

**NATIONAL REPORT
OF
AUSTRALIAN PHOTOGRAMMETRIC
AND REMOTE SENSING SOCIETY
1988-1992
TO
INTERNATIONAL SOCIETY FOR PHOTOGRAMMETRY
AND REMOTE SENSING, WASHINGTON, AUGUST 1992**

INTRODUCTION

The Australian Photogrammetric and Remote Sensing Society (APRSS) is jointly sponsored by three bodies, the Institution of Surveyors (Aust), Australian Institute of Cartographers and Remote Sensing Association of Australasia. The Society also has two affiliated members comprising the state societies for photogrammetry and remote sensing in New South Wales and Victoria. The Society acts as an executive, playing a coordinating role between the sponsoring bodies and affiliated members on the one hand, and the International Society on the other.

This report presents a summary of the significant activities in photogrammetry and remote sensing in respect of conferences and developments in acquisition and applications of data in Australia over the last 4 years. Major advancements have been made particularly in the development of products for the acquisition of data for photogrammetry and remote sensing, analytical stereoplotters for mapping from photography, including analogue-to-analytical conversions, and software for image processing. These developments will be discussed under the relevant Commissions.

CONFERENCES

The Remote Sensing Association of Australasia has held successful conferences at intervals of 3 years, the most recent being held in Perth in October 1990. This conference will be referred to later in this report under Commission VII activities. The interval for the national remote sensing conferences will change in 1992 to 2 years with the next conference being scheduled for 2-6 November 1992 in Wellington, New Zealand. The First Australian Photogrammetric Conference (FAPS) was held in Sydney in November 1991 and proved to be very successful. Sessions during the conference were devoted to a workshop of ISPRS Commission V. This Conference attracted some 120 delegates, 11 manufacturers who displayed new product lines and over 60 abstracts were received. A total of 55 papers were presented at the Conference which lasted for 3 days. The main theme of the Conference was close-range photogrammetry and its theory and applications in Australia and New Zealand. Some papers on other topics were also presented. Highlights of the conference were Invited Lectures by prominent authorities such as Professor Armin Gruen from Switzerland and Dr Clive Fraser from USA. Proceedings of both these conferences are available through the Society address.

COMMISSION I

1. DEVELOPMENTS IN DATA ACQUISITION EQUIPMENT

(i) Laser Airborne Depth Sounder (LADS)

LADS is a laser airborne sounder which surveys the sea floor from an elevation of 500m at the rate of 50 square kilometres per hour, producing digital records for later processing for hydrographic charting. Ten thousand soundings are recorded per square kilometre in swaths of 250 km wide to a resolution of 0.22metres. LADS is

installed in purpose-modified Fokker F27-500 aircraft. It is a new development that will provide a cost effective means of acquiring hydrographic data for charting.

Experimental designs for LADS were originally produced by the Defence Science and Technology Organisation (DSTO) in South Australia. BHP Engineering and Vision Systems Limited have subsequently developed the system for trial by the Australian Navy. The technology has now reach the commercialisation stage.

BHP Engineering Pty Ltd
Vision Systems Building
Technology Park
The Levels
South Australia
Telephone: +61 8 343 0447
Facsimile: +61 8 349 7528

Vision Systems Limited
Second Avenue
Technology Park
The Levels
South Australia
Telephone: +61 8 349 5988
Facsimile: +61 8 349 5989

(ii) Airborne Laser Terrain Scanner (ALTS)

ALTS is currently under development by BHP through its research laboratories. It is a laser based scanner with a 1 sq. m pixel that scans the terrain in 500m swaths at right angles to the aircraft, recording elevations with a resolution of 0.3m. The system will record data for the production of digital terrain data at the rate of 100 square kilometres per hour in near real time.

(iii) AuSAR Synthetic Aperture Radar for Mapping and Surveillance

AuSAR is being developed by DSTO for the Australian Defence Forces as a low cost system for coastal all-weather surveillance, search and rescue, topographic mapping, remote sensing and environmental monitoring. The system is particularly targeting at mapping scales of 1:50,000 in areas where weather conditions prohibit the application of optical or electro-optical systems for data acquisition. Trials are currently underway.

Defence Science & Technology
Microwave Radar Division
PO Box 1500
Salisbury, South Australia
Telephone: 61 8 259 6931
Facsimile: +61 8 259 5200

(iv) Airborne Multi-Spectral Scanner (AMSS MkII)

GEOSCAN Pty Ltd has completed the development of 24 spectral channel scanner, which records electromagnetic radiation in the wavelength range from 0.45 to 12.0 micrometres, in 10 visible/near infrared, 8 shortwave infrared and 6 thermal bands. The IFOV is

3.0 milliradians and the field of view is 45 degrees from nadir.

The system has full radiometric calibration. Variations in aircraft roll, pitch and yaw are corrected by sample timing for roll, and inertially stabilised integral mount for pitch and yaw. The scanner can operate at speeds up to 300 knots depending on altitude above ground. Typical area coverage per day can be as high as 8000 square km.

GEOSCAN Pty Ltd
PO Box 1017
West Perth WA, Australia
Telephone: +61 9 482 4491
Facsimile: +61 9 321 2782

2. SATELLITE DATA RECORDING

The Australian Landsat Receiving Station in Alice Springs managed by the Australian Centre for Remote Sensing (ACRES) routinely receives data from Landsat 5, SPOT, and ERS-1 SAR systems and will be able to receive data from JERS-1 SAR and Radarsat when data becomes available. The data is distributed through the ACRES facilities in Canberra. An additional ground receiving station is scheduled for installation in Hobart, Tasmania, in late 1992. A British Aerospace Australia fast delivery processor will be installed in the near future by ACRES to provide a SAR processing facility for customers.

Australian Centre for Remote Sensing
PO Box 28
Belconnen ACT 2616, Australia
Telephone: +616 252 4411
Facsimile: +61 6 251 6326

A new low cost NOAA Satellite Receiving System has been developed by Pikeville Pty Ltd in collaboration with the Centre for Remote Sensing, University of New South Wales and the New South Wales State Government. The system has an especially designed azimuth and altitude tracking mechanism, supported by sophisticated software that allows automatic and continuous 360° tracking of the satellite, and links directly to an IBM or IBM compatible personal computer. Data can be immediately viewed in image format or transferred via Exabyte tape to any other image analysis system. The cost of the system is approximately \$US 50,000.

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The Department of Lands in Queensland participated in the OEEPE SPOT triangulation study of 4 SPOT scenes. The adjustment model developed made use of recorded auxiliary data of satellite position and attitude. The results demonstrated that triangulation is an effective means of minimising the number of ground control points required for the adjustment with a minimum impact on geometric accuracy.

3. GPS AIRCRAFT POSITIONING

A number of organisations in Australia have been experimenting with the installation of GPS receivers in the

aircraft during photography to determine its position. These organisations include the Royal Australian Army Survey Corps, Australian Aerial Mapping together with the Queensland Department of Lands and AUSLIG. Preliminary results by the Army indicate that the aircraft positions can be determined with accuracies of less than 1m.

COMMISSION II

1. DEVELOPMENTS IN STEREOPLOTTER EQUIPMENT

There are three companies producing Photogrammetric Systems in Australia.

- (i) Qasco Analytical Systems
PO Box 233 Baulkham Hills. N.S.W 2153
Telephone: +61 2 639 8822
Facsimile: +61 2 686 2620

Qasco Analytical Systems is committed to the development of simple, cost effective digital mapping Systems. Products include digital encoder interface systems and software as well as the rapidly expanding range of PC based kits for converting analogue plotters to full analytical systems.

The Qasco range of conversion kits was introduced at Kyoto in 1988 and now includes kits for Wild B8, Wild B8S, Santoni IIC, Zeiss Topocart, Kern PG2, and Wild A10 instruments.

The most recent development is a kit to enable existing analytical plotters such as Wild BC1, BC2 and the Zeiss Planicom series to be upgraded to PC based operation.

- (ii) ADAM Technology
Unit 3/375 Enterprise Unit Complex.
Technology Park, Bentley, W.A 6102
Telephone: +61 9 470 2322
Facsimile: +61 9 470 2303

In the past four years ADAM has made significant progress in all aspects of its photogrammetric systems. ADAM works closely with several Australian Universities and now supports the foundation of a chair in Photogrammetry at Newcastle University. As well as the standard simultaneous bundle solution, research grants have resulted in three alternative orientation methods being offered to users. These are; a two-stage coplanarity solution for large-format users; a reduced normal equation collinearity solution for both terrestrial and aerial; and an incomplete datum solution for close-range terrestrial work. New versions of the standard system software have been released regularly, and the product range has increased to include analog-to-analytical conversions for PG2, Topocart and B8 instruments.

The MPS-2 has been improved through changes to chassis design (for added stability) lighting, optics and motor-control firmware.

Significant improvements to the ASP2000 have increased its performance to first-order standards with a repeatability of 2-5 micrometres now readily achievable. The optical system has been steadily enhanced and now includes fixed power oculars of 10x, 20x and 33x and 10-20x differential zoom as cost options. Its electronics system is currently being upgraded to utilise the i386 chip set.

By early 1992 all ADAM systems will use this common "core-processor" design based on a single CPU and math co-processor. This will enable higher transformation rates, better communication and a wider range of peripherals on the stereo-plotter. In addition,

all ADAM systems will be able to obtain an orientation for SPOT images and even the MPS-2 will be able to use photo-reduced SPOT sub-images without modification.

ADAM has widened the practical uses of small-format photogrammetry by interfacing its instruments and the MPS-2 in particular, to such industry standard CAD packages as AutoCad and MicroStation, as well as specialist survey and surface modelling packages such as GEOCOMP. The flexibility of these and "purpose-built" mapping packages such as 3DD (Micromap) and KORK have enabled ADAM's users to diversify and address new markets.

Research currently underway will see ADAM launch both state-of-the-art and low-cost systems in 1992, and existing systems will be available on UNIX workstations in the near future.

ADAM has sold nearly 200 instruments and has 122 active user sites throughout more than 15 countries. The popularity of the MPS-2 as a teaching and close-range instrument has prompted University of Leeds in the UK to form an international user group.

- (iii) Digital Mapping Systems Pty Ltd
2 Austin Street Hawthorn Victoria 3122
Phone/Fax: +61 3 818 6653

Digital Mapping Systems (DMS) is a Melbourne based company devoted entirely to the design and manufacture of photogrammetric systems.

The DMS StereoDigitizer is a portable (less than 20 kg) and low cost analytical stereoplotter. The hardware is essentially a solid-state stereo-comparator based upon a mirror stereoscope, twin digitizing tablets, footswitch and a modified parallax bar which includes cursor coils. The unit interfaces to an IBM PC (or compatible) over an RS-232 serial line. The Software provides a complete topographic mapping system for digitising, contouring (DTM creation), plotting, Independent Model observations and data transfer.

Software for Topcon PA-2000. DMS have a complete suite of mapping software for the Topcon PA-2000 written for IBM-PC computers. The suite includes modules for digitising, contouring, Independent Model observations, output to plotters, transfer to DXF and other ASCII formats, and database management systems for cameras, feature codes, instrument calibration, ground control and plotters. DMS are now jointly developing (with Topcon) direct interfacing of the PA-2000 to a range of mapping and GIS systems.

ANCO Analytical Conversions. DMS provide the software for the ANCO range of analytical conversions of analogue and analytical stereoplotters being developed in Melbourne by Photo Mapping Services. The hardware is based upon stepper motors, encoders and zero-backlash lead screws, each axis having its own control microprocessor. A high speed fibre optic loop connects microprocessors dedicated to either axis drives, handwheels, footdisk, keypad or an LCD display. Most operator input of feature codes and instructions is via the keypad and LCD combination.

2. IMAGE PROCESSING SOFTWARE

A number of packages for the analysis of remotely sensed data have been developed and marketed in Australia. These include:

(i) For workstation

DISIMP
Clough Engineering Group
246 Church St
Richmond
Victoria 3121
Phone: +61 3 427 1955
Facsimile: +61 3 427 1779

ER Mapper
Earth Resources Mapping
316 Churchill Ave
Subiaco, Perth
Western Australia
Phone: +61 9 388 2900
Facsimile: +61 9 388 2901

(ii) For PC

Microbrian
MPA Communications Pty Ltd
37-51 Lusher Road
Croydon
Victoria 3136
Phone: +61 3 724 4488
Facsimile: +61 3 724 4455

A-Image
CSIRO
Private Bag
PO Box
Wembley
Western Australia 6014
Phone: +61 9 387 0200
Facsimile: +61 9 387 8642

ESIPP
Department of Applied Geology
University of New South Wales
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Facsimile: +61 2 313 7269

COMMISSION V

Commission V activities in Australia have centred largely on research projects undertaken at Universities during the past few years. At the University of Newcastle research has concentrated on the use of small format cameras, the development of rapid video close-range analytical systems, and the continued development of small format analytical stereoplotters such as the MPS-2 produced by Adam Technology of Perth. Personnel involved in this research has included Professor John Fryer, Dr Harvey Mitchell, Mr Michael Elfick, Dr Eric Kniest, Dr Lloyd Pilgrim and Mr Bruce King.

At the University of New South Wales, Professor John Trinder has been involved in some Commission V activities, concentrating largely on video and robot vision techniques.

At the University of Melbourne Dr Mark Shortis and Mr Cliff Ogelby have undertaken considerable research and practical applications in Commission V activities. Dr Shortis has spent a period of time at NASA where he has been involved in the calibration of video systems and Mr Ogelby has been involved in architectural and heritage photogrammetric work. This pair of researchers has also undertaken a considerable number of consulting projects in industrial applications in Australia.

The Queensland University of Technology and the Royal Melbourne Institute of Technology have both undertaken many student projects in the area of close-range photogrammetry. The results of this work at these two institutions have not been published widely. At Curtin University in Perth, Mr Bruce Montgomery has continued on

active participation in small format camera studies and had involvement with local mining and other industries.

Industrial research work and applications of close-range photogrammetry have been conducted by the photogrammetric group attached to BHP Engineering at Wollongong in NSW. Several projects using CRC-1 and CRC-2 cameras have been undertaken and were reported at the First Australian Photogrammetric Conference.

COMMISSION VII

The major activities of Commission VII over the period are embodied in the Proceedings of the Fifth Australasian Remote Sensing Conference held in Perth from 8-12 October 1990, attended by over 300 people. Over 170 papers are included in the Proceedings which comprise 1300 pages. In such a large volume it is impossible to adequately summarise the contents of the meeting. Applications of remotely sensed data in Australia cover a very broad range of fields based on a range of sensors. Satellite and airborne remotely sensed data will continue to play a major role in the monitoring of resources and the environment in such a vast country as Australia.

Increasingly groups in Universities and CSIRO are undertaking research in radar and imaging spectrometer remote sensing systems. A number of researchers are principal investigators for the ERS-1, JERS-1 and SIR-B programs. In October-November 1992, Australia will host an Australia-United States cooperative deployment program for the JPL three frequency, full polarisation Synthetic Aperture Radar (SAR) system. A number of sites in Australia will be flown using NASA's DC-8 aircraft. Australian researchers, educators, and consultants are also playing an increasingly important role in remote sensing activities in the Asia-Pacific region. In 1990 Australia was admitted as a full member of the Asian Association on Remote Sensing.

Prof. J.C. Trinder
Chairman
Australian Photogrammetric and
Rem. Sensing Society

May, 1992.