



Space Industry Innovation Council

THE 'BIG EAR' CONCEPT

Location, Location, Location!

Working Group Final Report

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Background

At the inaugural meeting of the Space Industry Innovation Council (SIIC), held in Canberra on 10 February 2010, a concept, called the 'Big Ear', emerged from a strategic planning exercise. This was a shorthand label or a metaphor for a series of concepts which are elaborated below.

Australia as the 'Big Ear'

The 'Big Ear' is a metaphor for the unique advantages offered by the Australian continental landmass, augmented by island territories and the Australian Antarctic Territory. The advantages conferred by geography are further strengthened by the nation's broader geo-strategic circumstances, and place Australia in an exceptionally strong position to support international space initiatives and to develop local initiatives as well.

Phrases such as "a suitable piece of real estate", coined by Professor Desmond Ball from ANU and "There, bare and fair", coined by Dr Neal Newman, a former NASA Representative in Australia, neatly summarise the concept.

The Attributes:

- The continental landmass is geologically stable
- The nation is politically stable with a robust legal and regulatory framework
- Transport, communications and other infrastructure is reliable
- Australia is equidistant between North America and Europe and, therefore, is excellent for handling Tracking, Telemetry and Command (TT&C) and data especially from satellites in Geostationary Earth Orbit (GEO)
- The western part of the continent is well-placed to observe the immediate post-launch behaviour of satellites launched from North Asia
- The Australian population is small and is concentrated around the coasts – leading to profound radio quietness away from the coasts and in Antarctica as well
- When astronomers look out from the southern hemisphere, they look through the disc of the Milky Way (our galaxy) – an exceptionally rich aspect which is not available to observers in the northern hemisphere
- Australia has wide east-west baselines (in contrast South America and southern Africa are thin) – this allows great advantage to be taken of the Earth's rotation to support instruments such as the SKA radio telescope
- Australia is connected to the rest of the world by a series of undersea cables and a growing number of high capacity communications satellites. There is considerable resilience and redundancy in these systems. Data collected in Australia can be readily passed to other parts of the world for analysis and to inform decision-making elsewhere.

Implications Today

• *Ground Stations*

Australia is very well-placed to host satellite and space probe ground stations which support all kinds of missions, including:

- For national security (eg Pine Gap)
- For space exploration (eg NASA facility at Tidbinbilla and the ESA facility at New Norcia in WA)

- For weather, climate and Earth observation for national and international users (eg. Bureau of Meteorology and Geoscience Australia earth stations)

- ***Space Situational Awareness***

Australia is very well located to monitor human activity in near space (satellites and debris) and to assist with the creation and maintenance of safe space operations into the future (collision avoidance, confidence building measures) through the hosting of Space Situation Awareness (SSA) sensors:

- The US is keen to locate a current technology ground-based space surveillance on Australian territory to meet immediate operational needs and also as a precursor to the next generation so-called “space fence” presently under development. Two Australian companies, EOS and CEA, possess technologies and experience of possible relevance to 'space fence'. Australian Original Equipment Manufacturers (OEM), who supply EOS and CEA also stand to benefit of these companies become suppliers to the ‘space fence’ system.
- The attributes of the landmass, as outlined above, imply significant custodianship responsibilities for humankind – not dissimilar to those exercised by Australia with regard to the maritime environment and to Antarctica.
- One expression of custodianship responsibility is Australia’s investment in calibration and validation (CALVAL) capabilities which enable satellite measurements to be compared with ‘ground truth’ as they gather data of global value for climate monitoring, weather prediction, etc.

- ***Radio Astronomy***

Australia provides an exceptional platform for radio astronomy and this situation is likely to remain so for the indefinite future:

- Operational radio telescopes are presently located at Narrabri, Mopra (near Coonabarabran), Parkes, Canberra (Molonglo), Hobart and Ceduna.
- The Australian SKA Pathfinder (ASKAP) telescope is under construction at the Murchison Radio Observatory (MRO) at Boolardy which is approximately 300km north east of Geraldton.
- The Australian Government is making a substantial political and financial investment to persuade the international community to locate the SKA in Australia and not in southern Africa (a decision is expected in 2012).

Looking to the Future

- **The Global Navigation Satellite System (GNSS) ‘Hotspot’** Australia is uniquely located to take early strategic, operational and commercial advantage of the so-called GNSS Hotspot. There are currently two operational Global Navigation Satellite Systems. These are the USAF operated Global Positioning System (GPS) and a Russian system known as GLONASS. New systems are in development by Europe, China, India and Japan. All of these systems will cover the Australian continent – thus the word ‘hotspot’. Australian researchers and industry will have an opportunity, by virtue of the location of the continent relative to all of these global navigation satellite systems to be first to market with tools, techniques and products which allow all of these disparate systems to ‘inter-operate’ or to work as a single ‘virtual’ entity.
- Future communications from space, certainly during their development phases, almost certainly will need access to clear skies and open spaces such as Australia offers.

- Should demand increase for more near-real time access to earth observation data from satellites (considered likely), numerous satellite operators (nations and commercial providers) may well seek to locate ground stations on Australian soil. This could present some policy dilemmas for Australia - for example balancing emerging Chinese interests with those of the US and accommodating Japan and India as well. In February 2011, a press release from RMIT announced that Russia was seeking to place two 'major' ground stations on Australian territory. Whether this occurs, remains to be seen, however, this may be taken as an example of the attraction and utility of Australia's geographic location.

Corollary

The "Big Ear" metaphor also resonates if we look back in time to the origins of life on Earth. The oldest convincing evidence of life on Earth has been discovered in an ancient marine reef in the Pilbara in WA – dated at >3.5 billion years. This reef is vital to analogue studies which inform planetary exploration strategies. Not only is the Australian landmass a place from which to look out and listen in, it also provides observers with a unique window from which to look back to earliest life.

Summary

In essence, the "Big Ear" combines the three rules of real estate: Location! Location! Location! with the insight of the former NASA Representative that Australia is "there, bare and fair!" Australia's commitment to hosting a Space Situational Awareness system, the prospect of hosting the SKA and the potentials offered by the GNSS "Hotspot" exemplify the strategic and commercial opportunities afforded by the "Big Ear".