Aviation and the Environment

Aircraft PM National Roadmap: Program Overview

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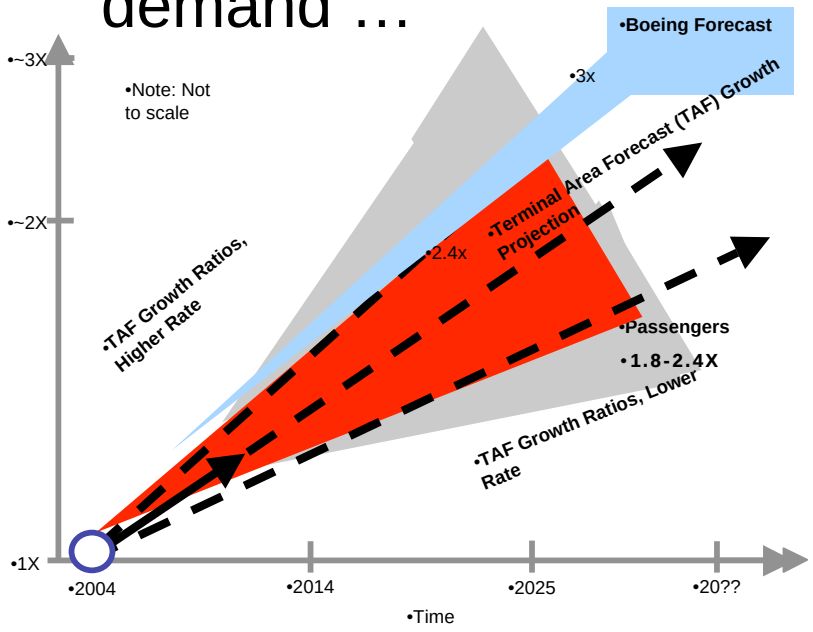
Federal Aviation Administration

Aviation and PM Emissions

- **Aircraft emissions of carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), and hydrocarbons (HC) are relatively well characterized**
- **Aircraft emissions of particulate matter (PM) have received more limited attention until recently**
- **39 US communities are now nonattainment for $PM_{2.5}$**
  - Many of the country's largest airports are in these communities
  - Little data is available on aircraft PM emissions to complete the analyses required for environmental impact statements, general conformity, and other environmental documents
- **Growing demand for air travel exacerbates the problem**

Challenge: Capacity Constraints

We have a growing demand …

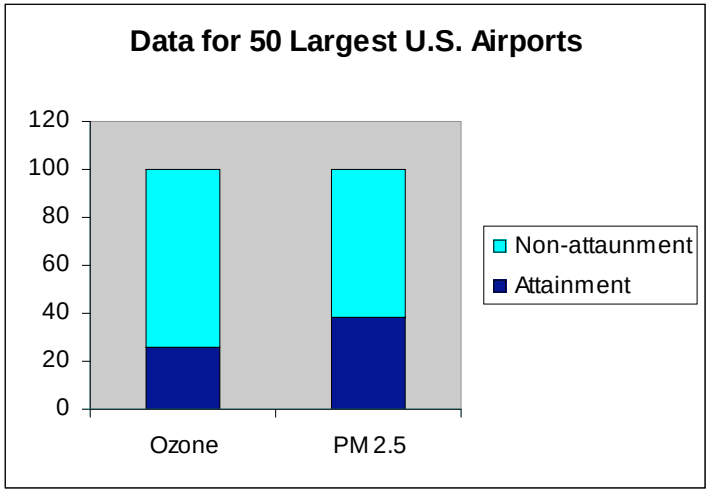


… coupled with environmental capacity constraints

Preliminary Analyses of Emissions Growth for NexGen Scenarios

… and a growing footprint

	2X Change
HC	***+ 75%***
CO	***+ 70%***
NOx	***+ 90%***
SOx	***+ 85%***



Aircraft Particulate Emissions

- **Aircraft engine combustion inefficiencies result in small quantities of soot (non-volatile particles)**
- **Some trace gases condense after the exhaust exits the engine to produce particles as well (volatile particles)**
- **Both non-volatile and volatile particles from the engine exhaust are very small; generally less than 1 micrometer, which fall into $PM_{2.5}$ category and can be inhaled easily**
- **Current research is characterizing the particulate emissions from aircraft engines as well as evaluating their impact on human health**

PM Roadmap

Recommendation for Executive Action	We recommend that the Secretary, DOT, direct the Administrator of FAA, in consultation with the Administrator of EPA and Administrator of NASA, to develop a strategic framework for addressing emissions from aviation-related sources. In developing this framework, the Administrator should coordinate with the airline industry, aircraft and engine manufacturers, airports, and the states with airports in areas not in attainment of air quality standards. Among the issues that the framework should address are

- **FAA Proposed developing PM national roadmap to fulfill GAO mandate**
- **Primary contributors include Government, Industry, Academia, Public**
- **Leverage funding from government and industry**
- **Coordinate research agenda to achieve common goals**
- **Assign roles/responsibilities and timelines (tied to EPA and ICAO/CAEP requirements)**
- **FAA manages the PM Roadmap**

PM Roadmap Structure

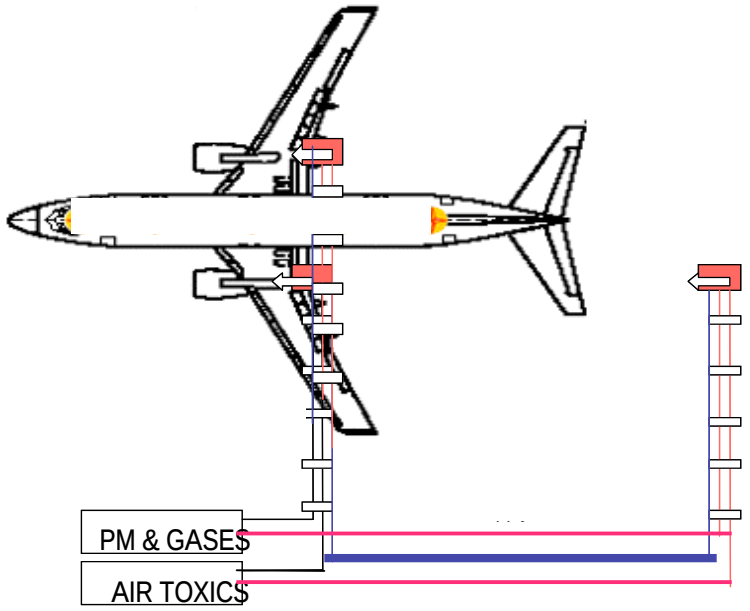
- **Five Product Groups lead the development of the Roadmap**
  - **Policy Analysis**: includes liaison with national and international regulatory agencies
  - **Measurement & Methodologies**: guides development of measurement techniques and instrumentation
  - **Impact Assessment**: assesses the health impacts of PM emissions using computer models
  - **Technology Development**: evaluates engine design and technical strategies for reducing PM emissions
  - **Database Development**: collects and organizes PM emissions data for public use

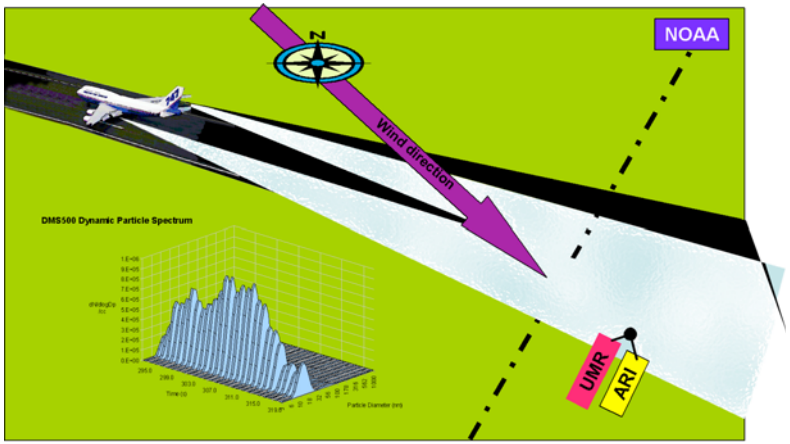
PM Roadmap Activities

- **Annual meeting in the spring to review progress and update Product Group work plans**
- **PM Roadmap Document - living document updated as needed**
- **PM Roadmap supports and informs JPDO Environmental Integrated Product Team (EIPT), Airport Cooperative Research Program (ACRP), and International Civil Aviation Organization (ICAO) Committee for Aviation Environmental Protection (CAEP)**
- **PARTNER COE researchers are active participants in the PM Roadmap**

PARTNER PM Research

- **Field measurement campaigns involving:**
  - Major U.S. airlines and airports
  - Test locations
    - Remote parking area
    - End of runway
  - Aircraft and engine mix
    - Regional to large commercial aircraft
    - Government aircraft
  - Data collection
    - At engine exit plane
    - downstream
- **Compared and assessed measurement methods – lessons learned**
  - Improved sampling techniques and locations
  - Sample preservation and line losses
  - Performance of measurement instruments
  - Measured and modeled plume behavior





ACRP PM Research

- **TRB is funding PM research through the Airport Cooperative Research Program (ACRP)**
  - Project 02-04: Research Needs Associated with Particulate Emissions at Airports
    - Surveying airports,reviewing literature, and summarizing research projects to define the current state of information about PM emissions from airport sources and to develop a comprehensive research agenda
  - Project 02-04A: Summarizing and Interpreting Aircraft Gaseous and Particulate Emissions Data
    - Developing a consistent, authoritative data source to characterize and quantify aircraft engine emissions to support both airport-level and national/international decision-making

Key Next Steps - PM Roadmap

- **Update all Product Group Work Plans**
- **Conduct annual meeting at FAA on April 24-25 (tentative)**
- **Release PM emissions database to make research project results publicly available**
- **Update PM Roadmap Document**
- **Publicize PM Roadmap accomplishments in aviation press**

PM Roadmap Contact

- **For additional information about the PM Roadmap, please contact:**

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