

REPORT FROM AUSTRALIA

1. National Activities

The Federal Government has recognised a need for effective coordination of GNSS implementation in Australia. The Hon John Anderson MP, Deputy Prime Minister and Minister for Transport and Regional Services, established the Australian GNSS Coordination Committee (AGCC) in May 2000. The AGCC reports to the Minister for Transport and Regional Services, and to the Australian Transport Council (Federal and State Transport Ministers).

The role of the AGCC is to consider and develop mechanisms to coordinate all land, sea and air aspects of GNSS; promote the safe and effective utilisation and development of GNSS in Australia; and coordinate national security issues, the application of augmentation systems, and the national use of GNSS in other relevant applications.

a. Time/frequency activities

Within Australia, the legal basis for measurement of physical quantities, including position, is provided by Commonwealth legislation, the *National Measurement Act 1960* and related regulations and guidelines. Responsibilities under the Act are discharged by the Commonwealth Scientific and Industrial Research Organisation's (CSIRO's) National Measurement Laboratory (NML) and the National Standards Commission (NSC). The regulations and guidelines specify the Australian Fiducial Network (AFN) as the recognised value standard for position.

Australia has established a mechanism by which a central agency will be responsible for all judicial related enquiries on GPS.

The *Radiocommunications Act 1992* sets out the regulatory framework for management of the radiofrequency spectrum in Australia. The Australian Communications Authority (ACA) administers the Act and is required to plan for use of the spectrum by a wide range of radiocommunications services. The ACA is also responsible for allocating, by way of radiocommunications licences, the right for particular users to operate radiocommunications devices to provide services. When required, the ACA conducts interference investigations to resolve complaints of interference to licensed services.

Preparations continue for the World Radiocommunications Conference 2003.

b. Survey/geodesy/GIS activities

The National Mapping Division (formerly AUSLIG) of Geoscience Australia has responsibility for the Australian Regional GPS Network (ARGN) of 15 permanent GPS tracking stations in Australia and Antarctica (as well as Macquarie Island in the Southern Ocean and Cocos Island in the Indian

Ocean). Outputs continue to improve in quality and reliability. Data and computed global solutions are contributed daily to the International GPS Service (IGS) as a Regional Data Center and a Regional Network Associate Analysis Center. Data and quality information from the ARGN is available from the National Mapping Division's (NMD) web site (<http://www.auslig.gov.au/geodesy/ARGN/argn.htm>) as are the solutions contributed to IGS (<http://www.auslig.gov.au/geodesy/sgc/>).

NMD continues to run four permanent GLONASS receivers co-located with IGS base stations in Australia and Antarctica and contributes these data routinely to the International Glonass Service (IGLOS).

In November 2000, AUSLIG released its on-line GPS processing service (<http://www.auslig.gov.au/geodesy/sgc/wwwgps/>). This free service uses a processing strategy compliant with IGS standards, constraining the nearest three IGS sites with the IGS products (satellite orbits, earth orientation parameters and coordinates) to produce results with an accuracy of a few centimetres on a global basis. For sites within the Australian region, this service also transforms the ITRF results to the Australian Geocentric datum, GDA94, using a seven-parameter transformation estimated from the GDA94 positions as at 1 January 1994 and current ITRF positions of the ARGN sites. The on line automated system completed computation of its 10,000th file of client data in March 2002.

2. Differential Services

There is a range of augmentation services provided by the private sector and by government agencies in Australia. The Government recognises the essential role of the private sector in the provision of GNSS augmentation services.

3. Development Activities

a. Land use

Land-based transport has benefited from including GNSS applications as part of Intelligent Transport Systems (ITS).

Intelligent Transport Systems Australia (ITS Australia) is an Incorporated Not for Profit organisation which represents a broad spectrum of 'Technology in Transport' members including industry, government, consumer organisations, and academia - fostering the development and deployment of Intelligent Transport Systems in Australia.

Promoting use of advanced technologies to improve Australia's passenger and freight transport systems, the aim of ITS Australia is to provide a forum to guide the development and integration of these technologies, systems and standards. ITS Australia currently represents over 80 organisations and companies involved in ITS, including infrastructure providers, hardware suppliers, content aggregators and suppliers, service providers, vehicle manufacturers and transport companies.

Some examples of ITS applications currently operating in Australia, include:

- Adaptive traffic control systems, to provide priority for road-based public transport vehicles;
- Freeway management and information systems, to reduce delays due to traffic incidents;
- Electronic fare collection systems, to improve the convenience of public transport travel and reduce system costs;
- Electronic Tolling;
- In-vehicle navigation and information systems, to assist drivers and reduce unnecessary travel;
- Vehicle location and scheduling systems, to reduce theft, improve roadside service, and improve efficiency of freight movement; and
- Advanced traveller information systems, to improve users' understanding and efficiency of use of public transport systems.

In addition, there are several ITS trials currently being conducted on Vehicle Collision Avoidance Systems, Remote Vehicle Guidance Systems and Automated Highway Systems. Other major ITS projects include a national tolling working group, a national trucking location and access study, an in-car driver awareness program, bus information systems and an urban freight study.

Land-based applications of GNSS are increasingly integrated with use of the mobile telephone networks for the purpose of delivering location-based services.

b. Maritime use

The Australian Maritime Safety Authority is a government agency with the charter of enhancing efficiency in the delivery of safety and other services to the Australian maritime industry. It is an active participant in the International Maritime Organization (IMO) and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

AMSA provides a free-to-air network of 14 Differential GPS base stations specifically for marine navigation. The final two sites in the planned network are expected to become operational by December 2002.

c. Aviation use

Australian ATM Strategic Plan

The first edition of the Australian Air Traffic Management (ATM) Strategic Plan was published in December 2001. The Plan has been developed through a collaborative process involving key aviation industry stakeholders including the Department of Transport and Regional Services, Civil Aviation Safety Authority, Airservices Australia, Defence and aviation industry representatives.

The current stage in the ongoing ATM Strategic Management process is the implementation of the ATM Strategic Plan. This involves identifying and implementing priority programs and projects aligned with six key ATM strategies as follows:

- Implement user preferred trajectories;
- Implement dynamic risk reduction service;
- Implement flexible use airspace;
- Develop a national demand/capacity management service;
- Develop a decision support information network; and
- Develop an ATM system performance measurement and reporting system.

These six strategies are designed to achieve a long term (15 year plus) desirable future, referred to as the Target ATM Operational Concept.

The use of GNSS and hence GPS, is fundamental to the present and future ATM system and will continue to play a key role in programs and projects to emerge from the implementation of the ATM Strategic Plan.

A copy of the ATM Strategic Plan is at: www.austatmsp.gov.au

Civil Aviation Safety Authority (CASA)

CASA was established as an independent statutory authority on 6 July 1995 with a primary focus of delivering aviation safety to the Australian public.

CASA has introduced rules allowing four categories of approval for the use of GPS:

- a. Supplemental Means En Route IFR Navigation Aid in Australian Domestic Airspace,
- b. Primary Means En Route and Area IFR Navigation Aid in Australian Domestic Airspace,
- c. Supplemental Means Non-Precision Approach IFR Navigation Aid in Australian Domestic airspace, and
- d. Primary Means En Route IFR Navigation Aid in Oceanic Airspace and Remote Areas.

These rules have provided a significant operational and safety element to flying operations in Australia.

The Australian government funded a study on the aviation use of GPS in Papua New Guinea (PNG) under the AusAID program Balus. The study was carried out by the US DoT Volpe Centre with assistance from CASA staff members. It recommended that following a review of GPS vulnerability in PNG, the country transition to a GPS based aeronautical navigation infrastructure.

In addition, CASA is funding a study on the use of TSO C145/146 receivers for general aviation operations in Australia.

Airservices Australia

Airservices Australia is the national air traffic management (ATM) service provider. As noted above, in conjunction with the aviation industry and the Departments of Defence and Transport and Regional Services, it produced the ATM Strategic Plan for Australia.

The Ground based Regional Augmentation System (GRAS) development continues. ICAO GRAS SARPs are being developed. Test results show a seamless navigation accuracy and integrity transition between VHF broadcast stations.

A major ADS-B trial using commercial off the shelf GPS and ADS-B equipment is currently taking place north of Brisbane in Queensland.

d. Space use

The AGCC Secretariat maintains contact with the Space Industry Development Team of the Commonwealth Department of Industry, Tourism and Resources (DITR). A case study on the AGCC and its role with satellite navigation will be published in a report to the Australian Government by the International Space Advisory Group (ISAG) Report.

A joint Industry-Government steering committee has been established to oversee the implementation of the Australian Spatial Information Industry Action Agenda.

e. Military use

The Australian Navy, Army and Air Force employ GPS for navigation and related military applications.

f. Time/frequency use

In common with the national timing laboratories of many other countries, the CSIRO National Measurement Laboratory (NML) uses the GPS system as one method of comparing Australia's national references for time of day and frequency with the international standard time scale Coordinated Universal Time (UTC).

NML has developed custom systems that use GPS for national and international comparison of atomic clocks. More than 20 of these systems are operating in Australia and in the Asia-Pacific regions. Outputs from these systems include timing and GPS integrity data. A subset of this data is published daily at <ftp://time1.tip.csiro.au/pub/timedata/>. Further information can be found at <http://www.nml.csiro.au>.

g. Survey/geodesy/GIS

Victoria's GPS base station network (GPSnet) is a co-operative GPS network facilitated by Land Victoria (www.land.vic.gov.au/gpsnet). It continues to grow and consists of 15 base stations as at March 2002. The network records, distributes and archives GPS satellite correction data for accurate position determination by differential post-processing and real time correction techniques, 24 hours a day statewide. Each GPSnet site consists of a dual frequency GPS receiver with a geodetic quality antenna. All sites are connected to the Australian National Network that is in turn linked to the Australian Fiducial Network. Data for post processing is sent from base stations to the GPSnet Central Server which in turn supports distribution to users via the Internet. Custom quality checking software (QUIMBY - <http://www.sli.unimelb.edu.au/geodesy/quimby.htm>) is used to assess all data received at the GPSnet Central Server. The software is used to assess the quality of raw GPS data in the RINEX format. It has the ability to automatically process data generated by GPSnet base stations and create summaries and send alerts via email if quality conditions are not met.

The network is expected to incorporate a further two hosted sites in the near future providing a multimodal capability in relation to weather research (GPSmet site) and geodesy (joint GPSnet/ARGN site). Additionally, five base stations are also now configured to propagate real time kinematic correction signals via UHF and VHF radio. Two of these sites are dedicated to public access. Investigations are also proceeding in relation to the application of Virtual Reference Station technology to the network.

4. Industrial Aspects

In the land transport area, GPS has been applied to provide vehicle location information.

Location information on public transport vehicles (buses) is used to determine delays and estimate arrival time of specific buses at selected bus stops. The delay information changes traffic signal timing to provide signal priority to buses. The arrival information is narrowcast at the selected bus stops to advise patrons.

Location information of taxis is used for job dispatch to minimise booking delays and to locate taxis when "panic" buttons are activated by drivers.

A project to examine the feasibility of monitoring the location (using GPS) of freight vehicles and their operational characteristics automatically, on a nation-wide basis, is being implemented by AUSTRROADS.

5. National Policy activities and decisions

The AGCC has developed a national strategic policy on GNSS in consultation with stakeholders, and is now in the process of obtaining Government endorsement. The draft policy, titled *Positioning for the Future*, is based around principles of: national coverage; safety; efficiency, economic and social benefits; industry development; flexibility of policy and strategy; standards; environmental benefits; national security.

GPS

Discussions continue between the USA and Australia on a civil GPS Agreement.

Galileo

A number of Australian agencies have been monitoring developments with the EU Galileo program. In response to an invitation from EU officials an Australian delegation headed by the Chairman of the AGCC visited Brussels at the end of April to discuss issues of common interest with the European Commission.

6. National Responsible Authorities

A number of Commonwealth Government agencies have roles in GNSS management within Australia, and these include:

- Airservices Australia;
- Australian Communications Authority;
- Australian Maritime Safety Authority;
- the National Mapping Division of Geoscience Australia;
- Civil Aviation Safety Authority;
- Commonwealth Scientific and Industrial Research Organisation;
- Department of Defence (incl. Defence Science and Technology Organisation);
- Department of Communications, Information Technology and the Arts; and
- Department of Transport and Regional Services.

7. Relevant Conferences/Seminars/Exhibitions held within nation

The Australian Global Positioning Systems Society (GPS Society Inc.) hosts a biannual international symposium on satellite navigation technology and applications. The symposium is supported by the Australian Institute of Navigation (AION) and by leading organisations in surveying, navigation and positioning. It provides an opportunity for attendees to:

- Learn about the new developments in the rapid integration of navigation with communication and spatial information;
- be updated on position augmentation services available in Australia;
- learn practical applications of satellite navigation; and
- be updated on the developments, equipment and applications of GPS and Galileo in a wide range of industries.

8. National Point of Contact

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