CAEP Analyses Supported by FAA Tools

Presented to: E&E REDAC Subcommittee
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Date: August 30, 2016
Outline

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• CAEP Analyses Supported by FAA Tools
• FAA Environmental Tools – Historical Use in CAEP
• Current full Aviation Environmental Tools Suite
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## CAEP Analyses Supported by FAA Tools

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### Tool use varies with the type of analysis

- Fixed-fleet (goals) analyses use only the base year fleet-types for growth and replacement then apply improvement factors
- Technology-specific analyses use in-production and technology readiness level eight (TRL8) project aircraft

> The latter is used for both Cost Effectiveness Analyses and Cost Benefit Analyses

> The fixed-fleet analyses use an equal manufacturer share assumption with the FOM for fleet evolution

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**Abbreviations:**

- **AEDT** – Aviation Environmental Design Tool
- **APMT-E** – Aviation environmental Portfolio Management Tool for Economics
- **APMT-I** – Aviation environmental Portfolio Management Tool for Impacts Analyses
- **FLEET-Builder** – FLleet Evolution, Estimation and evaluaTion Builder
- **FOM** – Fleet and Operations Module
CAEP Standard Development Overview

Tool use also varies by where CAEP is in the Standard Development process

CAEP Standards
Noise, NOx, nvPM, CO₂

Define Metric System
(as needed)
Metric, Correlating Parameters, Evaluation Options

Define & Analyze
Stringency Options

Define Instrumentation and Measurement Methodology
e.g., Annex 16, Chapter 4

Agree Certification Requirements

Agree Regulatory Level

Implement Domestic Regulation
FAA Environmental Tools History: CAEP 4 & prior

**Policy and Scenarios**

- Assumptions

  - Single Flight/Airport
    - Integrated Noise Model (INM)*
  - Single Flight/Airport Emissions and Dispersion Modeling System (EDMS)*

**Cost Analysis**

- Collected Costs
- Noise
- Emissions

* INM and EDMS 1978-2015
Current Full Aviation Environmental Tools Suite

Policy and Scenarios
Including outputs from other tools and analyses as appropriate

Alternative Fuels
Source and Composition

Rapid Fleet-Wide Environmental Assessment

Aircraft Design
Existing Aircraft, New Aircraft, and/or Generic Fleet

Operations

Fleet Evolution, Economics Estimation & Evaluation (FOM, APMT-E, FLEET-Builder)

Aviation Environmental Design Tool (AEDT)

Single Flight/Airport Regional Global Studies
Integrated Noise, Emissions, and Fuel Burn Analyses

Emissions, Noise, & Fuel Burn

Aviation Environmental Impacts Analysis (APMT-I)

Climate Impacts
Air Quality Impacts
Noise Impacts

Monetized Impacts

Cost Benefit Analysis

AEDT – Aviation Environmental Design Tool
APMT-E – Aviation environmental Portfolio Management Tool for Economics
APMT-I – Aviation environmental Portfolio Management Tool for Impacts Analyses
FLEET-Builder – FLeet Evolution, Estimation and evaluaTion Builder
FOM – Fleet and Operations Module
Tools use: USG input on CAEP Metric Systems

Policy and Scenarios
Including outputs from other tools and analyses as appropriate

Rapid Fleet-Wide Environmental Assessment

Aircraft Design
Existing Aircraft, New Aircraft, and/or Generic Fleet

Operations

Fleet Evolution
(FOM, APMT-E, FLEET-Builder)

Aviation Environmental Design Tool (AEDT)

- Single Flight/Airport
- Regional
- Global Studies

- Integrated Noise, Emissions, and Fuel Burn Analyses

Iterate assumptions with CAEP stakeholders

APMT-I – Aviation environmental Portfolio Management Tool for Impacts Analyses
APMT-E – Aviation environmental Portfolio Management Tool for Economics
FLEET-Builder – FLeet Evolution, Estimation and evaluation Builder
Tools use: USG input on CAEP Stringency Options

Policy and Scenarios
Including outputs from other tools and analyses as appropriate

- Rapid Fleet-Wide Environmental Assessment
- Aircraft Design
  - Existing Aircraft, New Aircraft, and/or Generic Fleet

Iterate assumptions with CAEP stakeholders
Tools use: CAEP Stringency Option Analyses

**Policy and Scenarios**
Including outputs from other tools and analyses as appropriate

**Aviation Environmental Design Tool (AEDT)**
- Single Flight/Airport
- Regional
- Global Studies
- Integrated Noise, Emissions, and Fuel Burn Analyses

**Cost Effectiveness Analysis**

**Operations**

**Fleet Evolution, Economics Estimation & Evaluation (APMT-E/ FLEET-Builder)**

**Collected Costs**

**Emissions, Noise, & Fuel Burn**

APMT-I – Aviation environmental Portfolio Management Tool for Impacts Analyses
APMT-E – Aviation environmental Portfolio Management Tool for Economics
FLEET-Builder – FLeet Evolution, Estimation and evaluaTion Builder

Iterate assumptions with CAEP stakeholders
Tools use: USG input on CAEP Standard Levels

**Policy and Scenarios**
Including outputs from other tools and analyses as appropriate

**Aviation Environmental Design Tool (AEDT)**
- Single Flight/Airport
- Regional
- Global Studies
- Integrated Noise, Emissions, and Fuel Burn Analyses

**Aviation Environmental Impacts Analysis (APMT-I)**
- Climate Impacts
- Air Quality Impacts
- Noise Impacts
- Monetized Impacts

**Operations**
- Fleet Evolution, Economics Estimation & Evaluation (APMT-E/ FLEET-Builder)

**Cost Benefit Analysis**

**Collected Costs**

**Integrated Noise, Emissions, and Fuel Burn Analyses**

APMT-I – Aviation environmental Portfolio Management Tool for Impacts Analyses
APMT-E – Aviation environmental Portfolio Management Tool for Economics
FLEET-Builder – FLeet Evolution, Estimation and evaluatIon Builder
Summary

The USG brings extensive analytical capabilities to ICAO with the current Aviation Environmental Tools Suite.

However, these capabilities have been in use for a relatively short time, and CAEP is still in a learning mode about some of the tools.

Which tools are used varies with the type of analysis and where CAEP is in the Standard Development process.

Aircraft design and rapid analysis tools have been used to inform development of Metric Systems and Stringency Options for Standards.

Cost Effectiveness Analyses for CAEP Standards development are informed by the fleet evolution, cost, noise and emissions tools.

Monetizing environmental benefits and Cost Benefit Analysis tools are being investigated by CAEP.

Continuing tools improvement will benefit CAEP (e.g., nvPM and fleet evolution).

The process for agreeing assumptions and an analysis framework for developing each CAEP Standard has complexities that are independent of the supporting tools.