

Are you Going to Mars?

Field Trip report to the Canberra Deep Space Communications Centre

By David Stevenson

On the 20th of January a delegation from NSAS were given the opportunity to walk around one of the most interesting space centres in Australia today. At the Canberra Deep Space Communications Centre (CDSCC) in Tidbinbilla just outside of Canberra we had a private tour to visit several of the communications dishes up close. The CDSCC is



responsible for the transmission of signals (commands etc) and the receiving of information (mostly scientific data and photos) sent from approximately 40 satellites, rovers and the like in deep space,



generally beyond 100,000km. (The International Space Station is only ~400km up and can be reached with a small hand-held satellite phone). The main dish (Deep Space Station DSS43) measures 70m across and due to its curvature can fit a cricket oval in the middle. It weighs in at a hefty 3000 tonnes yet floats on a sliver of oil 0.17mm thick with a total surface area of 4,180 square metres and when tilted on its side the edge of the dish is less than 1 metre off the ground. The surface of the reflector is accurate to 0.5mm, and the antenna has a pointing accuracy of 0.005°. The dishes can rotate a full field of access in a few minutes and DSS43 usually operates with a transmission power of 100,000 watts

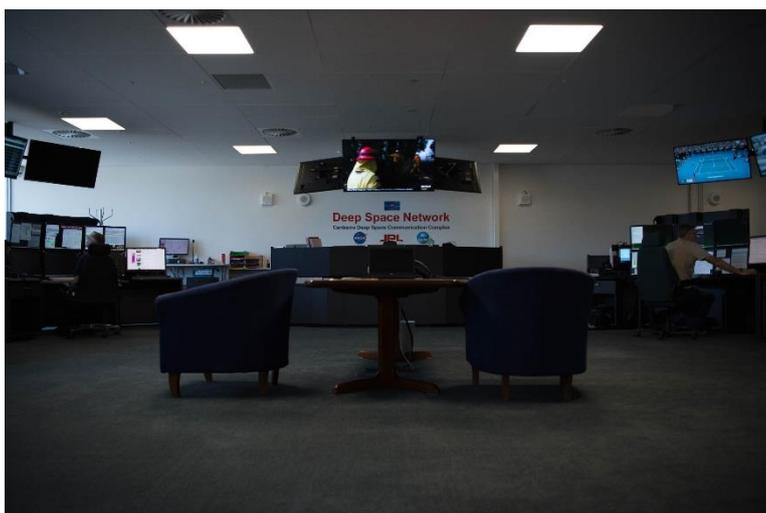
but in times of need this can be cranked up to 400,000 watts, quite capable of frying cattle 50kms away. Whilst this might be an easy way to beat any fire restrictions for the local BBQ the collateral damage to the rest of the family standing around might need some explaining. For obvious reasons there is a 5km wide exclusion zone for aircraft around the site.



When it was opened in 1965 it cost approximately [\$600K] but the replacement

cost in today's money exceeds \$200M. Also, on site are three 34m dishes built in the last 10 years. At the time we were there they were communicating with Voyager-1 18.8 billion km to the north and Voyager-2 15.2 billion km to the south.

CDSCC is a sister communications centre with two other NASA sites, one operating in Spain and the other California. These three dishes are almost equidistant around Earth and hence at least one dish can always communicate with any deep space satellite or rover in the galaxy. Whilst DSS43 can transmit with huge power, the rovers and satellites clearly cannot. An interesting statistic regarding Voyager 1. It generates about 40watts of power of which 19watts are used to send the signal back to earth. This is less than the wattage in your oven light. More impressive too is the fact that the signal spreads out as it travels back to earth and by the time it gets here it is approximately earths diameter, meaning that the signal wattage is only approximately 0.000033 watts!! ($70 * (19 / \text{Pi} * 12,741,000)$) if people want to check my math!!! It is obvious why we needed to turn our mobile phones off with the average iPhone like a loudhailer at 2watts.



Our host, Mr Glenn Nagle, held us captive with many interesting facts, figures and stories. When we went into the actual command centre he told us about the time California was in the process of receiving some important scientific information from a solar satellite when an emergency happened, and they asked CDSCC to take over with less than hour to go. California sent the relevant information and

commands to Australia, but they still had it calculated based upon their California location. An impressive story ensued with much nail biting and heightened tension and the dish coming online with barely minutes and seconds to spare. The team at

CDSCC received the signal and forward it immediately to NASA in California where the scientists started jumping up and down in excitement whereas the Australian team just fell in a heap with relief!!



Back at the visitors' centre Glenn then spoke to us about some of the future in space travel. He showed us a photo taken from Mars showing Earth in the distance and it was uncanny in its similarity of how Venus looks to us in the morning and evening sky. The realisation was that a trip to Mars is inevitable with current plans for Mars landing of humans in 2038, only 20 years away. With the current space crew all aged between 24 and 57 this means that the astronauts who will be landing on Mars are alive today and are aged between 4 and 37!!

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Oh and PS: There really is a cricket wicket painted on the Parkes Radio Telescope!