

Indonesia's Minister for Science and Technology, Dr Habibie, visits ACRES



PAUL TREZISE PRESENTS DR HABIBIE WITH LANDSAT TM AND ERS-1 SAR IMAGES OVER IRIAN JAYA. PICTURED LEFT TO RIGHT ARE DR INDROYONO SOESILO, DR HABIBIE, JOHN MELLORS, MR SABAM SIAGIAN AND PAUL TREZISE.

On Tuesday 30 May, ACRES hosted a visit by Dr Habibie, Indonesia's high profile Minister for Science and Technology. During his one and a half hour visit, Dr Habibie toured ACRES facilities and witnessed a number of presentations and demonstrations on the application of remote sensing in Australia. He was also briefed on the status of cooperative projects between ACRES and its Indonesian counterpart, LAPAN. He was

particularly interested in a presentation by CRA's Dr Kerry O'Sullivan on the application of remote sensing to minerals exploration, and entered into an animated debate on the subject. He was also most interested in a demonstration by ACRES' Craig Smith of shallow water mapping techniques.

Dr Habibie was accompanied on his visit by the Minister for Administrative Services, the Hon Frank Walker QC MP; the outgoing Indonesian Ambassador to Australia, Mr Sabam Siagian; the Deputy Chairman of Indonesia's BPPT, Prof. M.T. Zen; The Director of the Directorate of Technology for Natural Resources Inventory, BPPT, Dr Indroyono Soesilo; the Secretary of the Department of Administrative Services, Mr John Mellors; and the DAS Deputy Secretary for Business Development, Mr Brendan Godfrey.

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Manager's Message

Paul Trezise



The six months that have passed since the last edition of ACRES Update have been very eventful ones for ACRES.

Firstly the announcement that, after a public tendering process, British Aerospace Australia (BAeA) had been awarded the ACRES Operations and Maintenance Contract for the next 3 years. BAeA replaced CSC Australia as the contract manager on July 1st 1995. While I believe that CSC Australia achieved many significant improvements while it was at the helm of ACRES, I am confident that the wealth of experience and expertise brought by BAeA will only serve to improve the service we are able to offer our customers in the challenging years ahead.

A second key development was the implementation of ACRES new MANMAN/X manufacturing system software on July 1st. That this major initiative was successfully achieved with relatively few teething problems was a great credit to the professionalism and dedication of the ACRES staff involved, particularly Peter Pianella, Jenny Weissel and Steve Alder.

A third milestone was the letting of a contract for development of the ACRES On-line Digital Catalogue to Aspect Computing P/L of Adelaide, in conjunction with CORE Software Technology and EarthWare Systems. The implementation of this system in February 1996 will revolutionise the access to ACRES vast archive of imagery and allow customers to quickly assess the suitability of images on-line by examining digital 'quick looks'.

While all this was happening we have also seen a dramatic increase in the demand for ACRES remote sensing products. Gross sales rose by 43% in the 12 months to June 1995. We have seen a continuation of this growth in the last few months, largely due to a number of major projects in the environment and resource management arenas. These projects are using time-series remote sensing data on a scale not previously attempted in this country. Maybe remote sensing is finally shedding its 'emerging technology' tag?

I recently attended an excellent conference organised by the American Society for Photogrammetry and Remote Sensing entitled "Land Satellite Information in the Next Decade". It explored the vast array of remote sensing data sources that should be available over the next decade. It certainly appears as though we are going to be spoilt for choice. A major challenge for organisations like ACRES will be to understand their customer requirements sufficiently well to make informed choices about which 'horses to back'. At ACRES we are committed to meeting this challenge and providing our customers with an optimum range of products, an excellent standard of service and an efficient distribution mechanism via our nationwide network of distributors and specialist consultants.

Dennis Puniard to work on ARIES

AUSLIG's Remote Sensing Product Manager and ACRES Update editor, Dennis Puniard, has accepted a temporary offer to work as Manager for the ARIES project (Australian Resource Information and Environment Satellite). Dennis commenced his position on 1 August 1995, for a period of six months. His task will be to work on further developing a proposal that was submitted to the Australian Space Office during July. Since then, the Australian Space Office has announced a contribution of \$300K towards the funding of the feasibility study. Partners in the ARIES consortium are CSIRO, ACRES, AUSPACE, Earth Resource Mapping, Geoimage and Technical & Field Surveys.

During Dennis' absence, Jim Mollison will act as the Product Manager and ACRES Update editor.

ERS-1 and ERS-2 operations after the ERS-2 commissioning phase

The ERS-2 commissioning phase will terminate at the end of October 1995. From then on, the two satellites will be kept on their current orbits, with ERS-2 following ERS-1 at a one day distance, until further notice (eg. one satellite might in future be moved to reach an 8 days' shift). Therefore, no new phase will be defined for the time being.

The orbit maintenance manoeuvres will ensure ground tracks within the 1 km range relative to the nominal track, and 50 to 600 meters between the two satellites, in order to improve opportunities for interferometric applications.

AUSLIG General Manager John Kent recently signed an extension to the Memorandum of Understanding with ESA (European Space Agency) which will allow ACRES and TERSS to continue acquiring and processing SAR data from the ERS-1 and ERS-2 satellites.

Subsequent to this the Australian ground stations were invited by ESA to participate in a major campaign to acquire interferometric SAR data over the whole continent. ACRES management and the TERSS Board have both agreed to cooperate in the campaign.

ADDITIONAL INFORMATION ON ERS-1 & 2 CAN BE OBTAINED:

- Online through Internet where all the evolution of the ERS-1 and ERS-2 missions is reported and constantly updated.
Enter the URL: <http://services.esrin.esa.it>
- By e-mail, phone, or fax through the ERS Helpdesk at ESRIN Italy:
e-mail: helpdesk@ers.esrinvas.esrin.esa.it
Tel: +39 6 941 80 600
Fax: +39 6 941 80 510

New contractor for the operations and maintenance of ACRES – British Aerospace Australia

Following an open tender process by AUSLIG, British Aerospace Australia (BAeA) has taken over from Computer Sciences Corporation (CSC) as the operations and maintenance contractor at ACRES. The contractor has day-to-day responsibility for most facets of ACRES operations and employs 36 of ACRES' 43 staff. The new arrangements took effect on 1 July 1995.

British Aerospace Australia (BAeA) is one of the country's leading defence and aerospace companies with particular expertise in software and electronic systems, value added manufacturing, space, and communications.

The origin of BAeA dates back to the early 1950s when British companies established themselves in Australia to support the weapons trials at Woomera.

BAeA employs more than 1000 people throughout Australia and Saudi Arabia, has sales of A\$100 million, earns A\$45 million in exports and has contracts and commitments with more than 200 companies in Australia. BAeA is part of the worldwide British Aerospace group of Companies. With more than 125,000 employees, British Aerospace plc is Britain's largest manufacturing group and one of the world's largest aerospace organisations.

The Company's Head Office is based at Technology Park in South Australia but has contractual responsibilities at a series of satellite locations throughout Australia. This includes the Canberra Deep Space Communications Complex at Tidbinbilla and the Laser Ranging Station Moblas 5 at Yarragdee in Western Australia.



ACRES' NEW CONTRACT AND BUSINESS MANAGER, DONNA SCOTT, AT HER NEW DESK.

BAeA recognises that fundamental to establishing a successful and efficient operation is the creation of an environment in which all employees are able to contribute and operate as part of a team. It believes that the human resource is as valuable as the technological aspect of its operations.

This commitment is demonstrated by BAeA's open style of communications with its employees over a period of 40 years, and its low levels of employee turnover and absenteeism throughout the numerous contracts held by BAeA.

With the capabilities and reputation in industrial relations, design, development, manufacture, and support systems, BAeA is well prepared to work with AUSLIG in meeting the demands of a rapidly developing remote sensing business.

The changeover of the ACRES contract from CSC to BAeA involved no staff changes apart from that of the Contract Manager. ACRES therefore bids farewell to David Crago who will return to CSC, and thank him for his contribution towards the management of ACRES. We also wish to welcome Donna Scott of BAeA as the new Contract Manager.

Donna has a Science degree with managerial experience in the finance industry and considerable exposure to industrial relation issues. She has been with BAeA since September 1990 and we wish her all the best in her new role.

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Dr Habibie's visit is another manifestation of the excellent relationship enjoyed between ACRES and its Indonesian counterparts, and can only serve to raise the profile of remote sensing in both countries. During Dr Habibie's visit to Australia, it was announced that the Australian Government had approved funding for stage two of the ACRES/LAPAN ground station cooperation project. This stage of the project, which will commence in earnest in February 1996, has the aim of achieving catalogue interoperability between the two stations.

ACRES recruitment and training

ACRES bids farewell to a few staff members who have left us since the last ACRES Update edition. They are Anil Rai (Programmer), Honel Hutchison (Computer Operator) and Charles Stephens (Dispatch).

At the same time, the demand for satellite data has increased dramatically.

Therefore in an effort to maintain the best service for our clients and keep the quality standard high, ACRES has recruited a number of new staff.

They are Leneese McFarlane, Brian McDonald, Quynh Pham and Gypsy Bhalla who commenced on 26 July in computer operations. Chris De La Rue commenced 24 July as the new dispatch clerk. They join Jerri Cody and Kenji Walter (Computer Operations) and Vicky Williams (Photographic Laboratory) who started earlier this year.

Our new recruits have commenced an intensive training program designed to give them the skills and confidence to operate the various systems in use at ACRES. There is much to learn in operating systems such as MQS (Microimage Quicklook System) and GICS (Geocoded Image Correction System).

MQS is for cataloguing, cloud assessment and microfiche production of data from LANDSAT, SPOT, NOAA and JERS satellites. GICS is ACRES prime digital satellite imagery production system. It is able to produce data products with levels of correction ranging from 'raw' to 'precision geocoded with DTM', and photographic products considered worldwide to be among the best.

Training is also being conducted for operation of the AETHERS processor for ERS digital and photographic products.

ACRES is also well advanced in its program of transferring its extensive archive of digital data from magnetic media to optical tape media. (The optical tapes have a much longer life.) The additional staff will keep this program moving so that our valuable archive is preserved.

ACRES also welcomes Alice Lee who joins us a User Support Programmer. Alice will mainly be involved in maintenance support of our new manufacturing software MANMAN/X. (See article in this edition.)



DONNA SCOTT WITH TWO OF ACRES' NEW COMPUTER OPERATORS, BRIAN McDONALD AND LENESE MCFARLANE.



ACRES' NEW USER SUPPORT PROGRAMMER, ALICE LEE (RIGHT), AT WORK ON MANMAN/X WITH JENNY WEISSEL.

ACRES/AUSLIG to upgrade its WWW site

Jenny Weissel

Internet WWW users have been using AUSLIG's WWW information pages for the past year. The present pages were developed by AUSLIG's Geodesy Unit with additions by the PIPC (Public Interest Policy and Coordination) group. Before November 1995, there had been no information on ACRES and its products and services.

This is changing, with the development of a larger and more comprehensive AUSLIG information set which will include full coverage of ACRES, its products, services and distribution network. From the ACRES pages, users will be able to link to the proposed ACRES Digital on-line Catalogue - due to become operational early next year. In addition, users will also find links to other AUSLIG pages and to other WWW sites.

With the growth of the Internet, electronic publishing of information is the trend for the future. ACRES' customers, distributors and information users will be able to access ACRES' information via the Internet quickly and conveniently.

ACRES' information will start to be available on AUSLIG's WWW home page by November 1995, along with additional AUSLIG information. Further additions of information will continually occur into the new year.

AUSLIG's WWW address is: <http://www.auslig.gov.au>

We welcome your suggestions and opinions as to what should be in ACRES' WWW pages. Please make suggestions to:

Jenny Weissel
Tel: (06) 201 4108
Fax: (06) 251 6326
e-mail: weissel@auslig.gov.au

ACRES Sales Results

ACRES total gross sales for the 1994/95 financial year reached a record \$3 652 229. This figure represents a 43% increase from the previous financial year and highlights the strong growth in the remote sensing market.

Total Gross Sales

Year	\$Mill
1993/94	2.56
1994/95	3.65

The most outstanding growth area was Landsat TM digital data acquired by ACRES which increased by \$422 000 since the previous year. Consequently, ACRES Landsat TM sales accounted for 52% of the total sales. SPOT Panchromatic digital data sales also increased dramatically. A large proportion of this increase was due to the use of the data in AUSLIG's National Mapping Program.

Summary of Gross Sales 1994/95 Financial Year

	\$ Sales	Percent of Total
LANDSAT		
ACRES MSS	101 078	3
ACRES TM	1 895 376	52
EOSAT (Mainly TM)	364 727	10
NRCT - Thailand (TM)	54 336	2
EROS (MSS)	1 957	-
TOTAL	2 417 474	
SPOT		
Panchromatic	774 024	21
Multispectral (XS)	175 629	5
TOTAL	949 653	
OTHER		
ERS SAR	25 890	1
NOAA AVHRR	6 800	-
Image Writing	184 340	5
Microfiche Catalogue	7 350	-
Royalties	39 523	1
Misc	19 979	-

In relation to product media, the proportion of ACRES digital data and photographic data sold was 83% and 17% respectively. These figures confirm the continued trend towards digital data. Exabytes accounted for 85% of the value of all digital data.

ACRES/AUSLIG are very pleased with the sales results and congratulate our distributors on a job well done.

AUSLIG's Joint Agency Data Agreement (JADA)

Recently a new policy was announced by AUSLIG regarding the sale of satellite imagery to multiple users within State and/or Commonwealth Government.

The new policy is called the Joint Agency Data Agreement, or "JADA" for short, and applies to Landsat digital data only.

Its purpose is to encourage the use of satellite data for large public interest inter-governmental programs, with flow-on benefits of increasing the use of satellite data in general.

A JADA may apply when two or more government agencies wish to purchase the same satellite data (ie 'shared areas') for public interest projects. For the JADA to be approved, the total RRP of a single copy of the shared areas must be at least \$100 000.

A JADA may only be offered to 'on budget' Commonwealth and/or State Government departments and agencies using the data for public interest projects.

Of course, AUSLIG needs to approve all JADAs before orders are placed. Members of the JADA must identify a Lead Agency from their group. The Lead Agency should normally place all orders and make all payments. All data requirements need to be specified before approval can be given.

Data from a JADA may be sold to a Lead Agency by one of AUSLIG's satellite data distributors, or directly by AUSLIG.

The list price of data for a JADA will be:

- Normal RRP for the first data set; plus
- 20% of RRP for each additional copy of a shared area.

For more information, please contact one of ACRES Account Managers at AUSLIG's National Data Centre. Tel: (06) 201 4201.

ACRES On-line Digital Catalogue

It is with great pleasure that ACRES announces the signing of the contract to develop the ACRES On-line Digital Catalogue, incorporating a digital 'quick look' facility. Aspect Computing P/L of Adelaide has been awarded the contract, in conjunction with CORE Software Technology of the USA and EarthWare Systems of Canberra. The contract will involve Aspect developing PC-based client viewer software to complement the existing CORE catalogue system.

The aims of the catalogue are to:

- improve on-line search facilities for distributors;
- make information on remote sensing more widely accessible;
- improve search facilities for major customers;
- improve interfaces with international catalogue systems; and
- replace the current microfiche cataloguing system.

The major features of the new system will include:

- a central system accessed through the existing telecommunications network;
- access through common interfaces such as Internet and WWW;
- interactive client viewing of images with textual, image enhancement and mapping tools built in;
- availability of meta-data and 'quick look' images within days of acquisition; and
- on-line auxiliary data such as format documents and price lists.

The system will be declared operational and available to all users by the end of February 1996. It will include Landsat and SPOT data acquired since July 1995. Incorporation of data from ACRES historical archive will substantially be complete within a further 6 months.

After implementation, Aspect Computing and CORE Software Technology will be in a position to further enhance the catalogue system and the client viewer software in line with recommendations from ACRES distributors and customers.

Internet will be the recommended standard means of access, especially if you anticipate being a regular user. However other access options will be available. Access will be free of charge to all users until at least 30th June 1996. At that time this policy will be reviewed.

Karl Nissen is the ACRES Project Manager for the On-line Digital Catalogue. Please contact him if you would like further information regarding suitable Internet connections or any other related matter:

Karl Nissen
Tel: (06) 201 4113
e-mail: k.nissen@auslig.gov.au

ACRES looks forward to delivering this new service to you.

Microfiche

Production of the microfiche catalogue will continue until 31 March 1996. After this date it will no longer be available. All customers and distributors who currently subscribe to our microfiche will receive fiche until this date at no extra charge. Hence there will be about a four to six week overlap of the microfiche and the on-line digital catalogue. This will help you during the process of organising access to the new On-line Digital Catalogue. The project team for the new catalogue will keep microfiche users informed of the requirements to access the system.

ACRES' Confirmation Orders

A Confirmation Order is received by customers after placing their order with ACRES, and it forms an important and integral part of ACRES' quality procedures.

It is generated automatically by the production system following the input of a customer Order and details the specifications of the product to be generated for that customer. The Confirmation Order provides a check on ACRES interpretation of that customer's order and the chance to correct any typographical errors. By providing a copy of the Confirmation Order to the customer, the accuracy of the order details held by the production system can be checked.

It provides the Customer with an independent opportunity to ensure that the order details held by the production system are correct.

The customer Order and ACRES' Confirmation Order constitute our contract with the customer, and provided ACRES fulfils the contract as specified on the Confirmation Order ACRES has met its side of the contract and the responsibility for correcting any mistakes must be borne by the customer.

Please use the Confirmation Order as an independent check on what you have ordered. If there is any concern that your order might not be correct, please contact Customer Services before the product is generated.

LANDSAT MSS problems – Band 4 failure

The MSS sensor on Landsat 5 has experienced some major problems in the last 18 months. Last year, ACRES was the first organisation to notice that one of the six detectors on band 4 (near infra-red) was not functioning. After notification and confirmation from EOSAT it was discovered that this problem started on 29 April 1994. The dead detector caused a striped appearance in any MSS product using band 4 which was acquired on or after this date.

Since then the problem has become progressively worse, to the point where this problem detector was tripping the on-board safety systems. Consequently band 4 has been turned off by EOSAT as of 19 August 1995 and there is no plan to turn it on again. For any acquisition after and including 19 August 1995, only bands 1,2,3 will be available.

ACRES is investigating a number of alternative possibilities should Landsat 5 fail completely.

MSS Price Changes

A new pricing structure for Landsat MSS data began on 1 July 1995. The new structure sees some substantial decrease in the majority of MSS prices.

Prior to July, ACRES had not changed its MSS prices for about 3 years. During that time we had two different pricing structures depending on the age of the data, i.e. data less than two years old or data greater than two years old. Data greater than two years old was highly subsidised with our income falling well short of our costs of production. Hence we had no choice but to raise these particular prices.

However we wanted to make our pricing policy more consistent by having the one price for data of any age. The new pricing structure achieves this and is a compromise between the prices of the old two structures. Therefore prices for data less than two years old have fallen dramatically.

The new prices are:

	Digital	Photographic
Full Scene – path oriented, system corrected	\$550	\$570
Full Scene equivalent variable window – map oriented, system corrected	\$700	\$720

Please refer to price list for exact specifications.

The highlights of the new MSS prices are:

- data has the same price no matter when acquired;
- data less than 2 years old are now much cheaper (by nearly 50% for level 4 data);
- map oriented (level 8) products are now cheaper;
- data greater than 2 years old will cost a little more (to cover our production costs);
- only full scenes will continue to be available;
- precision products (levels 6 and 9) will not be offered as standard;
- floppy discs will not be offered; and
- Digital and photographic products can be purchased simultaneously for a reduced price.

Please note that MSS prices will not be affected by the failure of band 4. (See article below).

Please contact your preferred distributor or ACRES for more information.

MSS Copyright

ACRES would like to remind data users that copyright rules are not always the same between different countries. In particular, all MSS data acquired by ACRES and sold either directly or through our distributors, is subject to Commonwealth Copyright. These copyright rules are the same as those for Landsat TM.

Geoimage – new brochure

ACRES Distributor, Geoimage Pty Ltd has released a new 20 page colour brochure titled "The Landsat Satellites". This brochure complements previous brochures produced by Geoimage by providing more detail about the various Landsat sensors, data availability worldwide, and the radiometric and geometric corrections applied to the data.

In addition there is information on some of the Landsat mosaics which are offered by Geoimage.

For a copy of the brochure, please contact Geoimage in Brisbane or Darwin:

PO Box 789
Indooroopilly Qld 4068
Tel: 07 3871 0088
Fax: 07 3871 0042

GPO Box 3499
Darwin NT 0801
Tel: 089 413 677
Fax: 089 413 670

EOSAT photographic products – copyright

EOSAT has recently announced in their Summer 1995 “EOSAT Notes” a modified policy on copying and distributing most EOSAT photographic products. *The policy does not apply to ACRES products.*

From now on, no copyright applies to an EOSAT photographic product when:

- it is bought as a standard EOSAT photographic product (either directly or through ACRES);
- it is produced from EOSAT digital data; the only exception to this is for prints made from a Contractor's Tape*; these prints remain copyright. (In any case, copyright still applies to the digits.)

We wish to remind all customers that this is an EOSAT policy for EOSAT data. ACRES' agreement for the reception and distribution of satellite data has not changed.

In other words, it's 'business as usual' with regard to copyright of ACRES photographic data, or any photographic product made from ACRES digital data.

** A Contractor's Tape is a three band tape of EOSAT data from which ACRES can image write and sell the hard copy only.*

ER Mapper Version 5.0

As part of the recent release of ER Mapper 5.0, Earth Resource Mapping are distributing a Free Data Viewer on CD-ROM.

The Free Data Viewer enables people to view data without purchasing an image processing system. It will help new users explore possible data applications without a prohibitive outlay.

The Free Data Viewer in ER Mapper 5.0 runs on Unix workstations and on PCs under Windows NT. Version 5.1 which is currently coming off the press, also supports Windows 95. They provide viewing, but not processing, of raster data. Vector data can be integrated, but not edited, in the free viewer.

ER Mapper 5.0 CD-ROMs containing the Free Data Viewer are available free of charge from ER Mapper Resellers.

The full ER Mapper software is also available on the CD-ROM and can be trialed without a license on the supplied datasets.

Contact:

Earth Resource Mapping
Level 2, 87 Colin St
West Perth, WA, 6005
Tel: (09) 388 2900
Fax: (09) 388 2901

Processing of TERSS data by ACRES – the DTU connection

ACRES' Chief Engineer, Robert Denize, presents a light commentary on ACRES' efforts to process TERSS data:

Many times in the life of ACRES there has been a need to intelligently glue together two systems. Some of the glueing tasks were to allow a new system to connect to an old system (the so called 'heritage class'), and some to allow an old system to connect to a new system.

Such a case is the ACRES connection to TERSS (Tasmanian Earth Resources Satellite Station). Here we have a ground station built using recent technology to capture data from passing remote Sensing Satellites. For ACRES to take advantage of this new capture zone from Hobart, arrangements must be made to transfer the data from TERSS to ACRES

TERSS uses a RAID (Redundant Array of Independent Disks) to grab the Satellite downlink data, and ACRES uses a HDDR (High Density Digital Recorder) to do the same. Both technologies are quite different.

To compound the problem, TERSS uses standard computer tape to archive the data captured by the RAID, and ACRES uses Optical Tape to archive data captured by the HDDR.

HOW TO GLUE THE TWO SYSTEMS TOGETHER

A solution can be found, not in the capture methods, but in the archiving methods used at the two ground stations.

How?

First, some more background. A typical Satellite receiving ground station not only captures satellite data, but also puts a time stamp on the recording as the data is being captured.

For ACRES' ground station at Alice Springs, a time code called IRIG-A is recorded alongside the data. After arrival in Canberra, the data on the ACRES HDDR tape is transferred to Optical Tape in a transcription process. In this process, the data is copied to Optical Tape in a format that is not significantly changed, but the ground station time stamp is converted from IRIG-A to a parallel form suitable for recording on to the Optical Tape. In the case of the HDDR, the data stream is required to be at a constant rate for either recording or playback.

For the TERSS ground station at Hobart, a more computer oriented time stamp is inserted in the RAID data during acquisition. The RAID data files are then unloaded onto computer tape for archiving. At present this tape is an 8mm Exabyte. Unlike the HDDR, the RAID data stream is continuous for data recording, but intermittent on playback to archive.



IMAGE OF ASHBURTON REGION, NEW ZEALAND. PRODUCED FROM ESA'S ERS-1 SATELLITE DATA, WITH THE IMAGE ACQUIRED BY TERSS AND PROCESSED BY ACRES. COPYRIGHT ESA 1995. REPRODUCED WITH PERMISSION.

For the Optical Tapes at Canberra, continuous or intermittent recording and playback are acceptable.

Hence, the solution. Use the TERSS archive tape to transfer the data to ACRES archive Optical Tape. Having the TERSS data on Optical Tape immediately allows ACRES the ability to ingest and process data from the TERSS ground station.

Easy? But the format between the TERSS and ACRES archiving systems are different.

This is where the DTU features (you have been waiting for this haven't you?).

The DTU, or Data Transcription Unit, was built by Stuart Swan of CSIRO Division of Oceanography in Hobart. It allows reformatting of data from the TERSS 8mm tape, and hence allows the transfer of data to Optical Tape in a format that is immediately useable by the ACRES processors. This reformatting is done to the data, and the time stamp is converted to a parallel form. The playback of the 8mm tape and its conversion can be intermittent, but the Optical Tape does not mind a break in transmission, even one that occurs when an operator has to change out the 8mm tapes should one pass be across two tapes.

A prototype DTU has been built and delivered to ACRES for further testing. The test results have demonstrated that for ERS-1 SAR passes captured at TERSS, these can be transcribed to ACRES Optical Tape. Further, this data has been read into the ACRES SAR processor from Optical Tape and images made. This demonstrated to ourselves, and the world, that an end-to-end link exists from the TERSS ground station to ACRES processing platforms.

At the moment, the prototype DTU is being tested in a non-operational mode to transcribe a set of ERS-1 SAR data. It is expected that over the next few months, problems will be found and corrected, other satellite data will be tried, and the DTU will be better integrated into the ACRES environment with the prototype being replaced by a developed DTU.

In case you are wondering, the image shown is of Ashburton, South Island, New Zealand. It was captured and recorded by TERSS, transcribed by DTU, and processed by ACRES. The image is a SAR Fast Delivery Product, from an ascending ERS-1 orbit. This image is also historic because it is the first ERS-1 SAR scene of New Zealand to be produced.



STUART SWAN, CSIRO DIV OF OCEANOGRAPHY (LEFT) AND JOHN WOOLNER, ACRES, INSPECT THE FIRST SYNTHETIC APERTURE RADAR SCENE TO BE PROCESSED BY ACRES FROM THE TERSS GROUND STATION IN HOBART.

Image Writing Service – data formats

We have been experiencing a few technical difficulties with data sent to ACRES for image writing. By keeping the following points in mind when generating data for image writing, you will be ensuring that your product is able to be generated easily.

ACRES Exabyte drives will only ingest 'uncompressed' data, that is a cartridge which will only hold a maximum of 2.3Gb. To generate 'uncompressed' data, you may have to physically switch your drive to this option and/or check that the software option for 'uncompressed' data is selected.

Data formats are a continual problem, especially with the new open systems technology and software packages on the market. You are referred to the ACRES Image Writing Service Data Sheet (December 1994) for information on the ACRES Image Writing Format.

However, our research has shown that data from two image processing packages may be exported in a format that is suitable for image writing ingest. They are:

- ERDAS Imagine: 8 bit, Binary
(BIL format with no header)
- ER Mapper: Refer Appendix A of manual for list of ACRES BSQ formats

Note: BIL is Band Interleaved by Line; BSQ is Band sequential

For UNIX based systems, ACRES can also ingest data which is written using the "dd" command. The data is written to the device using the following command:

```
dd△if=<X>△of=/dev/Y△bs=Z
```

where:

△ = a space

if = input file,

X = filename.bil

of = output file

Y = name of output device

Z = number of pixels across image.

Please also remember to make sure that the correct image band is going to the correct colour 'gun' and that the RGB or BGR priority is noted on the order form.

If you do have any problems or are unsure of what to do, please contact ACRES Customer Services, who will ensure your query is promptly addressed.

ACRES digital data products – media and formats

ACRES production system is set up to produce a variety of tape products; they are:

- 9 track CCT (1600 or 6250 bpi);
- 8mm Exabyte (uncompressed only); and
- 4mm DAT (uncompressed only).

Data is written out to these media on our VAX system operating under VMS. Data can be written to these media in a variety of formats, though if a format is not specified, then data will be provided in the CCRS-LGSOWG (Canadian Centre for Remote Sensing – Landsat Ground Stations Operators Working Group) format (including SPOT data). Data can be organised as BIL (Band Interleaved by Line) or BSQ (Band Sequential).

Other formats available are:

- EOSAT Fast Format (BSQ only) – Landsat data only; and
- SPIM (SPOT IMAGE format) – SPOT data only.

SPIM FORMAT FOR DIGITAL PRODUCTS

The default file structure for ACRES digital products is the CCRS (Canadian Centre for Remote Sensing) format. This is one of the common formats in the so-called LGSOWG family of formats.

ACRES offers another format for selection (for SPOT data) known as the SPOT IMAGE format, referred to locally as the SPIM format. This is the format used by SPOT IMAGE in France for supply to its customers worldwide and is also one of the LGSOWG family formats. This format is slightly different to CCRS, especially in relation to auxiliary ephemeris data which is used by some software packages for special applications such as DEM generation.

For SPIM format this ephemeris data is in the same logical volume as the image data, whereas for CCRS format the ephemeris data is in a Supplementary Volume which is only generated and supplied if requested by the customer. Not many applications use the ephemeris data.

Some applications require the use of SPOT data with a processing level of SPOT IMAGE level 1A. To get the ACRES equivalent to this, ask for SPIM format and level 1 processing.

We also supply data in SPIM format at our processing levels 8 and 9, which are the geocoded products with the image grid aligned to the Australian Map Grid (AMG). These are the most user friendly processing levels in that the data is aligned to (Grid) north and does not require rotation. Our levels 8 and 9 equate to SPOT IMAGE levels 2A and 2B.

Whether you order CCRS (the default) or SPIM format will depend primarily on the tape reading utilities available in your Image Analysis system software.

Both CCRS and SPIM formats allow data to be organised in either BIL or BSQ forms.

Resampling options for ACRES products

Karl Nissen and Paul Wise

Recently, quantitative analysis of LANDSAT TM data which was resampled using Nearest Neighbour, revealed some interband misregistration at the pixel level. The problem was not apparent when Cubic Convolution resampling was used.

For most of our customers, this was not a problem, but ACRES investigated the problem and sought the advice of its system supplier, MDA.

The resampling options for digital products are as follows:

- Nearest Neighbour and Cubic Convolution continue to be the standard options.
- For Bulk and Georeferenced digital products, DS8 (an 8-point kernel based on windowing an 8-point truncated sinc kernel) is the option.
- For Geocoded digital products, DS16 (a 16-point kernel based on windowing a 16-point truncated sinc kernel) is the option.
- For customers who want to perform quantitative analysis on a product, the KD16 (a 16-point sinc function windowed by a Kaiser window) is recommended as the most accurate interpolator.

The sinc-based interpolators are derived from signal processing theory, which states that if a signal is band limited, it can be exactly reconstructed using a sinc ($=\sin(x)/x$) interpolator. The ideal sinc kernel is infinite, thus in practice it must be truncated to a finite length. This introduces truncation errors in the interpolator and, as expected, the shorter the kernel, the higher the truncation error. To reduce high frequency artefacts in the imagery, the truncated sinc kernels are typically 'windowed', that is they are convolved with a low pass filter to damp their 'tails'. By contrast, Cubic Convolution is a polynomial based interpolator.

The DS8 is a more accurate interpolator than the cubic convolution kernel because of its increased length, while the DS16 is slightly more accurate than the DS8 kernel.

The KD16 is the most accurate kernel, and MDA say that, "internal studies have shown that it produces a pleasing balance between image ripple and low frequency accuracy, and has good RMS error results. If a user wants to perform quantitative analysis of a product, the KD16 kernel is the most accurate interpolator".

For pure photographic products, Cubic Convolution remains as the interpolator.

The application of SPOT Panchromatic Imagery in the AUSLIG Topographic Mapping Program.

Craig Smith

The Australian Surveying and Land Information Group (AUSLIG) has the responsibility for providing topographic mapping at national scales. This involves mapping in a range of scales from 1:100 000 to 1:10 million.

AUSLIG has recently commenced a major program to maintain the currency of these maps especially in areas where significant changes in infrastructure are occurring. The maps are both the traditional printed map and GEODATA, a fully attributed topologically structured digital form suitable for ingest into a wide range of GIS and desktop mapping systems.

A primary source of data for the AUSLIG map maintenance program is SPOT Panchromatic imagery. This imagery is extremely useful in identifying changes in cultural features such as roads and built up areas.

Geocoded, high pass filtered imagery is produced by the Applications group at ACRES. The imagery is then analysed in the ARC/INFO environment with the vector representation of topographic features displayed over the imagery. The vector information is visually compared with the imagery and modified to match the imagery when required.

It is anticipated that about 400 non-standard SPOT Panchromatic scenes will be required each year by the map maintenance program. Large amounts of time and money can be saved by updating and maintaining AUSLIG's maps in this way. Large areas can be covered quickly, while digital information permits easy manipulation and integration.

The SPOT Pan imagery is suitable to identify most of the features we include in our topographic mapping products, although ancillary information will normally be required to verify the information derived from the imagery.



GENIE – Global Environmental Network for Information Exchange

GENIE is the United Kingdom's Federal Metadata Network for Global Environmental Research. It is funded by the Economic and Social Research Council (ESRC). The group responsible for implementing and publicising the GENIE service is based at The University of Nottingham and is directed by Professor Paul Mather.

The objective of GENIE is to facilitate access to descriptions of data ('metadata') that are relevant to Global Environmental Research from both a physical (environmental) and human perspective.

GENIE is a federal system consisting of a set of nodes which may represent 'users' or 'data providers', or both. This means that metadata records can be held anywhere in the UK (or other countries), preferably at the Data Centre that is responsible for the maintenance of the associated data sets. A list of all metadata known to the Federal Network is called the Master Directory. The ways in which users can access the information contained in GENIE are via the Casual User Service (on WWW) or by installing their own GENIE software.

The Federal Network currently consists of the ESRC Data Archive (University of Essex), the NERC (National Environmental Research Council) Corporate Data Directory, the University of Nottingham, and Loughborough University of Technology. The metadata at Loughborough is gathered from all over the world; contributors included NASA and the German Climate Computing Centre.

Each data supplier to the GENIE system enters metadata in the form of (i) a document title, (ii) a set of 'concepts' which are used to index the document itself. A document can be either text or an image. The document title is added to the Master Directory. The metadata user enters queries in the form of single or linked concepts (eg. ozone *and* UV radiation), and documents indexed in terms of these concepts are located. The document titles are displayed and the associated document can be retrieved from their home node if required.

Users of the Casual User Service can copy the retrieved documents to a text file on their own computer, or email a copy of the document to themselves or to anyone else. The Casual User Service is meant to be used for familiarisation purposes, or by users who have only occasional need for a metadata system.

Users of an X-interface to a local GENIE can add the retrieved document to their local metadata store, edit it, or create alternative indexing concepts, and in the process build up a fast, local and personal metadata system.

The type of researchers using GENIE are those interested in the field of Global Environmental Change. If you are a geographer, ecologist, climatologist, geomorphologist, oceanographer, glaciologist, or remote sensing researcher, or if you just have an interest in environmental matters, you will probably find something to capture your interest.

The ESRC Data Archive contains a wealth of data including socio-economic and demographic variables, while the NERC Corporate Data Directory provides summaries of the data holdings of the major NERC Data Centres. Add to that the 4,000 or so items held at Loughborough University of Technology, derived from world-wide sources including the NASA Global Change Master Directory, and the remote sensing metadata stored at The University of Nottingham, and you have a major international metadatabase. You can find details of satellite calibration factors, definitions of terms, summaries of documents and quick-look images.

The creators expect that as the level of use increases, users will contribute comments, descriptions of their local data holdings, and specifications of algorithms that will process data in new and innovative ways.

Users can participate in GENIE even if they decide not to install a GENIE system on a local workstation. However, you will lose the advantage of being able to store and manage your own collection of metadata.

All of the Data Centres collaborating in GENIE automatically publish details of their metadata to the nearest GENIE index node, from where it is made available to the other index nodes and thence to any user via the World-Wide Web. You can enter queries and perform searches on the Master Directory if you have a workstation or PC running Netscape, Mosaic or any other WWW browser.

For more information contact:

GENIE, Geography Department
University of Nottingham
University Park, Nottingham NG7 2RD
Fax: +44 115 951 5249
e-mail: genie@nottingham.ac.uk
Casual User Service: <http://www-genie.lut.ac.uk>

TerraScan/MapInfo dynamic link

ACRES Distributor, Resource Industry Associates (R.I.A.) continues to expand its user base for satellite imagery through its provision of TerraScan, a low cost powerful PC based image processing package.

R.I.A. has announced the release of TerraScan ProGPS 3.0 with its optional real-time MapInfo dynamic link to provide a desktop raster/vector GIS.

TerraScan runs on Windows 95, NT and 3.1 and only requires 5Mb of hard disk space. TerraScan has been developed by Elvin Slavik with R.I.A. and has been continually enhanced as more users throughout the world request new features. The MapInfo dynamic link provides the ability for any raster data including raw Landsat and SPOT BIL files to be processed and enhanced. It can then be dynamically transferred directly into MapInfo.

For serious applications, dynamically linked TerraScan/MapInfo is recommended to be run on a minimum of a 486 computer with 8 Mb of RAM running Windows 95.

The Victorian Government undertook an aerial survey of the Greater Melbourne region in early 1995 and awarded R.I.A. a contract to create a digital photo base on CD-ROM. By utilising this powerful TerraScan/MapInfo desktop system R.I.A. was able to use MapInfo for selection of control points on air photos displayed in TerraScan. A total of 530 images were subsequently rectified on three Pentium computers running Windows NT. A total of 34 CD-ROMs containing 19 Gigabytes of image files were created and delivered to the client in June 1995. The success of this project has shown the software to be extremely robust and thus worthy of release to all TerraScan users.

The price for TerraScan ProGPS with the MapInfo Link is \$2500. MapInfo is priced at \$2350.

R.I.A. is able to offer bundled purchases of these software packages.

ARCHIVING SATELLITE DATA ON CD-ROM

Resource Industry Associates (R.I.A.) has also announced the release of its new CD writing system based on the SONY 920s external SCSI enclosure and Corel CD Creator software. The price is \$3400 ex tax or \$3100 for the internal version.

The software operates similar to File Manger for selection of files for copying to CD-ROM. It is an easy to use read/write CD system – essential for all remote sensing users.

RIA are offering a special introductory bundle where purchasers can receive a free CD Mastering system with the purchase of 5 copies of TerraScan ProGPS including MapInfo Link

Contact details:

R.I.A. at 538 Brunswick St
Fitzroy North 3068 Victoria.
Tel: 03 9482 4945
Fax: 03 9482 4956.

TNTmips 5.1 shipped

MicroImages announces shipment of version 5.1 of TNTmips (the Map and Image Processing System), TNTview, and TNTAtlas to all clients in July. These software products run on all popular workstation platforms; with Windows 3.1, NT, and 95; and on the Mac and Power Mac. Significant new features include a combined object editor and a suite of second generation, soft photogrammetry processes. The combined object editor supports creation and editing of any number of CAD or topological vector layers as part of a complex multilayer display that may also contain huge reference images. The new approaches to soft photogrammetry are faster and more accurate for creation of relative geometry, DEM, and orthoimage products from stereo pairs.

TNTmips' interactive user interface now provides integrated toolbars with tooltips for commonly used actions (editing, zooming, measuring, etc.) and custom-designed, moveable toolbars for graphic access to commonly used processes. Interactive tabular viewing is available for vector and CAD attributes, such that attributes related to elements you select with the mouse are identified in the table and elements related to attributes you chose in the table are identified for editing actions. MapInfo data files can be linked to and used directly without importing. A simple CAD-oriented sketching tool is included in the inexpensive TNTview product and also with the general display process in TNTmips to support portable airphoto interpretation in the field. An extended set of properties (which include form ration, grain shape index, compactness, and circularity, among others) can be computed and saved as attributes to characterise vector polygons.

Contact:

MicroImages, Inc.
201 North 8th Street
Lincoln, Nebraska, 68508-1347 USA
Tel: +1 402 477 9554
Fax: +1 402 477 9559

ACRES' manufacturing system implemented

ACRES officially implemented its new manufacturing system on 1 July 1995. The system is ACRES' customised version of Computer Associates' MANMAN/X manufacturing software. It allows order entry, generation and scheduling of production orders, production control, inventory control and accounting.

After nearly three months of operation, the system has been constantly fine tuned to adapt MANMAN/X to the needs of an earth resource satellite processing operation. Change requests have arisen from both ACRES staff and customers' experience of the system. The adaptation of the system will continue for the next few months before we reap the benefits of this manufacturing control system.

ACRES would like to thank our customers for their patience during the development phase of the system.

Conference Report

NARGIS 95 - NORTH AUSTRALIAN REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS FORUM

The Second North Australian Remote Sensing and Geographical Information Systems Forum (NARGIS 95) was successfully held in Darwin 18-20 July 1995. One hundred and fifteen people attended the three day forum which was opened by Dr Neil Williams, Chairman of the Remote Sensing Board of the Australian Space Council who gave a presentation titled "Remote Sensing in Australia: Where is it going?"

Five invited speakers, twenty five paper presentations, six research bites and twelve poster papers were presented over the three days. The Forum provided a venue for people working in remote sensing and GIS to get to know each other and exchange ideas on their work in northern Australia.

AUSLIG/ACRES was a sponsor of the forum and wish to thank the organising committee for their commitment and in particular our Northern Territory distributor Mr Bernie Fitzpatrick, GEOIMAGE for his dedication in servicing the Remote Sensing and GIS industry in the Northern Territory.

It was agreed that a third Forum be held in 1997 with a venue still to be decided, but will either be north Queensland or again in Darwin.

The 8th Australasian Remote Sensing Conference.

"WHAT'S NEW AND WHAT WORKS"

The 8th Australasian Remote Sensing Conference will be held in Canberra from 26-29 March 1996. The conference is being held in conjunction with "SPACEWORKS '96" (an International Space Exhibition), the 4th Australian Space Development Conference and the 19th Space Engineering Symposium. The event will bring together a wide range of participants covering all areas of the space based industries discussing a wide range of topics in concurrent forums.

The Australasian Remote Sensing Conference will have the theme "What's New and What Works". It will bring together a range of professionals from around the world to discuss a gamut of issues from operational uses of remote sensing to new advances in the industry. The conference also encompasses workshops in a number of applications, as well as an exhibition of currently available products and services by a variety of organisations

For further information on the conference, including exhibitions and sponsorship, please contact:

8th ARSC
c/- ACTS
GPO Box 2200
Canberra ACT 2601
Tel: +61 6 257 3299
Fax: +61 6 257 3256

1995/96 calendar

Remote sensing and associated events

1995

4 Nov – 16 Dec Nakhon Ratchasima, Thailand

World Tech 95, World Agriculture and Industrial Exhibition including 16th Asian Conference on Remote Sensing.

Contact: World Tech 95, Bangkok
Tel: +662 216 5750
Fax: +662 216 5752

14 – 16 November Nashville, USA.

GIS/LIS '95.

Contact: GIS/LIS '95 14456 East Evans Avenue, Aurora, CO 80014, USA
Tel: +1 303 337 0513
Fax: +1 303 337 1001

20 – 24 November Melbourne

AURISA 95 Conference, workshops, user groups and technical exhibition. The premier Australasian event in GIS and spatial information disciplines. Theme: providing community benefits in the 90s and beyond. Radison President Hotel.

Contact: Australian Convention and Travel Services, GPO Box 2200, Canberra, ACT, 2601
Tel: 06 257 3299
Fax: 06 257 3256

26 Nov – 1 Dec Melbourne

International Symposium on Spectral Sensing Research (ISSSR).

Contact: Science and Technology Corporation, Meetings Division (Judy Cole).
Tel: +804 865 7604
Fax: +804 865 8721

5 – 8 December Indore, India

15th Indian National Cartographic Association International Congress. The theme will be "Cartography – Emerging Technologies and Alliances" which includes a sub-theme on remote sensing.

Contact: Prof. H.S. Mehta
Tel: +91 0731 43 4095
Fax: +91 0731 43 2540
e-mail: h.s.mehta@gsits.ernet.in

1996

5 – 7 February Hobart, Tasmania

4th Australian Conference on the Physics of Remote Sensing of Atmosphere and Ocean.

Contact: 3rd National AMOS Conference, Antarctic CRC, University of Tasmania
Tel: 002 20 2977
Fax: 002 20 2973
e-mail: amos3@postoffice.antcrc.utas.edu.au

27 – 29 February Las Vegas, USA

Applied Geological Remote Sensing Conference – Practical Solutions for Real World Problems.

Contact: ERIM/Geological Conference
Tel: +1 313 994 1200 ext. 3234
Fax: +1 313 994 5123
e-mail: wallman@erim.org

25 – 29 March Vancouver, Canada

26th International Symposium on remote Sensing of Environment and 18th Annual Symposium of the Canadian Remote Sensing Society. This joint conference will focus on applying remote sensing technologies to solve real world problems of the environment.

Contact: Symposium on Remote Sensing of Environment, 13800 Commerce Parkway, Richmond, B.C. Canada, V6V 2J3
Fax: +1 604 273 9830
e-mail: symposium@mda.ca

26 – 29 March Canberra, ACT

Spaceworks '96 incorporating the 8th Australian Remote Sensing Conference. The theme of the conference is "What's New and What Works". Two other concurrent conferences are the 8th Australian Space Development Conference and the 10th Space Engineering Symposium and Workshops.

Contact: Australian Convention and Travel Services, GPO Box 2200, Canberra, Act, 2601
Tel: 06 257 3299
Fax: 06 257 3256

19 – 25 May Gifu, Japan

20th International Symposium on Space Technology and Science.

Contact: Dr Michiro Kusanagi
Tel: +81 3 5473 7014
Fax: +81 3 5473 7814

30 May Chicago, USA

Business Geographics for Educators and Researchers.

Contact: Sylvia Marshall
Tel: +1 970 223 4848
Fax: +1 970 223 5700
e-mail: sylvia@gisworld.com

24 – 27 June San Francisco, USA

Second International Remote Sensing Conference and Exhibition: Technology, Measurement, and Analysis.

Contact: ERIM/Airborne Conference
Tel: +1 313 994 1200 ext. 3234
Fax: +1 313 994 5123
e-mail: wallman@erim.org

4 – 7 November Berlin, Germany

International Academy of Astronautics Symposium on Small Satellites for Earth Observation. This symposium will focus on the creation and usage of Small Satellites for solving most applied and scientific space exploration tasks.

Contact: Bernd Kirchner
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Sydney NSW 2000
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Fax: (02) 241 1249

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Fax: (07) 3406 2762

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13/180 Moggill Road
Taringa QLD 4068
PO Box 789
Indooroopilly QLD 4068
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Fax: (07) 3871 0042

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37 Tully Street
South Townsville QLD 4810
PO Box 5704 MC
Townsville Qld 4810
Tel: (077) 71 6622
Fax: (077) 71 6626

Geo Mapping Technology Pty Ltd (GMT)

6 Nyora Street
Everton Hills
Brisbane QLD 4053
Tel: (07) 353 0533
Fax: (07) 353 0534

SOUTH AUSTRALIA

Department of Environment & Natural Resources (DENR)

Resource Information Group
Image Data Services
282 Richmond Road
Netley SA 5037
GPO Box 1047
Adelaide SA 5001
Tel: (08) 226 4904
Fax: (08) 226 4906
(08) 293 4898

WESTERN AUSTRALIA

Remote Sensing Applications Centre (RSAC)

Department of Land Administration
65 Brockway Road
Floreat WA 6014
PO Box 471
Wembley WA 6014
Tel: (09) 340 9330
Fax: (09) 383 7142

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GEOIMAGE Pty Ltd

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59 Smith Street
Darwin NT 0800
GPO Box 3499
Darwin NT 0801
Tel: (089) 41 3677
Fax: (089) 41 3670

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University of Tasmania
Sandy Bay TAS 7005
GPO Box 252C
Hobart TAS 7005
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Fax: (002) 20 2494

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Fax: +1 301 552 3762

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Indonesia
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+62 21 750 6361
+62 21 750 6350
Fax: +62 21 750 8985
Internet:
indica@server.indo.net.id

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Environmental Research & Information Consortium Pty Ltd (ERIC)

Canberra Business Centre
49 Wentworth Ave
Kingston ACT 2604
Tel: (06) 295 5918
Fax: (06) 295 5988

Southern Remote Sensing

24 Curtis Street
North Adelaide SA 5006
Tel/Fax: (08) 267 3983

Technical & Field Surveys Pty Ltd (TFS)

Building 3
CSIRO Complex
30 Delhi Road
North Ryde NSW 2113
Tel: (02) 887 8642
Fax: (02) 887 8647

SPECTRASCAN Pty Ltd

2/184 Harbourne Street
Wembley WA 6014
Tel: (09) 387 8188
Fax: (09) 387 8400

National Geographic Information Systems Pty Ltd (NGIS)

Suite 4
Kishorn Court
58 Kishorn Road
Mount Pleasant WA 6153
Tel: (09) 364 3878
Fax: (09) 364 9200

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Australia 2616

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