

# Environment - Aviation Modeling and Analysis



Federal Aviation  
Administration

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for Alternative Jet Fuels and Environment

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# Environment and Energy Tradeoffs and Interdependencies

**Nacelle Modifications**

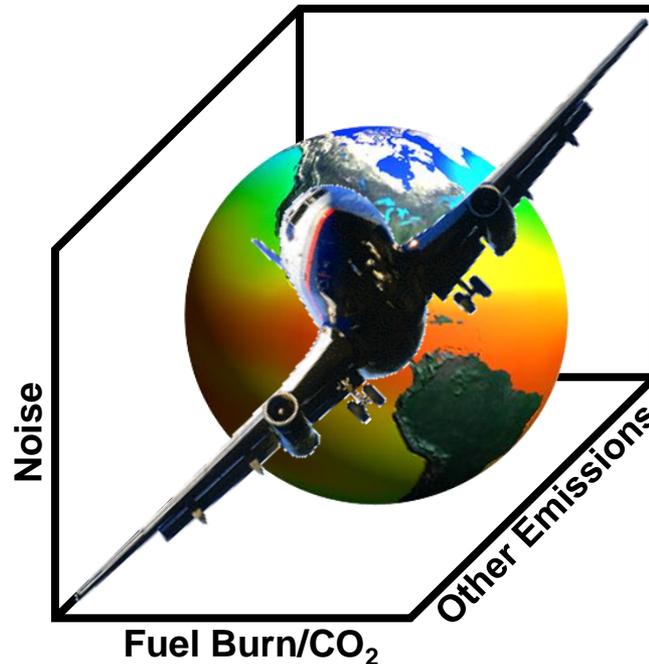
- Reduced **Noise**
- Increased **Fuel Burn/CO<sub>2</sub>**

**Increased Engine Pressure Ratio & Temperatures**

- Reduced **Fuel Burn / CO<sub>2</sub>**
- Reduced **HC and CO**
- Increased **NO<sub>x</sub>**

**Increased engine bypass ratio**

- Reduced **Fuel Burn / CO<sub>2</sub>**
- Reduced **Noise**
- Increased **NO<sub>x</sub>**



## Win-Win-Win Solutions

**Improved Aerodynamic Efficiency**  
**Reduced Weight**  
**Continuous Descent Arrival**  
**Reduced Vertical Separation Minimum (RVSM)**

**Operations changes**

- Reduce **contrails**
- More **fuel burn, CO<sub>2</sub>**

**Reduced polar flights**

- Less effects on stratosphere
- More **fuel burn, CO<sub>2</sub>**

**Steep climb**

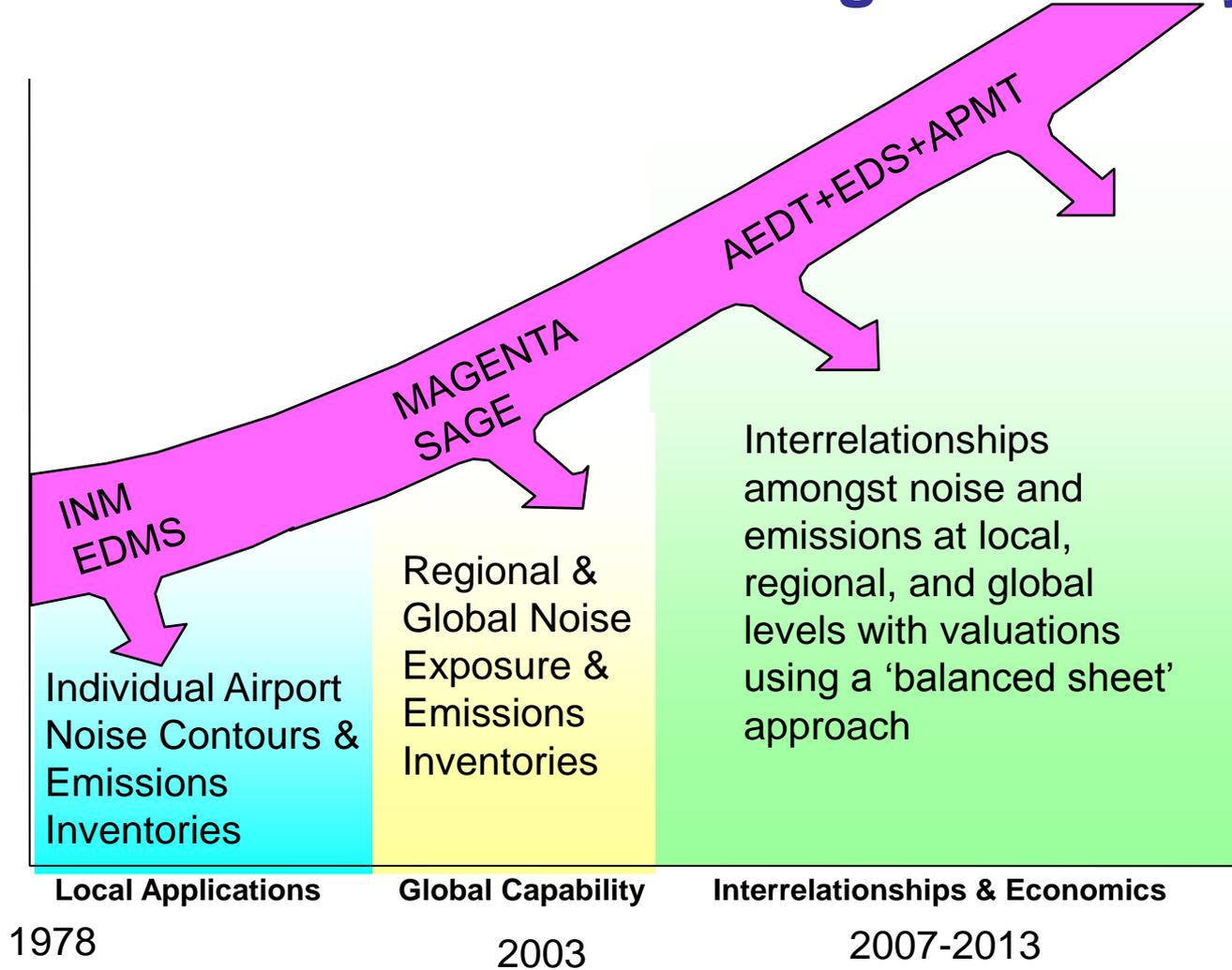
- Reduce **noise**
- More **fuel burn, CO<sub>2</sub>**

**Reduce cruise altitude**

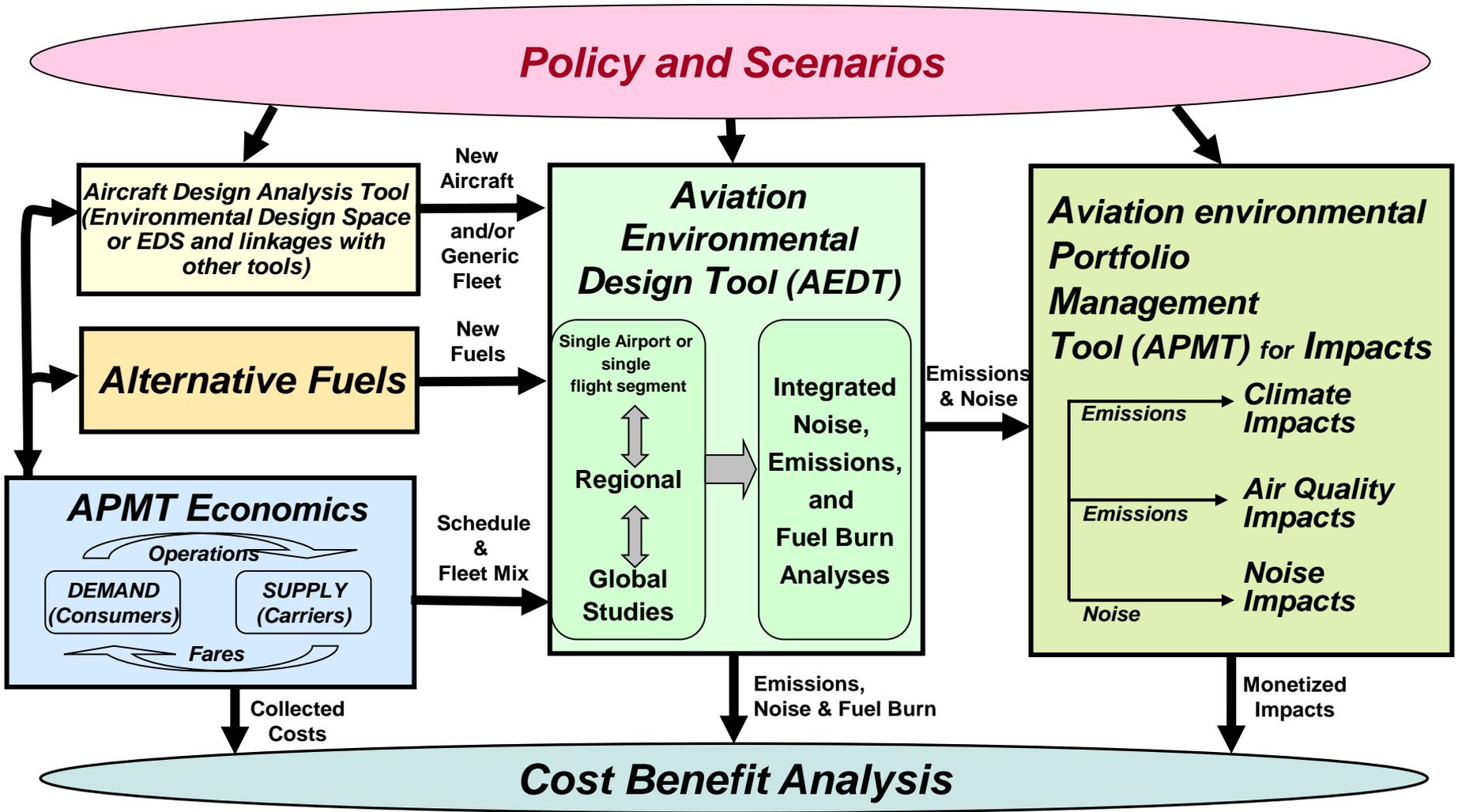
- Increased fuel burn, **CO<sub>2</sub>**
- Increased **NO<sub>x</sub>**
- Less increase **O<sub>3</sub>**
- Reduced **contrails**



# FAA Environmental Analysis Tools: A March Towards a Suite for Integrated Analysis



# A Suite of Tools for Integrated Environmental Analysis



[http://www.faa.gov/about/office\\_org/headquarters\\_offices/apl/research/models/](http://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/)



# Aviation Environmental Modeling and Analysis

- **Supports Environmental Planning, Regulatory and Compliance Requirements**
- **Tracks and Reports System-Wide Environmental Performance**
- **Guides Aviation Environmental Mitigation Options (Aircraft and fuel technologies, and operational procedures)**
- **Supports Analyses of International and Domestic Policy Options**



# Technical Areas of Interest (1 of 3)

- **Use technological and scientific advancements to support improvements to the aviation environmental tool suite being developed by the FAA to be able to model the consequences and impacts of aircraft noise and emissions (from current aircraft and potential future aircraft concepts) at the airport, regional and global levels.**
- **Develop models that can evaluate the fuel burn, emissions, and noise from existing and novel aircraft designs.**
  - **Seamlessly integrate environmental analyses of existing and novel aircraft designs into the aviation environmental tool suite.**
- **Develop models that can be used to model the techno-economic and environmental performance of alternative jet fuels.**
  - **Seamlessly integrate environmental analyses of alternative jet fuels into the aviation environmental tool suite.**



# Technical Areas of Interest (2 of 3)

- **Implement methodologies into the environmental tool suite that quantify the environmental and energy benefits of operational procedures.**
- **Develop models that use the performance, fuel burn, noise and emissions characteristics of aircraft to estimate fuel burn, noise and emissions at the local airport, regional, and global levels.**
- **Develop models that can calculate the physical and monetary impact of aviation noise and aviation emissions on surface air quality at the local airport, regional, and global levels.**
- **Develop models that can calculate the physical and monetary impact of aviation emissions on global climate change on both a global mean basis and on a regional basis.**
- **Develop models that can forecast the change in aviation demand and the evolution of the aircraft fleet under varied economic conditions and policy scenarios.**



# Technical Areas of Interest (3 of 3)

- **Analyze the impact on fuel burn, noise, emissions, as well as the interdependencies amongst these, of scenarios that utilize varied operational procedures, aircraft technology, alternative jet fuels, and policy measures.**
- **Analyze environmental impacts and economic trade-offs and cost-benefit assessments of policy options and mitigation strategies.**
- **Support environmental management system development and use, policy and economic analysis of environmental and energy related matters, facility energy management policies, National Environmental Policy Act and FAA facility environmental compliance, and other initiatives to improve the environmental performance of the national aviation system.**

