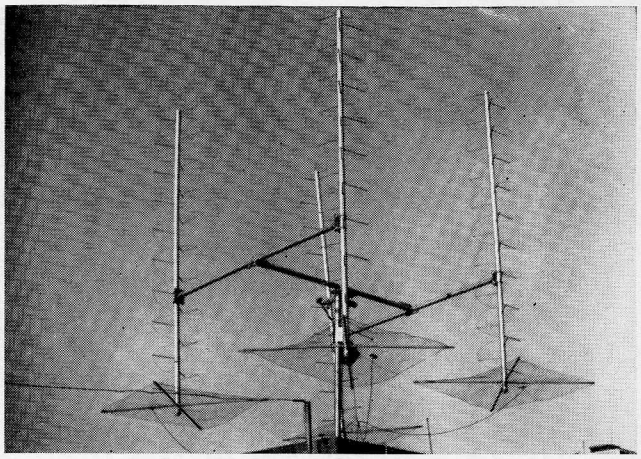
OSCAR FIVE



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At 9.31 a.m. (Australian E.S.T.) on January 23rd this year, Australis Oscar Five was launched from Western Test Range in California. Built by the Melbourne University Astronautical Society, in conjunction with the Wireless Institute of Australia, it is the second Australian orbital satellite. (The first was built by the Weapons Research Establishment of the Department of Supply and launched in 1969.) Australis Oscar 5 was carried as secondary payload on a Thor Delta launch vehicle whose primary load was the Tiros M developmental weather satellite.

The original Project Oscar was a California-based organisation which built and launched four orbital satellites, each one of increased size and sophistication. They were launched by the U.S. Air Force, the last two in 1965. It was after receiving radio signals from Oscar 3 that M.U.A.S. was inspired to build a satellite of its own.

The design was to be for an amateur radio satellite and the project would co-operate with the original Project Oscar. Because satellites were, at that time, unknown in Australia, Oscar 5 would have to be launched in the United States.

The satellite itself is constructed in the form of two concentric cuboid shells. It has a total weight of '5 pounds and is thermally insulated to protect electronic equipment. Most of the weight is in the form of 20 pounds of magnesium alkali cells to provide power. The antennae lie on the three perpendicular axes of the craft and were made from spring steel carpenter's tape so that they could be wrapped around the satellite to extend on ejection. Oscar was also provided with a set of springs to ensure ejection from the launch vehicle.

By way of equipment, is carries:

- a VHF transmitter on 144.05 MHz (2 metres), with a nominal power output of 50 mW;
- a HF transmitter on 29.45 Mego Hertz (10 metres) on 250 mW output, commandable;
- an 8 channel sequentially switched telemetry encoder, one channel of which transmits HI in morse;
- a command receiver;
- a command decoder controlling the HF transmitter's operation.

Both transmitters transmit the same telemetry. The eight channels are transmitted continuously in a sequence which takes 52 seconds. The first signal is the HI call in morse, the third is the "x"-axis horizon sensor, the fifth the "y"-axis, and the seventh the "z"-axis. The second, fourth, sixth and eighth represent respectively, the current drain, battery voltage, internal temperature and skin temperature.

Stabilisation was achieved magnetically. The Magnetic Altitude Stabilisation System reduces the spin to one axis and aligns it with the local magnetic field vector. Spin energy is removed by material with a large hysteris loop (the larger this

loop, which is a graphical plot, the less efficient it becomes at re-emitting magnetic energy which it has stored: hence it loses spin energy magnetically). Alignment is achieved by means of a bar magnet.

Among the problems which the builders of the satellite had to overcome were the fact that silver could not be used in the exposed parts because of its tendency to grow "whiskers" in a vacuum, and the tendency of metals such as aluminium to cold-weld because no oxide film forms in a vacuum. The electronic components had to withstand rapid acceleration to high speeds, zero pressure and extreme temperatures.

Those originally responsible for the programme were (in no particular order): Owen Mace, Stephen Howard, Peter Hammer, David Bellair, Les Jenkins, Paul Dunn, John Munro and Geoff Thompson, led by that notable chief stirrer, Richard Tonkin. (The current crop is headed by Keith Thomas.)

Mention must also be made of those who (knowingly or otherwise) provided the facilities for building and testing Oscar. Notable among the testing facilities are a particular refrigerator and a famous Carlton oven.

The political activities necessary to get such a project off the ground must not be overlooked either. The group, through its chief stirrer, gained much advantage from either forming or allying itself with, apart from M.U.A.S., the M.U. Rocket Research Group, the M.U. Radio Club, the M.U. Meteorological Club, and the M.U. Liberal Club.

Vac. jobs in the Meteorological Bureau, a campaign to have Tonkin elected to the Union Council where he could put M.U.A.S's case (he was finally co-opted), and approaches to such notable personages as Sir Robert Menzies and Sir Malcolm Sargent all played an important part in the final achievement of an orbiting Oscar.

In 1967, Oscar was taken to America, accompanied by three of its developers: Richard Tonkin, Owen Mace and Paul Dunn. Then began a two-year waiting period, during which it seemed that nothing further was going to happen.

Then, in April 1969, a new amateur group, AMSAT (Amateur Satellite Corporation) informed M.U.A.S. that it was willing to attempt to have Oscar 5 launched on a NASA vehicle.

Godard counted off the last 30 seconds so that the Melbourne group could hear it. With the lift-off successfully achieved, some of the tension disappeared. However, about seven minutes after lift-off, contact with Godard was lost and it was some time before communication was restored.

Contact was restored in time for confirmation, at 12.52 (G.M.T.), that the satellite was transmitting on the 10 metre band.

Due to problems with the receiving equipment, the first pass was unsuccessful. However, after emergency repairs to the antenna, clear signals were received on the second pass and the group was able to toast its success in champagne.

Such enthusiasm was engendered among amateur radio operators that the local amateur radio station (call sign, anybody?), was forced to continue operating hours after it would have shut down, to comment on signals that amateurs had received.

Oscar was a momentous success. It functioned as planned, except that the signal on the two-metre band became too weak to track after one month instead of two. One amateur who had planned to study the mode of stabilisation was unable to do so because it was carried out so quickly.

This success prompted plans for a multi-channel repeater satellite for amateur radio. The project is now being undertaken solely by the Wireless Institute of Australia.