

AUSTRALIAN UPDATE - CGSIC



Australian Government
Civil Aviation Safety Authority

www.casa.gov.au

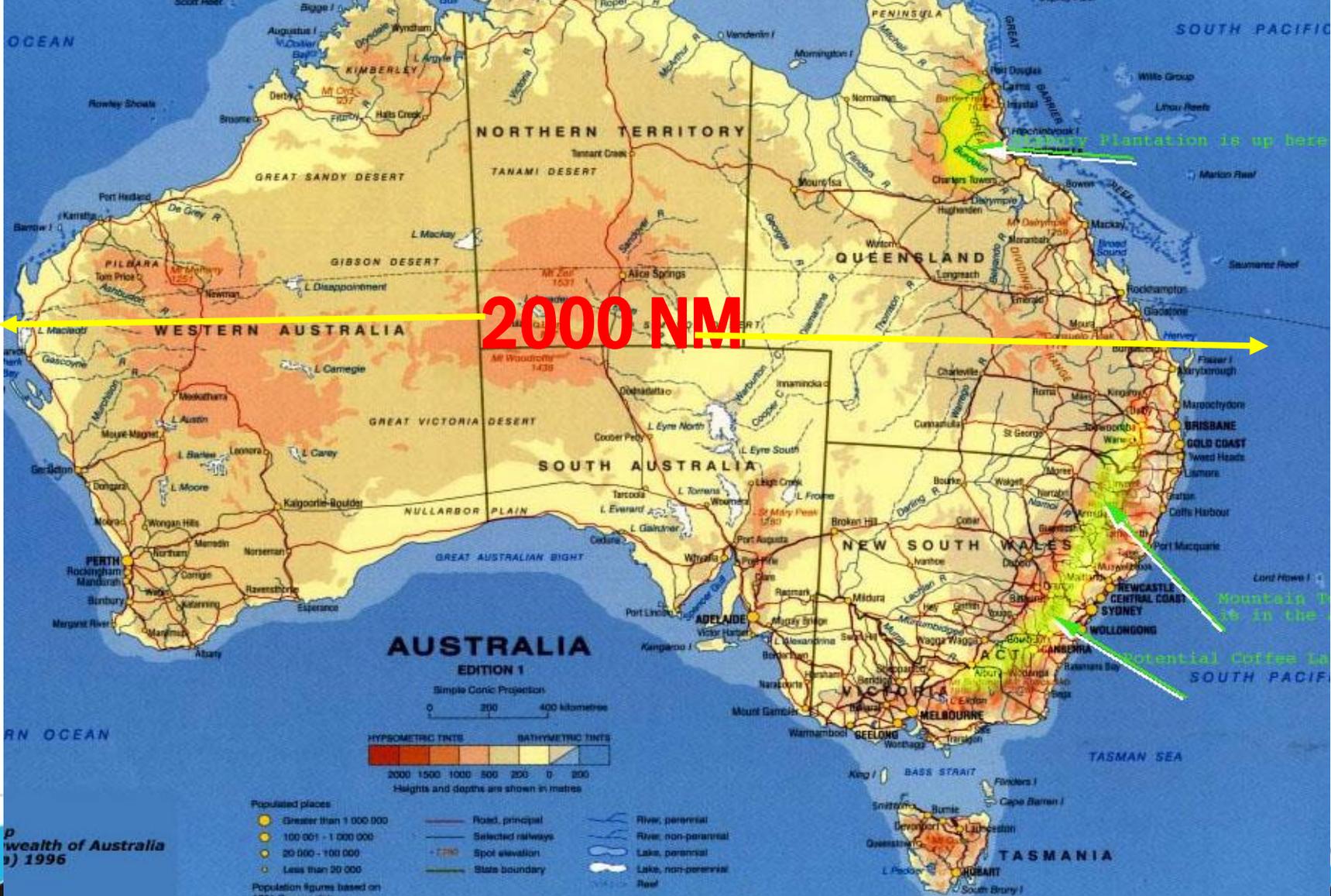
Ian Mallett
Ed Williams

safe skies for all

OVERVIEW

- Where is Australia?
- Recent activities
- CNS Transition
- SBAS
- Issues
- Discussion

Australia



2000 NM

Coffey Plantation is up here

Mountain B is in the

Potential Coffee La

- Populated places:
 - Greater than 1 000 000
 - 100 001 - 1 000 000
 - 20 000 - 100 000
 - Less than 20 000
- Road, principal
- Selected railways
- Spot elevation
- State boundary
- River, perennial
- River, non-perennial
- Lake, perennial
- Lake, non-perennial
- Reef

Depth of Australia
1996

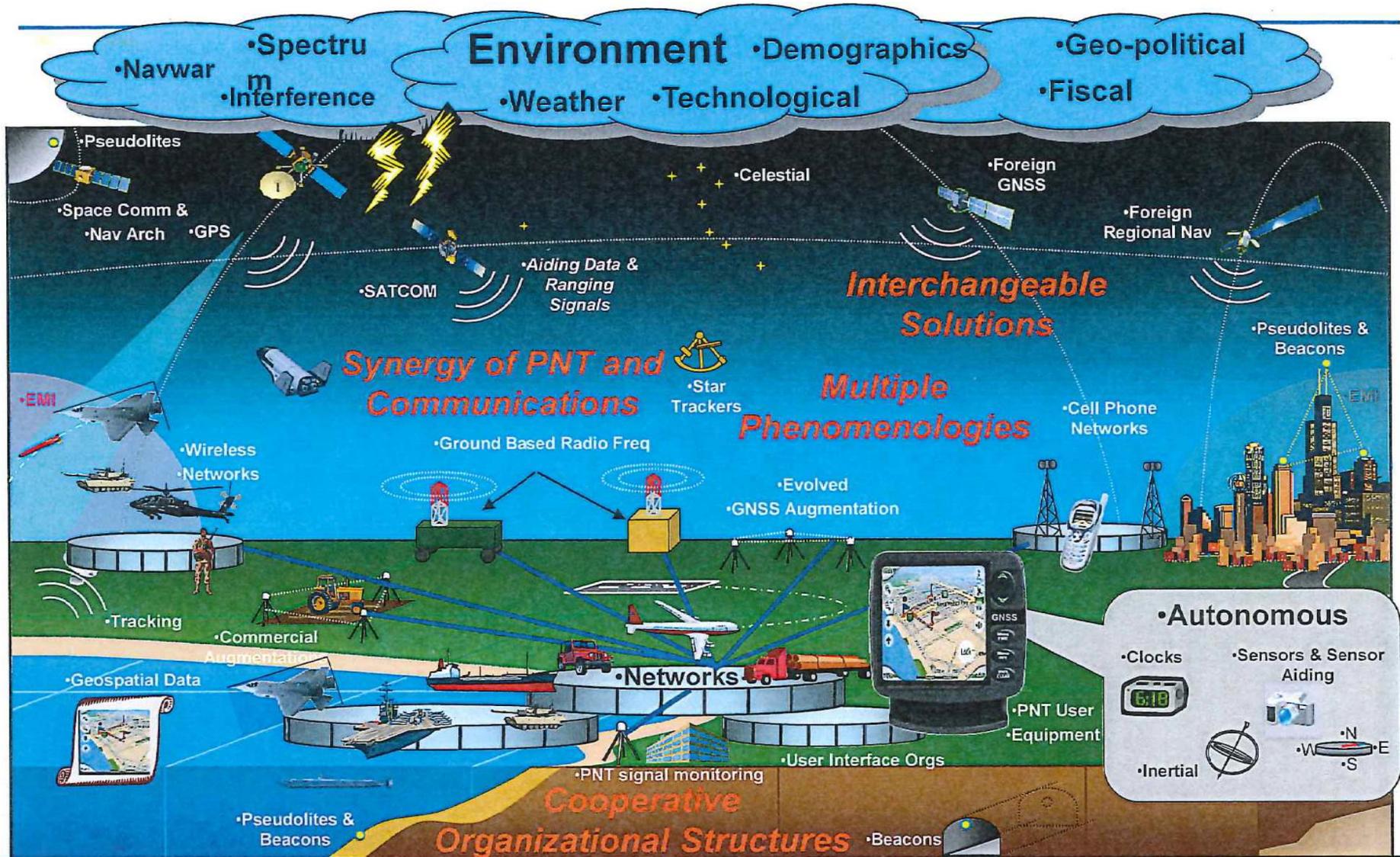


GNSS ENVIRONMENT





National PNT Architecture Graphic (2025)



•Standards •Reference Frames •Cryptography •Science & Technology •USNO •NIST •NGA •NGS
 •Star Catalogs •Launch •**ENABLERS & INFRASTRUCTURE** •NSA •Industrial Base
 •Electro Optical Info. •Modeling •Mapping/Charting/Geodesy •Laser Ranging Network •Policies •Testing

ACTIVITIES

- US PNT Advisory Board
- APEC GNSS Implementation Team - Korea
- NPI
- PBN Working Group
- Defence Workshop on GNSS Vulnerabilities
- IGNSS – WWW.IGNSS.org
- ICAO – Navigation Panel, PBNSG, CNS
- Papua New Guinea
- ASTRA – www.astra.aero ATM Advisory
- MH370 search

NPI

- National Positioning Infrastructure
 - Advisory Board
 - Multi-agency
 - Advice to Government
- Improved International Engagement
- Building Australia's NPI
 - Ground Infrastructure
 - NPI Plan

Australian Government Positioning, Navigation & Timing Working Group (PNT-WG)

Established by Australia's Satellite Utilisation Policy

Chaired by Geoscience Australia.

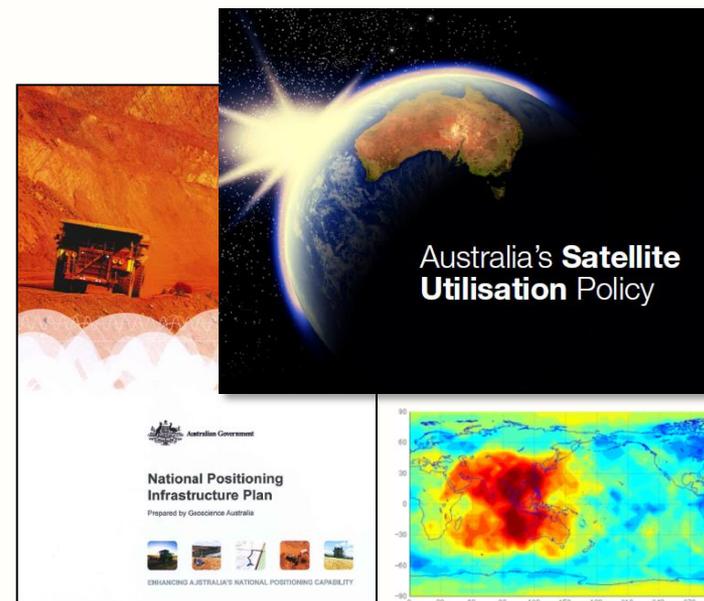
Reports to the Space Coordination Committee (SCC)

Draws together Australian Government agencies involved in PNT to advise the SCC on the status and future of positioning in Australia.

Quarterly meetings with industry presentations.

Key discussion points from 2014/2015:

- Australian Government coordination
- Spectrum management
- International engagement
- GNSS site-hosting (e.g. Japan, China)
- Critical infrastructure resilience



National Positioning Infrastructure Advisory Board

Improved
Governance

Ground
Infrastructure
Development

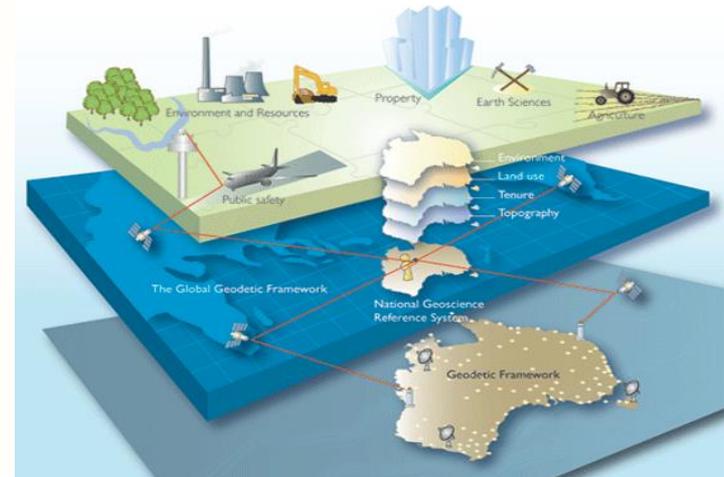
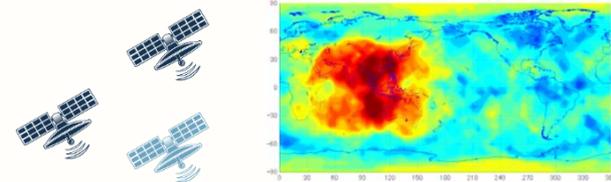
GNSS
Analysis
Capability

Data & Service
Delivery



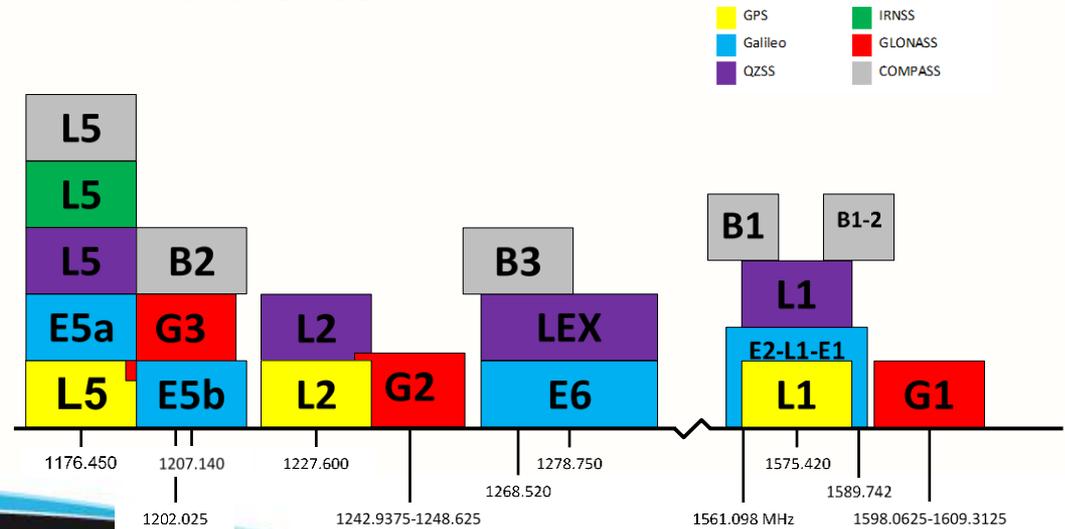
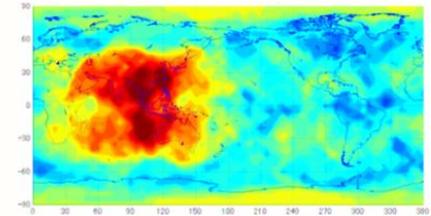
Australian Government
Geoscience Australia

- Established December 2014 to advise Geoscience Australia on developing and implementing the NPI.
- Comprises 10 members representing key user groups across Australia and New Zealand:
 - Land/Maritime Transport
 - Aviation
 - Engineering/Construction
 - Agriculture
 - Surveying/Mapping
 - Device Manufacturers
- Technical Working Groups (TWG) will address priority issues, including infrastructure management and performance standards.



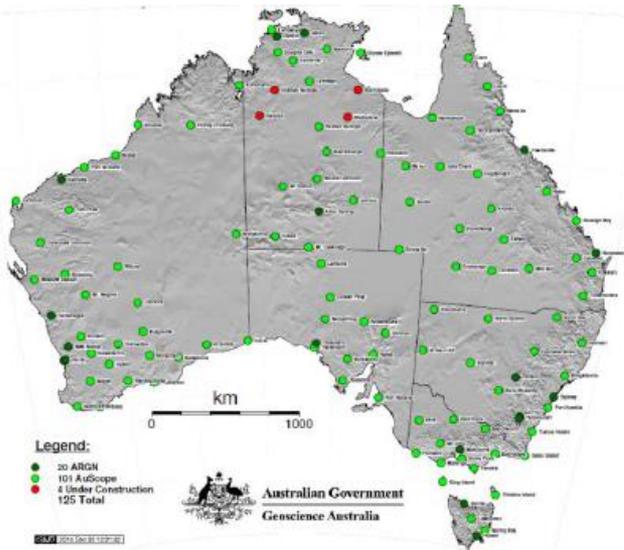
Spectrum Management

- The Attorney General's Space Community of Interest (CoI) identifies spectrum as a potential vulnerability.
- The Australian Communications and Media Authority (ACMA) is the regulatory authority for spectrum management in Australia.
- The PNT Working Group and NPI Advisory Board consult with government and industry on spectrum and related PNT issues.
- The ACMA is proposing to make the *Radionavigation Satellite Service (RNSS) Class License 2015* to better facilitate the use of GNSS frequencies in Australia.



Australian Collaboration on GNSS Infrastructure

Australia

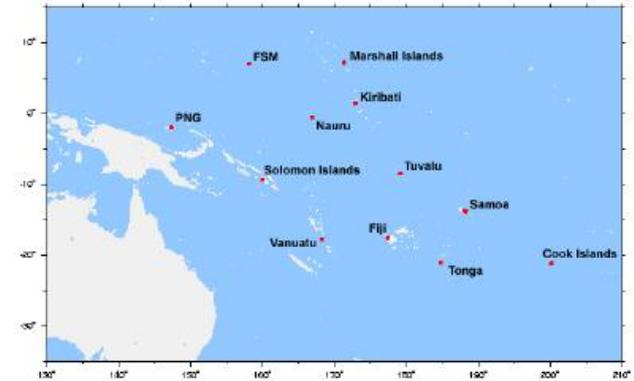


Australia-Japan



JAXA QZSS Master Station
Mount Stromlo, Canberra

Australia-Pacific



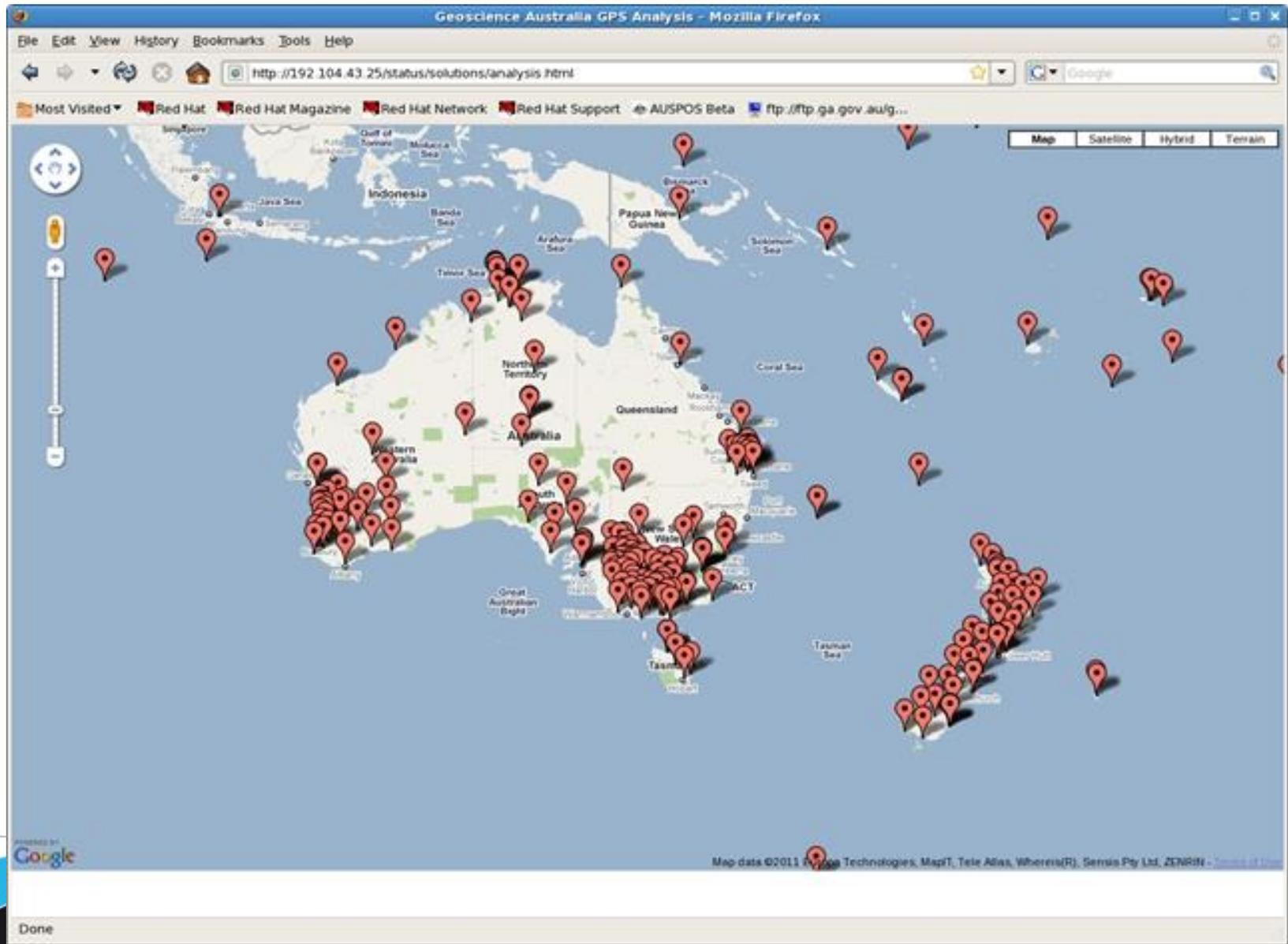
Australia-China



SOME LINKS

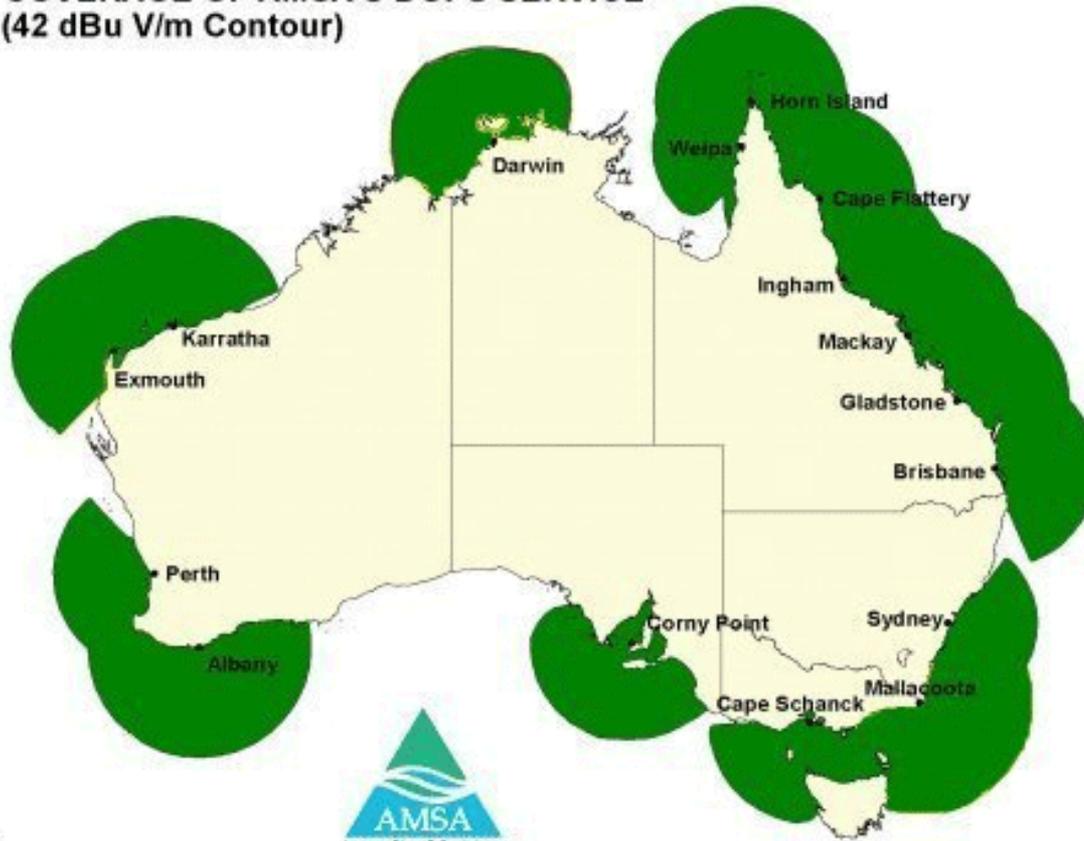
- GeoScience Australia - <http://www.ga.gov.au/>
 - Asia Pac Reference Frame
 - Sea Level Monitoring
 - Geo Magnetic Study
- www.igs.org
- Australian Augmentation Study
 - <http://www.ignss.org/LinkClick.aspx?fileticket=dKQ6MsXGBAw%3D&tabid=56>

REGIONAL CORS NETWORK



AMSA DGPS

COVERAGE OF AMSA'S DGPS SERVICE
(42 dBu V/m Contour)



Legend

- DGPS Aids
- Aids to Navigation Coverage

Coordinate Systems - GEOGRAPHICAL
Please note distance measurements
in this coordinate system
will not be accurate.

Conversion: 1 Nautical Mile = 1.853 Km

0 400 800 Kilometres

ITS

- Intelligent Transport Systems
 - Multiple integrated systems
 - GNSS, SBAS, 4G, radar, infrared, sim video,
 - Fully imported vehicle fleet
- International systems
 - National use
 - Incompatible or not available e.g. SBAS
 - Unauthorised frequencies and/or interference
- No risk assessments

GNSS VISIBILITY IN AUSTRALIA

- GPS, GLONASS, Galileo, Beidou
- IRNSS
 - GAGAN
- MSAS
- QZSS
- KSS?
- Non Government systems



THE TRANSITION TO A SPACE-BASED CNS INFRASTRUCTURE



Australian Government
Civil Aviation Safety Authority

www.casa.gov.au



safe skies for all

OneSKY PROGRAM

- Airservices OneSKY Australia program
- From 2018, Australia will be providing air traffic control services using the most advanced and integrated air traffic control system in the world.
- Through collaborating with the Department of Defence, it will unify Australian skies under a new, harmonised air traffic management system.



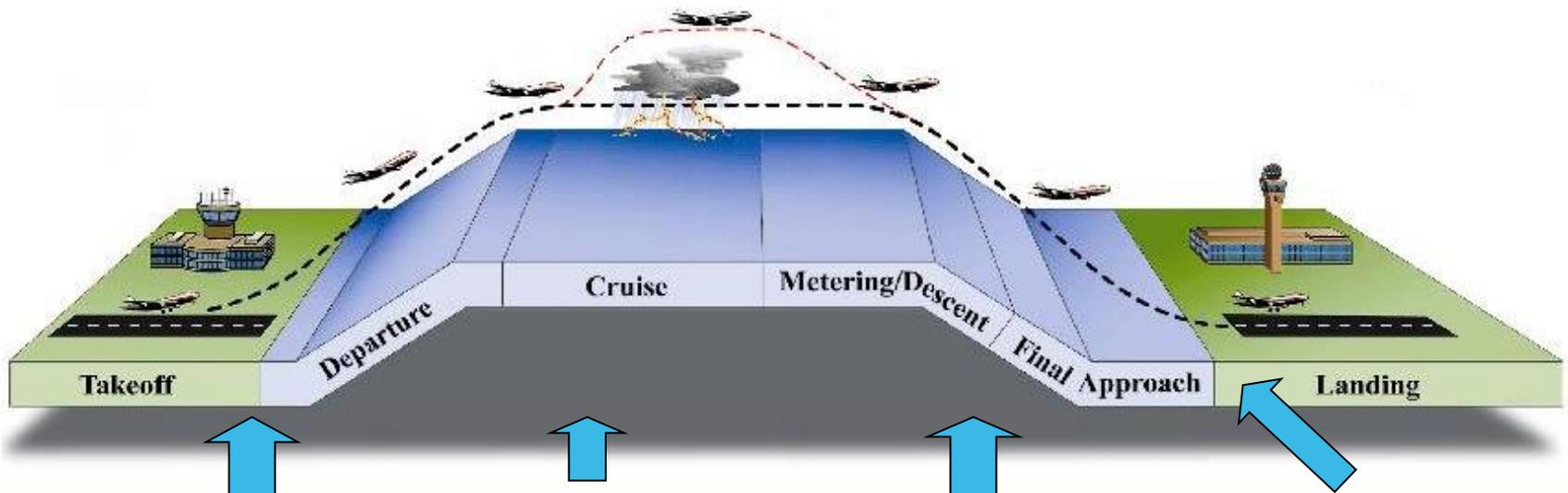


TODAY'S AIRCRAFT



No ADF or DME

PBN Concept



RNP 1
SIDs

RNP 4
RNP 2

RNP 1
STARs

RNP APCH
or
RNP AR
APCH

CNS EQUIPMENT MANDATES

GNSS

6 Feb 2016

Mandatory GNSS equipment for IFR flight
Performance Based Navigation (PBN)

RNP

26 May 2016

RNP across Australia

200+ Navaids removed

BNN

Back up network – to support transition

ADS-B

2 Feb 2017

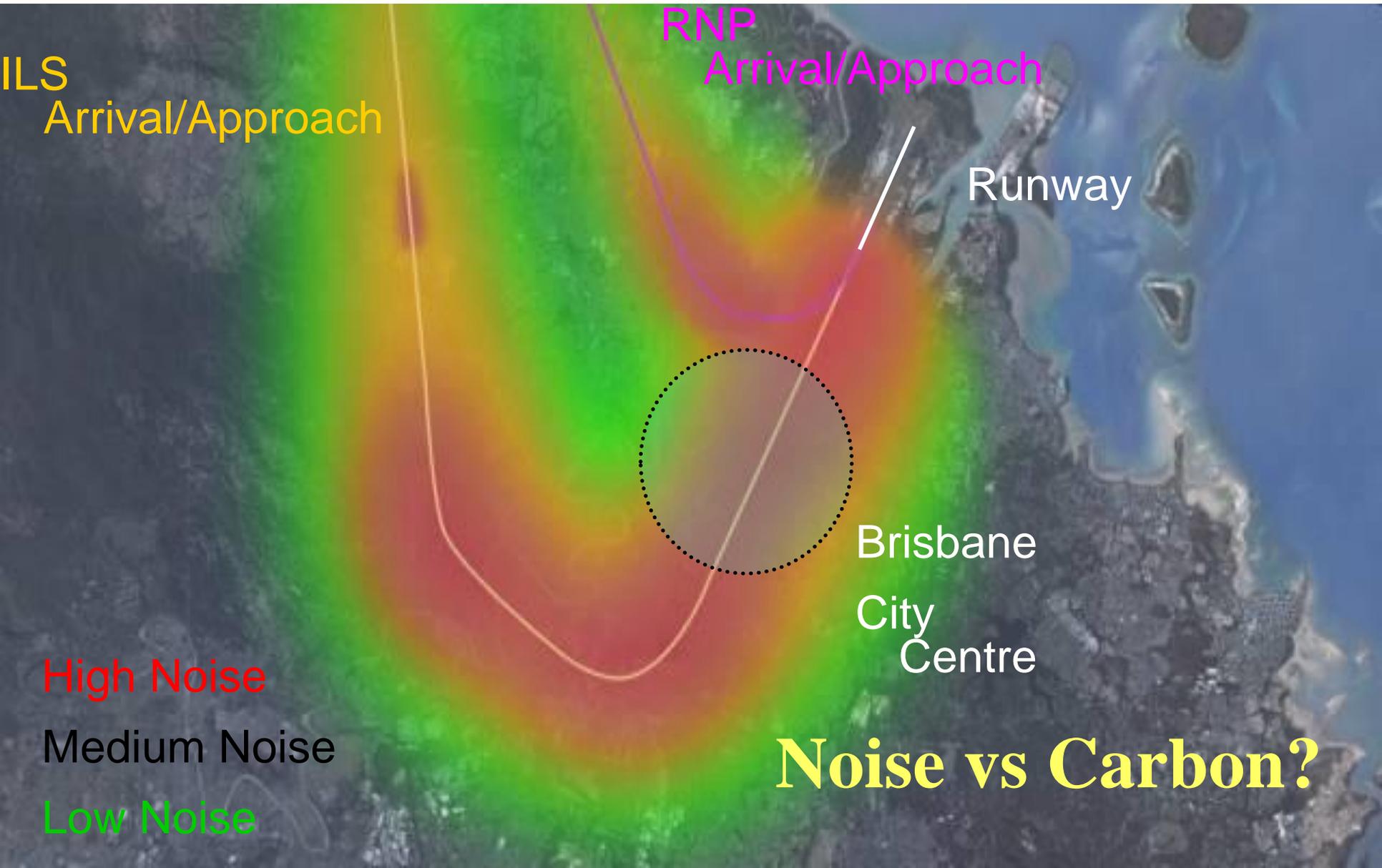
COMS

HF remains

Data link in place

Sat Com Voice for ATC – to be approved

PBN at Work





MAN
AUTO
HUD SRT

FUEL PUMPS
OFF
ON CTR
L R
AFT OFF FWD FWD OFF AFT
FUEL PUMPS
ON 1 ON 2
L WIPER
PARK INT
-LOW
-HIGH
RUNWAY
TURNOFF
OFF
ON
TAXI
OFF
ON
AUTO
OFF
ON

TRANSMITTER
RECEIVER
RADIO RECEIVER ON

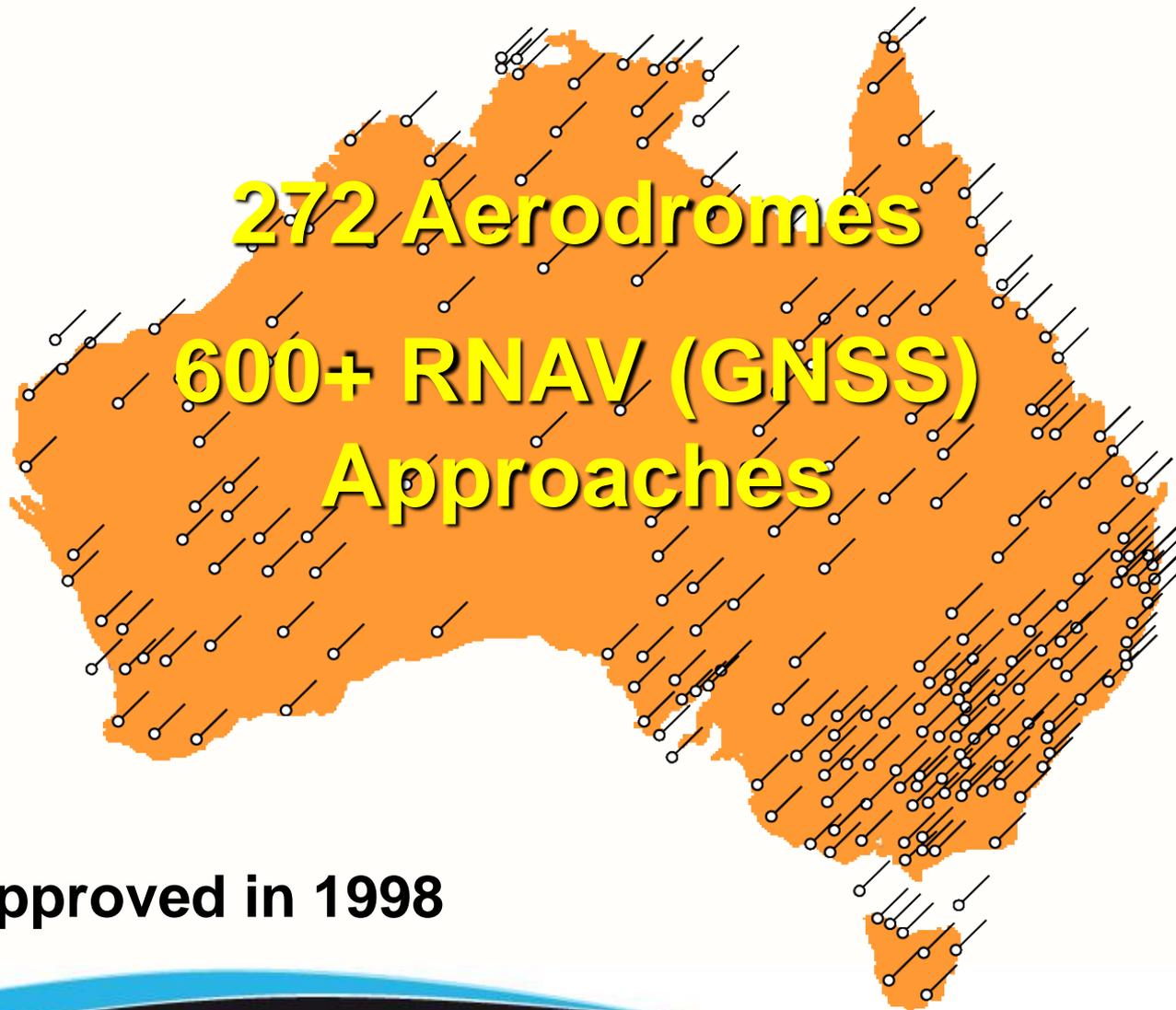
FIRE
PUSH
TO ARM

COURSE 234
A/T ARM
IAS/MACH
V MAX
HEADING 234
ALTITUDE 10500
VOR LOC
SPEED
LVL CHG
HDG SEL
APR
ATT HDG
WIND DRAIN
N SET
WIND
AUTO BRAKE
FUEL FLOW
AUTO
OFF

AD-8737/303
Fuel gauge
WARNING: REPAIRED

PHC 300 | 1.5W | 100W P18

Aerodromes with RNAV (GNSS)

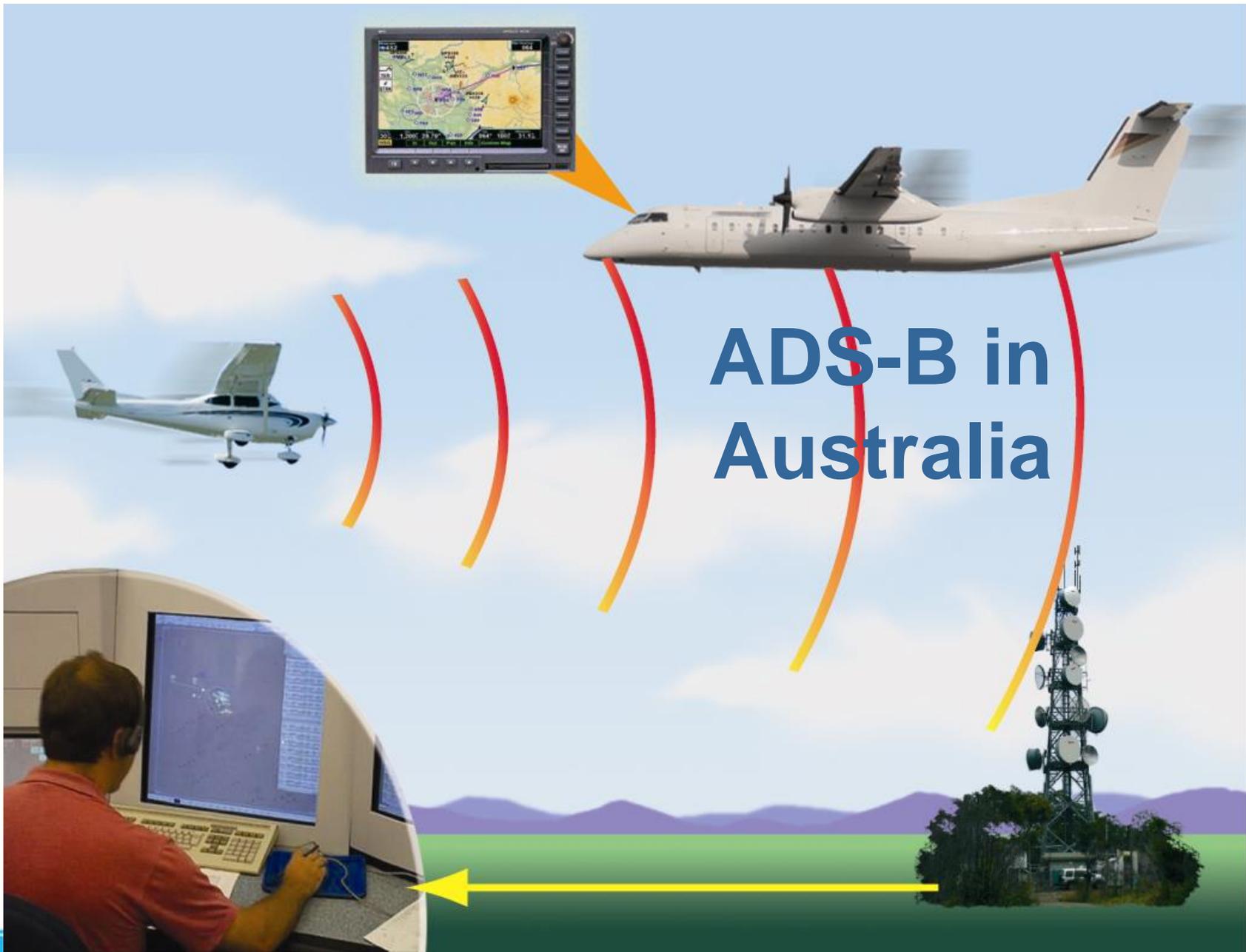


Approved in 1998



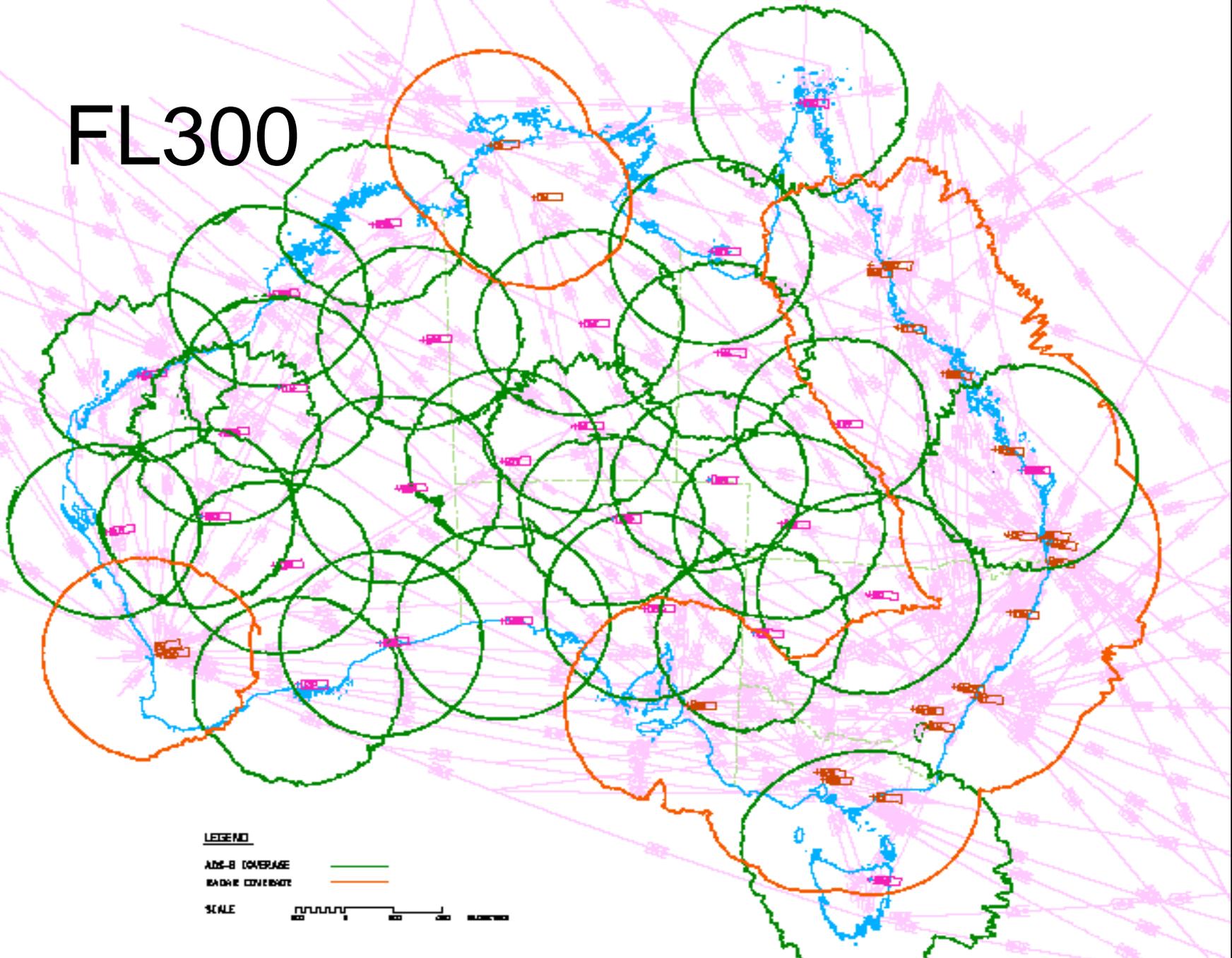
GROUND AID REMOVAL - 2016

- May 2016
- 200+ NDBs, VORs, DMEs to be removed
- Remaining ground aids (BNN) to support TSO C129 GPS + provide (limited) backup
 - TSO C129 requires conventional aid alternate



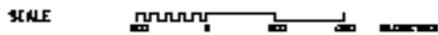
ADS-B in Australia

FL300



LEGEND

- ADD-B COVERAGE 
- RADAR COVERAGE 



SYDNEY GLS





Locata[®]

www.locata.com

Locata Technology

The technology, the development and the business...

Nunzio Gambale – Locata Corp



“I HATE GPS”

- Aston Carter - US Secretary of Defence
- Understandable concern
- 2-4 Billion users around the world
- Impact on GPS funding?
 - Only 21 Sv committed for ICAO
- Development of alternative systems
 - Accelerated R&D?
- How many GPS devices in your household??!

**Two billion GNSS units
now in use**

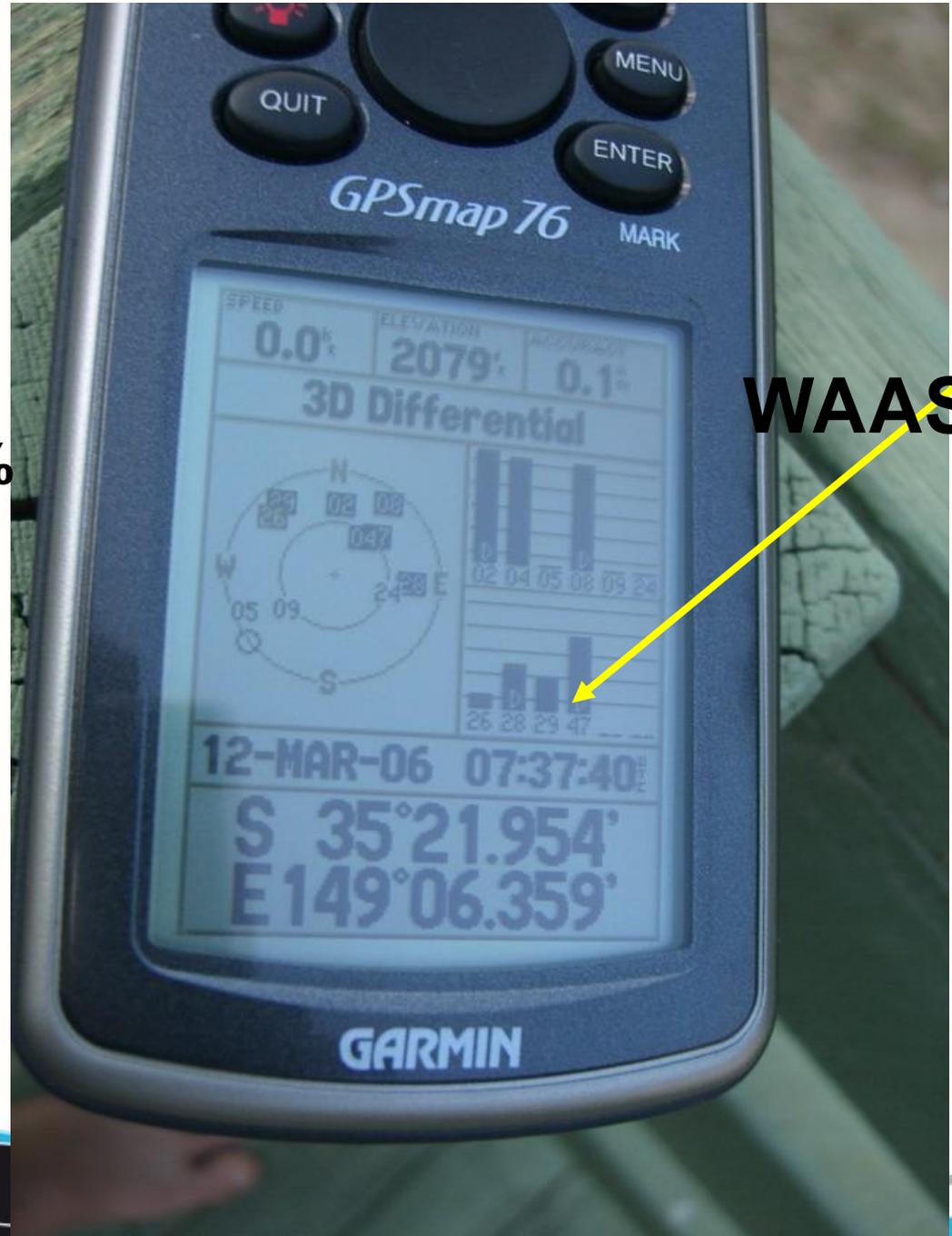
**Many multi-system
with augmentation**

Aviation a minor user <0.1%

Now critical infrastructure

**timing
power
phones
finance
ITS**

+++++



WAAS

GNSS VULNERABILITIES

- Interference
- Solar Flares
- US GPS funding
 - Reduction in GPS constellation <24 satellites?
- Hostilities
- **Back up systems**
 - Existing Ground aids – e.g. DME RNAV
 - Inertial systems, E Loran?
 - US – VOR as interim solution – US HLS Mandate!
 - **Locata** – Australian invention
 - USAF = Multiple GNSS systems – all in view



AVIATION GNSS RISKS

- Aircraft installation!
 - Almost all issues noted are aircraft related
 - Receiver design, installation, software issues
 - Filtering, antennae position, out of date software
- Data integrity
 - data base issues – new Part 175 rule
- Human Factors
 - 467 page GNSS Pilot Manuals!
 - VFR into IFR – GNSS made this worse
 - Receiver differences between aircraft
 - Pilots unaware, or uncertain of issues
- External threats – jamming, spoofing

SBAS ISSUES

- Australia can see a number of SBAS satellites
 - MSAS, GAGAN, WAAS, China?
- Most GNSS receivers SBAS capable
 - Some can deselect the SBAS
 - Some cannot deselect – manufacturer option
 - Paper to ICAO – FAA advised
- Software issues – receivers not updated
- MSAS issue – Sv 137
 - Total loss of navigation
 - Need for advice on issues by providers

MH 370 SEARCH

- Search for aircraft is continuing
- New contract for underwater search
 - Redefined search area
 - Drift plots on wreckage found?
- Continued support of investigation efforts
- Involvement in Global Tracking initiative

SUMMARY

- Australian transitioning to a space-based CNS infrastructure
- Need national reporting, location system
- Safety risks for ITS not designed for Australia
- Continued development of GNSS receivers
 - Multi-constellation Multi-frequency
 - Long implementation times for new fitment
- Deployment of a national SBAS?
- Continued R&D into alternate technologies and multi-constellation solutions for all users

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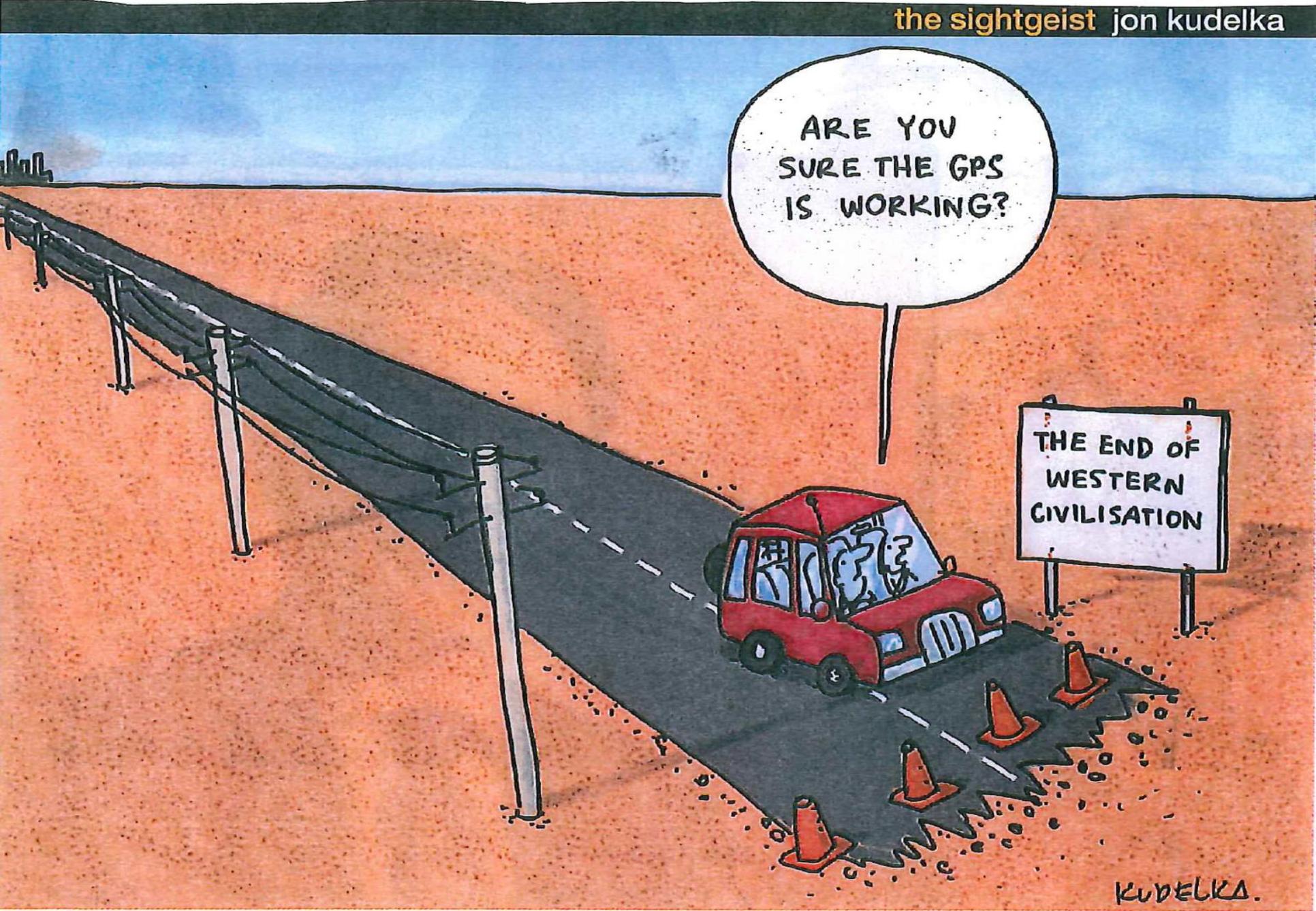
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QUESTIONS AND DISCUSSION



australia



photo: michalturski.com