AT NEWSLETTER
The Australia Telescope

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National Project

DIRECTOR OF THE AUSTRALIA TELESCOPE

The position of Director was advertised in February 1986 and an offer of appointment has been made. The relationship of the Australia Telescope to the CSIRO Division of Radiophysics must be defined before this appointment can proceed. Problems include the provision of technical services etc. for the Australia Telescope and the suggested transfer of the astronomers at present in the Division to the Australia Telescope project. These matters were considered by a CSIRO committee reviewing the Division of Radiophysics, and their report is expected to be considered by the newly appointed Board of CSIRO at the end of March.

ANTENNAS

Five antennas are in various stages of construction at Culgoora. The first antenna has all the panels fitted, and an intial survey of the surface has been made. When the surface is satisfactory the turret will be fitted. It is expected that the contractors will hand this antenna over at the end of March. The cryogenics will then be fitted and the University of Newcastle will install the servo drive system. Optical tests of the pointing will follow, and then focus and radio alignment tests using a 12 GHz satellite signal. Installation of the standard receivers and feeds will then commence.

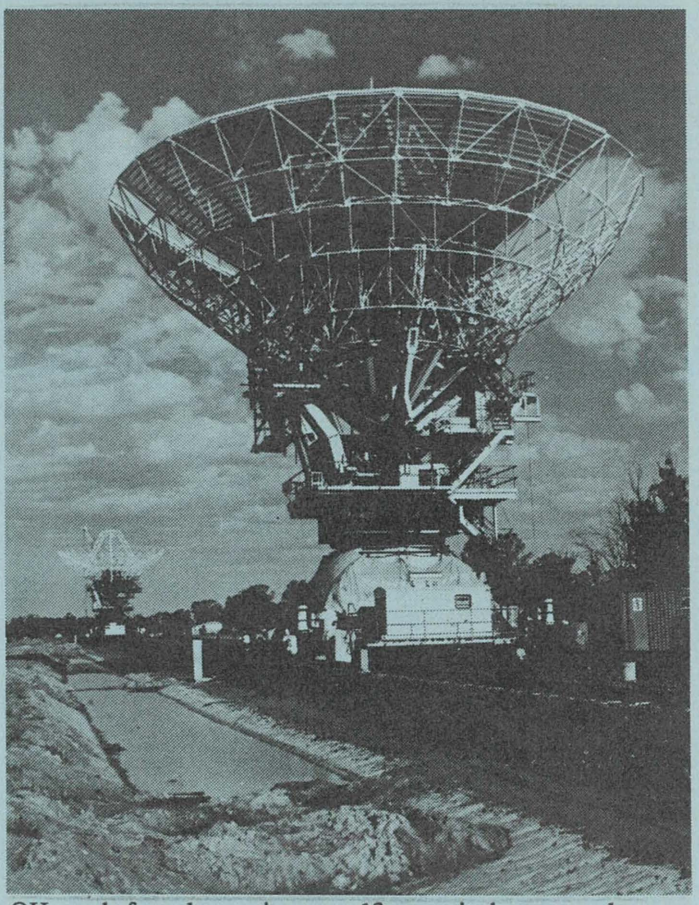
CIVIL WORKS

At Culgoora the 3 km E-W rail track, and the 75 m of track at the 6 km site, together with access roads and drainage channels are complete. The 37 concrete antenna pads, 35 on the 3 km section and two at the 6 km site, are also complete. The pedestals to hold the connections are complete to number 23, and the power cables laid and connected to number 16. Modifications to the building are essentially complete and the screened room has been installed.

At Siding Spring the access road, the building and the base for the antenna are complete, and services connected.

RECEIVERS

A prototype AT front end has been in use on the Parkes 64 m Telescope since late 1986. For studies of HI and



OH, and for observations at 13 cm, it has proved very satisfactory and is very stable. However at 3 cm the system temperatures were high a fault which has been traced to flexing of the cases of the 3 cm FET amplifiers during cooldown. A new one-piece case design has been adopted.

All low noise FET amplifiers for the 20 cm band have been assembled , as have about half of those for the 13 cm band. An amplifier design for the 6 cm band is now available with better performance than those in the Parkes prototype front end, and amplifiers for the 3 cm band are now being readied for assembly.

Two Compact Array 6 cm / 3 cm front ends incorporating cooled wide band polarizers are currently being assembled, and are expected to be complete by June 1987.

Microstrip component design for the conversion and i.f. systems of the receivers is nearing completion and large scale production of these components is about to begin. Cryogenic and hellium distribution systems for the first two antennas are complete and ready for installation.

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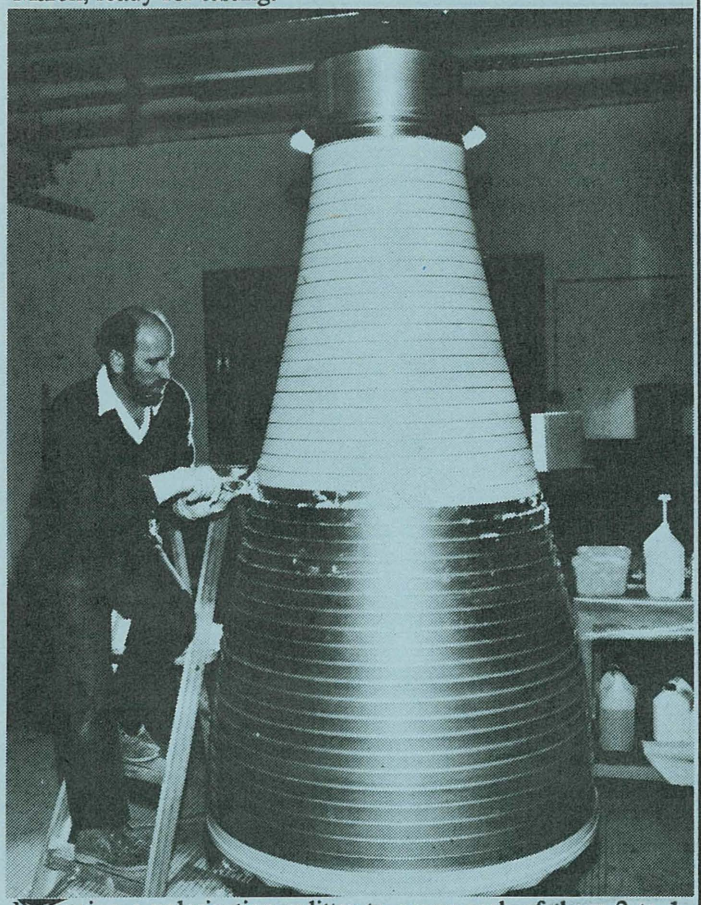
FEEDS AND POLARIZERS

The feeds to cover the frequency range 1.25 to 2.5 GHz (see photo) are complete and have been tested on the antenna range. These feeds, 2 m long and 1 m in diameter, were made from bands and rings of sheet aluminium, forced together to achieve electrical contact, and mechanically joined with external fibre-glass. The feeds for the range 4.4 GHz to 9.2 GHz are being machined from aluminium castings, with three sections per horn. They should be complete by early March, ready for testing.



Designing a polarization splitter to cover each of these 2 to 1 frequency ranges has required much ingenuity. To ensure a low noise contribution the polarizers must be cooled to about 70 K or below, and this places a severe limit on the size. Even so, the proposed polarization splitter for the 1.25 to 2.5 GHz range is to be 1 m long.

CORRELATORS

The 6,000 Radiophysics-designed X-cell correlator chips have all been delivered and tested satisfactorily at 16 MHz. A prototype correlator containing two modules was built and performed satisfactorily in all the intended modes of operation. A prototype of the final printed circuit board for the module has been manufactured. Wire-wrap prototypes for the other boards in the block have been completed and the backplane is being manufactured.

Data transmission at 32 MHz between blocks of the correlator has been tested and no problems were encountered. The design of the 2-bit samplers, which operate at up to 256 Msamples/s, is now 70% complete. The design of the fine delay units is nearly complete.

LOCAL OSCILLATORS AND DATA LINKS

For the Compact Array the local oscillator references will be distributed via buried coaxial cable since adequate reciprocity could not be achieved with optical fibres. The digitised I.F. signals, the monitor and control data, and the clock signals will be transferred by multimode optical fibre. The bandwidths desired could have been achieved more easily using singlemode fibre, but none of the connectors available for singlemode fibre were judged to be rugged enough to withstand frequent disconnection in dusty conditions.

For the Long Baseline Array the local oscillator reference will be transmitted via satellite. Frequency standards using saphire-loaded cavities are not sufficiently advanced for them to be used for the AT. The favoured satellite system has the effect of transferring the frequency standard from one site to another with essentially full compensation for the communication path length. This simplifies the task of providing phase and delay tracking at the antennas of the Long Baseline Array.

For the Long Baseline Array, tape recorders will be used to transfer the digitised i.f. signals to the correlator. Negotiations for the purchase of tape units from the U.S. VLB Array Project are under way.

COMPUTERS

The two Micro Vax II's and one of the Sky Warrior Array processors for the correlators are in hand, as are the seven PDP 11/73 antenna control computers. Two VAX 8200's, the main Culgoora computers, are expected to be delivered in March. One 8200 - the 'synchronous' computer - handles all tasks that are synchronized to the array control and data talking cycles, while the other - the 'asynchronous' computer - controls the data collection and does some preliminary processing. Selection of the main reduction computer, to be located at Epping, has yet to be made.

At each antenna 'data sets' connect the antenna control computer and the servo control computer to hardware in the antenna. Some 150 of these 'data sets' are needed: production has commenced. Elements of the clock system, which transmits time to 1 microsecond accuracy, are also in an advanced state and will be tested at Parkes in the coming months.

There has been considerable progress with software. The ephemeris routines are written and have been tested on the Parkes-Tidbinbilla Interferometer. Software controlling the servo system via the antenna control computer has been tested. Data base management programs and pointing analysis programs are also in an advanced state.

PARKES-TIDBINBILLA INTERFEROMETER

Using the microwave link constructed for the Voyager flyby, the Parkes 64 m telescope has been connected to NASA's Tidbinbilla 64 m telescope (or to one of the smaller Tidbiniblla telescopes) to form a powerful interferometer. This instrument is being used to test numerous techniques and software to be used in the Australia Telescope.