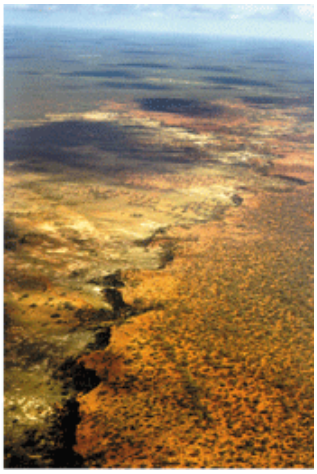
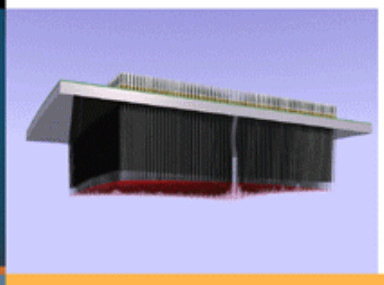


The Australian Astronomy MNRF



Annual report 2003-04

Executive summary

The Australian Astronomy Major National Research Facility (MNRF) is a collaboration between astronomical institutions and research organisations within Australia, with the aim of providing significant Australian participation in major new optical, infrared and radio facilities.

The broad objectives of the Facility are to: increase Australia's share of premier optical/infrared telescopes such as the twin Gemini 8-metre telescopes; develop world-class instrumentation for the Gemini telescopes; and develop enabling technologies for Australia to play a key role in, and host, the Square Kilometre Array (SKA), the centimetre-wave radio telescope of the future.

The key outcomes during 2003/04 were:

- Several important studies, based on Gemini observations, were made, including a high-resolution imaging experiment which showed unexpected evolution in host galaxies of high-redshift quasars.
- Substantial progress with the construction of two Gemini instruments: Gemini South Adaptive Optics Imager (GSAOI) and the Near-infrared Integral Field Spectrograph (NIFS), and the winning of a contract to conduct a feasibility study for the construction of a third instrument: the Wide-Field Multi-Object Spectrograph (WFMOS).
- The successful installation and operation of a prototype wideband digital filter bank at the Mopra telescope, and successful on-wafer testing of low-noise Indium Phosphide amplifiers at frequencies around 2 GHz, 8 GHz and 80 GHz.
- The hosting of a major international SKA planning meeting in Geraldton and the establishing of a reference SKA site at Mileura Station, WA.
- Design of a continuum correlator and detection of radio astronomical fringes using an interim correlator at the Molonglo telescope.
- The first international disk-based Very Long Baseline Interferometry (VLBI) observations initiated from Australia. The results were processed on the newly operational Swinburne supercomputer-based software correlator.

From a financial perspective, the participants' contributions to the MNRF continued to track to budget, as did the MNRF grant from the Department of Education, Science and Training. However, the MNRF continued to significantly under-spend due to a number of projects running behind schedule. The board will be taking steps in 2004/05 to rectify these scheduling issues.

Table of contents

1. Progress with establishment, enhancement and operation

1.1. Governance

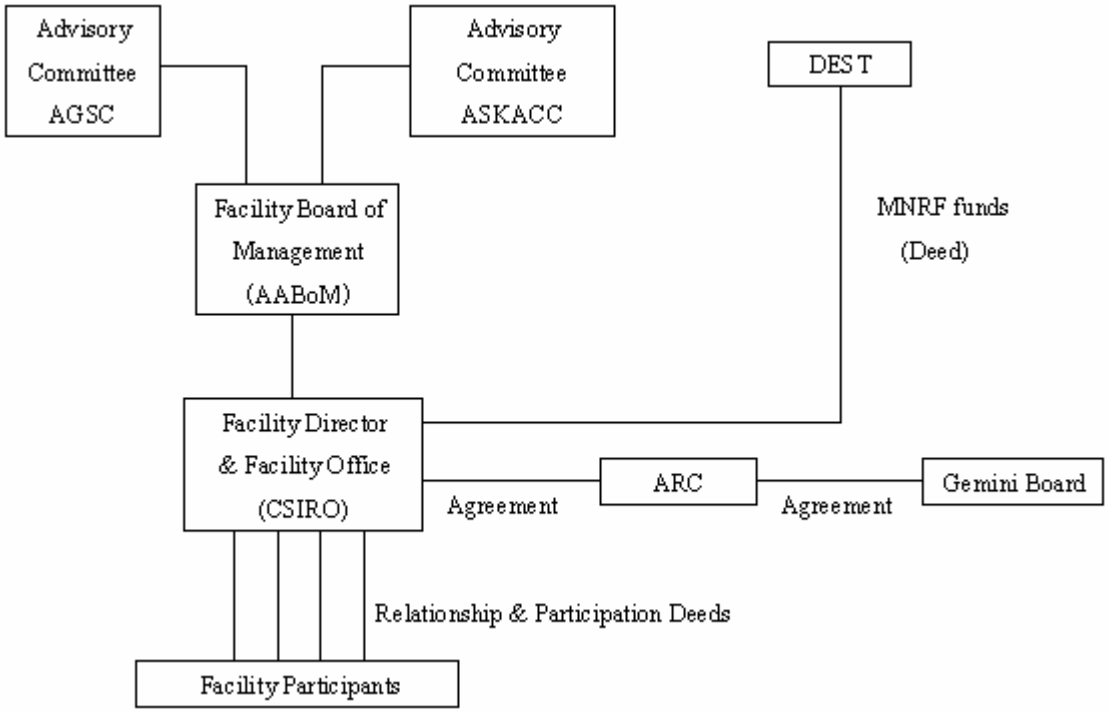


Figure 1: Relationships within the MNRF

This MNRF is managed by the MNRF Director, with assistance from the facility office. The Director reports to the Australian Astronomy Board of Management (AABoM).

This MNRF programme funds part of the Australian component of two international facilities, Gemini and the Square Kilometre Array (SKA). As such, AABoM are advised by the Australian Gemini Steering Committee (AGSC) and the Australian SKA Consortium Committee (ASKACC). AABoM provides the Department of Education, Science and Training (DEST) with a report each year detailing Gemini and SKA progress. When DEST accepts this annual report, they provide the facility office with the MNRF grant for that year. The facility office then distributes these funds to the various projects contingent on receipt of satisfactory progress reports detailing performance against agreed milestones.

In addition, the Australian Research Council (ARC) manages the relationship with the Gemini consortium. Payment for additional time is made by the facility office to the Gemini consortium on request from the ARC.

1.2. Project summaries

1.2.1. Project Office

The Project Office functioned well in 2003/04, although limited by understaffing. This will be rectified by the appointment of an executive officer. In addition, Ray

Norris, the MNRF director, is to take long service leave in 2005 and will be replaced by Lister Staveley-Smith. Both new appointments will be effective from 2nd August 2004.

Highlights:

- The appointment of the new, more effective, AABoM board.
- A one-day MNRF symposium held on 8th June 2004, with about seventy participants. Many exciting developments and science results were presented, and participants indicated that the symposium was very successful and should be repeated annually.

Issues:

- The majority of participation deeds have not yet been signed. This deed is of primary importance to Swinburne University of Technology and the University of Sydney, as their MNRF payments are contingent on them having signed this deed. Other participants have also formally agreed to sign a participation deed, but the consequences of not signing are less serious, as they are already committed to the MNRF by having signed the Relationship Deed. The outstanding participation deeds will be resolved in the immediate future.

1.2.2. Gemini

1.2.2.1. Increased share of Gemini telescopes

This project proceeded well in 2003/04 with Australia achieving a high profile on the international stage and establishing itself in key positions on science committees and working groups within the Gemini partnership. Australian astronomers also made significant contributions in the past year to the scientific strategic planning and advisory processes.

Consistent with the primary motivations for increasing Australia's share in Gemini, the Australian Gemini Steering Committee recommended to AABoM that up to four million dollars of unallocated funding be used to purchase additional nights on Gemini South from the UK during 2005 and 2006. In addition, it may be desirable to finance the Wide-Field Multi-Object Spectrograph (WFMOS) feasibility study being conducted by the AAO and a project scientist for the Extremely Large Telescope project.

Highlights:

- The first major Australian-lead Gemini paper was published by Croom & Boyle, which reported quite substantial and unexpected evolution over cosmological timescales in the galaxies/black-holes that host/power luminous high-redshift quasars. This important discovery was based on high-resolution adaptive optics imaging obtained with the Gemini North telescope.
- Australian astronomers Boyle, Colless and Couch are involved in a search for the very first galaxies to emit light in the universe, seen less than a billion years after the Big Bang; their initial detections of three such objects have been published.
- Two Australian-lead studies using Gemini have publications in the pipeline: the detection and characterization of the faint population of globular clusters around one of the central bright galaxies in the Virgo cluster by Forbes and collaborators; and the observation of temporal variations in the light emitted from the very

centre of the Crab Nebula (which provide important insights into the physical processes associated with the central pulsar) by Melatos and collaborators.

Issues:

- Since our payments to Gemini are in US dollars, exchange rate fluctuations are a potential hazard to the long-term viability of this project. Hedging has been considered as an option. Fortunately, in view of the strengthening Australian dollar, no funds were hedged. This may be an option if the Australian dollar shows signs of weakening.

1.2.2.2. RSAA Gemini instrumentation

Good progress has been made with both instruments under construction: Gemini South Adaptive Optics Imager (GSAOI) for Gemini South and Near-infrared Integral Field Spectrograph (NIFS) for Gemini North.

Highlights:

- Successful completion of the GSAOI critical design review allowing the project to progress to the construction stage.
- Vacuum and cold testing of the GSAOI cryostat that demonstrates that significant subsystems are operational.
- The image quality of the re-constructed NIFS on-instrument wave front sensor has been demonstrated and the spectrograph optics installed.
- A number of awards were received by the NIFS instrument team: ACT New Technology and Innovation Award; High Commendation for Engineering Excellence awarded by Engineers Australia, Canberra Division; ANU Staff Excellence Award.

Issues:

- Completion of the NIFS science detector system has been delayed by the resignation of the detector engineer and this position is currently under advertisement. The detector system is being progressed by the project engineer and the head of electronics. However, this is causing delays in interfacing the detector system to the Gemini software environment. These delays in the NIFS science detector system have the potential to impact on the delivery of the GSAOI detector system.

1.2.2.3. AAO Gemini instrumentation

This project is proceeding well, with only minor delays associated with finalising the Wide-Field Multi-Object Spectrograph (WFMOS) contract with Gemini.

Highlights:

- Winning the Gemini WFMOS feasibility study contract. AAO is the prime contractor for this study, and leads a consortium of seven institutions from Australia, USA, UK and Canada.

Issues:

- The start of the WFMOS feasibility study has been delayed by three months due to delays by Gemini in defining the scope of the study and finalizing the contract. As Gemini still require the study to be finished by 21 February 2005, this compresses the timeline for the study. In consequence, the AAO has negotiated with Gemini on the deliverables, and expects to be able to meet the deadline.

1.2.3. SKA

1.2.3.1. AT compact array broadband backend (CABB)

Progress has been slower than planned due to the delayed start of key personnel who were occupied in finishing previous projects. This situation was redressed early in 2004 when these previous projects neared completion. Delays have also occurred due to the unexpected complexity of the design process for the digital filter banks, in particular the development of firmware design techniques for the field programmable gate arrays. This has resulted in delays, particularly in producing the demonstrator spectrometers, which are an important part of the overall project plan.

Highlights:

- The installation and successful operation of the 256MHz digital filter bank at the Mopra telescope. As well as conducting a series of successful astronomical observations with the instrument, its capabilities in operating in a high interference environment were also demonstrated. The development of wide-band field programmable gate array-based digital filter banks is a critical requirement of this project.

Issues:

- A decision needs to be made soon on the choice between analogue or digital data transmission. The excellent performance but high cost of the digital solution, with sampling at the antennas leading to potential RFI problems, is competing against the comparably modest performance but lower cost analogue system. Valuable experience has been gained on the operation of wideband analogue links on the ATCA through their use in the wideband analogue correlator system, but the question of whether they can deliver adequate performance for CABB is as yet unresolved.

1.2.3.2. New technology demonstrator (NTD)

The research and development activities to date have allowed this project to reach a key stage in the choice of technology for the demonstrator: phased arrays in combination with reflectors will be used for the wide field-of-view technology demonstrator, not Luneburg lenses. Significant outstanding risk issues with the mass density of the dielectric material used to make the Luneburg lenses (six times higher than required for the SKA) lead to this decision.

Highlights:

- The Luneburg lens development has had a number of successes: completion of a prototype lens based on a new composite material; submission of a PCT patent application based on the lens development; and discussions with an external company for commercial development of the technology.

Issues:

- After a brief hiatus the project has undergone a change in project leadership and the development of a new project plan.

1.2.3.3. Microwave/millimetre-wave integrated circuit (MMIC)

Following the recent announcement of commercially available four Giga samples per second ten-bit digitisers, which would be suitable for the CABB project, the requirement for a fast sample and hold circuit has diminished. Work on the sample

and hold has been put on hold while tests are carried out on the commercially available devices.

In the integrated receiver area, an early review of the activity indicated that the original estimate of the time required for design was inadequate. This has resulted in a delay in the project time line of approximately six months. Progress against this modified time line has been good.

Highlights:

- The successful on-wafer testing of a number of InP HEMT designs. All the circuits: 1 to 3GHz band; 4 to 12GHz band; 67 to 90GHz low noise amplifier and a 1 to 60GHz distributed amplifier, met or exceeded expectations. The value of the integrated receiver design work received recognition with the acceptance for publication of a paper describing the work in a special SKA edition of Experimental Astronomy.

Issues:

- MMIC provides technology for the CABB and NTD projects. Delays in the CABB and NTD projects have meant that specific MMIC requirements have not yet become clear, resulting in a lower than expected spending profile to date. Some projected MMIC requirements for the CABB project are being reviewed and may not proceed. Also, an important issue is the extent to which MMICs will be required in the still developing NTD project. This is likely to have a significant influence on whether the remaining funds of the MMIC project can be fully committed within the five year project lifetime.

1.2.3.4. SKA Molonglo prototype (SKAMP)

In the past year good progress has been made with constructing the Stage 1 continuum correlator and related signal pathway. The infrastructure and signal pathway is complete. The correlator is a 10-layer PCB, which is now being commissioned and we anticipate the Stage 1 system to be complete by the end of 2004. The digitisers and control software are also complete.

The design matrix for the Stage 2 spectral line correlator is being revised and updated. Specification of this stage is well-advanced. An engineering appointment has been made to enable this part of the project.

The Stage 3 broadband line feed is under simulation study and a first prototype has been constructed. Feed development for a dual polarisation line feed is proceeding, funded by an ARC Linkage Project Grant. A first prototype (crossed wideband dipoles) has been built and is under test. Simulations of the total intensity and polarisation response of a large number of line elements are in progress.

Highlights:

- First fringes were achieved using an interim correlator for several different single baseline pairs, which verifies the integrity of the signal pathway.
- A new electronics lab has been established and tooled in the School of Physics at the University of Sydney.

Issues:

- The proposed location of the Defence Headquarters of the Joint Operations Command five kilometres from the telescope site. This has the potential to cause RFI. However, a very good cooperative relationship has been established with the

Defence project staff and a Heads of Agreement covering both the construction and operational phases is in final draft form. The RFI mitigation strategies planned are expected to be satisfactory.

1.2.3.5. SKA siting

This project is proceeding well against the revised timeline specified by the International SKA Steering Committee. In addition, work on radio-quiet zones is also being conducted outside of the MNRF.

Regarding the related issue of LOFAR, international funding constraints mean that LOFAR will be built in the Netherlands, not at Mileura in Western Australia. However, the international recognition of Mileura as the best technical site for LOFAR has raised the awareness of the suitability of Mileura for low frequency radio astronomy.

Highlights:

- There is sustained interest from MIT in continuing their low frequency radio astronomy work by siting a low-frequency demonstrator telescope in Western Australia, contingent on MIT funding.

Issues:

- Radio opacity testing may be necessary, including site ionospheric and tropospheric effects. This will increase the resources required to measure the suitability of Mileura for SKA.
- The hosting of SKA has become more competitive with the South African government now more active in promoting South Africa as a location for SKA. As well as investigating SKA technology issues, like Australia they are also investigating setting up radio quiet zones.

1.2.3.6. SKA supercomputer simulation & baseband processing (SKASS)

The second year of this project has seen a number of significant tasks reach practical completion. In addition, collaborations with the MIT/Haystack SKA simulations group and the International SKA Project Office have seen Swinburne become a central point for SKA simulation work relevant to the International Project. Ten research groups have used Swinburne facilities supported by the MNRF SKA project, involving approximately 30 researchers. Two thirds of the researchers who have made use of the Swinburne facilities have come from Australian institutions other than Swinburne as well as overseas institutions. In a user survey, users rated highly the Swinburne facilities and support from Swinburne staff.

A variance between actual and budgeted expenditure in 2003/04 exists because a planned major upgrade to the supercomputer at Swinburne's Hawthorn campus was postponed until the 2004/05 financial year.

Highlights:

- The development, construction, and testing of a disk-based baseband recording system for Very Long Baseline Interferometry (VLBI). This system, based on off-the-shelf hardware, has been used to perform the first international disk-based VLBI observations ever initiated from Australia. The disk-based system, in conjunction with a software correlator running on the Swinburne supercomputer (also completed this year) has been used to verify real-time fringes on VLBI

baselines within Australia and will be developed into a routine observing system over the next 3 years.

Issues:

- When Mr Craig West completed his Masters thesis in baseband processing and software correlation for VLBI, he was employed as part of the Swinburne SKA group on a six month contract. Due to the ongoing work in this part of the project, in particular the Swinburne collaboration with the ATNF for the development of e-VLBI, it will be necessary to extend Mr West's contract when it expires in October 2004.

1.3. Milestones

1.3.1. Project Office

Task	Project plan	Status	Comments
Project plans to be in place, and MNRF participation deeds (one each between CSIRO, on behalf of the MNRF office, and each participant) to be signed	December 2002	Revised to: September 2004	Project plans completed by December 2003. Participation deed signed with Swinburne September 2003.
New board composition to be agreed	June 2003	Completed: May 2003	Board formed September 2003.
Annual report to be provided to DEST	September 2003	Completed: May 2004	Delays occurred as this was the first annual report. The milestone should be achievable in 2004.
AABoM to meet at least:	Four times per year	Three meetings were held.	The Chair for the new board was not appointed until October 2003, leaving time for just three quarterly meetings.

1.3.2. Gemini

1.3.2.1. Increased share of Gemini telescopes

Task	Project plan	Status	Comments
The agreement with Gemini will be signed by ARC, (ratifying Australia's increased share of 1.43%).	November 2003	Achieved: October 2003	Brazil is the only partner who has not signed, but this has not delayed new shares coming into effect.
Australian astronomers will have access to an increased number of	January 2003	Achieved: February 2003	Thirteen hours of extra time now available on each of the Gemini

nights on Gemini			telescopes per observing semester.
A decision will be made on the strategic use of the balance of the MNRF Gemini funding	June 2004	Achieved: June 2004	The balance will primarily be used to purchase additional nights from the UK during 2005 and 2006

1.3.2.2. RSAA Gemini instrumentation

Task	Project plan	Status	Comments
1. Complete each of the remaining milestones for the completion of the Near-infrared Integral-Field Spectrograph (NIFS)	December 2004	On schedule.	
2. Deliver NIFS to Gemini	February 2005	Revised to: January 2005	
3. Successfully commission NIFS on Gemini North	June 2005	Revised to: August 2005	Dependent on telescope availability
4. Award of a new instrument contract from Gemini	July 2004	Completed: November 2002	Instrument is Gemini South Adaptive Optics Imager (GSAOI)
5. Contingent on 4 above, complete each of the milestones associated with the design and construction of GSAOI (see a to e below)	September 2005	On schedule	
5a. Approval of operational concept definition document and functional and performance requirements document by the US Association of Universities for Research in Astronomy (AURA)		Completed: May 2003	New milestone, added after project plan.
5b. Completion of ordering all optical elements		Completed: January 2004	New milestone, added after project plan.
5c. Completion of critical design review		Completed: October 2003	New milestone, added after project plan.
5d. Completion of cryostat and integration frame		Completed: March 2004	New milestone, added after project plan.

5e. Completion of first cool down with mechanisms.		On schedule	New milestone, added after project plan. Target: August 2004
6. Contingent on 4 above, deliver GSAOI	November 2005	Revised to: October 2005	
7. Contingent on 4 above, successfully commission GSAOI.	May 2006	On schedule	Commissioning date is dependent on telescope availability.

1.3.2.3. AAO Gemini instrumentation

Task	Project plan	Status	Comments
Provide back-office support for Gemini-related activities in Australia.	30 March and 30 September each year.	On schedule	Support provided at agreed level.
Pre-concept study for the Wide-Field Multi-Object Spectrograph (WFMOS).	June 2003	Completed: June 2003	
Complete Ukidna concept study for prototype of WFMOS.		Halted: December 2003	New milestone, added after project plan. Task halted as Gemini decided to seek WFMOS feasibility study. Results of Ukidna study documented.
Submit proposal for feasibility study for WFMOS.		Completed: March 2004	New milestone, added after project plan.
WFMOS feasibility study contract to be signed and study to begin.		On schedule.	New milestone, added after project plan. Target: July 2004.
WFMOS feasibility study submitted to Gemini.		On schedule.	New milestone, added after project plan. Target: February 2005.

1.3.3. SKA

1.3.3.1. AT compact array broadband backend (CABB)

Task	Project plan	Status	Comments
Commencement of project	January 2002	Completed: January 2002	
Demonstration of DFB spectrometer	October 2003	Completed: January 2004	
Installation of 256MHz DFB at Mopra		On schedule	New milestone, added in 03/04 project plan. Target: July 2004
Completion of 2GHz DFB (digital filterbank)		On schedule	New milestone, added in 03/04 project plan. Target: March 2005
Testing of prototype photonic data transmission system	February 2004	Revised: March 2005	
Testing of prototype conversion system		Revised: July 2005	New milestone, added in 02/03 project plan. Target: October 2004
Commencement of final production		On schedule	New milestone, added in 03/04 project plan. Target: January 2006
Six antenna ATCA operational with new backend.	January 2006	Revised: January 2007	
Completion of integration of NTD into ATCA system.	July 2006	On hold.	NTD project now considering sites other than Narrabri.
Broadband ATCA tied array operational.	July 2007	Revised: January 2007	Revised due to probable NASA 7mm tracking requirement. Additional resources required.

1.3.3.2. New technology demonstrator (NTD)

Task	Project plan	Status	Comments
Establish cross-divisional collaboration (CTIP, CMIT, CMS, ATNF) to investigate possible low loss and density composite dielectric materials.	December 2001	Completed	

Develop analysis and design software for spherical lenses	June 2002	Completed	
Demonstrate low-loss dielectric with values suitable for spherical lens.	June 2003	Completed	
Complete design of prototype spherical lens and wideband feed.	June 2003	Completed: November 2003	
Test hybrid array / lens system using FARADAY phased array	June 2003	Completed: February 2003	
Develop signal transport model based on LOFAR and SKA specifications.	June 2003	Completed: July 2003	
Develop wideband beam-former concept using direct digital sampling.	June 2003	Completed: July 2003	"A Baseband Receiver Architecture for Medium-N SKA", Ferris, D., SKA2003, Geraldton, WA, 2003
Complete construction of prototype spherical lens and wideband feed.	June 2003	Completed: December 2003	
Complete EM testing on prototype lens. Evaluate test results.	June 2004	Completed	Hayman, D and Li, L., "Measurement of a Prototype CSIRO Luneburg Lens", CSIRO ICT Centre Publication Number 04/1819
Develop business plan for possible commercialization of dielectric / lens technology	June 2004	Revised: September 2004	Draft business plan being circulated. Commercial negotiations in progress.
Decision point on further development work on spherical lenses.	June 2004	Completed	
Demonstrate high-speed direct digital sampling and polyphase filter bank technology.	June 2004	Completed	
Decide choice of NTD concept (lens; lens + array; phased array)	June 2004	Revised: November 2004	NTD will be a phased array-based system. Project plan being updated.

Develop complete EM analysis of lens plus integrated feed.	June 2004	Revised: August 2004	
Stage 1: NTD design and development of proof-of-concept prototypes.	June 2005	Being revised.	This project is now undergoing additional planning to specify the final NTD based on the knowledge gained to date. Once the updated project plan is complete in November 2004 these milestones will be updated.
NTD PDR. Stage 2: NTD design & development.	June 2005	Being revised.	
NTD CDR. Stage 3: NTD development & construction.	June 2006	Being revised.	
Complete NTD construction.	June 2007	On schedule	Scope of finished NTD will be specified in November 2004 project plan update.

1.3.3.3. Microwave/millimetre-wave integrated circuit (MMIC)

Task	**Project plan**	**Status**	**Comments**
Submit designs for first (InP) fabrication run.	March 2003	Completed March 2003	
Submit designs for second (sample and hold circuit) fabrication run.	April 2004	No longer required.	Commercial devices are now available that negate this sampler development.
Submit designs for integrated receiver prototypes		Revised: October 2004	New milestone, added in 02/03 project report. Target: April 2004.
Submit designs for integrated receiver assemblies		Revised: August 2005	New milestone, added in 02/03 project report. Target: November 2004.
Begin production fabrication of integrated receivers		Revised: January 2006	New milestone, added in 02/03 project report. Target: January 2005.
First devices (integrated receivers) available for integration into demonstrators	December 2004	July 2005	
Submit designs for third (stage 2 InP) fabrication run	January 2005	On schedule	
Final devices (samplers) available for integration into demonstrators.	December 2005	No longer required.	Commercial devices are now available that negate this sampler development.

Complete final integration of devices into demonstrators	December 2006	Revised: January 2007	

1.3.3.4. SKA Molonglo prototype (SKAMP)

Task	Project plan	Status	Comments
Test continuum correlator design	December 2003	Completed: May 2004	Delayed due to limitations with the PCB manufacturer.
Appoint RF Engineer	March 2004	Completed: June 2004	RF Engineer: Adrian Blake
Design concept for spectral line correlator	May 2004	Revised to: November 2004	Top level logic design complete; final detailed design dependent on results from continuum correlator testing, causing delay.
Fringes from 96-station continuum correlator	June 2004	Revised to: October 2004	Fringes achieved with interim correlator and a selection of single baselines.
Update SKAMP scope of project document	June 2004	Completed: June 2004	

1.3.3.5. SKA siting

Task	Project plan	Status	Comments
Establish clear contact points between WA Office of Science and Innovation) and ATNF.	June 2003	Completed	
Produce CDROM characterising the Mileura Station site with detailed information on landform, vegetation, geology etc	June 2003	Completed	
Discuss with relevant bodies issues of native title, planning permission, EIA etc in relation to the Mileura site.	June 2003	Completed	
Produce Australian Initial Site Analysis Document for submission to ISSC.	June 2003	Completed	
Meet with key science	June 2003	Completed	

groups in WA capable of supporting SKA.			
Organise international SKA Meeting in Geraldton and ISSC visits to Mileura site.	July 2003	Completed	
Respond to ISSC on initial site analysis document.	June 2004	Completed: December 2003	
Establish a process for selecting the best SKA site within Australia.	December 2003	Revised: September 2004	Draft procedure and selection criteria already produced. Awaiting final RFP from ISSC.
Choose one "reference site" for further evaluation.	October 2003	Completed: October 2003	ASKACC chose Mileura Station, WA as the reference site.
Ensure an adequate international RFI testing procedure.	June 2004	Revised: September 2004	One month RFI site testing procedure released. Release of the RFP due September 2004.
Stage 2: Initiate extended RFI tests to be conducted remotely over a full year, at the reference site.	June 2004	Revised: December 2004	Delayed while waiting for RF protocol from ISSC.
Choose whether Mileura site will be the Australian SKA site.		On schedule	New milestone added in 03/04 project report. Target: October 2004
Prepare final submissions for SKA siting if required	June 2005	Revised: December 2005	
Respond to ISSC on site submission if required	June 2005	Revised: March 2006	
Complete RFI tests to be conducted remotely over a full year, at the reference site.	June 2005	Revised: November 2005	There is some doubt within the project team whether this date can be achieved.
Interact with ISSC to ensure that Australian site is selected as SKA site	June 2006	Revised: September 2006	ISSC have changed their SKA decision date to September 2006.
Evaluate siting project and identify improvements	June 2006	Revised: October 2006	

1.3.3.6. SKA supercomputer simulation & baseband processing (SKASS)

Task	Project plan	Status	Comments
SUT SKA workforce established.	June 2003	Completed	
SUT and Parkes supercomputer operational	June 2003	Completed	
Initial simulations of baseband data including RFI	June 2003	Completed	
Completion of a two-station software correlator running on the SUT supercomputer	June 2003	Completed	
Investigation of new ATNF digital filter bank	June 2003	Completed	
A meeting of Australian groups undertaking SKA simulations	June 2003	Completed	
Participation in global coordination of SKA simulation activities	June 2003	Completed	
Software correlator operational	June 2004	Completed	
Workstation cluster to Narrabri	June 2004	Revised: October 2004	
A baseband recording system that can be deployed at any Australian radio telescope	June 2004	Completed	
A meeting of international groups undertaking SKA simulations	June 2004	Completed: July 2003	
Establish the MIT/Haystack simulation software package as the standard SKA simulation package	June 2004	Revised: October 2004	
Complete development of the LOFAR package as the standard simulation package for SKA	June 2005	Cancelled	These three milestones have now been replaced by the five new milestones listed below. These

Software correlator integrated with array configuration studies	June 2005	Cancelled	modifications have been in response to several new opportunities within Australian SKA-related projects and within the international SKA project.
RFI mitigation studies at Parkes and the ATCA	June 2005	Cancelled	
Develop MIT/Haystack simulation package to be suitable for SKA studies.		On schedule	New milestone, added in 03/04 project report. Target: June 2005.
Use clusters at Parkes and ATCA, in conjunction with the baseband recorders, to conduct RFI surveys at these two sites.		On schedule	New milestone, added in 03/04 project report. Target: June 2005.
Use cluster at ATCA to process pulsar observations and measure suitability of the ATCA tied-array for pulsar observations.		On schedule	New milestone, added in 03/04 project report. Target: June 2005.
Use software correlator, baseband recorders and supercomputing facilities to prove the concept of e-VLBI using an array of Australian radio telescopes.		On schedule	New milestone, added in 03/04 project report. Target: June 2005.
Develop software to calculate SKA cost based on parameters provided by all international SKA consortium members and guidelines set by the International Engineering Management Team.		On schedule	New milestone, added in 03/04 project report. Target: June 2005.
Demonstrate RFI mitigation in simulated and real data	June 2006	On schedule	These milestones will be described in more detail next year, since they follow from the old 2003/04 milestones which have been replaced.
Real and simulated spectral line observations with RFI mitigation	June 2007	On schedule	

2. Research, access & collaboration

2.1. Facility's access regime

2.1.1. Gemini

All Australian astronomers are eligible to apply for time on the Gemini telescopes. Proposals are evaluated on the basis of scientific merit by the Australian Time Allocation Committee, which oversees time allocation on all optical/infrared national-access telescopes. There is no direct charge for access to the Gemini telescopes and the telescopes are not used for commercial purposes.

In 2003/04 a total of thirty proposals requesting time on the Gemini telescopes were received, involving one-hundred and sixty-two astronomers. Twenty-one of these proposals were allocated time, amounting to one-hundred and forty hours on Gemini-North and seventy-one hours on Gemini-South. The Australian Time Assignment Committee provided detailed technical and scientific feedback to both successful and unsuccessful applicants.

When new instruments, such as those being developed by the Research School for Astronomy and Astrophysics and the Anglo-Australian Observatory, are commissioned on the Gemini telescopes, they will be available to all Gemini consortium astronomers, including Australian astronomers.

2.1.2. SKA

As the SKA will not be operational for many years, there is currently no defined access regime. However, the Australian facilities that are being developed or enhanced as part of the SKA planning phase have the following access regimes:

- Australia Telescope Compact Array: Proposals for observing time are allocated by the Australia Telescope National Facility's time assignment committee on the basis of scientific merit.
- Molonglo prototype: Proposals for observing time will be allocated by the Australia Telescope National Facility's time assignment committee.
- Swinburne supercomputer: Anyone in the SKA community who requires substantial computing resources to undertake SKA-related investigations may contact the Swinburne SKA Project Leader to obtain a resource allocation. Users are not charged for access to the facility and there is no commercial use of the facility. To date thirty people have already used the facility: ten from Swinburne, eleven from other Australian intuitions and nine from overseas.

2.2. Collaboration and linkages

Australian astronomers continue to work closely with international researchers on collaborative studies. For example, in 2003/04 seventy percent of the proposals made by Australian researchers to use the Gemini telescopes involved an international collaboration.

This international collaboration also occurs in the technology being developed for telescopes. For example the Wide-Field Multi-Object Spectrograph feasibility study involves collaboration with the National Optical Astronomy Observatory and the

Johns Hopkins University in the USA, the Universities of Oxford, Durham and Portsmouth in the UK, and the Canadian Astronomical Data Centre.

At a National level, a joint study on the new technology demonstrator antenna technology was completed in collaboration with Connell Wagner Pty Ltd.

2.3. Facility's contribution to research and training

2.3.1. Gemini

In 2003/04 thirteen Australian PhD students obtained Gemini data for their thesis and ten postdoctoral researchers from the Australian National University, Swinburne University of Technology, University of Melbourne, University of New South Wales, and University of Queensland, were supported on Gemini-related ARC grants.

In addition to the scientific research, training also occurs in the area of instrumentation development. For example, sixteen Australian National University engineers and technicians are working on the GSAOI and NIFS projects. Involvement in these projects exposes these professionals to design tools, components, procedures, and international collaborative discussions to which they would not otherwise have had access. On-time acceptance by the Gemini Observatory of GSAOI and NIFS will then generate thirty-two guaranteed nights on the telescopes for the instrument teams to use these instruments, contributing to further opportunities for science research.

2.3.2. SKA

During 2003/04 there were two PhD students working under the new technology demonstrator project, one PhD student working under the microwave/millimetre-wave integrated circuit project and three PhD students working under the SKA Molonglo prototype project. In March 2004 a Masters student submitted his thesis as part of the SKA supercomputer simulation project.

These projects are allowing Australian technologists to develop and maintain skills that will be highly marketable for the SKA project, for example wide-band antenna development, multi-path digital signal processing and innovative signal correlation techniques. It is also worth noting that Australia Telescope National Facility's expertise in the design and construction of state-of-the-art low noise amplifiers, a critical component for radio astronomy systems, is possibly the best in the World.

2.4. Contribution to Australian industry

Auspace Ltd is a small Australian enterprise based on advanced space technology. Auspace recognises that astronomical instrumentation demands similar technological skills to space instrumentation, and that astronomical instrumentation is a significant international market with over ten billion US dollars to be invested internationally in astronomical hardware over the next decade. The re-building of the Near-infrared Integral-Field Spectrograph by Auspace following the 2003 Canberra bushfire has resulted in technology transfer from the Australian National University to Auspace, strengthening the company's market position.

In addition the SKA Molonglo prototype stage one continuum correlator has been sent to the South Australian company EnTech for manufacture.

3. Promotion of the facility

3.1. Gemini

The Australian share of Gemini (http://www.ausgo.unsw.edu.au/) continues to be viewed as a key optical telescope facility by Australian astronomers, with every Australian astronomer aware of their right to apply to use this facility. The professional status of the Australian share of Gemini was further enhanced in 2003/04 with several papers published in refereed journals:

- **Croom, S.M.**, Schade, D., **Boyle, B.J.**, Shanks, T., Miller, L., Smith, R.J. 2004, ApJ, 606, 126. "Gemini Imaging of QSO Host Galaxies at z~2".
- Stanway, E.R., Glazebrook, K., Bunker, A.J., Abraham, R.G., Hook, I., Rhoads, J., McCarthy, P.J., **Boyle, B., Colless, M.**, Crampton, D., **Couch, W.**, Jorgensen, I., Malhotra, S., Murowinski, R., Roth, K., Savaglio, S., Tsvetanov, Z. 2004, 604, L13. "Three Lyα Emitters at z~6: Early GMOS/Gemini Data from the GLARE Project".
- **Forbes, D.**, Favio, R.F., Forte, J.C., Bridges, T., **Beasley, M.A.**, Gebhardt, K., Hanes, D.A., Sharples, R., Zepf, S.E. 2004, Mon. Not, Royal, Astr. Soc., in press. "Gemini/GMOS Imaging of Globular Clusters in the Virgo Galaxy NGC4649 (M60)".

In addition, this facility has also been promoted to the Australian public. For example, in 2003/04 three major media releases announcing Australian-involved discoveries with Gemini were issued. These resulted in a number of articles appearing in national newspapers and websites, including The Australian, Sydney Morning Herald, Sunday Sun Herald, Canberra Times and ABC Online. The importance of these discoveries was demonstrated by their coverage in international newspapers and magazines including New Scientist and Scientific American. These media releases also led to the Australian Gemini Scientist being interviewed on SBS Radio.

The Australian Gemini Scientist has also been active promoting Gemini to the public and astronomers in lectures and presentations. (See Appendix A for details of numbers of newspaper articles, presentations, etc.)

The international status of our technologists has also received international attention. For example, two papers on the Gemini South Adaptive Optics Imager (http://www.mso.anu.edu.au/gsaoi/) were presented at an international astronomical instrumentation conference. This instrument's critical design review was also used by the Gemini Observatory as their ideal in the tendering process for second-generation Gemini instruments.

3.2. SKA

The six projects within the Astronomy MNRF involved with SKA are actively working with international partners to position Australia at the forefront of SKA. For example, presentations on the new technology demonstrator have been given at the International SKA meeting in South Africa. However, the promotion of SKA as a usable facility will not commence until much later in the development of SKA.

4. Commercialisation: New technology demonstrator

Application of low loss dielectric materials to Luneburg lenses

The new technology demonstrator project has developed a new process for the production of low loss microwave dielectrics. This process may be commercially valuable and has therefore been protected by an international PCT patent application.

CSIRO's Molecular Science and Manufacturing & Infrastructure Technology divisions have been negotiating with the Victorian Centre for Advanced Materials and Manufacturing (VCAMM) and Polyfoam Australia Pty Ltd to undertake a development project to exploit and further develop this technology. The target applications are currently Luneberg lens, horns and other antennae devices for microwave telecommunications devices for both home and industry. There is also an interest in tracking and security devices.

The proposed project is dependent upon VCAMM securing follow-on funding from the Victorian government via the science, technology and infrastructure program. VCAMM will know by the end of the year if they have been successful or not. If funding is secured business and project plans will be written and submitted to the Victorian government.

Optimisation algorithms for Luneburg lenses and feed structures

Using the knowledge gained during the new technology demonstrator project, CSIRO engineers now have the skills and experience relevant to the commercial use of Luneburg lens technology. CSIRO's Information and Communication Technology division is currently investigating the application of such technology for use as a satellite terminal on mobile platforms. Such a scenario would allow Luneburg lenses and feed structures to be optimised to provide real-time broad-band communications from low altitude aircraft via satellite.

The use of the previously mentioned low loss dielectric materials may also be relevant to this commercial application.

5. Compliance with biological & radiation safeguards

Both the Gemini and SKA facilities are purely for astronomical research and associated technological developments. This work is not normally considered contentious in terms of science ethics, environmental risks, or danger to participants or others.

The Gemini Observatories have fulfilled all environmental requirements for their operation, as have the facilities of the Australia Telescope. Any expansion of Australia Telescope activities beyond the existing sites will be subject to an environmental impact study.

Site selection studies for the SKA in Western Australia are in collaboration with the Office of Science and Innovation and local leaders of the Aboriginal community.

6. Financial report

6.1. Financial summary

During 2003/04 the Astronomy MNRF revenue[1] continued to track reasonably close to schedule. From the commencement of the MNRF until 30th June 2004, $18,636,000 in revenue had been received against a budget of $18,713,000.

The Astronomy MNRF under-spent during 2003/04 by $2,609,000. This continues the trend from 2002/03 of significantly under-spending. From the commencement of the MNRF until 30th June 2004, $15,196,000 in expenses[2] had been incurred against a budget of $19,895,000. This 24% under-spend is due to a number of projects running behind schedule.

2003/04 financial summary

	($,000) Actual	($,000) Budget	Diff.
Revenue	10,294	10,665	(3%)
Expense	8,508	11,117	(23%)
Surplus	1,806	(452)	

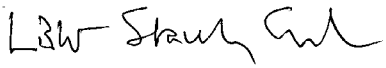
2001/04 financial summary

	($,000) Actual	($,000) Budget	Diff.
Revenue	18,636	18,713	0%
Expense	15,196	19,895	(24%)
Surplus	3,460	(1,182)	

Note: The financial details from which the above summary is drawn are in section 6.3. Electronic scans of the auditors' reports in agreement with the financial details are in section 6.4.

This financial report also confirms that all expenditure of the MNRF grant has been solely on the Facility in accordance with the Facility business plan.

Dr Martin Cole
Chairman
30th November 2004



Dr Lister Staveley-Smith
Director
30th November 2004

[1] Revenue means the total MNRF revenue, calculated as the sum of in-kind contributions from participants, and cash contributions from participants and DEST.
[2] Expense means the total MNRF expense, calculated as the sum of in-kind contributions from participants and cash expenditure.

6.2. Financial summary by project

An analysis of the 2003/04 finances by project indicates that the combined CABB and MMIC under-spend accounts for over half of the total under-spend for the 2003/04 financial year. An analysis of the finances by project from the commencement of the MNRF until 30th June 2004 shows that the Gemini, CABB and MMIC projects have significantly underspent their budgets.

Note: As the footnotes to the following table demonstrate, the initial project budgets have been established in such a manner that does not allow the sum of the per-project budget cash contributions and cash expense to be compared directly with the official MNRF budget. Therefore, the exact breakdown of the $2,609,000 under-spend as stated in 6.1 cannot be identified on a per project basis from the following table. However, the table does allow the general trend of which projects are underspending to be identified.

2003/04 financial summary by project

	In-kind			**Cash contribution**[3]			**Cash expense**		
	($,000)	($,000)		($,000)	($,000)		($,000)	($,000)	
	Actual	Budget	Diff.	Actual	Budget	Diff.	Actual	Budget[4]	Diff.
Office	43	50	(15%)	74[5]	104	(29%)	79	104	(24%)
Gemini	0	0	0%	5,361	5,687	(6%)	5,351	5,687	(6%)
RSAA inst	216	173	25%	0	70	(100%)	0	70	(100%)
AAO inst	413	252	64%	0	0	0%	0	0	0%
CABB	163	350	(53%)	798[5]	1,125	(29%)	306	1,125	(73%)
NTD	476	610	(22%)	780[5]	1,100	(29%)	732	1,100	(33%)
MMIC	46	300	(85%)	426[5]	600	(29%)	98	600	(84%)
SKAMP	140	131	7%	301	310	(3%)	0	310	(100%)
SKA siting	71	200	(64%)	264	0	N/A	0	0	0%
SKASS	94	429	(78%)	628	205	206%	280	205	36%
Total	**1,662**	**2,494**	**(33%)**	**8,632**	**9,202**[6]	**(6%)**	**6,846**	**9,202**[7]	**(26%)**

[3] Includes cash contributions from the participants and from DEST.
[4] The business plan does not contain budget estimates for project cash expense. The project budget cash expense has therefore been assumed to equal the project budget cash revenue as recorded in the business plan.
[5] The CSIRO Australia Telescope National Facility accounts do not record revenue on a per project basis. The $2,078,000 total DEST and ATNF cash contribution to the Project Office, CABB, NTD and MMIC projects in 2003/04 has therefore been recorded in the above table based upon the cash revenue budget ratio.
[6] This total does not match the equivalent total from financial table: Cash Contributions from Participating Parties, $8,171,000. This occurs because the DEST funding profile, accurately captured in the annex to the business plan, does not match the sum of the project budgets' facility contribution defined in the business plan.
[7] This total does not match the equivalent total from financial table: Cash Heads of Expenditure, $8,623,000. See footnotes 4 and 6 above.

6.3. Financial tables

6.3.1. In-Kind Contributions from Participating Parties

In-Kind Contributions from Participating Parties ($'000s)

Participating Party	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/2004	Variance from Deed (to end 2003/04)	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Contributions (Total to Date - Actual).	Cumulative Contributions (Total to Date - Agreement).	Projected Grand Total - 5 Years	Agreement 5 Years	Difference over 5 Years
CSIRO ATNF													
Salaries	0	760	0	830	-1,590	830	340	230	0	1,590	1,400	2,990	-1,590
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	550	250	506	280	526	280	120	80	1,056	530	1,536	1,010	526
Total	550	1,010	506	1110	-1,064	1110	460	310	1,056	2,120	2,936	4,000	-1,064
CSIRO TIP													
Salaries	157	96	111	96	76	96	96	96	268	192	556	480	76
Capital	0	64	0	64	-128	64	64	64	0	128	192	320	-128
Other	422	0	111	0	533	0	0	0	533	0	533	0	533
Total	579	160	222	160	481	160	160	160	801	320	1,281	800	481
AAO													
Salaries	68	84	246	189	41	275	541	675	314	273	1,804	1,764	41
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	68	28	167	63	144	137	271	337	235	91	980	836	144
Total	135	112	413	252	184	412	812	1012	548	364	2,784	2,600	184
SYDNEY UNI													
Salaries	67	128	70	131	-122	135	135	67	137	259	474	596	-122
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	67	0	70	0	137	0	0	0	137	0	137	0	137
Total	134	128	140	131	15	135	135	67	274	259	611	596	15
ANU													
Salaries	420	173	216	173	290	173	172	172	636	346	1,153	863	290
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	420	173	216	173	290	173	172	172	636	346	1,153	863	290
SWINBURNE													
Salaries	151	98	45	101	-3	106	29	0	196	199	331	334	-3
Capital	310	491	49	327	-460	0	0	0	358	818	358	818	-460
Other	2	0	0	0	2	0	0	0	2	0	2	0	2
Total	462	589	94	428	-462	106	29	0	555	1,017	690	1,152	-462
APT													
Salaries	0	15	0	15	-30	15	15	15	0	30	45	75	-30
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	5	0	5	-10	5	5	5	0	10	15	25	-10
Total	0	20	0	20	-40	20	20	20	0	40	60	100	-40
CEA													
Salaries	0	15	0	15	-30	15	15	15	0	30	45	75	-30
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	5	0	5	-10	5	5	5	0	10	15	25	-10
Total	0	20	0	20	-40	20	20	20	0	40	60	100	-40
WA Govt													
Salaries	73	100	71	100	-55	100	100	0	145	200	345	400	-55
Capital	0	75	0	75	-150	75	75	0	0	150	150	300	-150
Other	44	25	0	25	-6	25	25	0	44	50	94	100	-6
Total	117	200	71	200	-212	200	200	0	188	400	588	800	-212
UNSW													
Salaries	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
MELB UNI													
Salaries	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
DELL													
Salaries	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital	0	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total In-kind													
Salaries	935	1,469	760	1,650	-1,424	1,745	1,443	1,270	1,695	3,119	6,153	7,577	-1,424
Capital	310	630	49	466	-738	139	139	64	358	1,096	700	1,438	-738
Other	1,152	313	854	378	1,315	452	426	427	2,006	691	3,311	1,996	1,315
Total	2,397	2,412	1,662	2,494	-847	2,336	2,008	1,761	4,059	4,906	10,164	11,011	-847

6.3.2. Cash Contributions from Participating Parties

Table 2

Cash Contributions From Participating Parties ($'000s)

Participating Party	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/2004	Variance from Deed (to end 2003/04)	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
CSIRO ATNF	1,032	832	1,032	1,032	200	1,532	432	332	2,064	1,864	4,360	4,160	200
CSIRO TIP	0	0	0	0	0	0	0	0	0	0	0	0	0
AAO	0	0	0	0	0	0	0	0	0	0	0	0	0
SYDNEY UNI	65	155	65	155	-180	155	155	1,655	130	310	2,095	2,275	-180
ANU	245	315	245	315	-140	315	315	315	490	630	1,435	1,575	-140
SWINBURNE	10	10	10	10	0	10	10	10	20	20	50	50	0
APT	0	0	0	0	0	0	0	0	0	0	0	0	0
CEA	0	0	0	0	0	0	0	0	0	0	0	0	0
WA Govt	0	0	264	0	264	0	0	0	264	0	264	0	264
UNSW	210	210	210	210	0	210	210	210	420	420	1,050	1,050	0
MELB UNI	52	52	52	52	0	52	52	52	104	104	260	260	0
DELL	0	85	85	0	0	0	0	0	85	85	85	85	0
insert additional Participants above this line													
Total	1,614	1,659	1,963	1,774	144	2,274	1,174	2,574	3,577	3,433	9,599	9,455	144

Other Sources	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/2004	Variance	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5	Agreement 5 Years	Difference 5 Years
ARC	1,855	1,637	1,766	1,637	347	1,637	1,637	1,637	3,621	3,274	8,532	8,185	347
Victorian Govt	131	0	131	0	262	0	0	0	262	0	262	0	262
Sou. Qld Uni	5	0	5	0	10	0	0	0	10	0	10	0	10
Monash Uni	0	0	5	0	5	0	0	0	5	0	5	0	5
Tasmania Uni	0	0	2	0	2	0	0	0	2	0	2	0	2
					0				0	0	0	0	0
					0				0	0	0	0	0
					0				0	0	0	0	0
insert additional Other Items above this line													
Total	1,991	1,637	1,909	1,637	626	1,637	1,637	1,637	3,900	3,274	8,811	8,185	626

	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/2004	Variance	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
MNRF Grant	2,340	2,340	4,760	4,760	0	8,000	7,500	900	7,100	7,100	23,500	23,500	0

Grand Total of Cash Contributions	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/2004	Variance	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
	5,945	5,636	8,632	8,171	770	11,911	10,311	5,111	14,577	13,807	41,910	41,140	770

Notes on Cash Contributions:

6.3.3. Cash Heads of Expenditure

Table 3

Cash Heads of Expenditure ($'000s)

Total of Heads of Expenditure	Actual 2001/2003	Agreement 2001/2003	Actual 2003/04	Agreement 2003/04	Variance from Deed (to end 2003/04)	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
Salaries	821	483	942	155	1125	155	155	155	1763	638	2228	1103	1125
Capital	358	560	107	1760	-1855	1760	1759	1809	465	2320	5793	7648	-1855
Other	3113	5323	5797	6708	-3121	6949	7157	6248	8910	12031	29264	32385	-3121
Totals	4292	6366	6846	8623	-3851	8864	9071	8212	11138	14989	37285	41136	-3851

6.3.4. Summary of Resources Applied to Activities of MNRF

Table 4

Summary of Resources Applied to Activities of MNRF ($'000s)

	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/04	Variance from Deed (to end 2003/04)	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
Grand Ttl 5 Yrs Inkind from Tble 1	2,397	2,412	1,662	2,494	-847	2,336	2,008	1,761	4,059	4,906	10,164	11,011	-847
Grand Ttl 5 Yrs Cash from Tble 2	5,945	5,636	8,632	8,171	770	11,911	10311	5111	14,577	13,807	41,910	41,140	770
Ttl Resources Cash & Inkind Income	8,342	8,048	10,294	10,665	-77	14,247	12,319	6,872	18,636	18,713	52,074	52,151	-77

Allocation of Total Resources Applied to Activities of MNRF Between Heads of Expenditure ($)

	Actual 2001/2003	Agreement 2001/2003	Actual 2003/2004	Agreement 2003/04	Variance from Deed (to end 2003/04)	Agreement 2004/2005	Agreement 2005/2006	Agreement 2006/2007	Cumulative Total to Date - Actual	Cumulative Total to Date - Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
Total Salaries Cash & Inkind	1,756	1,952	1,702	1,805	-299	1,900	1,598	1,425	3,458	3,757	8,381	8,680	-299
Total Capital Cash & Inkind	668	1,190	156	2,226	-2,593	1,899	1,898	1,873	823	3,416	6,493	9,086	-2,593
Total Other Cash & Inkind	4,265	5,636	6,651	7,086	-1,806	7,401	7,583	6,675	10,916	12,722	32,575	34,381	-1,806
Grand Total (Cash & Inkind)	6,689	8,778	8,508	11,117	-4,698	11,200	11,079	9,973	15,197	19,895	47,449	52,147	-4,698

6.3.5. Summary of Planning/Construction/Upgrade/Operating Expenditure

Table 5

Summary of Planning/Construction/Upgrade/Operating Expenditure ($'000s)

		Actual 2001/2003	Agreement 2002/2003	Actual 2003/2004	Agreement 2003/04	Variance from Deed (to end 2003/04)	2004/2005 Agreement	2005/2006 Agreement	2006/2007 Agreement	Total to Date Actual	Total to Date Agreement	Projected Grand Total 5 Years	Agreement 5 Years	Difference 5 Years
SKA Planning Phase	*CABB*	0	N/A	0	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A
	NTD	1621	N/A	1,208	N/A	N/A	N/A	N/A	N/A	2829	N/A	N/A	N/A	N/A
	MMIC	300	N/A	0	N/A	N/A	N/A	N/A	N/A	300	N/A	N/A	N/A	N/A
	SKAMP	0	N/A	0	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A
	Siting	117	N/A	0	N/A	N/A	N/A	N/A	N/A	117	N/A	N/A	N/A	N/A
	SKASS	688	N/A	0	N/A	N/A	N/A	N/A	N/A	688	N/A	N/A	N/A	N/A
	Total	2726	3640	1208	2582	-2288	1517	523	0	3934	6222	5974	8262	-2288
	insert additional items above this line													
SKA Construction/ Upgrade Phase	*CABB*	358	N/A	469	N/A	N/A	N/A	N/A	N/A	827	N/A	N/A	N/A	N/A
	NTD	0	N/A	0	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A
	MMIC	0	N/A	145	N/A	N/A	N/A	N/A	N/A	145	N/A	N/A	N/A	N/A
	SKAMP	134	N/A	140	N/A	N/A	N/A	N/A	N/A	274	N/A	N/A	N/A	N/A
	Siting	0	N/A	0	N/A	N/A	N/A	N/A	N/A	0	N/A	N/A	N/A	N/A
	SKASS	0	N/A	374	N/A	N/A	N/A	N/A	N/A	374	N/A	N/A	N/A	N/A
	Total	492	0	1128	2199	-579	2946	3212	3338	1620	2199	11116	11695	-579
	insert additional items above this line													
SKA Total Planning & Construction		3218	3640	2336	4781	-2867	4463	3735	3338	5554	8421	17090	19957	-2867
Operating Phase	Office salary	446	432	64	104	-26	104	104	104	510	536	822	848	-26
	Office Other	0	50	58	50	-42	50	50	50	58	100	208	250	-42
	SKA	0	0	0	0		0	0	0		0	0	0	0
	Gemini Other	3024	4657	5980	6182	-1835	6583	7191	6482	9004	10839	29260	31095	-1835
Total Operating Phase		3470	5139	6102	6336	-1903	6737	7345	6636	9572	11475	30290	32193	-1903
Grand Total Expenditure		6688	8779	8438	11117	-4770	11200	11080	9974	15190	19896	47444	52150	-4706

6.3.6. Cash Cost (net of GST) of Purchased Capital Equipment

Table 6

Cash Cost (net of GST) of *Purchased* Capital Equipment ($'000s)

Fin Years	Description	Location	Quantity	Unit Value ($)	Total ($)
2002/03	List items separately > $50K				
	Supercomputer & IF, Parkes	Swinburne/ATNF	1	536	536
	Molonglo filterbank/correlator	Molonglo	1		0
	SKA demonstrator	ATNF	1		0
	Test equipment	ATNF	1		0
	Software	ATNF	1		0
	W'band correlator	ATNF	1	260	260
	Group items < $50K				
	In-kind capital items	ATNF	1	25	25
		CSIRO TIP			0
		W.A. DPC			0
Total					**821**
2003/04	List items separately > $50K				
	Supercomputer ATCA	Swinburne/ATNF	1	86	86
	Molonglo filterbank/b'former	Molonglo	1		0
	Semiconductor fabrication	ATNF	1		0
	SKA demonstrator	ATNF	1		0
	Test equipment	ATNF	1		0
	Software	ATNF	1		0
	W'band correlator	ATNF	1	62	62
	Group items < $50K				7
	In-kind capital items	CSIRO TIP			0
		W.A. DPC			0
Total					**155**
2004/05	List items separately > $50K				
	Molonglo filterbank/b'former	Molonglo	1		0
	SKA demonstrator	ATNF	1		0
	W'band correlator	ATNF	1		0
	Semiconductor fabrication	ATNF	1		0
	Group items < $50K				
	In-kind capital items	CSIRO TIP			0
		W.A. DPC			0
Total					**0**
2005/06	List items separately > $50K				
	Molonglo b'former & optics	Molonglo	1		0
	Molonglo feeds & LNAs	Molonglo			0
	Semiconductor fabrication	ATNF			0
	SKA demonstrator	ATNF			0
	W'band correlator	ATNF			0
	Group items < $50K				
	In-kind capital items	CSIRO TIP			0
		W.A. DPC			0
Total					**0**
2006/07	List items separately > $50K				
	Molonglo feeds & LNAs	Molonglo			0
	W'band correlator	ATNF			0
	Group items < $50K				
	In-kind capital items	CSIRO TIP			0
		W.A. DPC			0
Total					**0**
Grand Total					**976**

6.4. Auditors' reports

6.4.1. Australian Gemini Office

THE UNIVERSITY OF NEW SOUTH WALES

SCHOOL OF PHYSICS – KENSINGTON – NEW SOUTH WALES – AUSTRALIA – 2052
TELEPHONE +61-2-9385-4578
FAX +61-2-9385-6060
EMAIL: w.couch@unsw.edu.au

Prof. Warrick Couch
Australian Gemini Scientist

13 September, 2004

Institutional Contributions to the Gemini Share Project

As Australian Gemini Scientist and Project Scientist for the MNRF project "Gemini (Increased Share)", I hereby certify that the institutional cash contributions to the Australian Research Council Linkage Infrastructure Equipment & Facilities (LIEF0 Grant "Australian membership of the International Gemini Partnership", which pays for Australia's share of the annual operations costs of the Gemini Observatory, were as follows in 2004:

Australian National University	$245,000
University of New South Wales	$210,000
University of Sydney	$85,000
University of Melbourne	$52,000
Australia Telescope National Facility	$32,000
Swinburne University of Technology	$10,000
University of Southern Queensland	$5,000
Monash University	$5,000
Total cash contribution	**$624,000**

Warrick Couch

6.4.2. Anglo-Australian Observatory

Australian National
Audit Office

INDEPENDENT AUDIT REPORT

To the Department of Education, Science and Training

Scope

I have audited the attached Statement of Income and Expenditure, being a special purpose financial report for income and expenditure, of the Anglo-Australian Observatory's participation in the Major National Research Facilities Program for the period ended 30 June 2004. The Statement of Income and Expenditure was prepared at the request of the Anglo-Australian Observatory for the use of the Department of Education, Science and Training.

The Anglo-Australian Observatory is responsible for the preparation and presentation of the Statement of Income and Expenditure and has determined that the accounting policies used are appropriate to the needs of the Department of Education, Science and Training. I have conducted an independent audit of the Statement of Income and Expenditure in order to express an opinion on it to you.

The Statement of Income and Expenditure has been prepared solely for the Anglo-Australian Observatory and the Department of Education, Science and Training for the purpose of fulfilling the financial reporting requirements agreed between the two parties. I disclaim any assumption of responsibility for any reliance on this report or on the Statement of Income and Expenditure to which it relates to any persons other than the Anglo-Australian Observatory and the Department of Education, Science and Training, or for any purpose other than that for which it was prepared.

The audit has been conducted in accordance with Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards, to provide reasonable assurance as to whether the Statement of Income and Expenditure is free of material misstatement. Audit procedures included examination, on a test basis, of evidence supporting the amounts and other disclosures in the statement, and the evaluation of accounting policies. These procedures have been undertaken to form an opinion as to whether, in all material respects, the Statement of Income and Expenditure is presented fairly so as to present a view, which is consistent with my understanding of the results of operations under the Agreement. The Statement of Income and Expenditure specified does not require the application of all Accounting Standards and Urgent Issues Group Consensus Views.

The audit opinion expressed in this report has been formed on the above basis.

PO Box A456 Sydney South NSW 1235
130 Elizabeth Street
SYDNEY NSW
Phone (02) 9367 7100 Fax (02) 9367 7102

Audit Opinion

In my opinion,

(i) the Statement of Income and Expenditure is in agreement with the accounting records which are required to be kept by the Anglo-Australian Observatory in accordance with the requirements of the *Anglo-Australian Telescope Agreement Act 1970*; and

(ii) the Statement of Income and Expenditure gives a true and fair view of the matters required by the agreement between the Anglo-Australian Observatory and the Department of Education, Science and Training for the year ended 30 June 2004.

Australian National Audit Office

P Hinchey
Senior Director

Delegate of the Auditor-General
Sydney
28 September 2004

8. FINANCES

In FY2003-4 the AAO spent $413k of in-kind contributions on the various aspects of the MNRF program, making a cumulative total for 2002-4 of $548k (out of a total in-kind contribution over the course of the program of $2.6M). The original budget plan indicated a cumulative total for 2002-4 of $574k, so that AAO is at present under-spent by $49k (or 8%). This shortfall is mainly due to the delay in the start of the GWFMOS feasibility study, and is expected to be made up in FY2004-5.

Table 1

In-Kind Contributions from Participating Parties ($k)

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Contributions (Total to Date - Actual)	Cumulative Contributions (Total to Date - Budgeted)
Salaries	246	274	-28	313	340
Capital					
Other	167	188	-21	235	234
Total	413	462	-49	548	574

Table 2

Cash Contributions From Participating Parties ($k)

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
Cash contribution from participating institution	-	-	-	-	-

Other Funding Sources (ARC etc.)	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
(List name of source here)					
Total	-	-	-	-	-

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
MNRF Grant	-	-	-	-	-

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
Grand Total of Cash Contributions	-	-	-	-	-

Table 3

Cash Heads of Expenditure ($'000s)

Total of Heads of Expenditure	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
Salaries	-	-	-	-	-
Capital	-	-	-	-	-
Other	-	-	-	-	-
Totals	-	-	-	-	-

Table 4

Cash Cost (net of GST) of *Purchased* Capital Equipment ($k)

List each item of purchased capital equipment (>$50k) separately, and group items that are less than $50k each

Fin Years	Description	Location	Quantity	Value ($)	Total ($)
	List items separately > $50K				
2003/4					
	Group items < $50K				
Total	-		-	-	-

6.4.3. Australia National University

BDO Chartered Accountants & Advisers

Level 19, 2 Market Street Sydney NSW 2000
GPO Box 2551 Sydney NSW 2001
Tel. +61 2 9286 5555 Fax +61 2 9286 5599
Email: bdosyd@bdosyd.com.au
www.bdo.com.au

AUDITORS REPORT TO THE AUSTRALIAN NATIONAL UNIVERSITY IN RELATION TO THE MAJOR NATIONAL RESEARCH FACILITY TITLED THE GEMINI AND SQUARE KILOMETRE ARRAY-AUSTRALIA'S ASTRONOMY FUTURE

FINANCIAL INFORMATION FOR THE YEAR ENDED 30 JUNE 2004

Scope

We have audited the in-kind contributions amounting to $216,000 contained in section 8 of the Project Report for FY 2003-2004. The Australian National University ("ANU") is responsible for the preparation and presentation of the financial information. The ANU has determined that the accounting policies used are appropriate to meet the requirements of the Major National Research Facility ("MNRF") Participation Deed between the Commonwealth Scientific and Industrial Research Organisation ("CSIRO") and the ANU ("the Agreement"). We have conducted an independent audit of the financial information in order to express an opinion on it to the Commonwealth.

Our audit has been conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the financial information is free from material misstatement. Our procedures include examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial information, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether in all material respects, the financial information presents fairly the contribution the ANU has made to the MNRF.

Given the nature of in-kind contributions, testing has been limited to:

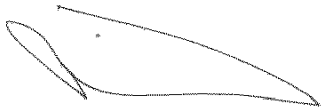
1. Verifying the mathematical accuracy of the calculation of the in-kind contributions, based on salary rates and hours used by the ANU in the calculation.
2. On a sample basis, comparing hours in the in-kind calculation to those recorded in time sheets.
3. On a sample basis, comparing rates used in the in-kind calculation to the rates prescribed by the ANU.

Audit opinion

In our opinion, the financial information presented in the section 8 of the 'Project Report for the year ended 30 June 2004 presents fairly the contribution the ANU has made to the MNRF.

BDO

BDO
Chartered Accountants



K R REID
Partner

Sydney, this 23rd day of November 2004

8. FINANCES

Table 1

In-Kind Contributions from Participating Parties ($k)

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Contributions (Total to Date - Actual)	Cumulative Contributions (Total to Date - Budgeted)
Salaries	216	294	-78	636	589
Capital	0	0	0	0	0
Other	0	0	0	0	0
Total	216	294	-78	636	589

Note: Variations are due to the fluctuating rate at which work is proceeding on the Gemini instruments over fiscal years. It is expected that the cumulative contributions will conform to the project budget.

Table 2

Cash Contributions From Participating Parties ($k)

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
Cash contribution from participating institution	0	70	-70	0	140

Other Funding Sources (ARC etc.)	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
(List name of source here)					
Total	0	0	0	0	0

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
MNRF Grant	0	0	0	0	0

	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
Grand Total of Cash Contributions	0	70	-70	0	140

Note: In the Project Plan, a cash contribution of $70K per year over the life of this MNRF was contingent upon RSAA winning a new bid to supply instrumentation to Gemini and on the AUD/USD exchange rate remaining at or below the rate assumed in the instrument contract (see the MNRF Business Plan). RSAA won a contract to provide GSAOI for Gemini South, with an assumed exchange rate of 1AUD = 0.63USD. During the report period, the AUD strengthened; at October 2003 it stood at 0.70USD, and as of 30 June 2004 was 0.69USD. On the contract price of some US$3.2m, this fluctuation represents some A$508k, or A$102k p.a. over 5 years, which must be absorbed by RSAA. Given this and the stated conditions upon which this cash contribution was contingent, RSAA is not in a position to make this contribution.

Table 3

Cash Heads of Expenditure ($'000s)

Total of Heads of Expenditure	Actual 2003/2004	Budgeted 2003/2004	Variance	Cumulative Total to Date - Actual	Cumulative Total to Date - Budgeted
Salaries					
Capital					
Other					
Totals	0	0	0	0	0

Table 4

Cash Cost (net of GST) of *Purchased* Capital Equipment ($k)

List each item of purchased capital equipment (>$50k) separately, and group items that are less than $50k each

Fin Years	Description	Location	Quantity	Value ($)	Total ($)
2003/4	List items separately > $50K				
	Group items < $50K				
Total					0

6.4.4. CSIRO Australia Telescope National Facility

BDO Chartered Accountants & Advisers

Level 19, 2 Market Street Sydney NSW 2000
GPO Box 2551 Sydney NSW 2001
Tel. +61 2 9286 5555 Fax +61 2 9286 5599
Email: bdosyd@bdosyd.com.au
www.bdo.com.au

AUDITORS REPORT TO THE DEPARTMENT OF EDUCATION, SCIENCE AND TRAINING REPRESENTING THE COMMONWEALTH IN RESPECT OF THE MAJOR NATIONAL RESEARCH FACILITY – CSIRO AUSTRALIA TELESCOPE NATIONAL FACILITY

FINANCIAL INFORMATION FOR THE YEAR ENDED 30 JUNE 2004

Scope

We have audited the financial information, which is stamped for identification purposes, of the CSIRO Australia Telescope National Facility's ("ATNF") participation in the Major National Research Facilities Program ("MNRF") for the year ended 30 June 2004, as required by clause 13.3 of the Commonwealth Deed. The ATNF is responsible for the preparation and presentation of the financial information. We have conducted an independent audit of the financial information in order to express an opinion on it to the Commonwealth.

Our audit has been conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the financial information is free from material misstatement. Our procedures include examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial information, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether in all material respects, the financial information is presented fairly in accordance with Australian accounting concepts and standards and requirements of the Commonwealth Deed so as to present a view of the income and expenditure of ATNF which is consistent with our understanding of its financial activities during the year.

Audit opinion

In our opinion, the financial information presents fairly the income and expenditure in respect of the grant for the year ended 30 June 2004.

1. The Grant has been expended solely upon the establishment, enhancement and/or operation of MNRF in accordance with relevant Australian Accounting Concepts and applicable Australian Accounting Standards.

2. ATNF's reporting of all allocations of the budgetary resources between Heads of Expenditure has a sound and reasonable basis.

3. Assets acquired by ATNF from the Grant are vested as provided in the Commonwealth Deed (Clause 20).

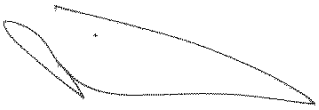
4. The value of ATNF's contributions (both cash and in-kind) towards the establishment and operation of the MNRF have a sound and reasonable basis.

Other

The MNRF's budget, as contained in the Business Plan and Deed, has been completed on a total project basis and not in relation to each participant. As a result, we are unable to compare ATNF's income and expenditure to the budget.

BDO

BDO
Chartered Accountants



K R REID
Partner

Sydney, this 7th day of October, 2004

BDO

INCOME AND EXPENDITURE STATEMENT OF THE MAJOR NATIONAL RESEARCH FACILITIES PROGRAM
CSIRO AUSTRALIA TELESCOPE NATIONAL FACILITY
FOR THE YEAR ENDED 30 JUNE 2004

	Actual Year Ended 30 June 2004 $	Actual Year Ended 30 June 2003 $
REVENUE		
MNRF Contract Payment from the Department of Education, Science and Training	4,760,000	2,340,000
CSIRO Cash Contributions	1,032,000	1,032,000
TOTAL REVENUE	**5,792,000**	**3,372,000**
EXPENDITURE		
Salaries	755,206	659,507
Salary overheads (in-kind contributions)	505,988	441,870
Capital	69,277	83,840
Other expenditure	4,072,488	502,905
TOTAL EXPENDITURE	**5,402,959**	**1,688,122**

6.4.5. CSIRO Information & Communications Technology

BDO Chartered Accountants & Advisers

Level 19, 2 Market Street Sydney NSW 2000
GPO Box 2551 Sydney NSW 2001
Tel. +61 2 9286 5555 Fax +61 2 9286 5599
Email: bdosyd@bdosyd.com.au
www.bdo.com.au

AUDITORS REPORT TO THE DEPARTMENT OF EDUCATION, SCIENCE AND TRAINING REPRESENTING THE COMMONWEALTH IN RESPECT OF THE MAJOR NATIONAL RESEARCH FACILITIES PROGRAM – CSIRO TELECOMMUNICATIONS AND INDUSTRIAL PHYSICS DIVISION

FINANCIAL INFORMATION FOR THE YEAR ENDED 30 JUNE 2004

Scope

We have audited the financial information, which is stamped for identification purposes, of the CSIRO Telecommunication and Industrial Physics Division ("CTIP") participation in the Major National Research Facilities Program ("MNRF") for the year ended 30 June 2004, as required by clause 13.3 of the Commonwealth Deed ("the Deed"). CTIP is responsible for the preparation and presentation of the financial information. We have conducted an independent audit of the financial information in order to express an opinion on it to the Commonwealth.

Our audit has been conducted in accordance with Australian Auditing Standards to provide reasonable assurance as to whether the financial information is free from material misstatement. Our procedures include examination, on a test basis, of evidence supporting the amounts and other disclosures in the financial information, and the evaluation of accounting policies and significant accounting estimates. These procedures have been undertaken to form an opinion as to whether in all material respects, the financial information is presented fairly in accordance with Australian accounting concepts and standards and requirements of the Deed so as to present a view of the income and expenditure of CTIP which is consistent with our understanding of its financial activities during the year.

Audit Opinion in respect of Salaries, Travel and Operating Expenses

In our opinion, the financial information presents fairly the income and expenditure in respect of the Deed for the year ended 30 June 2004.

1. Expenditure has been incurred solely for the establishment, enhancement and/or operation of MNRF in accordance with relevant Australian Accounting Concepts and applicable Australian Accounting Standards.

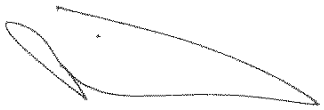
2. CTIP's reporting of all allocations of the budgetary resources between Heads of Expenditure has a sound and reasonable basis.

Qualification in respect of Direct Overheads and Indirect Costs

CSIRO management have represented that direct overheads and indirect costs have been allocated to the project in accordance with CSIRO methodologies and calculations. We are unable to form an opinion on the reasonableness of the expenditure allocated to CTIP's participation in the MNRF project without undertaking an audit of total expenditure and the complex calculations underlying the basis of allocation of expenditure to this project. We note that we have been provided with supporting analysis for the overheads charged to the project.

BDO

BDO
Chartered Accountants



K R REID
Partner

Sydney, this 11th day of October, 2004

BDO

INCOME AND EXPENDITURE STATEMENT OF THE MAJOR NATIONAL RESEARCH FACILITIES PROGRAM
CSIRO TELECOMMUNICATIONS AND INDUSTRIAL PHYSICS DIVISION
FOR THE YEAR ENDED 30 JUNE 2004

	ACTUAL Year Ended 30 June 2004 $	ACTUAL Year Ended 30 June 2003 $
INCOME	**0**	**0**
EXPENDITURE:		
Salaries	217,800	156,945
Travel	17,282	25,262
Operating expenses	21,634	6,587
Direct overheads	188,793	367,807
Indirect costs	28,759	22,137
TOTAL EXPENDITURE	**474,268**	**578,738**

To: Colin Jacka

File Note: ICT Centre participation in MNRF program

The agreement between ICT and ATNF calls for a participation of 800K over 5yrs or 160k Per annum.

The audited financials for the past two concluded financial years are as follows:

Project	Costs
2002-03	
DS48	578.7k
2003-04	
HH59A SKA General	222.0k
HH59B Dielectric Material	186.0k
HH59H Focal Plane Arrays	66.2k
Total 2003-04	474.2k

Following recent discussions with Dr Colin Jacka, it is apparent that there exists a mixture of research that contributes not only to MNRF deliverables, but also exists as strategic antenna research in its own right. This strategic research may have many application areas over and above that of the MNRF.

Accordingly, it is recommended that only designated specific MNRF activities be claimed for the 2003-04 year and that other activities (HH59B and HH59H) be removed from the MNRF claim to ensure the strategic nature of this work is clearly maintained for future IP protection where appropriate.

Whilst it is acknowledged that the work in 2002-03 has a similar nature, it was not delineated at activity level and is therefore difficult to value the component parts. In addition the Centre has lodged and had included the above number for the MNRF accounts for 02-03.

In summary, the ICT Centre will formally recognise a contribution to MNRF for the 03-04 year of $222.0k and in future, clearly identify the research being undertaken for MNRF purposes only, and those for which it undertakes as part of its operational plan for application in a wider sphere.

22/11/2004

Warren Bax
Finance Manager
CSIRO ICT Centre

Cc Steve Giugni
Cc Mark Macauley

6.4.6. Swinburne University of Technology

Swinburne University of Technology
Victorian Node of Gemini and Square Kilometre Array Facility
Financial report for year ended 30 June 2004
Fed Grants

	30/06/2004	Total
Opening Balance as at 30/6/03		- **39,403.55** (1)
Receipts for Year End 30/6/2004		
MNRF grants received from CSIRO	205,200.00	
MNRF grants received from CSIRO	205,200.00	
Payments received from Dell Computer Pty Ltd	85,000.00	
Income from The University of Tasmania	2,342.00	
SUT Inkind Contribution	93,944.48	
SUT Cash Contribution	20,000.00 (2)	
Total Receipts for 30/06/2004		611,686.48
Payments for Year End 30/6/2004		
Salaries	186,601.99	
Other Expenses	55,787.34	
Inkind Contribution	93,944.48	
Total Payments for 30/602004		336,333.81
Balance as at 30/06/2004		**235,949.12**

State Grants

Opening Balance as at 30/6/03		- 95,248.81
Receipts for Year End 30/6/2004		
Grants received from Victorian Government Department	43,750.00	
Grants received from Victorian Government Department	43,750.00	
Grants received from Victorian Government Department	43,750.00	
Total Receipts for 30/06/2004		131,250.00
Payments for Year End 30/6/2004		
Computer Equipment	37632.00	
Total Payments for 30/602004		37632.00
Balance		- **1,630.81**

Notes

Swinburne cash subscription to Gemini	20,000.00 (2)
PAYMENTS pertaining to Swinburne in-kind contributions	
PAYMENTS	
Salaries	45365.00 (3)
Capital equipment	48579.00
	93,944.00

(1) Includes $39,404 of payments not reported in FY2002/03
(2) Includes $10,000 of payments not reported in FY2002/03

(3) Swinburne in-kind salary contributions have been costed at based salary plus 100% oncosts and university overheads, in accordance with costing methodology used for the Major National Research Facilities Programme

CSIRO and the Swinburne University of Technology (SUT) executed the MNRF Participation Deed on the 18th of September, 2003, under which SUT will receive $1.026M of cash funds over the five years (starting July 1, 2002) of the MNRF Programme.

Dr Steven Tingay
SKA Project Leader, Centre for Astrophysics and Supercomputing
Swinburne University of Technology
16-Sep-04

Barry Telford, CPA
Chief Financial Officer
Swinburne University of Technology
22-Nov-04

6.4.7. University of Sydney

The University of Sydney
Internal Audit & Review
NSW 2006 Australia

Craig Prosser
Director

Margaret Telfer K07
Tel: +61 2 9351 2415
Fax: +61 2 9351 3596
Email: cprosser@finance.usyd.edu.au

Professor Ray Morris
MNRF Program Director
ATNF
PO Box 76
Epping NSW 2220

21 September 2004

Dear Professor Norris

CERTIFICATION OF EXPENDITURE
CSIRO Australia Telescope National Facility

I certify that during the period of 1 July 2003 to 30 June 2004 the University of Sydney's in-kind contribution to the SKA Molongolo Prototype (SKAMP) project was $140, 256 to support the salary of Duncan Campbell-Wilson. The contribution is calculated as follows:

Base Salary	$70,128.04
+ 100% (on-cost & overhead)	$70,128.04
TOTAL	$140,256.08

The attached spreadsheets, which have been reconciled to the University's General Ledger, provide details of payments to Mr Campbell-Wilson. Also attached is a statement by Associate Professor Brian James which refers to the duties undertaken by Mr Campbell-Wilson. These duties appear to be consistent with the terms of the MNRF Participation Deed.

Please do not hesitate to contact me should you have any further questions.

Yours sincerely

Craig Prosser CPA

The University of Sydney

School of Physics

Faculty of Science
College of Sciences and Technology
NSW 2006 AUSTRALIA

Associate Professor Brian James
Head of School

School of Physics, A28
Telephone +61 2 935 12537
Facsimile +61 2 935 17726
Email: hos@physics.usyd.edu.au
http://www.physics.usyd.edu.au

20 September 2004

Professor Ray Norris
MNRF Program Director
ATNF
PO Box 76
Epping NSW 2220

Dear Professor Norris,

This is to certify that Duncan Campbell-Wilson has been employed by the University of Sydney during the period 1 July 2003 to 30 June 2004 as Manager of the Molonglo Observatory. His present contract extends to 31 December 2006. His classification is Higher Education Officer Level 9 Step 3 (total gross salary at 1 January 2004 was $69,971 per annum).

His duties include management of technical development at the Molonglo Radio Observatory as part of the SKA Molonglo Prototype (SKAMP) project under the MNRF Program. He is responsible for the design and implementation of electronic equipment and the ongoing supervision of maintenance and repair of the telescope.

Yours sincerely,

A/Prof Brian James

6.4.8. WA department of Science and Innovation

STANTON PARTNERS

1 HAVELOCK STREET
WEST PERTH 6005
WESTERN AUSTRALIA

TELEPHONE: (08) 9481 3188

Facsimile: (08) 9321 1204

e-mail: australia@stanton.com.au

INDEPENDENT AUDIT REPORT
TO THE COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION ("CSIRO") REPRESENTED BY THE AUSTRALIAN TELESCOPE NATIONAL FACILITY ("Division")

Scope

We have audited the attached Payments Statement ("Statement") for the Department of Education, Science and Training: Major National Research Facilities ("MNRF") Gemini and Square Kilometre Array 2003/2004 ("GSKA") program run through the Office of Science and Innovation ("OSI") of the Department of Premier and Cabinet pursuant to an agreement between the OSI and the CSIRO Division. The OSI is responsible for the information contained in the Statement and has determined that the Statement meets the needs of the acquittal requirements of the CSIRO Division.

We have independently audited the Statement in order to express an opinion.

The attached Statement has been prepared, pursuant to the MNRF Participation Deed, for the purpose of reporting to the CSIRO Division. We disclaim any assumption of responsibility for any reliance on this report or on the Statement to which it relates to any person other than the purpose for which it was prepared.

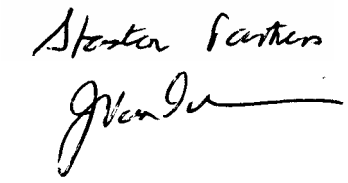
Our audit has been conducted in accordance with Australian Accounting Standards. Our procedures included examination, on a test basis, of evidence supporting the amounts in the Statement and verification of the existence of a separate accounting facility in relation to expenditure incurred on the MNRF GSKA program. These procedures have been undertaken to form an opinion as to whether, in all material respects, the Statement is presented fairly in accordance with applicable generally accepted accounting standards.

The audit opinion expressed in this report has been formed on the above basis.

Audit Opinion

In our opinion, the Statement presents fairly, in accordance with the MNRF Participation Deed, of actual expenditure incurred for the MNRF GSKA program.

STANTON PARTNERS



J VAN DIEREN
Partner

West Perth, Western Australia
29 September 2004

DEPARTMENT OF PREMIER & CABINET
Office of Science & Innovation

PAYMENTS STATEMENT
Department of Education, Science and Training – Major National Research Facilities Gemini & Square Kilometre Array Program
2003/2004

	30 June 2004 $
EXPENDITURE	
Salaries	71,379
Project costs	263,975
Total Expenditure	**335,354**

CERTIFICATION

I, William Robert Gates, Manager, International Science Infrastructure, hereby certify that the above information is true and correct and is understood by the Office of Science & Innovation to include only expenditure eligible within accordance with the MNRF Participation Deed.

Signed ..... Date: 29/09/2004

Appendix A: Performance indicator survey

Note: There are two facilities covered by this MNRF: The Australian share of Gemini and the SKA. As the SKA will not be operational until at least the next decade, it is not possible to complete a performance indicator survey for the SKA. Therefore this performance indicator survey is only related to the Australian share of Gemini facility.

Name of Facility The Australian share of Gemini

NB: All questions refer to the current reporting period, unless otherwise specified.

1. Facility demand and usage

(a) Facility demand

152 %

>100% indicates Facility is oversubscribed

(b) Users accessing the Facility

User Type	National		International		Total
	Number	Percentage of total users	Number	Percentage of total users	Number
• Public-funded researchers (not university)	3	4%	0	0%	3
• Industry	0	0%	0	0%	0
• University	72	96%	0	0%	72
• Other (please specify)	0	0%	0	0%	0
• Total	75	100%	0	0%	75

(c) Competitive government grants used to access and conduct research at the Facility

Not applicable. Astronomers are not charged to use the Australian share of Gemini, rather time is allocated on scientific merit. The funding for the Australian share is Gemini is detailed in the financial tables elsewhere in the annual report.

(d) Opportunity cost to access similar overseas facilities

Not applicable. No eight metre class optical telescopes exist in Australia, and the Australian share of Gemini is already Australian access to an international facility.

(**e) Details of similar/same facilities emerging in Australia**

Not applicable. No eight metre class optical telescopes are planned for Australia.

2. Access arrangements

(a) User satisfaction with access arrangements

The Australian Gemini Office has initiated a survey of all Australian users who had been awarded Gemini time over the last four years. The main goals of this survey are to obtain statistics on program completion rates, to evaluate the scientific return from

Gemini time in terms of major results and peer-reviewed publications, and to obtain feedback from users on problems encountered in this context and how the end-to-end observing process could be better improved. The responses to this survey are still being received at the time of writing, and hence the results will not be reported until the 2004/05 annual report.

(b) To what extent have overseas users accessing the Facility provided increased leverage for Australian researchers to access overseas facilities?

In addition to the enhanced links Australia has developed with the other partner countries through its membership in Gemini, science programs being pursued by Australian researchers on the Gemini telescopes involve a high level of international collaboration. In 2003/04 seventy percent of proposals involved international collaboration.

Collaborations involving astronomers in countries which belong to the Gemini partnership have the opportunity of obtaining multiple allocations of time for their project through being able to apply to the individual time assignment committees in each of the partner countries. Australian astronomers are effective users of this "joint proposal" mechanism; in 2003/04, thirty percent of the proposals received were in this category.

3. Facility promotion and enhancement to Australian SET

(a) Publications and activities which include data obtained from research performed at the Facility

Publication		Number	
		Local	Overseas
Academic	Peer reviewed journal and conference articles	0	3
	Books and chapters in books	0	0
Media	Newspaper, TV, radio	14	7
	Popular scientific press	3	20
Other (Websites)	(eg ABC Science Online)	3	5

(b) Prizes awarded for research conducted at the Facility

Award	Name of awardee	Reason

(c) Other communication and promotional activities

Activity	Number	
	Local	Overseas
Trade Displays	1	0
Seminars	6	10
Community-based fora eg talks to schools	2	0

Workshops	1	0
Conference poster presentations	3	5
Other (PMSEIC presentation)	1	0

(d) To what extent has the Facility contributed to enhancing the skills base and training opportunities for Australian researchers?

The Gemini telescopes are playing an important role in the training of Australian postgraduate students. In 2003/04 forty percent of the proposals received had Australian PhD student involvement, which in terms of numbers amounts to thirteen students who obtained Gemini data for their thesis. In addition there are ten postdoctoral researchers supported on Gemini-related ARC grants, located at the Australian National University's Research School for Astronomy and Astrophysics, Swinburne University of Technology, the University of Melbourne, the University of New South Wales and the University of Queensland.

4. Collaborative activities

Gemini is an international partnership managed by the Association of Universities for Research in Astronomy under a cooperative agreement with the USA National Science Foundation. The running of the Gemini telescopes is therefore beyond the scope of this report which is concerned solely with the approximately six percent of Gemini that comprises the Australian share of Gemini.

The international collaboration of the users of the Australian share of Gemini is covered in 2 (b) above.

5. Commercial activity and application of research results

(a) New Australian Enterprises

Activity	Number	Capitalisation ($'000)	Comment
Start-up companies and spin-offs	0	0	
Other (please specify)	0	0	

(b) What evidence is there that industry and research users are adopting sophisticated technologies and advanced designs and products developed by use of the Facility?

None.

(c) What evidence is there of new industry and/or research clusters, or expansion of existing clusters, that can be attributed to the existence and use of the Facility?

None.

6. Financial indicators

(a) Income from access arrangements

User Type	National ($'000)	International ($'000)	Total ($'000)
• Public-funded researchers (not university)	0	0	0
• Industry	0	0	0
• University	0	0	0
• Other (please specify)	0	0	0
• Total	0	0	0

(b) Additional investment (surplus to budget in Schedule 3)

Investor	National		International	
	Cash ($'000)	In-kind ($'000)	Cash ($'000)	In-kind ($'000)
• Public-funded researchers (not university)	0	0	0	0
• Industry	0	0	0	0
• University	0	0	0	0
• Federal Government	0	0	0	0
• State Government	0	0	0	0
• Local Government	0	0	0	0
• Non-Government Org	0	0	0	0
• Philanthropic contributions	0	0	0	0
• Other (please specify)	0	0	0	0
• Total	0	0	0	0

(c) Commercialisation of research results and knowledge diffusion

Activity	Number	Income ($'000)	Comment
• Licensing agreements	0	0	
• Contract services and consultancies undertaken by Facility for fee paying clients	0	0	
• Income to Facility from royalties and sales of products and services	0	0	
• Other (please specify)	0	0	
• Total	0	0	

(d) Total income received in the reporting year

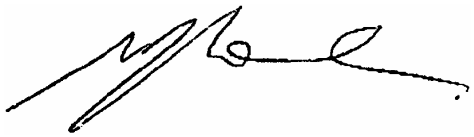
Income type	National	International	Total
• Total Cash ($'000)	2,261	0	2,261
• Total In-kind ($'000)	0	0	0
• Total MNRF grant ($'000)	3,100		3,100
• Total	5,361	0	5,361

(e) Self sufficiency in terms of operating costs

Percentage of total income that covers the Facility's operating costs excluding the MNRF grant.[8] 55%

Declaration

I acknowledge that giving false or misleading information is a serious offence.

Signature of Facility project scientist: 

Printed Name: Prof Warrick Couch

Date: 15th September 2004

[8] During 2003/04 $1,282,000 of the MNRF grant was used towards the purchase of an additional share of Gemini for Australia, and $1,818,000 was contributed towards the operating costs of the Australian share of Gemini. The calculation of the self sufficiency of operating costs only considered the portion of the MNRF grant contributed towards the operating costs.

Appendix B: AABoM members

- Dr Martin Cole (Chair), Cole Innovation & Design Pty Ltd
- Dr Brian Boyle, CSIRO Australia Telescope National Facility
- Dr Matthew Colless, Anglo-Australian Observatory
- Dr Ron Ekers, CSIRO Australia Telescope National Facility
- Mr Roger Franzen, Auspace Ltd
- Prof Penny Sackett, Australian National University
- Dr Lister Staveley-Smith, CSIRO Australia Telescope National Facility
- Prof Erich Weigold, Australian Research Council

Appendix C: AABoM's advisory committees' members

Australian Gemini Steering Committee

- Prof. Gary Da Costa (Chair), Australian National University
- A/Prof. Tim Bedding, University of Sydney
- Dr Brian Boyle, CSIRO Australia Telescope National Facility
- Prof. Warrick Couch, University of New South Wales
- Prof. Ron Ekers, CSIRO Australia Telescope National Facility
- Dr Anne Green, University of Sydney
- Prof. Penny Sackett, Australian National University
- Prof. Vicki Sara, Australian Research Council
- Prof. Rachel Webster, University of Melbourne

Australian Square Kilometre Array Consortium Committee

- Dr Bob Frater (Chair), ResMed Ltd
- Dr Martin Cole (Deputy Chair), Cole Innovation & Design Pty Ltd
- Prof. Matthew Bailes, Swinburne University of Technology
- Mr Tony Barry, Connell Wagner Pty Ltd
- Dr Brian Boyle, CSIRO Australia Telescope National Facility
- Dr Wim Brouw, CSIRO Australia Telescope National Facility
- Dr Matthew Colless, Anglo-Australian Observatory
- Dr Ron Ekers, CSIRO Australia Telescope National Facility
- Dr Anne Green, University of Sydney
- Dr John O'Sullivan, Cisco Systems Australia Pty Ltd
- Prof. Elaine Sadler, University of Sydney
- Prof. Mark Sceats, Australian Photonics Pty Ltd
- Dr Brian Schmidt, Australian National University
- Prof. John Storey, University of New South Wales
- Dr Michelle Storey, CSIRO Australia Telescope National Facility
- Mr Stephen Trengove-Jones, Department of Education, Science and Training
- Prof. Ah Chung Tsoi, Australian Research Council
- Dr Alex Zelinsky, CSIRO Information & Communication Technology

Appendix D: Project leaders and project participants

Project Office – Ray Norris[9]

- CSIRO Australia Telescope National Facility

Increased share of Gemini telescopes – Gary Da Costa

- CSIRO Australia Telescope National Facility
- Australian Research Council
- Australian National University
- University of Sydney
- University of New South Wales
- University of Melbourne
- Swinburne University of Technology

RSAA Gemini instrumentation – Penny Sackett

- Australian National University

AAO Gemini instrumentation – Sam Barden

- Anglo-Australian Observatory

AT compact array broadband backend (CABB) – Warwick Wilson

- CSIRO Australia Telescope National Facility

New technology demonstrator (NTD) – Colin Jacka[10]

- CSIRO Australia Telescope National Facility
- CSIRO Information & Communication Technology
- CSIRO Manufacturing & Infrastructure Technology
- CSIRO Molecular Science

Microwave/millimetre-wave integrated circuit (MMIC) – Warwick Wilson

- CSIRO Australia Telescope National Facility

SKA Molonglo prototype (SKAMP) – Anne Green

- University of Sydney
- CSIRO Australia Telescope National Facility
- CSIRO Information & Communication Technology

SKA siting – Ron Beresford

- CSIRO Australia Telescope National Facility
- Government of Western Australia

SKA supercomputer simulation & baseband processing (SKASS) – Steven Tingay

- Swinburne University of Technology
- Dell Computer Pty Ltd
- Government of Victoria

[9] Due to hand over responsibility for this role early in 2004/05
[10] From 1st July 2004