

FAA Approach to Helicopter Noise

Presented to: Flying Quiet Symposium
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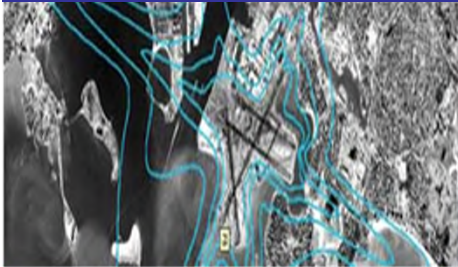


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Aviation Environmental Challenges

NOISE



AIR QUALITY



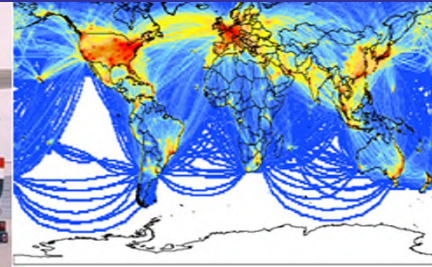
WATER QUALITY



ENERGY



GLOBAL CLIMATE



- Aviation impacts community noise, air quality, water quality, energy usage, and climate change
- Environmental impacts from aviation could pose a critical constraint on capacity growth
- FAA are pursuing aircraft technology, alternative jet fuels, operations, and policy measures to address the environmental challenges facing aviation



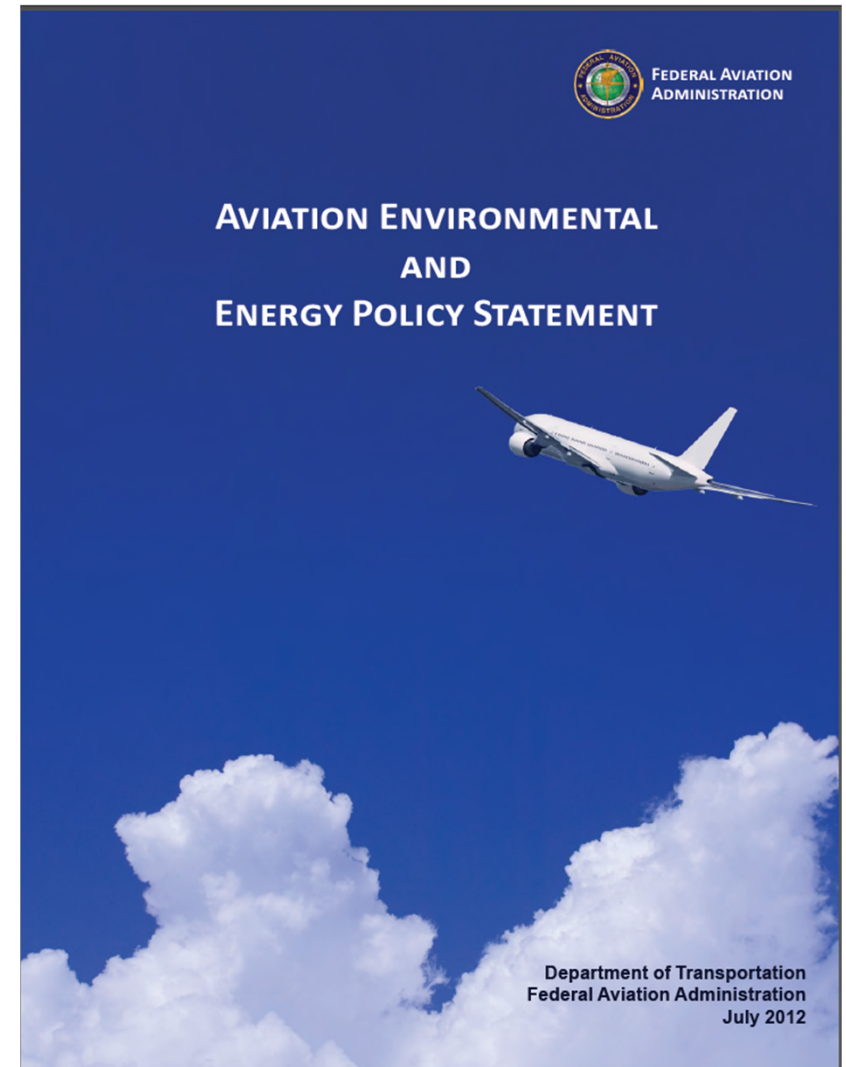
Vision and Principles

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.



The Five Pillar Approach

Science and Tools

PILLAR 1: Improved Scientific Knowledge and Integrated Modeling

- Decision-making based on solid scientific understanding
- Work with research community through the **Aviation Sustainability Center (ASCENT)**
- Understand public health and welfare impacts
- Incorporate this knowledge within the Aviation Environmental Tool Suite

Technology

PILLAR 2: New Aircraft Technologies

- Offer the greatest opportunity to reduce environmental impacts
- Partner with industry, research community, NASA, and Department of Defense
- Mature new engine and airframe technologies through the **Continuous Lower Energy, Emissions and Noise (CLEEN) Program**

Alternative Fuels

PILLAR 3: Sustainable Alternative Aviation Fuels

- Reduce environmental impacts, enhance energy security, and provide economic benefits
- Collaborate with stakeholders through the **Commercial Aviation Alternative Fuels Initiative (CAAFI)**
- Test alternative jet fuels to ensure they are safe for use through **ASCENT** and **CLEEN**
- Analyze their potential for reducing the environmental impacts of aviation

Operations

PILLAR 4: Air Traffic Management Modernization and Operational Improvements

- Increase efficiency of aircraft operations through the **Next Generation Air Transportation System (NextGen)**
- Engage with industry, research community, NASA, and Department of Defense
- Develop advanced operational procedures to optimize gate-to-gate operations
- Integrate infrastructure enhancements to the National Airspace System (NAS), improving environmental performance

Policy

PILLAR 5: Policies, Environmental Standards, and Market Based Measures

- Implement domestic policies, programs, and mechanisms to support technology and operational innovation
- Develop and implement aircraft emissions and noise standards
- Work within the International Civil Aviation Organization (ICAO) to pursue a basket of measures to address emissions that affect climate, including a global market based measure as a gap filler
- Seek international partners to further our environmental and energy strategy

 NextGEN

<http://www.faa.gov/nextgen>



<http://www.caafi.org>



 NextGEN

<http://www.faa.gov/go/cleen>



<http://ascent.aero>



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Addressing Aircraft Noise

- Understanding Impact of Noise
 - Noise impacts: annoyance, sleep, cardiovascular health and children's learning
 - Improving modeling capabilities
 - Evaluating current aircraft, helicopters, commercial supersonic aircraft, unmanned aerial systems, and commercial space vehicles
- Outreach
 - Increase public understanding
 - Community outreach
- Mitigation
 - Land use planning and related measures
 - Vehicle operations
 - Airframe and engine technology



Addressing Helicopter Noise

- Understanding Impact of Noise
 - Noise impacts: annoyance
 - Improving modeling capabilities
- Outreach
 - Increase public understanding
 - Community outreach
- Mitigation
 - Vehicle operations



Annoyance

- **Objective:** To ensure that an accurate understanding of the relationship between helicopter noise exposure and its effects on communities
 - A helicopter specific annoyance survey is in active development
 - Will use methodologies developed in recent years through projects completed by FAA, NASA, and Transportation Review Board's Airport Cooperation Research Program
- **Results:** Annoyance survey results will provide updated information on the percent of the population highly annoyed to different levels of helicopter noise exposure. It will also enhance the understanding of the relationship between the perception of helicopter NOISE versus fixed wing noise.
- **Status and Timeline:** Helicopter annoyance survey should be completed by end of calendar year 2020



Modeling Helicopter Noise

- Seeking improved helicopter performance modeling capabilities for more accurate analysis
 - Focused on performance and fuel burn
 - Completed in 2016
- Noise modeling guidance
 - Reviewed, evaluated, and documented current helicopter noise prediction models and identified potential improvements to AEDT to better capture the unique complexity of helicopter operations
 - Published by TRB ACRP in January 2016

FAA is currently reviewing Aviation Environmental Design Tool (AEDT) priorities to determine implementation plan for these improvements



Outreach and Operations

- Outreach
 - Multiple efforts focused on both impacted communities and operators
 - Volpe will discuss this further
- Operations
 - Flight Tests with NASA and Volpe
 - NASA will discuss this further
 - Noise Abatement Procedure Development
 - Work being completed by Ken Brentner at Penn State University
 - More details to follow



Noise Abatement Procedures

- **Objective:** Develop noise abatement procedures that have the opportunity to reduce noise experienced on the ground
- **Results:** PSU WopWop model used to predict noise of several helicopters that were tested during NASA/FAA flight test. The model will also be used to inform Helicopter Association International's Fly Neighborly program.
- **Status and Timeline:**
 - 2017 – Completed updating the PSU model to be able to predict noise of test helicopters
 - 2018-2020 – Analyze findings from NASA/FAA helicopter test and develop noise abatement procedures for each helicopter

More Information:

ASCENT Project 06 website:

<https://ascent.aero/project/rotorcraft-noise-abatement-operating-conditions-modeling/>

ASCENT Project 38 website:

<https://ascent.aero/project/rotorcraft-noise-abatement-procedures-development/>

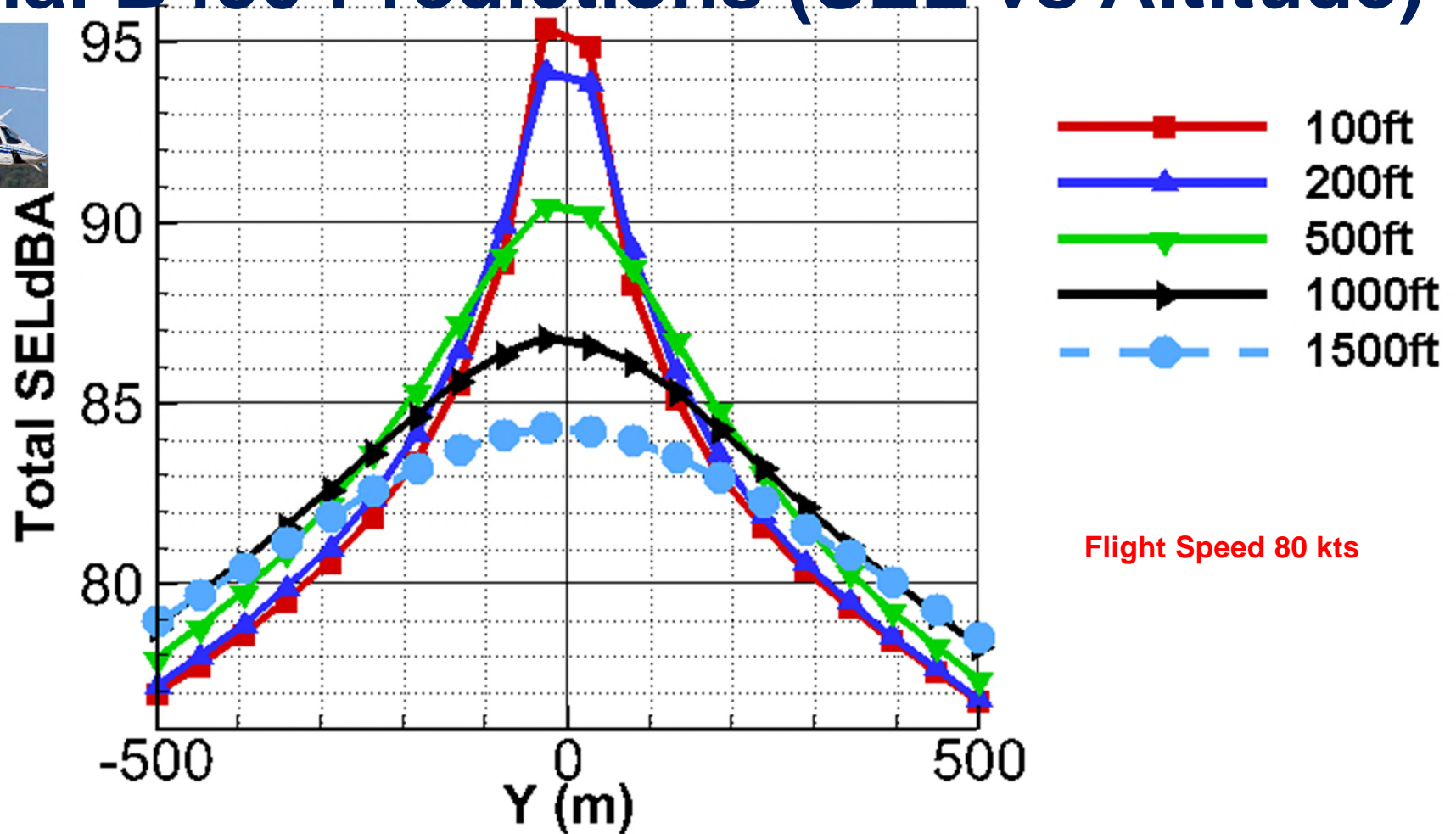


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Noise Abatement Operations - details

- Developed an analytical model that predicts rotorcraft noise. That model can then be used to:
 - Develop low noise flight procedures
 - Evaluate new low noise design technologies, such as new main rotor blade designs and anti-torque systems
 - Use a real time prediction capability to support future development of a cockpit display which shows the noise emitted by the helicopter and guides a pilot to fly in manner that minimizes its noise impact
 - Analyze findings from NASA/FAA Flight Test and develop noise abatement procedures
 - Determine if tested helicopters can be placed into various categories such as gross take-off weight, number of main rotor blades, standard vs non-standard anti-torque systems

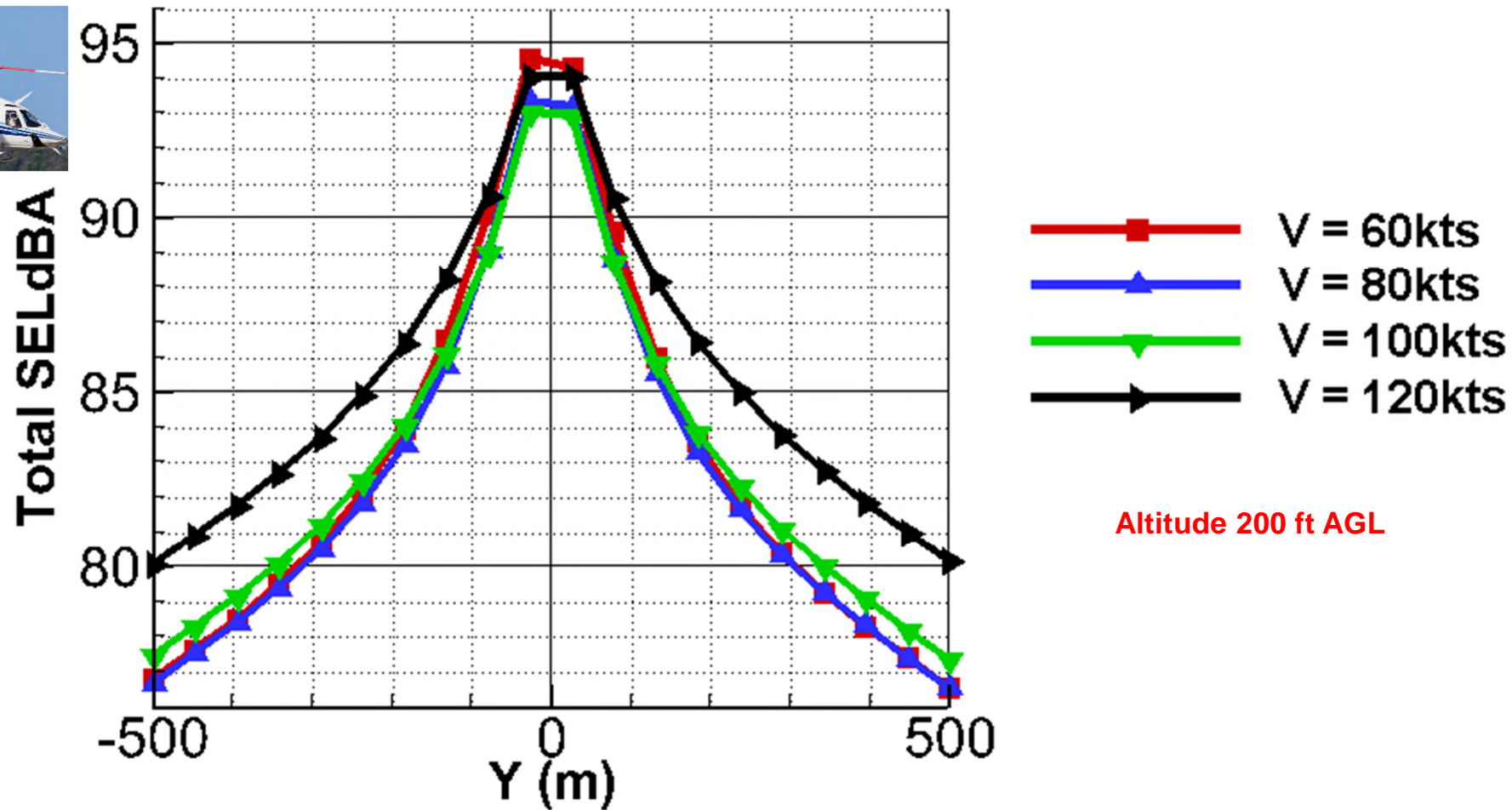
Initial B430 Predictions (SEL vs Altitude)



- Noise decreases along the flight path (centerline) as the aircraft altitude is increased.
- Noise increases slightly at sideline locations with increased altitude, due to change in directivity



Initial B430 Predictions (SEL vs Speed)



- Increased speed increases noise, but this is only reflected in SEL at the sideline locations
- Along the flight path (centerline), increased flight time results in similar SEL values as higher speeds



Closing Remarks

- FAA has increased its research with respect to helicopters in the last few years and has a wide portfolio looking at different areas regarding helicopter noise
- FAA wants to ensure it is continuing to address the current and future research needs with respect to helicopters
- We are seeking your input on potential research directions that may be beneficial for FAA to pursue
 - Any final decisions on research direction will be FAA's



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