

GNSS Coordination at the National Level: the Australian Experience

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Abstract. In May 2000 the Australian Minister for Transport and Regional Services, advised by his Department, established a non-executive stakeholder body, the Australian GNSS Coordination Committee (AGCC), with terms of reference aimed at national coordination of GNSS application. This initiative responded principally to perceptions of potential for economies and efficiencies from national-level standardising and investment-sharing of equipment and services, especially in GNSS infrastructure and augmentation. In the event, in its first three years the AGCC was little able to exert significant influence in such market-driven areas. Rather, it successfully developed for government endorsement, in August 2002, a wide-ranging national GNSS policy and also addressed priority applications issues concerning GNSS jamming and interference, spectrum licensing, legal positioning/timing matters, and national and international connections, including with GPS and Galileo program management. Following a performance review in 2003 the AGCC's mandate was extended to 2006, with revised terms of reference. This paper critically examines the experience of the AGCC in national-level coordination of GNSS application. As in many countries, Australia does not control sources of GNSS signals and applications are pervasive within a free-market economy. No single government agency or industry sector has general GNSS control or policy mandate. The degree to which, in this environment, a non-executive body like the AGCC can be effective in its role is discussed. The experience and future plans of the AGCC reported in this paper raise topics of relevance not only for Australia but for other countries as well that seek a degree of national coordination and efficiency in GNSS application

Key words: Coordination, Australia, national, government, jamming.

1 Introduction

The Australian Global Navigation Satellite Systems coordination Committee (AGCC) was established for an initial three-year term by the Deputy Prime Minister and Minister for Transport and Regional Services in May 2000. Its establishment came from work of an interim committee that researched the value of having such a body of GNSS stakeholders able to advise government on cross-sector issues relating to the uptake and application of GNSS in Australia.

There were multiple motivations for the establishment of the AGCC and these have mostly proven enduring over its initial term and into what is now the first year of its second term. As is outlined below, the AGCC has found more tasks than it has resources to address and new areas for consideration continue to be added to the AGCC's interest-list, with current considerations such as Galileo, GPS modernisation and the relentless development of GNSS applications technology raising a series of issues of national importance to Australia.

The most visible outcome of the AGCC's first term was the drafting of a significant national policy document, *Positioning for the Future*, (AGCC, 2002) which the Minister released in August 2002. The policy document was developed by a team established by the AGCC that canvassed all major stakeholder groups and Federal government Departments for concurrence before seeking Ministerial endorsement and release. It is a challenging and forward-looking document.

A description of the first three year's activity of the AGCC, structured against the major headings of *Positioning for the Future*, was given at SatNav2003 (Sinnott, 2003) and will not be repeated in detail here. Suffice it to say that, in addition to the focus provided by development of *Positioning for the Future*, specific issues of GNSS jamming and interference, spectrum licensing, legal issues attached to GNSS reliance for position and timing and international programs in GPS and Galileo were major themes. Some commentary under these and

other headings follows in subsequent sections of the present paper.

At the time the SatNav2003 paper was prepared a formal external review of the AGCC was under way but its findings were not available. The review was released in mid-2003 so now, a year on, it is timely to reflect on both internal and external perceptions of the AGCC's performance and its potential for the future.

2 Maturing of the AGCC's terms of reference

The initial terms of reference for the AGCC have been revised to some extent as a result of the review of 2003. To some extent the revisions were a reflection of experience and an assessment of what is reasonably possible to expect from such a group. But the real underpinning for any terms of reference must come from the *why* and *what* questions – *why* is GNSS important to Australia and *what* can a non-executive advisory and consultant body deliver?

2.1 The GNSS market environment in Australia

A key factor on which the existence of the AGCC was, and is, predicated is expectation of sustainment and growth in demand for GNSS services in Australia. This demand is in turn driven by important economic activity for which GNSS is a crucial infrastructure element.

There are no readily accessible figures for market penetration or projections for growth of GNSS in Australia but some international comparisons are informative. Based on figures developed by DSTL UK, global sales of GPS-based products grew at a compounded annual rate of over 30% from 1996 to 2003. This growth projection is the economic driver for European investment in Galileo.

Notably, the European market assessment is that personal location services – mobile phones and in-car telematics – will be a major component of GNSS growth projections. In a recent European market analysis (Styles *et al*, 2003) gross annual product revenues from GPS/Galileo enabled mobile phones were estimated to grow from €23B in 2010 to €92B in 2020. In-car systems, currently a negligible market, are estimated to deliver gross annual product revenues of €40B by 2020. Location-base services of these types comprise a sector largely unexploited as yet in Australia. Past experience has been that Australians are fast adopters of new technology so modelling rates of penetration of new GNSS applications on those of the US and Europe is broadly valid.

With the appearance of Galileo, and an increasingly competitive market place for augmentation services, some of the constraining features associated with current

GPS services will be set aside, thereby encouraging further GNSS applications. Integrated GPS/Galileo sets will have access to a combined constellation of over 50 satellites, providing high levels of accessibility, precision and integrity as well as avoiding many of the current issues attached to multi-path and restricted angles of sight attending operations in urban environments. Advances in GNSS user equipment and, potentially, higher power GNSS transmissions will allow more reliable use of GNSS in shadowed and indoor environments.

As projected globally, new markets in Australia in personal location-based services can be expected, including applications that rely on a higher tolerance by the public for personal surveillance and localisation that may be sourced in community concerns about international terrorism. The penetration of RFID tagging for freight and inventory control will, far from displacing GNSS location logging, work in synergy with GNSS technology where the inherent short-range nature of RFID logging can be creatively augmented with the long-range capability of GNSS/GSM position logging. And while there have been some initial Australian moves to exploit GNSS technologies to monitor maritime and land transport vehicles (for example, the VicRoads Intelligent Access Program, as described by Koniditsiotis (2003)) there remains far more scope for potential exploitation of such technologies in Australian transport applications, such as for tolling (Kallweit, 2003) and traffic congestion management.

Further, the Australian market is as open as any in the world so it is not expected that growth rates will be impacted negatively by government controls: the introduction and application of new technology is essentially left to the free market. Australian federal governments of any persuasion are unlikely to intervene to constrain or manage penetration of a new technology for reasons other than equity (as in guarantees for a level of services judged to be a universal entitlement, such as is the case for telecommunications) or civil rights and privacy (as in prohibiting interception or jamming, again by analogy with telecommunications).

There are two areas in which legislative actions may work to encourage GNSS penetration in Australia.

- It is likely that, eventually, Australia may introduce requirements on mobile communications carriers to provide a means of localisation of emergency calls made from mobile phones. In the US the E911 mandate and in Europe the somewhat softer provisions of the E112 reporting requirements are already driving industry to develop localisation techniques, predominantly GNSS-based, and single-chip GNSS receivers, costing less than \$US10 in bulk, for embedding in new generation handsets.
- A different type of intervention mirrors that of many governments of capitalist economies, which promote

competition through means such as anti-trust legislation and competition policy (as in Australia's Trade Practice Act). It can be expected that Australia's competition policies will remain substantially unchanged and will continue to be enforced with vigour. This is likely to have a positive rather than constraining impact on growth of GNSS applications.

However, it has also been pointed out (Perez, 2002) that, historically, states act to standardise and consolidate commercial practices in a technology regime once it has encountered a mid-life turning point where rebalancing of individual and social interests within capitalism is called for. This is arguably typical of the current state of the ICT revolution in which GNSS development is established. On this basis, albeit circumstantial, the possibility for some government involvement in regulating or controlling aspects of GNSS application, and thereby impacting market projections, cannot be ruled out.

The conclusion of this sketch of the future is that Australia can expect markets for GNSS technologies to expand at a rate close to 30% pa for the next decade in a free-market environment. While the Federal government is unlikely to be drawn to intervene in this market-driven growth there may be some areas where equity, security or privacy issues, among others, could drive some legislative intervention. It is in such areas where government recourse to a body such as the AGCC, from whence independent and balanced cross-sectoral advice can be sourced, is likely to be critically important.

2.2 What can the AGCC reasonably be expected to achieve?

Before passing on to more specific issues it is important to underline what a non-executive body such as is the AGCC can realistically be expected to achieve. Australia does not control sources of GNSS signals and has no realistic ambition to do so. It relies on the provision of such signals by major countries and power blocks and seeks to encourage applications based on this technology that return national benefit within a free-market economy. No single portfolio agency or industry sector has control over GNSS applications or a specific policy mandate for it in Australia (except that Defence has an agreement with the US on military aspects of GPS and there are GNSS implications in international aviation and maritime navigation agreements to which Australia is party). Accordingly, a body such as the AGCC has a quite limited locus of control and must see itself as primarily a consultative and advisory body. Nevertheless, as is set out in what follows, it can fulfil a valuable role if its advice is sought and valued on the basis of the informed base from which it comes.

2.3 The AGCC business case – initial terms of reference

In September 1999 an interim AGCC prepared a business case for formal establishment of the AGCC. The interim committee noted the fact that GNSS was in extensive use in a wide range of sectors and, in particular, was finding increasing application in multi-modal transport applications in Australia. It pointed to the growth of national and regional based differential GPS networks, created by governments and their agencies as well as by the private sector and industry throughout Australia, and saw some national cost-benefit possible by coordination of these burgeoning differential GPS systems.

The business case was much influenced by particular case studies that focussed on the wasteful proliferation of real-time differential GPS services. But it also saw benefits, less well defined in economic terms, coming from having an expert forum in the AGCC that could advise government pro-actively on GNSS application areas where government should play a role in policy and standards frameworks. Radio frequency spectrum matters were a particular case in point.

One weakness of the business case is that in most broad sectors of GNSS application, such as transport, the application of GNSS is against quite clear sectoral objectives and it is not clear to those involved in such sectors that there is benefit from wider coordination. Thus, for example, while there was, and is, strong evidence that there are substantial benefits in road transport from greater application of GNSS technologies it is less clear that a more widely-based coordination body advising government would materially improve outcomes in this one sector. There are already bodies like the Australian Transport Council and Intelligent Transport Systems Australia (ITS) that can be expected to include in their purview relevant aspects of GNSS application to transport. Similarly, the Department of Defence might see itself as internally self-sufficient in managing defence GNSS applications; its attitude to the AGCC might well be more informed by the economy it presents by allowing a single point of contact with key representatives of civil users of a military system, GPS, than by any expectation of increased defence efficiency in GNSS application.

This background is encompassed in the forward-looking statement made in the business case when leading into describing a proposed work program. It reads as follows.

The proposed Australian GNSS Coordination Committee (AGCC) will be a proactive Committee identifying areas of GNSS use which can be managed better through a nationally coordinated approach. It presents an ideal forum for exchange of information with an international flow-on. The Committee would provide information to, and liaise with, Australian representatives on

international bodies, and would seek information exchange from similar bodies. The Committee would also look at gaps in the use of GNSS between the different transport modes and how they can be overcome. The range of skills and backgrounds which the members would bring to the Committee would be compounded in impact by the networking opportunities made possible.

2.4 The AGCC review – refining the terms of reference

Establishment of the AGCC in 2000 was for an initial term of three years so in 2003 an external review was carried out. The review noted that the environment in which the AGCC worked had changed considerably from that foreseen in the initial business case. In particular, just before the AGCC's first meeting, selective availability was removed from the GPS standard positioning system signal, making many metric-precision differential GPS systems redundant in terms of precision improvement. With this was removed a major plank of the initial "national efficiency" coordination role foreseen for the AGCC. Conversely, the maturing plans of the European Union for Galileo, barely hinted at in the 1999 business case, posed a new set of challenges in developing a national position on GNSS in Australia.

The review noted that the AGCC had struggled to achieve outcomes in some areas. These included its inability to influence GNSS infrastructure, including augmentation systems, standards, protocols and receiver technologies. This is undoubtedly a true assessment and is now accepted in the new terms of reference that these are not areas in which a major AGCC impact will be felt.

On the positive side, the review noted the substantial outcome represented by release by the Federal Government of a wide-ranging policy statement on GNSS, *Positioning for the Future*, which had been developed by the AGCC. Other areas in which the Committee's work was deemed effective was in interference and jamming, legal issues, security for the GNSS spectrum and information provision to the GNSS user community. Each of these areas is addressed in following sections of this paper.

The net assessment of the AGCC was sufficiently positive for the review to recommend a further three-year term for its activity. Proposed amended terms of reference were then developed by officials of DOTARS and the AGCC Chair, noting the assessments and recommendations of the review, the experience of the AGCC's first term and the resources currently accessible to the AGCC. These were put to the Minister with the review recommendation for a further three-year term. The Minister agreed with the recommendation for

extending the AGCC's term to 2006, reappointed the Chair and has formalised current terms of reference.

It is instructive to compare and contrast the original terms of reference with those now in place, as the shift in emphasis is in part the product of three years experience in what is reasonable and feasible for such a body to address. In particular, other countries in a similar position to Australia – ie dependent on GNSS-derived services but not having any vesting in space assets or GNSS control – might gain some benefit from noting the evolution in the AGCC terms of reference.

The following shows a comparison of the body of the original (2000) and current (2004) terms of reference, subdivided into clauses of convenience, which requires some reordering of paragraphs to allow comparison. (Some minor amendment to grammar, shown in square brackets, of the 2000 version has also been effected to allow more ready comparison, but without altering the sense.)

Preamble to original (2000) Terms of Reference:

The AGCC will [function by] ...

Preamble to current (2004) Terms of Reference:

The AGCC is the national advisory body to Minister for Transport and Regional Services on issues relevant to Global Navigation Satellite Systems (GNSS). In developing advice, the Committee consults with Australian GNSS stakeholder communities, and is informed by linkages with international GNSS providers and authorities. The Committee provides information on GNSS developments to Australian stakeholders, and encourages the take-up of GNSS applications.

The Committee has a role in ...

Clause 1, 2000 version:

consider[ing] and develop[ing] mechanisms to coordinate all aspects of GNSS on land, sea, and in the air, including:

- development and maintenance of a national strategic policy towards GNSS;
- coordination of national infrastructure development taking advantage of economies arising from multiple use of common systems; and
- recommendation of direction for preferred GNSS standards and protocols for use in Australia;

Clause 1, 2004 version:

- developing and facilitating national GNSS policy;
- harmonising GNSS standards and protocols to achieve the potential economic and social benefits from applications;

Clause 2, 2000 version:

promot[ing] the safe and effective utilisation and development of GNSS in Australia, including through:

- promotion of GNSS user education and effective information dissemination;

- an integrated approach to establishing mechanisms to minimise the effects of interference to GNSS; and
- investigation of specific GNSS related issues through the initiation and management of studies;

Clause 2, 2004 version:

promoting the efficient and effective development of national GNSS infrastructure;

Clause 3, 2000 version:

coordinat[ing] national security issues and assist[ing] in keeping users aware of GNSS developments and security in all transport modes and relevant areas and provid[ing] a forum for an exchange of information on receiver technology and applications;

Clause 3, 2004 version:

- coordinating advice on national security issues as they impact on GNSS applications by Australia;
- promoting the further penetration and application of GNSS technology to all modes of transport where efficiency, safety, environmental and other benefits can be realised;

Clause 4, 2000 version:

Coordinate[ing] the application of augmentation systems, particularly the provision of new augmentation systems, taking advantage of economies available through sharing common systems;

Clause 4, 2004 version:

deleted

Clause 5, 2000 version:

coordinat[ing] and influenc[ing] national and international use of GNSS through existing radiocommunications fora in Australia; and

Clause 5, 2004 version:

promoting and protecting GNSS spectrum management interests and issues in national and international radiocommunication fora;

Clause 6, 2000 version:

coordinat[ing] the national use of GNSS in other relevant applications.

Clause 6, 2004 version:

- maintaining an informed understanding on the provision and application of GNSS nationally and internationally, through liaison with relevant authorities;
- providing advice on GNSS matters requested by the Minister for Transport and Regional Services and undertaking specific tasking referred to it by the Minister.

What is clear in this clause-by-clause comparison is that the current terms of reference emphasise the participative, consultative and advisory nature of AGCC operations rather than promoting an unrealistic expectation that the Committee will have the resources and authority to intervene in market-driven areas in a significant way. There is now a concentration on ends and an avoidance of

prescription of means. In particular, the focus on rationalising augmentation systems, which played such a major part in initial thinking about AGCC activity, is significantly de-emphasised. All these changes reflect the reality of the first three year's operation of the AGCC and provide some useful guidance to any other nation contemplating a group similar in function to the AGCC.

What does carry over from the original to the current terms of reference is a recognition of the importance of networking through AGCC membership. There is no other interactive forum in which GNSS stakeholder representatives meet to compare notes on a technology which is pervasive. In day-to-day operations there is little reason for the geodesic community to touch base with aviation services or defence, for example, yet experience has shown that the AGCC's linking thread of GNSS has allowed valuable synergies and mutual benefits to be realised for stakeholders from these sectors, and others.

3 Significant AGCC outcomes

In its activity to date the AGCC has addressed a number of significant issues and delivered some important outcomes. A selection is described in what follows.

3.1 Licensing of GPS spectrum

The radiofrequency spectrum is managed in Australia under the *Radiocommunications Act 1992*. The Australian Communications Authority (ACA), which is established by the Act, is responsible for planning, licensing and technical standards for use of the spectrum. Although GPS signals are widely used in Australia there seemed, at the time of the AGCC's inception, no assurance that the spectrum used for GPS transmissions would be protected and that, indeed, nothing stood in the way of the ACA allowing other use of this spectrum in accordance with its charter.

There were several options under the *Radiocommunications Act* by which GNSS signals could be protected. After study by the AGCC, including referral to its Legal Issues working group and ACA advisers, licensing of the primary in-space transmissions has been achieved through having the Department of Defence hold a space licence (a form of apparatus licence) and covering receivers through a class licence. These arrangements are now in place so that Australian users of GPS services may rest assured that they have free and unhindered access to GPS signals and that legal remedies exist to prohibit incursions into this spectrum.

It might be considered anomalous that the Department of Defence should, at significant annual cost to it, hold a

licence for civil GPS services when its access to the military GPS signals is protected in other ways. While Defence does have some requirement to access civil signals its holding of the civil GPS signal licence is primarily for benefit of the rest of the Australian user community. For its part, ACA has a charter to charge annual fees for spectrum licensing so the current arrangement with Defence is no different from any other commercial licensing arrangement. The AGCC has reflected that, from the perspective of the Australian taxpayer, it must be considered curious that two agencies they fund are committing a good deal of administrative time and energy to exchanging taxpayer money annually to achieve such an obvious and long-term community need. One might also have some concerns that, under funding pressures, Defence might at some future time opt to cease holding the licence and thereby leave the spectrum unprotected. There seems a good case for some minor legislative change to avoid this current unwieldy and essentially unsatisfactory fix by an amendment to the *Radiocommunications Act* and this has been tabled as a recommendation from the AGCC's Legal Issues Working Group.

3.2 Ban on GNSS jammers

The AGCC had been concerned that, while it is an offence in Australia to operate an unlicensed transmitter, such as might be used to attempt to jam or interfere with GNSS signals, it has not until recently been an offence to supply, or possess for the purposes of supply, such a device. With jamming devices advertised for sale (albeit at a significant price) on the web, and circuit designs and instructions sufficient for a trained technician to construct such a device similarly available, the AGCC consulted with the ACA to determine an appropriate regulatory response.

The AGCC noted the growing reliance our community has on GNSS signals for position-fixing, navigation and timing so that jamming and interference to GNSS signals poses a significant public safety and security risk. The AGCC agreed with the ACA that there appeared to be no legitimate radiocommunications use for a GNSS jammer and that, so long as legitimate Defence use was permitted, for which an exemption exists, a legislative approach was appropriate.

A public consultation process was initiated by ACA in August 2003 and followed through to the enactment of legislation. The outcome, as announced on 1 September 2004 by the ACA (Australian Communications Authority, 2004), is that devices that can be used to jam GNSS are now prohibited under section 190 of the *Radiocommunications Act 1992*. The impact of the prohibition is that any person who supplies, or possesses a jamming device for the purpose of supply, can be

prosecuted under the Act. Penalties range from fines of up to \$165, 000, to imprisonment. The ACA has publicised the ban to increase public and supplier awareness of GNSS jamming device prohibitions in the hope that widespread awareness will minimise the need for regulatory action after the event. Of course it may be said that such legislation only deters those who abide by the law and that legislation by itself does not remove the threat of GNSS jamming. This is undoubtedly true but it is equally true that the legislation *ups the ante* in a major way for those who might seek to disrupt a significant element of our national infrastructure.

3.3 Evidentiary use of GNSS signals

On occasion GPS positioning data is used for evidence purposes in the courts, and there have been calls for an independent authority to verify the performance of the GNSS signal at a given point in time. It is expected that, as awareness grows of the application of GNSS signals to "prove" location and time in court proceedings, there will be more emphasis on this matter.

The AGCC's Legal Issues Working Group has investigated the way in which GPS position and time is derived and how it relates to the GPS data collected and processed by Geoscience Australia and to coordinated universal time (UTC) as measured by the National Measurement Institute in Australia. The group investigated whether the data collected and the tracing of GPS time in this way was sufficient for the purposes of evidence in Australian courts for signal verification.

The group concluded that the National Measurement Institute and Geoscience Australia record and maintain sufficient data to support the accurate and reliable calculation of timing and position data, and that these records may provide appropriate evidence for the verification of GPS signals. Geoscience Australia also collects data that may provide some assistance to verify GLONASS signals if required. This advice is now listed on the AGCC web site.

3.4 Vulnerability

GNSS signals are extremely weak and their reception may easily be interfered with accidentally or intentionally, leading to erroneous time or position being derived by users or service being denied. Sources of unintentional interference include spurious emissions from other electrical/electronic equipment operating at different frequencies than the GNSS signal, but producing some signal power in the GNSS frequency bands (e.g. harmonics, bandwidth spill-over). Spectrum Management Regulations managed by the Australian Communications Authority (ACA) allow for the

enforcement of sanctions against users of equipment producing the unintentional interference to alleviate the problem. This can be achieved in a number of ways including electromagnetic shielding and/or RF filtering.

As noted in section 3.2 above, as a result of AGCC actions it is now illegal to own, operate or supply a device intended to jam GNSS transmissions. However, the possibility still exists for mischievous or malicious persons to ignore legal sanctions and seek to jam GNSS. Sources of intentional interference include dedicated barrage jammers designed to stop the GNSS receiver from forming a navigation solution, and dedicated deceptive jammers designed to cause the GNSS receiver to form an incorrect navigation solution. Under conditions of military hostility it must be expected that forces will seek to limit use of adversary GNSS, so both sides would have GNSS jamming capabilities and means for protecting their own use of GNSS. This military discipline, NAVWAR, is a specialist area which is not touched on further in this paper.

The risk of a civil GNSS receiver failing due to the presence of RF interference depends significantly on the scenario in which the receiver is operating. The effect of the loss of GNSS is again scenario-specific, but could range from limited impact (for example, a GNSS-guided agricultural machine loses its guidance, requiring the operator to navigate manually) to a more significant economic loss (for example, banking transactions cease because of time-synchronisation problems) and potentially loss of life (for example, a bushwalker relying solely on GNSS for navigation becomes lost when his receiver fails).

Up until now, there have been relatively few reported incidents of operations being significantly affected by interference-related failures. It must be noted, however, that interference, whether intentional or unintentional, can only be successfully mitigated if the interference can be recognised. Systems that rely on GNSS for time information specifically can be more easily deceptively jammed and it is often much more difficult to identify that deceptive jamming is occurring. Such GNSS-time dependent systems include cell-phone base stations.

Failure of a GNSS receiver to produce navigation and timing information does not, of itself, cause damage to a system or operation relying on that information. Systems and operations that rely on GNSS for information can be designed to operate for periods of time when the GNSS signal is unavailable and it is important to promote wider awareness of the need for critical navigation and timing systems to have adequate mitigation procedures in place, rather than rely totally on a GNSS system that, while extremely reliable, represents a potential single point of system failure.

It follows that the key to mitigating the effect of interference to GNSS receivers is to educate the user to put in place adequate backup systems and/or procedures that either: (i) prevents the interference from occurring; or (ii) allows the system/operation to continue with safety in the absence of GNSS information.

The AGCC has sought to promote, and be involved in, such educative processes. It is pleasing to note that the Attorney General's Department and other agencies addressing critical infrastructure protection have now included GNSS as an element of this infrastructure, although it is rarely seen as such by the general populace.

3.5 Factual public information

The AGCC has a useful web site, www.agcc.gov.au, that is quite heavily used to source factual information, including reliable links to other GNSS web sites, GNSS course information and breaking GNSS news. Suggestions for improvements are always welcome.

Although it is over four years since the US removed selective availability from the GPS transmissions there are still sporadic media outbreaks of rumours of its reimposition. All such rumours have been shown to be false and the AGCC has responded to the more serious media misrepresentations by using its contacts in US agencies that manage GPS to issue authoritative statements refuting ill-founded claims.

It is noted that US GPS policy is currently under review and a statement is expected at any time. It is expected that, because the US is the nation most dependent on civil use of GPS, this will only serve to fortify the long-term intent to make GPS maximally useful for the civil community as well as for the military purposes for which it was originally designed.

3.6 Australia's relationship with Galileo

The AGCC has been active in seeking to build bridges with the EC and to promote dialogue with the intent of defining the parameters for an Australia-EU relationship on Galileo. There were AGCC/EC discussions in Brussels in April 2002 and there has been ongoing exchange of correspondence. Clearly any formal EU/Australia relationship specifically on Galileo would have to be established and managed through government channels and no government position has yet been adopted.

There is, however, a general framework for EU/Australia cooperation in which Galileo gets some coverage. In April 2003, the Australian Department of Foreign Affairs and Trade entered into an overarching *agenda for cooperation* with the EU that includes provision for

development of arrangements to enable cooperation associated with the Galileo Satellite Navigation project. This includes a framework for ongoing cooperation with the Galileo Joint Undertaking in the following areas.

- on-ground infrastructure in Australia;
- the potential for industrial cooperation
- scientific and commercial Galileo application;
- associated research and development;
- co-operative research in the field of the radiofrequency spectrum, including research into mitigation of signal interference; and
- standards

The AGCC has been monitoring carefully the development of the agreement between the EU and USA on Galileo/GPS frequency access and other matters and has been briefed by the US State Department. The conclusion of this agreement in June 2004 is seen as assisting Australia in achieving some of what was intended from the EU/Australia *agenda for cooperation*.

Prompted by AGCC advice that there are potentially very significant benefits for Australia in some closer relationship with Galileo that is likely from the general *agenda for cooperation* DOTARS officials have moved to establish an Interdepartmental Committee (IDC) to progress this matter. The IDC has met once (September 2004), confirmed that a whole-of-government approach would be appropriate to progressing any plans for an EU/Australia relationship on Galileo, and has determined areas in which further information is to be sought.

The AGCC will seek to continue to advise the IDC in accordance with its advisory charter. The AGCC sees opportunities for Australia to secure major benefits from the greatly expanded position fixing and timing capabilities that will be made available when, with Galileo fully deployed, there are over 50 GNSS satellites in orbit. One issue implied within the *agenda for cooperation*, on which the AGCC has sought to gain more widespread acceptance, is the value to Australia, as well as to the Galileo consortium, of having Galileo reference stations on the Australian landmass, desirably collocated with existing GPS reference facilities.

3.7 Privacy issues

Privacy and civil surveillance in this country falls under a number of legislative provisions of the Commonwealth or States and Territories. Legislation tends to be reactive and is primarily targeted at regulating the collection of individuals' information by government agencies, with a tacit understanding that the private sector will be largely self-regulating. The impact of new and emerging technologies has yet to be felt in many areas of legislation. In particular, legislation covering the individual's right to privacy of location, as opposed to

more traditional privacy rights over such things such as medical records and telecommunications, is quite immature. Although GNSS of itself cannot be held to infringe, or potentially infringe, on any such privacy rights, clearly when allied with logging or mobile communications technology it can enable infringement of such rights.

As location-based services become more ubiquitous there will be a growth in concern about individuals' right to privacy over their location and movement history. The aggregation of location information with other data, though each element of the aggregation may be relatively benign, clearly opens opportunity for serious abuse of individual privacy rights. The AGCC has recently completed a study on this matter that concluded that present privacy legislation is adequate at the current state of technology. It has alerted the Privacy Commission to its findings. It is expected that the AGCC will need to review its position on this matter at some future date as further GNSS-based location technologies are considered or adopted.

4 The future of the AGCC

Because the AGCC operates in an area of policy and practice which is pervasive but which is no one sector's or government portfolio agency's preserve it is difficult to sustain a case for resourcing its activity. The Department of Transport and Regional Services has provided secretariat services, including hosting the web site, without which the committee could not function and stakeholder agencies from which members are drawn have supported their representatives' attendance at meetings and some associated additional time commitments. However, it has been difficult to secure membership from major GNSS-user sectors like agriculture and SMEs. In its present phase of operation, with extremely tight funds, the AGCC is unable to cover costs of member travel or attendance. Although the facts speak very clearly otherwise, there is a risk that in this environment members may feel that their efforts are underappreciated as well as unrewarded and may lose interest in continuing to serve.

In the present funding climate the AGCC can operate only to the end of its current term, ending mid-2006. If it is to continue beyond this date, a major task for the next two years will be to continue to grow its support base and credibility among its stakeholder community.

5 Conclusion

The AGCC has, within its terms of reference and operating as what amounts to a volunteer committee, delivered excellent outcomes over its four-year life. The

paper has outlined some of the key areas of its work during this period, pointing to the major challenges that remain in the future. These come from the explosive growth of GNSS applications, the entry of Galileo into the GNSS scene and GPS modernisation, the potential for uncritical reliance on GNSS to expose vulnerabilities, and a potential threat of legal and related issues in the area of privacy.

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