

# FAA's Environment and Energy Research and Development Efforts

Meeting: CLEEN Market Survey Conference

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Federal Aviation Administration

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Federal Aviation  
Administration



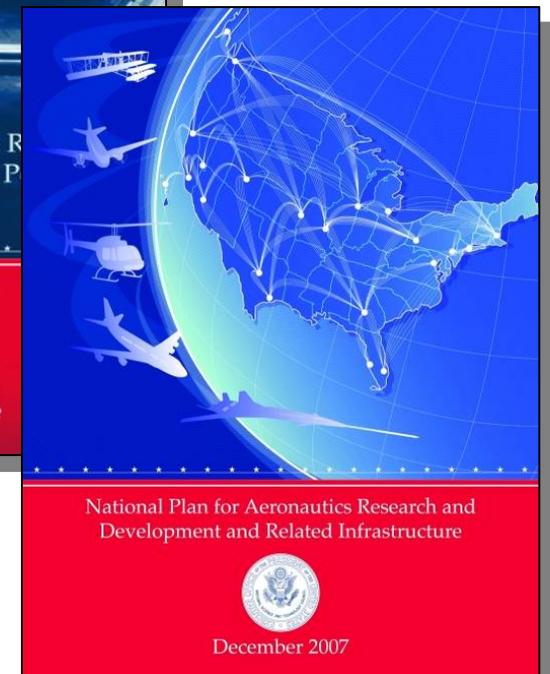
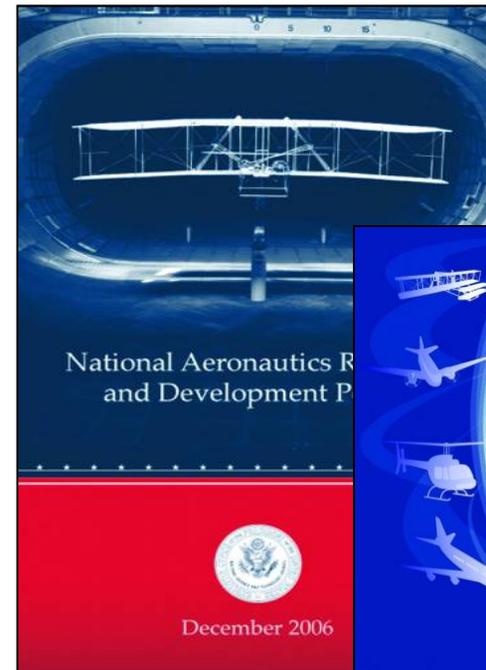
# National Aeronautics R&D Policy and Plan

- Policy

- Executive Order signed December 2006
- Outlines 7 basic principles to follow in order for the U.S. to “maintain its technological leadership across the aeronautics enterprise”
- Mobility, national security, aviation safety, security, workforce, **energy & efficiency**, and **environment**

- Plan (including Related Infrastructure)

- Plan signed by Pres. Bush December 2007
- Goals and Objectives for all basic principles (except Workforce, being worked under a separate document)
- Summary of challenges in each area and the facilities needed to support related R&D
- Specific quantitative targets where appropriate
- More detailed document/version to follow later in 2008



*Executive Order, Policy, Plan, and Goals & Objectives all available on the web*

*For more information visit: [http://www.ostp.gov/cs/nstc/documents\\_reports](http://www.ostp.gov/cs/nstc/documents_reports)*

# National Aeronautics Goals

Near Term (<5 years)	Mid Term (5–10 years)	Far Term (>10 years)
<ul style="list-style-type: none"> <li>-Enable <b>fuel efficient N+1 aircraft and engines</b> (33% reduction in fuel burn compared to a B737/CFM56)</li> <li>-Enable <b>quieter and cleaner N+1 aircraft and engines</b> (32 dB cumulative below Stage 4); <b>LTO NO<sub>x</sub></b> emissions reduction (70% below CAEP 2 standard)</li> </ul> <p><b>CLEEN</b></p>	<ul style="list-style-type: none"> <li>-Research and enable new <b>energy efficient operational procedures</b> optimized for energy intensity (3–5% energy intensity improvement for the energy efficient procedures over existing 2006 baseline procedures)</li> <li>-Enable <b>fuel efficient N+2 aircraft and engines</b> (at least 40% reduction in fuel burn compared to a B737/CFM56)</li> <li>-Enable <b>N+2 aircraft and engines</b>; (42 dB cum below Stage 4); <b>LTO NO<sub>x</sub></b> emissions reduction (80% below CAEP 2)</li> </ul>	<ul style="list-style-type: none"> <li>-Enable new <b>energy efficient operational procedures</b> optimized for energy intensity (6–10% energy intensity improvement for the energy efficient procedures over existing 2006 baseline procedures)</li> <li>-Enable <b>fuel efficient N+3 aircraft and engines</b> to reduce fuel burn by up to 70% compared with a B737/CFM56 (70% is a 25-year stretch goal and assumes significant advances in novel configurations, engine performance, propulsion/airframe integration, and materials)</li> <li>-Enable <b>N+3 aircraft and engines</b> to decrease the environmental impact of aircraft (62 dB cumulative below Stage 4 - a 25-year goal); <b>LTO NO<sub>x</sub></b> Emissions reduction better than 80% below CAEP 2)</li> </ul>

**N+1 Conventional**



**N+2 Hybrid Wing/Body**

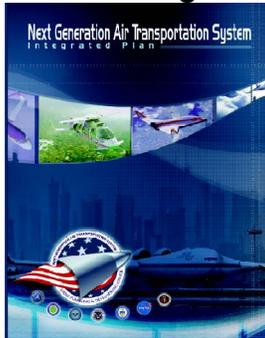


**N+3 Generation**

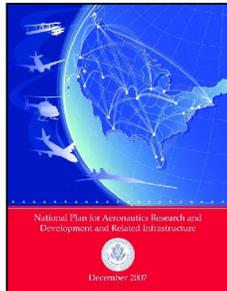


# Translating NextGen Plans into Programs

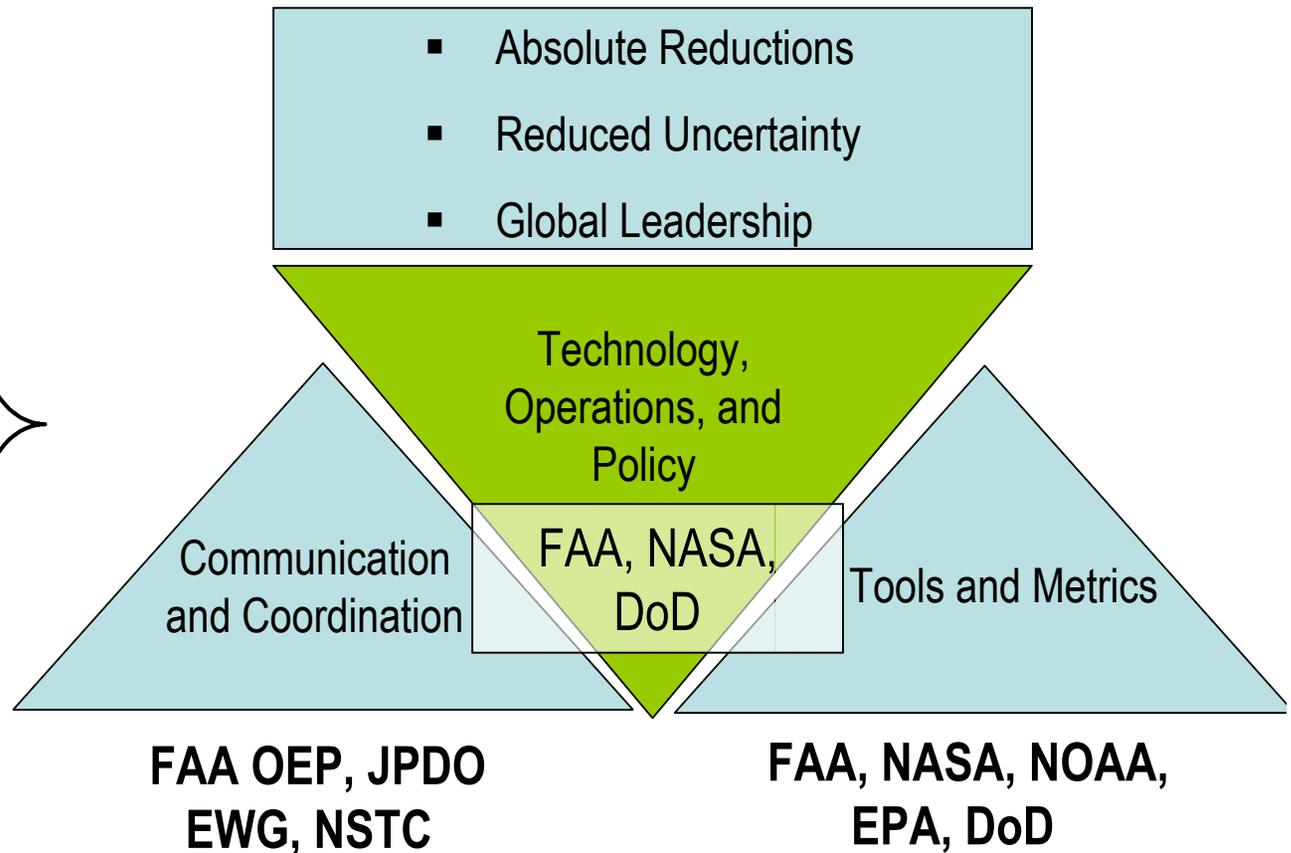
## 2004 NGATS Integrated Plan



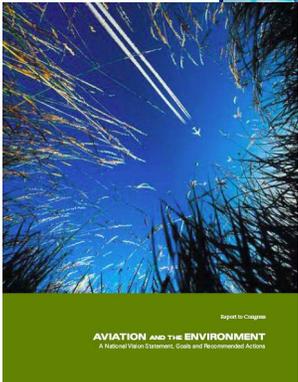
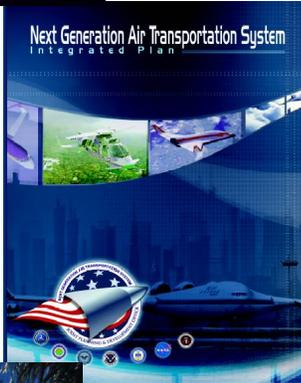
## National Aeronautics R&D Plan



## 2004 Aviation and the Environment Report to Congress



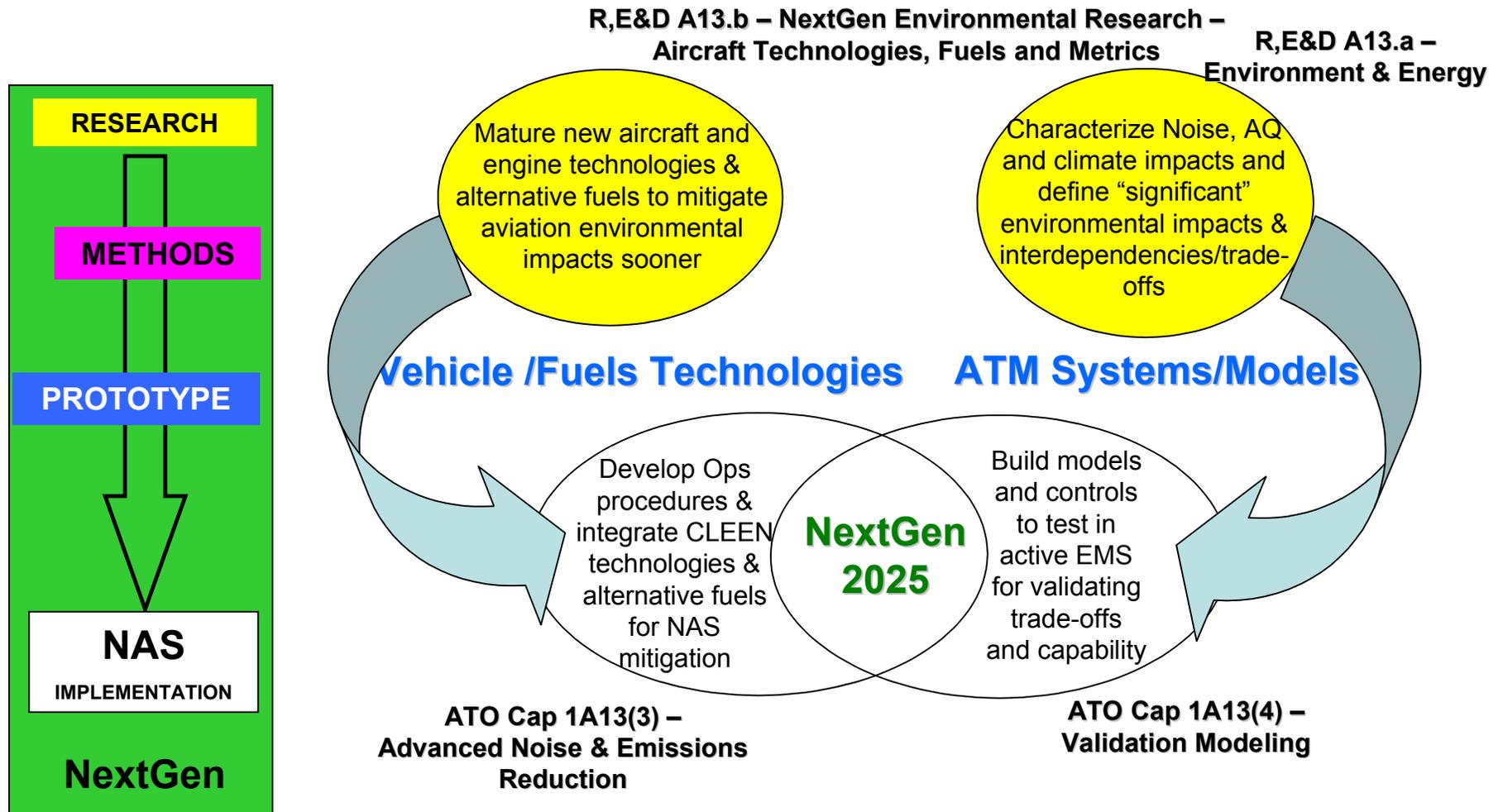
# Role of FAA Environment and Energy R&D



- Develop tools and metrics to effectively characterize, assess and communicate environmental effects, interrelationships, and economic
- Facilitate international agreements on standards, recommended practices, and mitigation options; assess consequences and inform policy
- Develop and advance operational, technology and policy options to enable a balanced approach to environmental improvements for the NextGen system (NextGen)
- Enable development of Environmental Management Systems to dynamically manage Next Gen environmental impacts (NextGen)

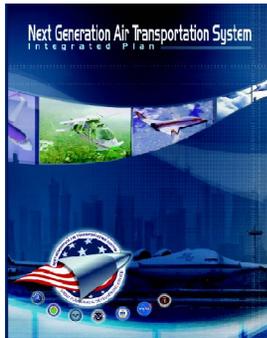
***Managing Environmental Impacts to Allow Growth***

# Comprehensive Investment Strategy

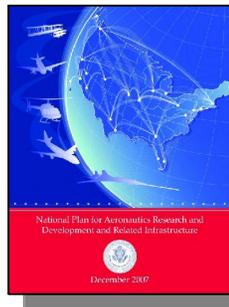


# 5-Pillar Approach to Achieving NextGen Vision/FAA R&D Role

## 2004 NGATS Integrated Plan & IWP



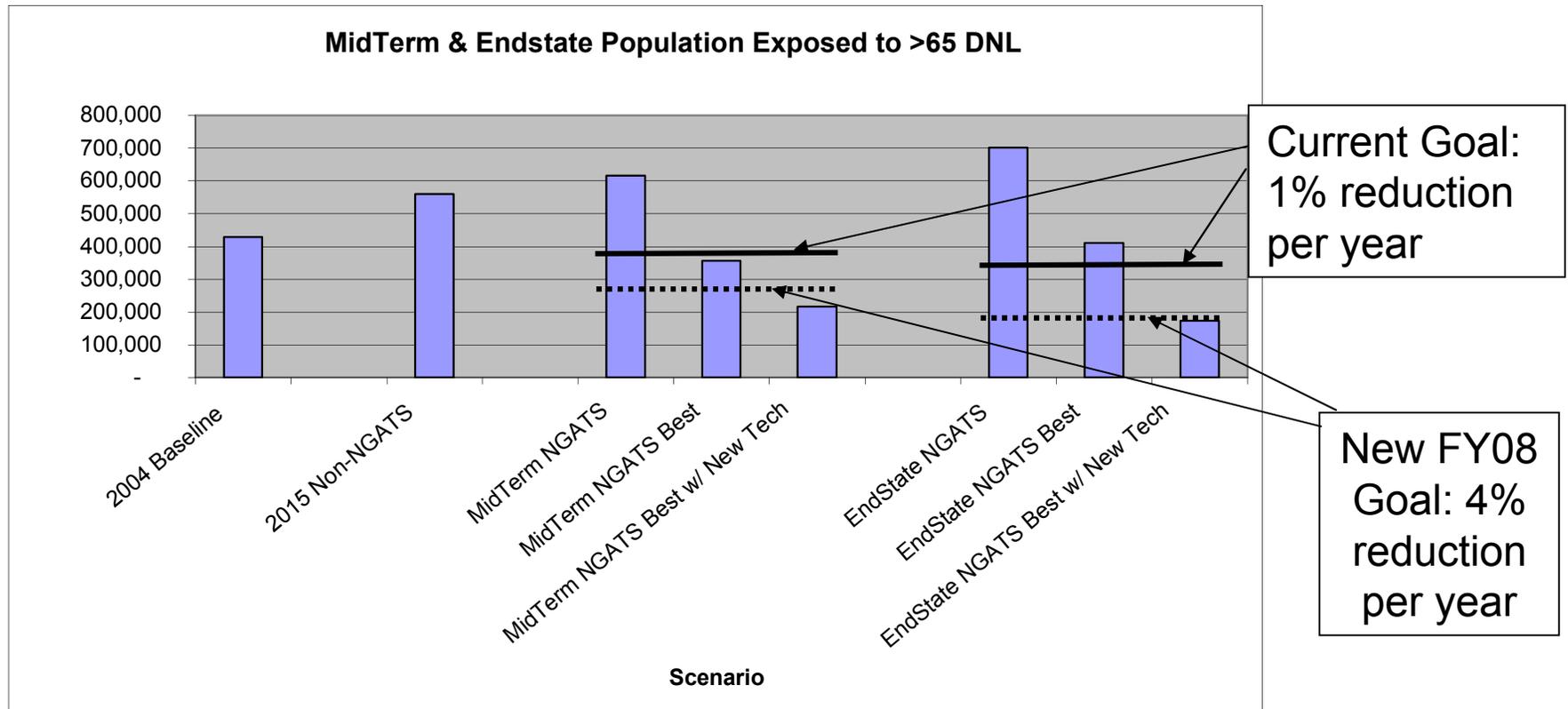
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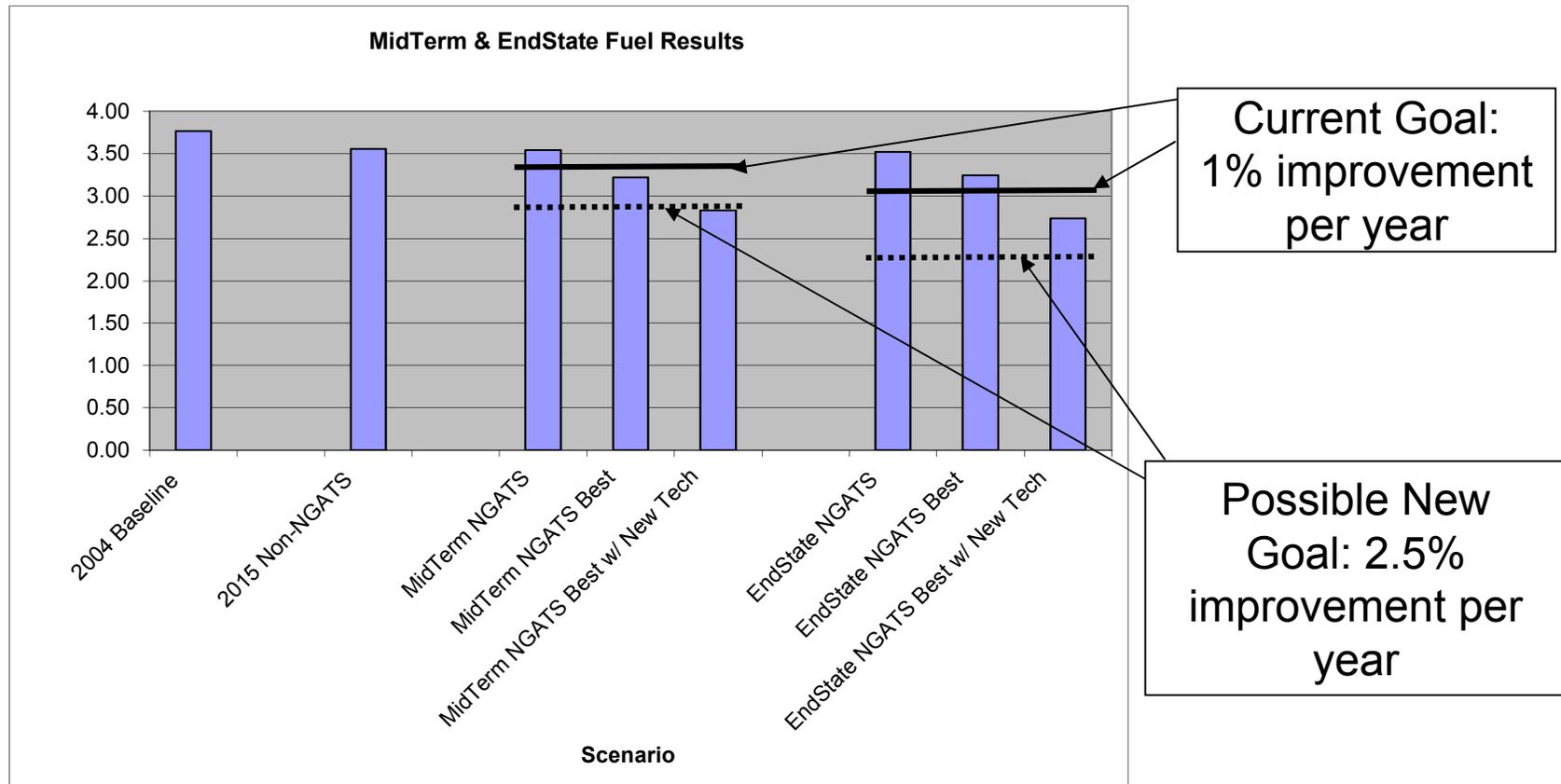
- Better Science & Integrated Modeling
  - Tools and Models
  - Aviation Emissions Characterization Roadmap
  - Aviation Climate Change Research Initiative (ACCRI)
  - Noise Research
  - Airports Cooperative Research Program
  - Environmental Management Systems (EMSs)
- Accelerate ATM Modernization
  - CDA
  - AIRE
  - ASPIRE
  - Advanced clean and quiet procedures
- Encourage New Aircraft Technology
  - CLEEN
- Explore Alternative Fuels
  - CAAFI
  - CLEEN
- Market Based Measures
  - Tools and Models

# Illustrative NextGen Noise Constraints Analyses



Number of people experiencing > 65 DNL increases  
 unless Adv. Ops and A/C with new technologies are used;  
 A/C with significant new technologies can reach the noise goal  
 in the end-state even if enhanced noise reduction goals are used  
*NOTE: Best in Class and New Tech Fleets not Fully Achievable*

# Illustrative NextGen Fuel Burn Constraints Analyses



Fleets with new A/C technology and Adv. Ops are required to meet Current mid term and end-state fuel efficiency goals; modeled A/C technology did not meet more challenging goals  
*NOTE: Best in Class and New Tech Fleets not Fully Achievable*

# What Next?

**So What Do We Do?**

***Should We Ignore Environmental Constraints and Hope  
They go Away?***

**Or**

***Curtail Aviation Growth and Live With the Economic  
Consequences?***

**Or**

***Should We Make Aviation Quieter, Cleaner and More  
Efficient to Enable Growth?***

**CLEEN critical to enable choice #3**

