Too difficult for helicopter; too slow by fixed wing – Examining the role of the tilt-rotor in inter-hospital medical retrieval

Andrew Berry

NETS

Newborn & pædiatric Emergency Transport Service

Overview

- Profile of NETS
- Vehicles available to NETS
  - Fixed wing
  - Helicopter
  - Road
- Possibilities offered by the BA 609
- Cost and effectiveness

Profile

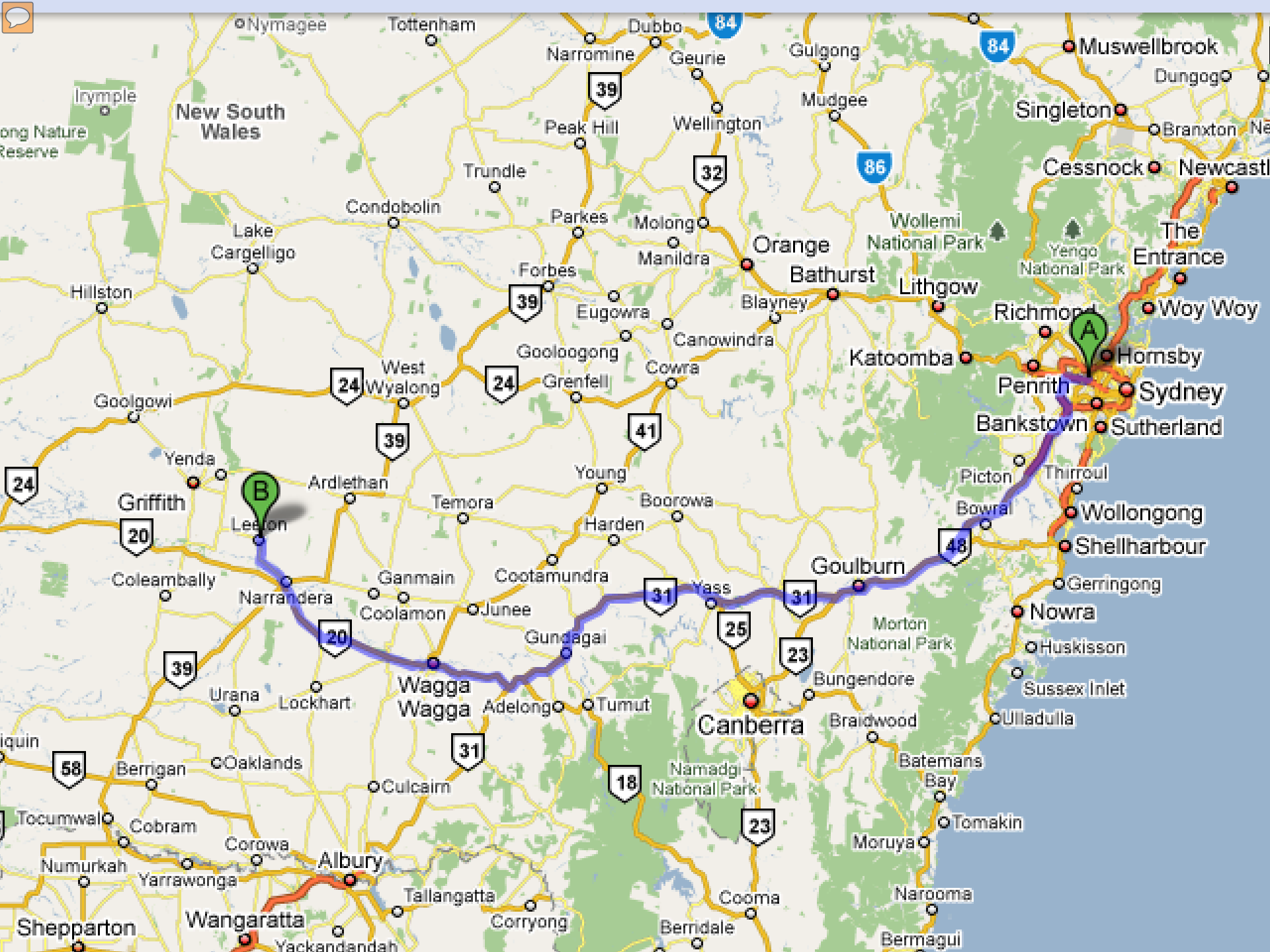
- Specialist inter-hospital retrieval service
- A gazetted ‘ambulance service’ in NSW/ACT
  - 34% of the national population (7.5m)
  - 254 hospitals served
- Neonatal & paediatric patients to age 16 years
- Coordination of complex maternal transfers
- Pioneer in clinical call conferencing
- An extension of the hospital system
- 1:49 uses the service; sometime in childhood

Bases

- Sydney (Road/RW/FW). Neonate & Paed.
- Canberra (Road) Neonates
- Hunter (Road/RW) Neonates

Scenario

- Imminent birth of twins at 29 weeks in Leeton
- 575km 7 hours from Sydney
- No ventilator
- Nearest paediatrician – Griffith 65km
- Decision path
  - Go now? Await delivery?
  - Advice & support — NETS team(s) mobilised
  - Destination city? — FW or RW?
  - Regional response?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Dungog
Irymple
New South Wales
Peak Hill
Wellington
Mudgee
Singleton
Branxton
Trundle
Cessnock
Newcastl
Condobolin
Parkes
Molong
Wollemi National Park
Lake Cargelligo
Manildra
Orange
Yengo National Park
The Entrance
Forbes
Bathurst
Lithgow
Hillston
Eugowra
Blayney
Woy Woy
Canowindra
Gooloogong
Katoomba
Hornsby
West Wyalong
Cowra
Grenfell
Penrith
Sydney
Goolgowi
Bankstown
Sutherland
Yenda
Young
Picton
Thirroul
Griffith
Ardlethan
Temora
Boorowa
Bowral
Wollongong
Leeton
Harden
Shellharbour
Coleambally
Goulburn
Ganmain
Cootamundra
Yass
Gerringong
Narrandera
Coolamon
Junee
Nowra
Gundagai
Morton National Park
Huskisson
Wagga Wagga
Bungendore
Sussex Inlet
Urana
Lockhart
Adelong
Tumut
Canberra
Braidwood
Ulladulla
Berrigan
Oaklands
Batemans Bay
Culcairn
Namadgi National Park
Tocumwal
Tomakin
Cobram
Moruya
Corowa
Albury
Numurkah
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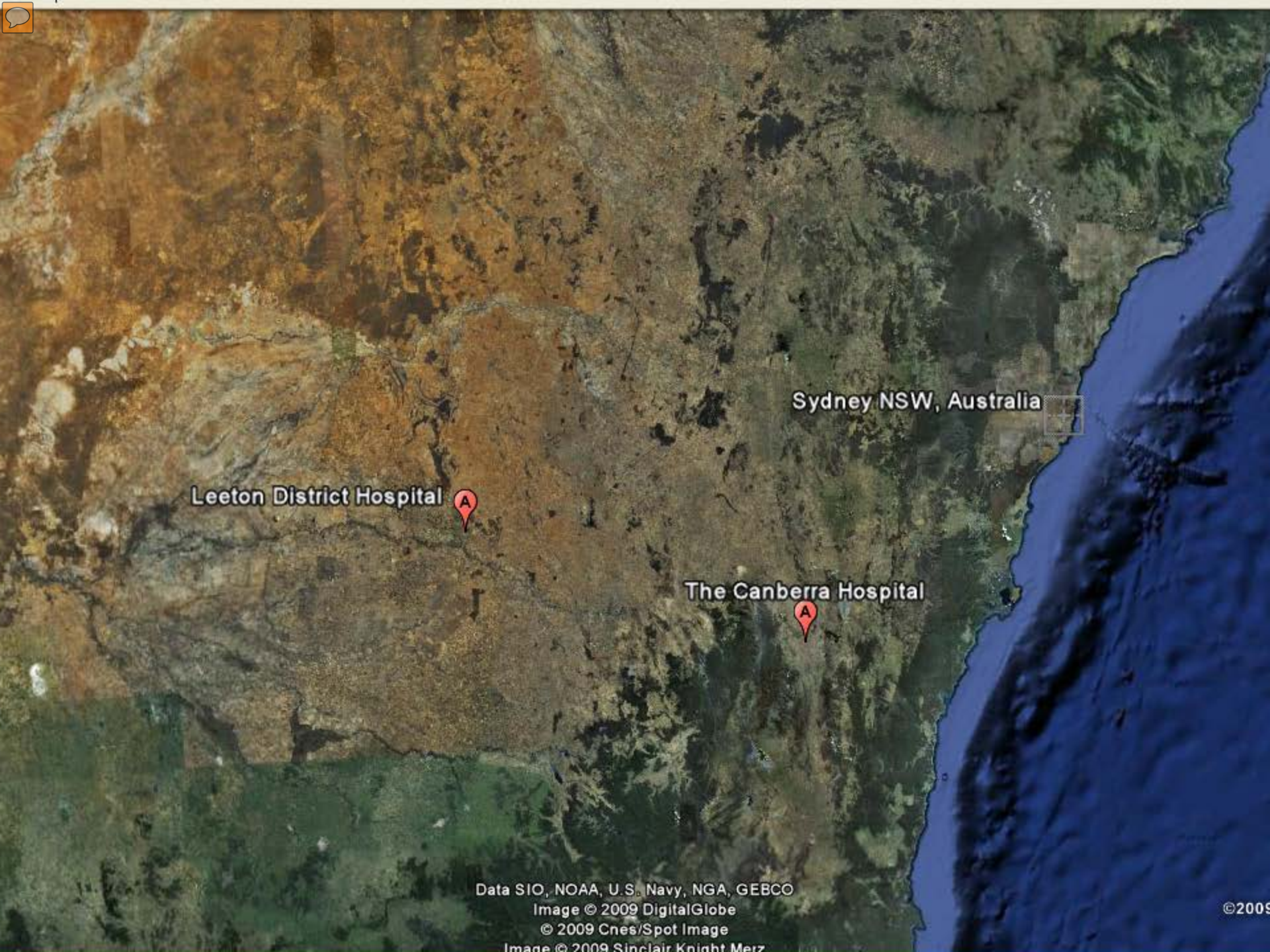
Corryong
Shepparton
Berridale
Bermagui
Yackandandah


Sydney NSW, Australia
Leeton District Hospital
The Canberra Hospital
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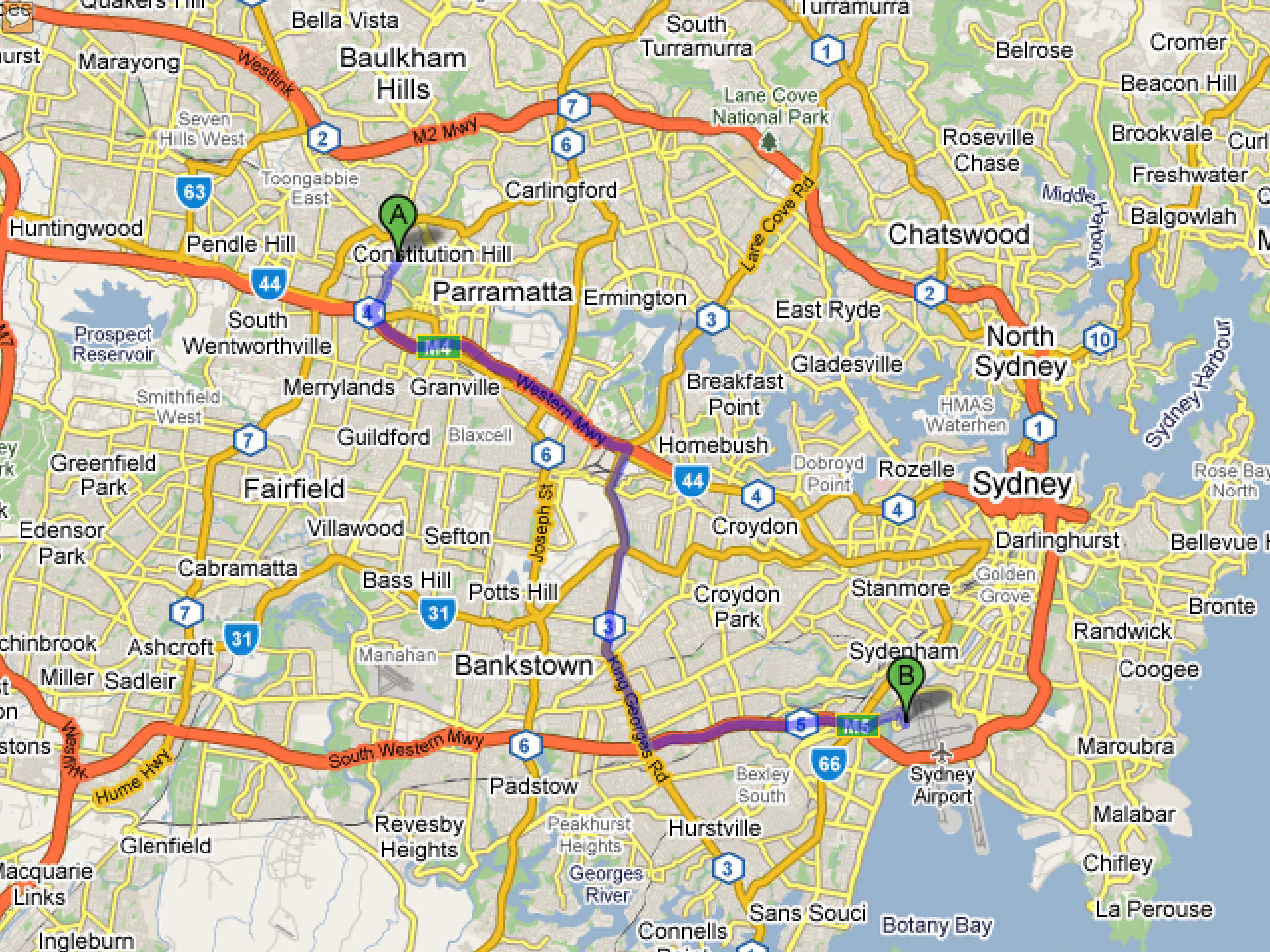
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Seven Hills West
Roseville Chase
Brookvale
Freshwater
Toongabbie East
Carlingford
Middle Harbour
Balgowlah
Huntingwood
Pendle Hill
Constitution Hill
Chatswood
Lane Cove Rd
Parramatta
Ermington
East Ryde
Prospect Reservoir
South Wentworthville
M4
Western Mwy
Gladesville
North Sydney
Sydney Harbour
Smithfield West
Merrylands
Granville
Breakfast Point
HMAS Waterhen
Guildford
Blaxcell
Homebush
Dobroyd Point
Rozelle
Sydney
Greenfield Park
Fairfield
Joseph St
Croydon
Edensor Park
Villawood
Sefton
Darlinghurst
Bellevue
Cabramatta
Bass Hill
Potts Hill
Stanmore
Golden Grove
Croydon Park
Bronte
Ashcroft
Manahan
Bankstown
Sydenham
Randwick
Miller
Sadleir
King Georges Rd
Coogee
Westlink
South Western Mwy
M5
Maroubra
Hume Hwy
Padstow
Bexley South
Sydney Airport
Revesby Heights
Peakhurst Heights
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Malabar
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Chifley
Sans Souci
La Perouse
Botany Bay
Connells
Ingleburn
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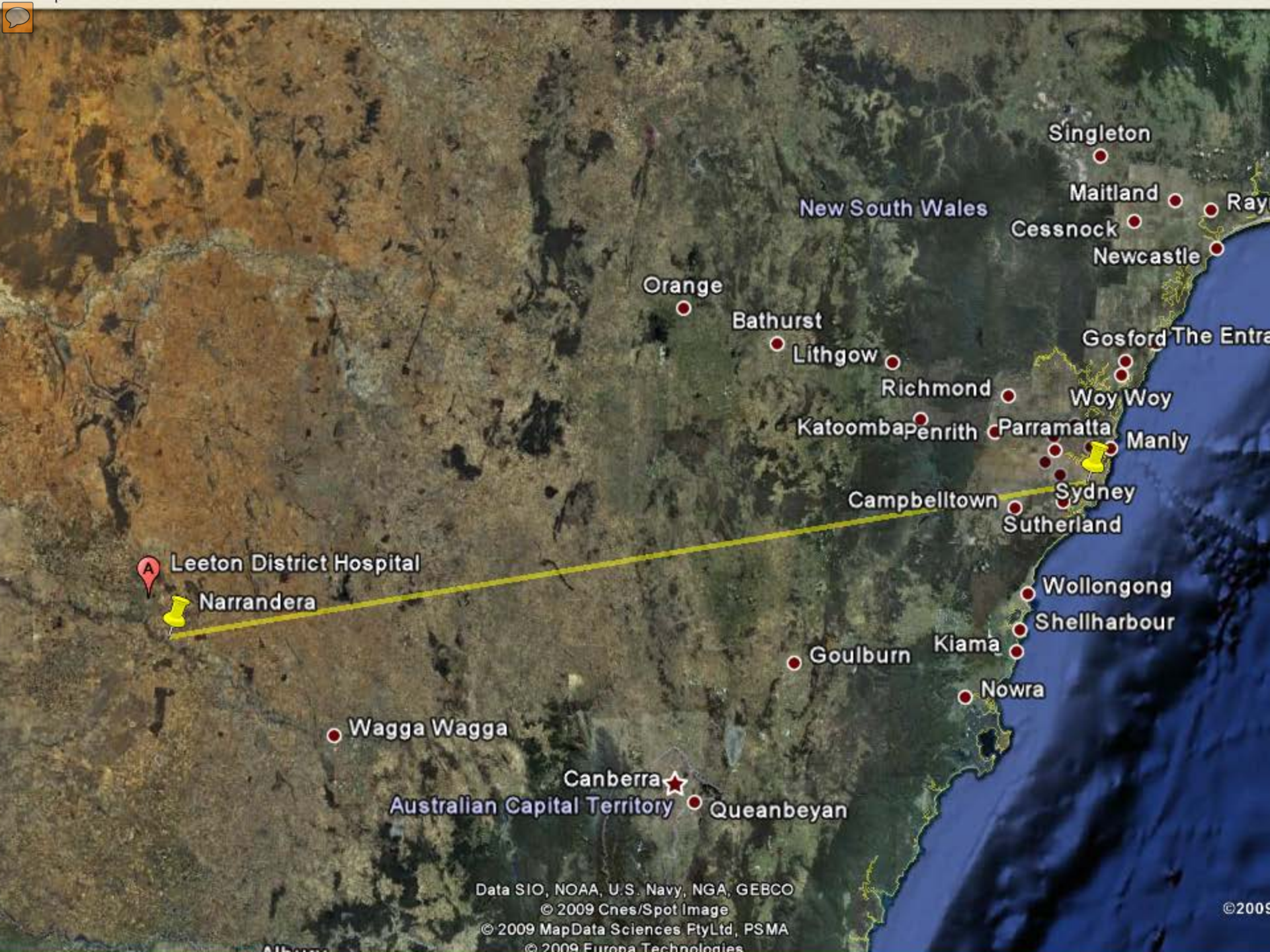
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Richmond
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Katoomba
Penrith
Parramatta
Manly
Sydney
Campbelltown
Sutherland
Leeton District Hospital
Narrandera
Wollongong
Shellharbour
Kiama
Goulburn
Nowra
Wagga Wagga
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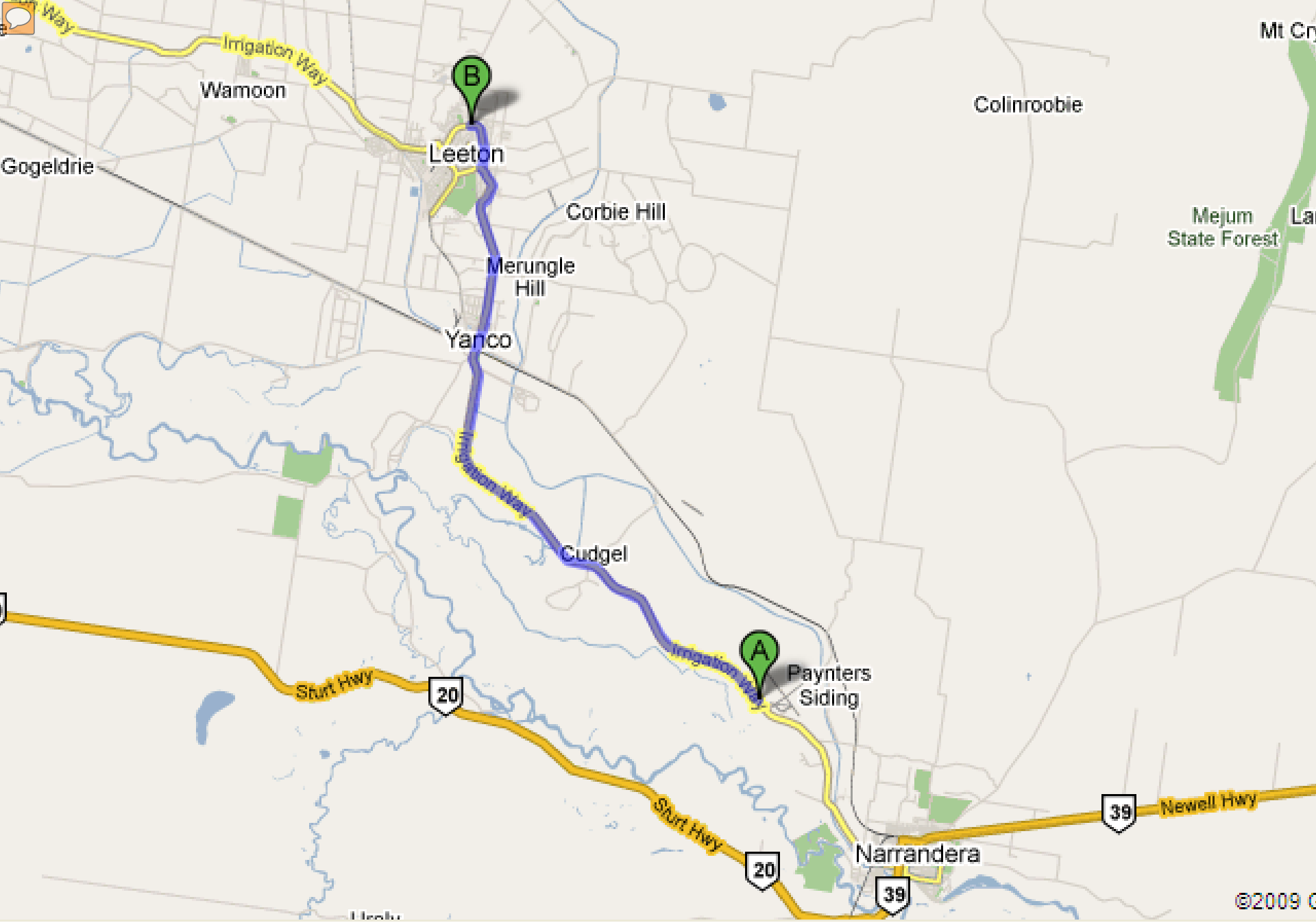
Irrigation Way
Wamoon
B
Leeton
Gogeldrie
Colinroobie
Corbie Hill
Mejum
State Forest
Merungle
Hill
Yanco
Irrigation Way
Cudgel
A
Paynters
Siding
Sturt Hwy
20
Sturt Hwy
20
39
Newell Hwy
Narrandera
39
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Response times

- "Decision to task" *to* "First Look"
- Fixed wing (Beech 200 – King Air)
  - Base to airport (25km) | Flight planning
  - Aircraft availability/Fuel/Loading
  - Flight time (55 mins)
  - Ambulance transfer airport to hospital (24km)
  - 4:31

- Rotary Wing (AS365N2 or BK117)
  - Flight planning/Loading
  - Flight time (116 mins)
  - Ambulance transfer from showground to hospital
  - 3:19

Fixed wing

- Fast - 250kt cruise
- Pressurised
  - Flight at levels
  - Patient care
- Anti-icing
- Moderate cost $4,772

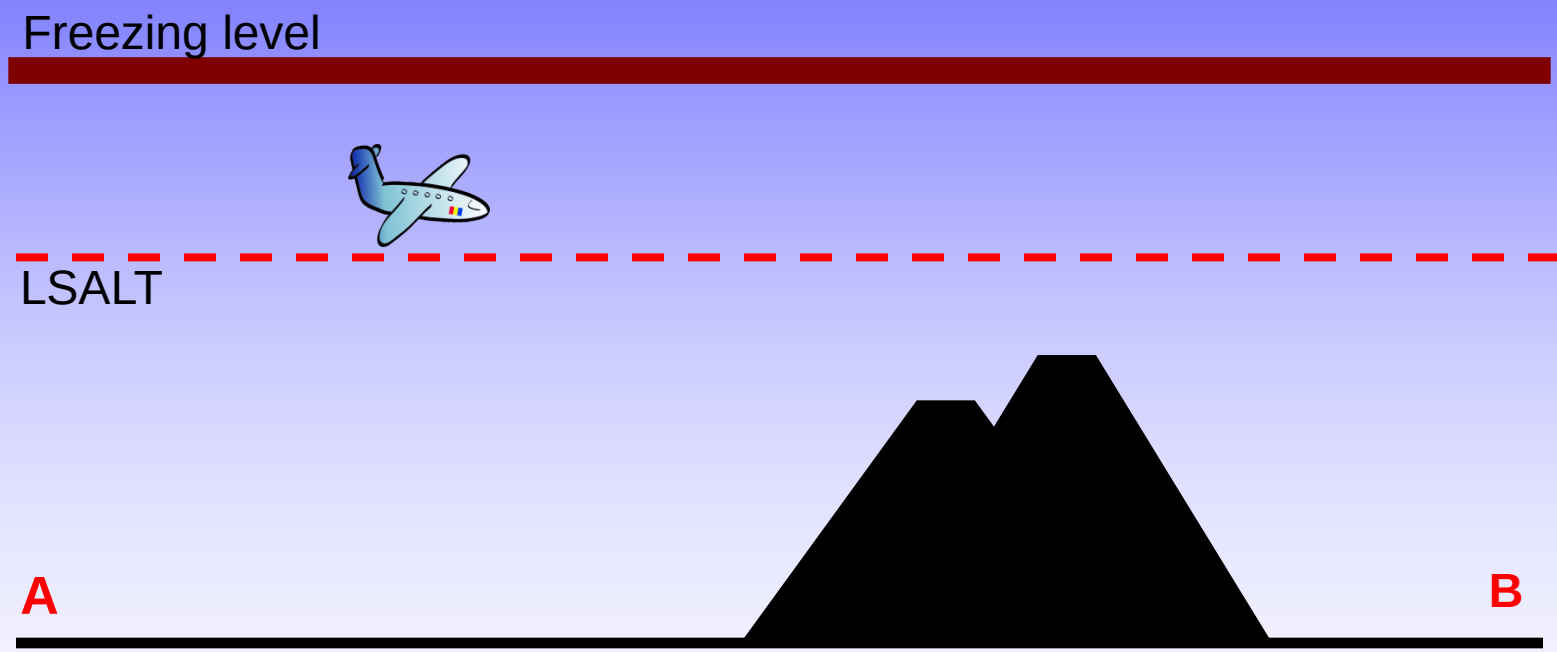
- Flight is 20% of RT
- Availability
- 1 ICU patient & team
- Fuel load management
- Complex, high loading
- Duty time
- Opportunity cost

Helicopter

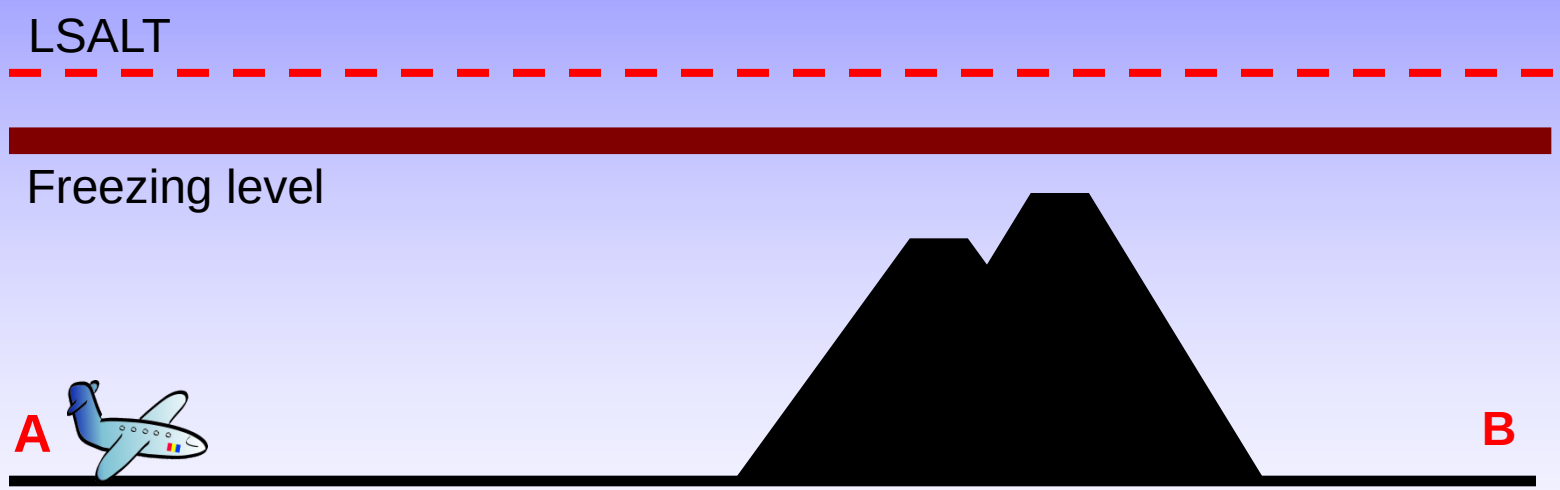
- Point-to-point (mostly)
- Flight time 58% of RT
- Slide loading
- Duty time

- Slow - 120kt
- Flight is 60% of RT
- Range & endurance
- No flight in/near icing
- LSALT & FZL
- Turbulence
- Mission decline rate
- 1 ICU patient & team
- High cost $11,276

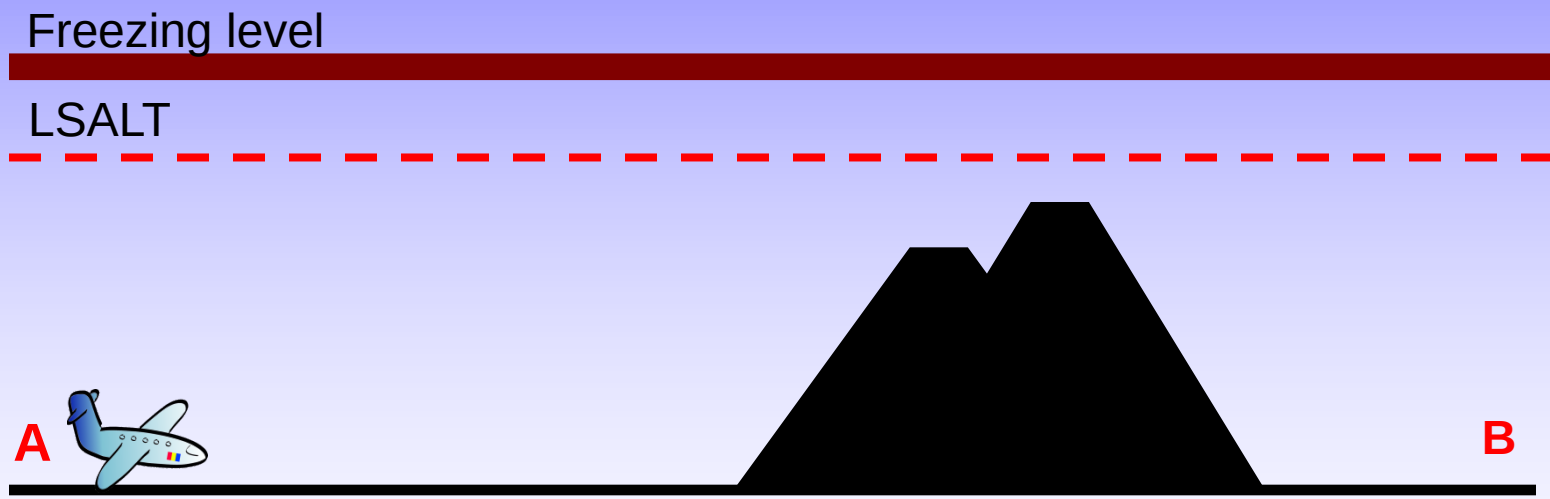
LSALT versus FL



FL below LSALT

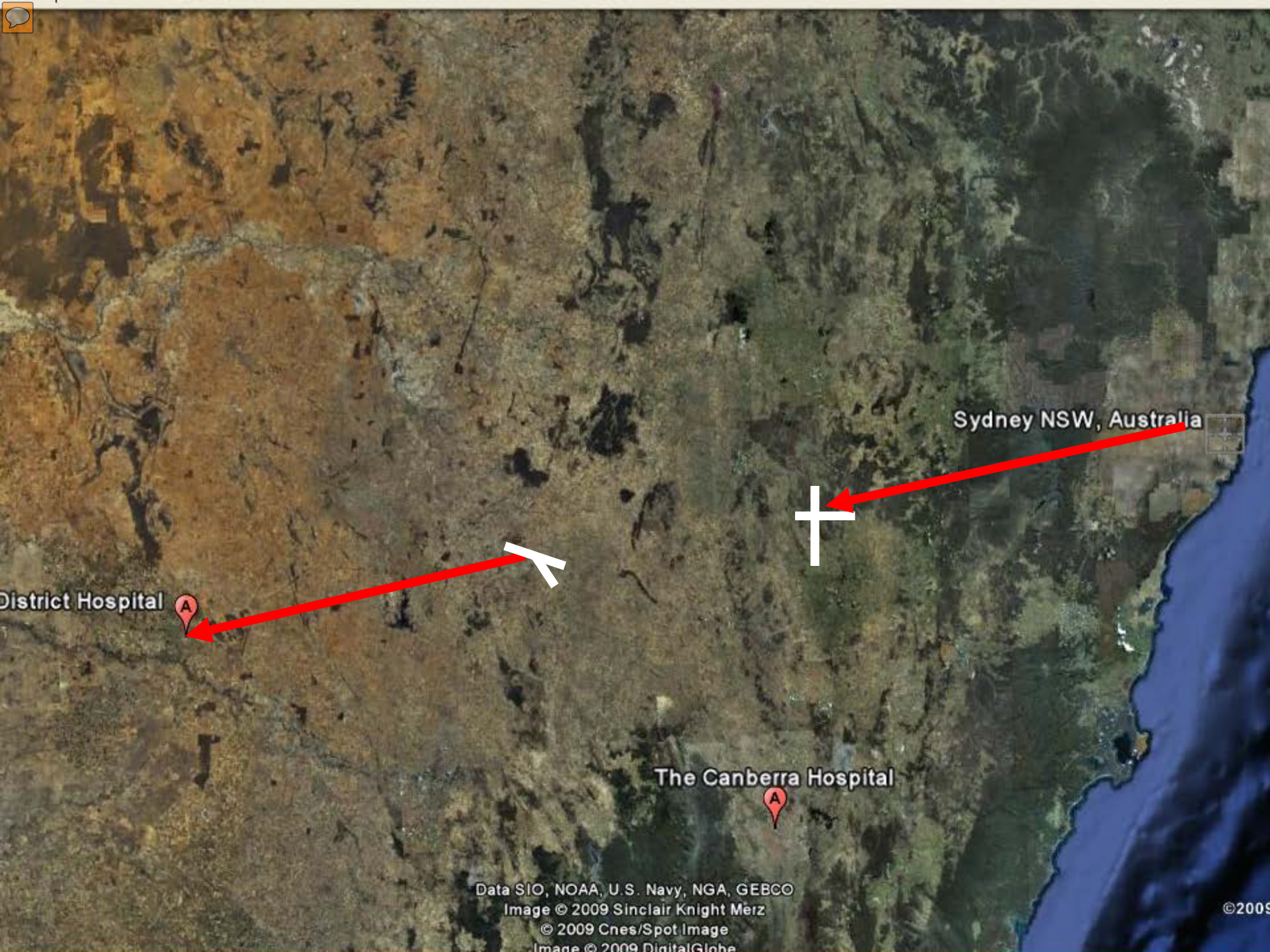


FL too close to LSALT



Country Hospital - 1952

Country Hospital - 2005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The Canberra Hospital
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Best of both worlds?

- Hybrid aircraft
- Based on V22 (Osprey) – 140 in operation

The hype

- Range - 750nm (1,000 with aux.) – no reserves
- Cruise - 275k cruise (say 250k)
- Ceiling - 25,000 ft
- HOGE - 5,000 ft
- Utilises existing helipad infrastructure
- Pressurised
- Certified for IFR flight into known icing conditions
- Two critical care patient capacity
- Easy loading – wide door; knee height sill

Numbers

MTOW	7.631 t
Useful payload	2.5 t
Footprint	18.3m X 13.3m
Height	4.5m
Fuel capacity	3,101 L
Engines	PT6C 67A
Cockpit	Collins Proline 21

Cost

- High capital cost
  - $US15 million
  - Comparable to modern medium twin helicopter
- Low operating cost
  - DOC $1,200 per hour
  - Comparable to Beech King Air

The angst

- First of type
  - Initial flight March 2003
  - Currently in icing tests
  - Customer launch 2011
- High capital cost - $US15m
- V22 (Osprey) problems – 4 accidents

NETS mission flight planning

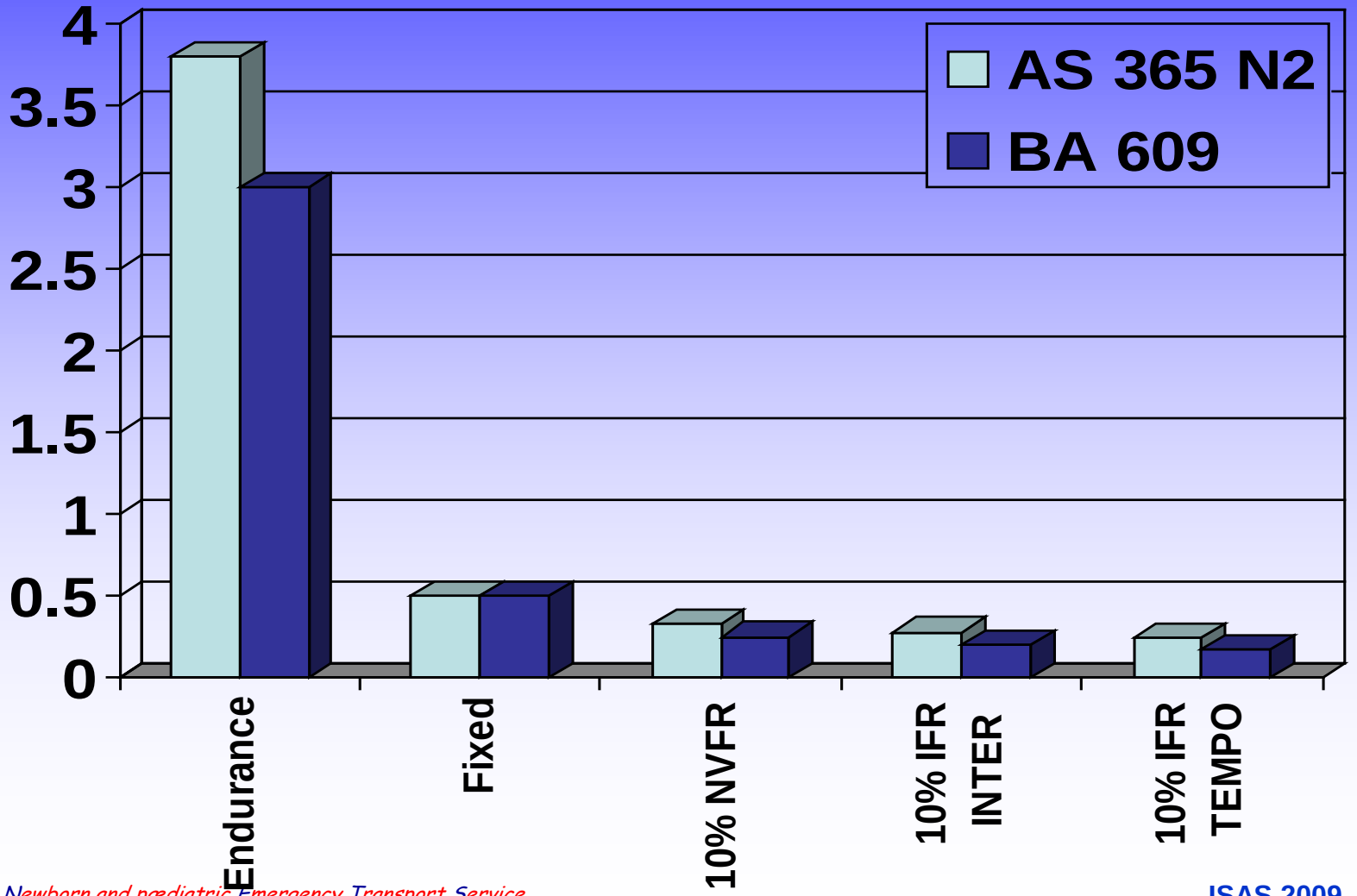
- Weather Operational Fuel requirements
  - INTER; a weather condition below landing minima lasting for up to 30 minutes
    - Requires 30 minutes holding fuel
  - TEMPO; a weather condition below landing minima lasting up to 60 minutes
    - Requires 60 minutes holding fuel
- Fuel policy
  - All missions must hold 30 minute fuel reserve
  - Night VFR and IFR must hold an additional 10% of the fuel remaining after all other reserves have been accounted

BA 609 performance

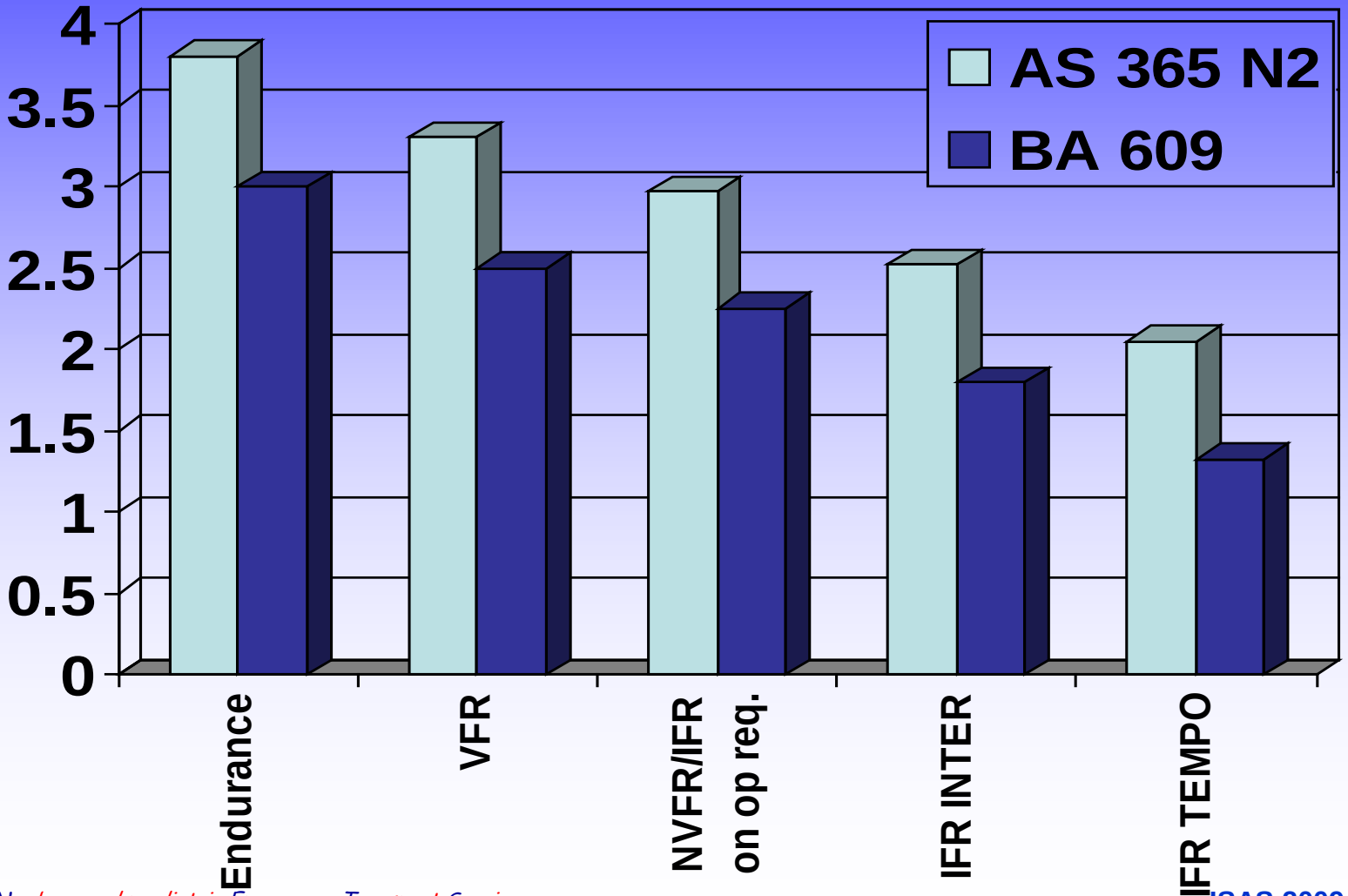
- Source of performance figures
  - http://www.bellagusta.com/air_ba_main.cfm
  - http://www.agustawestland.com/product/ba609
- Limitations
  - No company performance charts available. Website figures should be treated as a guide only.
- Assumptions
  - Maximum fuel load available for all environmental conditions (based on Bell Agusta quoting 5000-ft Hover Out of Ground Effect at Max Gross Weight)
  - Assumed cruise fuel flow for hold
  - Bell Agusta states 275 knot cruise, assumed 250 knot cruise to allow for other assumption-induced inaccuracies

	BA 609	AS365	Applicable Reserves
Endurance (hours)	3	3.8	
Cruise Speed (kts)	250	125	
Fixed Reserve (hours)	0.5	0.5	
10% reserve NVFR (hours)	0.25	0.33	
10% reserve IFR INTER (hrs)	0.2	0.28	
10% reserve IFR TEMPO (hrs)	0.175	0.247	
Available Cruise (hours)			
VFR	2.5	3.3	Fixed Reserve Only
NVFR/IFR - no op requirement	2.25	2.97	Fixed, 10% Reserve NFVR
IFR - INTER (less 30min)	1.8	2.52	Fixed, 10% Reserve IFR INTER, 30 minutes for INTER
IFR - TEMPO (less 60 min)	1.325	2.053	Fixed, 10% Reserve IFR TEMPO, 60 minutes for TEMPO
Range (nm)			
VFR	625	412.5	Fixed Reserve Only
NVFR/IFR - no op reqm	562.5	371.25	Fixed, 10% Reserve NFVR
IFR - INTER (less 30min)	450	315	Fixed, 10% Reserve IFR INTER, 30 minutes for INTER
IFR - TEMPO (less 60 min)	331.25	256.625	Fixed, 10% Reserve IFR TEMPO, 60 minutes for TEMPO

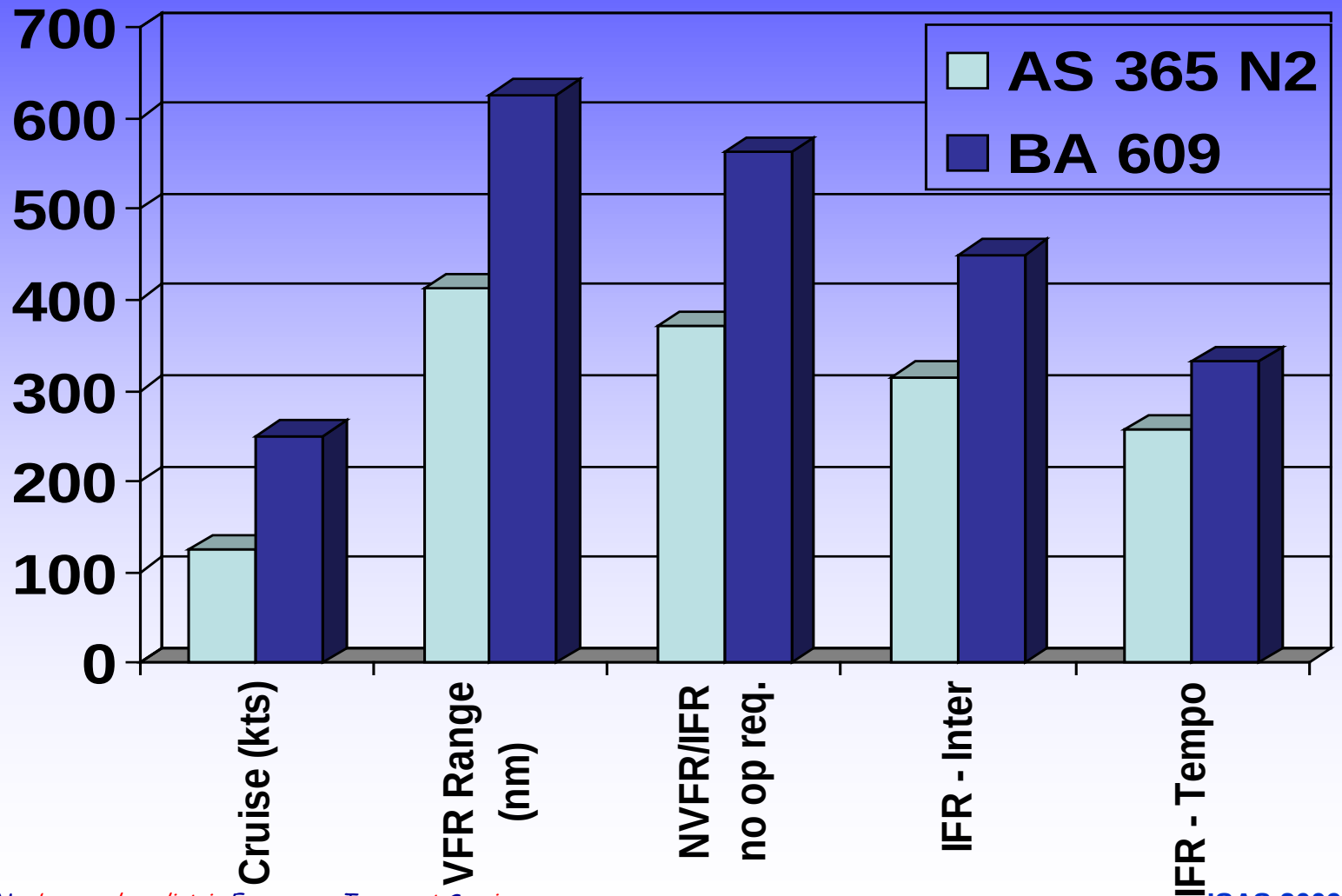
Endurance & Reserves (hours)



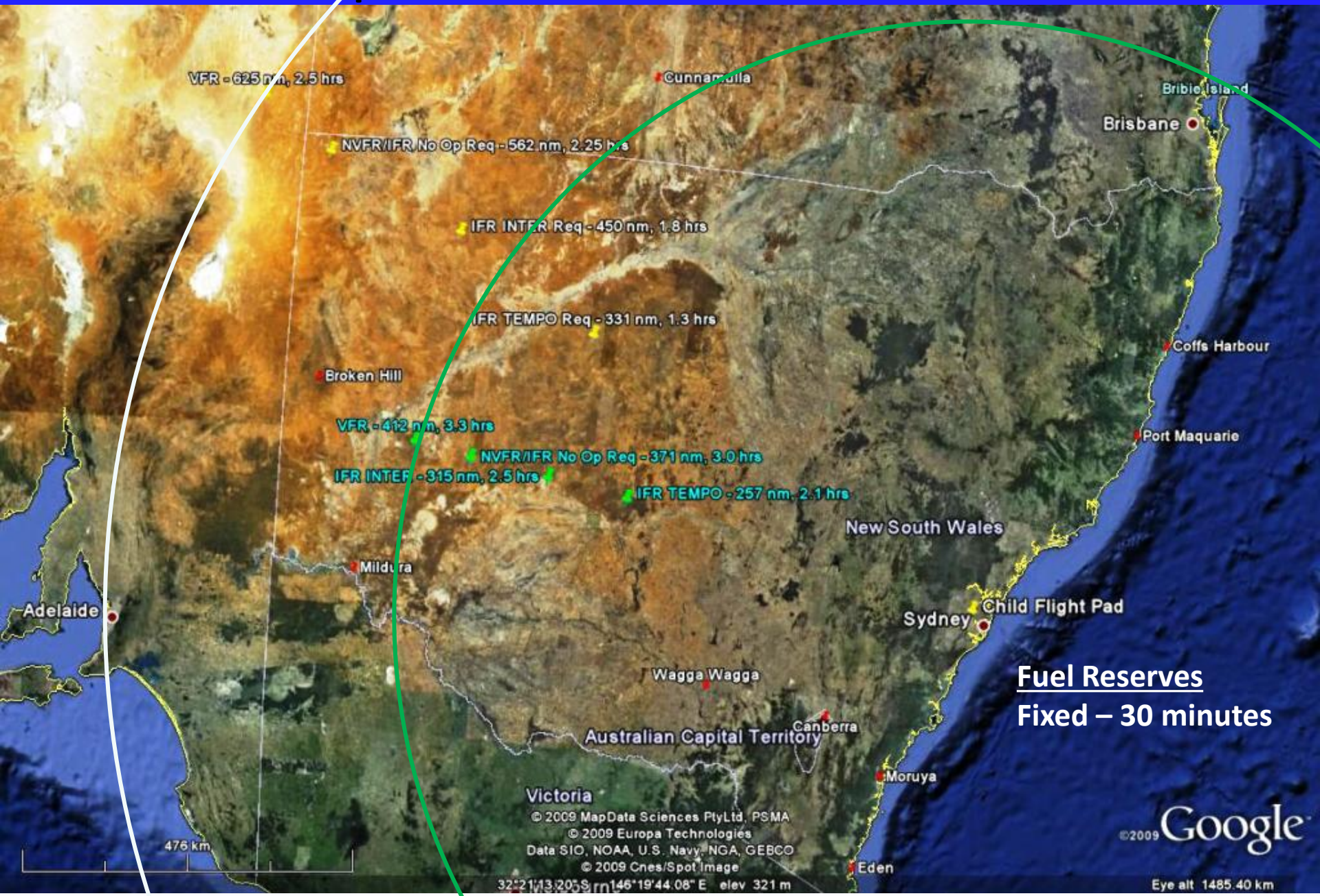
Available cruise (hours)



Cruise & Range



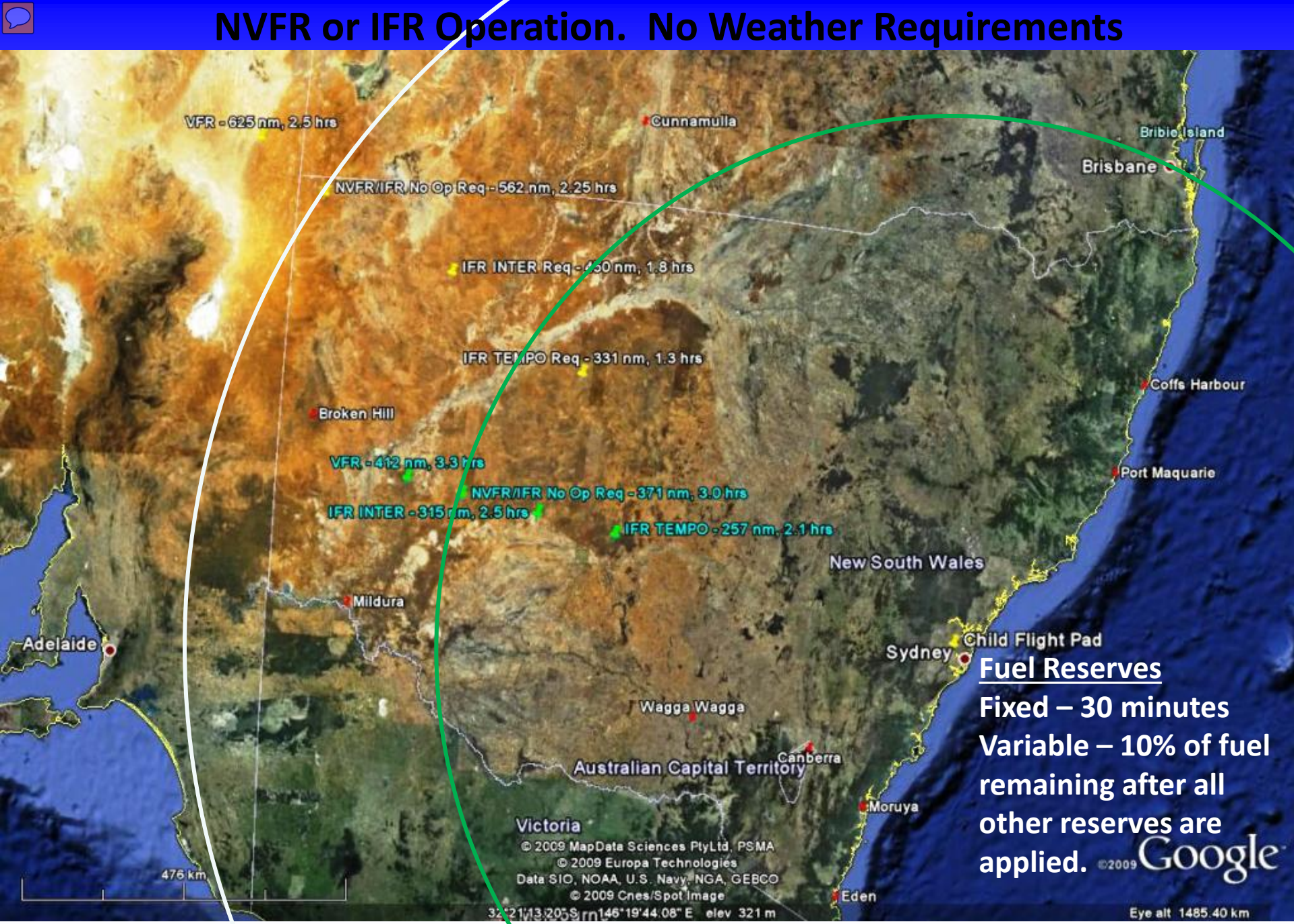
VFR Operation. Fixed Reserve of 30 minutes



Fuel Reserves

Fixed – 30 minutes

NVFR or IFR Operation. No Weather Requirements

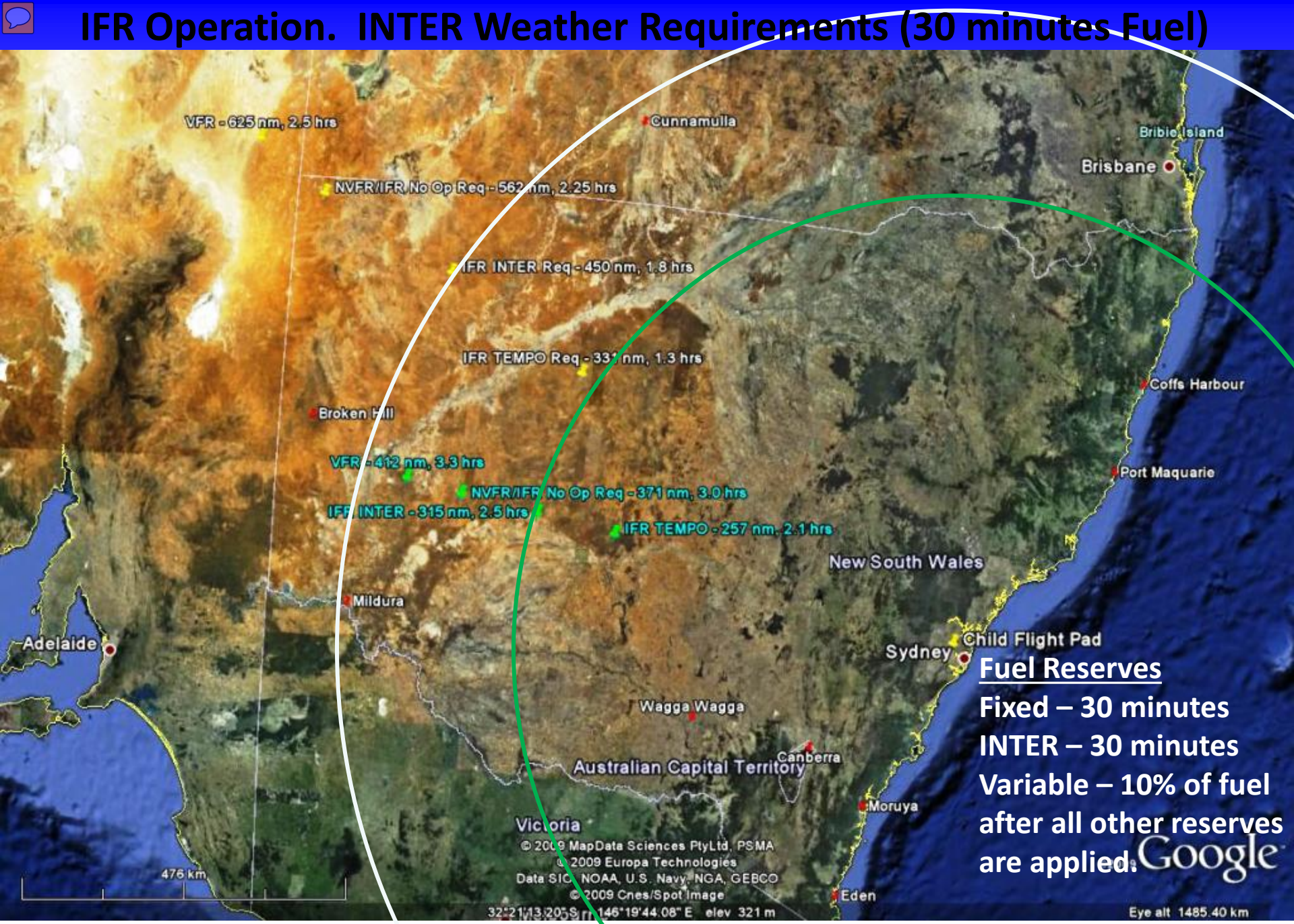


Fuel Reserves

Fixed – 30 minutes

Variable – 10% of fuel remaining after all other reserves are applied.

IFR Operation. INTER Weather Requirements (30 minutes Fuel)



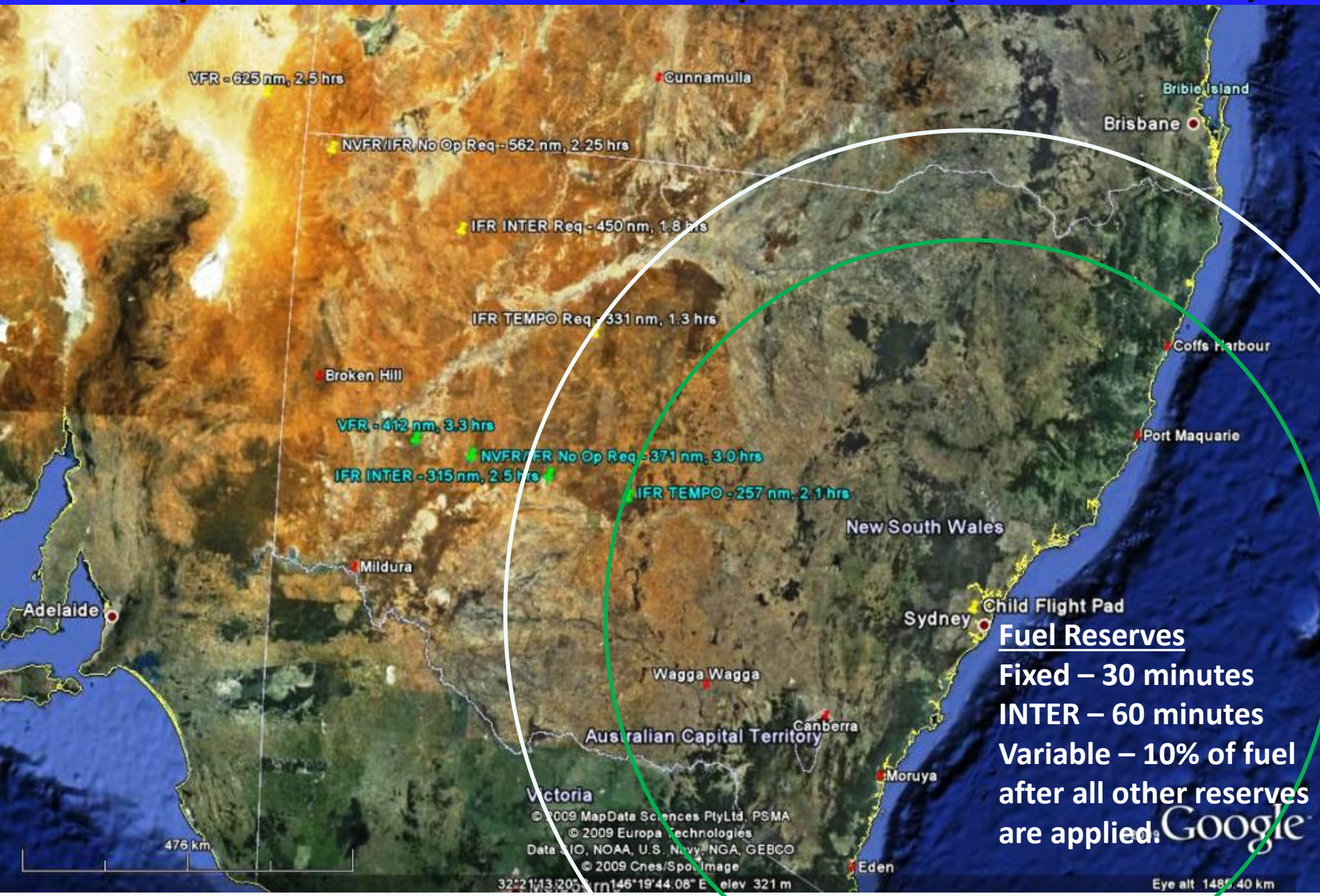
Fuel Reserves

Fixed – 30 minutes

INTER – 30 minutes

Variable – 10% of fuel after all other reserves are applied.

IFR Operation. TEMPO Weather Requirements (60 minutes Fuel)



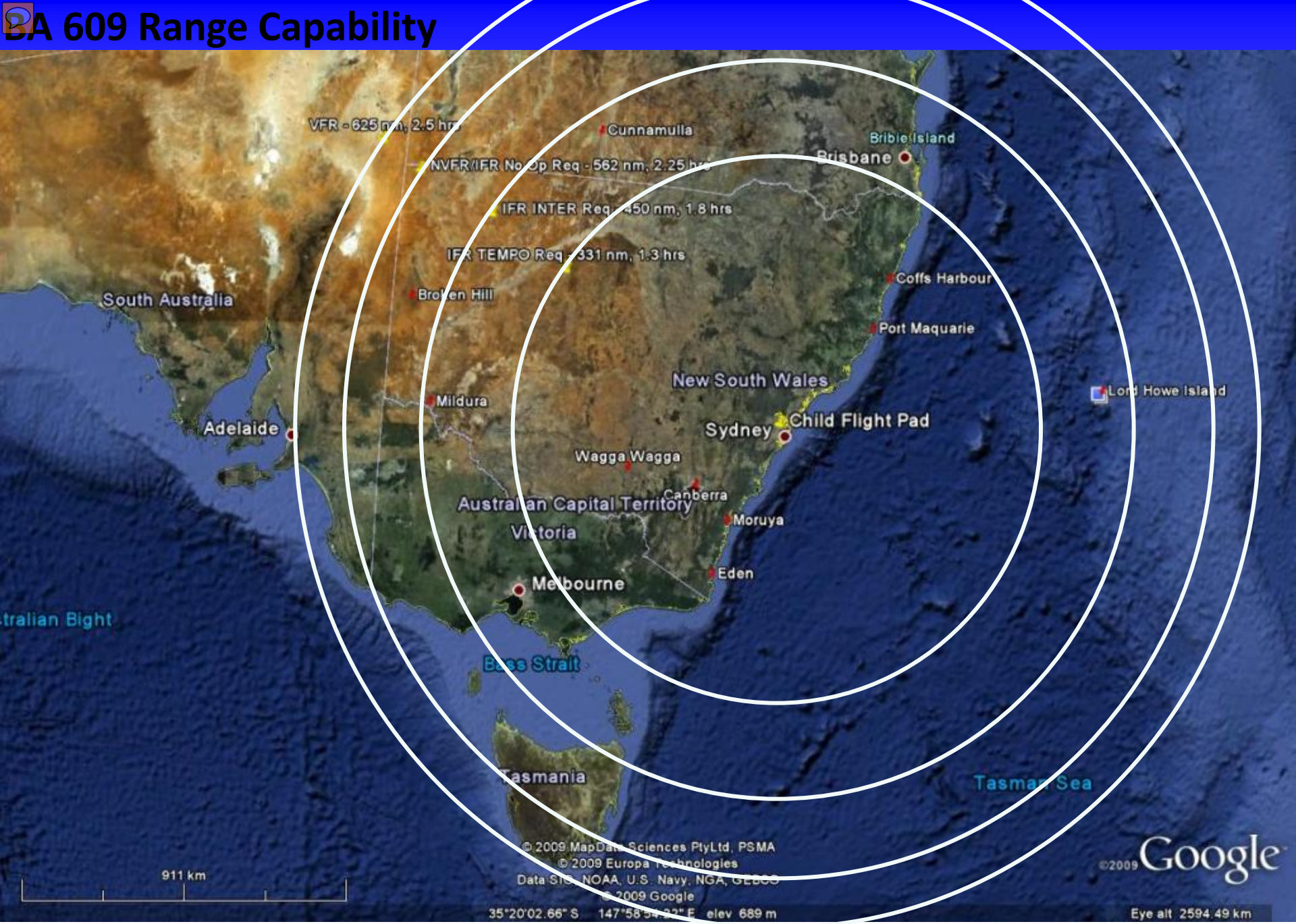
Fuel Reserves

Fixed – 30 minutes

INTER – 60 minutes

Variable – 10% of fuel after all other reserves are applied.

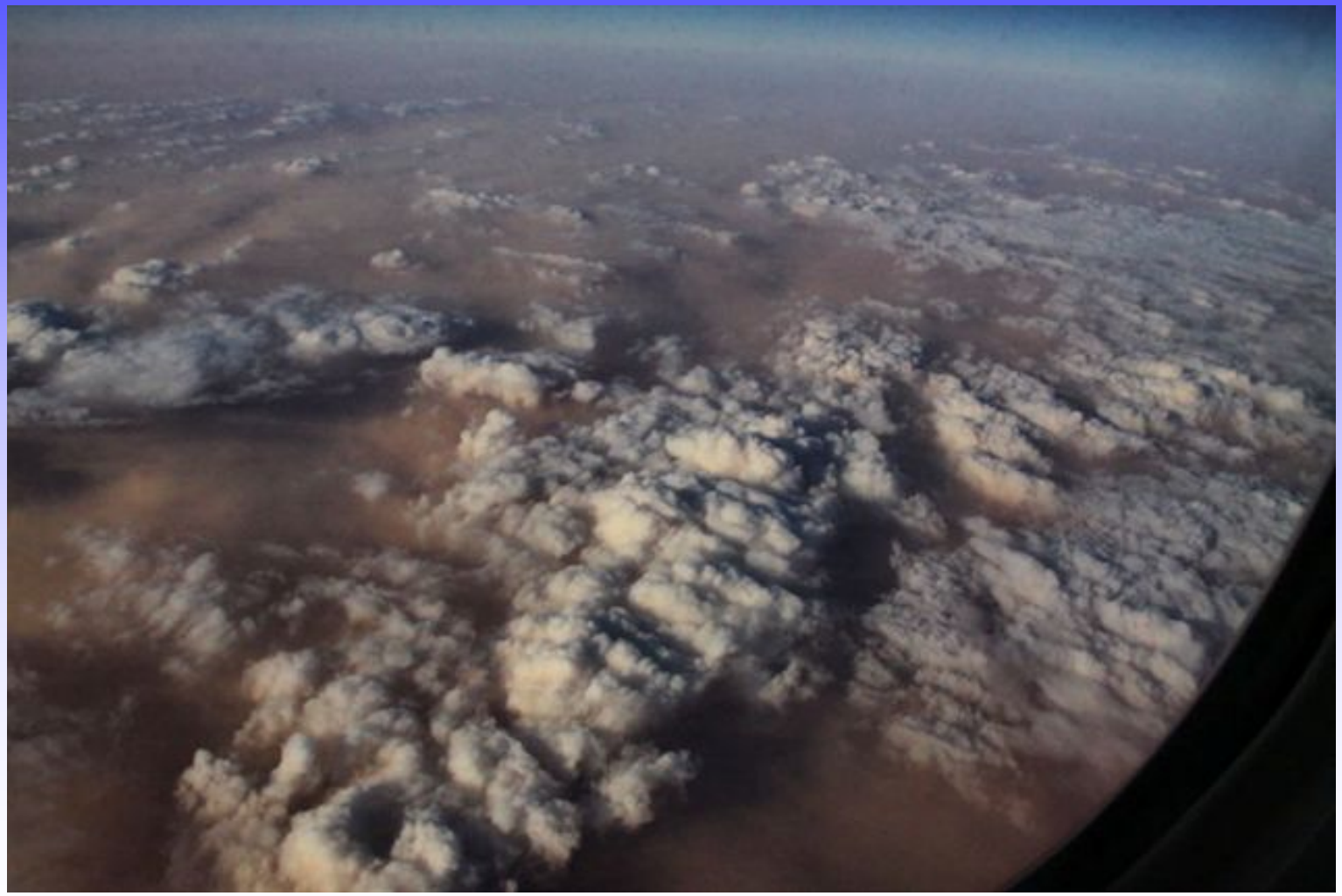
BA 609 Range Capability



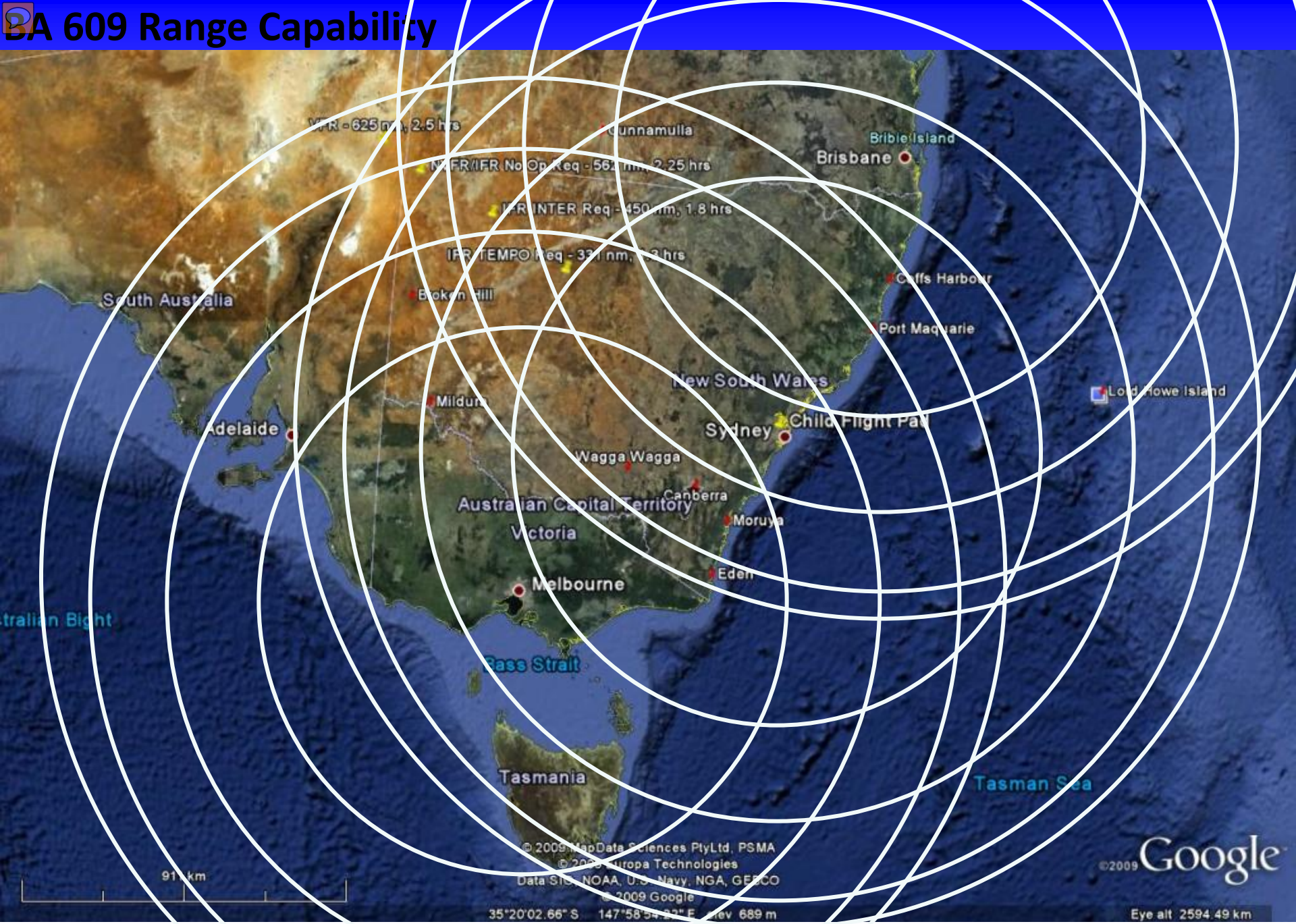
Back to Leeton…

- Response time – 75-90 mins
- Two systems in one aircraft with 2 teams
- Second task?
  - Repositioning to Base - 60 min
  - Deploy second task
  - Return to Leeton; transport first team
  - Return to second task; transport that team
- Decoupling aircraft from team
- Process mapping analysis - PWC

Partial auto-land



BA 609 Range Capability



Questions?

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andrew.berry@nets.org.au