Perspectives on Flight Operational Efficiency and the Environment

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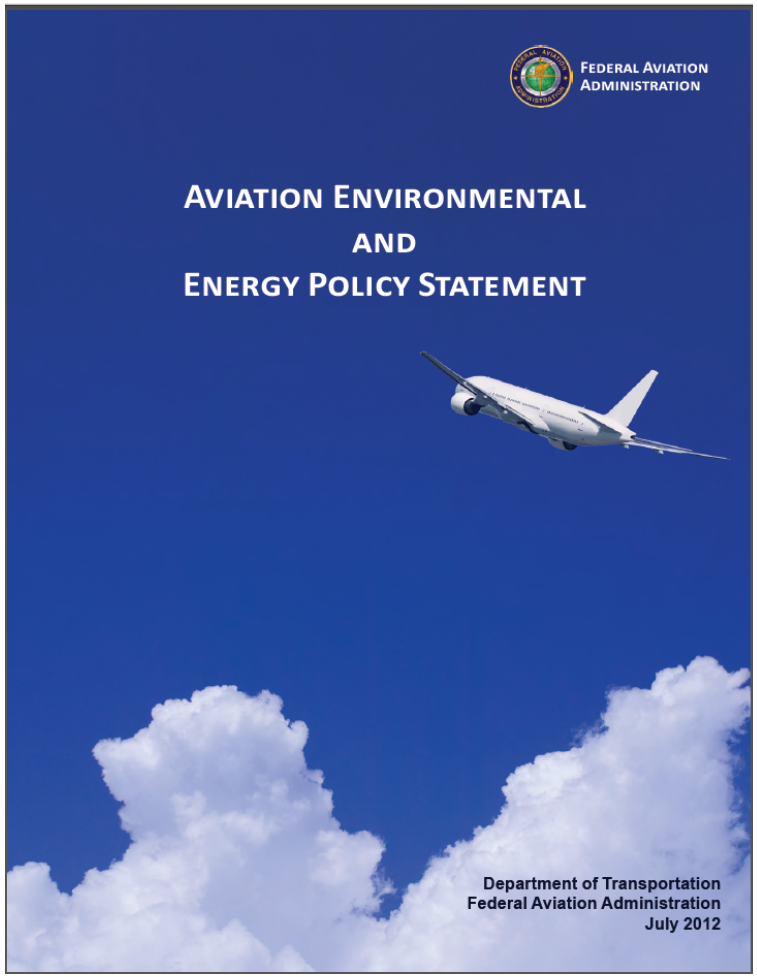
Vision and Principles

Vision:

Environmental protection that allows sustained aviation growth

Guiding Principles:

1. Limit and reduce future aviation environmental impacts to levels that protect public health and welfare.
2. Ensure energy availability and sustainability.



Want increased mobility with reduced environmental impacts and enhanced energy availability and sustainability

Aviation E&E Policy Statement (Federal Register 77-141, 2012): http://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/media/FAA_EE_Policy_Statement.pdf

FAA Office of Environment & Energy

ENVIRONMENT AND ENERGY GOALS

NOISE

Reduce the number of people exposed to significant noise around U.S. airports

AIR QUALITY

Reduce significant air quality impacts attributable to aviation

CLIMATE

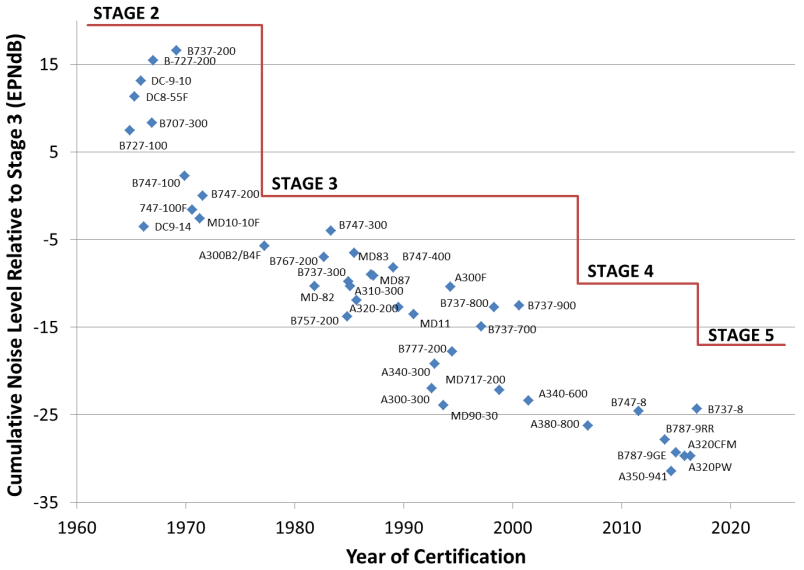
Achieve carbon neutral growth by 2020 relative to a 2005 baseline

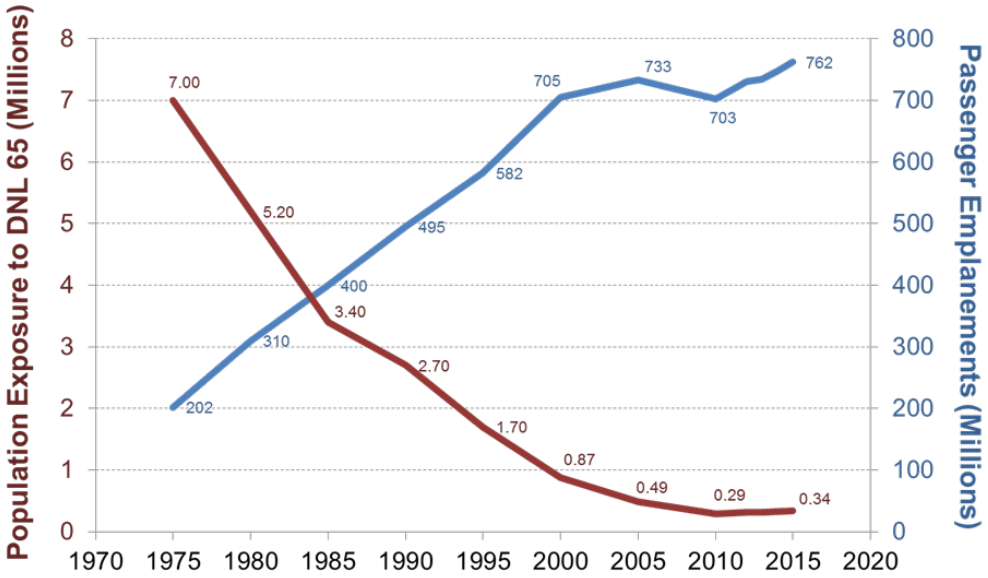
ENERGY

Develop and deploy sustainable alternative aviation fuels

Large Reduction in Population Exposure and Source Noise, but…

- A factor of 20 decrease in community noise exposure has been accompanied by increased community concerns
- GAO Reports state environmental issues can cause delay in projects[1, 2]



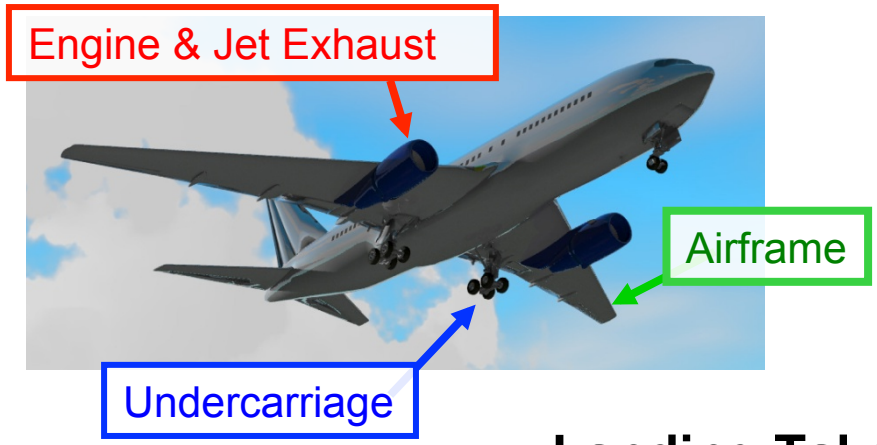


- The implementation of precision aircraft navigation over the last few years has been accompanied by increased airport community concerns regarding noise

Source:
1. http://www.gao.gov/archive/2000/rc00153.pdf
2. http://www.gao.gov/assets/310/309622.pdf

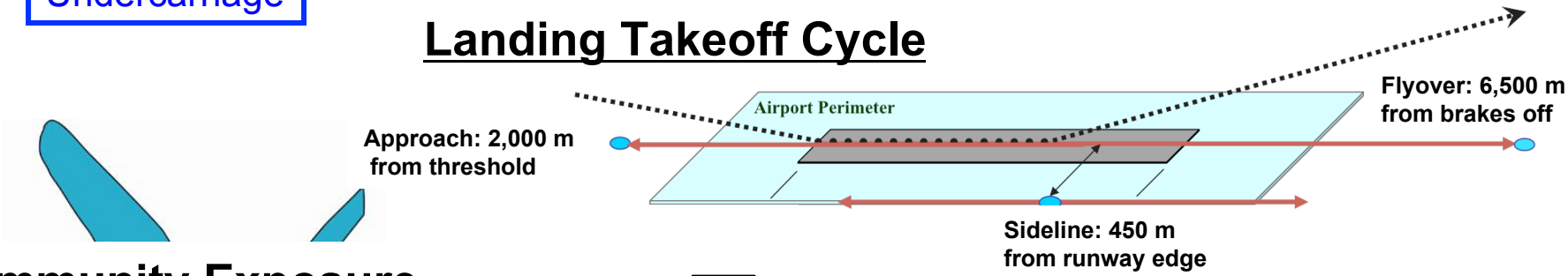
Community Noise from Aircraft

Aircraft Noise

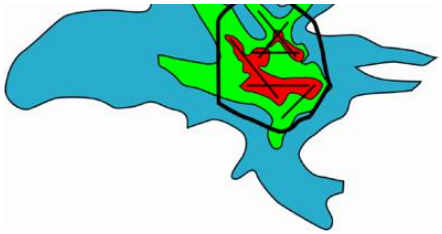


All noise sources contribute to acoustic signature – both at takeoff and during landing

Landing Takeoff Cycle



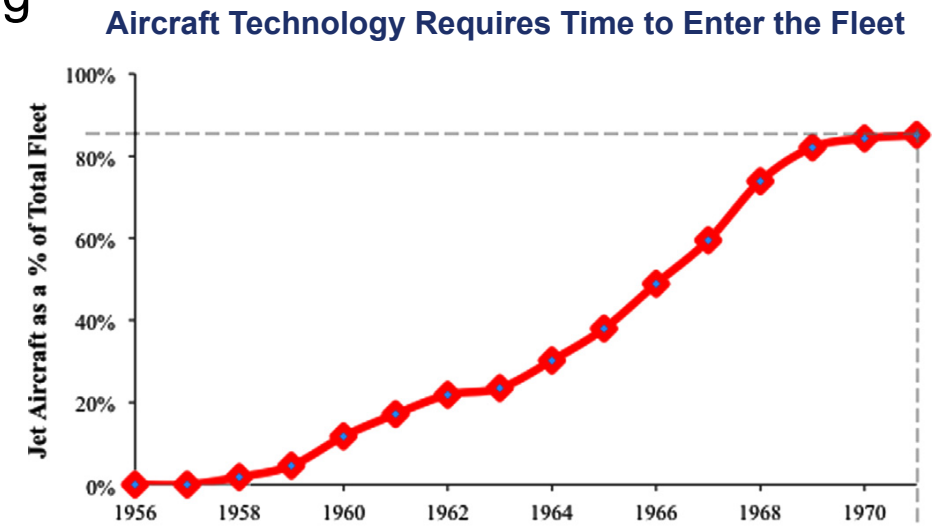
Community Exposure



Community exposure set by aircraft types and operational tempo over day and night

Addressing the Aircraft Noise Challenge

- **Understanding Impact of Noise**
  - Noise impacts: annoyance, sleep, health and children's learning
  - Improving modeling capabilities
- **Outreach**
  - Increase public understanding
  - Community outreach
- **Mitigation**
  - Land use planning
  - Vehicle operations
  - Airframe and engine technology
  - Aircraft architecture



Diffusion of first generation jet aircraft into the airline fleet: 15 year diffusion dynamic[1] (Data source: ATA Annual Reports 1958–1980)

Source: Hileman et al. 2013 http://dx.doi.org/10.1016/j.paerosci.2013.07.003/

Noise Reduction through Technology

- Noise improvements have come with fuel efficiency gains
- Increased engine bypass ratio

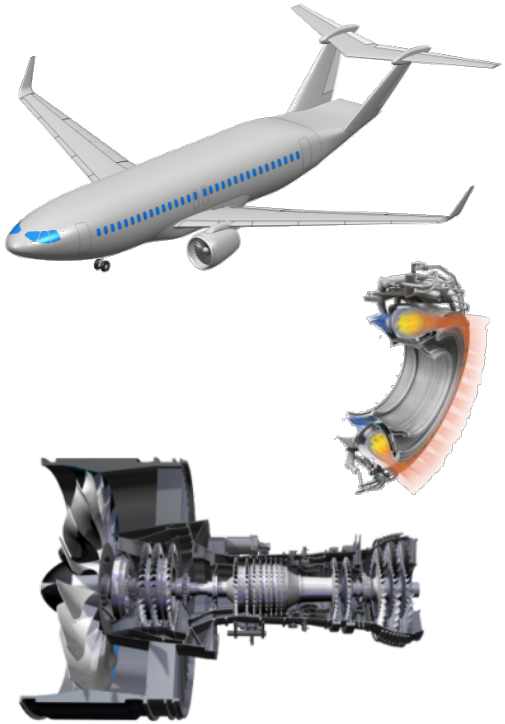
- Simplified high lift systems

Images from airliners.net

Continuous Lower Energy, Emissions & Noise (CLEEN)

- FAA led public-private partnership with 50-50 cost share from industry
- Reducing fuel burn, emissions and noise via aircraft and engine technologies and alternative jet fuels
- Conducting ground and/or flight test demonstrations to accelerate maturation of certifiable aircraft and engine technologies

	CLEEN I	CLEEN II
Time Frame	2010-2015	2016-2020
FAA Budget	~$125M	~$100M
Noise Reduction Goal	32 dB cumulative noise reduction	32 dB cumulative noise reduction
NO_X Emissions Reduction Goal	60% landing/take-off NO_X emissions	75% landing/take-off NO_X emissions
Fuel Burn Goal	33% reduction	40% reduction
Entry into Service	2018	2026



Efficiency through Precision Navigation

- Precision navigation delivering considerable benefits (e.g., fuel burn, workload, efficiency), but it is also concentrating noise
- Precision navigation is ideal when you can utilize compatible land use (water or industrial corridors), but few airports have this

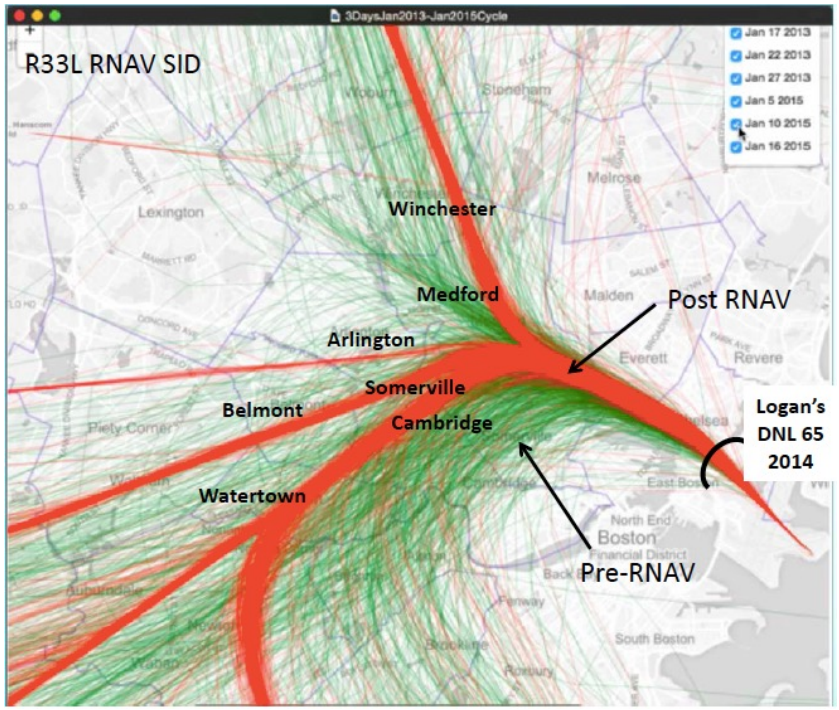


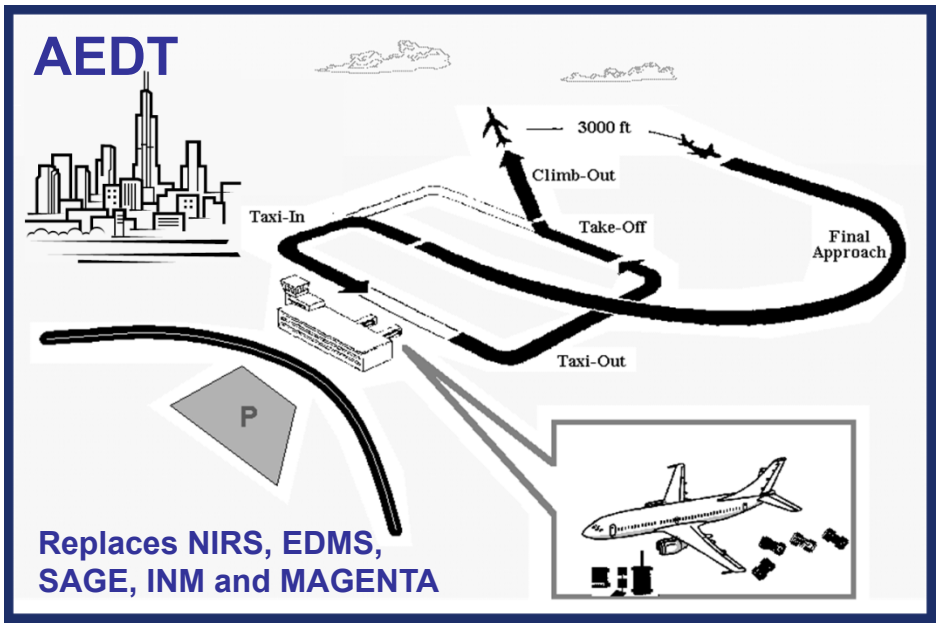
Image Source: Massport

- Need to consider opportunities for noise reduction

Modeling Noise

Aviation Environmental Design Tool (AEDT)

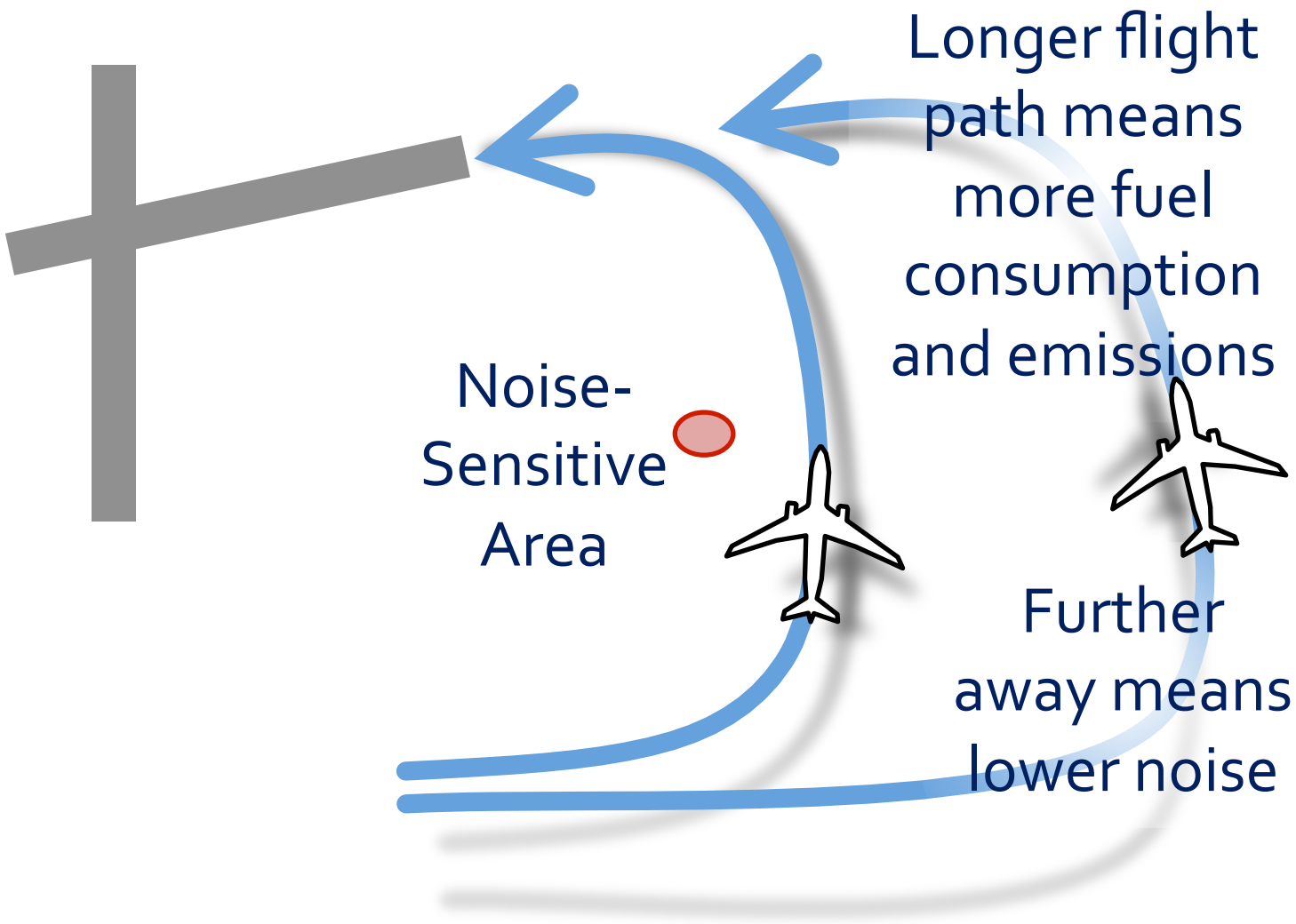
- Computes noise, fuel burn and emissions
- Required for all regulatory actions



Applications

- Computes noise, fuel burn, emissions, and air quality
- Replaces NIRS, EDMS, SAGE, INM and MAGENTA
- Airport, Regional, National, and Global level analyses

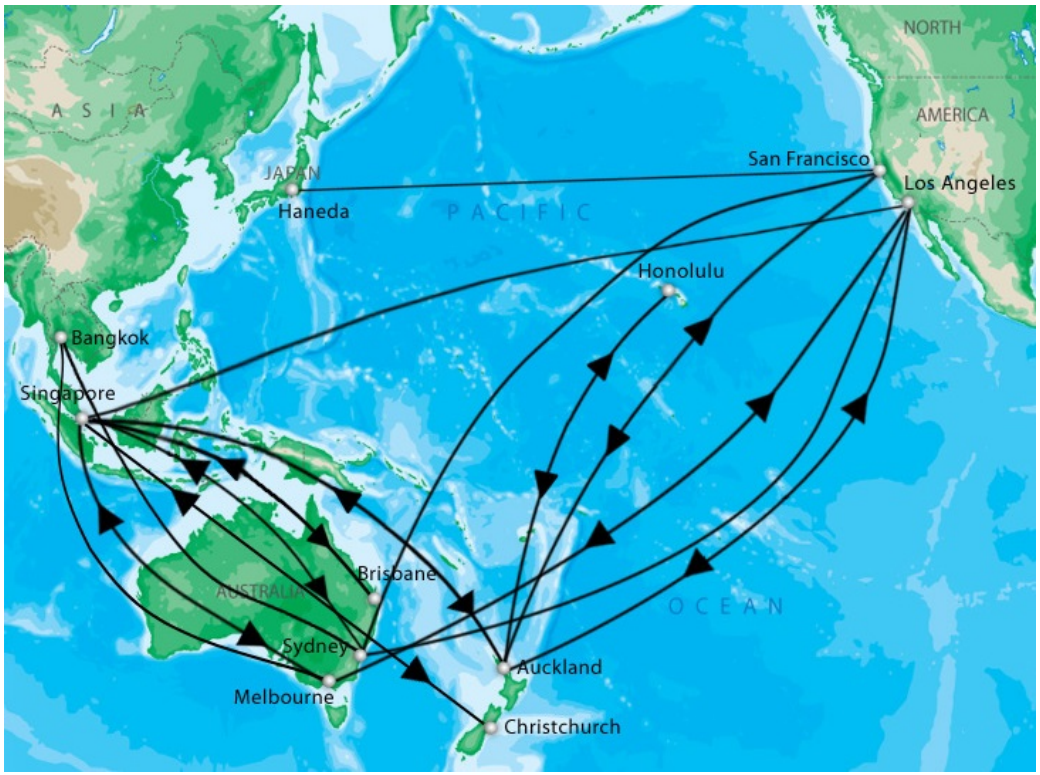
Modeling Interdependencies



Asia Pacific Initiative to Reduce Emissions

- ASPIRE is a partnership of air navigation service providers focused on environmental stewardship in the region.
- The ASPIRE Partnership is a comprehensive approach to environmental stewardship for a region where significant disparities exist in the level of available service provision.
- Under ASPIRE, current and future partners pledge to adopt and promote best practices that have demonstrated and proven success in the reduction of greenhouse gasses, as well as to the development of work programs to promote future gains for the environment

Current ASPIRE-Daily City Pairs



- *www.aspire-green.com*

- **Not yet depicted on map*

1. Auckland – San Francisco
2. Los Angeles – Singapore
3. Los Angeles – Melbourne
4. Sydney – San Francisco
5. Singapore – Melbourne
6. Melbourne – Singapore
7. Singapore – Sydney
8. Sydney – Singapore
9. Melbourne – Los Angeles
10. Sydney – Los Angeles
11. Auckland – Singapore
12. Christchurch – Singapore
13. Singapore – Auckland
14. Singapore – Christchurch
15. Tokyo (HND) – San Francisco
16. San Francisco – Kansai (KIX)*
17. Bangkok – Sydney
18. San Francisco – Auckland
19. Auckland – Los Angeles
20. Los Angeles – Auckland
21. Bangkok – Melbourne
22. Singapore – Brisbane
23. Brisbane – Singapore
24. Auckland – Honolulu*
25. Honolulu – Auckland*
26. Wellington – Canberra*
27. Canberra – Wellington*
28. Canberra – Singapore*
29. Singapore – Canberra*
30. Honolulu – Brisbane*
31. Brisbane – Honolulu*
32. Las Angeles – Narita*

ASPIRE Successes

- New City Pairs Added
- Industry Support
- ANSP Engagement
- Demonstration Flights

ASPIRE Challenges

- Difficult to Quantify
- Requires Crew Report
- Lack of Data

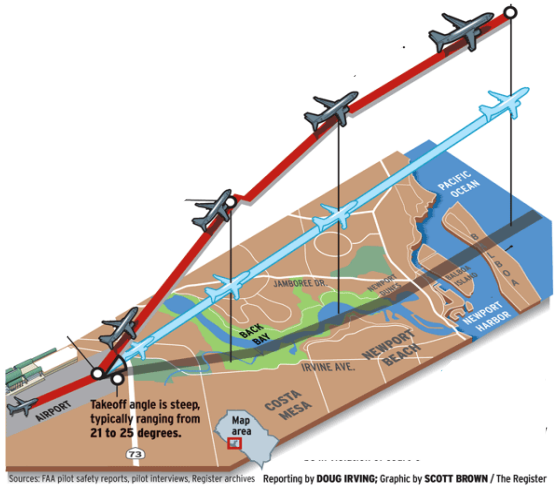
Future of ASPIRE

- **Engaging additional Air Navigation Service Providers**
  - The ASPIRE Environmental Stewardship Award (possibly in association with CANSO) to recognize achievement by Asia/Pacific ANSPs for ATS environmental initiatives
  - Validate ASPIRE-Daily city pairs from non-partner ANSPs

- **Communications Program to update the ASPIRE brand recognition**
  - ASPIRE presence at regional events such as DGCA or the CANSO conference (plus other key sustainable aviation events)
  - Seek input from Air Transport Action Group (ATAG) or other industry lobby groups

Closing Observations

- Despite considerable reductions, noise remains a constraint on aviation growth
- Utilizing a comprehensive approach to address aircraft noise challenge
- Research program is being executed to better understand noise impacts
- Advancing our modeling tools to improve our ability to model aircraft noise
- Examining potential means to reduce noise from the current fleet through operational procedure concepts
- Technology advancements are needed to achieve aircraft noise reduction



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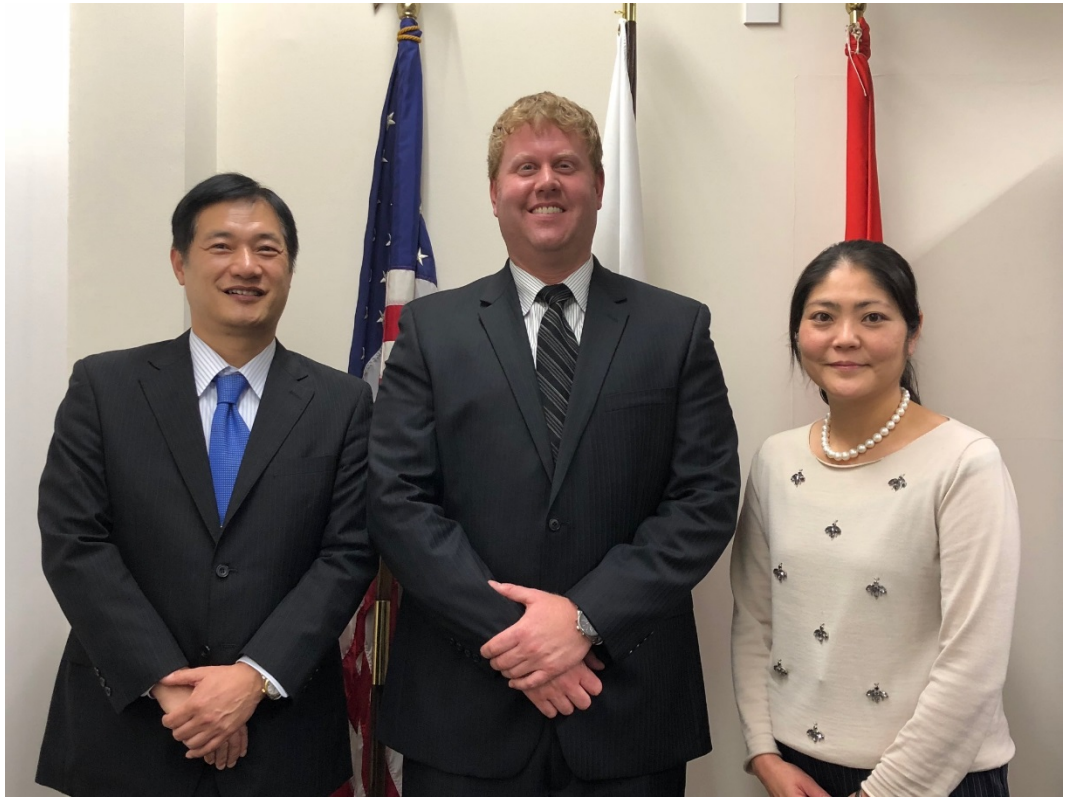

FAA Team Tokyo