



Public lecture at the Victorian Space Science Education Centre (VSSEC)
Strathmore Secondary College 400 Pascoe Vale Rd Strathmore 3041
5th July @ 6:00pm - limit 85 people
\$5 (\$2 Mars Society) bookings bookings@vssec.vic.edu.au

The Mars Society Australia's Mission Architecture and Concept Vehicle Designs for a Manned Mars Mission

David Willson SEMF, Hobart & Mars Society Australia
Jonathan Clarke (presenter) Australian Centre for Astrobiology and Mars Society Australia

In 2001 Mars Society Australia (MSA) commenced researching design concepts for their proposed simulated Mars station 'MARS-Oz' to be located in the South Australian outback. This project is intended to provide a platform for field research into human factors and design issues surrounding human Mars missions and for outreach and education, including workshops for school students and space enthusiasts to 'Explore the art of living on another planet'.

At the same time the MSA conducted a theoretical exercise as to how a Mars station similar to MARS-Oz could be put on Mars using current technology. This research greatly increased our understanding of the difficulties and risks in undertaking a manned Mars mission and was a source of great debate amongst the Australian Mars Society members.

The outcome of this research was the development of a mission architecture similar to the Zubrin and Weaver 'Semi direct' approach, later adopted by NASA in their series of Design Reference Missions. A 'family' of concept vehicles were engineered to a level to provide shapes and masses suitable to plan the infrastructure for manned Mars missions. A number of interesting conclusions were revealed.

MSA's proposed an alternative mission architecture using biconic and horizontally landed bent biconic vehicle design concepts. The vehicle concepts are suitable for estimating the level of infrastructure required for a future manned Mars mission. The design aims are to provide a manned Mars mission at minimum cost while maximising safety, reliability and science outcomes, and leave infrastructure on the Mars surface suitable to build a long life station. In the process key choices involving mission architectures and vehicle design are explored and quantified.



These choices include options for orbital trajectories, Mars orbit insertion, whether or not to adopt Phobos as a base, the provision of an ISRU plant on the Martian surface, the number of crew, nuclear or solar power, nuclear, chemical or electric, propulsion, level of recycling, and the type of structures best suited to build a long term base. Finally we provide a family of vehicle concept designs and associated mass estimates.



Dr Jonathan Clarke is the vice-president of Mars Society Australia and an associate of the Australian Centre for Astrobiology. His Mars research interests include analysis of potential terrestrial analogues of surface features including springs, soils, and small-scale landforms, and the design of Mars stations and missions. Previously Jonathan was spent 12 years in the mineral and petroleum industry, 4 years teaching geology at the Australian National University and 3 years working in salinity management for CRC LEME. He has published more than 100 papers and abstracts.