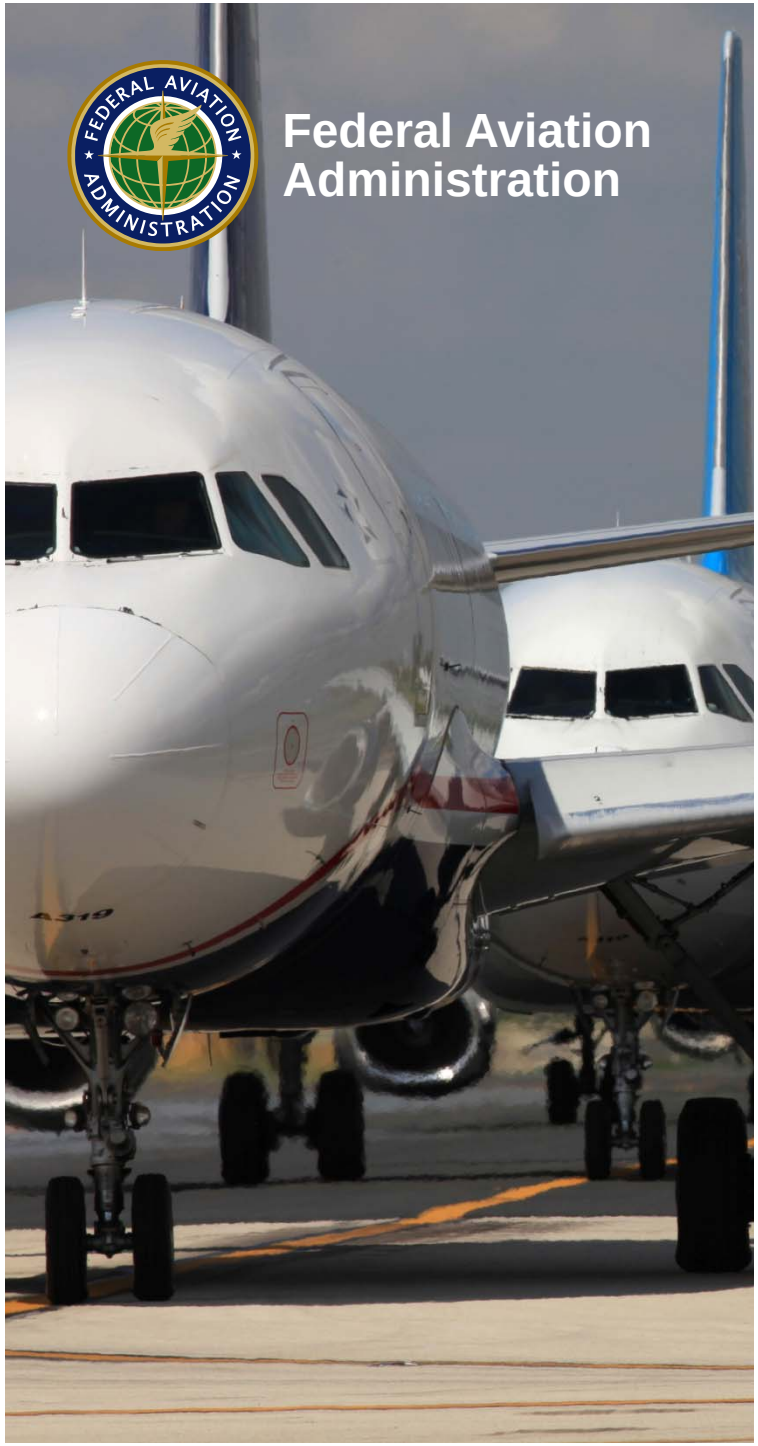
FAA Office of Environment and Energy (AEE) Research Overview



Presented to: E&E REDAC Subcommittee

By: Dr. Jim Hileman
Office of Environment and Energy
Federal Aviation Administration

Date: August 26, 2014

Outline

- **Refresher on AEE Research**
- **Budget Update**
- **Status of ASCENT Center of Excellence**
- **Summary**

Aviation Environmental Challenges

- Aviation impacts community noise, air quality, water quality, energy usage, and climate change
- Environmental impacts from aviation emissions could pose a critical constraint on capacity growth

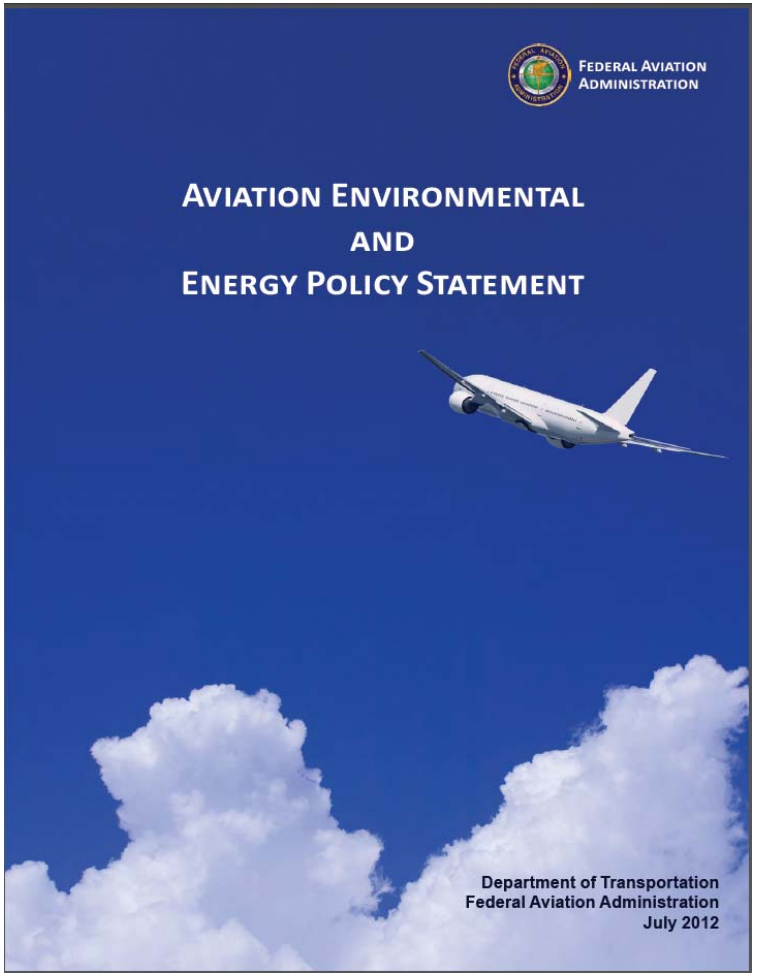
Vision and Principles

Vision:

Environmental protection that allows 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.



Aviation E&E Policy Statement (Federal Register 77-141, 2012):
http://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/media/FAA_EE_Policy_Statement.pdf

Environment & Energy Goals

Aspect	Goal
Noise	Reduce the number of people exposed to significant noise around U.S. airports in absolute terms, notwithstanding aviation growth, and provide additional measures to protect public health and welfare and our national resources.
Air Quality	Achieve an absolute reduction of significant air quality health and welfare impacts attributable to aviation, notwithstanding aviation growth.
Energy	Improve National Airspace System (NAS) energy efficiency and develop and deploy alternative jet fuels for commercial aviation.
Climate	Limit the impact of aircraft CO2 emissions on the global climate by achieving carbon neutral growth by 2020 compared to 2005, and net reductions of the climate impact from all aviation emissions over the longer term (by 2050).

Aviation E&E Policy Statement (Federal Register 77-141, 2012):
http://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/media/FAA_EE_Policy_Statement.pdf

AEE Research Overview

Characterize the Problem and Assess Risk:

- Improve our scientific understanding of E&E constraints
- Incorporate this scientific knowledge into an integrated tool suite that can characterize the system, assess the risk and inform development of potential mitigation options

Develop mitigation solutions:

- Airframe and engine technologies
- Sustainable alternative jet fuels
- Clean, quiet and energy efficient operational procedures
- Environmental standards and policy measures

Manage system performance:

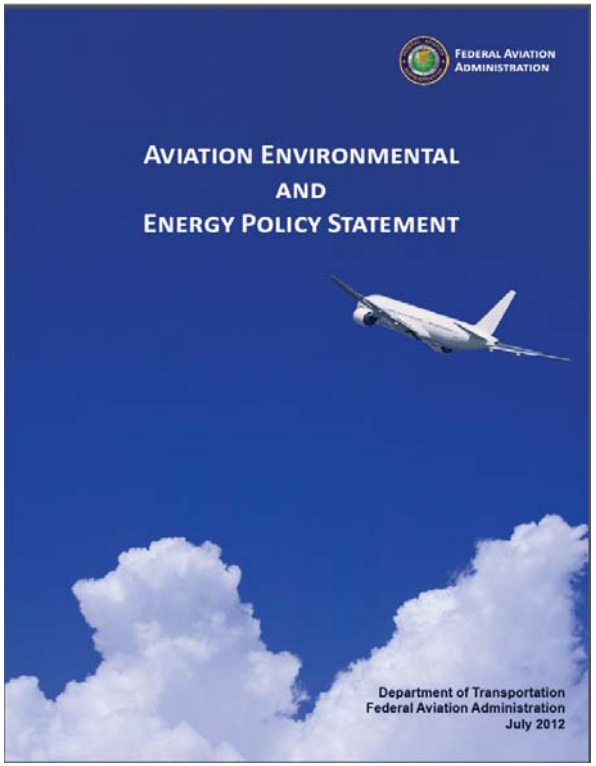
- Integrated analysis that engages a wide range of stakeholders to understand the current and future state of the aviation system
- Utilize knowledge to provide guidance on system-wide environmental improvements

Environment & Energy Strategy

Environmental protection that allows aviation growth

NextGen Five-Pillar Environmental Approach

- P1: Improved Scientific Knowledge and Integrated Modeling
- P2: New Aircraft Technologies
- P3: Sustainable Alternative Aviation Fuels
- P4: Air Traffic Management Modernization and Operational Improvements
- P5: Policies, Environmental Standards, and Market Based Measures



Source: Aviation Environmental and Energy Policy Statement (2012)

Mapping of Environmental Goals and Pillars

Pillars → / ***Goals ↓***	**P1** Scientific Knowledge	**P1** Integrated Modeling	**P2** Aircraft Technologies	**P3** Alt Jet Fuel	**P4** ATM Mod & Ops Improvement	**P5** Policy Measures
NOISE: Reduce significant noise impact	X	X	X		X	X
AIR QUALITY: Reduce significant air quality impact	X	X	X	X	X	X
ENERGY: Improve NAS energy efficiency	X	X	X	X	X	X
ENERGY: Develop sustainable alternative fuels	X	X		X		X
CLIMATE: Reduce GHG emissions and their impacts	X	X	X	X	X	X

E&E Program addresses Environmental Goals through the NextGen Five Pillar Approach.

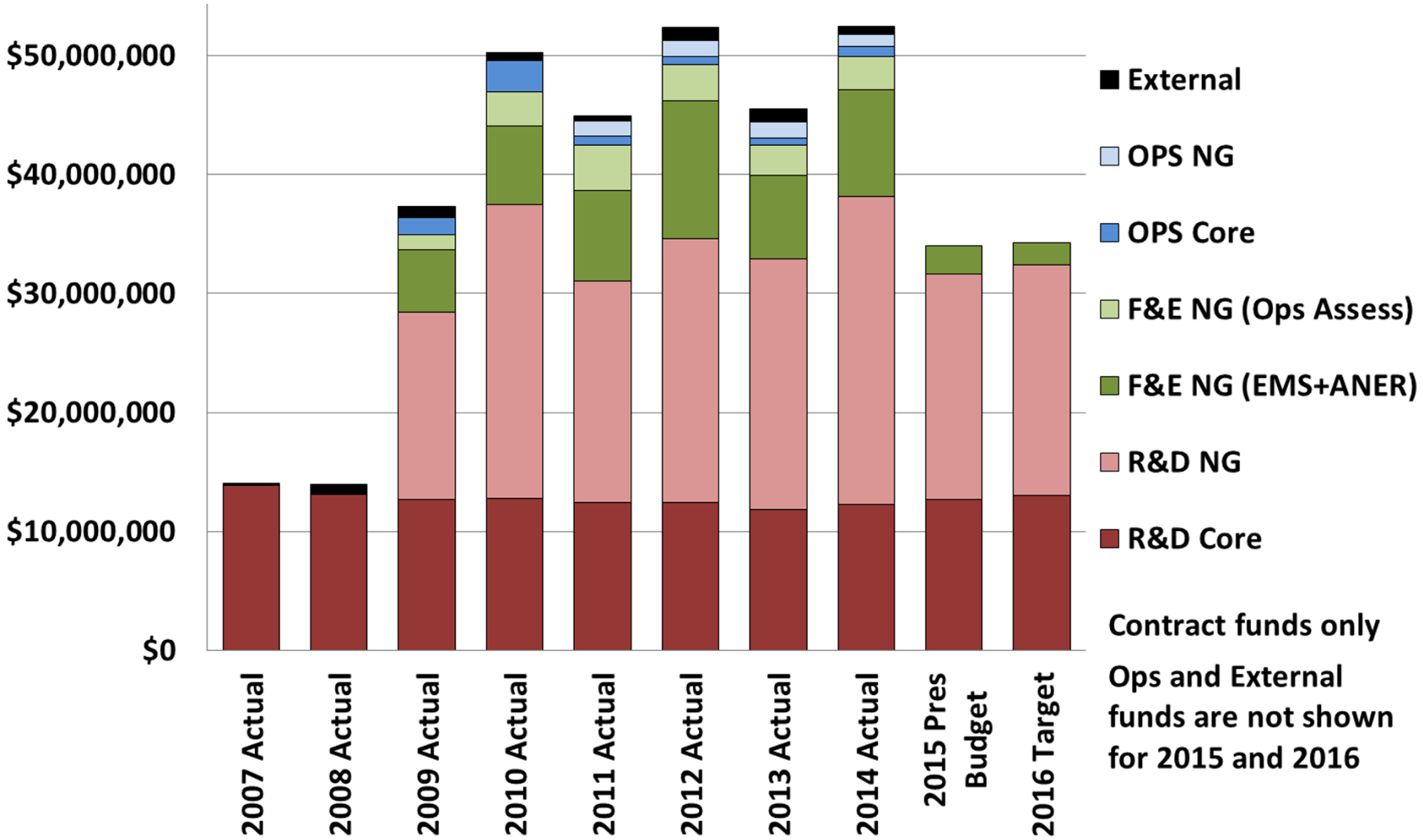
AEE Research Objectives

1. Resolve key E&E questions relating to the environmental impacts of aircraft noise and emissions and provide sound scientific data to inform policy making relating to aviation's energy use and environmental impacts.
2. Develop and implement integrated aviation environmental tool suite that can evaluate environmental impacts of aviation and potential mitigation options.
3. Identify solutions that will reduce environmental impacts and/or improve energy efficiency.
4. Investigate E&E effects of solutions with aviation environmental tool suite.
5. Accelerate solution maturation with our partners in government, industry and academia.

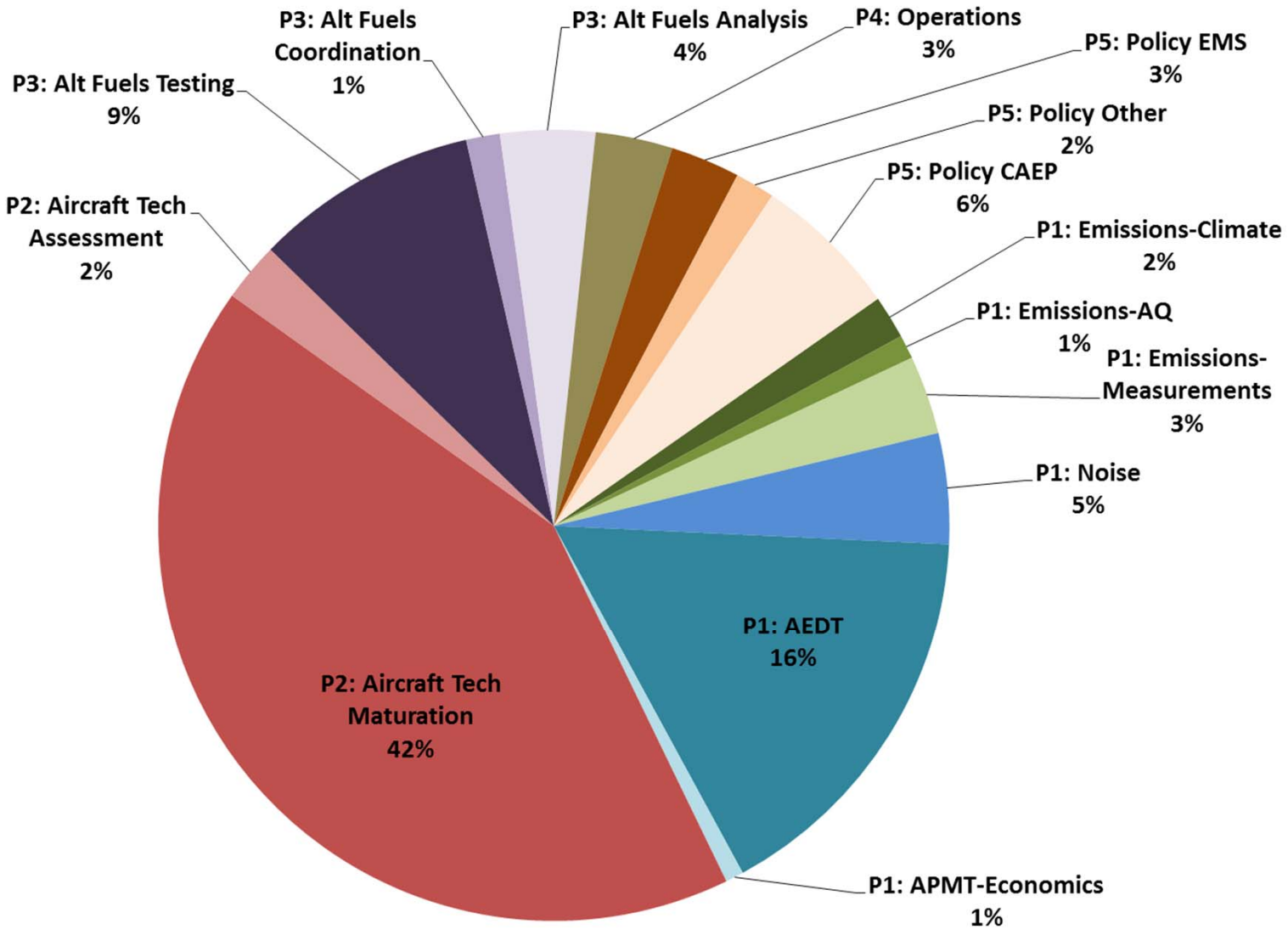
Mitigation Concepts:
- **Aircraft Technology**
- **Alternative Jet Fuels**
- **ATM Modernization / Ops Improvements**

6. Analyze environmental and economic impacts, trade-offs and cost-benefit assessments of both domestic and international policy options and scenarios.
7. Evaluate progress toward E&E goals and develop research roadmaps that resolve identified gaps with solutions.

Budget Profile – Broken out by Funding Source



FY14 Budget Allocation by Pillar & Topic



FY12-FY14 Budget Allocation Comparison

Pillar and Area	FY12 Amount	FY13 Amount	FY14 Amount
P1: Emissions - Climate	2,330,245	1,225,000	910,000
P1: Emissions - Air Quality	615,986	849,953	500,000
P1: Emissions - Measurements	1,000,000	2,370,000	1,650,300
P1: Noise	1,014,000	1,576,000	2,320,500
P1: AEDT	10,359,225	8,155,845	8,395,743
P1: APMT-Economics	500,000	-	380,000
P2: Aircraft Tech Maturation	20,003,850	20,601,250	21,625,071
P2: Aircraft Tech Assessment	1,953,156	1,962,313	1,240,000
P3: Alt Fuels Testing	3,668,100	1,300,000	4,702,000
P3: Alt Fuels Coordination	1,029,000	250,000	710,000
P3: Alt Fuels Analysis	380,000	700,000	1,990,000
P4: Operations	850,134	850,000	1,620,000
P5: Policy EMS	2,855,000	1,539,769	1,460,000
P5: Policy Other	1,702,000	614,500	835,000
P5: Policy CAEP	1,000,000	1,660,000	3,070,000
COE Office	485,000	205,000	803,155
Other		390,434	723,179
TOTAL	**$ 49,745,696**	**$ 44,250,064**	**$ 52,934,948**

Research Programs

Center of Excellence (COE) Program

- Focused on university research
- Three PARTNER projects will continue into 2015

Continuous Lower Energy, Emissions and Noise (CLEEN)

- CLEEN I: 2010-2015
- CLEEN II: 2015-2020
- Reduce aircraft fuel burn, emissions and noise through technology & advance alternative jet fuels

Additional Research Efforts

- Volpe Transportation Center
- Contract mechanisms (e.g., SEMRS, PEARS)

Aviation Sustainability Center (ASCENT) Overview

- Partnership among universities, commercial firms, and government laboratories to conduct research and education
- Expands environment and energy research carried out by PARTNER to address alternative jet fuel research request in 2012 FAA Modernization and Reform Act
- COE brings together expertise of PARTNER COE with USDA AFRI Regional Bioenergy Coordinated Agriculture Projects (CAPS) and SunGrant Initiative

- Award announced in September 13, 2013
- Duration is five years and is renewable once to get to ten year total
- Funding $11.7M ($8.5M allocated thus far) plus cost share requirement
- Engaging U.S. government agencies (FAA, USDA, DoE, U.S. Navy, U.S. Air Force, DLA-Energy, EPA, NASA) and Transport Canada

ASCENT Research Areas – Year 1

Continued COE Research

- Noise research
- Emissions measurements
- Air quality and climate modeling
- Aircraft performance evaluation and tool development
- Exploration of novel operational procedures
- Analysis and research to support ICAO CAEP

New Research Areas

- Helicopter Noise
- Alternative Jet Fuel Supply Chain Analysis
- National Jet Fuel Combustion Program

Process for going from a research need to proposal submission*

This approach is meant to provide equal opportunity to all COE universities in planning and being a part of a project team

1. **AEE will create a solicitation that identifies a research project** with a title, short description, estimate of available funds, period of performance, names of project manager(s) (or PM), and a deadline for the receipt by the PM of the Notices of Intent (NOI) from the ASCENT universities. The **deadline should be nominally 3 weeks from the date the universities receive the NOI solicitation.**
2. Division Manager (DM) will update AEE ASCENT project tracking spreadsheet with solicitation information (including number).
3. PM will communicate the solicitation to COE Co-Directors with cc provided to DM and AEE-3.
4. **The COE Co-Directors will communicate the solicitation to all COE universities, sponsors, and Advisory Committee members.** The COE Co-Directors will ask the COE universities to develop their Notices of Intent (NOI) to submit a full proposal to meet the objectives identified in the solicitation. Sponsors and Advisory Committee members are welcome to provide comments on the solicitation to the ASCENT Community (AEE, other sponsors, ASCENT Co-Directors, universities, and/or Advisory Committee members) as they see fit.
5. **One or more PIs may take a lead, form teams of researchers from COE universities (may invite non-COE researchers as appropriate) and develop a brief draft proposal that will serve as a NOI to submit a full proposal.** The NOI should include the team members (university and non-university collaborators), approach description (not to exceed two pages), expected deliverables, timeline and preliminary project cost. These must be submitted to the COE Co-Directors by the deadline from the first step (send email to both cavalieri@wsu.edu and rjhans@mit.edu).
6. The COE Co-Directors will review draft NOI and then submit to the PM without any filtration.
7. **PM will review the draft proposal(s) and communicate internally with Division Manager and AEE-3 (and others, as needed) and down-select (if multiple draft proposals were submitted) to final team(s).** PM can request additional, clarifying information (e.g., CV, relevant publications). Decision will be made based on meeting objectives, team qualification, schedule, cost, and technical merit. One or more projects may be funded from a single solicitation or a decision could be made to select no team. Further, multiple teams may asked to merge.
8. PM will communicate decision to PIs with cc to COE Co-Directors, DM, and AEE-3. Decisions should be communicated by the PM to the PIs within 6 weeks of the NOI submission deadline.
9. PM will work with lead PI to develop a full proposal following ASCENT template. PI will submit the final full proposal via Grants.gov and AEE will approve the proposal for funding.
10. PM and project team will convene regular telecons, discuss progress and interim results prior to any presentation/publication.

*** Process applies to AEE funds and is subject to revision.**

ASCENT Notice of Intent Request (NOIR) Summary

Research Area	NOIRs (% awarded)	Total Grant Amount	Solicitation Areas
Emissions Measurements	1 (100%)	$2,300,000	7, 10
Air Quality and Climate Modeling	5 (100%)	$800,000	7, 10
Noise Research	7 (100%)	$795,000	6, 10
Aircraft Technology Modeling	4 (100%)	$1,490,000	8, 10
Alt Jet Fuel Analysis	2 (50%)	$1,750,000	1-3
Alt Jet Fuel Testing	11 (18%)	$3,295,000	4-5
Operational Procedures	3 (100%)	$540,000	9, 10
Analysis to support Environmental Standard Setting	1 (100%)	$720,000	10
Total:	**34**	**$11,690,000**	

NOI Request Process by the Numbers

- **34 total NOI Requests (using FY13-14 funds)**
  - 23 have been issued and decision made
  - 7 are being examined by FAA
  - 2 are open
  - 2 have not gone out to ASCENT
- **Of the 23 NOI Requests that have a decision:**
  - 9 requests resulted in just 1 team submitting an NOI
  - 13 requests resulted in 2-3 teams submitting an NOI
  - 1 request resulted in 6 teams submitting an NOI
- **So far (based on 23 NOI Requests with a decision):**
  - Funding 13 of the 16 ASCENT universities
  - Roughly 3/4 of Principle Investigators were part of PARTNER COE

Proposed ASCENT COE Reporting

March Advisory Committee Meeting	• Briefings by all projects • Second week of March
March Quarterly Report	• Quarterly report (progress and financials) via KSN • March 31
June Quarterly Report	• Quarterly report (progress and financials) via KSN • June 30
September Annual Report	• Detailed technical reports for all projects • Quarterly report (progress and financials) via KSN • September 30
October Advisory Committee Meeting	• Briefings by all projects • Second week of October
December Quarterly Report	• Quarterly report (progress and financials) via KSN • December 31

COE Reports:

- Report to Congress
- NARP Report
- COE Website

Summary

- Noise, emissions and the need for a sustainable and secure energy supply remain critical issues facing the growth of aviation
- Reduced funding limits our ability to develop solutions that could prevent environment from being a constraint on aviation growth

- ASCENT being stood up
  - Nearly $12M of funds going in first year
  - PARTNER research is continuing via ASCENT
  - Standing up new efforts relating to alternative fuels and helicopter noise
  - Seeking engagement from other government agencies