(continued from page 5)

be used for announcements, similar to those presently being made on AMSAT's OSCAR 6 and 7. The actual locations of the assignments and the amount of passband allocated to each must be made by us as users, because it is voluntary and can only be enforced if the users agree to do so. The development of any kind of band plan should be started now, because it's going to take two years to get everyone to agree.

Your comments are needed. Comment on the type of band plan (if any), the amount of spectrum allocated to each mode, and on anything else.

ELECTIONS

Over the last seven years AMSAT has grown from a group of clubs in Washington, D.C. to become a worldwide organization. Each year we publish a list (and biographies) of candidates to the AMSAT Board of Directors, and the whole membership votes by mail. To the majority of the electorate outside Washington there is nothing to distinguish the candidates from each other, and the incumbents are usually re-elected. This may or may not be a bad thing. However, in the future I'd like to publish not only a biography but some sort of statement as to what a candidate could do for the organization if elected, as well as the biography (who he is and what he has done) to allow the membership to elect someone more in tune with their feelings.

BOILER PLATE

Previous newsletters listed orbits, AMSAT Area Coordinators, Services (stickers, slides, etc.), Nets and other such repetitive items each time, even though new members joining were being sent the back issues of the year. This "boiler plate" material is growing to such an extent that it will strangle the technical and other "meat" in the Newsletter if the same policy is allowed to continue. This year the "boiler plate" is being published once only, in this Giant Economy Sized Newsletter. The remaining three issues will only carry updates and changes. This policy will save money both on postage and on printing costs.

SUMMARY

This editorial has been a personal opinion by:

Joe Kasser

Joe Kasser, G3ZCZ

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DEADLINE for copy for
next Newsletter is
12 May 1976

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COVER PHOTOGRAPH

"Kaz" K2ZRO demonstrating the use of the Satellabe.

TABLE OF CONTENTS

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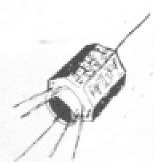
第3巻 第3号 (通巻21号)

AMSAT OSCAR Newsletter

JAMSAT
1975年9月25日 発行
発行人 JA1ANG 米田治雄

を145.925・145.935MHzの間で行なう予定です。もし私の信号が聞こえたら，正確な日付と時刻（GMT）の記録を忘れないでください。他の局の信号に対しても同様にお願いします。

この手紙は，KH6BZF，GRU，JJ，AD，JA8DJJ，ZL1AZR，VK2ALU，VK3ATN，ZK1AA，FO8DRその他私の知っている7Bのユーザーに送ろうとするものです。目的は，オスカー7のモードBを使って，明らかに超DXの可能性があ



E D I T O R I A L

PERSONAL OPINION

So far in my year of editorship the editorials have been passive. This issue I'm going to inflict some of my opinions on you. You don't have to read the rest of the editorial, but if you do, please comment either by letter or by tape cassette (if you have a lot to say).

DEADLINE DATES

Each issue of the newsletter prominently lists a deadline date for contributions for the next issue. Well, when the deadline date arrives and the input box is empty, what is an editor to do? Well, this one calls up the people he knows promised material and politely points out that the deadline has passed and requests the status of the material. Then depending on the state of the material, a decision is made as to how long to slip the deadline date. This means that the newsletter is going to be late. This issue of the newsletter was slipped one month.

The one-month slippage is the longest any newsletter has been delayed, and should not occur again. Please do your part and keep to the deadlines.

WRITING TO AMSAT

AMSAT is an organization staffed by volunteers working on a part-time basis. The people who respond to your letters do so in their "spare" time. Thus, incoming mail is put on their stack and answered as time permits. If a particular person has to go out of town for any reason, there will be an extra delay in answering mail.

Incoming mail at Box 27 is opened and sorted (if the envelope is addressed to a specific person or is marked personal, it is not opened). The sorted letters are then remailed (via the U.S. mail) to the volunteer who deals with that specific type of correspondence. The sorted letters are held for up to a week to allow a sufficient weight to build up to save on postage and to ease the load on the sorter. The bundles are then mailed by second class mail.

The moral of this story is: Do not expect an instantaneous reply to any letter that you send in. When you write in for specific items, such as photographs need for a demonstration, write in as far ahead of time as possible. When you send in several different queries, write them on different sheets of paper and put your name and address on each, allowing your queries to be dealt with in parallel rather than in series.

COMMUNICATION BY RADIO

We are radio amateurs. Radio amateurs tinker with and sometimes communicate by means of radio. Many queries arriving at Box 27 are such that could be answered in one or two sentences in personal communication. Why not use the AMSAT Nets for such queries. There will usually be someone on the air who can answer your question there and then. You will get a speedy reply and the load on the "letter replier" will be eased. If there isn't someone on the air who can answer, then Net Control can forward your query or phone patch (if allowed) to someone who can. This will save time, effort and money. We are radio amateurs, let's use radio.

LOCAL CHAPTERS

If you answered "yes" to question 4 of the membership survey in the last newsletter, the first thing you should do is contact your local area coordinator. If there isn't one, contact me. Then get together and form a local chapter of AMSAT and share the work. The area coordinator is usually the first one in his area to volunteer. He handles requests for information, demonstrations, bulletins, hamfests and such things, and in some areas the work is getting too much for one person. Thus forming a local chapter is the most effective way that you can help out. You don't even have to do anything formally. Just letting him know that you are available is enough.

SUPER POWER

AMSAT's OSCAR 6 and 7 are designed so that stations running average power output can access the satellites. The answers to question 2 of the membership survey show that most members can overload the spacecraft if their equipment is running at its rated power output and their multielement antennas are pointing anywhere near the spacecraft. Fortunately, most people do not run "super power." Some who do, do so out of ignorance and when they learn that they are running

(continued on page 4)

(continued from page 3)

super power, reduce their power to acceptable levels. Good for them! The same goes for people who operate through the satellites on "OFF" days.

It is super power and operating on OFF days that can reduce the lifetime of the satellites, and AMSAT's OSCAR 6 and 7 have to last us until the Phase III spacecraft is launched in about 2 years' time.

Talking of the Phase III spacecraft there is no truth to the rumor that it will contain a Laser Zapping Experiment (LZE) (The LZE scans the passband, stops on a super power station, attitude control servos zero in the Laser and it zaps the antenna of the super power station).

Several super power stations refuse to reduce power. Recently I visited an area coordinator well away from Washington, D.C. He told me about two super powered stations; I noted their calls to see if they were members. When I got back to Washington, I looked them up and found that they were life members. So, what is the point of being life members if you consistently run super power?

MICROPROCESSORS

Microprocessors have dropped in price to such an extent that it is now economically feasible to use them in the home. Microprocessors and microcomputer clubs are springing up all over the U.S.A. and possibly in the rest of the world as well. In many of these clubs radio amateurs comprise a large number of the memberships and AMSAT members comprise a large number of the active technically orientated radio amateurs.

The Phase III spacecraft contains a microprocessor. the PCM data on the Engineering Beacon will require sophisticated telemetry data processing in the ground station. This is best implementated by means of a microprocessor. Microprocessors have lots of other uses both in the home and in the ham shack. Aside from the home uses, they can be used to control the azimuth and elevation of antennas during OSCAR passes; they can calculate Equatorial Crossing times for AMSAT's OSCAR 6 and 7, and so on.

There are enough microprocessor application notes published so that most engineers and knowledgable radio amateurs can build up the hardware and get it working within a short period of time.

However, the published notes only allow us to build the hardware and get it working without "reinventing the wheel." That is, the circuits are standard. We copy it (almost), debug it and it works. To get it (the hardware) to do what we want to do, is quite another matter. We have to instruct it to perform its task, and that means writing programs (software). In AMSAT we will be doing similar things with our station microcomputers, and it seems to me that it would be a good idea to set up some sort of software library for AMSAT-OSCAR related programs. The Automated Command and Control Stations for AMSAT's OSCARs 6 and 7 use Intel 8008's and 8080's, and software has been written. We also have a Monitor-Debug package for the 8080 originally developed by Richard Allen, W5SXD. It allows programs to be loaded from paper tape and dumped to a teletype. It also allows registers and memory locations to be examined and changed. It allows breakpoints to be set during program debugging. It is too long to be listed here but will be published in a forthcoming issue of Byte Magazine.

AMSAT is a worldwide organization, and the fact that some software has already been developed for the 8080 in the U.S.A. is no reason to proclaim that the 8080 shall be the AMSAT microprocessor. (A lot of software for the RCA-Cosmac (to be flown on Phase III) has been developed in Germany, and the Australians are working with the National SC/MP unit). The actual choice must be made by each person to suit his particular situation (and will depend on software, availability, cost, etc).

In the same way as we have been publishing announcements of the availability of orbital prediction programs for pocket calculators, we should publish announcements of the availability of software for various microprocessors, and, space permitting, we could publish actual listings (with lots of comments). Hardware designs should be limited to the non-microcomputer section. For example, a published design for a PSK demodulator to demodulate the Phase III Engineering Beacon telemetry data will be limited to the section that provides clock pulses and the reconstructed serial TTL level data stream. Each person can then interface the serial data to his microcomputer by using standard Interface circuits for that microprocessor already designed and published.

This will allow microcomputer users to share software as well as hardware and will allow everyone to build working systems (that actually do things) in a reasonable period of time.

THINKING AHEAD

Almost every day a new call is heard through the downlink of AMSAT's OSCAR 6 and 7. When the Phase III spacecraft is in orbit, the situation will change drastically. No longer will we be limited to 5000 miles, for a whole hemisphere will then come into range. For the first years of operation any station in the Northern Hemisphere will be able to communicate with any other in that hemisphere for up to 15 hours a day as well as with Southern Hemisphere stations for part of the time. This communication facility will be there irrespective of the state of the Sunspot Cycle, Solar Flares and most other phenomena that upset conventional HF band communications.

Consider what that will mean in terms of QRM!

On a "typical" hf band such as forty meters, a number of qso's can take place on one frequency at any time, because depending on the time of day, two stations located in, say, Europe can work each other without hearing two stations in North America also working each other on the same frequency. It would also be possible for more qso's to take place on the frequency causing minimal qrm as long as those other stations are well separated or within the dead zone (skip effect). In fact, this is normal for forty meters.

Now consider two meters. 144.12 MHz is a typical SSB frequency. At any given time many qso's could take place on that frequency, without causing any qrm at all to each other, because of the geographical spacing between the stations in qso and the line of sight properties of 2 meter propagation.

What would happen if the characteristics of forty meters were suddenly super imposed onto the two meter band? . . . Instant QRM! Stations all over half a world would suddenly start hearing one another on the frequency. Local qso's could take place, simply by covering up more distant stations on the same frequency. Dx working would be possible only if no locals appeared on the frequency at either end. Now take away the dead zone, and let the band be open to everywhere at the same time. Everyone is now a "local," and can be heard anywhere else.

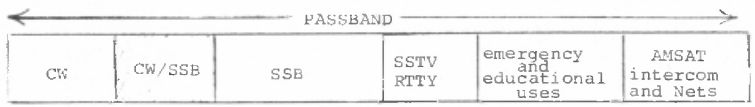
This is what may happen to part of two meters (and 70 cm) when the Phase III spacecraft is in its final orbit. It is up to us to plan ahead to try and control the qrm so that qso's can take place.

A two meter fm repeater puts a station in contact with any other one within, say, 60 miles or so for up to 24 hours a day.

The transponders on AMSAT's OSCAR 6 and 7 increase that range to 5000 miles, but only for 20 minutes or so, three or four times a day. The Phase III spacecraft will put a whole hemisphere in range for up to 15 hours a day. This means that round table qso's between stations in Europe, the U.S.A. and Japan could become commonplace. This would introduce a whole new era in phone patches, traffic handling, emergency communications, and educational uses.

It is these latter uses that will be instrumental in getting a place aboard the launch vehicle for the spacecraft.

It's going to take a lot of planning to ensure that we utilize the Phase III spacecraft in the best way. For a start some sort of band plan such as the one shown below may be required.



G3ZCZ

This is an attempt to split the passband into modes, similar to the voluntary band plans in effect in IARU Region 1 on all amateur bands.

In this plan starting at one end of the passband, there is a cw section, then an ssb section, with an overlap area for mixed mode contacts. The top end of the ssb section and the bottom end of the cw section could be used for traffic and messages where allowed by the licensing authorities. Then follows a segment reserved for sstv and rtty. Another segment is reserved for educational uses including an Emergency Calling Frequency. The last section is a small one reserved for the use of the AMSAT Command Stations as an intercom frequency. It may also

(continued on page 48)

Reprinted from

73 Magazine

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Shoot Oscar with a Satellabe

Communication via Oscar satellites is, in principle, similar to conventional amateur operating procedure. In both cases, one calls or answers CQ, exchanges signal reports and other "vital" information, wraps up the QSO with a 73, and then tries to work somebody else. For communicating over long distances on VHF and UHF bands, large gain antennas are routinely employed. Because such antennas are characterized by a narrow beam-width, they must be accurately aimed toward the station sought.

While in ground-to-ground communications, directing the antenna towards the desired direction is not a particularly difficult task. In satellite work this matter becomes more complicated.

Let's review some of the problems encountered in satellite communications.

1) The large distance (912 to 3000 miles) between the spacecraft and ground station, and the QRP power of the translator, make high gain beams a necessity for Oscar communications, if consistent results are desired.

2) A satellite represents a "moving target" traveling with the velocity of 4 miles per second (14,000 mph), some 912 miles above the surface of the earth.

3) The satellite rises above the horizon several times a day for periods lasting from a few seconds to a maximum of 22 minutes, during which time it becomes available for communications. (Oscar is not accessible beyond the line-of-sight.)

4) The times the satellite rises and sets are different for each geographical location on the earth.

5) The elevation (vertical angle) of the spacecraft, in respect to the tracking station, may, during certain passes, change from 0° to 90° within a period of only 12 minutes. During the same time the azimuth (horizontal angle) may sweep an arc 180° wide.

The above points clearly imply that an Oscar user must follow the satellite with his high gain antennas to secure optimum performance. Consequently, he must know the position of the satellite in respect to his QTH at any time around the clock. This objective can only be achieved by employing some form of satellite tracking method.

The reference point for satellite tracking purposes is the time and longitude at the very instant the satellite crosses the equator from south to north. (The orbital constants of the spacecraft, period and inclination, must also be known.) Listings of Oscar 6 and Oscar 7 equatorial crossings, hereafter referred to as EQX, are published by Amsat, 73 and many other sources months in advance, and are, in general, easily available. Some listings include all daily EQX's, others provide that data for reference orbits only. A reference orbit is the first daily satellite pass which crosses the equator after 0000 GMT.

Once the EQX data becomes available to the Oscar user, it is left to his discretion how to employ it for tracking purposes.

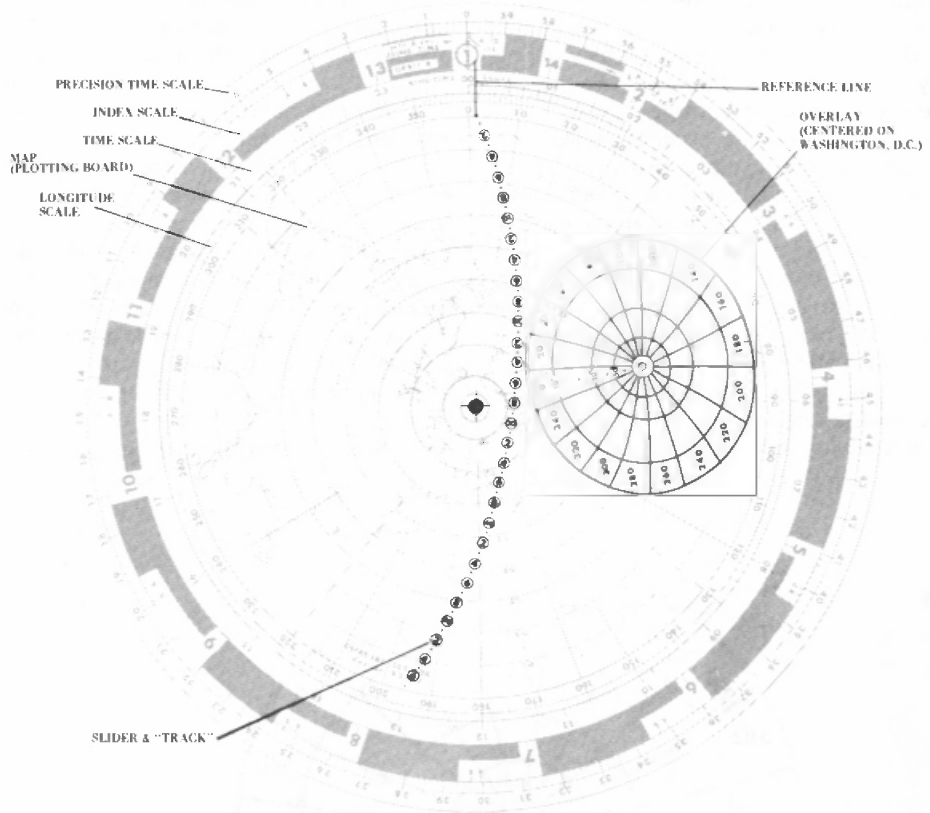

Fig. 1. Total view of Satellabe, showing four concentric scales (Map Plotting Board, Time Scale, Index Scale, and Precision Time Scale), with their relation to each other. The Range Overlay is centered on the QTH of the tracking station. Rotary transparent Slider shows the path and instantaneous location of Oscar in terms of minutes after equatorial crossing. The Slider pivots in the center of the device.

A number of amateurs, lacking adequate tracking facilities, resort to "dead reckoning" — namely, trying to guess the approximate direction and periods of accessibility of Oscar satellites. On the other end of the scale, there are individuals who by employing sophisticated mathematical formulas, processed by modern computers, come up with tracking data which equal those used by NASA.

In the middle, there is a group of Oscar users which has developed all kinds of "private" tracking methods, using globes, maps of different projection, and other ingenious schemes or devices perfectly suitable for their intended purpose. Unfortunately, the remainder of amateurs who own suitable equipment for space communications become so overwhelmed by the apparent complexity of satellite tracking that, in all probability, they never even attempt to try this new and exciting form of amateur communications.

The device described in this article allows tracking of Oscar satellites with an accuracy exceeding the needs of even the discriminating amateur. It requires no knowledge of the mathematics or astrophysics on the part of the user.

It resembles a circular slide rule 11 inches in diameter with a map of the northern hemisphere in the middle. It operates on the principle of an "astrolabe," an instrument used by astronomers in the ancient times for predicting the apparent movement of celestial bodies as viewed from a particular location on the earth. I feel that this