ACRES

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New leap forward as ACRES offers JERS data

After lengthy negotiations, ACRES has signed a distribution agreement with the National Space Development Agency of Japan (NASDA) to provide remote sensing products from the Japanese Earth Resources Satellite, JERS-1.

Because it uses a synthetic aperture radar (SAR) operating on a different part of the spectrum than the two existing SAR satellites, ERS and RADARSAT, JERS-1 provides images more suited to land based applications.

ACRES has been acquiring JERS-1 optical and SAR data at its Alice Springs ground station for some time, but this has only been available to a small number of scientific researchers. The new agreement will allow ACRES to receive satellite data direct, then process and distribute JERS-1 products, and to sell data from its extensive JERS SAR archive.

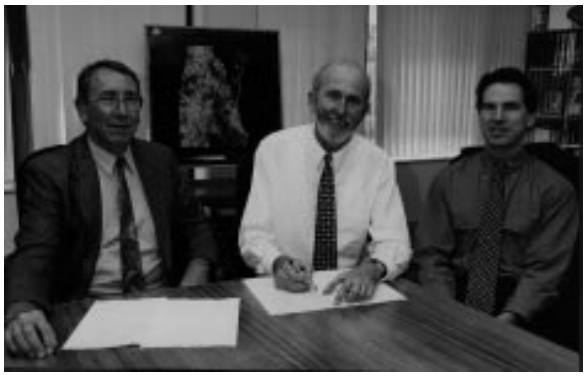
More recently, worldwide data has been available from ACRES through a distribution agreement with Space Imaging EOSAT in the USA.

According to Paul Trezise, Manager of ACRES, the SAR sensor is an active microwave sensor capable of imaging the Earth regardless of the time of day, cloud, haze or smoke over an area. The instrument is classified as *active* as it emits the microwave energy necessary to image the Earth's surface. In contrast, *passive* or *optical* sensors rely on the sun's reflected energy to image the Earth.

ACRES has sought distributors for JERS-1 products. These distributors will be announced as soon as they have been selected.

JERS-1 is a joint project between the National Space Development Agency of Japan and the Japanese Ministry of International Trade and Industry (MITI).

INSIDE



Pictured signing the JERS Distribution Agreement are (left to right): Laurie Oliver, now retired from ACRES; Peter Holland, AUSLIG General Manager; and Paul Trezise, Manager of ACRES.

NASDA is in charge of the satellite while MITI is responsible for the observation equipment. JERS-1 was launched in February 1992 and observes the Earth's surface using optical sensors and a SAR sensor. The optical sensors collect information from eight spectral bands, while the SAR sensor operates in the L-band of the microwave wavelengths.

JERS SAR CHARACTERISTICS

Frequency	1.3 GHz
Band Width	15 MHz
Band Name	L-Band
Wavelength	235 mm
Off Nadir Angle	35°
Ground Resolution	18 m
Swath Width	75 km
Polarisation	HH

Continued on page 2

Manager's message

It is great to be back in the Manager's seat at ACRES after an absence of 18 months. I am extremely grateful to Ian Shepherd for the excellent job that he did "holding the fort" while I was involved in the AUSLIG restructure. I look forward to continuing to work closely with Ian in his new role as Manager of AUSLIG's Information Access program.

Shortly after returning to ACRES, I had the opportunity to attend the annual ground station meetings for the Landsat, SPOT, RADARSAT and ERS programs. This was a perfect opportunity for me to come up to speed with the latest technical developments in the international remote sensing community. There is a lot happening with all these programs and a very pleasing commitment to continuity of data supply and improvement of service over the next 5–10 years.

There have been many happenings at ACRES since the last edition of *ACRES Update*. We hope you will soon see the benefits of some of these developments. Others we hope you didn't notice at all! One item that definitely falls into the latter category is the move of ACRES Data Processing Facility from the Don Gray to Scrivener buildings in Fern Hill Park, Canberra. The move was necessitated by the recent AUSLIG restructure which resulted in the need to rationalise accommodation arrangements in Canberra.

While the distance between the two buildings is only a few hundred metres, this belies the complexity of moving the entire ACRES processing system and archive while still maintaining services for our customers. I believe the entire ACRES team, led by the move coordinator Mike Pasfield, deserves congratulations for the dedicated and professional manner they have approached and accomplished this difficult task.

While on the subject of congratulations, I am delighted that ACRES has achieved Operational Certification for RADARSAT. Again Mike Pasfield led a team of ACRES staff through the gruelling series of test acquisitions and product generation that were required to meet the stringent certification requirements of RADARSAT International and the Canadian Space Agency.

I would particularly like to recognise the efforts of Warren Serone and his team at the Data Acquisition Facility in Alice Springs and Rosalie Booth in Canberra who have all worked long and unsociable hours in order to achieve this milestone in record time. I look forward to renewing my acquaintance with ACRES distributors and customers at the Australasian Remote Sensing Conference in Sydney.

Paul Trezise

continued from page 1

New leap forward as ACRES offers JERS data

JERS-1 PRODUCTS AND PRICES

ACRES will be providing JERS-1 SAR scenes, with a full scene of 75 x 75 km coverage area, at a price of $1,500. Images will be available in both digital and photographic forms of media. The price of extra copies of any digital or photographic product ordered at the same time will be $180. A photographic or digital product ordered with a digital or photographic scene of the same area, respectively, will cost $400. As with all ACRES digital products, scenes are available on a CD, EXABYTE or DAT media.

Like ACRES ERS products, JERS-1 products are available to be purchased for approved research and demonstration purposes, at a reduced price. The price for full scene imagery bought using this category is $375. Only digital products can be ordered using the R&D category.

A new variable window option for Landsat and SPOT products

New variable window options for Landsat and SPOT products have just been released, improving ACRES product range by replacing the Floppy Disk product with similar characteristics, but at a reduced price. It also replaces the Customised Sample Product, removing the 3 scenes per new client limitation on the number of products purchased.

NEW PRODUCT OPTIONS

Product	Coverage area	Price
Landsat TM	625 sq km (nominal 25x25 km)	$495 (4 band option) $695 (7 band option)
SPOT PAN & XS	225 sq km (nominal 15x15 km)	$495

Both the Landsat and SPOT products are processed at Level 8, map oriented and system corrected and are available on CD.

Please do not hesitate to contact ACRES Customer Services if you require any further information.

RADARSAT certification process

by Mike Pasfield

Members of the RADARSAT team visited Canberra and Alice Springs earlier this year to assess ACRES for RADARSAT certification. Pictured (left to right) are: Bill Jefferies, RADARSAT International (RSI) Manager of the Canadian Data Processing Facility; Dr Satish Srivastava, SAR Specialist with the Canadian Space Agency; ACRES Manager, Paul Trezise; Rosalie Booth, ACRES; Mike Pasfield, ACRES; Joerg Germann, RSI Network Stations Manager; and John Hornsby, RSI Director of International Sales.

Since late last year, ACRES has been working with RADARSAT International (RSI) and the Canadian Space Agency (CSA) to ensure all aspects of ACRES acquisition, processing and delivery of RADARSAT data and products meet their specification. RADARSAT is currently the only civilian satellite remote sensing program with a rigorous certification process.

The success of this process leads to ACRES being 'certified', by both RSI & CSA, for acquisition, processing and product delivery. This certification is required prior to ACRES being able to sell RADARSAT products that are received directly and processed in Australia.

A major part of this process included a range of RADARSAT acquisitions via Alice Springs and a two-week visit by a team of four Canadians. The team – Satish Srivastava of CSA and Joerg Germann, Bill Jefferies and Kevin Jones of RSI – arrived in April and carried out an assessment of ACRES operational procedures and provided further training for ACRES personnel. Satish and Kevin also travelled to ACRES Data Acquisition Facility (DAF) at Alice Springs to witness real-time RADARSAT downlinks. They were ably assisted by Warren Serone and the DAF team of Shaun Evans and Jeremy Williams.

During the Certification process, the DAF team were required to acquire some 65 RADARSAT passes, consisting of around 210 different segments (including all of the possible beam modes, descending and ascending) which added up to a total of nearly 9 hours of recorded data. Warren, Shaun and Jeremy were burning the candle at both ends to ensure that passes as early as 4:30am and as late as 8:30pm were successfully acquired.

Since this visit ACRES has been processing a selection of these acquisitions, to level 0, and supplying them to RSI/CSA for screening. Products covering the full range of beam modes and all of the possible processing levels, other than precision geocoded, are required to fulfil the requirements of Certification. For this phase, some 32 products are to be produced.

ACRES was formally advised that as of 15 June it had achieved Operational certification. This means that RSI and CSA formally recognise that ACRES has the capacity to:

- Order and schedule RADARSAT-1 direct downlink data at the ground station;
- Receive direct downlink data at the ground station;
- Archive and catalogue downlinked data;
- Establish communications interfaces between ACRES, CSA and RSI;
- Achieve the operational performance expected of a RADARSAT program Network Station; and
- Generate RADARSAT program compliant Level 0 products in CEOS format.

However, there was still one further milestone to achieve: Product Certification. To do this, a further selected range of products has to be generated and supplied to RSI/CSA for screening. Rosalie Booth has put in a huge effort, working with the ACRES Synthetic Aperture Radar Processing System (SARPS) to establish procedures and initiate input and processing parameters. Rosalie, with the assistance of the ACRES operations team, has to produce more than 45 products to satisfy RADARSAT Product Certification requirements. However, based on our success with the Operational Certification and the initial examination of the products derived, ACRES is confident it can reach product certification by late July 1998.

The RADARSAT Certification process has, at times, stretched the resources and the resolve of ACRES. However, the resulting high standard and consistent quality of product and service to our customers will make it well worth the effort. The majority of ACRES personnel were involved in some way and their willing and eager participation has contributed greatly to the successful result. Also, the efforts of the RSI/CSA Certification team were very much appreciated by all. Their training and advice were first class.

GEODATA SPOT-LITE nears release

There have been a number of changes to the SPOT-LITE project since the last edition of *ACRES Update*, including a move to on-line delivery and ordering and an expected release in September.

The new product, SPOT-LITE, will be a geocoded, orthorectified SPOT Pan image tile corresponding to a 1:50K map sheet area and will be available both in UTM and equirectangular projections with either the GDA94 or AGD66 datums.

NEW ON-LINE DELIVERY

Initially, SPOT-LITE tiles were to be released on CD-R. This has now been changed to on-line sales across the Internet. This method eliminates the need to produce, archive and distribute the CDs, passing the inherent cost savings directly to the customer. It also has the added advantages of easy access and faster delivery. ACRES has recently investigated and tested the feasibility of delivering SPOT-LITE data on-line through the Internet using a prototype SPOT-LITE server.

SPEED OF DELIVERY AN ISSUE

Speed of data transfer and security are the two major issues of concern in dealing with Internet based distribution. Each SPOT-LITE image contains 2500x2500 pixels, with 8 bits per pixel; the size of the image is 6.25Mbytes. For a customer on a 28.8kb modem connection, the theoretical minimum download time is approximately half an hour. In reality, due to network traffic and phone line quality, the download time is likely to be an hour or more. This time is excessive, especially in the scenario where the customer requires several images to cover their area of interest. This issue has been resolved by employing appropriate data compression schemes. We evaluated three different compression schemes: LZW, Packbits and JPEG and concluded that JPEG is the most suitable compression scheme for this purpose.

The publicly distributed JPEG library supports a quality factor parameter that provides control over the amount of compression. A series of trials determined the amount of JPEG compression that can be applied to the SPOT-LITE images without noticeable loss in quality. The results pointed towards JPEG quality factor 50 as the most suitable for delivering the SPOT-LITE images. The size of a compressed SPOT-LITE image depends largely on image content, with the sizes in our test suite of 52 SPOT-LITE images ranging from 0.26Mbytes to 1.1Mbytes, with an average of 0.87Mbytes. For an average compressed SPOT-LITE image, the theoretical minimum download time on a 28.8kb model is down from half and hour to four minutes and the likely download time down from an hour to less than 10 minutes.

ON-LINE CATALOGUE FOR ORDERING

The SPOT-LITE on-line catalogue provides graphical search facilities to allow customers to visually determine the current coverage of images in the catalogue. It allows customers to graphically zoom in and pan to locate map sheet tiles, generate quick preview images and choose map projection for the output files. It processes customer orders and dynamically compresses SPOT-LITE images before delivering them in the specified format over the Internet.

SPOT-LITE images are stored and delivered in GeoTIFF format. GeoTIFF is an extension of TIFF (Tagged Image File Format) with additional cartographic tags. These additional tags include information about the image coverage in terms of latitude and longitude, projection, datum, etc. GeoTIFF is supported by most GIS packages and was one of the preferred formats as indicated in our customer survey.

The SPOT-LITE server supports two purchasing methods. The first one allows ACRES approved SPOT-LITE distributors to log onto the system and purchase tiles before downloading the images. The

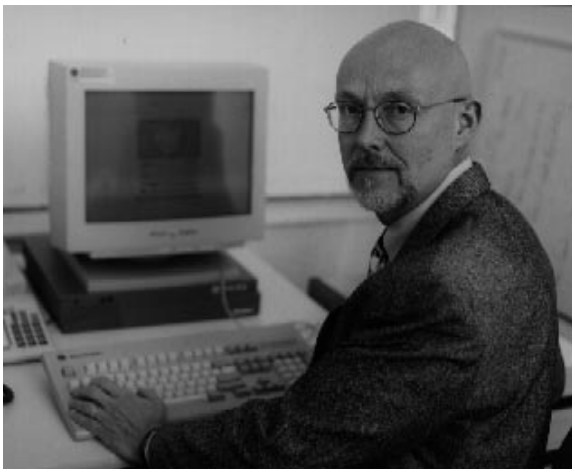
PRODUCT SPECIFICATIONS

Source Data: SPOT Panchromatic (black & white) satellite imagery
Area coverage: Each 50K SPOT-LITE tile covers an area of 15' x 15' (2500 x 2500 pixels)
Processing level: Mostly level 10 products (a few of them are level 9 products)
Locational accuracy: Average error of 20m, not worse than 60m.
Pixel size: 0.0001° in latitude and longitude (approximately 9m x 11m varying with latitude)
Projection: Plate Caaré (Lat/Long) or UTM
Geodetic Datums: GDA94 or AGD66
File Format: GeoTIFF with internal JPEG compression (quality factor 50)
Image enhancements: Contrast stretch and edge enhancements
Media: On-line delivery via Internet with invoicing through approved distributors

second method involves the use of pre-purchased credit tokens, which are special number keys that allow a customer to download selected images. Credit tokens can be purchased from any approved ACRES SPOT-LITE distributor. The software will allow customers to complete token purchasing and image downloading in one session. For each image downloaded, the SPOT-LITE server generates an invoice and sends a copy to the corresponding distributor.

Currently, the prototype version of the SPOT-LITE catalogue is being upgraded into an operational system. ACRES plans to demonstrate this product to the GIS industry at the forthcoming AURISA conference in Perth this November.

Progress on the DAF upgrade



by Erik Elmar

The running of a satellite ground station is a seven days-a-week operation, 365 days-a-year. Before the introduction of satellites equipped with active radars, Earth observation was limited to the sunlit part of the day, resulting in little or no operational activity from the early hours of the afternoon until the following morning. Satellite borne active radar systems have no such constraints. The implication on ground station operation is that data acquisition becomes an all-hours-of-a-day task.

In anticipation of this development, and encouraged by the success of the ground station at Hobart developed by CSIRO, ACRES embarked on a project called the "DAF Upgrade". This project is aiming at a fully automatic and unattended Data Acquisition Facility (DAF). Task scheduling is from "Satellite Operations", a small group of dedicated people located at Canberra or Alice Springs (but could be anywhere in the world since the technique is Internet based). The scheduling process merges user requests and background coverage requirements to form "Satellite Programming Requests" that are communicated electronically to the various satellite agencies (Space Imaging, SPOT Image, NASDA, RSI, etc.). This is done well in advance and during normal office hours.

The aim of the DAF Upgrade project is that data acquisition, recording, and cataloguing is automatic and unattended. The main components of the project are:

- Automatic Antenna Control
- Direct Recording of High Bit-Rate Data to Disk
- Immediate Browse and Metadata Generation
- Communications
- Archiving onto Digital Linear Tape
- Interactive Cloud Cover Assessment Tools.

All hardware for the project has been procured and tested. An Antenna Control computer was installed and commissioned in October, last year. This system currently depends on the regular, semi-automatic updating of ephemeris data and uses a remote Scheduler. Browse and Metadata modules for SPOT and Landsat TM are being developed and support for other sensors will follow. An Interactive Cloud Cover Assessment tool has been developed. Digital Linear Tapes will be handled through a commercial Robotics Tape Library. Software modules for this mechanism are under development.
Dual Direct Recording systems will be installed and commissioned at the DAF early next year. Then, the recording of data onto High Density Digital Tape will be abandoned in favour of the Digital Linear Tape, a medium that is both more reliable and much less expensive.

In summary, the benefits to the end user as a result of this upgrade are:

- An infinitesimal bit error rate (10E-17), introduced by the archive tape.
- An almost immediate availability of catalogue material from a satellite pass.
- All catalogue data from a pass, including Browse images – but excluding the cloud cover assessment values – will be on the Internet within an hour of the acquisition. The (manual) cloud cover estimates will be entered within the next couple of weekdays.
- Upgrades to include additional sensors will be relatively simple compared to the past infrastructure.
- Attended acquisitions no longer necessary.

The DAF Upgrade will position ACRES to more readily and inexpensively support current and future missions and sensors.

ACRES works to achieve Year 2000 compliance

All Australian government systems must have achieved Year 2000 compliance before 1 January 2000. This, of course, includes ACRES and other AUSLIG systems.

Wide publicity has been given to the problems inherent in any computer hardware and software where the date year fields are stored as only two digits. This means, for instance, that computer clocks will roll over to the year 00 on the 1st of January 2000. Some computers will interpret this year as 1900, others as 1980.

Software that uses date calculations but does not store the year as four digits will also create problems with applications such as databases, financial systems, production systems, sales and order entry systems and so on. Imagine dealing with invoices dated 1st January 1900! Some systems will also have a problem with the leap year in the new millennium and will not be able to deal with the date 29 February 2000.

The Federal Government approach to the Year 2000 problem is published on the OGIT World Wide Web site at http://www.ogit.gov.au. OGIT is the Office of Government Information Technology and has established a special Year 2000 team to co-ordinate the government's efforts to deal with this serious situation. To achieve compliance, an IT component must be able to interpret correctly the Year 2000 and handle the extra day in February arising from the leap year in the new millennium.

ACRES hardware and software is being inventoried to identify non-compliant items and define a strategy to deal with each case. Fortunately, most of our existing systems are compliant. Work will be needed in only a few cases. Any new hardware and software items are checked for compliance before purchase.

ACRES data products generated on our GICS (Landsat, SPOT) and SARPS (ERS, JERS, RADARSAT) systems use four digit years in date fields.

Jenny Weissel

Crop type and yield mapping in the Harden Shire, now and into the future

by Peter Holding, Harden-Murrumburrah Landcare Group, (02) 6386 2020

Members of Harden-Murrumburrah Landcare Group studying maps of remnant vegetation and crop variation.

Farmers in the Harden region now have access to advanced techniques to monitor their crop yields and soil conditions, thanks to a successful project recently completed by Environmental Research and Information Consortium Pty Ltd (ERIC).

Working with the Harden-Murrumburrah Landcare Group and the Harden Shire Council, the project aimed to make Harden an area for excellence in Australian agriculture.

The primary objective was to develop the application of optical satellite data to identify remnant vegetation as part of developing a catchment management plan. A second objective was to develop techniques in mapping, monitoring and quantifying crop types and yield.

The land cover mapping project used a combination of LANDSAT TM and SPOT panchromatic data. The satellite data were processed to highlight variation in land cover and land condition so that location and variation in vegetation communities and waterlogging were identified. These maps also provided valuable information on crop variation and health. Landholders verified that the differentiation of crop types and variation in yield was extremely accurate.

This successful outcome has now lead to a program to continuously map, monitor and quantify crop variation and predict the yield of wheat, canola and other crops in the Harden region. Satellite data will

be acquired three times a year at critical times for crop development and crop management. Farmers will work closely with ERIC to provide a delivery service of map products that will be integrated with paddock records, using farm GIS software.

In addition, detailed soil maps will be derived from airborne radiometric (gamma-ray) data that has been recently flown for the Cootamundra 1:250 000 sheet and used to assess the effects of soil properties on crop variation, and to select alternative sites for crops including viticulture and farm forestry.

Initial assessments by farmers of the usefulness of the radiometric data, using data from the Goulburn 1:250 000 map sheet on the eastern edge of the Harden Shire, show that there is a strong correlation between the radiometric patches and crop variation. ERIC is a leader in the development and application of this soil mapping technology in Australia.

The crop mapping and delivery approach developed by ERIC and local farmers has attracted considerable interest in the Harden region, and associated industries involved in agricultural delivery services.

SPOT Imaging Services have agreed to provide SPOT 4 data during the 1998 season for further research of this precision farming technology.

ImageMap – new dataset

GEOIMAGE Pty Ltd has recently released the Australian MSS Mosaic as a natural colour 50 metre resolution dataset.

The new product is called ImageMap and is suitable as a colour backdrop for Geographic Information Systems.

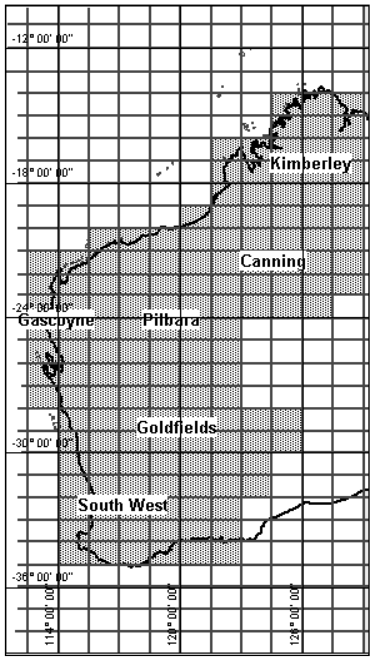
The mosaic is presented as standard 1:250 000 map sheets in JPEG format and is available on seven CD-ROMs covering all of Australia. Each 1:250 000 map sheet has a 10 kilometre surround and is contrast stretched over the corresponding standard 1:1000 000 map sheet.

Both AGD66 and GDA94 projections are available on each CD-ROM and each sheet has georeferenced headers for MapInfo and ArcView. For further information contact your nearest GEOIMAGE office or see the enclosed leaflet.

The Darwin office has recently moved to larger premises. Update your records using the contact details on the back page. New email addresses for Darwin and Perth offices are:

darwin@geoimage.com.au
perth@geoimage.com.au

WA 1:250 000 Landsat TM Digital Mosaic Series



From the Satellite Remote Sensing Services Branch, Department of Land Administration, WA

The Satellite Remote Sensing Services (SRSS) branch of Western Australia's Department of Land Administration (DOLA) has expanded its seamless satellite image mosaic of WA to include the goldfields.

The images within the mosaics are radiometrically calibrated to minimize across scene variations caused by the atmosphere, seasonal conditions and sensor effects to provide the user with a seamless, continuous digital dataset.

The imagery is available as 1:250 000 digital map sheet tiles, but customized areas are easily extracted from the mosaic. The data is supplied in a variety of formats including IL, ER Mapper, ArcView or TIF on CD ROM or 8 mm Exabyte tape.

COVERAGE: DEPARTMENT OF LAND ADMINISTRATION – WESTERN AUSTRALIA 1:250 000 LANDSAT TM DIGITAL MOSAIC SERIES

Vegetation on South Australian 1:50 000 topographic maps from Landsat and SPOT

David Hart of the South Australian Department of Environment, Heritage and Aboriginal Affairs (DEHAA) explores the complexities of plotting vegetation cover, including the move to remote sensing instead of traditional photogrammetric methods.

The photogrammetric capture of map data has been carried out by what is now the South Australian Department for Environment, Heritage and Aboriginal Affairs since the 1960s.

The 1:50 000 topographic map series required the photogrammetrist to capture drainage, fence lines, relief, cultural and vegetation stereoscopically. The decision to include vegetation was made late in the production of the first edition series (late 1970s) which resulted in only one quarter of the first edition being given vegetation before the first edition was completed in the early 1980's.

Map revision has continued to this day with most map sheets now having a second edition and a few having a third. The revision components are cultural and drainage with all revised maps having vegetation, whether captured on the first edition or not. Of these three components, vegetation was usually the one which occupied most of the photogrammetrist's time. For remote areas, it would take much more time than the other two combined. The most difficult sheets were those covering national and conservation parks which are complex mixtures of mallee, large trees and low shrubland. Remote sensing of vegetation was introduced to eliminate this very labour intensive activity.

According to the 1:50 000 mapping specifications, in order for a clump of trees or scrub to be classed as vegetation, it has to have a height greater than two metres after which it can be plotted as one of three classes: 'Scattered', 'Medium' or 'Dense'. Scattered was defined as a range of 3–15% canopy cover, medium as 15–60% canopy cover, and dense as over 60% canopy cover. The size of agglomerations to plot varied between 50 metres for dense up to 150 metres for scattered. Native vegetation in roadside strips and along watercourses were originally plotted as single lines with a constant density of medium.

The successful photogrammetric implementation of these specifications depended on the judgement of the stereoplotter operators and supervisors. It was often difficult to standardise between operators, and even the same operator over time or in different structural formations or biogeographic regions.

Photogrammetry/remote sensing technician Lyn Donnellan inspecting a recently printed 1:50 000 map showing satellite derived vegetation with cartographer Theo Sanders.

The specifications outlined above were kept in the transfer from photogrammetric capture of vegetation to remote sensing classification of vegetation. Early attempts to change the specifications were made. A single vegetation classification using Landsat TM without density differentiation was printed experimentally in 1991, but was not proceeded with.

An added requirement in the specifications specifically related to remote sensing was that the vegetation polygons should lose the pixel or stepped shape without losing positional accuracy at the edge. Internal variation in density in large clumps of vegetation had to be simplified, but not eliminated. In other words the processing of the imagery should simulate the output product of a photogrammetrist. Additional feature grouping, smoothing and generalisation was needed in the post processing to create a product suitable for the cartographer.

For georectification, ground control was derived from the controlled photography used to produce the previous edition 1:50 000 maps. The stereomodels are set up in analytical stereoplotters and point features common to the model and the imagery are chosen. These are digitised in the coordinate system that was used for the original mapping: either AGD66 or AGD84. Control points are usually the intersections of prominent sealed and unsealed roads.

Care must be taken to ensure that the positions of the chosen features have not changed in the many years between the photographic and satellite coverages. This control is thus accurate to 1:50 000 mapping standards. The Landsat TM scene is then georectified and resampled to 25 metre pixel size and then classified. The classification is later converted to GDA94 as the 1:50 000 mapping program has already shifted to this datum.

Specialised vegetation landcover (mangroves, irrigated pasture, pine plantations, orchards, vineyards and eucalypt timber plantations) continues to be plotted manually on the stereoplotter as its occurrence is so small that image analysis for automatic location will not be done any faster. Their locations and characteristics are usually very well known.

Bushfires dramatically affect the amount of vegetation which results either from this method or traditional plotting. The final map shows a 'snapshot' of the vegetation at the time the imagery (aerial or satellite) was acquired.

The classification is filtered to reduce the file size and to reduce unnecessary complexity.

With the raster data filtered, it must now be converted to vector format for use by the Cartographic Section. The lines delineating the boundaries between classes have a pixel or 'staircase' appearance and on 1:50 000 maps appears too 'blocky'. The Landsat TM 25 metre pixels are 0.5 millimetres on the map and even with the vegetation stipple symbol used, the right angled bends in the vegetation polygons were clearly obvious.

Two methods were developed to overcome the problem and give the mapping a closer resemblance to the previous photogrammetric plotting:

- Curve fitting (quarter circle fitting to the corners);
- Region growing: expanding the vegetation by half a pixel.

These methods have created a very good result but it should be stressed that they do not improve the 'accuracy' of vegetation mapping. They simply improve the aesthetics of the paper map product, and provide a more gentle transition between vegetation and clear ground.

The method has also been used successfully with orthorectified SPOT2 XS digital imagery. This was

Image processing specialist David Gibson refining the filtering and cartographic enhancement program.

Photogrammetric method of vegetation capture, now replaced by Landsat and SPOT image classification. Photogrammetrist Carmen Boehnke now concentrates on topographic and cultural data capture.

in an area covering the southern metropolitan Adelaide suburbs and intensive agriculture in the Mt Lofty Ranges – areas considered too detailed for Landsat TM.

The same methodology was used apart from the orthorectification rather than georectification to 1:50 000 mapping accuracy standards to take relief displacement into account. Scanned 1:20 000 aerial photography (DEHAA's PanAIRama98 CD-ROM product) was used for vegetation identification and attribution. This sped up attribution considerably.

This method produces a vegetation layer on the 1:50 000 map that is visually similar to a photogrammetrically produced product. The main difference that remains is that the vegetation is still much more detailed than the previous product. However, this is quite acceptable to the cartographer.

For more information contact David Hart at DEHAA. Email: dhart@dehaa.sa.gov.au.

New SPOT prices

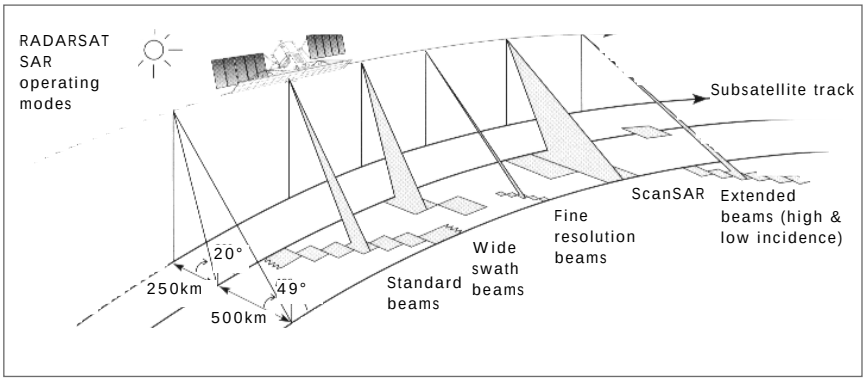
SPOT Imaging Services, with the support of ACRES, has increased the prices of all its SPOT digital products by 10%. This took effect from 1 May 1998. The prices of SPOT photographic products have not been raised and remain at the current price.

This is the first price increase for SPOT products since January 1996. Despite this increase, SPOT data over Australia is still by far the least expensive of any ground station in the world, and well below the prices charged for overseas data.

Please contact ACRES, SPOT Imaging Services, or your SPOT distributor should you require the new SPOT price list.

ACRES RADARSAT products

In November last year, ACRES signed an agreement with RADARSAT International (RSI) which allowed ACRES to acquire SAR data directly from the RADARSAT satellite and to produce products from this data.



ACRES RADARSAT products are planned to be available from August.

Officers from RSI and the Canadian Space Agency visited ACRES in Canberra and the Data Acquisition Facility in Alice Springs for the On Site Evaluation phase of the RADARSAT Certification process in April.

The second phase of the certification process deals with a stringent test of RADARSAT products produced by ACRES. Once this second phase is complete, ACRES will be able to fill any order for RADARSAT imagery acquired in Alice Springs.

The SAR sensor is an active microwave sensor capable of imaging the Earth regardless of time of day, cloud, haze or smoke over an area. The SAR sensor on RADARSAT has the unique capability to acquire data in any one of a possible 25 imaging modes. Each mode varies with respect to swath width, resolution, incidence angle and number of looks.

Because different applications require different imaging modes, RADARSAT gives users tremendous flexibility in choosing the type of SAR data most suitable for their application. The diagram above shows most of the image

TABLE 1: RADARSAT IMAGING MODES

Beam Mode	Nominal Resolution (m)	Nominal Number of Looks	Nominal Swath Width (km)	Incidence Angle (Depends on sub-mode) (degrees)
Fine	10	1x1	50	37–48
Standard	30	1x4	100	20–49
Wide	30	1x4	150	20–45
ScanSAR Narrow	50	2x2	300	20–46
ScanSAR Wide	100	2x4	500	20–49
Extended High	25	1x4	75	49–59
Extended Low	35	1x4	170	10–23

TABLE 2: RADARSAT PROCESSING LEVELS

Path Image	Path Image processing aligns the image parallel to the satellite's orbital path. Latitude and longitude positional information has been added to represent the first, mid and last pixel positions of each line of data. The data is also calibrated.
Single Look Complex	At the Single Look Complex processing level, data is stored in slant range, has been corrected for satellite reception errors, includes latitude/longitude positional information, and is calibrated. In addition, Single Look Complex data retains the optimum resolution available for each beam mode and the phase and amplitude information of the original SAR data.
Signal Data	Signal Data cannot be viewed as an image. It is an unprocessed matrix of time delays that has been repackaged to fit into standard CEOS format. Customers will require SAR processing capabilities to use Signal Data.

modes available. Table 1 summarises the imaging modes and their parameters.

ACRES RADARSAT products will initially include the beam modes, Fine, Standard, Wide, ScanSAR Narrow and ScanSAR Wide. Each of these beam modes will be initially available with Path Image, Single Look Complex or Signal Data processing options. For a brief description of these processing levels, please refer to Table 2. Data will be available on CD and Exabyte.

RADARSAT SAR CHARACTERISTICS

Frequency	5.3 GHz
RF Band Width	11.6, 17.3 or 30.0 MHz
Band Name	C Band
Wavelength	56 mm
Incidence Angle	10–59 degrees
Ground Resolution	10–100 m
Swath Width	50–500 km
Polarisation	HH

ACRES has appointed the following RADARSAT distributors:

- AGRECON
- Environmental Research and Information Consortium (ERIC)
- GEOIMAGE, Brisbane, Darwin, Perth
- Geo Mapping Technologies
- Landcare Research
- Remote Sensing Services, Department of Land Administration, WA

See the back page for distributor contact details.

Landsat band 5 saturation

ACRES has been having trouble with saturation of band 5 from Landsat 5 over drought affected areas. Tests have been conducted with new detector combinations to ease the problem. This has not been as easy as some would expect because of two problems:

- the drought, leaving areas of high reflectance and saturating band 5; and
- mirror bump wear, which is gradually getting worse and aggravating the problem of finding suitable reference detectors.

Prior to 1995, all the calibration pulses could still be found in the downlinked data, and so calibration was handled by updating the GICS Cal Pulse Location files.

Since 1995, bumper wear in the forward scan direction of Landsat TM has meant that the calibration pulses are not contained in the downlinked data for sensor detector number one. This detector therefore cannot be selected for calculating the relative radiometric calibration gains and offsets.

It was never imagined during the design stage that Landsat 5 would still be operational 14 years after launch and mirror swing would become such a problem.

Despite these problems, ACRES has now settled on a set of reference detectors for the relative radiometric calibration. This new set does not include sensor detector one and results in the histogram of the data for each band not displaying excessive clipping or saturation.

The detector set is:

Band	1	2	3	4	5	6	7
Detector	15	12	7	7	7	2	15

Eclipse effect on RADARSAT

RADARSAT International has advised ACRES that the forthcoming Eclipse Season will restrict acquisition of data in any region south of 39 degrees south. For our part of the world, the 39th parallel runs through Bass Straight so it will mean that there will be no acquisition of data over Tasmania during this period.

The Eclipse Season commenced on 15 May, increasing to maximum effect on 21 June, then reducing in effect to end on 30 July. During this time, the solar array of the satellite moves in and out of the Earth's shadow and the power budget of the satellite needs to be carefully managed. When in shadow there is insufficient power to acquire SAR data.

Both RADARSAT's and ACRES planning tools will be upgraded so that no acquisitions will be able to be planned in the affected areas during this time.

If you require further information please do not hesitate to contact ACRES Customer Services.

1998 International remote sensing ground station meetings *by Paul Trezise*

Each year, the various remote sensing satellite operators hold meetings of their ground station networks. At these meetings we are informed of the health of current operational satellites, hear of the latest plans for future missions and are updated on technical and operational issues.

ACRES always sends senior technical or managerial staff to these meetings. We find them very useful not only for the information provided by the satellite operators but also from the networking opportunities provided with the other 20 or so international remote sensing ground stations.

In 1998 the meetings were all held during the month of May: The Landsat LGSOWG meeting in the USA, the RADARSAT meeting in Canada, and the SPOT GOSS and ESA ESOWG meetings held later in the month in France. It provided an excellent opportunity for me to get a first hand update on international developments in remote sensing, as well as to renew acquaintances and swap ideas with colleagues from the other international ground stations.

LGSOWG participants Prof Lim Hock (Singapore) on the right and Mr Vincenzo Beruti (European Space Agency) admire the large globe in the atrium at EROS Data Centre.

The USGS's EROS Data Centre at Sioux Falls, South Dakota – venue for the 27th annual LGSOWG meeting.

27th Landsat Ground Station Operations Working Group (LGSOWG) Meeting

The Landsat 7 processing system ready for action, deep in the EROS Data Centre.

The 27th meeting of the Landsat Ground Station Operations Working Group (LGSOWG) was held at the EROS Data Centre in Sioux Falls, South Dakota USA. Representatives from 12 international ground receiving stations were welcomed by senior officials from the Landsat Program Management team (NASA, NOAA and USGS) and by Space Imaging.

Space Imaging reported that the 14 year old Landsat 5 satellite was still in remarkably good shape. The orbit of the satellite is projected to be satisfactory until at least mid 2001 and no life threatening problems are immediately obvious. Reported global sales of Landsat data for 1997 remained stable overall compared to the previous year, although there were significant fluctuations between regions.

Much of the meeting was devoted to preparations for the launch of Landsat 7. Due to problems experienced during the testing of the power supply for the ETM+ instrument, the launch has been delayed until at least February 1999 from the original July 1997 schedule. The problems with the power supply have now been resolved.

The Landsat 7 processing system has been installed at the EROS Data Centre in readiness for the launch of the satellite. The system has the capability of generating up to 100 Level 1 products per day.

2nd RADARSAT International Network Stations' Meeting

The 2nd RADARSAT International Network Stations' meeting was held in Vancouver, Canada. RADARSAT International (RSI) and the Canadian Space Agency (CSA) welcomed representatives from the four certified network stations (Norway, UK, Singapore and China) as well as

countries such as Australia that are in the process of certification or seriously considering RADARSAT direct reception.

Dr Rolf Mamen of CSA highlighted the success of the mission so far. A number of significant improvements have been made including an increase in the capacity of the on-board recording system and an increase in SAR transmitting time per orbit to 32 minutes. Further improvements are planned including a reduction in the lead time for emergency acquisition requests. He said that the mission had now developed a high degree of "operational robustness".

Staff from RSI gave a number of impressive demonstrations of the ability to deliver near-real time RADARSAT data to customers. Acquisitions that had been directly received at Tromso, Singapore and West Freugh only a few hours earlier were processed and delivered to the meeting venue via electronic means including the DirecPC system.

RSI outlined the proposed plans for RADARSAT-2, which is scheduled for launch in November 2001. It was announced earlier this year that Macdonald Dettwiler and Associates had been awarded the contract to design and build RADARSAT-2 on behalf of the Canadian Space Agency. RADARSAT-2 will carry a new generation SAR instrument with a design life of seven years. It will be particularly targeted at surveillance and mapping applications. The SAR will be able to look left and right of the satellite which will greatly improve the revisit capacity. All RADARSAT-1 modes will be supported, but there will also be new modes such as dual and quad polarisation on selected beams and a 3 metre resolution mode.

12th SPOT GOSS Meeting

The 12th annual meeting of the SPOT international ground station network (GOSS) was held at SPOT Image headquarters in Toulouse, France. Jean-Luc Diebald, SPOT Image's Marketing Director, opened a meeting with an overview of business trends and objectives. He noted that with the successful launch of SPOT 4 almost any place on the earth could now be viewed by one of the three SPOT satellites every day.

SPOT 4 was declared operational on the first day of the meeting after a successful checkout phase. The only set back experienced so far is a problem with several dead detectors on the new SWIR band. SPOT Image and CNES are developing a processing solution to overcome this problem but this means that the availability of the SPOT 4 Xi product (4 band) will be delayed until at least September.

It was reported that SPOT 1 and 2 are still operating well. SPOT Image plans to have all three SPOT satellites operating in tandem for at least the next 12 months.

The final SPOT satellite, SPOT 5, is currently scheduled for launch in November 2001. CNES demonstrated the theory behind the SPOT 5 "supermode" which will allow the equivalent of 3 metre resolution imagery to be processed from the data coming from two detector arrays with 5 metre ground resolution.

Jacques Mouysset announced the proposal for the SPOT follow-on program "3-S". This involves two small satellites with 1 and 3 metre resolution PAN and 3–10 metre multi-spectral capability. SPOT Image will be seeking French government permission within the next six months for the first mission, scheduled for 2003.

SPOT Image headquarters at Toulouse, venue for the 12th annual meeting of the SPOT groundstation operators (GOSS).

ESA ESOWG Meeting

The annual ESA ground station meeting, ESOWG, immediately followed the SPOT GOSS meeting at Toulouse. It was attended by virtually all stations in the large ESA network, including new receiving stations in Germany and Russia.

The meeting focused on the status of the SAR missions on the two ERS satellites and the growing applications for ERS SAR data worldwide. ESA has granted a funding extension for ERS-2 operations until the end of 1999. ESRIN is also hopeful that funding will be found eventually to extend the mission as far as 2003. All systems on ERS-2 are working nominally – there have been no significant anomalies since February 1997. ERS-1 is currently in a holding mode and can be reactivated quickly if necessary. However, there was a major failure in the solar array in December 1997 with the result that only 40% of the power capacity is now available. This restricts the SAR transmitting time to 5–6 minutes per orbit and hence restricts the opportunities for interferometric campaigns in tandem with ERS-2.

There were a number of interesting presentations on emerging commercial applications for ERS. These applications often use SAR in conjunction with optical data either in terms of redundancy (when optical data can't be acquired due to cloud data) or synergy, where ERS SAR adds significantly to the interpretation of an optical image. Applications presented included the generation of ground control networks (especially good on offshore islands) and tropical forestry (using the coherence characteristics). Interferometry has been proven as a useful methodology for the generation of DEMs, although lack of coherence and atmospheric artifacts have limited its universal application. ESA has recently implemented interferometric browse imagery on its web site so potential users can immediately determine whether the fringes generated by a particular image pair are suitable or not.

ACRES to host 1999 SPOT GOSS and ESA ESOWG meetings

ACRES has agreed with SPOT Image and ESA to host the 1999 GOSS and ESOWG meetings. It will be the first time ever that these meetings have been held in Australia. The meetings are scheduled for October and will be held in Canberra.

We can expect to see senior representatives from virtually the entire global network of remote sensing ground receiving operations as well as the senior executives of SPOT Image and ESA. We look forward to showing them some traditional Australian hospitality. It will also be an excellent opportunity for Australia to showcase its expertise in remote sensing applications to the international community.

SPOT 4 in Orbit: With the successful launch of SPOT 4 from French Guiana in March, almost any place on the earth can now be viewed by one of the three SPOT satellites every day. Launched on Ariane Space Flight 107 using an Ariane 40 launch vehicle, SPOT 4's solar array was first deployed, then oriented to face the sun, then the satellite's attitude was adjusted relative to the earth. CNES operations control centre in Toulouse took control of the spacecraft as soon as it separated from the Ariane launcher. The centre uses a worldwide network of French and international tracking, telemetry and command stations to monitor and control the satellite. Further news is available at: http://spot4.cnes.fr/spot4_gb/index.htm

SPILLCON – 7th International Oil Spill Conference

Featuring a display of RADARSAT Synthetic Aperture Radar (SAR) imagery for ship detection and oil spill monitoring, AUSLIG will be exhibiting at SPILLCON'98, Australasia's premier marine and environmental pollution prevention and response conference being held in Cairns from 18–20 August 1998.

Attracting a range of delegates from a breadth of industries involved in the marine environment and spill response, the conference will present a comprehensive program of papers and workshops.

RADARSAT Workshop on Applications in Mineral and Petroleum Exploration, 31 July 1998

Featuring Canadian and Australian experts, AUSLIG is hosting workshops on how RADARSAT satellite data can enhance mineral and petroleum exploration activities. They will be held on 31 July at the Leuwin Centre, Floreat WA. Speakers include:

Dr Geoffrey O'Brien, Senior Principle Research Scientist, Australian Geological Survey Organisation

Dr Vern Singhroy, Senior Research Scientist, Canadian Centre for Remote Sensing

Dr Ian Tapley, Research Scientist with the Co-operative Research Centre for Landscape Evolution and Mineral Exploration, CSIRO

Two distinct sessions will be held:

MORNING SESSION 0900–1230

MINERAL EXPLORATION

- RADARSAT provides unique and complementary information on lithology, contacts, structure, lineaments, landforms, drainage, property access, and water bodies.
- RADARSAT allows for acquisition of stereo pairs, which can be used to create DEMs
- Digital RADARSAT data can be integrated with geophysical data for surface-subsurface analysis, and/or loaded into GIS.

AFTERNOON SESSION 1330–1700

PETROLEUM EXPLORATION

- RADARSAT can be used to consistently detect natural offshore oil seeps that could indicate potential drilling sites.
- RADARSAT can acquire data reliably and quickly over remote offshore sites regardless of local weather or illumination conditions.
- Digital RADARSAT data can be integrated with bathymetric data and existing basin maps for analysis and/or loaded into GIS.

- RADARSAT can form the basis of an **integrated exploration approach/solution.**
- RADARSAT can serve as an excellent **stand alone data source** for on-shore and off-shore exploration and environmental management.
- The information content of RADARSAT data is **complementary** with that derived from other data sources.

Each session costs $65 or $100 for both workshops and includes course material, sample data and the RADARSAT Geology Handbook.

For more information please contact Madeleine Clark on 02 6201 4130.

Level 10 available for PNG and Indonesia

ACRES now has the ability to produce level 10 (orthocorrected) products over its acquisition area of Indonesia and Papua New Guinea. This was made possible by the installation of the USGS GTOPO30 DEM into ACRES GICS processing system.

The GTOPO30 is a global digital elevation model with a horizontal spacing of 30 arc seconds, which is approximately 1 kilometre. Vertical accuracy is assumed to be that of the Digital Chart of the World, specified as ±650 metres linear error at the 90% confidence level. More information can be obtained from the Internet site:

http://wwwl.gsi-mc.go.jp/gtopo30/gtopo30.html

ACRES holds a complete set of Papua New Guinea 1:100 000 topographic maps and can produce level 10 products without any extra mapping material. However, as ACRES has no maps of Indonesia, clients are requested to supply topographic mapping for their level 9 and 10 products.

Laurie Oliver retires from ACRES

A fond farewell to Laurie Oliver was held in April following his retirement. Laurie is now travelling the world with his wife Jennifer.

As some of you may be aware, Laurie Oliver retired from ACRES on 30 April.

Laurie graduated with a degree in surveying from the University of NSW in 1965. He commenced full-time employment with the Department of the Interior soon after graduation. This was the beginning of more than 30 years distinguished employment with AUSLIG and its forebear organisations, the Australian Survey Office and the Dept of Interior Survey Branch.

During the first 10 years, Laurie was engaged on a wide range of field and engineering surveys across Australia and in Papua New Guinea. The surveys included microwave communications links in remote areas of Australia and the Ramu Hydro-Electric project in PNG.

The next 10 years saw Laurie engaged in a wide range of photogrammetric activities including close range photogrammetric surveys of Aboriginal rock art and heritage listed buildings.

From 1987, Laurie was a member of the Applications section of ACRES. A major initial project was the management of the production of 1:250 000 scale image maps of the Great Barrier Reef Marine Park. The major data source for this project was Landsat MSS data. This data was processed with the original BRIAN software, the forerunner to the microBRIAN image analysis system, developed by the CSIRO Division of Water and Land Resources.

Later work included the provision of advice to data users about the more complex parts of ACRES digital data formats and improving the geometric accuracy of our geocoded products. Another major project undertaken by Laurie and the Applications staff was the production of image maps of Antarctica for the Australian Antarctic Division.

This project made extensive use of Landsat MSS & TM and SPOT data. The identification of suitable ground control points and the histogram matching of the imagery were significant challenges in the production of these maps. The maps have been an invaluable resource to successive Antarctic Research expeditions at each of Australia's three bases in the Antarctic.

Laurie's social activities at work included assistance with the organisation of the Ginninderra Handicap, a fun run, and more lately, lunchtime swimming. His work in these, and many other areas of ACRES, are greatly valued and we wish him well in his life after ACRES.

Craig Smith

ACRES Update

ACRES Update is now on the web at ftp://ftp.auslig.gov.au/pub/acres/publications/update.pdf.
Contributions to the next edition are welcome.
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Thanks to all those who contributed to this edition.

STOP PRESS

ILWIS 2.2 for Windows – now shipping!

ITC will release its new user-friendly PC-based GIS and Image Processing package in September. For details contact ITC – ILWIS,
Tel +31 (0)53 4874337, Fax +31 (0)53 4874484,
Email ILWIS@ITC.NL, http://www.itc.nl/ilwis

Introducing several new faces at ACRES…

Andrew Longhorn
Software Engineer

Andrew Longhorn started his career with AUSLIG on April Fools day last year. But his work as a Programmer for the Data Acquisition Facility (DAF) Upgrade Project is no joke.

DAF is AUSLIG's satellite tracking station in Alice Springs. Currently, the Alice Springs facility is manually operated. The DAF Upgrade project is concerned with automating the entire satellite tracking component of the data acquisition process.

Automating the task will allow for greater scheduling of night passes (so operators don't have to be present at odd hours of the night) and release operators from most of the tedious manual interventions required currently.

The project will also convert existing archiving to Digital Linear Tape (a newer high capacity, reliable computer information storage medium), so AUSLIG does not have to rely on superseded tape technologies.

Andrew, or 'Roo' as he is otherwise known, finds AUSLIG's friendly environment the most enjoyable aspect of his work.

Andrew says he is an energetic person. Currently studying for an MBA, it's a wonder he has time for his other pursuits which include learning Korean, snowboarding, martial arts, bonsai and music.

Craig Ayliffe
Software Engineer

Craig Ayliffe completed a degree in Computer and Information Science at the University of South Australia in 1995. Since graduating, Craig has had a range of experience in both the public and private sectors. He worked at the Australian Bureau of Statistics and the Department of Defence before starting at ACRES in December 1997.

Along with Andrew Longhorn, Craig is involved in the Data Acquisition Facility upgrade. He assists in the design and implementation of AUSLIG's software systems. His work will ultimately lead to improved efficiency in the cataloguing of satellite data onto the ACRES online catalogue server.

Craig likes the challenge of working in a totally different application area to his previous experience.

Of himself, Craig says his most distinctive characteristic is that he will try almost anything once, and he has a carefree attitude. His interests include a variety of sports such as skiing, tennis, squash and soccer. He enjoys watching alternative films and listening to good music which, he says, excludes the Spice Girls.

Shanti Reddy
Applications Specialist

When you are used to the tropical heat of India, the Canberra winter chill can be severe. "Too cold" is the verdict from Shanti Reddy, who started working at ACRES in March as an Applications Specialist.

Despite the cold, Shanti has decided to make this his new home, along with his wife, Sunitha, five year old son Sankalp and newly arrived son, Sanjog.

Before joining ACRES, Shanti was working for the National Remote Sensing Agency in India. Along with a change in climate, the new job has brought some cultural adjustments, such as a change of name. "My full name is Shanti Swaroop Reddy Chintalaphani, which nobody can remember, so I shortened it," he said.

Shanti's job is to support the mapping program and develop new remote sensing products for applications.

"Currently I am working on SPOT-LITE, which is a new product to be made available to customers through the Internet," he said. "This is a significant project to our readers in the sense that for the first time we are going to offer on-line product sales. That means they can procure data quickly and at lower cost."

Shanti will also shortly be involved in the RADARSAT program. "My very first assignment at ACRES was the ARIES ADP which was a terrific and rewarding experience. I had to go through 130 project proposals, of about 400 to 500 pages and come up with a list of suitable proposals."

Shanti says that so far the work has been very satisfying and the excellent working environment and the focus on customer satisfaction are the two aspects of ACRES that he most likes.

A moving story

Left: Photographer Anton Albina gives John Woolner a helping hand as ACRES moves to new premises in the Scrivener building.

Top: In the new photographic lab, Laurie McLachlan is undertaking a delicate procedure – moving one of the two FIREs (Film Image Recorders), which write the satellite data coming from the computer room onto negative film. They required careful recalibration after the move.

ACRES has moved to the Scrivener building, home of the Australian Surveying and Land Information Group (AUSLIG), its parent organisation.

The Computer Operations, Photographic Lab, Engineering Group, Customer Services and other Support Staff are now located on Level 2 of Scrivener Building. Really just a stone's throw across Dunlop Court in Fern Hill Park from the previous location, but a move which still involved many hours of effort for those ACRES personnel responsible for achieving the move while maintaining a level of service as near as possible to ACRES usual standard.

An innovative approach to avoiding a large gap in ACRES satellite imagery production was to hire a system known as the PGS (Product Generation System) from Macdonald Dettwiler of Canada while the present production system is being moved. This system has coped easily with the product load and given ACRES an insight into the latest generation of high level satellite imagery processing systems.

Major reconstruction of the Scrivener Building was needed to accommodate ACRES specialist computer and photographic facilities. A new sophisticated Uninterruptable Power Supply was installed to mitigate production losses due to power supply interruptions and several high capacity, state of the art, air conditioning units were installed to ensure environmental conditions are maintained.

Any inconvenience to our customers during the move is regretted. However, ACRES will soon return to full operation, with the high level of service and quality of products that our customers have come to expect.

Mike Pasfield

New delivery address and phone numbers for ACRES

Please note that effective immediately, ACRES new delivery address is:

Scrivener Building
Dunlop Court
Fern Hill Park
Bruce ACT 2617

Our postal address remains the same as:
PO Box 28
Belconnen
ACT 2616

Last year, as a result of the introduction of 8 digit telephone numbers in Canberra, the area code for all ACRES phone numbers was changed from (06) to (02) and a 6 was added before the remaining 7 digits. For example,

(06) 251 6326 became
(02) 6251 6326

While both the old and new numbers will continue to work for a few more months, we suggest you update your records as soon as possible.

Calendar

20–24 July 1998 — Sydney, Australia

9th Australasian Remote Sensing and Photogrammetry Conference

Contact: Australian Convention and Travel Services Pty Ltd, GPO Box 2200, Canberra, ACT, 2601, Australia
Tel: 61 2 6257 3299
Fax: 61 2 6257 3256
Email: arsc98@acts.ccmail.compuserve.com
Web: www.geog.unsw.edu.au/arspc98

27–29 July 1998 — Sydney, Australia

5th Australian Space Development Conference

Contact: Secretariat, GPO Box 7048, Sydney, NSW, 2001
Tel: 61 2 9975 4857
Fax: 61 2 9975 7730
Email: ernex@s054.aone.net.au

9–12 August 1998 — Boston, USA

4th International Symposium on Environmental Geotechnology & Global Sustainable Development

Contact: Centre for Environmental Engineering, Science & Technology
Tel: 1 978 934 3185
Fax: 6 978 934 4014

18–20 August 1998 — Cairns, Australia

Spillcon '98. Oil Spills: Causes and Cures

Contact: The Meeting Planners, 108 Church Street, Hawthorn, VIC, 3122, Australia
Tel: 61 3 9819 3700
Fax: 61 3 9819 5978
Email: spillcon@meetingplanners.com.au

September 1998 — Curitiba City, Brazil

III Seminar on Remote Sensing & GIS to Forestry

Contact: Parana Forest Research Foundation
Tel: 41 352 2443
Fax: 41 253 2332
Email: disperati@sul.com.br

28 September–2 October 1998 — Melbourne, Australia

49th IAF International Astronautical Conference

Contact: ICMS, 84 Queensbridge Street, Southbank, Vic 3006, Australia
Tel: 61 3 9682 0244
Fax: 61 3 9682 0288
Email: astro@icms.com.au

5–7 October 1998 — San Diego, California

Fifth International Conference on Remote Sensing for Marine and Coastal Environments

Contact: Nancy Wallman, ERIM, Box 134001, Ann Arbor, MI, 48113-4001, USA
Tel: 1 313 994 1200 ext. 3234
Fax: 1 313 994 5123
Email: wallman@erim.org

November 1998 — Manila, Philippines

20th Asian Remote Sensing Conference

Contact: Asian Association of Remote Sensing
Email: chiwa@shunji.iis.u~tokyo.ac.jp

23–27 November 1998 — Perth, Australia

AURISA Conference 98 – "Information Access"

Contact: Australian Convention and Travel Services, GPO Box 2200, CANBERRA, ACT, 2601
Tel: 02 6257 3299
Fax: 02 6257 3256

1–3 March 1999 — Vancouver, Canada

13th International Conference & Workshops on Applied Geologic Remote Sensing

Contact: ERIM
Tel: 1 734 994 1200
Fax: 1 734 994 5123
Email: wallman@erim-int.com
Internet: www.erim-int.com/conf/conf.html

15–21 May 1999 — Portland, USA

American Society for Photogrammerty & Remote Sensing Annual Conference

Contact: ASPRS
Tel: 1 301 493 0290
Fax: 1 301 493 0208

1–3 June 1999 — Warsaw, Poland

Remote Sensing and Forest Monitoring Conference

Contact: Tomasz Zawila-Niedzwiecki and Heronim Olenderek, SGGW, Warsaw Agricultural University, Faculty of Forestry, 26/30 Rakowiecka str., 02-528, Warsaw, Poland.
Fax: 48 22 491 375
Email: tzawila@giswitch.sggw.waw.pl

5–7 July 1999 — Darwin, Australia

4th North Australian Remote Sensing and Geographic Information Systems Conference

Contact: NARGIS 99, Science Faculty, Northern Territory University, Darwin, NT, 0909, Australia.
Tel: 61 8 8946 7218
Fax: 61 8 8946 7088
Email: nargis@ntu.edu.au

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Panorama Avenue
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Fax: (02) 6332 8296
Email: info@lic.gov.au
Web: www.lic.gov.au

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Suite 502
156 Pacific Highway
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Web: www.spotimage.com.au

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Web: www.geoimage.com.au

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Email: jo.plunkett@dnr.qld.gov.au
Web: www.dnr.qld.gov.au/slats

Geo Mapping Technologies
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