Advanced Navigation: Enabling a Path to Enhancing Safety While Saving Energy

CAFE 2nd Annual Electric Aircraft Symposium. San Francisco, CA
April 26, 2008
Environmental & Safety Stewardship in Aviation

- Who is Naverus?
- What is RNP?
- Safety & Environmental Benefits
- Global Adoption & Implementation
- Brisbane Video, ties it all together
- Questions any time
NAVIGARE – *Latin*, na-vi-gare, verb
1. to navigate

VERUS – *Latin*, ver-us, adjective
1. true

Naverus builds, deploys, and supports the world’s largest network of performance based flight paths to optimize air transport operations.
WHAT IS RNP?

✿ Performance Based Navigation

▷ Navigation Revolution - Transition from ground-based to aircraft-based navigation
RNP is Area Navigation (RNAV), with:

- Performance specification
  - Lateral and vertical
- Performance monitoring
- Crew alerting
- Obstacle clearance

Technically independent of sensors

Typical primary GPS + IRS → Flight Manager

- More basic GPS-only is possible
- WAAS is not RNP...but it could be
 Defined 3D Path (can even be 4D)
  ▸ Arrival, approach
  ▸ Missed approach
  ▸ Departure
    • Guided extraction
  ▸ En route
  ▸ *End-to-end*

 Invented to solve a terrain problem
 ✨ Now used as a consistency builder
RNP Benefits

- Access, independent of navaids
- Vertical guidance everywhere
  - Dive and Drive is over. (It can be.)
- Safety
  - About 70% of aviation fatalities occur on unguided or poorly guided arrival. C-F-I-T
- Efficiency
  - Fuel, emissions
  - Schedule, time
- Airport & Airspace Capacity
ENVIROMENTAL BENEFITS OF RNP

Green RNP Approach
Benefits:
- Lower Noise
- Less Fuel Used
- Reduced Emissions

Today's Vectored Step Down Approach

Runway

City

Image: www.3D-Aviation.com
FRA RNAV TRANSITION RW07

Vertical Paths
B737NG Approaches to FRA RWY 07L

Dist to Runway (NM)

- B737 Frankfurt Approaches
- Green Approach mean
- RNP Approach to 07L (simulated)

AVTECH
OPERATIONAL VARIANCE WITH RNP

Sample RNP Blocks

92 min 94 min
Avg. 80%

6 min block savings
2 for distance, 4 for variance

Calgary, AB

Abbotsford, BC
RNP Implementations

- Juneau, Alaska, followed by the rest of Alaska Air’s northern network
- Canada
- China
- Australia, New Zealand
- Continental USA---Southwest Airlines
- Europe & beyond
- Growth: we’ve reached the tipping point
St Moritz (Engadin,) Switzerland
RNP IMPLEMENTATION—AUSTRALIA/NEW ZEALAND
10 Airports in Service
- Queenstown, NZ – August, 2004
- Canberra – 2005
- Sydney – 2006
- Alice Springs
- Hobart
- Gold Coast
- Ayers Rock
- Townsville
- Cairns
- Brisbane – 2007

Qantas
- B737-800
- 10 Additional Airports Planned for 2008
POTENTIAL SAVINGS

Annual CO2 That Could Be Saved by Worldwide RNP Capable Fleet

Thousands of Tons

1st RNP at Alaska

A320 Capability

737 classic upgrades, 737 NGs, late model A320 family
If we could flip an RNP switch...

Airlines would immediately reduce emissions by 3.5 million tons annually.
It’s happening right now in Australia...
Findings...

- Fully integrated with other types of traffic
- 276 lbs fuel saved each Qantas RNP arrival
- 1.4 million lbs less CO2 emissions to date
- Growing participation
  - Right now: about 9000 RNP ops/month
BNE RWY01 NOISE PROFILES
Proponents believe change *is* possible
- Unwilling to accept the status quo

Return on investment approach
- Willingness to invest time, money, political capital for a return

Pragmatic approach regarding outside expertise
- Proponent and regulator recognize missing advancing capabilities

Achievable, realistic initial programs
- In terms of ATS environment, equipment, training, ops issues
Air Transport History...Can GA do this?

- Absolutely
- Mature criteria & standards are here
  - Not perfect yet, evolving
- Regulators’ capabilities are growing
- Awareness of capabilities & benefits
- Equipment is coming to market
- Mythology—still an issue
Questions?

Thanks

www.naverus.com