

Radio amateurs set their sights on Mars

In this monthly feature Hans van de Groenendaal ZS6AKV, executive chairman of the South African Amateur Radio Development Trust (SAARDT) looks at various technologies and activities that drive amateur radio. SAARDT is dedicated to the development of Amateur Radio in South Africa with a special interest in the youth. The organisation is funded from donations and supports the South African Radio League and SA AMSAT. For more details visit www.amateurradio.org.za or write to saardt@intekom.co.za

When radio amateurs in the USA launched OSCAR 1, a mere four years after the Russians rocked the world with man's first artificial satellite in 1959, few would have believed that radio amateurs would one day set their sights on Mars

OSCAR is the acronym for orbiting satellite carrying amateur radio. In 1960 a group of radio amateurs in Sunnyvale California were fired up by what was happening around them and started the OSCAR Association. Their first hurdle was to convince the US government that amateur radio satellites could serve a useful function in one or more of the following areas: scientific exploration, technical development, disaster communication and scientific and technical education. The many satellites that have been launched since OSCAR-1 certainly proved beyond doubt that the contribution amateur satellites are making far exceeds expectations.

After two years of efforts the first satellite OSCAR-1 was ready and scheduled for launch. Weighing less than 5 kg, the spacecraft contained a 140 mW beacon at 145 MHz transmitting a simple, repetitive Morse code message at a speed controlled by the internal and external temperature. The amateur radio world was fired up. It is ironic that radio amateurs discovered the usefulness of short waves when commercial interests believed that the shortwave spectrum

was of no commercial value. When the satellite era dawned, low earth orbits were explored by radio amateurs. The commercial world had their sights on geostationary orbits. Today low earth orbits are in high demand and extensively used for satellite phones.

Shortly after the success of OSCAR-1 the Amateur Radio Satellite Corporation (AMSAT) was formed. Today there are many AMSAT groups around the world including SA AMSAT in South Africa (www.amsatsa.org.za). Over the past four decades over 70 amateur radio satellites have been launched with many still in operation. In July 2002 the AMSAT-DL (Germany) announced that it was going to build two new spacecrafts, AMSAT-Phase 3-E (P3E) and AMSAT-Phase 5-A (P5A). The P3E satellite is to be launched as a communication and scientific platform into a highly elliptical orbit around Earth and will also serve as a test bed for project P5A which is destined to enter an orbit around the planet Mars.

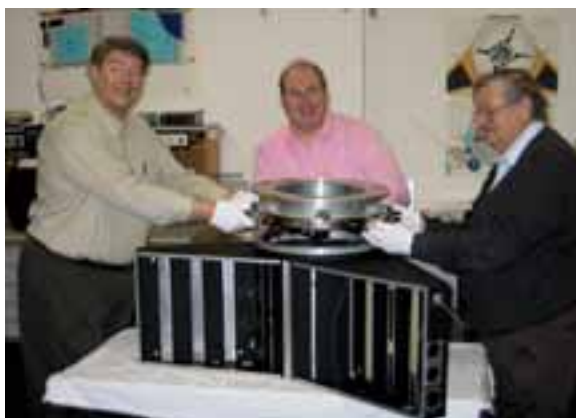
So far three successful Phase 3 satellites were launched under the leadership of AMSAT-DL. The projects demonstrated sufficient bus and propulsion capabilities for a flight to Mars. The P5A spacecraft will not only carry scientific experiments, but also sub-payloads to be released in the direction of the Martian surface. "The main task of P3E is to serve as a communication platform for the nearly 2-million radio amateurs worldwide" says Peter Gülzow, president of the German AMSAT (AMSAT-DL). Using existing technology, several transponders on frequencies between 145 MHz and 47 GHz are being built. The P3-E spacecraft will be an important test bed for some of the technology, needed for the Mars mission.

Funding projects of this nature is no mean task. Recently the Martian project was in jeopardy because of insufficient funds to continue operation of the Zentrales Entwicklungslabor für Elektronik (ZEL- Central Development Lab for Electronics). ZEL was established

over 20 years ago at the University of Marburg for the purpose of satellite construction. It is in this suite of workshops that several amateur space frames have been constructed, integrated and tested, including the famous OSCAR 13. The ZEL is staffed by 10 engineers and technicians who are a mixture of university employees and AMSAT-DL volunteers. The two largest AMSAT groups, the US and the UK, came to the rescue and donated €40 000 to AMSAT-DL for the purpose of funding the continued operation of ZEL P3E - considered vital to the amateur radio space community for a variety of reasons. Currently there is no high orbit satellite carrying analogue transponders allowing DX (long distance) multiple simultaneous contacts. There are amateur radio satellites in low earth orbit but these, because of their low orbit, only support relatively short range contacts and are only visible for short periods of time (e.g. 10 - 15 minutes). The proposed orbit of P3E will cause it to be visible from amateur radio stations on earth for several hours at a time, allowing increased periods of operation and experimentation.

P3E is considered a 'low risk' approach based on many of the design parameters of the successful OSCAR 13. In order to keep costs low, it is being constructed on a spare chassis left over from the OSCAR 13 development programme. There will, however, be several innovations. For example, the mode U/V (UHF uplink and VHF downlink) transponder, with a planned 80 kHz bandwidth, will be based on DSP technology using software developed in the UK and SDR HELAPS jointly developed with AMSAT-NA. (North America) The Internal House Keeping Computer (IHU-3) will be a new development modelled on a unit successfully tested on OSCAR-40. There will be several other experiments which will test techniques needed for the proposed flight of an amateur radio spacecraft to Mars.

The optimal years for launching a Mars-bound spacecraft are 2009 or 2011 so it is important that P3E is launched as soon as possible. This is currently planned to be at the end of 2008. It is realised that the next important step is to obtain an agreement with a suitable launch agency to undertake to fly the satellite.



L-R Rick Hambley W2GPS (AMSAT NA); Peter Gülzow DB2OS (AMSAT DL) and Jim Heck G3WGM (AMSAT UK) with the space frame of the P3E satellite