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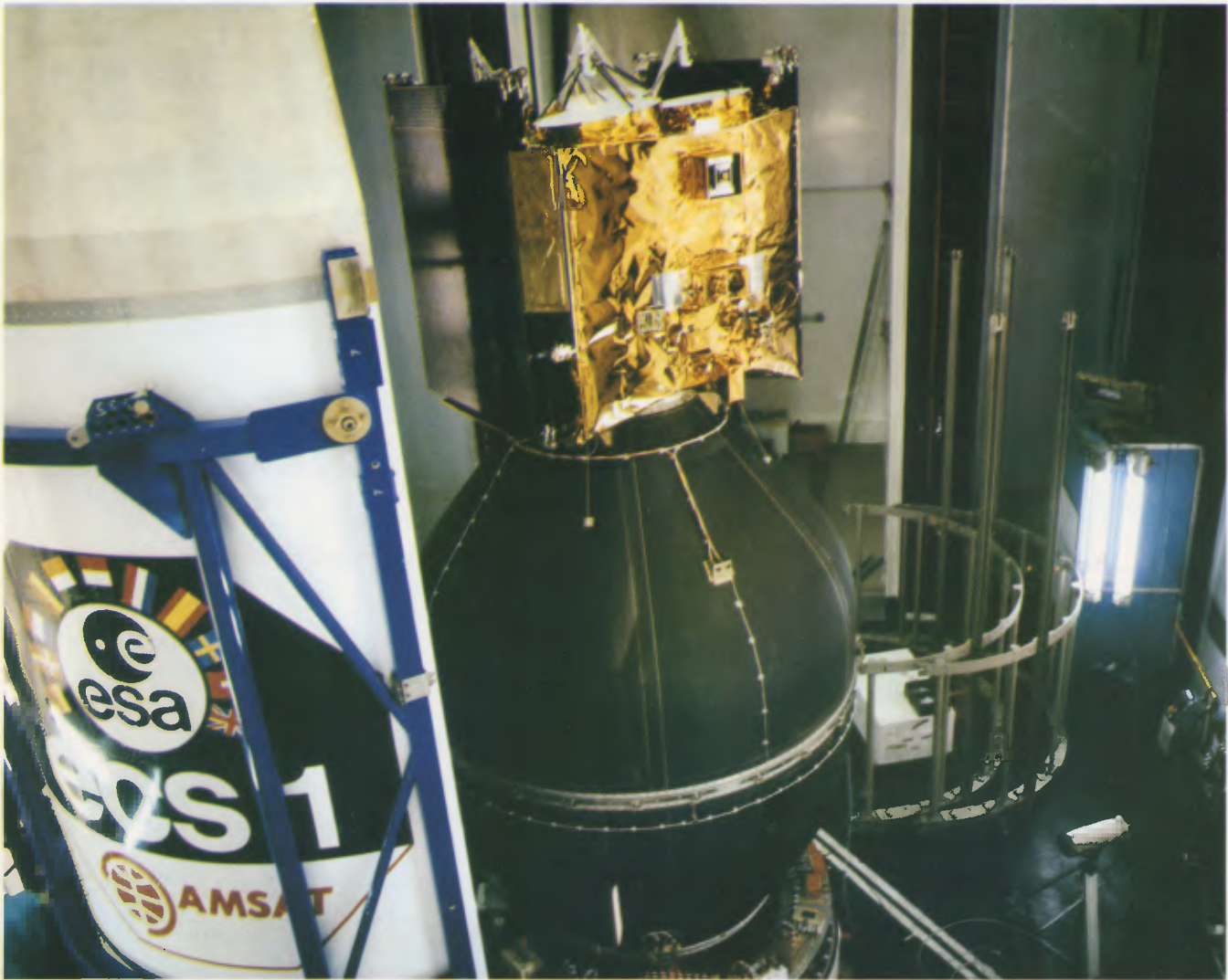
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**Our Cover:** Taken just a few seconds after ignition, this ESA supplied print shows the power and beauty of the Ariane L6 launch with ECS-1 and AMSAT-OSCAR 10 aboard.



ECS-1 atop the SYLDA with Phase IIIB inside. The fairing bearing the logos is about to enshroud the payload.

Comets

### **New AMSAT T-Shirts!**

You'll be *looking good* and *feeling proud* in your new "AMSAT . . . Future Now" T-Shirt. Celebrate the launch of OSCAR 10 and a future of great operating for only \$7.50 donation. Sizes: small, medium, large, and ex-large. Please specify. Send to AMSAT Headquarters, Post Office Box 27, Washington, DC 20044. Supplies are limited.





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# Ellipsis...

An Editorial by Harold Winard, KB2M\*

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## Dawn of a New Day

If you were one of the many thousands of radio amateurs who listened to the live coverage of the AMSAT-OSCAR 10 launch, you may well have experienced the same emotions we did when word came from the launch facility in French Guiana: "Event 13" was nominal. Event 13 was the separation of AMSAT-OSCAR 10 from the Ariane launch vehicle and was, as satellite aficionados like to think of it, the birth of a new earth satellite.

Was it thrilling? Most certainly. Was it exciting? After the long wait, almost 37 months since the loss of Phase IIIA, it was more than exciting. It was downright exhilarating. This was no ordinary OSCAR (if I can take the liberty of calling any OSCAR launch "ordinary"), this was Phase III, the dawn of a very new day for amateur radio.

Not since radio amateurs proved that frequencies far above 1.8 MHz would support very long distance communication has the amateur radio world had so potent a symbol. As it loops its way from apogee to perigee and back, AMSAT-OSCAR 10 proves that radio amateurs have finally removed themselves from the vagaries of the ionosphere. Long distance communication — reliable communication, both voice and data — is now possible for hours at a time. An observer perched on one of AO-10's antennas would, at some apogees, view areas enveloping some 80% of all the world's amateurs.

But we said that AO-10 is a symbol; it is not yet a tool. And a tool it must certainly become if all the hours, days, and years of dedicated work will be rewarded. Use of the satellite by the world's radio amateurs will bring a plentiful return on the investments so carefully made these past seven years or so. Indeed, as more and more radio amateurs join the ranks of satellite users, the greater will be the return and the more powerful AO-10 will become as both a tool and a symbol of amateur radio.

But active involvement in the Amateur Space program requires a commitment to its future. That's a word many of us dread — *commitment*. For some it means serving on some committee that gobbles up too much of our spare time. For others it means some financial obligation that siphons away the money we could use on some more immediate pleasure; a new low-band rig perhaps.

Commitment need not be a dirty word, however. It doesn't have to separate us from our interests in life. A commitment to the amateur space program brings with

it a host of rewards for the individual amateur. And these benefits can become all the more enjoyable because they serve others as well. Let's illustrate.

As a participant in amateur space activities, as a user of amateur radio satellites, especially AO-10, as a contributor to publications such as *Orbit*, and as a member of AMSAT, the amateur advances the ideals of amateur radio. Moreover, the opportunities for using a satellite productively have increased manifold with the launch of AO-10; satellite technology has been pushed forward too. AO-10 virtually bursts with public service potential, we believe!

As the individual amateur becomes familiar with AO-10, he or she will find features that have not been experienced before. Because of its lengthy access times, AO-10 will be a convenient meeting place for nets, both public service and special interest. Also, the satellite has superb capabilities for transmission of data; perhaps detailed medical information for a doctor struggling with a life-or-death case deep in the African bush. Or how about errorless Amateur Radio Bulletins, delivered and printed quickly. Perhaps a radiogram sent through AO-10 will bring words of comfort to anxious relatives from a disaster-struck village overseas. All that has made amateur radio a shining example of what public service means can be enhanced by the new OSCAR.

Does traffic-handling sound new to you? Or is public service a new concept? Of course not. Many relish the opportunity to help in these ways and many others participate in classes to bring young people in touch with our hobby and public service activities. Those too are an important part of AO-10's future because the bird will inspire and educate all of us, but especially the young people who will look up, marvel, and contemplate all that Space holds in store for us.

What does this have to do with personal commitment? Plenty. It means we can continue to pursue our hobby and public service as in the past but with some new and satisfying twists. By our productive use of AO-10, by doing those very things that we find most enjoyable about amateur radio, we will be affirming our continued support for the amateur space program and its future. Use and enjoy the satellite, and show the world that amateur radio satellites are here to stay. By our productive use of the satellite and all its advanced features we can commit ourselves to the great adventure started more than 20 years ago by OSCAR 1.

# Tracking Phase III Type Satellites with the *Satellipse*

By K. J. Deskur, K2ZRO

*The inventor of the famous Satellabe describes a new tracker for elliptical orbits.*

A simple tracking aid, similar to the OSCAR locators familiar to Phase II users, will help Phase III users keep track of Amateur Radio's newest satellite — AMSAT-OSCAR 10. The device determines the position of the satellite with respect to the user's location in terms of azimuth and elevation as a function of real time.

During the past decade, many articles have been published on the subject of tracking aids, especially for application to Phase II satellites traveling in nearly circular orbits; the OSCAR and RS series for example. The usual tracking methods ranged from sophisticated, computer-generated tables and graphics to simple "dead reckoning" instructions. But probably the most popular tracking devices were the Satellabe, the OSCAR Locator, and W2GFF's OSCAR Plotter, simply because they were easy to construct and use and were sufficiently accurate for most practical purposes.

A similar tracking plotter can track Phase III satellites traveling in elliptical orbits and is equally easy to use by those familiar with the fundamentals of this method of satellite tracking.

Briefly, the satellite tracking plotter consists of three parts.

1. A polar projection map of the earth (or a polar graph) called the plotting board.
2. A normalized rotary ground-track/slider, pivoted at the pole with time-marks distributed along its length. If the origin of the track (as indicated by a cursor) is positioned on the longitude of an established reference point for the desired orbit (i.e. the equatorial crossing), the track will trace the path of the subsatellite points during the orbit in terms of the time-into-orbit beginning at the moment the satellite passed that orbital reference point.

3. The overlay consisting of a family or range-circles that are centered on the location of the tracking station. Each circle represents the locus of points equidistant from the station. The overlay, which is also divided into azimuth sectors, helps determine the bearing and elevation of the satellite with respect to the tracking station. It also helps estimate the duration of periods when the satellite is within communications range.

Although the tracking plotter for both Phase II and III are identical in principle, there are some structural differences between them.

## The Plotting Board

A typical polar projection map for a Phase II plotter is usually extended no further than  $30^\circ$  beyond the equator. However, since the communications range of Phase III satellites covers almost an entire hemisphere, the map covers an area extending  $50^\circ$  to  $60^\circ$  beyond the equator (i.e. the Northern projection map should include the area up to  $-60^\circ$  latitude — south).

## The Earth Track

Because circular-orbit satellites orbit at nearly constant altitude and uniform velocity, the Phase II earth track looks like a bow that is partitioned with uniformly spaced time-marks.

The shape of the earth-track of an elliptical-orbit satellite is much more complex. It may be shaped like a hairpin, a resonance curve, or it may contain loops (Fig. 1). The shape of the track depends on the orbital parameters including the period, altitude at apogee and perigee, eccentricity of the orbit, angle of inclination, and the argument of perigee. Unless the inclination of the orbit is very close to  $63.4^\circ$ , the last parameter changes slightly with each consecutive pass. That in turn