HJ 30. W4LRL
15. W8JY 31. W4QXK
16. W8PZ 32. W4QI
AREA CO-ORDINATOR UPDATE (USA)

The following correction should be made to the list published in the March Newsletter:

Delaware Mr. A. Earl Hensold, W32NF, RD 2, Box 208, Camden, Del. 19934 (302) 697-6267.

Idaho Mr. Ronnie E. Moss, K7ELE, Route 3, Box 400, Rexburg, Idaho 83440 (208) 356-2339.

New York Mr. Jay Buscemi, K20YX, 8 Westford Court, St. James, Long Island, NY 11780, (516) 584-7851.

Oregon Mr. Dave Leonard, W7VRC, 1980 Hillcrest, West Linn, OR 97068, (503) 636-2379.

Pennsylvania Mr. E. F. (Bang) Rupert, W3KH, RD 1, Box 166, West Alexander, PA 15376 (412) 663-5004.

Delete K3BZ.

South Dakota Mr. Stan Burghart, W8IT, P.O. Box 73, Watertown, SD 57201.

Washington Delete KT7H.

Wyoming Mr. Paul Humerson, W7DKZ, 508 Clark, Laramie, Wyoming 82070.

Maine Mr. Jon Neary, W2UXA, Starr Acres Maplewood, Maine 04052, (207) 793-8975.

OVERSEAS COUNTRY CO-ORDINATORS UPDATE

France G. Francon, F6BEG, 2 Rue Du Quercy, 1500 Aurillac, France.

India V. Subramanian, VU2UV, 159/1 Silver Oak Avenue, Hq. Trg. Command, IAF, Hebbal-Bangalore, 560066, India.

Editor: Joe Kasser, (G3JCE), 11532 Stewart Lane, Silver Spring, MD 20904, U.S.A. Telephone: (301) 622-2194.

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Editorial

A NEW ERA IN AMATEUR RADIO

BY JOE KASSER, G3JCE

Amateur Radio is about to undergo a fundamental change. About fifty years ago amateur radio as it was then was revolutionized by the discovery that the HF bands could support long distance communications. For that time amateurs were limited to working their friends across town using high powers and long wire antennas on the long wave bands. With the introduction of the short wave bands dx contacts became common place with small antennas and relatively low power. Encouraged by this dx, amateurs started using shorter and shorter waves to work the world. Time passed, the technology improved and frequencies became higher and wider until a barrier was found at a wavelength of about ten meters. The ionosphere only allowed reasonably reliable dx contacts at frequencies below about 30 MHz. Thus for years dx contacts were in the main limited to HF. Now that barrier is being broken and a fundamental change in Amateur Radio is about to take place.

In the change that amateur radio is about to undergo, whole new bands will open up with characteristics unlike any of those existing at present. When will that change take place? It will begin with the successful launch of the first AMSAT-PHASE III spacecraft now scheduled for late in 1979. AMSAT is a world wide organization of radio amateurs with more than 3,000 members in over 85 countries. However, everyone communicating via the AMSAT-Oscar 6 and 7 spacecraft has not been members of AMSAT, and there is no requirement that they become members. It is estimated that at this time many thousands of radio amateurs have made use of these spacecraft. If you count the amateurs who have been involved in commanding the spacecraft so as to ensure that they are available for use when scheduled and you count those amateurs involved in publicizing AMSAT and making known the capabilities of the existing satellites and the potentials of the new ones, and you count the amateurs building these new ones, you will find that only a few hundred out of an estimated 500,000 radio amateurs worldwide are pioneering the way into the satellite era of amateur radio.

AMSAT is currently managing the day to day operation of the AMSAT-Oscar 6 and 7 spacecraft. These satellites are in low altitude orbits and allow communications ranges of up to 6000 km or so without any skip zones. However, the band is open for only about 20 minutes or so, five or six time a day, when the satellite passes within range. Whilst satellite communication is indeed possible, it is restricted more to communications using the HF bands, and, also, relatively little commercial equipment is available to users at this time. The AMSAT-PHASE III spacecraft will open the vhf bands for hours at a time. In use similar to the HF bands, in that the vhf band will open up for communications with stations to the east of the user, slowly change to include areas to the north and south and then open up to the west before closing off. The spacecraft will be in orbit between these areas. Contacts will be possible with the whole of the northern hemisphere and much of the southern for hours at a time with no skip zones. Can you imagine what that will mean? Anyone in the northern hemisphere will be able to hear anyone else. Can you imagine a round table qso between stations in New York, Washington, Los Angeles, Hong Kong, Tokyo, Paris, Delhi and Moscow, all able to hear each other at the same time. This is not possible using the HF bands. Nets, emergency traffic handling, educational demonstrations and plain old qso will all assume a new dimension.

Historically AMSAT has worked to build operational, simple to use satellites and now our goal is within sight. Our space program has been international in the true co-operative spirit of amateur radio. Our first spacecraft was AUSTRALIS-Oscar built in Melbourne, Australia, by radio hams at Yalbool, Victoria. It was not a communication satellite but carried among other things a prototype sound system which proved that radio amateurs could control the operation of satellites in space. AMSAT-Oscar 6 built by Australian, German and American hams was the first long life amateur radio communications satellite. Designed for a one year lifetime it is now showing signs of old age after four and a half years of faithful service. AMSAT-Oscar 7 built by American, Australian, Canadian and German hams is now approaching its three year operational design lifetime.

In order to keep interest in space communications alive through until 1980 when the first AMSAT-PHASE III spacecraft is expected to become operational, AMSAT is stretching its resources and building one more low orbit spacecraft (known as AMSAT-Oscar D until launch). AMSAT-Oscar D is a joint effort of the Japanese

(Continued on Page 4)
AMSAT Association, Project Oscar, and the ARRL all working closely in co-operation with AMSAT. AMSAT-OSCAR D is presently scheduled for launch in late 1977 and is primarily intended for educational purposes. Once the spacecraft is launched and in orbit it will become AMSAT-OSCAR 8 and will be considered to be in the public domain so that anyone can use it for communications purposes. The ARRL will then become responsible for all the operations management aspects of the satellite. To ensure operation consistent with the design of the spacecraft, AMSAT will act as technical consultants for the operational management of AMSAT-OSCAR 8 during its active lifetime. The ARRL will also pay AMSAT the sum of $50,000 to partially reimburse AMSAT for the development and construction costs of the spacecraft. Space satellite costs are not cheap. AMSAT-OSCAR 7 cost in the neighborhood of $60,000, but a similar commercial communications spacecraft could have cost $2,000,000.

AMSAT also has a policy of not obsoletng equipment. AMSAT-OSCAR 6 carried a 145.9/29.5 MHz transponder. AMSAT-OSCAR 7 introduced a UHF/VHF transponder on 432/145.9 MHz. This transponder designated as MODE "B" (145.9/29.5 became MODE A) clearly demonstrates the superior capabilities of vhf for amateur satellite transponders. The Mode B link on AMSAT-OSCAR 7 is clearly superior to the Mode A links of AMSAT-OSCARs 6 and 7. AMSAT-OSCAR D will also carry a Mode A transponder and a new Mode J transponder (built in Japan) on 145.9/435.15 MHz. (Similarly, the first of the AMSAT-PHASE III spacecraft will carry two transponders, utilizing Modes A and J. Thus, as amateurs become interested in satellite communications and obtain equipment, they can be sure that their investment will not become obsolete with the passing of any one spacecraft.

The AMSAT-PHASE III spacecraft will be accessible with full quieting at or below vhf signals by any amateur radio station using an output power of the order of 20 Watts and small rooftop vhf style antennas. Thus, any apartment dweller with a balcony having some northern exposure will be able to work the world. In fact the performance of this equipment communicating through an AMSAT-PHASE III spacecraft will usually be superior to a kilowatt-quad combination on the hf bands.

Amateur spacecraft have long passed the days when launches were made available to amateurs because the spacecraft were there, or to demonstrate that they could do it too. There are now many spacecraft competing for all too few launch opportunities. AMSAT thus has to show how the piggy back launch can be implemented for a minimum of cost by the launching agency, and also show cause as to why a spacecraft should even be carried aloft in the first place. Thus the OSCAR series spacecraft have also been used for scientific and public service demonstrations of communications capabilities. There have been educational transmitters to introduce the space sciences to students in classrooms; demonstrations of an emergency crashed aircraft locating technique in Canada and the USA which has shown that it is possible to pin point the position of a simulated crash site to within a few miles of the exact location. NASA is now studying an operational satellite system to do just that, saving uncalculable numbers of lives and thousands of dollars in search and rescue costs. Data collection techniques using remote sensors relaying data via satellite to a central location have been demonstrated. Mobile terminals have been set up in cars, boats and private aircraft. Medical emergency traffic has been simulated. Electrocardiograph data has been transmitted coast to coast; phone patches have linked Hawaii to the Mainland US; direct "broadcasting" experiments have taken place. Many of these activities are only being talked about by the professionals, or if they are being done, are being done at many times the cost, in terms of both the spacecraft and the ground equipment.

AMSAT-OSCAR's 6 and 7 have paved the way. They have shown that we can use the satellite bands and have some grasp of the potential that they have to offer, but impressive as these are, much is yet to come. Contacts via AMSAT-OSCAR's 6 and 7 require some technical expertise. The spacecraft must be tracked as they speed across the sky, pass the last only about 20 minutes and ranges are limited. The AMSAT-PHASE III spacecraft will change that. Spacecraft gao's will become very simple to implement. Communications will be possible for hours at a time, but these capabilities will not come for free.

Hardware costs for the first AMSAT-PHASE III spacecraft are estimated as $200,000 (a government or commercial spacecraft providing similar performance would cost millions). You can help the AMSAT-PHASE III program financially by sponsoring part of the satellite. You can sponsor any number of solar cells ($200 each), battery cells ($20,000 each), transponders ($50,000 each), an on-board microcomputer ($8,000) or a rocket motor ($10,000). All donations including the $100 life membership donations are tax deductible under section 170 of the IRS.

The importance of the proposed 64° angle of inclination of the Phase III satellite orbit

The paper by DL3XK in the December, 1976, issue of the AMSAT Newsletter covered quite thoroughly the "mechanics" and calculations involved in tracking a satellite in an elliptical orbit. One item, however, was not covered: the importance of the drift of the perigee point "against the track" of the satellite. (In other words, the long axis of the ellipses rotates slowly, with the center of the earth as a pivoting point.) It is also mentioned that this drift, after a period of time, will cause the apogee of the satellite to shift, from its original position over the North Pole to a point above the equator, as shown on Figure 1 (below).

The orbit may rotate in its plane with geocenter acting as pivoting point.

Note that the angle of inclination will remain constant.

(Continued on Page 15)

(Continued on Page 6)
Such a drifting apogee causes all kinds of grief to the designers of tracking calculators, because it requires periods to recalculate and redrawing of the shape of the earth track and relocation of the time marks upon it. This is, to say the least, a great nuisance and may be a discouraging factor for many prospective satellite users.

Fortunately someone, in his great wisdom, decided to shoot Phase III into orbit with an inclination of approximately 64°. This will make all of us who design tracking systems eternally grateful. Why? Let me present a somewhat oversimplified picture of what is involved.

The effect of the rotation of the major axis in an elliptical satellite track (also called perturbation) is caused by a 19 mile equatorial bulge of the earth at the equator. For a satellite traveling in a highly elliptical orbit, most of its journey takes place far away from the earth. From a large distance the gravitational irregularities of the earth appear "smoothed out" and the earth acts, gravitation wise, as a fairly perfect sphere.

But as the satellite approaches its perigee, the gravitational bulges will have an effect on the orbit of the space craft.

Let's consider now two extreme conditions:

1) A satellite traveling in an equatorial orbit or inclination of 0°. (Figure 2)
2) In a polar orbit, inclination 90°. (Figure 3)

--- AVERAGE MASS OF THE EARTH ACTING UPON A SATELLITE AT LARGE ALTITUDE

--- APPARENT MASS OF THE EARTH ACTING UPON A SATELLITE ORBITING CLOSE TO THE EQUATOR (EARTH MASS APPEARS LARGER)

As a satellite in an equatorial orbit approaches its perigee, the concentration of the earth's mass and its gravitational pull caused by the bulge, "appears" to the satellite as if it was orbiting a larger body. The "unexpected" increase of the gravitational pull will cause the satellite to swing in a tighter curve than expected. This will cause the subsequent orbit to swing slightly in the direction of the satellite's travel. This accounts for the rotation of the major axis of the satellite's orbit.

A satellite traveling in a polar orbit experiences the opposite effect. Because its travel at its perigee takes place in the area of maximum earth flatness, (decreased gravity) the earth will "appear" to the satellite to be smaller than originally anticipated and the decrease of the gravitational force will cause the satellite to swing a wider curve. In result, the subsequent orbit will be shifted slightly in the opposite direction of the satellite's travel.

Obviously somewhere between the equatorial and the polar orbit there will be an angle of inclination where those two described effects will cancel one another.

The rate of turn of the major axis of the satellite orbit is expressed by a rather "hairy" equation:

\[ \beta = \frac{1}{2} j (g/R)^{1/2} (R/a)^{7/2} (1-e^2)^{-2} (5 \cos^2 \lambda - 1) \]

where \( j \) = constant for equatorial bulge
\( g = 32.12 \text{ ft/sec/sec} \)

(Continued on Page 8)
\( R \) = radius of the earth

\( Q \) = major axis of the elliptical orbit

\( e \) = excentricity of the ellipse

\( i \) = inclination of the orbit

Examining the equation, we may notice that for a particular orbit with a defined major axis and excentricity, all terms except the last one are constants and beyond our control. The only choice is the angle of inclination.

Simplifying the equation:

\[ 8 = K(5 \cos^2 i - 1) \]

where \( K \) is the constant.

Now, if the term \( 5 \cos^2 i - 1 \) is made to equal 0, \( \beta \) (or the rate of rotation) will also be 0 or nonexistent.

Well, let's do it:

\[ 5 \cos^2 i - 1 = 0 \]

i.e. \( 5 \cos^2 i = 1 \)

\( \cos^2 i = \frac{1}{5} \)

\( \cos i = \frac{1}{\sqrt{5}} \)

\( i = \arccos \frac{1}{\sqrt{5}} \)

\( i = 63.43^\circ \)

This is the intended inclination of Phase III!

Satellites shot into the so called, "63" slot", (very much favored by the Russians for this very reason), have stationary (nonrotating) elliptical orbits and their apogees are fixed permanently over a particular earth latitude. This makes their tracking no more difficult than those of OSCAR 6 and 7.

With the proposed "argument of perigee" of 270° the apogee will be fixed at the latitude equal to the angle of inclination; in other words, in a position closest to the North Pole. (See Figure 4)

Now, how does all this affect tracking:

With the orbital parameter described above, the subsatellite track superimposed on the northern projection of the earth will look similar to that shown on page 7 of the December, 1976, Newsletter and will remain constant for the life of the spacecraft.

If the track is drawn on a transparent material, it only needs to be rotated (North Pole being the pivoting point) to the published equatorial crossing position on the equator, in exactly the same manner as the track of the "Satellabe" or OSCARLOCATOR is. The time marks on the track will remain permanent, because the orbital ellipse will be in a fixed position in respect to the earth.

The altitude of the satellite in an elliptical orbit is changing continuously. Therefore, if elevation information is required for tracking purposes, the instantaneous altitude of the space craft must be known at all times.

The convenient property of the "63" slot" is the fact that as the subsatellite points cross various earth latitudes, the altitudes (although different for each latitude) will remain constant for the life of the satellite. In other words, the satellite crossing of a particular latitude will always be related to the same altitude.

This convenient arrangement will allow us to calculate and devise permanent azimuth/elevation overlays (to be centered on the user's QTH) identical in application (although somewhat different in shape) to overlays presently used with the "Satellabe".

A Satellite-type calculator suitable for Phase III is presently being developed by yours truly. As soon as the exact orbital parameter of Phase III become known and verified, final correcting calculations will be made and an article describing the construction of the tracking device will be published.

At any rate, readers should not be disturbed by the apparent complexity of tracking a satellite in an elliptical orbit. The "63" slot" simplifies the matter to a point that tracking Phase III will be as simple as tracking OSCAR 6 and 7.

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100.00 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS:

| LM-591 | Robert W. Barbee, Jr., WA4AMI |
| LM-592 | Robert B. Grebba, G8GHI |
| LM-593 | Earl W. Tonjes, W4NG |
| LM-594 | Gunther Meier, WB8NCL |
| LM-595 | Benigno I. Santos N., KCIBI |
| LM-596 | David U. Maier, KB8OZ |
| LM-597 | Ramon P. Traver, WALIM |
| LM-598 | George E. Taylor, WA4GUM |
| LM-599 | Harry A. Roylance, W7RTY |
| LM-600 | Irving C. Klepper, W3KSD |
| LM-601 | David F. Riley, WIAAI |
| LM-602 | Wolfgang Paenler, DL8VX |
| LM-603 | Ernesto J. Dreher, PY3AB |
| LM-604 | Jonathan W. Bloom, WA1JSV |
| LM-605 | Jack Tielrooy, W6MTC |
| LM-606 | Mamoru Yoshisawa, PY2DOF |
| LM-607 | R. C. Arnold, VE3BBA |
| LM-608 | Michel L. Ailes, FL0K |
| LM-609 | D. Robert R. Kemper, W5G1T |
| LM-610 | David E. Walker, K5SDE |

LMS-23 Montreal Amateur Radio Club, Inc., Montreal, Quebec, Canada (VEJARC)
LMS-24 The Heath Company, Benton Harbor, Michigan
PHASE III
---

**AMSAT-UK NEWSLETTER (G3OR)**

PHASE III is now destined to fly on the Ariane 2 launch from Kourou in December 1978, into an elliptical orbit with a 932 mile perigee and a northerly 24,249 mile apogee. The period will be some 11 hours, with an aspect of 4 to 5 hours minimum. The configuration will take the form of a tetrahedron, to give the maximum surface area for solar cells to provide the 40 watts of power required. Arm length will be some 1.5 meters, with the modules carried in the corners of the arms. It will have an active attitude control system, with earth sensors, sun-sensors, a pulsed auto-magnet, and a spin-rate of between 5 and 6 rpm (producing 6 G's) at the end of the spin. A computer board, with micro computer commanded by ground based computers will dictate the attitude for the spacecraft. It will have a computer control command and a computer control command data, and will not be decipherable by the average radio amateur without access to sophisticated equipment. A 2304 MHz beacon will also be flown, in the hope that permission will be forthcoming to power up this much desired beacon. There exists a possibility that this could be used as a single channel transceive system, as few users are that advanced. The command link will also employ two means at the present time. The spacecraft will be supplemented by a computer scan emphasis system that will function even when the signal is 20 dB below the noise, so that the beacon will be manifest by a simple banded by a simple banded tone. Clark noted that the work was still being done in our "less-than-basement" mode and wondered if this was holding up progress. Daniels, who is doing some of the work, felt this to be unquestionably so.

**BOARD OF DIRECTORS MEETING, 17 MARCH 1977**

The 17 March 1977 meeting of the Radio Amateur Satellite Corporation board of directors was held in the Building 2 Conference Room, Goddard Space Flight Center. The meeting was called to order at 20:04. The following persons attended the meeting:

- Perry Klein, W3PK
- Thomas A. Clark, W3JND
- Jan King, W3EY
- Charles Dorian, W3PT
- William A. Tynan, W3XO

There was a discussion of plans for the AMSAT Annual Meeting. A date of either 8 or 22 October 1977 was chosen. Klein will investigate the possibility of holding the meeting at the Smithsonian Institution Air and Space Museum. Clark will check if the meeting can be held at Goddard as in the past. It was agreed that a technical session should be held in conjunction with the meeting.

There was a discussion of AMSAT obtaining BankAmericard and Master Charge facilities, "so make it easier for people to send in donations, memberships, etc.

On the motion of Clark, seconded by Tynan, the following resolution was unanimously passed:

> "The President shall establish BankAmericard and Master Charge accounts at the Virginia National Bank, or other bank if agreement cannot be achieved with the Virginia National Bank."

There was a discussion of a request from the organizers of Personal Computing that AMSAT participate and send a number of representatives. They intend to donate a per-attendee sum to AMSAT above a minimum attendance figure. The meeting will be held August 28-29, 1977, in Atlantic City. It was agreed that AMSAT should agree to commit to be represented, but that it is presently too early to name the representatives.

Ed Kain gave a report on the progress on A-0-D. He and Clarke Greene, W4JLD, are planning to have the ARRL to work at AMSAT for the ARRL an A-0D. The plan is for the ARRL to work on the completion of A-0-D, the Oscar 6 replacement satellite. There is substantial progress on the electronics tasks, but there is still a lot of work remaining on the mechanical tasks. Kain mentioned that they are planning to "fly" at least one thousand feet of 1/4 inch diameter wire in a "less-than-basement" mode and wondered if this was holding up progress. Daniels, who is doing some of the work, felt this to be unquestionably so.

King gave a report on the progress on Phase III. We now have two potential missions for Phase III, Ariane - which is approved - and the SSS-S on the Shuttle - which has not been approved. King mentioned that Phase III is now scheduled for December 1979. It is proposed that at least two spacecraft be built.

Phase III progress items are:

1. Clark has written an antenna model program useful for the spacecraft antenna design.
2. A European manufacturer has agreed to partially donate one set of solar arrays, however, the proposed costs would not fully meet our requirements and the AMSAT contribution toward the cost would be in the $8,000 to $10,000 range. Further progress of our plans to buy at least two spacecraft, other sources are to be investigated.
3. The 70 cm to 2 m transponder exists in a breadboard form.
4. King has formed a Ground Support Committee to plan the ground station portion of Phase III. He has appointed VE3SAT, WM45S, W5LER, and W5XO.
5. Davidoff and others are working on orbit prediction techniques for Phase III.

(Continued on Page 15)
ANNOUNCEMENT OF AMSAT ANNUAL MEETING

The ninth AMSAT Annual Meeting will be held at 8:00 P.M. on Saturday, October 23, 1977, 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: Charles Dorian, W3PFX; Jan King, N5GEY; Perry Klein, W3PK; and William Tyden, W3XOK/ W3KRM.

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

AMSAT Annual Report
AMSAT-OSCAR D Project
AMSAT Phase III Progress Report
AMSAT-OSCAR 6 and 7 Operations
Results of election of Directors

As we did last year, there will be an AMSAT Technical Symposium on OSCAR satellites, beginning at 3:00 P.M.

For those coming from out of town, let us know, and we will 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 (on the left). Turn left onto Soil Conservation Road and go 0.1 mile to the first open gate you come to on the right. Go through this gate, continue onto the gravel road and then on to 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.

PERSONAL COMPUTING 77

Personal Computing 77 will be two full days of seminars, major exhibits and demonstrations in home and personal computers to be held 27 and 28 August in Atlantic City, NJ. Last year over 4,000 computer hobbyists and radio amateurs enjoyed Personal Computing 76. This year, Personal Computing 77 hopes to be able to sponsor a part of the microprocessor module to be included in the Phase III satellite that the Radio Amateur Satellite Corporation (AMSAT) is building for launch in 1979. By attending Personal Computing 77, you will help this organization extend its support to AMSAT and you will see many radio and computer exhibits. For a free TRIP-KIT, write PC 77, Route 1, Box 242, Mays Landing, New Jersey 08330.

AMSAT will be one of the radio organizations with a booth at PC 77 for the two day exposition. If you as an AMSAT member could spend an hour at our booth explaining amateur radio to computer hobbyists, it would be very helpful. If you desire to help at the booth or give a seminar, please drop a QSL to W3HUC, 7925 Nottingham Way, Ellicott City, MD 21043.

80 ISLAND

"LETTERS AND COMMENTS"

Dear Sir,

My membership in AMSAT expired in December, 1976. In reading the AMSAT Newsletter, which was current at that time, I saw that the cost of that newsletter represented over half the membership dues. With all due respect to those who produce it, I really get little from the Newsletter.

I am therefore, sending along my check for $5.00 as a donation to the work of the group. I do not expect to receive membership for it and perhaps you can save some of the Newsletter cost by not having to send one to me.

You and the Board might take a hard look at the content and usefulness of that publication to the membership at large and determine how much of the information it disseminates is also available to your members from other publications. There might just be a large savings in printing and postage by reducing or eliminating the Newsletter.

Good luck to the entire group in your coming endeavors.

73,

Thomas M. Gooding

(A NewsLetter contains submitted material. It can only publish that which is available. Does anybody else agree with Thomas? Does anybody disagree? Please let me know. ...Joe)

Dear Joe,

AMSAT lost a good friend and helper with the recent passing of Mr. William A. Kotras, K9HUC, of Kokomo. Bill had helped with several design projects for the CODESTORE ground equipment used by Randy, VE3SSAT. Bill had also co-authored one of the AMSAT package of articles in July, 1975, 73 Magazine entitled "OSCAR RTTY Converter"

Bill will be long remembered as a fine engineer and a real gentleman.

73,

K. O. Lerner II

AMSAT Area Coordinator -- Indiana

Dear Perry,

I am enclosing a check for $20.00 to sponsor two solar cells for our upcoming new satellite. I am particularly proud to be a member of such a fine organization, and am pleased to be able to assist in the technological advancement of this facet of amateur radio. Under your guidance as President, it has continued to maintain the aura of a truly professional organization. Consequently, I impatiently await launching of the next vehicle by which to establish two-way communication.

73,

Canada 10

Stan Brigham

PAR AVION AEROPHOT

Gentlemen:

Enclosed is my personal check for $100.00 to pay for 16 solar cells for the new satellites. Hope they are good ones and do a good job of keeping the batteries up. A case of paying cash for something that charges!

Hope that everything goes well with assembly and testing of the next satellite. Will have to get a 435 Hz converter to take advantage of both modes. Good luck and 73.

Sincerely,

Richard J. Cotton

M8DX

Dear Sir,

This is my first letter enclosed with the Summary Sheet for TWO-WAY Satellite Contacts.

One month ago, one minute before my first QSO via OSCAR 7, I was not sure that I could do it. I simply couldn't believe that my equipment, a YAESU FT-221R, running about 7 watts output on 2 meters (considering cable losses) and only a hand plane QSO-2 by HY-GAIN was good enough for this powerful achievement. With me was FYICX, Flavio, who is responsible for my start in working OSCAR. He

(Continued on Page 14)
Code. All sponsors will receive a certificate suitable for framing acknowledging their contribution. A plaque honoring for postery contributors of $1,000 or more will be carried on the spacecraft in orbit around the Earth; contributors will receive a replica of the plaque as a momento.

If you are willing to contribute time or money and would like to get involved in bringing a new era to amateur radio, join AMSAT's active team. For further information contact all aspects of AMSAT and the costs of 100 kHz or satellite communications program, write to Joe Kasser GJ3CZ/W3, at AMSAT, Box 27, Washington, DC, 20044.

(Continued from Page 1)

There was a discussion of the fund-raising program, conducted by Clark. Clark gave estimates of the costs and returns from various aspects of the fund-raising program. George Perrine, W9K0J, is generating advertising material for the solar-cell sponsorship program. Larry Fapke, WB5MOK, is preparing certificates for this promotion.

On the motion of Tymen, the Board authorized an expenditure of no more than $3,000 for costs in running the solar cell donation project.

Tom Clark was appointed to head the entire fund-raising activity.

Clark reported on a tape letter received from Pat Gowen.

There was considerable discussion on obtaining more suitable quarters for the hardware work now going on in Klein's apartment and Daniels' basement. Klein put forth a plan whereby AMSAT could rent an apartment adjacent to his. Others worried about industrial use of the apartment and the problems of getting the large spacecraft out the window and to the ground. There was a discussion of rental of warehouse-type facilities in an industrial park. This will look into this.

The meeting adjourned at 0620, 18 March 1977.

Respectfully submitted,

Robert J. Carpenter, WJ2C
Secretary

(Continued from Page 10)

sharpness of your beam will not have the disadvantage it has now in tracking, as the rate of movement will be very slow other than at the horizons. Your existing mode, 'A' and 'B', would have brought a large quadriof for gain plus the famous 6424C sensitivity will ensure this.

DX-Potential will be enormous, as this will be the first time that radio amateurs will be able to go all W, JA, EU, and the North Pacific, indeed all the Northern Hemisphere and down to 45' South at the same time, but, note that this will all be in 150 kHz! Imagine 14 MHz without any skip differential or selection... unless we all carefully practice our bandplan and power limitations, it could be made transparent. It is up to the users themselves to establish operational ethics right now so that the incredible possibilities of Phase III can be fulfilled.

Your ideas are requested. Write to GJ3CZ, c/o AMSAT.

The article "Cost-Performance Criteria for Evaluating Phase III Satellites" in the February issue assumes a transponder bandwidth of 400 kHz, which the first Phase III satellite will probably have a bandwidth of 150 kHz, the conclusions are even more favorable than those quoted: (1) the figure specifying the maximum number of users for 400 kHz, which the first Phase III satellite can accommodate should be increased to 30,000; (2) the figures specifying the yearly cost per user should be scaled downwards.

(Continued from Page 11)
IMPORTANT! MEMBERSHIP RENEWAL FORM AND BALLOT ENCLOSED - SEE PAGE 31.
AMSAT-Oscar 6

After four and a half years of valiant service, the AMSAT-Oscar 6 spacecraft appears to have reached the end of its useful life. It is worth noting that the spacecraft carries a plaque dedicated to the memory of Henry Helfrich (the original W3XM) who was one of the original directors of AMSAT.

**Articles**

You too can be published in this magazine. If you have developed something useful why not share it with the rest of us. The Newsletter rarely turns down an offering. Manuscripts do not have to be typed; clear handwriting (double spaced) will do. One article lay in the pile (at times it was the pile) for a year or so, because not only was it hand written but it was very closely spaced and without paragraphs. Each time I picked it up, I looked at page one and put it down again. Finally a publication deadline came when material was lacking, and I had to force myself to read that article. Would you believe it was pretty good? It would have been published much earlier had it been readable. One good reason for publishing in the Newsletter is that you can publish a first draft in these pages, get comments from members, polish it up and submit an expanded, polished version of the article to one of the national magazines, who pay for material.

The Newsletter contains material submitted by the members of AMSAT. I try to put everything on hand into each issue, thus the fluctuating size of the Newsletter. Do your bit to make each issue of the Newsletter a giant economy package.

**Computers**

Amateur radio is becoming computerized. The price of home computers is dropping and amateur radio is a natural application. Morse code, RTTY and logging are ideal applications for computerizing. A down to earth application of the computer is to track a satellite in the sky. Antenna pointing and orbital predictions are tasks easily performed by the computer. This issue of the Newsletter carries an introductory article describing cost effective home computer hardware and software designed for AMSAT applications as well as general purpose home computing. Now the AMSAT Newsletter is not a computer club magazine, so the depth of coverage of the design must depend on the member response. The format of Part II of the article will depend on your response. If you are interested in the AMSAT-80 Computer, send in a QSL card saying so. An arbitrary minimum of 100 cards has been set as an indicator of sufficient interest in the project.

**Vote**

This issue contains the ballot form for the elections to the Board of Directors. A completed election is an indication of an active organization, and all AMSAT's elections have been contested. Your vote counts. Be sure to mail one in if you do not plan to attend the general meeting.

**Membership Renewals**

This issue contains your membership renewal notice. If you are not a life member, don't forget to mail in your dues as soon as possible.

**Save Some Money**

Why not save some money and send your ballot, your membership renewal, solar cell sponsorships and comments on the AMSAT-80 in the same package. If you feel energetic, add a letter to the editor or an article to the bundle. Looking forward to hearing from you.

Joe GJ2EZC
AMSAT-OSCAR 6 BATTERY DECAY

The graph shown below clearly illustrates the failure of the AMSAT-OSCAD 6 spacecraft battery. This graph compiled at the University of Surrey (site of the British Command Station) shows how the battery voltage (over Europe) improved when the Command Station was commissioned.

As each cell failed, a distinct step can be seen in the curve until finally the failure came so fast that a near vertical curve resulted.

The graph was generated by a computer at the University.

---

FAREWELL OLD FRIEND

BY JOHN FOX, W0EER

The batteries on the AMSAT-OSCAR 6 have been slowly degrading since January 1, 1977. On June 15, 1977, AMSAT-OSCAR 6 failed to respond to ground commands and remained in an "On Mode" until orbit 21495 when the beacon ceased transmitting shortly after acquisition in Minneapolis, Minnesota.

AMSAT-OSCAR 6 was launched aboard a Thor-Delta rocket from Vandenberg Air Force Base in California, U.S.A. on October 15, 1972. AMSAT-OSCAR 6 was an international venture by Amateurs in Australia, Canada, Germany and the United States.

The list of accomplishments by the AMSAT-OSCAR 6 spacecraft are many. The following is a partial list of some of the more publicized accomplishments:

- First Amateur Communications Satellite capable of responding to telemetered commands.
- First Amateur Satellite with dual frequency beacons of 29.45 MHz and 435 MHz.
- First long life Amateur Satellite with regular two-way communication capability.
- The use of Codestore for the automatic retransmission of a telemetered message.
- Used by many U.S. educational institutions for classroom instruction.
- Used in the development of a downed-aircraft emergency location system (ELIC) in a joint venture between the Canadian and United States Governments.
- Discovery of the Inverted Doppler propagation mode using the 435 MHz beacon.
- Used in numerous tests involving transmission of medical data between medical institutions and field mobile to medical institutions.
- Numerous propagation experiments.
- Allowed regular communication between all continents involving over 100 countries.
- First Inter-Satellite communication involving AMSAT-OSCAR 6 and AMSAT-OSCAR 7.
- First transmission of meteorological data using 110 baud ASCII from a remote platform.

The design lifetime of AMSAT-OSCAR 6 was one year, with the actual lifetime being 56 months. The long life of AMSAT-OSCAR 6 is directly related to the excellent and efficient operation of the command stations. Without the dedication of the members of the International Command Network, AMSAT-OSCAR 6 would have failed after only a few months of operation.

To all of you involved in the commanding and operation of AMSAT-OSCAR-6 a sincere Thank You from the Amateurs of the World.

With the end of the usefulness of AMSAT-OSCAR 6 another proud entry goes into the annals of Amateur Radio history. It will be missed by all the satellite users but time marches on and the future looks bright for the Amateur Satellite program. We still have an excellent functional satellite in orbit, AMSAT-OSCAR 7; the planned launch of a Russian Amateur Satellite in the near future; the launch of A0D in early 1978 and the launch of the first Phase III satellite in late 1979.

Congratulations to AMSAT, the International Command Network and the users of AMSAT-OSCAR 6 on a very successful program. And last but not least Thank You to AMSAT-OSCAR 6 for thousands of hours of enjoyment. "Farewell Old Friend".
ANNOUNCEMENT OF AMSAT ANNUAL MEETING

The ninth AMSAT Annual Meeting will be held at 8:00 P.M. on Saturday, October 8, 1977, at the NASA Goddard Space Flight Center Employee Recreation Center in Greenbelt, Maryland.

In accordance with the AMSAT Bylaws, ballots for the election of four Directors and two alternate Directors will be counted at this meeting. The term of the following Directors will be expiring as of this meeting: Charles Dorian, W3JFT; Jan Ring, W3KCV; Perry Klein, W3PR; and William Tynan, W4KX/W4KMX.

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

- AMSAT Annual Report
- AMSAT-OSCAR-D Project
- AMSAT Phase III Progress Report
- AMSAT-OSCAR 6 and 7 Operations
- Results of election of Directors

As we did last year, there will be an AMSAT Technical Symposium on OSCAR satellites, beginning at 3:00 P.M., organized by Marty Davidoff, K2JBC/1.

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

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

AREA CO-ORDINATOR UPDATE

Please note the following additions/changes to the published listing of Area Co-ordinators.

OVERSEAS
Czechoslovakia  Andrej Oravec, OK3CDI, ul. Slobody 31, 040 11 Kolice II.
India  Wg-Cmdr. V. Subramanian, VU2NIV, L.R.D.E. High Grounds, Bangalore-1, PIN 560001.
Zambia  Kanhbhai Patel, 9J2KT, P.O. Box 233, Lusaka.
U.S.A.  Illinois (South)  Larry H. Roberts, W9MXC, 3300 Fernwood, Alton, IL 62002.

A PROPOSED SATELLITE BAND PLAN

BY JOE KASSER, G3ZCZ

A new band plan has been proposed for application to all satellites and all transponders, and is published here for user comments. If adopted, this plan would follow the observed use of the satellites over Europe and is based on the downlink passband as follows:

PASSBAND

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NOTES:
1. Guard Band to avoid interference to beacons, to be used only by Emergency and Bulletin Stations.
2. RTTY and SSTV/PAX are put at edge of CW or SSB bands conforming to their mixed mode usage at HF.
3. Mixed mode area, recommended for use by crystal controlled stations and dx-peditions wishing to work both CW and SSB stations.

Splitting the passbands into CW and SSB are traditional. The edges of the sub-bands merge into the mixed mode area and are flexible so that occupancy can expand from the band edge past the RTTY/SSTV/PAX area depending on the number of communicators using the satellite at any time.

This band plan is based on percentages of the passband. It is based on the downlink passband and applies to both inverting and non-inverting passband transponders. Thus on AMSAT-OSCAR 7 the frequency sub-bands are as follows:

<table>
<thead>
<tr>
<th>LF</th>
<th>GU</th>
<th>R</th>
<th>T</th>
<th>S</th>
<th>F</th>
<th>ST</th>
<th>R</th>
<th>T</th>
<th>MIXED</th>
<th>ST</th>
<th>SSB</th>
<th>U</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>W</td>
<td>E</td>
<td>B</td>
<td></td>
<td></td>
<td>X</td>
<td>D</td>
<td></td>
<td></td>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>S</td>
<td>E</td>
<td>F</td>
<td></td>
<td></td>
<td>X</td>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mode A 29.4 29.435 29.465 29.5 MHz

Mode B 145.925 145.94 145.96 145.975 MHz

NOTE:
Mode A Guard Channels, 5 kHz
Mode B Guard Channels, 2.5 kHz

It is expected that on Mode B, the SSB subband would spill over into the mixed mode more than on Mode A simply because of the large number of communicators in the 'small' passband.

Please send your comments on this proposed band plan to AMSAT, C/O Joe Kasser, G3ZCZ.
This article presents three basic types of antennas and the derivation of each. Since the launch of the AMSAT-OSCAR 6 spacecraft the author has, at one time or another, been responsible for the antenna design of many communications, from a coat hanger ground plane to a log periodic helix. During this five year period of experimentation the various antennas configured have been used on such world records as, first aeronautical mobile amateur satellite communication including an airborne satellite command station over the Pacific Ocean. This was accomplished using a bent mast antenna and plane. The first maritime mobile, transcontinental amateur satellite contact was conducted using a "J" antenna for uplink and a dipole for downlink. The first autostacking "H" antenna (see diagram) was completed on one side of the vehicle for uplink and a Webster Band Spanner mobile antenna on the other side. The acclaimed longest distance contact via amateur satellite, 9,264 km. Kwajalein, Marshall Islands was completed using a ground plane and longwire on the South Pacific end of the contact. In the setting of all these activities a new antenna was used, (below ten watts), so "brute force" is not the name of the game.

A ground plane antenna (GP) can be built onto a female coaxial fitting, a BNC, N, and SO-239 being most common. This allows a coaxial feed, a great convenience. If you choose a stinger for low VSWR and good impedance matching, drop the radial to about 42° out of the horizontal. This increases the impedance from the normal GP, 36 ohms to approximately 50 ohms. This type of antenna can be used for both uplink and downlink. It is a fixed frequency device and an SWR approaching 2:1 will be noticed at operation 10% of the frequency for which it was constructed. GP's are noted for their low angle of radiation and it is where you must put your power, toward the horizons. The "cone of silence" mentioned in various texts occurring directly above a GP may not be noticed due to the very high sensitivity exhibited by the OSCAR series spacecraft. The GP can be mounted almost anywhere without difficulty, preferably above existing structures: an outrigger from the existing ham tower; a pole stuck in the back yard; a fence post; the eaves of the house to mention a few.

From two meters, up in frequency or down in wavelength, the GP's are not very visible, especially if painted sky-blue. I make this point in case the intended operation is to be in a neighborhood of grousers or if an apartment type of operation.

Building the GP involves a minimum of material. Brazing rod is the author's main copper wire project. Copper wire will work, however flimsy. For a ten meter GP, a modified CB antenna will work great plus they are already of proven design and inexpensive. Used ones are readily available for little or nothing. For higher frequencies, as previously mentioned, a coax fitting can be used for the hub. Then radials, at least four, can be soldered to the fitting and connected to the center conductor. Two more can be attached to a circular sheet of aluminum or formed into a cone in order to achieve the degree of matching desired.

A derivation of the GP is the 5/8 wave-length radiator. Several advantages are available in this configuration. The first being an approximate 1.8 dB gain over the conventional GP almost the same gain as a vertical dipole. Secondly, a slightly lower angle of radiation which is the reason for the increased gain; thirdly, and possibly the most attractive feature, is the radiating element may be attached directly to the radial system, plane or mounting device. Part of the radiating element is wound into a three turn coil. The reason for the increase in gain is the presence of these coils plus the fact that the effect of the more vertical elements are reduced. A long, thin, solid, rigid, and flexible stainless steel can be used and would weather the test. To keep weather out of the coax, tin the braid before affixing it to the counterpoise and secure the 6" length of the coaxial to the radio mast. This 5/8 wavelength antenna may also be built on a female bulkhead coax fitting if desired.

The dipole antenna is a center fed half wavelength radiator. Its characteristic impedance is 72 ohms. It is generally utilized in a horizontal configuration, some applications may necessitate its vertical usage. Horizontally it is a bidirectional radiator; vertically it's omni-directional with a low radiation angle. The dipole when used in the HF region and constructed of wire requires two structural supports or support, vertically it may be supported by a number of means. Wood, preferably wooden or other nonmetallic material in order to reduce pattern distortion is the normally applied method, but 7/8" monofilament line is available from Belden Cable Company. In the application of a folded dipole, 300 ohm TV twinlead is readily available and inexpensive. A dipole may be constructed of wire, tubing, brazing rod, flat stock, whatever may be available. In the category of VHF/UHF dipoles, construction may be on, again, coaxia fitting. Baluns may be added, but for the sake of simplicity are not required.

Mounting a dipole .2-.25 wavelength above a sheet of aluminum that, on a side, is 5% greater than the length of the dipole, yields a system of 3 dB more gain than a dipole by itself, and becomes unidirectional. This configuration makes it a handy, portable antenna for 2 meters or 70 cm. It does not have the aperture (cross section) required for very weak signal reception but for OSCAR work it performs quite well.

A derivation of the dipole antenna is the "Turnstile". This comprises two dipoles perpendicular to each other and fed through a 1/4 wave coaxial balun. The result is a cleverleaf pattern effectively doubling the aperture and enhancing the directional properties. The "Turnstile" may be also mounted above reflector as previously mentioned with the dipole. The dipole configurations exhibit a slightly greater tolerance to frequency excursions than the GP. The order of ±12-15% should not raise the VSWR over 2:1 especially at 145 MHz and above. Unless the VSWR is extremely high, it won't be all that noticeable because of the feed line loss. The best policy is to cut the dipole for the frequency to be most used and don't worry about occasional frequency and accompanying VSWR excursions.

At this point I'd like to introduce a frequency independent antenna, the Disccone. The main advantage of this type of antenna for satellite communications is its ability to absorb reflection and by and by reflecting back another. An 81 frequency range with the VSWR remaining below 1.5:1 can certainly be appreciated by those of us that don't have a great deal of room for various multiple arrays. The Disccone is made up of a coaxial cable with an insulated end and a center pole. It is omni-directional and vertically polarized. The feed-point arrangement is that of an octo-craft used by the marine school. Construction of this antenna requires nothing fancy. Brazing rod and amateur cloth (copper screen) plus a suitable insulating material, preferably Teflon, is all that meets frequency range requirements. The bottom end of the design is the bottom end of the design. In most cases this antenna will be built for 2 meters as the bottom end. A rule of thumb is to drop the design frequency 20% be extended to use lower frequencies. You intend to use higher frequencies allows the coverage of three or two bands, two of them common to the present OSCAR series. The space required for this antenna is less than two cubic feet. This still isn't large to be used on an apartment dweller's balcony.

Construction details are not the subject of this article; however, dimensions are available in Bill Orr's Radio Handbook and Henry Jasik's Antenna Engineering Handbook.

Last but not least, let's look at the Yagi antenna for satellite operation. The Yagi is narrow-banded but a derivation of the Yagi, the "Log Periodic", which I will discuss, is frequency independent. Frequency independent dipole, may also be made on the Disccone, the Yagi is unidirectional having a front to back ratio of 15-25 dB depending on the number of elements and their spacing. As a basic Yagi antenna let's consider a three element Yagi on 3 meters. The elements are approximately 80 feet long. The longest element (reflector) is approximately 40 inches. A gain of 4.5 dB is obtainable over a dipole. It would require a little over 2 feet for turning radius. A light weight TV rotor would be adequate. For best results a fixed tilt angle of 30° is suggested unless elevation control is contemplated. The boom can be wood or fiberglass with the same turning radius. The only real limitation is the location. A variety of matching systems may be used. This is left to the constructor's preference. I'd use a matching system that allows the use of coax for the sake of simplicity.

As we progress higher in frequency, the Yagi becomes smaller allowing us to add more elements and still conserve space. A word of caution--the more elements, the longer the boom, the sharper the beamwidth, lots of time spent in repositioning (manual tracking), i.e., reduced operating time in the embryo stages of your satellite communicating, the emphasis should be on operating, not pin-point tracking.

(Continued on page 21)
R-S OSCAR

AMSAT has received Circular No. 1273 dated July 12, 1977, from the International Telecommunication Union's International Frequency Registration Board giving advance information on a planned amateur satellite network by the U.S.S.R.

A summary of the information is presented below:

General Information: "The U.S.S.R. Administration wishes to inform members of the ITU that the U.S.S.R. is working on the establishment of an amateur-satellite service system. This system "RS" will be based on 3-4 satellites in a circular near-polar orbit. The amateur satellites are designed for multiple access with retransmission and frequency translation without demodulation on a real time scale."

Date of Activation: 1977-1978

Number of Satellites: 3-4

Orbital Information:
- Inclination, 82°
- Altitude, 950 km (circular orbit)
- Period, 102 minutes

Uplink Characteristics:
- 145.8-145.9 MHz (100 kHz bandwidth)
- Quarter-wave receiving antenna, circularly polarized
- User uplink power, 10-15 watts to 10-12 dB antenna
- Transponder receiver noise temperature, 3000° K

Downlink Characteristics:
- 29.3-29.4 MHz (100 kHz bandwidth)
- Half-wave transmitting antenna, circularly polarized
- Transponder power, 1.5 watts peak to 0 dB gain ant.

Maximum Ground Communications Range: 6,000 km (3,720 st. mi.)

From this advance publication orbital information, it seems likely that the "RS-OSCARs" will be launched piggyback with the Meteor meteorological satellites from the Plesetsk launch site.

AMSAT welcomes this new series of Soviet amateur radio satellites in the spirit of international friendship and cooperation.

POTENTIAL LAUNCH DATES

BY WILL WEBSTER, W2TMC

The notice submitted by the USSR to the International Frequency Registration Board of the ITU does not nail down the launch date for the first RS OSCAR any closer than "1977-1978". It is, in fact, not normal practice in these notices to be any more specific than that. We can, however, make some educated guesses as to when the Soviets are likely to launch.

From the orbital characteristics, the RS OSCARS will probably be launched piggyback with the USSR meteorological satellites called Meteor. The standard launch vehicle used for the Meteor series has plenty of reserve capability. Weight of the RS OSCAR should not be a problem in getting a launch.

At present, the USSR is launching about 8 to 10 payloads into orbit a month. Of these, about half are going into the Meteor type orbit. Not all of these are meteorological payloads of course. Most are Cosmos scientific satellites and other payloads. Thus, the availability of a ride won't be much of a problem.

It is not the policy of the government of the USSR to give out the exact launch date unless an international agreement requires it. The ITU convention does not require notification before the fact.

However, there are two important anniversaries coming up, October 4, 1977, is the 20th anniversary of the launching of Sputnik 1, the first artificial earth satellite. Also, depending on which calendar one uses, the 60th anniversary of the Russian Revolution takes place on October 15 or 17, 1977. The best guess is that the Russians will try to launch on one of these dates.

We are not likely to get any warning, so be prepared. If you should hear a beacon, carefully determine its frequency and try to measure the doppler shift. If all you get is your transponded signal, carefully look for doppler shift. Check again much later to be sure you aren't being led astray by an image in your receiver.

TRACKING THE RS-OSCAR SATELLITES

An aid to tracking the RS-OSCAR satellites is Will Webster, W2TMC, generated the following ground track tables. The table on the back page of the W2AJ orbit book should be modified by the RS-OSCAR data listed below. The OSCAR 7 data is given as a reference check for your computations.

<table>
<thead>
<tr>
<th>STATION LATITUDE (degrees)</th>
<th>OSCAR 7 LONGITUDE CORRECTION (degrees)</th>
<th>OSCAR 7 TIME CORRECTION (min/sec)</th>
<th>RS-OSCAR LONGITUDE CORRECTION (degrees)</th>
<th>RS-OSCAR TIME CORRECTION (min/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70° N</td>
<td>-40.4</td>
<td>+23:126</td>
<td>-14.5</td>
<td>20:8</td>
</tr>
<tr>
<td>60° N</td>
<td>-29.5</td>
<td>+19:46</td>
<td>-7.9</td>
<td>17:8</td>
</tr>
<tr>
<td>50° N</td>
<td>-18.3</td>
<td>+16:121</td>
<td>-4.5</td>
<td>14:8</td>
</tr>
<tr>
<td>40° N</td>
<td>-33.2</td>
<td>+13:101</td>
<td>-3.0</td>
<td>11:8</td>
</tr>
<tr>
<td>30° N</td>
<td>-9.3</td>
<td>+ 9:44</td>
<td>-1.9</td>
<td>8:18</td>
</tr>
<tr>
<td>20° N</td>
<td>- 5.9</td>
<td>+ 6:28</td>
<td>-1.1</td>
<td>5:9</td>
</tr>
<tr>
<td>10° N</td>
<td>- 2.9</td>
<td>+ 3:14</td>
<td>-0.5</td>
<td>2:19</td>
</tr>
<tr>
<td>0°</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10° S</td>
<td>+ 2.9</td>
<td>- 3:14</td>
<td>+ 0.5</td>
<td>- 2:19</td>
</tr>
<tr>
<td>20° S</td>
<td>+ 5.9</td>
<td>- 6:28</td>
<td>+ 1.1</td>
<td>- 5:9</td>
</tr>
<tr>
<td>30° S</td>
<td>+ 9.3</td>
<td>- 9:44</td>
<td>+ 1.9</td>
<td>- 8:18</td>
</tr>
<tr>
<td>40° S</td>
<td>+13.2</td>
<td>-13:01</td>
<td>+ 3.0</td>
<td>-11:8</td>
</tr>
<tr>
<td>50° S</td>
<td>+18.3</td>
<td>-16:22</td>
<td>+ 4.5</td>
<td>-14:8</td>
</tr>
<tr>
<td>60° S</td>
<td>+25.9</td>
<td>-19:46</td>
<td>+ 7.9</td>
<td>-17:8</td>
</tr>
<tr>
<td>70° S</td>
<td>+40.4</td>
<td>-23:26</td>
<td>+14.5</td>
<td>-20.8</td>
</tr>
</tbody>
</table>

Convention: Add (algebraically) longitude correction to WEST longitude of Equator crossing.

These stickers are printed in black on a fluorescent red background. They are pressure sensitive and will stick to anything including QSL cards and envelopes.

They come in sheets of 48 and may be obtained from David Middleton, W7SC, Box 303, Springdale, Utah 84767, for only $1.25 postpaid.
A SILVER JUBILEE MESSAGE
BY RICHARD LIMEBEAR, G3RWL

During Sunday the 5th of June, AMSAT-Oscar 7 continuously transmitted a Jubilee message in Morse code over the Codestore message storage system. The text of the message read, "AMSAT sends greetings to the United Kingdom on the occasion of The Queen’s Jubilee." This message, intended as a tribute from the amateur radio fraternity, was repeated more than 1,000 times as the satellite passed over every single country in the world, and was received by thousands of the world’s radio amateurs.

THE FOLLOWING LETTER WAS RECEIVED BY AMSAT-UK:

BUCKINGHAM PALACE

29th July, 1977

Dear Mr. Limebear,

Thank you for your letter of 14th July which has been shown to The Queen.

Her Majesty learned with interest of the Jubilee message transmitted by the amateur radio satellite, Oscar-7, and greatly appreciated the greetings to the United Kingdom sent by AMSAT to mark Her Silver Jubilee.

Yours sincerely,

Richard T.L. Limebear
Communications Officer, AMSAT-UK

THE AMSAT-80

© BY JOE KASSER, G3ZCZ

PART 1

INTRODUCTION

Microcomputers are getting cheaper and are useful for satellite applications in the ham shack. Their usefulness in producing satellite orbit predictions, antenna pointing data and telemetry processing is well known. Thus, the AMSAT-80 Project for an 8000 or 800 based S-100 bus Microcomputer for tracking OSCAR 7, Phase II, amateur radio and other general uses. The AMSAT-80 is designed to be low cost, multipurpose and capable of using any S-100 based hardware. AMSAT has also arranged a group purchase of hardware to keep the cost down. Software as well as hardware will be available, again designed for modularity and inter-compatibility.

The hardware features of the design include the following:

a. a bootstrapping feature, allowing RAM in low memory and ROM in upper memory without the requirement for a complex front panel.

b. the generation of the MMMM signal, not performed on most commercial printed circuit CPU cards.

The software features include a full debug program, applications packages and high level languages, all inter-compatible. Input/Output handlers for many categories of devices such as baudot/ASCII teletypes, audio cassettes, floppy discs, video display boards and paper tape devices. The software will be available for basically a reproduction cost. It is planned to publish full details in a computerist magazine and make object or source tapes available. In this way, AMSAT gets the exposure; the documentation is complete, and the cost of distribution is lowered. Periodic announcements will be made in the pages of the Newsletter to the status of the project. At the time of writing this article each item of software announced is at least 75% completed (excluding documentation). No software will be released until it is 100% tested and documented, so don’t write in and ask for it; wait for the announcement.

The AMSAT Newsletter is not a computer magazine, even though the next generation of spacecraft will incorporate them both in orbit and on the ground for telemetry, tracking and command purposes. Thus, if you, the reader, wish to see the AMSAT-80 project described herein in more detail, send in a QSL (with or without your order for hardware). An arbitrary minimum of 100 cards has been set as a level of interest indicator sufficient to allow the publication of details. Otherwise, only broad outlines will be published. On the other hand, if you do not wish to see the AMSAT Newsletter full of computer articles, write in and say so.

In order to obtain some of the cost advantages of mass produced hardware, the optional software will be available prelocated in memory. After extensive research Tom Clark, W1JLND, came up with the memory usage map shown in Table 1. Note that the low memory is RAM, for multiple program usage, and the debug package -- I/O handlers (AMS-80) resides in PROM in upper memory. Other software can reside anywhere.

SOFTWARE

The optional software available will include the following:

AMS-80 (version 5) An extensive debugging package containing I/O handlers and utility subroutines. Functions performed include memory/register examine and change; symbolic disassembly; Intel hex format object code reading and writing; ASCII dump of memory; hex dumps of memory; utility routines include I/O handlers for teletypes; keyboards, graphics on VCM board; baudot to ASCII conversion for RTTY; hex to ASCII; ASCII to hex; ASCII text input and output. A terminal mode of operation is also present.
**ASMT STANDARD** —— 0000–225 MEMORY ASSIGNMENTS

<table>
<thead>
<tr>
<th>MEMORY RANGE</th>
<th>TYPE</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000 – HFFF</td>
<td>RAM</td>
<td>REQUIRED FOR ASMT MONITOR LINKAGES</td>
</tr>
<tr>
<td>8000 – 9FFF</td>
<td>RAM</td>
<td>USER RAM AREA, SEE NOTE BELOW</td>
</tr>
<tr>
<td>0000 – 1FFF</td>
<td>RAM</td>
<td>LEAVE UNASSIGNED ALLOCATIONS</td>
</tr>
<tr>
<td>0000 – 5FFF</td>
<td>RAM</td>
<td>PROGRAM/STORAGE AREA, THIS AREA VILL</td>
</tr>
<tr>
<td>0000 – 7FFF</td>
<td>RAM</td>
<td>BLD/RW BASIC INTERPRETER, BASIC,</td>
</tr>
<tr>
<td>2000 – 2FFF</td>
<td>RAM</td>
<td>ASSEMBLY AND UTILITY PROGRAMS</td>
</tr>
<tr>
<td>0000 – 1FFF</td>
<td>RAM</td>
<td>NORTH STAR MICRO-FLIPQ 5.0+B BASIC AREA</td>
</tr>
<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>CROM: LEAVE UNASSIGNED</td>
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<tr>
<td>8000 – 7FFF</td>
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<td>0000 – 7FFF</td>
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<td>CROM: LEAVE UNASSIGNED</td>
</tr>
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<td>RAM</td>
<td>SMALL STORAGE AREA</td>
</tr>
<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>PROGRAM/STORAGE AREA</td>
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<tr>
<td>0000 – 0FFF</td>
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<td>RESERVED 16K AREA FOR USER EPROM</td>
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<td>3000 – CFFF</td>
<td>ROM</td>
<td>RESERVED FOR CORESET DECK INTERFAACES</td>
</tr>
<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>программ на national multiplex</td>
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<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>PROGRAM STORAGE AREA</td>
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<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>RESERVE THIS BLOCK FOR VIDEO RAM</td>
</tr>
<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>MACHINE CODE, ASMT AND AMOS</td>
</tr>
<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>UNASSIGNED, OTHERS</td>
</tr>
<tr>
<td>0000 – 0FFF</td>
<td>RAM</td>
<td>OTHERS</td>
</tr>
<tr>
<td>E500 – EFFF</td>
<td>DISK</td>
<td>RESERVED FOR NORTH STAR MICRO-FLIPQ</td>
</tr>
<tr>
<td>F000 – FFFF</td>
<td>ROM</td>
<td>ASMT AMOS MONITOR OPERATING SYSTEM</td>
</tr>
<tr>
<td>F000 – FFFF</td>
<td>ROM</td>
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<tr>
<td>F000 – FFFF</td>
<td>ROM</td>
<td>ASMT AMOS MONITOR OPERATING SYSTEM</td>
</tr>
</tbody>
</table>

**TABLE 1. Memory Map**

This is an expanded version of the earlier monitor package/operating system published in the September 1976 issue of "byte" magazine. All I/O to the software is on a character basis (A in. B or C out) and thus is I/O device independent. The I/O handler takes care of any "blocking" required. I/O is assignnable in software with certain restrictions and can even be changed within a program. (85% completed)

**MATH**

A full floating point math package: includes scientific and trigonomtric functions. Works to seven (7) significant digits. (All I/O via AMOS-80) (90% completed)

**FPI**

Floating Point Interpreter, allows floating point instructions to be written using a floating point accumulator. Adds a tiny overhead to execution time but saves a lot of programming grief. (All I/O via AMOS-80) (75% completed)

**TRACK**

Real time Tracking Program for ASMT-Oscar 7. Shows position of spacecraft with reference to your OTH (az-el) in real or speeded up time and doppler. (Requires VDM board Real Time Clock and FPI) (Originally developed by Richard Allen, WSSDX) (75% completed)

**BASIC**

Patches for Livermore Basic, MIT'S 8K Basic (version 3.0) and Processor Technology 5K Basic to interface to AMOS-80 will be available. Note that only patches to proprietary software will be available and not the original software. (80% completed)

**ORBIT**

Assembly language program listing orbital crossing times for the ASMT-Oscar 6 and 7 spacecraft. Options include, reference all, develop by Joe Kasser, G3ECZ, 95% completed. Used to generate orbit listings published in AMSAT Newsletter.

**LOG**

Contest logging program, keeps checksheet in memory and dumps to high speed output device. (All I/O via AMOS-80) (Assembly language, developed by Joe Kasser, G3ECZ) (80% completed)

**POWER SUPPLY AND MECHANICAL DESIGN**

This is up to each and everyone. The Power Supply should deliver between 8 and 10 V at 15-20 Amps, as well as both +16 to 18 V and -16 to 18 V at 2 Amps each. It does not need to be stabilized. It is recommended that the front panel include a RESET and BOOT switch as a minimum.

Optional (and recommended) extras include an I/O port (address OFF Hex) and a HALT light.

Further extras include full data and address bus switches and displays for hardwar trouble shooting.

**HARDWARE**

Any S-100 bus hardware is suitable, providing that the addressing of areas of memory is compatible to the one shown in this article. AMSAT has arranged a group purchase of Cybercube or Solid State Music cards (my favorite home computer magazine) in the following categories (kits only), as a service to members.

- 4K RAM Board — contains 4K of 21102 type RAMS. (450 ns)
- 8K RAM Board — contains 8K of 21102 type RAMS. (450 ns)
- 16K RAM Board — contains 16K of static RAM. (200 ns)
- 4K FROM Board — contains 4K of 1702A type PROM (2 wait states)
- 8K FROM Board — contains 8K of 2708 type PROMs.

- TO-2 Board — contains one input and one output port to PC board with address decoding for seven more. Schematics are given for adding serial I/O port with various communications baud rates (45.5 to 110) for USAF giving RTTY capability.

Schematics for the front panel features such as Reset, Boot, and I/O port and a keyboard interface port schematic are also available.

- Video Display Board (VDM) — displays 16 lines of either 64 or 12 characters. Full graphics capability on a 128 x 48 matrix (dots) or reverse video options available (with software driver package).
- Mother Board — a 15 position single sided mother board. IMSAI (either PC or wirewrap) edge connectors fit. At least one wirewrap connector is required for ease in trouble shooting.

- Extender Board — eases trouble shooting by allowing a board to be lifted above the others in the chassis. Requires a PC type edge connector on the top to complete the socket for the card being tested.

Additional hardware may become available in time.

The recommended CPU card (for cost purposes only) is the Byte Shop Special (8080 + PC for about $100), available from any Byte shop in the USA. This card also contains a programmable interrupt circuit (81H).
THE FRONT PANEL

The front panel is the visual interface to the outside world. It is the part that non-technical people see when they first gaze upon your machine (with wonder?). It can be as complex or as simple as you wish it to be. Circuits have been developed that let you put a large number of features on your panel, each one independent of the others and fortunately none are mutually exclusive.

The following features are available:

1. RESET SWITCH

This is a must. It causes the 8080 to begin execution at location $0000$.

2. BOOT SWITCH

Let's add a word in the AM80-80 design. It causes the 8080 to begin
execution at location $0000$ (the base address of AM80-80). When
the boot switch is pressed, the 8080 will return to low memory. It requires eight ($100$) cycles and works by detecting
the signal on the CPU card and forcing No-ops until address $0000$ is
reached, then returning control to the 8080 to continue execution in
AM80-80.

3. MEMM GENERATOR

This simple circuit is another must. The CPU card does not generate
the MEMM signal; thus, circuitry must be provided to generate it. Alternatively, you can patch the Byte Store Special CPU Card to generate the signal if you really want to. Both schematics will be available.

4. I/O PORTS

An I/O Port is desirable but not necessary. It can be used to blink lights or test status under program control. They are useful during program debugging and for setting up custom overrides to particular software if structured that way.

5. ADDRESS BUS DISPLAYS

An optional feature of having the contents of the address bus displayed all the time is useful (provided it is not a binary display) because loops in the program can be determined visually and instantly. The displays can be in either Hex, Octal or Binary.

6. CPU STATUS DISPLAYS

The status lines such as HALT, BUSY and WRITE can be used to drive
front panel LEDs. These features are optional, but HALT and INTE lights are recommended.

7. SINGLE STEP

A single step feature is optional. This can be used in conjunction with
the address bus and status displays to manually follow through the steps of a program.

8. DEBUGGING CIRCUITRY

An optional extra is full hardware debug capability allowing memory to be read and changed from the front panel. In this mode the CPU is halted and the front panel takes control of the bus. This feature is only really useful when first bringing a system up, or in a unit designed to check out S-100 hardware. It is recommended that each group of people building an AM80-80 have at least one of these cards.

NOTES: At present a printed circuit card is not available. The necessary circuits are wired on an $100$ board, leaving space for a keyboard interface (to go with the video display board).

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### Table 2. Serial Interface

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
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<tbody>
<tr>
<td>1</td>
<td>Chassis Ground</td>
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<tr>
<td>2</td>
<td>EIA data from Terminal to Computer</td>
</tr>
<tr>
<td>3</td>
<td>EIA data from Computer to Terminal</td>
</tr>
<tr>
<td>7</td>
<td>Signal Return</td>
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<tr>
<td>10</td>
<td>-18 V Supply</td>
</tr>
<tr>
<td>13</td>
<td>-18 V Supply</td>
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### INTERFACE STANDARDS

Interfaces come in two types, namely serial and parallel. A standard is desirable to enable several individuals to get together and combine equipment to build a system greater than the sum of the individual parts, like demonstrations or club meetings. Thus, the following standards (which are already in existence) are suggested:

1. Audio signals - Audio signals to/from cassette recorders via phono connectors. Phono plugs/socket are cheap and widely available.

2. RF/Video Signals - SBC RF connectors should be used. The SBC type of connection is used in amateur equipment and is readily available throughout the world.

3. Digital Signals -
   - a) Serial Data - Serial Data Interfaces will be via a 25 pin EIA (mark = +3 V to -12 V, space = +5 to +12 V) connector. The pin assignments are based on the RS-232 standard as shown in Table 2.
   - b) Parallel Data - Parallel Data Interfaces will also use the same type of connector. Each connector will carry one 8 bit input port, one 8 bit output port and a set of handshaking control/status signals. The signal pin connections are shown in Table 3 and are compatible to the MIT 8 System pin outs.

The chassis connector on the computer will be male; the chassis connector on the remote device will be male for the following reasons:

- a. Power may be fed from computer to remote device via that cable. Having a female connection on the "hot" lead reduces the probability of short circuits.
- b. Cables can be joined together to make longer ones without needing any special adapters.

---

COMING IN PART II:

In Part II there will be details of the "front panel" circuits. The circuitry is modular so that any or all parts may be incorporated into your system. The use of AM80-80 will also be described and a status report on software development will be given. Anyone who already has an S-100 bus system running and is interested in helping in the project development, please contact me at the Editorial address listed on page 2. A specific requirement at this time is the development and interfacing of a software package to drive an audio cassette recorder with blocks of data and start and stop of recorder so that the tape can be stopped while data is processed.
Please use this format for sending your group purchase orders:

**TO:**
Dr. Thomas A. Clark, W4LMN/W01UF
AMSAT = Computer GPP
700 Box 258
Washington, DC 20004

**FROM:**

**CALL:**

**ADDRESS:**

**CITY** ___________ **STATE** ___________ **ZIP** ___________

**AMSAT MEMBER NUMBER** ___________ **DATE:** ___________

I hereby authorize T. Clark and/or J. Kaesser to act as my agents to purchase the following items for my personal use through the AMSAT Computer Group Purchase plan. I understand that AMSAT has no liability for any purchase made under this plan.

**SIGNED**

<table>
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<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>PRICE</th>
<th>TOTAL</th>
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**SHIPPING:** $0.50 x 1.00 per board = $0.50
(Excess will be donated to Phase-III?)

**INSURANCE FOR SHIPMENT (OPTIONAL):**

**TOTAL ($U.S. FUNDS) ENCLOSED:**

AMSAT NEWSLETTER, September 1977

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**AMSA GROUP PURCHASE PLAN FOR S-100 BUS MICRO-COMPUTERS**
Tom Clark -- W4LMN/W01UF

Since AMSAT's members are among the technical elite of amateur radio, there has been considerable interest voiced about the possibility of AMSAT providing micro-computer hardware and software support for our members. In a companion article, Joe Kaesser describes a homebrew 8080/780 micro-computer system based around the hobby-standard AMSAT ALT/H0R0L S-100 bus, and supporting software (including our "AMS80" Monitor/Operating System) that is now available. Joe and I have worked out arrangements with several hardware manufacturers and "friendly" dealers to make S-100 bus peripheral kits available to AMSAT members at a considerably discount from retail prices. To achieve this, we're offering discounts for use to dictate certain "ground-rules" for the Group Purchase Plan (G.P.P.): (1) Joe and I will act as your agents to obtain the best possible prices, but we aren't in the computer business. Our other AMSAT responsibilities make it difficult to offer personalized service, but we'll do our best to help. (2) Payment must be in advance for all items ordered. All checks should be payable to T.A. Clark. (3) We reserve the right to "pool" orders to get the best deal. Therefore, we may wait a few weeks to place orders, and delivery times may be as long as 60-90 days. (4) Except for a few items that we buy in bulk, we have no stock. (5) We will not attempt to repair or maintain your boards. If you have problems, deal directly with the manufacturer. If you feel that you will need personalized help, then buy directly from your local hobby computer store; their business is to provide services. (6) The prices reflected below are by us a few percent above actual costs. This margin insures that we will not personally lose any money on the G.P.P. The small "profit" margin will be used to help support AMSAT's Phase-III satellite program, but AMSAT has no liability for any losses sustained by the G.P.P. (7) Nearly all the G.P.P. products have been used by us, and we make every effort to insure that you won't get stuck with junk. (8) We want to add additional quality G.P.P. products; if you are a dealer or manufacturer, please contact us. If you stumble onto a good deal (for example, EPROMs or VDOS monitors) and want to offer an item for the G.P.P., contact us, and (if we determine that the item is salable) we will add to the G.P.P. pool. (9) You should include a shipping allowance (if you can't pick up your order yourself); we suggest that you allow $0.50 per board, plus insurance if desired. Remember that floppy-disk drives weigh several pounds, so plan accordingly. Foreign G.P.P. subscribers should plan on 0.5 kg per board plus duty and insurance, and make payment in U.S. dollars. Canadians should contact VE3SAT. (10) Since the AMSAT Newsletter is not a computer journal, we will not publish updated G.P.P. listings very often. Send an SASE if you want the current G.P.P. list or manufacturer's literature on items of interest. Even if you don't order right away, we would like to have an expression of your future interest in the G.P.P., so I'll see QSL.

***REMEMBER -- THE PROCEEDS HELP SUPPORT PHASE-III!!***
ITEMS CURRENTLY AVAILABLE:

----- SOLID STATE MUSIC/CYBERCOM "Blue Boards" ----- 

MB-3 = 2k/4k byte EPROM card. Holds up to 16 1762A's with switch selectable wait states for slow chips. Use this board to keep the AMS80 Monitor permanently resident. With all support chips, but no 1762A's ---- $ 57.00

MB-4 = 4k byte RAM using 2102A's. Can be kludged to hold 8k of RAM by "plug-and-backing" 32 more 2102's. 1 minute cycle time with the 2102's provided. ---- $165.00

MB-6 = 8k byte RAM with low power 2102A's. 300 ms cycle time. Memory Protect and Battery Backup. ---- $190.00

MB-7 = 16k byte RAM using NEC 4410 4kx16 static RAM chips. Memory Protect and Battery Backup. ---- $370.00

MB-8 = 8k/16k byte EPROM card. Holds up to 16 2708's with all support chips but no 2768's. Board is quite similar to the MB-3, except for using 2708's. ---- $ 60.00

VB-1 = Video board displaying contents of 1k byte of on-board low-power 2102A RAM in 16 line x 64 character format. Can generate either inverse video or 4x128 dot matrix graphics. Similar to Processor Tech. and Polymorphic video boards. Both text and graphics supported by the AMS80 monitor package. ---- $150.00

10-2 = 8-bit input port and 8-bit output port plus lots of universal "kludge" area for wire-wrap or solder jumper wiring of special circuits, like power-on jump, front panel functions, etc. ---- $ 30.00

MT-1 = 15 slot mother board or ALTAIR expander board. This board uses the 100-pin connectors listed below, NOT those used by ALTAIR! ---- $ 33.00

XB-1 = 100-pin extended card, with connector ---- $ 1.00

Coming soon -- new CPU card and serial l/0 card. Send SASE.

--- NORTH STAR COMPUTERS ---

MDS-A = A full micro-floppy disk system for 3800-780 S-100 bus systems, including Shugart drive, DOS and Disk BASIC software. Drive can be powered from your mainframe if you have some reserve. Delivery could be up to 90 days so that we can pool orders for best prices. Please allow extra funds for shipping drives! ---- $550.00

MDS-B = Extra drive for MDS-A (price approximate) ---- $390.00

MDS-C = Small cabinet for Shugart-type disk drives ---- $ 35.00

MDS-P = Power supply for each Shugart drive ---- $ 35.00

Other North Star products also may be available. SASE please.

USEFUL PARTS AND COMPONENTS

100-pin edge connector with gold-flashed contacts. Fits IMSAI, SOL 8 MT-1 boards. Solder-tail and/or wire-wrap type, with the wire-wrap type the more universal. Either fits these boards as well as we will. We have, unless you specify what you need the wire-wrap type. ---- $ 4.00

IPSMA-type nylon card edge guides, per pair. ---- $ 0.40

1702A U.V. EPROM's --- brand new from Intel/AMD/TI ---- $ 4.50

8080 chip set = 8080A + 8212 + 8214 + 8216 + 8224 + 8225 ---- $25.00, price from Intel/AMD/NEC ---- $ 50.00

T.I. Low-profile solder-tail DIP sockets, with tin-dipped contacts ---- $ 3.00

(10 each minimum order)
The 5 June 1977 meeting of the AMSAT Board of Directors was called to order at 9:30 PM at AMSAT headquarters, 700 7th Street S.W., Washington, D.C., by AMSAT President, Perry Klein. The following attended: Perry Klein. The following attended: Perry Klein.

Perry I. Klein, W3PP
Thomas A. Clark, W3LND
Jan King, W3JOY
Walt A. Tyman, W3XO
Richard Daniels, WADDU

There was a discussion about finding suitable space for AMSAT activities. King will be temporarily moving to an apartment in a couple of weeks, so the substantial AMSAT work done in his basement will be displaced. The W3N club, where membership processing takes place, will be losing their quarters in the next year, etc. It was decided that a search be confined to laboratory-industrial-warehouse rental space in the Herdade-Greenbelt vicinity. Local members will be asked to assist in this search.

KENYN will be contacted further concerning his generous offer of radio equipment to AMSAT. Klein will write him. A policy was adopted that the equipment will not be accepted until AMSAT is in a position to actually use a major portion of it.

Dr. Gschwind will be here from Hungary later this summer so that an operations department meeting should be held, perhaps in Hungary with him, K1HTY, VELSAR, and others.

The launch of Landsat and AMSAT-Oscar D seems to be sure to slip until March 1978.

There was further discussion of suitable quarters for AMSAT. Clark and King will be looking at the Goddess Radio Club, 1611 Dumbarton, and the W3LGM will be asked to look for rental quarters. Size to be about 1000 sq. ft. at a cost not less than $5000 a year as possible. A work party will gather in the next couple of weeks to empty the King basement of AMSAT property.

W4GS is not interested in receiving any product from the program.

There was a discussion of the necessity of prompt dispatch of the September Newsletter if it is to contain ballots for the Board of Directors meeting in October. It was decided that a separate mailing of ballots be made if the Newsletter will not be ready in time.

G3CZC assured the meeting that he could get the September Newsletter out in time if everyone cooperates.

There was a discussion of policy concerning Board of Director/Headquarters participation in Hamfests. Clark advocated that each B of D member attend at least one per year. The importance of an Armed Forces Radio Club Dayton Hamvention/etc., each year. King pointed out that there are so many other hamfests that time and money considerations discourage participation by people from Washington. Clark advocated that we buy a booth at Dayton next year to get better ride. Klein expressed considerable reluctance to personally attending such activities in view of the other demands on him.

King reported on Phase III status. He feels that approval is near for a second flight, this on the upper stage of ESSUS (Solid Spinning Upper Stage). It would be piggy-back with a chemical release experiment in December 1979. Ariane Launch. Karl has designed cooling to make a 5.5 meter diameter center structure for Phase III, better suit the application. The structure will be comparable to K3A. Karl has heard from people in the center. There is a problem that only one-chip versions of COSMAC are available, but the existing boards are for the two-chip version. This should be solved soon. The Telefunken solar cell offer has been evaluated and is unacceptable due to the rapid radiation aging of the proposed cells and price asked.

The Board voted to support a trip to Washington by Melinker, DJ4ZC, in July. He will bring over Phase III material and attend coordination meetings. Ginner and Browning of Project OSCAR are still investigating the possibility of an Air Force launch in early 1980.

Such support as may be necessary was voted for the operations meeting to plan for AMSAT-Oscar D, as mentioned above.

King noted that the partial Delta failure in May put its satellite in an orbit quite similar to our Phase III plans. Interested tracking stations should practice with its signals on 137.250 MHz. He also noted that a command station located at a latitude greater than 45 degrees North will be able to command Phase III on upper orbit.

Klein reported on AMSAT-Oscar D. The system has not yet been integrated. AMSAT-OQM will build the flight battery charge regulator. The structural work is done, except that some backing plates are still needed. The Antenna Deployment Module and 10-meter and 2-meter antennas have not been built. Marv Murr is progressing with the wiring harness.

Things to be done are: thermal coating; improving surity of turnoff of the Mode-A transponder, assemble a battery from the cells on hand.

The vehicle situation looks good.

There was a discussion of fund-raising results. There has been about a seven-fold increase in the rate of life-member applications, to one or two a day. So far perhaps 50 to 100 solar cell have been submitted. Several donors will be available in a few weeks. The Newsletter will carry a drawing to allow sponsors to locate "their" cells. The ARRL Foundation campaign has received perhaps a hundred donations, mostly modest.

Clark and Kasser are running a group-purchase of microcomputer hardware for Chesapeake Microcomputer Society and AMSAT members. Any excess revenues will go to AMSAT.

About ten minutes of tape from G3GVR discussing abuse of satellite operation was played. He suggested that AMSAT award applicants be required to affirm their following of day, power and band-plan recommendations in the contacts that apply for the award.

There was a discussion in which most present felt that the power rules would be hard to enforce. King strongly urged every effort to keep power levels down. Greene pointed out that most amateur awards include a statement that decisions of the award committees are final. This should allow the adoption of a suitable statement of following suggested practice by AMSAT award applicants.

Greene pointed out that, by and large, most hams know very little about the use of the satellites. He suggested that a USER article appear as soon as possible. Kasser plans to write such an article (when he gets the time).

On the FCC 5th Notice of Inquiry for the WARC, Clark summarized the amateur satellite sections. Clark and Klein will get advance AMSAT input to the Advisory Committee on Amateur Radio in time for their next meeting.

The meeting was adjourned at 10:50, 5 June 1977.

Robert J. Carpenter, W3OTC
Secretary

(Continued from Page 9)

The "Log Periodic" type of Yagi is independent of frequency over about a 10:1 range. This type of antenna allows multi-band operation with one antenna and without the complications of traps. The LP requires no special type of match since one-half the composite boom is fed (foot) along with all the elements on that boom half. The second half acts as a balun plus supports the other assembly of dipole halves. Here again economy of space is stressed. The wire may be stripped, stranded, swaged into holes in the two-piece main boom structure. Even though the LP has a lot of elements, the gain on any one frequency will not be more than a three element Yagi. In operation, the LP has one element that resonates at the frequency of operation, a longer element behind acting inductively as a reflector and a forward element acting capacitively as a director.

I hope to have inspired some of you that have thought about satellite communications to try it. Contrary to some erroneous beliefs, LP's are not needed and high power is for the most part wasted. I used as little as 0.5 watts to set the world distance record, so I'm sure you can do a lot with 180 watts to a GP, dipole, Dishcone orturnstile. Let's hear you via OSCAR.
Dear Joe:

I almost forgot to send you the picture of the SSTV signal from DB4EX that I mentioned when you phoned me a few weeks ago. The data is on the back of the photo. This was the first time I heard an SSTV signal from Europe via the satellites and had time to get my monitor warmed up and the tape recorder running before the signal stopped.

Receiving SSTV via OSCAR is much more complicated than on the lower frequencies. Besides the usual tuning problems, I have to keep retuning the receiver because of doppler shift and turning my antenna to keep on the satellite. Tape recording adds another chore. One needs to be an octopus to keep everything in adjustment! The DB4EX signal was very good, however, and some good frames were received. After the pass was over I replayed the tape and took a picture from the screen with an old Model 800 Polaroid, which is the only model that has time exposure. With a very small stop, close-up lens and an 8 second exposure the pictures turn out fine.

DB4EX did not break so I could not give him a call on my own SSTV. His signals dropped out at LOS while he was still transmitting. I have worked him several times since by SSB and we said he was transmitting for some SSTV group in his area.

Nothing much new otherwise. Am up to 71 countries with the addition of PK3AP and E44AI and W1AC. Heard WAC during the recent DXpedition to San Marino but only on Mode B on one orbit and seemed to have receiving problems.

73, Dick Cotton - WB8X

Dear Editor,

Just a short note to say Height of Antenna cannot be stressed enough.

Prior to July 22 I sweated out 18 QSO's in 12 days with double four skeleton slot antenna 18 feet high (surrounded by 70 foot pines and birch). Weekend prior to July 22, this same antenna was hoisted up a stripped pine 65 feet -- in one day, on passover 12269A - 12270A - 12276A - 12278A - 12280A and 12281A made 12 QSO's (inc. 2 with England) running ten watts to an ICOM 211.

73, Dick Cotton - WB8X

Dear Joe:

How does the group at AMSAT handle feel about utilizing Slow Scan TV (SSTV) on OSCAR 7 Mode A? I’ve read where contacts from Hawaii to New York via OSCAR have been made on SSTV...I have seen some pictures matter-of-facts that were exchanged by both parties.

I’m ready to go, but first, before I do, I want to check with AMSAT.

I’ve been in SSTV only a month now and my time back and forth working OSCAR...I’d like to incorporate both of them.

I’ve run across a lot of guys and gals who operate both SSTV in HF and OSCAR too....Being the bandwidth is no more than SSB anyway, I’m sure that is one reason the FCC authorized its use.

Please advise as soon as possible.

Also, if you give me the go-ahead, how about putting in the following excerpt in the upcoming Newsletter:

SSTV via OSCAR???

All interested operators contact WB7BFK, Bill, 4471 40th NE, Oak Harbor, WA 98277. Also, any Asian countries wishing OSCAR Confirma-
tions via OSCAR, contact Bill, WB7BFK, and arrange for ASIA’s SSTV or SSB. There are certainly more JA’s out there than the four that I’ve worked???

Looks like 11 more states and I’ll have MAC -- I can’t seem to even catch any European?? I work JA with no problem. What’s the answer -- I’ve called CQ on what I felt would be the best passes too (SSTV is ok. Have you heard Europe yet -- Joe, Ed.)

Bill, WB7BFK

Dear Joe,

SUBJECT: The AMSAT Newsletter Content vs. Effect

CONGRATULATIONS

As one who is most intimately involved in another area of amateur radio specialty (VHF-UHF repeaters, remote bases, etc.) and responsible for the production of an assortment of newsletters and bulletins, I appreciate very much the monumental effort required to effect the "AMSAT Newsletter".

I, contrary to a letter you received and reported in the Newsletter, feel that this publication is worth every cent spent to produce and distribute it.

The Newsletter at this moment is the only link I personally have with AMSAT in view of my limited direct involvement to date, in the exciting program. At some time in the near future I hope to have my station operational on all bands. But until then, the comprehensive material supplied via the Newsletter is most important serving to keep me up as we date with the program as possible.

Congratulations Joe on a fantastic effort.

Jack Forbing, K9IEB Member $777 AMSAT

(Thank you very much -- Joe)

Gentlemen:

Some fellow amateurs and myself are planning an airborne "DX-pedition" on September 17, 1977. Our route of flight will take us from New York, NY, to Las Vegas, NV, to Barstow, CA, to San Jose. We would like to try to work some of the OSCAR satellites during this flight. Our flight time window is pro-

posed to be between 1400 GMT and 2400 GMT on that date. If inclement weather forces postponement of the flight, we will make it the following Saturday, September 24.

The object is to make as many contacts as possible during the flight, including some through OSCAR, if possible.

73, Alan Christian
Four Airborne Amateurs Reaching Out

Hi Joe:

Here is some information about my trip to England and Ireland on May 1-8, 1977.

I went to the International Communications Exhibition at Alexandra Palace in London. Gus had a fine setup for OSCAR. They had full sized models of OSCAR 6 and 7 hanging from the ceiling. They looked real good. They also had a board with G3IDR DX cards. They also had slides and a recorder explaining all about OSCAR.

I met G3EML, G8CST, G4CBO and G8JHL. I then went on to Ireland and met Jim Malone, EI4A, Ireland's OSCAR Coordinator and Albert E1AAS, the most active station in Ireland on OSCAR, Mode B, 2 meters SSB and FM, 4 meters, and 23 cm. Albert drove me around and worked mobile and also OSCAR Mode B, E1SP. E180, E12W are all on OSCAR also.

In two days I worked 9 countries on 5/20/77 I3EE, F1CF, K4AD, W2LV, G1PEJ, PE7NC, DB4EX, OE5DJ/3, G8JHL, W9BE. If these stations want QSL, please QSL via K9VRS (my American call).

(Continued on Page 27)
A Quad Antenna for OSCAR 7 Mode B Operation

By Jack Tielrooy, W5HDG

The sketch shows dimensional data for a simple four element quad antenna for Mode B operation. The 145 MHz quad is based on a design by KE6PS. The 432 was scaled down from the 145 MHz. Construction was by W4VQM and testing by W5HDG.

We used the antenna on Field day (June 26, 1977) with excellent results using horizontal polarization. Tests so far indicate that the antenna works best with horizontal polarization.

Silent Key

On Friday, July 15, 1977, the Radio Amateur satellite program lost one of its most prolific supporters with the passing of W4GHR, Floyd Forrest. Those who knew him well were familiar with his stories of "mule-back mobile" operation and his many expeditions on VHF to mountaintops throughout the country. Listeners to these stories were familiar with his line "Well now, just let me say this..."

Floyd was originally licensed with a W4 call, and was changed to W4FBZ when part of the ninth call area became the fourth. After an absence from Kentucky around 1950, he returned and obtained the call W4GHR which has become so well known to those who worked him. He had been licensed for a total of 46 years.

Floyd had always been interested in VHF and UHF even before it was popular to be so. He won the "W4XEG Award for 144 MHz DX" in 1948, sponsored by the ARRL club of Louisville, Ky. His interest in the satellite was a natural one, combined with his interest in VHF communication. Floyd was only 2 days behind W2QMN/mobile in putting a signal out from Kentucky on OSCAR 6. Floyd had worked the satellites (06, 07) regularly until about two weeks before his death.

Floyd was responsible for almost everyone in Kentucky that is on the satellite: W4HOP, W4HDS, W4GZK, W4AJU, W4SPI, et al. He supplied not only advice, but antennas, rig, and even would help assemble stations for those who needed his special brand of consultation.

Floyd had been sick for about a year, but his spirit was undaunted all the way to the end. Those who saw him at the Dayton and Indianapolis Hamfests knew of the weakened condition he was in. His main interest in the last few years was in satellite communication, and his Amateur career was completed on the satellite around July 4, 1977.

In recognition of his interest in the OSCARs, W4HOP proposed that a memorial fund be set up with the objective being to have Floyd's name and call placed aboard the new OSCAR. Collections have been going well, however, we are still far short of the needed $1000.00. Contributions should be sent to W4HOP or myself, W4GHR, and checks should be payable to AMSAT. All monies collected will be forwarded to AMSAT at the time the collection is completed.

Everyone should be sorry to lose such a dedicated satellite operator, but none more than those of us who knew him well.

73,
W4GZK P. C. (Bo) Lowrey
1805 Hill Creek Road
Louisville, Ky. 40229

(Continued from Page 25)

My Irish call was EI7VUK. For all Irish contacts I QSL'd 100%. Also, I would like to make a comment about the poor rate of QSL returns. I have worked 17 states, got cards from 8, and worked 7 countries, and got a card from only one. Please try and do something in the Newsletter to get the boys to send out the QSLs Cards. (Ed. Note: What do you suggest? -- Joe)

Here is a picture of Albert E16AS. (Center PT7VOK (K9VUG) Desmond and Jim Malone E14N, Irish AMSAT Coordinator.)

Hope you can get this picture in the AMSAT Newsletter, as I have never heard of hams in Ireland getting in any magazine. So hope you can help. The picture was taken by Mrs. Malone in their front yard.

73's, yours hamfully,
Desmond G. Coghins
K9VUG/EI7VUK
The following AMSAT Nets meet regularly to disseminate information to newcomers and to keep regular satellite users in communication with one another.

**USA-East Coast Net**
- Wednesdays 0100 Z 3850kHz LSB
- Net Control W3UN or WA3NAN

**USA-Midcontinent Net**
- Wednesdays 0200 Z 3850kHz LSB
- Net Control W2CY

**USA-West Coast Net**
- Wednesdays 0300 Z 3850kHz LSB
- Net Control KG6OW

**JA-Net**
- Mondays 1300 Z 3555kHz LSB
- Net Control JA1ANG

**Asia-Pacific Net**
- Sundays 1100 Z 14,200kHz USB
- Net Control JA1ANG

**Western Europe Net**
- Sundays 1000 Local 3780kHz LSB
- Net Control GI8ML

**International Net**
- Sundays 1800 Z 14,200kHz USB
- Net Control W3EM or W3UN
- Sundays 1900 Z 21,000kHz USB
- Net Control W3EM or W3UN

**Africa-Europe Net**
- Sundays 1700 Z 14,200kHz USB
- Net Control GI3OR

**Africa Net**
- Saturdays 1000 Z 14,200kHz USB
- Net Control GI3OR
- Saturdays 1100 Z 14,200kHz USB
- Net Control TUIZEF
- Saturdays 1130 Z 21,200kHz USB
- Net Control TUIZEF

The following VHF frequencies are also in use:

- **London, England** 144.2MHz USB Net Control G8CST Sundays 1930 Local
- **Atlanta, Georgia** 145.8MHz USB/CW Net Control W4DHH Sundays 2000 Local
- **Washington, D.C.** 146.25-85MHz FM Net Control W3UN Wednesdays 0000 Z
- **Los Angeles, Calif.** 146.25-85MHz FM Net Control W6CO Daily

Bulletins of general interest to those interested in amateur satellites are now transmitted regularly on AMSAT-OSCAR 7 reference orbits, at approximately 10 minutes after equatorial crossing. These bulletins are transmitted on a downlink frequency of approximately 29.44 MHz on Mode A days, and 145.975 MHz on Mode B days and can be received over most of Eastern North America.

Hurricane advisory bulletins and alerts are also transmitted on AMSAT-OSCAR 7 reference orbits on 29.43 MHz during the Summer-Hurricane season.

Educational bulletins via OSCAR have been terminated for the summer during school recess. Write Steve Place, W6ZIJW, ARRL Educational Program Asst. at ARRL Headquarters, 225 Main Street, Newington, Conn. 06111 for OSCAR educational bulletin schedules for the Fall semester.

**AMSA-OSCAR QSL BUREAU**

Dennis Grindrod, WA1EBF
564 Stillman Street
Bridgewater, CT 06010
(203) 579-1921

is serving as AMSAT QSL Manager for OSCAR cards in the United States. U. S. users should send several #10 (business-size) SASE's, which will be filled with incoming QSL cards and mailed when full. Outgoing DX OSCAR QSL's will be forwarded at a rate of 6c per card or 20 cards for $1.00. Domestic QSL's (U. S., Canada, and Mexico) can be sent free in bulk. These will be sorted and placed in the SASE's.

**ATTENTION:** Those with new call letters, please file new envelopes with the QSL Bureau.

---

**NOTICE OF 1977 AMSAT BOARD OF DIRECTORS ELECTION**

Four positions on the Radio Amateur Satellite Corporation Board of Directors are to be filled by the present election. Ballots must be received at or before the AMSAT Annual Meeting to be held at 8 PM, October 8, 1977, at the Employees Recreation Center, Goddard Space Flight Center, Greenbelt, Maryland. Mail ballots should be sent to: AMSAT, Elections Secretary, PO Box 27, Washington, DC, 20044. Be sure to put your name, membership number and zip code (USA members only) on your mailing envelope so that your vote can be validated.

The following members have been nominated and are willing to serve if elected:

- **Dr. Martin R. Davidoff, K2UBC**, Baldwin, Maryland
- **Jan A. King, W3GEY**, Crofton, Maryland
- **Dr. Perry J. Klein, W3PR**, Washington, D.C.
- **Dr. Earl F. Skeaton, W3ES**, Washington, D.C.
- **Randall Smith, W3EAST**, Barrie, Ontario
- **Dr. William J. Webster, Jr., W8YCC**, Rehoboth, Maryland

(Charles A. Dorian was nominated but requested that his name be withdrawn from consideration in order to give others an opportunity to serve on the Board.)

Vote for up to four (4) of the above as soon as possible. A ballot sheet is contained on page 31 of this issue of the AMSAT Newsletter.

---

Further information supplied by nominees:

- **Dr. Martin R. Davidoff, K2UBC**
  - First licensed in 1957, now Extra Class, also first Phone (Commercial).
  - AMSAT life member #138, Nominated by MIN Radio Club.
  - AMSAT Activities: Responsible for devising and testing techniques for determining the orbital elements of AMSAT-PHASER III-A after launch.
  - Other Amateur Activities: Author of numerous articles, talks, etc.
  - Professional Activities: Ph.D. Physics, Syracuse Univ., now Asst. Prof., Catonsville Community College, Baltimore, Md. Director NSF project SFD 75-17333 "Using Satellites for Science Instruction".

- **Jan A. King, W3GEY**
  - (Information supplied by Secretary)
  - AMSAT member #2. Nominated by OR7UE VHF Group and AMSAT-Mexico.
  - AMSAT Activities: Vice-president for Engineering; member Board of Directors since formation of AMSAT in 1969; currently Phase-III Project Manager; was Project Manager for OSCAR 5, 6 and 7.
  - Professional Activities: Member of professional staff, Goddard Space Flight Center, NASA.

- **Dr. Perry J. Klein, W3PR**
  - First licensed in 1957, Extra Class since 1959, First Phone (commercial).
  - AMSAT life member #1. Nominated by AMSAT-Mexico and MIN Radio Club.
  - AMSAT Activities: President and member of Board of AMSAT since its formation in 1969, responsible for all aspects of AMSAT's activities and day-to-day operations. Employed by AMSAT since summer of 1973. Developed two-to-ten meter transponders for AMSAT-OSCAR 6, 7, and AO-7. Currently serving as Project Manager of AMSAT-OSCAR-D Project.
  - Professional Activities: Ph. D. in Electrical Engineering, 1968, from Univ. of Penna. with specialty in communications and navigation satellites. Engineer on Technical Staff of COMSAT and COMSAT Labs, 1968-1972. Two patents on navigation satellite system and over two dozen publications in communications, navigation, and transportation.
Dr. Earl F. Skelton, NJ2ES

- First licensed in 1955, now Extra Class. AMSAT life member #103. Nominated by Naval Research Lab Amateur Radio Club.
- AMSAT Activities: AMSAT awards manager; also updates (with input from WB2DNN) and maintains OSCAR users directory; wrote and distributed OSCAR A2/EL calculation routine. (Newsletter-March, 1976).
- Amateur Activities: Interests include satellite, EMK, coherent CN, DX, and contests; holds WAC, WAB, DXCC, and 5 satellite certificates; organizer and instructor of amateur radio training classes at NRL and Prince George's College; past president NRE ARC.
- Professional Activities: Ph. D. -- solid state physics; Section head -- Phase Transformation Sect., Cryogenics and Superconductivity Branch, Naval Research Lab; Associate Prof. Lecturer in Engineering, George Washington Univ.

Randall Smith, VE3BAT

- AMSAT Activities: Chief command station, OSCAR 6 and 7.
- Amateur Activities: Long-time VHF operator.
- Professional Activities: Member, Royal Canadian Air Force.

Dr. William J. Webster, Jr., WB2TNC

- AMSAT Activities: Net Control Station at W3JAN for East Coast AMSAT Net. Maintains orbits of current satellites, analyzing orbit for AMSAT-OSCAR-D, provides predictions for command stations.
- Amateur Activities: Principal instructor, Novice classes, vice-president -- Goddard Amateur Radio Club.
- Professional Activities: Member scientific staff, Geophysics Branch, Goddard Space Flight Center. Involved in Seismology, radio astronomy, relay of data from remote locations by satellite.

**SPACECRAFT TRANSPONDER FREQUENCIES**

<table>
<thead>
<tr>
<th>SPACECRAFT</th>
<th>UPLINK</th>
<th>DOWNLINK</th>
<th>BEACON</th>
</tr>
</thead>
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<tr>
<td>A-O-D</td>
<td>145.98 - 145.95 MHz</td>
<td>29.40 - 29.50 MHz</td>
<td>29.400 MHz</td>
</tr>
<tr>
<td></td>
<td>145.90 - 146.00 MHz</td>
<td>435.10 - 435.20 MHz</td>
<td>435.095 MHz</td>
</tr>
<tr>
<td>A-O-7</td>
<td>145.95 - 145.95 MHz</td>
<td>29.40 - 29.50 MHz</td>
<td>29.502 MHz</td>
</tr>
<tr>
<td>(Mode A)</td>
<td>432.125 - 432.175 MHz</td>
<td>145.975 - 145.925 MHz</td>
<td>145.972 MHz</td>
</tr>
<tr>
<td>(Mode B/C)</td>
<td>435.10 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mode A/D)</td>
<td>-</td>
<td></td>
<td></td>
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</tbody>
</table>

**QRM on 29.502 MHz**

Recently, TUEF reported hearing a complex telemetry signal just above the OSCAR 7 ten-meter beacon. Hugh described this signal as sounding like 'bagpipe'. It appeared at about 1800UTC and was heard for periods as long as two hours. The signal was also heard by W3KH. The signal has been identified as the second harmonic of a 14.751 telemetry signal. The signal is remarkable in that it is obviously from a terrestrial station. We are attempting to locate the transmitter site so we can tell them about their second harmonic problem. Beam headings from anyone receiving this signal would be appreciated.
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 (17,000 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.

Editor: Joe Kasser, G3ECZ, 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 Feb 1978

AMSAT OFFICERS

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Vice President Operations: Richard Zlirko, KLHTV
Vice President Engineering: Jan King, W3GQY
Vice President Special Programs: William Dunkley, W21IB
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Larry Martin, W3IBO (Asst.)

COVER PICTURE

B. C. (Bert) de Kat
VE1DDB maching the AMSAT-OSCAR D spacecraft attach fitting.

35mm SLIDE SETS
21 slides for talks and demo's, $5.45 per ($4.78 or OICRC's overseas)
K60X, Norm Chalfin, Box 463, Pasadena, CA, 91102.

EDITORIAL

OPERATING SCHEDULE CHANGE

Beginning January 1, 1978, the AMSAT-OSCAR 7 operating schedule will change. The satellite will operate in a three-day schedule of B=LA. The mode A day will be that Julian day of the year divisible by 3. For example:

Day 1 2 3 4 5 6 7 8 9 10 11 ... 298 299 300 ... 363 364 365
Mode B B A B B A B B A B B ... B A ... A B

The schedule change is because, with the expected launch of the AMSAT-OSCAR D spacecraft, and the anticipated launch of the Soviet R-S OSCAR, there will be three working spacecraft in orbit with Mode A transponders.

AMSAT-OSCAR 7

On November 15th AMSAT-OSCAR 7 celebrated its third birthday. On the whole, the spacecraft is in good shape after three years. However, it will only remain in good shape if we, the users, allow it. Let us ensure that our transmitted uplink power is within the recommended levels (100 watts for Modes A and B and 8 to 80 watts for Mode J). Write your actual transmitted power on your QSL card when you verify a contact, not the 500 to 1000 watts capability that you may have available. Let's keep AMSAT-OSCAR 7 up there in use as long as possible.

COMPUTERS

At this time only about 60 cards/letters have come in for the Computer Project and one against. Thus, the amount of coverage in this Newsletter is curtailed. The plan now is to announce items in the Newsletter, briefly outline them and say what state they are in. Then for further information you will have to supply a self-addressed stamped envelope. Several people did enclose such SASE's and they will be mailed out sometime in January. Now, when writing for information, please tell us something about your technical background. Remember that construction of the AMSAT-80 is recommended for clubs or groups who can share test equipment, especially if you reside overseas. If everything works the first time you are okay. Each part tests the other. If you can't get it to work the first time...oops...

The AMSAT-80 is an open-ended money drain; it will never be completed because you will always be adding peripherals. If you want help, information or advice from us, write in (SASE please) or telephone me at home.

BEACON IN THE SKY

A propagation experiment by Stanford Research Institute aboard space satellite P76-5 contains beacons in the amateur UHF bands. The frequencies are 435.97 MHz and 1299.00 MHz. (Note 1299.00 MHz is the image frequency when a 1296 MHz converter is used with a 28 MHz IF). The spacecraft transmits AR modulations and the beacons are switched off on Sunday evenings (GMT). The 435.97 MHz beacon transmits right circular polarization at a power of 200 kW. It is thus ideal for setting up 435 MHz converters for the AMSAT-OSCAR D Mode J transponder.

The orbital parameters are as follows: Inclination 99.655 degrees, period 105.729 minutes, longitude increment 26.43 degrees, maximum height 1025.968 km, eccentricity 0.045. The orbit is sun-synchronous with equatorial crossing passes repeating at 1117 and 2317 daily LOCAL time.

(Continued on page 43)
INTRODUCTION

The AMSAT-OSCAR D, the next AMSAT spacecraft in the OSCAR series, is a Phase II type spacecraft due for launch in March 1979. It was the second spacecraft ever built by and for the AMSAT. The spacecraft on which AMSAT Electric Groundlink Flight Engineering, Inc. has added two modes of operation.

AMSAT-OSCAR D carries transponders for two modes of operation. The first is a conventional 145.9 MHz/28.4 MHz Mode A transponder, and a new 145.9 MHz/435.1 MHz Mode J transponder, a similar frequency combination to that pioneered by the OSCAR IV spacecraft in 1966. Six channels of telemetry are provided to monitor the onboard status of the spacecraft. The spacecraft makes extensive use of parts left over from the AMSAT-OSCAR 7 and Phase III programs.

MISSION OBJECTIVES

The principal objective of the AMSAT-OSCAR D spacecraft is to provide educational opportunities for the study of communications and related subjects. Other objectives include the use of satellites as an educational tool in schools or other educational institutions. The spacecraft will demonstrate the feasibility of using satellites for educational purposes, including communication between remote centers located in various locations, most of which have not been flown in the AMSAT Phase II series. The spacecraft will be used to conduct experimental studies in various disciplines, including space science, education, and communication technology. The spacecraft will also be used to conduct educational experiments in various schools and universities, with the goal of increasing the interest of students in science and technology.

AMSAT-OSCAR D will permit the continuation of the educational program which began with the AMSAT-OSCAR 5, 6, and 7 spacecraft, and which has been used extensively by many schools and universities. The spacecraft will be used to conduct educational experiments in various schools and universities, with the goal of increasing the interest of students in science and technology. The spacecraft will also be used to conduct educational experiments in various schools and universities, with the goal of increasing the interest of students in science and technology.

SPACECRAFT DESCRIPTION

AMSAT-OSCAR D is a communication satellite in the Phase II (low-orbit) series, designed to operate with small stations in the amateur-satellite service on a non-commercial basis. The spacecraft contains two communications transponders and telemetry systems. The spacecraft is powered, weighs 60 pounds, and is a 15-inch rectangular solid 13 inches high. It is an active satellite system as a resource for demonstration and experimentation.

Two types of communications transponders are aboard the spacecraft. Normally, only one transponder will be operated at a time because of spacecraft battery constraints.
The solar cells, combined with a 12-cell, six-ampere-hour rechargeable nickel-cadmium battery should be adequate to power the spacecraft with a positive power budget in Mode A for several years even considering solar cell degradation in the radiation environment. The power drain in Mode J is somewhat larger, and so the Mode J transponder probably cannot be operated continuously. A battery charge regulator is also contained which converts from the 28-30 volt solar array voltage to the 14-16 volts required by the battery. It also tapers the charge rate so that the battery trickle-charges as the battery approaches full charge (as indicated by the battery voltage).

Stabilization System

Four permanent magnets located inside the spacecraft and aligned along the 2 axis provide stabilization, as in AMSAT-OSCAR 6 and 7. The polarity of the magnets is such that the top (+2 axis) of the spacecraft always points toward the magnetic North Pole of the earth. Hysteresis permalloy damping rods mounted behind the +X, -X, +Y and -Y solar panels are designed to reduce the spin of the spacecraft about the 2 axis, functioning in a manner similar to a shorted transformer turn as it cuts the lines of flux of the earth’s magnetic field. The permalloy rods are leftover from AMSAT-OSCAR 7, which successfully used the same type of stabilization system.

LAUNCH INTERFACE AND ORBIT

The AMSAT-OSCAR D spacecraft is being launched from the NASA Western Test Range as a secondary (“piggyback”) payload with the NASA LANDSAT-C earth resources technology satellite and the NASA PLX (Plasma Interaction Experiment). The spacecraft will be ejected from the second stage of the two-stage Thor-Delta 2910 launch vehicle 5120.6 seconds after liftoff, at an approximate position of 78 degrees N, latitude and 15 degrees W, longitude. Programmed orbital parameters are:

Apogee: 577 statute miles
Perigee: 549 statute miles
Period: 103 minutes
Inclination: 99.0 degrees
Time of Descending Node: 9:30 AM (launch window from 9:54-10:24 AM)

The orbit is planned to be sun-synchronous, with passes repeating at the same time each day on a one-day cycle (as opposed to the two-day cycle of AMSAT-OSCAR 6 and 7).

SPACESTATE INITIALIZATION PROCEDURE

AMSAT-OSCAR D will automatically be powered up upon ejection from the Thor-Delta launch vehicle over Northern Greenland at which time it will assume the next available number in the OSCAR series. It is designed to initialize itself in Mode J (two-meter-to-seventy-centimeter transponder ON). The two-to-ten meter (Mode A) transponder will be initialized OFF and should be kept off until the spacecraft is nearly completely stabilized, which may require a period of as much as a week. Because of the non-rigidity of the deployable ten-meter dipole antenna, this antenna must not be deployed until the spacecraft spin rate is less than 8 rpm; otherwise, the antenna may be severely damaged or may not deploy properly. AMSAT-OSCAR D’s ten-meter antenna is comprised of tubular extendable members which are unraveled slowly from the spacecraft by small motors. The deployment process takes approximately 15 seconds and is non-reversible (i.e., the antenna elements cannot be retracted once they are deployed). During the time when the antenna is being deployed, the telemetry beacon switches from its normal Morse code format to a series of keying pulses, the rate of which is a function of the tip-to-tip length of the ten-meter dipole, and the rate-of-change of which indicates the rate of deployment. The telemetry tone should be carefully tape-recorded during deployment of the antenna to permit analysis later to verify success.
Telecommand Verification Procedures

AMSAT-OSCAR D's telecommand and telemetry systems have been designed to provide two means to easily verify whether the spacecraft is accepting commands. First, when the telecommand system has been enabled and is ready to accept a command, the Morse code telemetry will be interrupted, and an unmodulated carrier will be heard on the beacon frequency. The beacon will revert back to Morse code telemetry when the telecommand system is no longer enabled.

The second method of telecommand verification is to use the "Ten-meter antenna Deployment" command. This will cause a series of key pulses to be heard on the telemetry beacon in place of the Morse code telemetry if the command has been accepted. The "Ten-meter antenna Deployment" command should be sent once every 20 minutes in order to restore the beacon to the Morse code telemetry mode. (WARNING to telecommand station operators: Do not use this second method of command verification until positive confirmation by AMSAT that the ten-meter antenna has been deployed.)

Telemetry Interpretation

The most important telemetry channel that will affect operations decisions is channel 3 (battery voltage). In Mode A the spacecraft should maintain a positive power budget so that there should not be a net discharge of the battery over an orbit average. Mode J operation, however, requires somewhat more power, which may result in a net discharge of the battery, especially under conditions of high transponder loading, and therefore it will be necessary for telemetry and telecommand stations to keep a close watch on the battery voltage so that action can be taken as necessary to command the spacecraft into Mode D (charge mode) before the battery discharges too far. Three cutoff levels are specified below:

| Red Level "A" | 1.2 volts/cell | Ch. 3 = 40 counts |
| Red Level "B" | 1.1 volts/cell | Ch. 3 = 50 counts |
| Red Level "C" | 1.0 volts/cell | Ch. 3 = 30 counts |

Red Level "A" should be used during the first year or so of the spacecraft's life as the cutoff point below which telecommand stations should command the satellite into Mode D for recharging. Later in the spacecraft's life as the battery discharge characteristic curve changes, Red Level "B" should be used, and Red level "C" should be used if there is evidence of deterioration of the battery, or if it is desired to recondition the battery.

Channel 1 (solar array current) provides an indication of whether the spacecraft is in the sun or eclipse (it should read in the nineties in counts when in eclipse.) Fluctuation in ch. 1 telemetry is the best indicator of the rate of spin of the spacecraft, along with observations of fading, particularly of the 435 MHz Mode J downlink signal from the uplink 435 MHz monopole antenna. Channel 2 (battery charge-discharge current) gives information on whether the battery is charging or discharging. A reading larger than 50 counts indicates that the battery is charging, while a reading of less than 50 counts means the battery is discharging. There is a two-second integration time associated with the current telemeasured on this channel. The total power drain of the spacecraft can be determined by observing channel 2 while the spacecraft is in darkness (as indicated by channel 1, which should read in the nineties in darkness).

Telemetry channels 4 and 5 (baseplate temperature and battery temperature) should generally track within a few degrees (except perhaps in the first day or so after launch when the spacecraft has not yet stabilized at thermal equilibrium.) Experience from AMSAT-OSCAPS 6 and 7 indicate that the battery can overcharge and overheat during periods of the year when the spacecraft sees the sun most of the time. If this is the case, channel 5 may exceed channel 4 in temperature by 10 degrees or more (Centigrade), and action should be taken to reduce this overheating. This can be accomplished by keeping the spacecraft in Mode J to consume any extra charge current from the battery.

Channel 6 is a measure of the Mode J transponder 435 MHz RF power output. Associated with the telemetered readings is an integration time of 2.5 seconds, so that it is average power rather than peak power that is telemetered. There is no telemetry of the Mode A transponder. The Mode A transponder power consumption (largely determined by the PA current) can be measured by observing channel 2 telemetry as noted above.

OPERATING SCHEDULE

Since the prime mission of the AMSAT-OSCAR D spacecraft is to use the Mode A transponder for the APRS OSCAR educational program in schools, the spacecraft may be left in Mode A during weekdays (Mondays through Fridays, U.S.A. time), and put in Mode J on weekends. Note that all communications should conform to the GIKCS band plan. Additionally, if not an excessive burden on the telecommand stations, evening orbits in the Western Hemisphere (morning orbits in the Eastern Hemisphere) can be switched to Mode J, battery permitting. In any case, all operation in Mode J will require careful monitoring of the battery charge level (as indicated from channel 3 telemetry, battery voltage). The power budget may not support the Mode J transponder for fulltime, continuous operation in this mode over an entire weekend.

In any event details of the operational modes of the spacecraft will be announced by AMSAT in the Newsletter, and later updates on the AMSAT NewsNet.

AMSAT-OSCAR D will operate in a 560 statute mile orbit, i.e., at just over half the altitude of the 910 statute mile orbit of AMSAT-OSCAR 7. Thus, communication ranges will be different. The usual 6000 miles instead of the 2400 miles of AMSAT-OSCAR 7. This means, for example, that trans-Atlantic communications will still be possible but not as often as with AMSAT-OSCAR 7.

Keeping track of this satellite is going to be much simpler than for AMSAT-OSCAR 7. It will come into range at the same time each day (more or less); the overhead descending node pass is planned for 9:30 A.M. local time.

CREDITS

AMSAT-OSCAR D as a spacecraft was built primarily because the Phase III spacecraft would not be available until 1979. By stretching its resources almost to the limit, AMSAT has been able to work on both the Phase III spacecraft (with lots of publicity) and AMSAT-OSCAR D (with hardly any). It is possible we might have all those who contributed to the construction of the spacecraft, but a few calls can be listed as follows:

JAMSAT - Mode J Transponder
JALANG, JALCRE, JLGCM, JALIVO, JALJHF, JRLPB
AMSAT - Mode A Transponder
W4DDU, W3PK
Morse Code Telemetry System
W4DDU, W3PK
Telesystem
W3EAY, W3LND, W3ACCE, W3HUC, W3TO, K1RT/1WJJC
The G3ZCZ Satellite Band Plan

This band plan proposed in the September 1977 issue of the AMSAT Newsletter has been adopted by the AMSAT Board of Directors as the recommended operational usage of the AMSAT-OSCAR communications transponders. This conforms to the normal downlink usage of the AMSAT-OSCAR 7 satellite over Europe.

This plan allocates a percentage of the available radio frequency spectrum as seen on the downlink to different modes of communication. The relative amount of spectrum for each mode is thus the same for any transponder in any satellite.

The allocations are as follows:

<table>
<thead>
<tr>
<th>GUARD</th>
<th>CW</th>
<th>RTTY</th>
<th>MIXED MODE</th>
<th>SSTV</th>
<th>SSB</th>
<th>GUARD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td></td>
<td>10%</td>
<td>30%</td>
<td>5%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Notes:
1. Guard Area to avoid interference to beacons. These frequencies are available for Emergency and Bulletin Stations.
2. RTTY and SSTV are placed at the edge of the CW and SSB passbands, conforming to their usage at HF where RTTY is present within the CW space and SSTV is transmitted in the SSB subband.
3. Mixed Mode Area. This is recommended for crystal controlled stations, or by DXpedition stations, or anyone wishing to work both CW and SSB stations.

This band plan is always based on percentages of the downlink passband. It applies to both inverting and non-inverting transponders. The allocations of frequency for AMSAT-OSCARs 7 and D are as follows:

<table>
<thead>
<tr>
<th>LF GUARD</th>
<th>CW</th>
<th>RTTY</th>
<th>MIXED MODE</th>
<th>SSTV</th>
<th>SSB</th>
<th>HF</th>
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<tbody>
<tr>
<td>MODE A</td>
<td>29.4</td>
<td>29.415</td>
<td>29.465</td>
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<td></td>
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<tr>
<td>MODE B</td>
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<td>145.94</td>
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<td>145.975 MHz</td>
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<tr>
<td>MODE J</td>
<td>435.1</td>
<td>435.135</td>
<td>435.165</td>
<td>435.2 MHz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Guard Channels 5 kHz
PART II -- Assembling the Computer

The computer can be assembled in a logical order so that at each stage, the previously built sections can be used to test the new section just completed. Since new S-100 cards are constantly being announced, and the price of the hardware is also, in the main, dropping, it is advisable to purchase only as much hardware as you will require for the next stage.

The first thing to do is to build the power supply and cabinet. The power supply must have the following characters for output capability.

- +8 to +10V at 10–20 Amps
- +16 to +18V at 2 Amps
- -16 to -18V at 2 Amps

Since all S-100 cards have onboard voltage regulation, the main power supply voltages do not need to be regulated.

The Cabinet

This should be a box big enough to contain the motherboard (and power supply if you intend to put it in the box). The minimum quantity of switches are "reset, (power on/off) and boot". If you plan to do a lot of I/O operation, common in amateur radio applications, a front panel input and output port would be advisable. Software can be written to sense the switches and output to the display depending on the state of itself. The motherboard should be installed in the cabinet. If you do not plan to fill it up with cards, space the connectors when you do solder them to the motherboard. Take care in the construction of your cabinet. No matter how many switches or lights it contains, it is the part that all visitors will view and thus should truly reflect the best of your workmanship.

The Logical Card Building Sequence

The cards should be assembled in a logical order such that results may be obtained from each, giving a level of confidence to the builder. A suggested order is as follows:

1. Front Panel Interface
2. Video Display or I/O
3. Memory (one ram/rom at this time)
4. CPU
5. Remaining Memory
6. Cassette I/O
7. Any remaining

If you don't build a hardware test facility (or the full front panel), get your cards tested by a friend in his machine. There is nothing more frustrating than owning a system in which a lot of dollars have been sunk and have it do nothing and not be able to troubleshoot it.

Front Panel Interface Card

This card is built on a Vector Wire Wrap Card. It contains hardware circuitry to single step the microprocessor, generate the MEM signal, reset the S-100 on turn-on, and display the contents of the address and data busses on a front panel. By putting the CPU in the hold state, the front panel can be used to examine and change the contents of memory locations and I/O ports. A presetable up-down counter is used to address the memory. Buffering is provided for the following control bus signals so as to enable their display on the front panel: IOW – IOR, MEMH MEML STK WAIT HOLD ELTA and INTE. Decoding is provided for two output and one input ports.
Amateur Radio Card -- 1

The ARC-1 is built on an IO-2 card. It contains the following I/O circuitry:

1 input port (8 bit parallel) - TTL Level
1 output port (8 bit parallel) - TTL Level
2 control bits (one to each port) - TTL Level
2 status bits (one from each port) - RS-232/20mA levels
1 programmable serial port
1 programmable baud rate generator

The parallel port circuitry uses 8212's and the serial port uses an 8251 USART. The serial port is thus programmable for asynchronous (RTTY) 5 or 8 level signals. The serial input line is also available separately for Morse Code decoder software. The programmable baud rate generator uses a 4,509 MHz crystal (so as to be bus clock independent) and provides the following baud rates under software control 45.5, 50, 56.8, 74.2, 75, and 110 bauds. At present schematics but no write-up exist. A block diagram of the card circuitry is given below.

Antenna Az-E1 Control Card

WN0X has developed an S-100 Antenna Control Card on wire wrap with the following specifications:

- 3-1/2 digit A/D Converter
- 8 channel Analog Multiplexer
- 4 Relay Lines (Up, down, left, right)
- Spare I/O port for station control

The price of a pc kit version of this card would be under $100.00. We need to know if you are interested in such a card so as to decide if making a pc layout is worthwhile. If you would like such a card, please send a QSL/post card to GE2CZ now.

Answers to Questions

This section is in lieu of individual replies in order to save time.

The AMSAT-80 can be a stand alone machine. It is designed as a modular system of hardware and software. The software is mostly hardware independent and can run on any 8080/2-80 machine. The only hardware dependent software written at this time is the VB-1 driver routines.

The AMSAT-80 as a construction project is designed as a group project. If you don't have adequate experience and test facilities, think twice about building it. If you have an 8080 system and have applications software that you'd like to share, let us know. It will save us re-inventing it. We now need an interrupt driven Morse Code to ascii conversion routine (paper tape source code) or 100 baud audio cassette recorded with RTTY tones 170 shift.

AMSAT-80 COMPUTER PROJECT PROTOTYPE

Group Purchase Plan Update

VB-1 Video Display Board - Price reduced to $110.00
10-4 I/O Board, New - 2 serial ports multibaud rates
  2 Input ports (8 bits each) $110.00
New Memory Board - See page 3 of December KIJANMUD for specs.
  Wired, tested, and burned-in. Uses 41 TMS-4044
  4K x 1 static memory chips $24K - $600.00
  32K - $640.00
  16K - $180.00
  8K - $160.00

Control Card -- 1

The Control Card is built on an IO-2 card. It contains the following circuitry:

- Front Panel Status Lights Drivers
- Sense switch input port
- 2 Input ports (8 bits each)
- 1 Output port (8 bits)
- Boot Start Circuitry
- MEM Generator
- VB-1 Hardware accessories
- Run/Stop Flip-Flop

The VB-1 hardware accessories include scrolling rate, cursor blinker, bell circuit. The I/O ports will support a keyboard, bell, control and status lines, etc. Schematics only exist at this time.
When I became involved with the world of Microcomputers about eighteen months ago, I had no idea that they would be able to play such a great part in my Amateur Radio activities. I have since used the computer for many ham related activities: everything from keeping maintenance records, to logging. I can not only use it to log each QSO, but can use it to copy the log. This has proven very handy for contesting. Not only these chores are handled by my Commodore and Technical Products 6800 machine. I am also able to send and receive high speed Morse code, displayed in video, of course, with the system. This feature, coupled with the log program, and a simple monitoring system, will allow me to try to be the first to achieve DXCC without making a single transmission myself.

However, this is not the topic of this article. The real purpose herein is to present a highly accurate, and very reliable OSCAR Prediction program, capable of being used on systems with small memories, simple basic languages, and even on programmable hand calculators. Being designed for use by the simple user, the program allows for the use of fixed point arithmetic operations, yet it provides 4 digit accuracy in the figured E0X longitudes. Not only this, but you can forever after put away your OSCARLOCATOR, as the program also will tell you if the orbit can be accessed from your QTH!!

Run with a day to day reference information update, the program is flawless. Checking the results of the calculations over a full year of orbits, the error is small, but significant. The error is caused by the fact that the satellite orbit is slowly changing. The figures that are provided to the ARRL for broadcast over WIAW, are regularly corrected by ANSAT to compensate for these changes, but, even with this factor not accounted for in the program, the use of daily reference figure updates, which are readily available, will give the user very accurate predictions.

Now, into the next of the program. As with any calculative program, the user inputs are called for first. These appear from lines 60 to 150 of the program. The lines preceding this can be eliminated to save memory, as they play no part in the function of the program.

Starting at line 200, the parameters have been set, and the program begins calculating the desired information. Line 200 sets the orbit counter to the difference between the number of the reference orbit, and the target orbit. This counter is used to stop the program, when the desired number of orbits have been completed.

The times, in seconds, minutes, and hours are calculated from line 250 to line 265, inclusive. The seconds are calculated first, and if the number of seconds is greater than 59, the minute counter is incremented by one. The program then checks to see if the number of seconds is less than 59, and if it is, the process repeats itself until there are 59 or less seconds, incrementing the minute timer each time there are more than 59 seconds showing on the counter. The number 59 was used, as the 60th second of each minute is zero.

The minute calculations are accomplished in the same fashion, with the exception that the hours are incremented. The hour clock in the program was set for a 24 hour clock, and when the hours go beyond the 23rd hour, the program increments the day counter (date) by one. No provisions are made in the program to change the month counter or the year counter, so it is possible for the program to give us a 32nd day in December, and not change the year. These provisions could be easily added, but they would force the program to occupy more than the less than four K that it presently does.

Lines 300 to 387 calculate the E0X longitudes for each of the successive orbits. Line 389 increments the orbit counter to see if the calculations are finished. Line 390 will end the program when all of the calculations are complete.

Lines 395 to 550 print out the orbital reports. The addition of the following statement will provide a delay for each frame that the program prints.

Line 555 LEF V = 750
560 LEF V = V-1
565 IF V > 0, THEN GO TO 560.

Line 550 sends the program to the subroutine that is used to determine if the satellite should be accessible from a QTH. The numbers used in lines 200 to 206 should hold fairly accurate for anyone living in Southern New Jersey, but if you live in the Southwest, like one full heals a SATELLITE to determine the figures that you should use. I will now explain how to get the figures from the SATELLATE.

The figure 110, used in line 202, was derived from the westernmost point that intersects the RANGE circle centered on my QTH. This was found by placing the satellite on a map, in such a manner that the westernmost intersection was displayed, and then the longitude was read from the equator circle.

The figure 210 used in line 203 was similarly found, but this time, the westernmost descending node point was established.

In line 204, the number 319 represents the westernmost intersection for descending node orbits.

Three-hundred thirty-nine in line 205 represents the point at which the orbit begins intersection of the range circle on the late afternoon passes.

Two-thousand six is the last determining line, and the number 340 is the point where the orbits again begin to intersect the range circle.

Remember when using this function, that certain passes indicated as accessible by this system are marginal AT BEST. This is because the figures represent the long range reception edges, to allow the user the possibility of experimenting with band conditions, antennas, and any other trick one might try to use to get a few more receptions per week from the satellite.

That's it, that works, and if enough interest is shown in the use of computers and amateur radio, perhaps I'll sit down and type out the text of some other OSCAR programs in the future, like one full heals a SATELLATE to determine the azimuth and elevation of the beams I use for OSCAR.

10 PRINT"OSCAR ORBITS FOR SIMPLE MINDED BASICS"
20 PRINT"WRITTEN BY DAVE JONES, WA3AML"
30 PRINT"REV.1.5 C 1977"
40 PRINT"LAST UPDATE AND DATE OF REFERENCE ORBIT"
50 INPUT L,F
60 PRINT"INPUT THE REFERENCE ORBIT NUMBER"
70 INPUT L
80 PRINT"INPUT THE LONGITUDE OF THE E0X IN DEGREES AND TENTS"
90 INPUT L,G
100 PRINT"INPUT THE TARGET ORBIT NUMBER"
110 INPUT J
120 PRINT"INPUT THE TIME OF THE REFERENCE ORBIT INHRS,MIN, &SEC."
130 INPUT H,B,C
140 LETF=31-F
150 LETG=R
160 IFF=50LGT-G+58
170 IFK=50LEB-B+114
180 IF=IFF+59LEB-B+1
190 IF=IFF+59LEB-B-10
200 IF=IFF+59LEB-B-5
210 IF=IFF+59LEB-B+5
220 IF=IFF+59LEB-B+10
230 IF=IFF+59LEB-B+20
240 IF=IFF+3LLEB+B+1
250 IF=IFF+3LLEB+B-20
260 IF=IFF+3LLEB+B-10
270 IF=IFF+3LLEB+B-5
280 IF=IFF+3LLEB+B-1
290 IF=IFF+3LLEB-B+1
300 IF=IFF+3LLEB-B-1
310 IF=IFF+3LLEB-B-5
320 IF=IFF+3LLEB-B-10
330 IF=IFF+3LLEB-B-20
340 IF=IFF-9999LEB-L+1
350 IF=IFF-9999LEB-L-10
360 IF=IFF-9999LEB-L-100
370 IF=2000LGT-G+1000
380 IF=2000LGT-G+30
390 IF=2000LGT-G+30
400 IF=2000LGT-G+30
410 LETK=K
420 IFK=00G00TO3000
430 LETL=K
440 LETL-0-1
450 PRINT"OSCAR REPORT FOR ORBIT NR.:";0
460 PRINT"LEF=",L,F;"";
470 PRINT"LEF=",L,F;"";
480 PRINT"LEF=",L,F;"";
490 PRINT"LEF=",L,F;"";
500 PRINT"LEF=",L,F;"";
510 GOSUBB2000
520 IFK=00G00TO3000
530 END
Although AMSAT-OSCAR 6 operations have passed into history, AMSAT-OSCAR 7 entered its fourth year of operation in November. AMSAT-OSCAR D is scheduled for launch in March 1978 and the Soviet 86-OSCAR series has been announced. Thus, 1978 should be a bumper year for radio amateur space communications with three active operational spacecraft in orbit.

These Phase II satellites are forerunners of an operational amateur radio space service in the sense that the orbital passes are short (18-22 minutes) but they have demonstrated the potential of the Amateur-Satellite Service, a resource that will be fully realized with the launch of the first Phase III spacecraft in 1979.

The potential for the uses of the Phase II spacecraft are described below. They are many and varied. Some have been demonstrated systematically, some have not. If you are interested in active AMSAT operations, why not use your equipment to perform or carry out some of these experiments.

- Small-terminal "Bush" Communication Tests

"Bush" or "out-back" communication of a non-amateur variety, such as might be found in Alaska, northern Canada, Australia, Antarctica or the developing countries, is analogous in many respects to amateur communication anywhere in the world. Many amateurs regularly use small portable HF and VHF transmitters and receivers, equipment installed in automobiles, and hand-held equipment. The Phase II spacecraft are designed to provide long-distance VHF communication at distances up to 3,000 miles, especially needed at night or during other times when long-distance ionospheric communications at HF are difficult.

- Emergency Communications

Radio amateurs have, on numerous occasions, provided the only source of communication in time of emergency. The 1970 earthquake in Peru and 1972 earthquake in Managua are but two examples. Indeed, in setting forth the basis and purpose of the amateur service, the U. S. Federal Communications Commission cites "...the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications." It is expected that Phase II spacecraft can be used in support of such communications during any such emergencies, as a backup for HF radio, which is highly dependent upon favorable ionospheric conditions.

- Medical Data Communications

Many cases have been documented in which amateur communications were used to locate needed drugs, diagnose a rare disease, or give medical instructions during surgery. Phase II spacecraft are capable of relaying such communications, and in addition, tests will be continued between medical centers and hospitals in isolated areas to exchange medical data using the satellites to relay this information. The National Institutes of Health Radio Amateur Club in Bethesda, Md. has already been involved with the University of Arizona Medical Center in this aspect of the amateur satellite program.

- Mobile Terminal Communication

AMSAT-OSCAR 7 and D employ circularly polarized uplink antennas so that the spacecraft can potentially provide further useful data on satellite signal propagation to mobile terminals. Aircraft, ship and automobile amateur terminals will be installed to provide further information on the feasibility of using VHF/UHF satellite mobile terminals over all possible satellite elevation angles and with several types of modulation.

- Direct Satellite-to-Home Voice Broadcasts

The transmitter power output of Phase II satellites are expected to be sufficient so as to permit useful reception with ordinary amateur receivers using low-gain receiving antennas. Transmissions using the satellite transponders, such as those conducted at the Technical University of Budapest, will demonstrate the potential of using satellites for satellite-to-home voice broadcasting directly to conventionally inexpensive receivers. In addition, it is anticipated that satellite experience will lead to the development by amateurs of increasingly simple ground equipment for these applications. Amateurs have a history for devising innovative methods for producing simple equipment at low cost.

SUGGESTED EXPERIMENTS

- Educational demonstrations in schools.
- Ranging (distance-measurement) experiments to determine satellite or user position.
- Doppler (range-rate) measurements to determine satellite or user position.
- Emergency Locator Transmitter (ELT) experiments to locate downed aircraft or ships in distress.
- Small-terminal user experiments using hand-held equipment, or mobile terminals operated from an automobile, airplane, boat, motorcycle or bicycle.
- Emergency communications demonstrations with portable equipment.
- Medical data transmission experiments, including the transmission of analog or digital physiological data (e.g., ECG's and EEG's).
- Data collection from remote, unattended ground terminals.
- ASCII data transmission experiments, including remote accessing of digital computers.
- Slow-scan and medium-scan television experiments.
- Remote control experiments (such as radio-control aircraft, garage-door opener, remotely controlled kitchen ovens, etc.)
- Transponder interlinking experiments between different Phase II spacecraft.
- Multiple-access experiments (such as quantitative experiments to evaluate the effects of power sharing with different modulation techniques).
- Ground station automation (closed-loop monitoring of downlink signals and automatic adjustment of uplink power and frequency).
- "Broadcast" demonstrations using the transponder in a single-access mode, evaluating performance for different modulation modes.
- Extended range communications experiments to attempt transmission or reception beyond the normal maximum satellite range.
- Low-power (QRP) user experiments to determine the minimum power needed to sustain communications.
- Traffic nets scheduled on the satellite.
- Automatic tracking of ground station antennas in azimuth and elevation (either on an open-loop or closed-loop basis).
- Unattended, automatic telemetry data collection (e.g., using tape recorders for later analysis).
- Unattended online or offline computer processing of received Morse code telemetry data, with printout of parameter values and units. Automatic decoding of Morse code characters in the presence of noise.
- Experiments involving physical parameters, e.g., determination of spacecraft spin characteristics and orientation.
a licensed radio amateur is there to help string a 10 meter dipole, plug in the receiver, tune in the right frequency and explain the "strange" sounds that emanate from the speaker), YOU are needed.

Are you a teacher? Consider using OSCAR in your classroom and spread the word among your fellow faculty. You may find enough strength in numbers to obtain local funding for a school station! And innovative teaching approaches are well respected these days.

Not satisfied with a passive role? Then go out into your community and actively "sell" your School Committee on bringing its students into the space age. If you plan on giving a demonstration, let us know well in advance and we'll send you our demonstrator's kit and help you in any other way possible. One exciting idea has recently been developed into a full scale course by Dennis Brown, an elementary school principal in Lakefield, Minnesota. He, with the help of local amateurs (notably W4UN) is conducting two weekend seminars on OSCAR use in the classroom for nearly ONE HUNDRED area teachers! He took the initiative, obtained a grant from his state's Council on Quality Education and has followed through admirably. (Incidentally, Dennis' daughter did a science fair project on OSCAR for which she won local and regional honors -- to the Browns, OSCAR is a member of the family.)

Others have contributed in many ways in the past and continue to do so today. Special thanks go to W2GN and the OSCAR Education Bulletin Stations, W6DOW, W6ELT, W4UR, W4RMY, W6CG and W6DN, who are responsible for the bulletins beamed to classrooms several mornings each week. And special mention should also be made of Marty Davidoff who has written the excellent manuscript on educational applications of the OSCAR satellites. And our thanks again to those of you who have previously submitted your names as OSCAR Ed volunteers, those who have already assisted in the classroom and those who have sent us stories of students using the satellites in their daily studies.

Whatever your resources, if you are concerned about the future of amateur radio, the OSCAR program and the quality of education at your local schools, please drop me a line. The OSCAR Education Program is one of the best demonstrations for the concern and involvement of today's radio amateur.

The ARRL hopes you will do your part to help make the OSCAR Education Program a resounding success. If you assist a teacher in your local area by giving a demonstration or lecture, have the teacher briefly state your name and what you did on a piece of school stationery. Send this note and a summary of your activities (with clear black and white photographs if possible) to OSCAR Ed, 225 Main Street, Newington, CT 06111. This will help us keep our records of your contributions up to date and enable us to publish periodic summaries in the AMSAT Newsletter. In return, we will send you a complimentary copy of the 1977 Radio Amateur's Handbook (which you may keep or donate to the school library) as a small token of our sincere appreciation.

OSCAR EDUCATION BULLETINS

Want to hear firsthand what's happening in the OSCAR Education Program? Here's how to tune in the Educational Bulletins that are beamed to students across the continental throughout the year. Every weekday that OSCAR 7 is in Mode A, listen around 29,490 MHz during the first two appropriate morning passes (accessible to North American classrooms during school hours). Whenever Mode B falls on a Wednesday, you can catch the bulletins around 145,950 MHz on the same morning passes. We thank you in advance for your cooperation in keeping downlink signals off these bulletin frequencies on the morning orbits.

Many people have found many ways to lend a hand. At the very least you can volunteer to help schools in your area should they request assistance. Whether you have 2 way capability, receive only, or can lend a little moral support (some teachers feel reassured if
I think there is room for improvements in this program, for example, if we use the **RCL** key, we will save a few steps of this program.

One of the weak points of this program is that the order which we set initial data is inverse to the order which we can get the orbital data after calculation. I think if we use a few more steps, we can arrange the same order.

I am very happy if anyone who is interested in this program suggests some improvements and uses this program in order to get orbital predictions.

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**Example:**

If the data of initial orbit are as follows:

- **Orbit No:** 12681, **Crossing Time:** 1:48 (GMT), **Longitude:** 81.1.

**Initial operation:**

- 81.1, **ENTER**
- 1.48, **ENTER**
- 12681

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(Continued on page 29)
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### DO’S AND DON’T’S FOR SATELLITE USERS

**BY PAT GOWEN, G3I0R**

Don’t turn on your carrier, whistle, send CW or otherwise UNTIL you can hear the satellite as evidenced by the beacon. If you have a poor downlink and a good uplink, as the vast majority of European users have, the chances are that you will be blottoing out someone’s dx QSO who can hear you — and how!

Don’t run more than 100 w. e.r.p. at any time, or you will push out those who are playing the game, and give them grounds for irresponsible operating also.

Don’t call that rare dx station you have already worked if others are calling him, or you will be preventing them from having a chance.

Don’t call stations in your own area at horizon times, as they have but a few seconds daily in which to work the distant ones, but most of any orbit to work you.

Don’t call CQ incessantly. A short burst is quite enough, then listen, otherwise you are depressing AGC and using up battery power unnecessarily. Many of the rare ones are crystal controlled, and you will need to listen for them, and they won’t get in in any way if everyone is transmitting.

Don’t transmit SSB in the lower half of the satellite input segment, nor CW in the upper, or you will upset the common mode operation scheme. Also, keep 5 kHz clear of the beacon frequencies.

Don’t transmit off schedule, nor on any Wednesday, unless you have specific permission to do so, otherwise you will be wreaking others’ attempts at valuable work.

Do be aware of the other guy’s horizon, as he may be trying to get those on the limit.

Do pay maximum attention to your receiving system, as when it is good enough you will hear returns from even 100 mW e.r.p. Mode B splinks, and hence work a lot more dx, and run less power yourself. Attention to higher gain, lower angle and less noise on your downlink is cheaper and far more productive than anything else you can do.

Do tell other stations who are not qualifying for the above conditions, fifty times if necessary, as they will not cease their bad practice unless they are helped to realize that it is unethical.

Do listen attentively on the frequency that you are considering using, until you are sure that another station is not already there.

Do use the outer limits of the passband, thus avoiding the already overcrowded centre, and encouraging others to spread out too to avoid unnecessary QRM.

Do listen to codestore, bulletins, news items and the nets, and benefit by applying the updated operational information heard.

Do keep clear of specific frequencies where rare or weak ones are known to be, and do not sit there and call CQ hopefully, listen instead.

Do move off a frequency where you have answered a CQ or a call, as it is the original caller’s frequency, and he may be crystal controlled.

Do let people know if you are crystal controlled, by adding “C.C.” or “Xtal” with your call, so that they can comply with the above.

Do try to be patient enough to listen for and work the weak ones, as it is possibly their first OSCAR QSO.

Finally, do try to have meaningful QSO’s via OSCAR, e.g. by spreading the word on new stations, schedules, and items of common interest, rather than merely exchanging a few numbers. Names and QTH’s are a common courtesy on all amateur QSO’s, so why not on OSCAR?

From “OSCAR News”, No. 18, July ‘77

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#### BACK ISSUES AVAILABLE

Back issues of the Newsletter are available upon request in return for a donation to AMSAT.

If you specify what year you first joined AMSAT, we’ll send you an assortment of ten earlier issues for $10.00, or fifteen issues for $15.00.

Certain pre-1974 and the September 1975 issues are not available.

Note that due to the time and effort involved in servicing back issue requests, the minimum donation should be $10.00.

Write to Back Issues, AMSAT, F. O. Box 27, Washington, D. C., 20044.

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THE POWERS THAT BE

BY PAT GOWEN, G3IOR

The opinions aired in this article are not those of G3IOR as a member and representative of the AMSAT Board of Directors, but those of G3IOR as an OSCAR operator.

The purpose of the article is not to please and entertain, but to cause some degree of concern to those who enjoy, and both give and accept much from the exciting use of our satellites.

The intention, at the risk of stepping on some toes, is at attempt to obtain both the recognition and co-ordinated action by fellow OSCAR enthusiasts in an effort to overcome some of the apparent tolerance toward those who are systematically destroying the common means of communication between those who are attempting to use the transport bus in the way set out by AMSAT and the designers of the spacecraft, so that logical and sensible use can be seen to function, and indiscriminate anti-social employment ceases.

The history is that initially, AMSAT-OSCAR 6 was primarily and prematurely killed by the objectionable operation of ultra-high power users, i.e., those who continued, in the face of advice, pleas for common sense, calls for sanity of operation, etc. to employ grossly excessive powers even on scheduled "OFF" days.

The current situation is that now AMSAT OSCAR 7, despite every effort that some of us can make, is continuously being subjected to unnecessary and enormous uplink powers, causing major changes on a regular basis, and in the long term the demise of the satellite due to battery failure.

The situation in Europe is that some ten percent of Mode H users are regularly using uplink powers calculated by ALC observation and known power uplink comparison to be in excess of 10 KW e.r.p. with even a few using stated powers of 50 KW e.r.p. Thus, although 10 KW e.r.p. is highly successful, and furthermore is more than adequate under any range or conditions, stations running outside recommended power of 100 KW e.r.p. cannot be heard while the ALC is maximised by the abusers, leaving them either to be forced to use high power themselves, or to lose interest. It is often impossible to tell these irresponsible power-houses to desist, as few signals can get into the satellites while they are on to be able to tell them, unless one breaks the rules oneself.

AMSAT-UK, while doing little as yet in the building field, has devoted a disproportionate amount of time and postage costs in asking these most persistent offenders to play the game, and the reasons why they should. One particular station in France who regularly uses powers in the order of 15-20 KW e.r.p. on Monday QRP, and on Wednesdays also, has been asked by myself alone some six times to date, with no effect whatsoever.

Papers accepted at the last TARU Region I meeting requesting action on this behavior have had little if any effect, and the power escalation continues, with the result that many logically powered stations in remote and rare areas have little success while the satellite is within the range of the problem users.

We in Europe have suffered from the morosity since the flight of AMSAT-OSCAR 6 when the satellite(s) are sometimes impossible to use on evening and weekend orbits, but now, with the QRO menace causing Mode switching or total loss of any transponder, their effect is being evidenced to stations well beyond their normal crippling range! If no improvement occurs, the affects of what they are apt to do the Phase III, when the increased simplicity of a direct non-tracking large array is possible, bears consideration. They will then be directly audible by the entire Northern Hemisphere, and attentuate everyone.

One particular problem that we have here in Europe is large numbers of stations who have obtained their VHF phone only license without the need to ever know a note of CW. Thus, they cannot read codestore messages, have little idea of weak signal operation, cannot enter and thus ignore the many informative HF nets run by AMSAT-UK, and are only familiar with the wide open spaces where optimum power affects DX. It is apparent that their regional societies, TARU, AMSAT, and their license authorities are ineffective in reducing the problem that they are causing, thus, it is a problem that may lay in the hands of others.

May I, sounding contrary to the usual "amateur spirit", recommend the following points.

1. Do not compliment stations on their strong signals, as if it was something to be proud of. If they are stronger than the beacon, then you are safe in assuming them to running unnecessarily high powers, so only call them to tell them to "QRP or QRT" and why!
2. Only use high power yourself momentarily to get a signal across to the problem causes to perform the above.
3. Encourage AMSAT to build a scanning ALC system into the next satellite so that QRO use is not only ineffective, but counter-productive as well.
4. Do not respond to QRO callers, but call those who are no stronger or who are weaker than you are, but say why you don't encourage excess power, too.
5. Talk ABOUT OSCAR when USING OSCAR to give some idea on the technicalities and the code of conduct to those who are so out of touch with it in every way except sheer brute force power.
6. Spend a little more time listening rather than calling those strong stations you have worked many times over. The less input, the greater the input sensitivity, and you will hear many a rare one come up out of the noise.
7. If you cannot tell the offending station because of the effect that he is having upon you, then write to him, which will also allow you to express your feelings in finer detail.
8. Write to the AMSAT Newsletter, listing the calls of those who persistently break the havoc. It may be possible to award the stations listed ten times or more a silver pin-through-the-coax in recognition of services rendered.

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The meeting began with King reporting on developments concerning obtaining a suitable facility for AMSAT. King and Clark have approached GSFC through the Public Information Office, looking for at least 1000 square feet of working space, either vacant existing space or a place to erect our own prefabricated building. Locations adjacent to the GSFC Radio Club or to the Visitors Center were mentioned. Apparently a prefabricated building would not be appreciated next to the Visitors Center, though the PIO also new visitors a satellite under construction. A building about 24 by 36 feet is contemplated.

Clark felt that financial guidelines were needed in order to continue the negotiations.

There was an agreement without dissent that negotiations continue with a tentative limit of $10,000 expenditure on AMSAT's part. The Board will act on any tentative agreement at the appropriate time.

Tynan proposed that $10,000 be allocated for facilities on GSFC grounds. Clark felt that this was a vote of confidence, but that a final commitment should not be made at this time.

There was a short discussion of the proposed gift of equipment by KBMN.

There was a discussion of the heavy workload on the volunteers in the AMSAT administration, particularly those handling membership expansions and renewals. King proposed that AMSAT employ a person for office work on membership/administrative work. Klein suggested that the apartment next to his will be available for this purpose, and stated that he expects AMSAT to have a person on duty there during working hours. This would be a reasonable work station for the proposed employee. Clark suggested employment of a recent-graduate ham such as the ARRL often employs. Klein moved that the Board of Directors authorize the employment of administrative help. This was seconded by King, and approved by those present. Clark suggested placing a notice in HR Report.

There was considerable discussion of a request from ARRL for use of the AMSAT mailing list to advertise their new publication "Getting to Know OSCAR from the Ground Up." On a motion by Dorian, seconded by Tynan, this use was approved.

Clark noted a letter from the Secretary requesting to be replaced after the 24 October 1977 Administrative Volunteers meeting.

There was a discussion of the progress and management of the AO-D project. Klein, the project manager, felt that progress was sufficiently advanced to ensure meeting the 17 February 1978 launch date. King wished that Daniels part in the construction of AO-D be recognized by all. Klein gave a short review of the status of AO-D components. He will present a detailed schedule to Board members by 22 September 1977. There will be a status report to ARRL on 9 October 1977. A dry-run of the AO-D/PHASEMATE hardware will take place 5 October 1977.

King noted that the project manager of Landsat is still objecting to the launch of AO-D with his flight on a 3-day launch basis.

Clark played a portion of a tape letter from Gowan, G3IOR, a member of the Board. The portion commended the decision at the last Board meeting to encourage Board members to participate in hamfests, etc., in order to keep the membership from feeling cut off from AMSAT. Clark summarized two other comments from Gowan; (a) On the subject of an assignment for the University of Surrey control station. King noted that they will again be needed for AO-D, but that a useful task would be an automated telemetry reception station; (b) On the subject of violators of

(Continued on Page 35)
AMSAT VOLUNTEERS' MEETING

A meeting of the AMSAT volunteers assisting in the greater Washington area was held on 24 October 1977 at the NIB ARC station in Bethesda, MD. The meeting was chaired by Bob Carpenter, W30TC, and took place between about 10:00 and 16:00 EDT, with a 45-minute break, while recording the meeting for the benefit of Pat Gown, G31OR. Volunteers in attendance at the meeting were:

Bob Balcom, W3PEK
Bob Carpenter, W30TC
Ed Clammer, W3ON
Tom Capwell, W3LND
Martin Davidoff, K2OHC
Art Feller, W4ART
Bill Book, W3BC
Joe Kasser, G3JC
Jan King, W3GEY
Perry Klein, W3PK
Larry Martin, W3IBO
Walt Rader, W3JMF
John Shew, N4QQ
Earl Skelton, N1ECC
Bill Tynan, W3XO
Will Webster, W2YCN

Items discussed were as follows:

1. OBJECTIVE OF THE MEETING: Perry Klein, W3PK, stated the purpose of the meeting was to discuss the current status of volunteer efforts and in so doing to (1) identify possible problem areas and recommend solutions and (2) avoid duplication of efforts and thus attempt to streamline operations.

2. "WHO'S WHO IN AMSAT": Bob Carpenter, W30TC, reported that the directory "Who's Who in AMSAT" identifying all AMSAT principals by name, function, address, and telephone number was being updated and would be distributed to all persons listed in the directory.

3. MEMBERSHIP PROCESSING:
   a. Gains and Losses in Membership: Bob Balcom, W3PEK, indicated that specific figures regarding the 1977 membership status were not yet available. Preliminary data shows that the net membership growth for the year was approximately 300 members growing at the expense of Regular Members. A problem of about 400 'backsliders' (regular members who fail to renew) was identified. One proposed solution was to forward personalized appeal membership renewal card each back-slder. W3PK indicated that the new AMSAT Administrative Assistant, Martha Saragovitz, may be able to handle this task.

b. New Member Enrollment: With the recent increased PR, processing of new membership applications is running about two months behind, according to Larry Martin, W3IBO. Roughly 60 applications are currently awaiting action but no problems are foreseen.

c. Renewals: W3PK reported that, with the addition of the aforementioned Administrative Assistant, a new addressing system is being introduced which will result in "in-house" handling of most general membership related mailings. Expanded discussion on this point revealed the need for eventual computerization of both membership and user directories. Jan King, W3GEY, advised that a computer would be available at Goddard within the next two years and although its primary mission is directed toward Phase-III flight support, it was felt that administrative problems, as noted above, could also be dealt with on the computer. Joe Kasser, G3JC, offered to investigate the possibility of using another machine during the interim. It was pointed out that any computer utilized by AMSAT should (1) be generally available to the volunteer community and (2) provide straightforward editing capabilities. An interactive facility accessible via telephone/teletype interface would be ideal.

d. Office Space Requirements: Bill Book, W3BC, indicated that the NIB ARC facilities, which continue to be extensively used for storage of AMSAT supplies, would no longer be available after June, 1978 due to large scale modifications at NIB. Thus a 'centralized' storage location for AMSAT paperwork is currently sought. W3GEY noted that any storage space at the proposed AMSAT facility at Goddard would probably be consumed by flight-related hardware. The problem remains.

4. FUND RAISING:
   a. Solar Cell/Phase III Contributions: John Shew, N4QQ, advised that as of 1 October about 1200 solar cells ($10) and 24 battery cells ($20) had been sold. N4QQ urged greater utilization of the donor information, e.g., follow-up next year with a personalized mailing to all previous donors requesting additional support.
   b. Miscellaneous Income Producers: W3PK suggested that A-0-7 Orbital Calendar income might be supplemented in 1978 through production and distribution of similar A-0-D and RS calendars.

5. AWARDS, CERTIFICATES, AND CONTESTS: Earl Skelton, N1ECC, reviewed the AMSAT awards program which is currently offering the following awards: AMSAT 1977 Award, Oscar Satcom Hall Award (OSA), and the recently created Oscar Century Award (OCA). As of 24 October, the number of awards issued are as follows: OSA 42; OSCAR 33; 1977 10; OCA 7. (The OCA have not yet been delivered due to delays in printing.) There are also several local award managers participating in the awards program: DC9DC, F6SBK, G9KLO, O21KL, SP9DH, VK5HI, and ZL2G. The awards committee is still expecting in that all outstanding applications for the return of all evidence submitted in support of award applications. It was noted that the number of received applications has been declining in recent months; a reduction in the award distribution was additional publicity. The question of an exclusive Award, i.e., satellite only, communications contest was raised but support was weak to non-existent.

6. TELEMETRY REPORTS: W3GEY advised that, although currently little use is being made of the A-0-7 telemetry data, it is important to continue this operation. He prefers this to cease and a handleable for most applications. W3GEY further advised that a large scale data reduction service was needed, e.g., to reduce say 30 days of telemetry data to a single page. A solution to this may be on the horizon.

7. ACTIVITY REPORTS:
   a. Walt Rader, W3JMF, reported on the processing of Oscar activity reports. His extensive efforts to encourage non-AMSAT applications for exchange of telemetry data and satellite, i.e., satellite only, communications contest was raised but support was weak to non-existent.

8. QSL BUREAU: W3PK advised that three offers have been received to take over operation of the AMSAT QSL Bureau from WAI8HP. A decision regarding the next QSL manager had not yet been made.

9. NEWSLETTER: G3JC noted no serious problems with the operation of the Newsletter, other than a need for the submission of copy. The continuing need for satellite articles, preferably with black and white photographic work, was stressed. In addition, it was suggested that a package of honorary AMSAT membership upon the noted science fiction writer Arthur C. Clarke could be ready for the December Newsletter. G3JC noted that noteworthy items appeared to be forwarded to him for the purpose of documentation. In response to this, it was agreed to provide Joe with copies of "envelopes," in which most of the 'hot' items are usually published the week following their appearance on the Nets.

10. NETS:
    a. Will Webster, W2YCN, reported on the operation of the various AMSAT Nets. The effectiveness of Net operations was aptly demonstrated recently in terms of the annual election: a concerted effort was made during the two to three days preceding the annual election to "get out the vote," a three-fold increase in ballot receipts speaks for itself. The only anticipated change in Net operation times with the semi-annual conversion between UT and ET will be the local 2n FM Net, which will move from 00:00 to 02:00 Z (= 21:00 EST) -- all other Net operating times remain at the same UTC.
    b. Ed Clammer, W3ON, briefly reviewed the operation of the 2n Net and the difficulties in simultaneous operation of more than one transmitter for Net operations were stressed by both W3ON and W2YCN.

11. Miscellaneous:
    a. W3XO suggested that an article be written for the Newsletter providing hints and suggestions for those setting up satellite demonstrations.
    b. It was noted that Wednesdays, the days reserved for special experiments on A-0-7, are indistinguishable from any other day in Europe. A recommendation was made to investigate this problem.

(Continued on Page 37)
MINUTES OF 1977 ANNUAL MEETING
8 OCTOBER 1977

The 1977 Annual Meeting of the Radio Amateur Satellite Corporation was held on 8 October 1977, at the Employees Recreation Center, Goddard Space Flight Center, Greenbelt, Maryland. The meeting was called to order at 1913 EST by AMSAT Exec VP, Thomas Clark, W4JLKD. There were approximately 75 members present including the following members of the Board:

Thomas Clark, W4JLKD
Jan King, W4KII
William Tynan, W4XO

Charles Dorian, W4JLT
Perry Klein, W4KE
Richard Szwirko, KMTU

Clark thanked the Goddard Amateur Radio Club for acting as hosts for the meeting and furnishing the quarters. He introduced two members of that club, W4PA and W4ZJT/C. He then introduced those standing for election to the AMSAT Board of Directors: Webster, W4ZJT; Davidoff, K2ZJC/3; King, W4KII; Klein, W4KJP; Skelton, N3ES; and Smith, VE3SAT, the last ballots having been collected earlier in the evening. The Ballot Teller Committee was counting the ballots at this time. The committee consisted of N8BZ, K2PPO, K2QVS and W4GKF. W3PKZ assisted them in validating members from the membership list.

All attending the meeting were introduced.

AMSAT President Klein, W4KJP, summarized the status of AMSAT. The regular membership is remaining relatively constant at about 2000, but life membership has increased about 30% and now stands at just over 700 life members. He noted that AMSAT-OSCAR 6 had finally failed earlier in the year, after over four years of operation. He mentioned 21 stations who had a significant role in the commanding of this satellite, thus contributing to its useful operation of more than four times its designed lifetime. He then mentioned that the scheduled launch date for AMSAT-OSCAR DWAS 17 February 1978, (now March 5, 1978).

Engineer VP King, W3EY, spoke about the status of Phase III. Work is progressing. The liaison with the European Space Agency, the first launch provider, is quite satisfactory. The structural prototype for use in vibration tests was on display at the meeting. King noted that the Arland launch in 1979 is fully approved and that space on a Spinning Upper Stage launched from a Shuttle flight in 1980 seemed likely to be available. He also mentioned the dilemma caused to AMSAT by the simultaneous possibility of space being made available on the Syncom 4 geostationary satellite carrying a 6-meter dish. He also emphasized his feeling of the importance of amateur radio performing public service activities.

Clark talked further on the attractions of a synchronous orbit. He also emphasized that AMSAT is primarily a volunteer organization and that many of our most vital technical workers feel the need for their AMSAT activities to contain technical challenges and that they would lose interest without new frontiers to conquer.

Webster, W4ZJT/C, objected to the strong emphasis on change. He felt that the emphasis was wrong and that the correct mode of operation for AMSAT (drawn from his work experience in the area of satellite application) would be to FIRST determine the users it intends to serve and then establish a satellite program emphasizing continuity of service to these users. In the case of the education program, he felt that considerably more detailed advice ought to have been given the educational community, such as lists of suggested equipment, etc., before satellite launch if possible. He pointed out the extremely limited discretionary funds available to MOST school science programs for the purchase of equipment for satellites. He felt that changes in new satellites ought to recognize the importance of continuity of service, even if it was mutually exclusive with another service which proved "interesting" to the satellite builders.

W4JLKD commented that AMSAT is a subset of amateur radio, which recognizes TWO major goals, the advancement of the art technically, and public service. Clark commented that his disagreement with Webster was one of degree, but noted that he had found it to be the most technically advanced set of hams. He felt that AMSAT had a duty to do some technical pushing to encourage its users to advance technically.

WA4BLUE, from the Norfolk area, commented that he had only been active on satellites for a couple of years and that AMSAT should recognize that there will always be people just learning about satellites who will need something achievable as a first step into the field.

Dorian, W4JLT, gave a short talk as an outgoing member of the Board of Directors. He noted that he had been on the Board for eight years, and served as Secretary for over six. The press of his employment and heading VHF preparation commanding in both the Amateur and Maritime services left him little time, and in any case he thought it was time for new blood on the Board.

Tynan, W4XO, also spoke as an outgoing Board member. He also cited the load in his job, as well as conducting the VHF column in QST as reasons for giving up the office. He went on to comment that the satellite program has brought many new people into VHF activity, especially in parts of the world where such activity never existed before. He encouraged satellite users to participate in earth-bound communication at VHF and UHF as well. In Africa and South America, AMSAT members have been discovering unusual terrestrial propagation conditions.

Operations VP Szwirko, KMTU, gave a few operational suggestions. The major change is that starting 1 January 1978, OSCAR 7 will be on Mode A only one day of every three. The Mode A day will be days of the year that are exactly divisible by three. (3, 6, 9, 12, ..., 363). Wednesday will be experiment days. The change is brought about due to the imminent launch of A-O-D. There will also be a change in the location of the CW and phone subbands. Starting 1 January, CW will be in the LOWER end of the 2880-2999 band on all AMSAT satellites. (See GB5CZ Bandplan in this Newsletter.)

The ballot tellers returned with the results of the Board election. The chief teller, Cotton, W8DKX announced the results as follows:

Directors elected to the Board for two year terms:
- Klein, 383 votes
- King, 374
- Smith, 204
- Webster, 160

New Alternate Directors for one year terms:
- Davidoff, 136
- Skelton, 110

Webster, W4ZJT/C, spoke about the Hf Russian amateur satellite program. There was little new information over that printed. The launch date is still unknown, quite possibly some major Russian historical anniversary.

Steve Place, WB8EYI, manager of the ARRL satellite education program, spoke about that program. He passed around a sample of a kit which is sent to interested educators.

George Barker, WB8RDC, also of ARRL, reported that the ARRL Foundation collected some $15,000 as a result of their campaign earlier that year for funds for VHF preparation and for AMSAT.

Clark reported that the AMSAT Phase III donation program has collected approximately $25,000 in the past year.

The meeting adjourned at 22:30.

Robert J. Carpenter, W3OTC
Secretary

Continued from Page 30:
the AMSAT-OSCAR operating recommendations, band plans, experiment days, etc., he generally agreed with the board action taken at the last meeting.

The meeting adjourned at 2315.

Robert Carpenter, W3OTC
The number of AMSAT Life members rose to more than 700 during 1977. This represented a doubling of the 369 figures of 1976. The number of regular members remained at about the same level as last year, that is 2065 members in 73 countries, because although many people joined AMSAT last year, about an equal number failed to renew their memberships.

Summary of Activity in 1977

AMSAT-OCSAR 6 reached the end of its useful operating lifetime in mid-1977 after having served for 4-1/2 years. From January through May, its Nickel-cadmium batteries were too weak to allow the spacecraft to power the on-board radio equipment. The number of regular members remained at about the same level as last year, that is 2065 members in 73 countries, because although many people joined AMSAT last year, about an equal number failed to renew their memberships.

Future Activities

A new series of OSCAR satellites called "RS" (for Radio-amateur Sputnik) has been announced as being planned by the Soviet Union, and it is anticipated that these satellites could take place at any time now. These satellites, according to information published by the International Frequency Registration Board and the Soviet journal Radio, will contain two-to-ten meter linear transponders using uplink frequencies in the 145.80 - 145.90 MHz range and downlinks in the 29.3 - 29.4 MHz region. It is expected that these satellites will be placed in 82° inclination, 950-kilometer circular, polar orbits with periods of 102-104 minutes. AMSAT welcomes this new series of Soviet amateur radio satellites in the spirit of international friendship and cooperation. We expect to assist with the distribution of orbit and operating information as soon as launch is confirmed.

AMSAT-OCSAR D spacecraft testing continues toward its planned launch, now in March, with thermal-vacuum, vibration and antenna tests planned. After launch, AMSAT will provide technical consultation to the ARRL, who will handle nearly all aspects of operations for this satellite.

AMSAT Phase II spacecraft design work will be completed during 1978, as will prototypes of the transponders, computer, attitude control/stabilization and power systems. The Phase III fund-raising program will also continue, largely with the assistance of the ARRL Foundation. It is certainly evident that 1978 will be a critical year for AMSAT and the Phase III program, both in terms of hardware and fund-raising.

In the process the power of the uplink, and consequently the downlink, repeated pretty much all the time, which inescapably leads to its overload. Therefore, in the process of communication it is necessary to decrease the radiated power of the earth transmitter as the slant range decreases.

In page 31:

S-meter indications can serve as the criterion of a normal signal level.

In no case should this exceed the beacon signal level.

It may happen that even with normal earth station signal levels an overload is experienced as the repeater is brought about by the large quantity of simultaneously operating stations. This can be determined by monitoring the repeated segment and noting noticeable distortions and suppression of weak signals by stronger ones. It is obvious that in such cases it is desirable to refrain from operation for some time. In any event it is necessary to strive to operate with the minimum possible power.

It should be noted that questions of the methodology of conducting QSO's, discipline, and correctness in sport -- which have great significance in amateur practice -- take on special significance in operation via educational-experimental communication satellites.

AMSAT-Phase III satellite progressed, with the delivery of a prototype structural model of the spacecraft for vibration tests. A fund-raising program has been underway to raise the $250,000 needed for Phase III spacecraft, and about 104 has been contributed so far. The ARRL Foundation has been assisting in fund-raising efforts and has raised about another 104. A computer simulation of the spacecraft antenna system was completed leading to a feasible antenna design. A high level microcomputer independent user program launched on the Phase III spacecraft is planned, and the approval of the launch of the first Phase III spacecraft on the Ariane second test flight was received (launch is in late 1979).

Discussions were held with NASA Goddard Space Flight Center management concerning the construction of an AMSAT building adjacent to the Goddard Visitor Center for use in AMSAT spacecraft integration and testing, and also containing office and storage space. Approval is expected, and it is hoped that a prefabricated building structure can be completed by this winter.

Earl Skelton, NJ3ES
AMSAT Secretary
Dear Joe,

For some time now I have been wanting to drop you a note and congratulate you on the fine job you are doing with the Newsletter. The award you received was very appropriate! Over the years I have -- from time to time -- tried to edit a group bulletin or paper for different Ham groups and I know what a difficult task it can be. You are a real credit to AMSAT, Joe!

Coordinator activities picking up very fast now and requests for OSCAR talks at clubs and schools are really starting to pick up. If the RS Satellite goes up next week, I expect I'll have to take my phone off the hook.

Personal best wishes,

Bud Schultz - WSG

Dear Joe,

Please carry on with AMSAT-80 articles as articles of that sort are our only source of information on the subject. I am still at the stage of deciding what CPU to use, but no doubt eventually I'll sort that out. I agree with KYL5B that the Newsletter is worth every cent, my only regret being that I cannot constructively assist.

Activity here is looking up; there are 3 stations in Rotorua with Mode A capability and at least one other building a transponder. No activity Mode B but hopefully some on Mode J.

73's,

Phil, ZL1PK

Dear Mr. Kasser:

I have just returned from Tokyo where I go several times a year on business. During this trip I wore my lapel AMSAT pin which, I must say, created quite a stir among my Japanese friends. In a country where every company executive wears his company pin, my AMSAT pin out-shown them all!

It was my good fortune, while in Tokyo, to have dinner with my good friend, Harry Yoneada (JALANG), at the Foreign Correspondents Club. Harry, AMSAT liaison for the area, gave me much needed background on the Japanese amateur satellite effort.

Please accept my congratulations on an excellent newsletter.

With best wishes,

Warren Birkenhead
KHECA - LM-582

Dear Joe,

You've got a good publication, and it fills a real need, I believe.

My personal opinion is that only a few readers can benefit from too much computer material. If it doesn't get too deep, it is good, but it can easily get beyond most of us (my personal opinion).

All the best for you, Joe.

73,

Warren Miller, LM-697

Dear Joe,

Greetings from the far west. First off, I did not receive your June Newsletter and surely would like one if possible. We are getting a few converto bars so I had a good turn out for the OSCAR Demo by W7ZBO and seminar by myself at the WING at Mack's Inn, Idaho, August 5, 6, and 7.

Enclosed is a snapshot of several of us to assure you that there is activity out here.

Left to right are: W7RYZ, Harry, Montana; W7JDC, Mac, Idaho; W7CCS, Ski, Idaho; K7EN, Ron, Idaho; and W7ZBO, Larry, Utah. Also did Pop, W7OXM, from Wyoming at the hamfest but he wasn't available for the picture.

We put out a lot of literature and hope that we will have a few more on by the time the snow comes. Hope to have my 432 MHz antennas in shape in a few days and get on Mode B. I try to keep up on Mode A as much as possible. Best of everything.

73,

Harry, WH2Y

[You weren't the only member to miss the June Newsletter. I hope you have it by now. Anyone else who did not get a June issue, send a postcard requesting it to Box 27. -- Joe]

Dear Joe,

Congratulations on winning in your class in the ARRL 1976 Publications Contest. MOBILE NEWS, the journal I edit, managed third place.

I'm beginning to wish I had never been tossed with a caligraf ending with a "K." You see, G3FP and me (G3FKK) have both operated through 0-6 and 0-7 for some years. Until recently, Bernard, G3FP, spent his time on Mode B but he has lately shown up on Mode A. In the past I have often been confused with G3FP and occasionally Bernard has forwarded QSL's sent to him in error.

The problem is twofold, First are the "too-quick-on-the-trigger" types who get as far as the G3FP part and then assume it is Bernard without waiting to hear the final letter. Second are those who think the final "K" is the "invitation to transmit" signal. In both cases subsequent attempts to correct the error are to little avail even when I send very deliberately - "de G3FKK KB." Another problem is that some stations sometimes call me G3FPD, something which only happens on satellite QSOs. In common with many others I find I do not always copy a callign correctly first time so always make a point of listening carefully each time the fellow sends it unless it is somebody whose fist or signal is unmistakable.

Finally, I had a letter from Dave Jarrall, CT2BS, who says he will be posted to Scotland in January 1978. Guess we may be hearing a QSO on the satellite(s) in '78.

73,
Norman Pitch
G3FKK

Earl Tonjes, WANG
Dear Joe,

Things have been busy here in the jungles and I haven't been on OSCAR as much as I would like. I did work VHF several weeks ago for country #20. Things have worked out so we can continue here in Peru and I plan to be active as OAV 6 until June 1979. I'm running 25 watts output mode A to 5 el yagi up 51 feet tilted 10°. Receive is Ameco pre-amp and Drake R4B. On mode B I'm now on SSB using the Argonaut to drive a microwave transmitting converter at 7 watts output to 11 el yagi. Receiver is Rochester VHF converter and Drake R4B. I enjoy working WFF, I have 25 states and 20 countries.

If anyone would like to make a sked for either OSCAR Mode A or B, I'd be happy to try from this end.

I'm enclosing picture of station. I guess I've been too active on HF and VHF - trophy in background is #6 DXCC with 5 watts or less. Now have 166 countries worked with 5 watts.

Enjoy Newsletter. I hope I can try Phase III before leaving the jungle.

VY 73,
Paul Wyse
OAV 6
Casilla 2492
Lima 100, Peru

Dear Editor,

The Wheaton Community Radio Amateurs Inc. would like to take this opportunity to recognize both the past achievements, and future plans of AMSAT.

The successful construction, implementation, and operation of AMSAT's satellites has brought the interest of Amateur Radio, and have opened new horizons for all amateur radio operators around the world. AMSAT has broadened Amateur Radio through its facilities and organization, and is probably directly or indirectly responsible for thousands of new amateur radio operators at a time when it is so important that the amateur ranks be well represented. The AMSAT organization serves as an example for all of Amateur Radio and has shown us our strength when our efforts are channeled for a common cause.

The Phase III project of AMSAT will have as much of an effect on our communications ability as VHF and UHF repeaters have had in recent years. This is particularly important in providing emergency and public service communications which our hobby is most dependent on. When in operation, the Phase III project will probably give us the future of what Amateur Radio will be like in future years.

Therefore, the Wheaton Community Radio Amateurs Inc. unanimously voted to contribute $350.00 toward the Phase III project. We all hope that your project will be a success, and that every amateur radio operator will contribute to the future of our hobby individually or through his or her club organization.

Greg Charrand, WA9EYY
President MCRA

Dear Editor:

Regarding Tom (KL4NB)1's letter in the June Newsletter, the idea of having a "News Letter" is great. Volume IX, No. 2, but must say we all went to a meeting and that something seems 64 but didn’t mention that OSCAR 6 is a wipeout and should not be used at present (the letter arrived 28 July).

The fact is that you have two entirely different groups of readers; those that read the newsletters and the operators (2). The engineers appear to be well served by the letter. [We can only print material that we receive. -- Joe]

This operator (and other members of our club) would like to build a simple, solid state, CW xmitter, say on a 2"x6" fiberglass pc board (2N706,2N3866, 2N5405, etc. that is not too difficult to build and is rather direct to a delta-beam and run by a battery 13 V for school demonstrations use. (The 2N375 is Poly-Pak's bargain UHF transistor.235.) How about a schematic and pc board layout for something like this -- in the Newsletter? Having something to operate with would double the number of OSCAR-interested hams. An RF amplifier (tuned) to be attached directly at the receiver beam and a simple converter would be of value. If you had a Rochester converter half built for 6 months, I can't find all the parts -- mini-RMS will appear to be going off the shelves many places.

I can't find this without compliments all of you on the excellent job you are doing on OSCAR's present and future.

Sincerely,

Marvin J. Berry
WL6JF

[How about it readers? Has anyone built such a rig? If so, write about it...]

Has anyone tried the VHF Engineering Kits on OSCAR? -- Joe

Dear Joe,

I would like to thank all the members of AMSAT for making the OSCAR OSL Bureau a great success. As well know, I have given the Bureau to Ross Forbes W66DQJ. I know you will find him very capable for this great task. He's a fine chap, so give him a little time to get the ball rolling again. I would also like to thank Vic Politi, W1NU, for his endless help in getting the Bureau started, and we couldn't have done it without him. Good luck, Ross, with your new task.

73,
Dennis & Sharon Grindrod
WA9IF W9AUM

Dear Editor:

First of all, count me as interested in seeing Part 2 of the computer information. While I am not interested in purchasing any equipment at this time, I will be in the future.

Second, would it be possible to repeat some of the "neat" Newsletter articles from time to time to allow those of us who are new to satellite operations to catch up with the oldtimers? Maybe you could simply print a list of the best or most informative past articles with the date of the issue so we could order back issues (or at least know which issues to look for).

Third, newcomers might be interested to know that it is helpful to have more than one type of antenna available when working through OSCAR 7. I have found that switching between a vertical and horizontal antenna for receiving gives excellent results on both Mode A and B. When the downlink signal fades on one, I switch to the other and usually find a dramatic change. For Mode A, the vertical (a 48TV) does best on the horizon and the horizontal (a 100 foot wire) does better from elevation angles of 20° or greater. On Mode B, I sometimes switch to a Hingo Ranger vertical when the downlink signal is just too weak to come in on if I normally use a 7 element horizontal beam on an az-el mount.

Of course, using circular polarization eliminates a lot of this but my method is cheaper for those already having a couple of antennas for FM, HF, or whatever.

Fourth, I find the Newsletter very informative, and I hope you keep up the good work!

73,
Carl Yaffey
KBNU

(There was a complete INDEX published in the December 1975 issue. For back issues see announcement on page 26. -- Joe)
The first meeting of the newly elected Board convened at 10:15 AM at the apartment of Perry Klein, W3PK, in Washington. In attendance were:

Tom Clark, WAILND, Director
Marty Davidoff, K4UBC/3, Alternate Director (newly elected)
Jan King, W3ZGY, Director
Perry Klein, W3PK, Director
Randy Smith, W3HAT, Director (newly elected)
Rich Swirko, W3IVT, Director

Attendance of Board meetings of our Directors from out of town was discussed, considering that three of the Directors are from Canada, England and Connecticut and travel is not always feasible. It was concluded that subjects discussed at the Board meetings would be summarized as to opinions and conclusions and conveyed to the out of town Board members by telephone for consent and vote. Agenda items will be mailed out in advance wherever possible to permit advance comment, although it was pointed out that the Board often meets at short notice to discuss "crisis" situations requiring rapid action.

Officers were elected for the next twelve months as follows:

President - Perry Klein, W3PK, was elected for a tenth one-year term.
Executive Vice-President - Tom Clark, WAILND
Vice-President - Jan King, W3ZGY, who also continues as AMSAT Phase III Project Manager.
Vice-President Operations - Rich Swirko, W3IVT was elected for a third year.
Vice-President Special Programs - Bill Dunkerley, W3ZIN, was elected to fill this new position.
Treasurer - Roy Ronser, K4YV, has agreed to serve for a third year.
Secretary - Earl Skelton, N3ES, has agreed to serve in this capacity.

All other officers, including Membership Chairman, Assistant Membership Chairman, Assistant Treasurer, Newsletter Editor, Information Director, Asst. Information Director, Communications Net Manager, and AMSAT Area and Country Coordinators were reaffirmed. W3WKP, who for the last 4-1/2 years has been serving as AMSAT GRL Bureau Manager, has asked to give up this job, but has agreed to continue to serve as Area Coordinator for Connecticut. He and his wife, Sharon, were commended for a job well done, and a replacement is being sought.

On Operations matters, the satellite users band plan as proposed by G3ZGC in the September AMSAT Newsletter was approved for use with all AMSAT satellites, to take effect January 1, 1978. Efforts will be made to include it with the 1978 W6PAJ AMSAT-Oscar 7 orbit calendar book.

On legal matters, the "AMSAT" trademark settlement agreement worked out between Norm Chalfin, K6PKX, and COMSAT's attorneys was approved by the AMSAT Board.

On financial matters, Perry Klein, W3PK was requested to prepare and submit to the Board a proposed AMSAT budget for 1978.

The meeting adjourned at 1 PM.

Perry Klein, W3PK

THE AMATEUR RADIO CLUBS OF JPL AND HAC
TEST FLY JAMSAT (AMSAT MODE J) TRANSPONDER
OVER SOUTHERN CALIFORNIA IN SHAKEDOWN FLIGHT

For an hour-and-a-half Booth Hartley, K49HI, of the JPL Amateur Radio Club piloted his Beechcraft Bonanza over Southern California on November 5 carrying a prototype model of the AMSAT-Oscar D Mode J transponder. Maurice Pirovian, W6G0FB, of the Hughes Aircraft Co. Amateur Radio Club operated the ECHO II XLM 432/435 MHz receiver aboard to monitor the output of the Mode J transponder. The flight was in preparation for a full-scale all-day flight on December 3.

Just before the flight, tests were made on the ground with Skip Reymann, W6PAJ, and Gene Halaas, W6GSGP, who operated SSB through the transponder. Norm Chalfin, K6PKX, operated PM on a new W600D Wilson into the transponder on 2 meters receiving the output on an inexpensive battery operated portable tuned down from the 450-470 MHz commercial band.

The Mode J beacon was keyed by a PM operated keyer putting out "HI HI HE WE WAMSAT AA-4". The keyer was built by Dick Ulrich, K6KCY. Dick was to have been aboard the aircraft but was grounded by a strep throat. He did, however, despite his discomfort manage to prepare the equipment for the flight.

At the QTH of N6IC, Don Bostrom, there were three ground stations set up:

John Densel, W66JNL, operated the "Downlink" position receiving signals from the airborne transponder on a Kenwood TS820 equipped with a Hamtronics 435 MHz Converter.

Elliot Oseas, W64KGN, operated the "uplink" position using a Kenwood TS700A.

Dick Handlen, W66LJL, maintained ground-to-air and air-to-ground communications position operating via a 220 MHz repeater on Mount Wilson, WBHAI.

Don, John, Elliot, and Dick are members of the Hughes Aircraft Co. ARC. Tom McInnes, W6GZGZ, president of the HAC Club and Sam Weise, W6LJR, set up and maintained ground station antenna facilities.

John Swancar, W6ELOD, and John Gerlack, K6RBD, also participated in the operations.

Sandra Bostrom (PHD), Don's XYL, provided a most delightful buffet. Also, in the wings was Nancy Reymann, Skip's XYL.

About 10 calls were heard in the narrow passband of the Mode J transponder. On the ground tests at the airport Skip (W6PAJ) reported an 18 MHz bandwidth for the prototype transponder (=/= the AMSAT-Oscar D onboard flight unit—Editor) calls heard were (in addition to the Ground Station operators):

W8GSGP (SSB)
W6TCQ (SSB)
K6G8X (PM)
W6PAJ (SSB)
W6NXT (CW)
W6IC (SSB)
W6LO (SSB)

There were no interfering signals and no reports of signals being interfered with.

K6PKX

(Continued from Page 3)

For those wishing to compute their own orbit predictions, the following reference orbit data is available.

Year 1977, Day 339: S/N ascending node equatorial crossing time 1 hour, 41 minutes 45.3 seconds; longitude 213.096 degrees West.

-- Data supplied by W6KXN via 20 meter AMSAT Net on December 4, 1977
We have found that the Model MR-2 twelve-channel, two-meter FM receiver sold and distributed by Henry Radio easily can be modified to receive downlink CW and SSB signals from the AMSAT-OSCAR 7 Mode B satellite transponder. It is (145.925 - 145.975 MHz). The modifications can be accomplished without removing the unit from its case. All components are readily accessible by removing the top cover containing the speaker (remove two Phillips-head screws). Suggested modifications are:

1. Add the following receiving crystals to receive the OSCAR 7 Mode B downlink passband. If you begin with one or two crystals, pick them around the center of the passband.

<table>
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<th>To Receive</th>
<th>Use Crystal At</th>
<th>To Receive</th>
<th>Use Crystal At</th>
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<tr>
<td>145.930 MHz</td>
<td>145.960 MHz</td>
<td>145.940 MHz</td>
<td>145.990 MHz</td>
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<tr>
<td>45.0766 MHz</td>
<td>45.08667 MHz</td>
<td>45.0800 MHz</td>
<td>45.0900 MHz</td>
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<tr>
<td>145.950 MHz</td>
<td>145.980 MHz</td>
<td>45.08333 MHz</td>
<td>45.09333 MHz</td>
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2. To add incremental tuning capability, clip the leads of capacitor C7 and replace it with a subminiatue 5-25pf trimmer capacitor. One end of this trimmer capacitor can be soldered to IF in TL, and the other end to the top lead of R6, both accessible without removing the unit from its case. Drill a small hole in the top cover next to the speaker to provide external access to the capacitor for tuning.

3. Connect a 1-5pf subminiatue trimmer capacitor from the base of transistor Q4 to the base of Q2 to provide a BPO by producing controlled feedback oscillation across the 455 kHz IF stages. One end of the trimmer capacitor can be soldered to the top lead of R7, and the other end to the top lead of R16. R16 is the 470-ohm resistor labeled "R15" in the data sheet (located between Q8 and T7). Drill a small hole in the top cover next to the speaker to provide external access to the trimmer capacitor to adjust BPO injection level. Again, R7 and R16 are accessible without removing the unit from its case.

4. Peak RF transformers TL2 and T5, and local oscillator transformers T8 and T4 for maximum signal using incoming satellite signals as a signal source.

It was found that no modification of the detector circuit was required, nor was it necessary to modify the limiter stages, since the satellite signals are generally not strong enough to cause limiting and quieting in the receiver. Signals are strong enough, however, that the unit's 20" wire antenna is sufficient for satisfactory reception of AMSAT-OSCAR 7 Mode B.

### STARQUEST

"STARQUEST", a small group of interested Radio and Astronomical Amateurs, was founded two years ago in the San Francisco Bay Area by Nick Marshall, W6LO. One of the founders (also first Technical Director) of Project OSCAR and father of Project MONORAY, Nick is also a Charter Member of AMSAT. The new "STARQUEST" group, now numbering about 25 members is open to anyone interested in the Search for Extraterrestrial Intelligence. There are no dues or fees of any kind -- only a sincere interest in the subject is required. The "STARQUEST" group is currently in the process of assembling an Amateur "EARTH STATION" that will be receiving on the 144.900 MHz band with a large aperture (50 to 150 ft) spherical or parabolic dish (still to be scrounged). A monthly "STARQUEST" Net operates on the AMSAT net frequency of 14.280 MHz on the first Sunday of each month and immediately follows the closing of the AMSAT Net at 1900 Z. Those interested in obtaining further detailed information about "STARQUEST" activities, send a self-addressed stamped envelope to W6LO (G.K. in any Call Book) for a "STARQUEST BULLETIN".

### AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF NEW LIFE MEMBERS

$100 OR MORE FROM THE FOLLOWING

<table>
<thead>
<tr>
<th>Life Member</th>
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<tr>
<td>LM-638</td>
<td>David L. Timmerman, W8SCE</td>
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<tr>
<td>LM-639</td>
<td>Patrick Hauptaeg (Belgium)</td>
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<tr>
<td>LM-656</td>
<td>Roland Gugeler, HB8BDZ</td>
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<td>LM-657</td>
<td>Alan G. Gearing, WB4ETC</td>
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<td>LM-658</td>
<td>Dr. John Swartz, W9SS2</td>
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<td>Olifer Pearce, 255Y</td>
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<td>LM-660</td>
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<td>Herman C. Knief, W2YTO</td>
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<td>Leonard F. Martin, W10DH</td>
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<td>LM-692</td>
<td>Donald D. Goff (New York)</td>
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<td>LM-693</td>
<td>Connie A. Smith, WB5WID</td>
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<td>LM-694</td>
<td>William J. Smith, WB5WIC</td>
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<td>LM-695</td>
<td>Paul Petrovsky, WS2XKI</td>
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<tr>
<td>LM-696</td>
<td>Stephen A. Towner, W4A1W</td>
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### 1979 AMSAT-OSCAR 7 ORBITAL DATA CALENDAR

Skip Reymann, W6PAJ, has published an improved AMSAT-OSCAR orbital data calendar containing all orbits for 1978 for AMSAT-OSCAR 7. Designed so that it may be hung on the wall, the calendar includes information on the operating schedules and frequencies for the spacecraft, and also the telemetry decoding equations. Also included is step-by-step information on how to determine times of passage of the satellite.

The orbital calendar is available post-paid for $5.00 U.S. funds or 30 IRC's ($1.00 to AMSAT members, and free on request to AMSAT Life Members). Orders of 10 or more will be airmailed. Orders and payments should be made in U.S. currency to:

Skip Reymann, W6PAJ
P. O. Box 374
San Dimas, California 91773 USA

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 gummed, self-addressed label.

Proceeds from the sales of the Orbital Calendar benefit AMSAT.
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 available 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 G3UOR, W2CCB, and W2RS.) Alternately, 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. Appropriate 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 ($) 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, G8KLO, QZLWL, SP9DR, VKSHI, and ZL0QX.

Earl Skelton, N3ES
AMSAT Awards Manager

AREA COORDINATOR UPDATE

The following changes should be made to your Area Coordinator lists:

USA
South Carolina delete K4DBV/V4EL

West Virginia
Clark L. Stewart, W8TN, 104 Henrietta Street, Ravenswood, West Virginia, 26164 (304) 273-4680

Iowa
Ralph Woll, N9RPK, RR4, Indianola, Iowa, 50125 (515) 961-6406

New Mexico
delete W850PG

California
Norm Chalfin, K6PGX, Box 463, Pasadena, CA 91102

OVERSEAS

AMSAT-DEUTSCHLAND (New address) Alexander Schoening, DCTAS, Ludolfingerweg 52, Berlin 28 (030) 401-4611

GIBRALTAR
Jimmy Bruzon, Z82BL, 27 Flat Bastion Road, Gibraltar, phone 70170

HUNGARY
Andras Gschwindt, H4SWM, Radio Club of the Technical University of Budapest (HGGSM), H-1111, Budapest, Goldmann Gyorgy, Ter. 3.

SWITZERLAND
Ted Vogel, HB9QF, 23 Pont Cear, CH-1290 Versoix/Geneva

MEMBERSHIP RENEWAL NOTICE

Dec. 1977

AMSAT Newsletter

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

Name ____________ Call ____________ License Class ____________ APRL Member? ____________

State ____________ City ____________ State ____________ City ____________

(Country) ____________ Code ____________

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 or 7

Mode A ______; AMSAT-Oscar 7 Mode B ______. Would you be willing to accept an AMSAT assignment in a technical area? ______; an administrative area? ______

Individual membership dues for the calendar year 1978 ____________ $10.00

(20.00) (Approx. half the dues are for subscription to the quarterly "AMSAT Newsletter")

Member Society dues for the next calendar year (20.00) ____________ $5

Life Membership (donation of $100 or more) ____________ $5

An AMSAT-OSCAR Satellite Pod to New Life Members

A-0-7 Orbit Calendar for 1978 ($ 3 each) ____________ $5

(Provided free to Life Members on request)

Life Member Society (donation of $200 or more) ____________ $5

Contribution toward AMSAT Phase III Satellite (Solar cells may be sponsored at $10.00 per cell, battery cells at50.00) $5

Other ______

TOTAL AMOUNT ENCLOSED ______

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