Amateur Satellites

AMSAT-UK and Ham Radio Today have co-operated to produce this guide

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Orbiting Satellite Carrying Amateur Radio "OSCAR" is possibly the only radio field in which Hams were not the pioneers, but they were certainly not far behind.

OSCAR 1 was launched on the 12th December 1961 and stayed in orbit for 20 days sending "Hi" in morse as it circled the earth from its 100 mW transmitter. June the following year (1962) saw the launch of OSCAR 2 another "Hi" beacon lasting for only 18 days, it was to be another 3 years hard work before OSCAR 3 went into space in March 1965, although was the first communication satellite receiving on 144.1 MHz and retransmitting on 145.9 MHz, unfortunately the flight was only partially successful.

In December 1965 OSCAR 4 was launched, receiving on 144.1 MHz and retransmitting on 431.9 MHz, maintaining orbit for three months then, due to rocket failure, went into a highly elliptical orbit.

The first ground controlled satellite was OSCAR 5 which went into orbit in January 1970, lasting only 2 months. OSCAR 5 carried beacon transmitters only; however a great deal of information on controlling satellites from the ground was gained from the flight.

Almost 2 years later OSCAR 6 carried a forward message relay system (cold store) a beacon and transponded 145.9 MHz to 29.45 MHz at a power of 2 watts PEP. OSCAR 6 circled the earth for 4½ years.

The OSCAR programmes have been developed over three phases. Phase 1 purely experimental, just to see what was possible. OSCAR's 1-5 covered this phase.

OSCAR's 6-9 and the Russian RS1-8 formed phase 2 as long life medium orbit satellites, with transponders and state of the art experimentation.

Phase 3 consists of high altitude (Dx) Orbits with sophisticated transponding and control systems.

WHAT YOU CAN HEAR NOW

The current operational satellite is OSCAR 8, orbitting the earth every 103 minutes at an altitude of 910 km. The on board equipment conists of transmitters, receivers and controlled system. The batteries are charged by the solar cells when the satellite is in the sunlight zone of its orbit.

OSCAR 8 receives on one amateur band and transmits in another (see **table one**). This satellite repeater system is known as a transponder, the modes of operation acceptable to the transponder are CW, SSB, RTTY, NBFM and AM, although only the first four are recommended, being power efficient and of low duty cycle. OSCAR 8 carries two transponders and is under the control of several ground stations around the world, including the UK (Guildford University).

The Soviet Union joined the Amateur Radio Satellite Race in October 1978, with two satellites RS1 and RS2 (RS is derived from the Radio Sports Federation, the controlling body of amateur radio in the U.S.S.R.) both these satellites only lasted a few months. However, at this time RS 5-6-7-8 are still in orbit.

AMSAT's first attempt for a high altitude (Dx) satellite known as phase 3A failed to go into orbit when the ARIANE launch vehicle plunged into the South Atlantic in May 1980. This exercise was repeated again earlier this year, it seems ARIANE rockets are prone to go down rather than up!

WHERE TO FIND THE SATELLITES

Satellite transponders are specified by mode type:

Modes A, B, C, D, J and U are in current use, the following table shows how the modes differ:

Table 1.

Mode 'A': Uplink 145.8-146 MHz in the 2 metre band. Downlink 29.3-29.5 MHz in the 10 meter band.

Mode 'B': Uplink 435-438 MHz (70 cm band). Downlink 145.8-146 MHz (2m band).

Mode 'C': Frequencies as mode 'B' but lower power.

Mode 'D': Battery charge Mode, transponders off, beacons may be operational.

Mode 'J': (made by Jamsat) Uplink 2 meters. Downlink 70 cm. Frequencies as 'B' mode.

Mode 'L' Uplink approximately 1296 MHz (23 cm band). Downlink 435-438 MHz (70 cm band).

It will be observed from **Table 1**OSCAR 8 signals may be heard from 29.4 to 29.5 MHz or on 435.1 to 435.2 subject to the mode of operation for the day, also providing the satellite is above the receiving station's horizon. Beacon transmissions on CW will be heard subject to the above conditions. The majority of signals heard will be CW or SSB, ther is a little RTTY and SSTV activity; SSB signals on 10 meters will usually be USB, however, at higher frequencies (2 meter and 70 cm) 'phone signals may be LSB because of transponder characteristics.

ORBITAL INFORMATION

The simplest way to understand OSCAR orbits is to imagine you are out in space observing the earth, rotating on its axis from west to east with the north pole at the top. If you could detect the satellite orbiting