GPS & Australian Aviation

CGSIC
International Information Session
Nashville, Tennessee
17 November 2012

Ed Williams
Navigation Planning
Airservices Australia
Contents

- Australian Aviation Context
- GPS and Aircraft Navigation
- GPS and Aircraft Surveillance
- Thanks and Thoughts
Australia’s ATC Environment

Approximately 5000 nm

Radar Separation

Procedural Separation

© Airservices Australia
Aviation Growth

2005 - 2025 Cumulated Growth

Fig.2-5: Long-term Forecasts in Worldwide Traffic Growth
Contents

 추진 Australian Aviation Context

 추진 GPS and Aircraft Navigation
  – Optimised long haul Oceanic
  – Optimised Arrival & Approach

 추진 GPS and Aircraft Surveillance

 추진 Thanks and Thoughts
Performance Based (Area) Navigation (PBN)

RNAV
- RNAV 10 / RNP 10
- RNAV 5 (BRNAV)
- RNAV 2 (RNAV A)
- RNAV 1 (PRNAV, RNAV B)

RNP
- RNP 4
- RNP 2
- RNP 1
- RNP APCH (0.3)
- RNP AR APCH
- Advanced RNP

Oceanic: RNP-4
En Route: RNP-2
Arrival: RNP-1
NPA: RNP-APCH / RNAV(GNSS)
Specialised: RNP Special

GPS is a powerful enabling technology
User Preferred Route

Figure 2. Los Angeles-Sydney daily flexible track plot for one week (with optimum daily routes in black and optimum fixed-track routes in red). Box indicates time saving achieved for different months of the year.

2.4 < 29 mins * 8 flights = 0.3 < 3.8 flt hours/day
0.3 < 3.8 hr @ 11 tonne/hr = 3.3 < 41.8 tonne/day
3.3 < 41.8t * 10.8 * 59 * 1.48 = $ 3,112 < 39,420 AUD
3.3 < 41.8t * 3.3 = 10.9 < 138 tonne CO₂

*Courtesy of QANTAS
Brisbane – RNP Concept

3 RNP-AR APP to RWY 19
2 curved & 1 ILS overlay

Runway

3 RNP-AR APP to RWY 09
2 curved & 1 ILS overlay
PBN at Work

RNAV Arrival & ILS Approach

RNP Arrival/Approach

Runway

Brisbane City Centre

High Noise
Medium Noise
Low Noise
Four Consecutive Arrivals

- Instrument weather conditions (IMC)
- VOZ & UAE flights RNav onto the ILS
- QFA536, a B737-800, conducted an RNP-AR approach

5NM range rings are centred on the runway threshold
small Level Off
Level Off
Flight Level

NO Level Off
24 Months of Operations

- Two aircraft types (B738 & A320)

Track Keeping:
- 7,532 flights (2,404,276 data points) analysed
- Straight flight – 20m (1 std dev)
- Manoeuvring – 42m (1 std dev)
- B737NG wingspan 36m
- Greatest deviation 469 m

Economic Savings
- 3,200 RNP Arrival/Approach otherwise ILS (due weather)
- 55,946 track miles avoided; 699,325 kg fuel saved
- 2,237,840 kg CO2 not emitted
- PLUS efficiency of Continuous Descent Arrival/Approach
The more efficient green RNP/APV - GLS guided procedure compared to typical vectored red track currently used at Sydney.
Contents

egrator

IGATION

1. Context

2. Performance Based Navigation (PBN)
   - Navigation Specifications
   - Beneficial Application of RNP
   - Choice of Navigation Specifications
   - Approach with Vertical Guidance (APV)
   - GPS Landing System

3. ADS-B
   - Applications and Technology
   - Beneficial Application

4. Mandates
ADS-B above FL 290
Some ADS-B installations are in remote areas.
ADS-B cohabitates with other services
ATC Feedback

- Greater probability of optimum altitude
- Flexibility to accommodate weather
- Less ATC intervention
- Greater visibility increases Safety
- 55% of Domestic Flights
- 73% of International Flights
Broome

ADS-B Receivers near regional airports
Broome
Surface Movement ADS-B

- Aircraft on runway
- Ground vehicles
Installation Issue?

GPS Antenna
Contents

➔ Context

➔ Performance Based Navigation (PBN)
  – Navigation Specifications
  – Beneficial Application of RNP
  – GPS Landing System

➔ ADS-B
  – Applications and Technology
  – Beneficial Application

➔ Mandates
Mandates

➔ PBN IFR Navigation:
  – Using GPS as enabling technology
  – Forward fit: 6 Feb 2014; Retrofit: 4 Feb 2016

➔ ADS-B Out
  – Aust aircraft operating at/above FL290: 12 Dec 2013
  – IFR Aircraft registered on/after 6 Feb 2014
  – IFR Aircraft registered before 6 Feb 2014 retrofit 2 Feb 2017

➔ Navigation & ADS-B Carriage Requirements:

➔ PBN Approval Requirements:
Thanks

GPS improved with time:
- Robustness - 27 Satellite geometry
- Accuracy - Equivalent User Range error decreased
- Availability – Practical Purposes 100%

Women and Men who pioneered / operate GPS:
- You have our Sincere thanks for the truly exceptional Service

Politicians & Administrators:
- GPS gives immense Safety, Environment and Economic benefit
- Ubiquitous in all aspects of life
- Easy to take for granted
- GPS needs to be protected, fostered, replenished, grown
Questions

Ed Williams
Airservices Australia

Ed.Williams@AirservicesAustralia.com