

NEWSLETTER ARCHIVES

OSCAR 40 by Jerry G0FPI



- tion What is Phase 3D ?
- Introduction What is Phase 3D ?.
- Tracking Where do I point my antenna, and when?
- Base station equipment What do I need to get started?
- On-board equipment What gear does it carry?
- Operation How do I use the satellite?
- Operating frequency s Where do I tune my radio?
- Other payloads What else can it do?
- References How do I find out more?

Introduction What is Phase 3D ?.

The latest Amateur Radio satellite to be launched, known as Phase 3D , is the latest in a series of amateur satellites which are an ever developing and expanding series of projects. This new bird is going to revolutionise the way in which we can communicate around the world.

This article will try to tell you something of what to expect from amateur radios newest satellite. However, it will be a huge task to cover an in depth article, as the total amount of general and technical information available is enormous! Please see the references section at the end to find more detailed or specific information.

Phase 3D (P3D) is a development from the technology and experience gained from two previous major projects. Phase 3B (OSCAR 10) is now an OAP , but still functioning, and Phase 3C (OSCAR 13) re-entered the earth s atmosphere quite recently.

The main objectives for the design of this new satellite can be outlined as follows:

- Smaller ground antenna systems due to the use of the microwave bands
- Smaller ground antenna systems due to the use of the microwave bands
- Antennas with less gain, as the transmitter power is greater than previous satellites.
- An orbit that will allow much less use of directional antenna systems as the satellite will appear to hang in the same place for a longer period of time.
- A far greater choice of frequency bands to use, giving more flexibility.
- A new concept in satellites that will ALLOW EVERYONE TO ENJOY THE HOBBY.



This is the first amateur satellite to have deployable solar panels, which are folded against the space frame during launch and

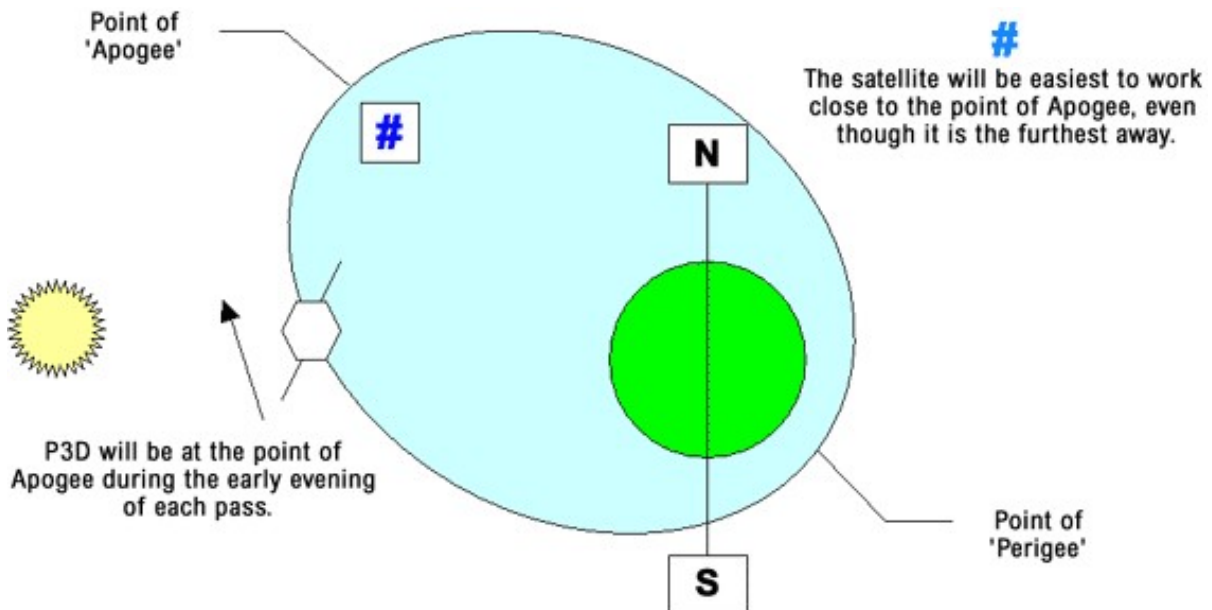
will be deployed when the correct orbit is achieved. The huge array of panels will provide a much larger power source, and will allow more equipment to be installed with higher output powers than on previous satellites.

2. Tracking Where do I point my antenna, and when?

P3D has now been launched into a temporary orbit by the Ariane-5 rocket, and a 400N Kick motor (fuelled by six propellant tanks inside the space frame) will be fired to slowly adjust the satellite into its final elliptical orbit, (see below). Once this is reached, it should be possible to fix a beam in one position and see the same satellite window every second day for several hours at a time, which will make tracking easier. This will apply to each of the world's main population areas, i.e. Europe, America and Asia.

However, the best DX will often occur with the beam or dish pointing within 10 degrees of the horizon, so some means of elevation will be an advantage as the satellite can be out of an ordinary antenna's beamwidth. It will be possible to work almost the whole world during normal leisure time! The Perigee (lowest height) will be 4000km, and the Apogee (greatest height) will be 47700km.

The drawing below shows the basic elliptical orbit of the satellite relative to earth:



3. Base station equipment What do I need to get started?

Simple beams, medium power, and a fairly sensitive receive set-up should be all that is needed to use this satellite. The exact transmitter powers or antenna gain for each band are to be fully determined as the final orbit is yet to be reached.

Antennas do not have to be large, but on the higher bands lots of gain can be achieved from a fairly small dish. IT WILL NOT BE NECESSARY TO FILL THE GARDEN WITH ALUMINIUM.

Reception will be the most important part of working P3D, but even though it carries beams and dishes, there will be times when they are not pointing directly to earth. A receive pre-amplifier could make the difference between working the satellite or not.

The recommended operating modes for the analogue parts of P3D are CW and SSB, but FM is not very friendly to the onboard power budget, and will be discouraged. Various digital modes are also available with much spare capacity for future developments, creating a very versatile digital package.

4. Operation How do I use the satellite?

Satellite operation is mostly full duplex, where we listen to our own signals coming back from space. This is possible by having the transmit and receive frequencies (called uplink and downlink) on different bands. The table in section 6, shows the uplink and downlink bands, but not all the transmitters and receivers will be switched on at the same time.

When the satellite has been tested in orbit, the spacecraft will be loaded with a schedule telling it which combinations of transmitter and receiver to switch on, and when. This will depend on several technical reasons such as:

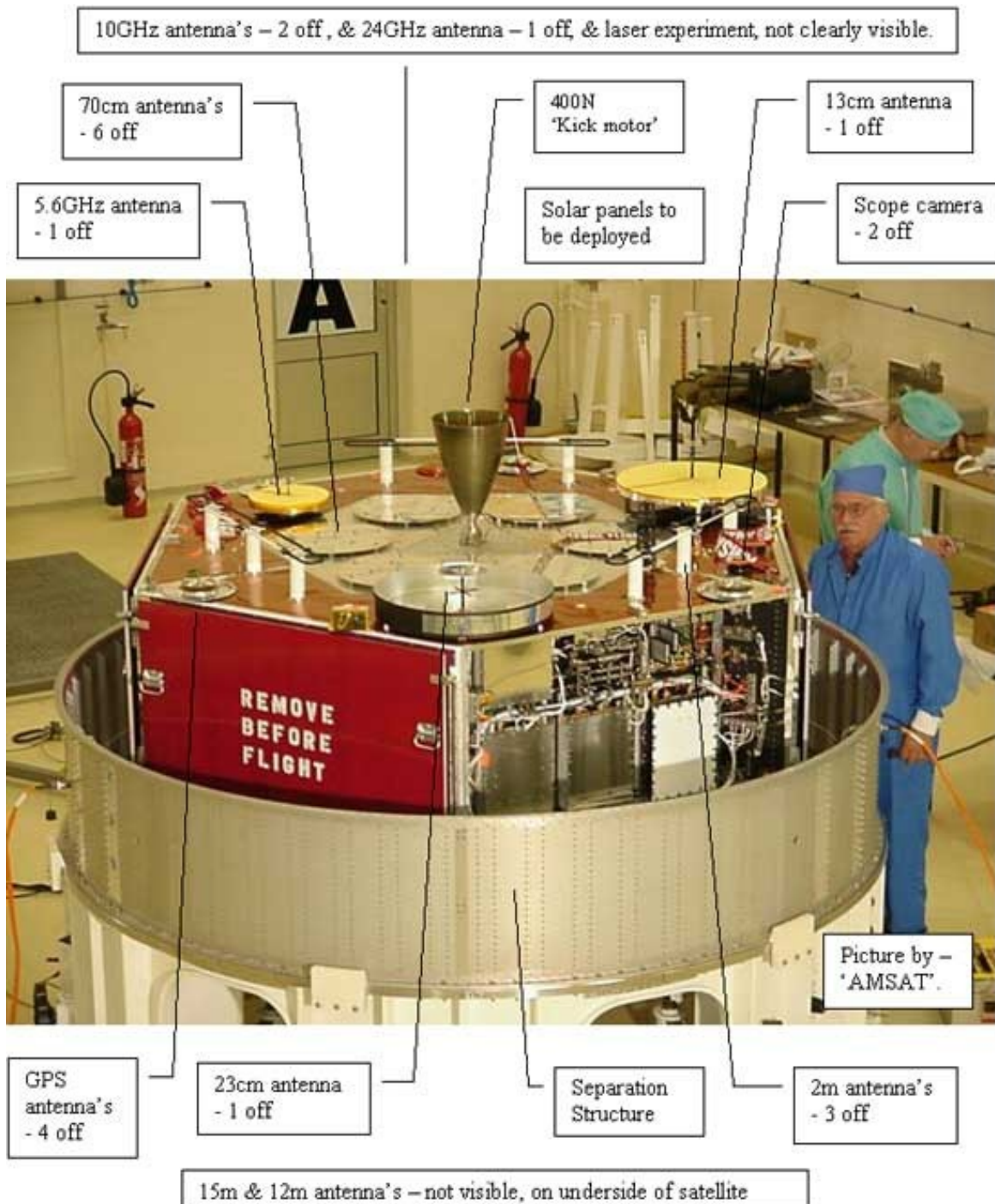
- When the microwave bands are being used, the perigee passes will create a high value of Doppler shift (a constant rapid change of frequency), and these bands will only be switched on around apogee, where this problem is much reduced.
- When the satellite goes into eclipse the availability of electrical power will be reduced, and the timetable will be relative to orbit position.

Because of the many combinations possible for a receiver on one band feeding a transmitter on another band, a new designation of interconnection according to band will be used. So a 70cm receiver connected to a 2m transmitter will be called mode UV and a 23cm receiver connected to a 13cm transmitter will be called mode LS etc. The FIRST letter denotes the uplink.

5. On-board equipment What gear does it carry?

In comparison to OSCARS 10 & 13, OSCAR 40 could be described as a flying power station, due to the huge area of solar panels on board. A lot of equipment can be carried as a result.

The picture and captions below show Phase 3D mounted into the separation structure, in the final assembly building at the launch site, and gives a basic guide to the layout of the satellite:



6. Operating frequency s Where do I tune my radio?

P3D carries equipment to allow operation over the largest combination of bands ever to be available on an amateur satellite. There has never been so much equipment available for the EASY use of microwaves, as well as the normal bands used in the past. The exact frequency s for each band are too numerous to list in one table, but can be obtained in the references section at the end.

The table below shows the main frequency bands and uplink & downlink details:

Freq Band	Band letter	Uplink	Downlink	Notes
15m	T	Yes	No	
12m	H	Yes	No	
2m	V	Yes	Yes	
70 cm	U	Yes	Yes	
23 cm	L	Yes	No	Two Band Sector
13 cm	S	Yes	Yes	Two Band Sector
5.6GHz	C	Yes	No	
10GHz	X	No	Yes	
24GHz	K	No	Yes	
360GHz	?	No		Experimental only

7. Other payloads What else can it do?

In addition to the conventional amateur radio equipment described earlier, P3D carries some other experiments, which include:

- A S.C.O.P.E. unit (Spacecraft Camera for Observation of Planets and Earth) which will transmit colour pictures to earth taken with two cameras, one wide angle & one telescopic .
- GPS receivers which are to demonstrate that it is possible to generate the position and attitude of an AMSAT satellite by analysing the position data.

8. Reference s How do I find out more?

Much more information in the form of technical articles, photographs, data sheets etc. than is possible to include in a newsletter article can be accessed either on the following web sites (many more available):

AMSAT P3-D Launch Campaign Kourou www.amsat-dl.org/launch

Phase 3D Project www.amsat.org/amsat/sats/phase3d.html

Or by joining AMSAT-UK, details from:

Mrs Jenny Southwell, G1LIT, 40 Downs View, Small Dole, Henfield, W.Sussex, BN5 9YB. Tel: (01273) 495733

E-mail: g1lit@amsat.org

AMSAT-UK is just one of many international groups working together to keep trends in amateur radio up-to-date .

Please remember that the OSCAR satellites are built by radio hams for radio hams and the funding mostly comes from voluntary donations. OSCAR 40 will make a high tech satellite available to amateur radio operators, which is unique in the large number of operating possibilities and will open up a new era in amateur satellite communications. This will now allow . . .

EVERYONE TO ENJOY THE HOBBY!

73 s, Jerry G0FPI.

Jerry can be contacted [by email](#)

MAIN INDEX