FAA Environment & Energy Research & Development Program Overview

Prepared for: CAAFI Biennial General Meeting

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Date: June 2, 2022

SAF Grand Challenge Roles (in MOU[1])

DOE

- Continue investments and develop expertise in sustainable technologies to develop cost effective low carbon liquid fuels and enabling coproducts from renewable biomass and waste feedstocks
- Continue a significant multi-year SAF scale-up strategy committed to in FY21
- R&D aimed at creating new pathways toward higher SAF production
- Advance environmental analysis of SAF
- Collaborate with EPA to expedite regulatory approvals of SAF with significant life-cycle GHG reductions

DOT/FAA

- Develop overall strategy to decarbonize aviation
- Coordinate ongoing SAF testing and analysis
- Work with standards organizations to ensure safety and sustainability of SAF
- Continue International technical leadership
- Promote end use of SAF
- Support infrastructure and transportation systems that connect SAF feedstock producers, SAF refiners, and aviation end users.
- Collaborate with EPA to expedite regulatory approvals of SAF with significant life-cycle GHG reductions

USDA

- Continue investments and build expertise in sustainable biomass production systems
- Decarbonize supply chains
- Invest in bio-manufacturing capability & workforce development
- Community and individual education
- Provide outreach & technology transfer to producers, processors and communities to accelerate adoption and participation
- Commercialization support
- Collaborate with EPA to expedite regulatory approvals of SAF with significant life-cycle GHG reductions

1. SAF Grand Challenge MOU available at: https://www.energy.gov/sites/default/files/2021-09/S1-Signed-SAF-MOU-9-08-21_0.pdf

FAA SAF Program Focus

Testing
accelerate SAF development

- Test fuels
- Improve testing methods
- Conduct evaluation
- Streamline approval

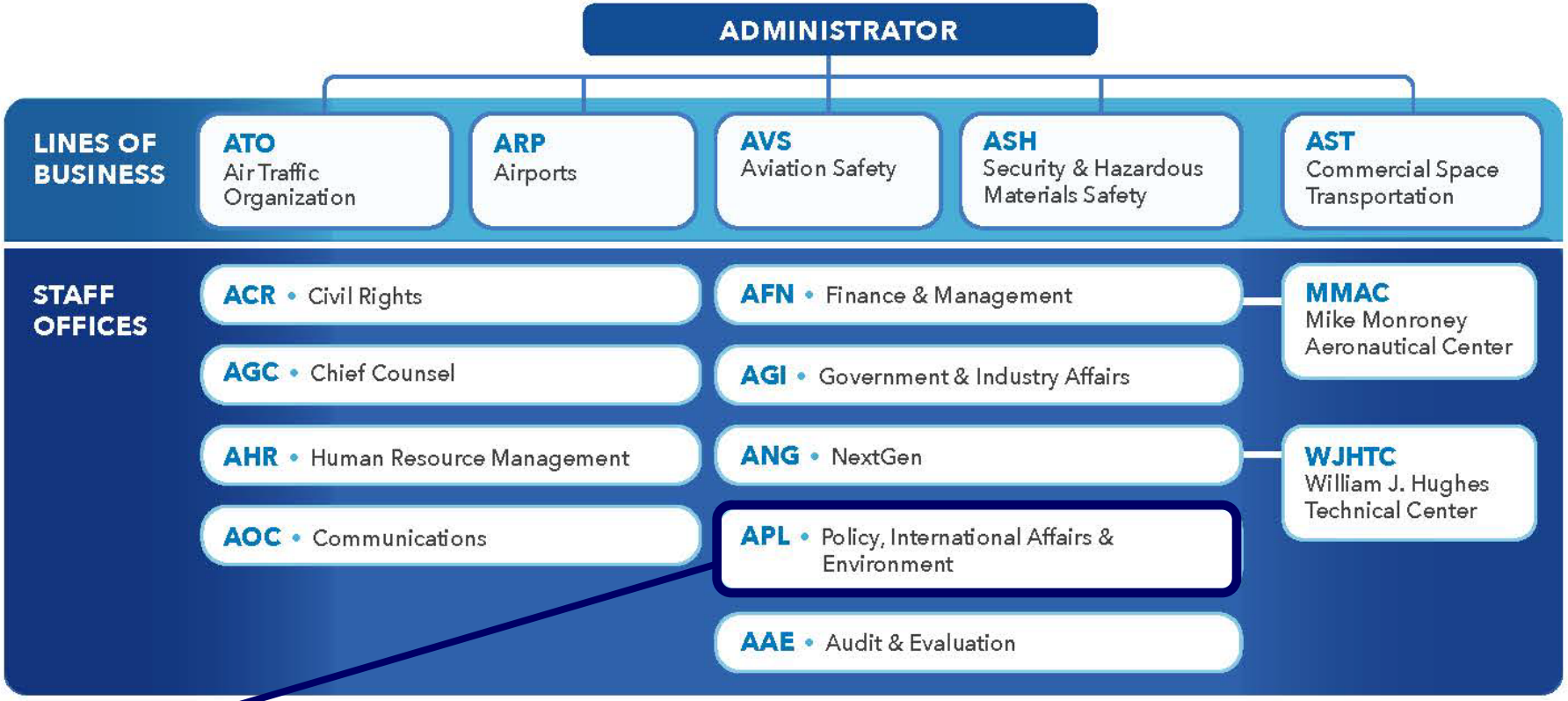
Analysis
environmental and economic sustainability

- Lifecycle emissions
- Cost reduction
- Supply potential
- Supply chain opportunities

Coordination
support SAF integration

- Public-private partnership – *CAAFI*
- U.S. interagency cooperation
- International cooperation – *ICAO*

FAA Organizational Structure



Office of Environment and Energy (AEE)

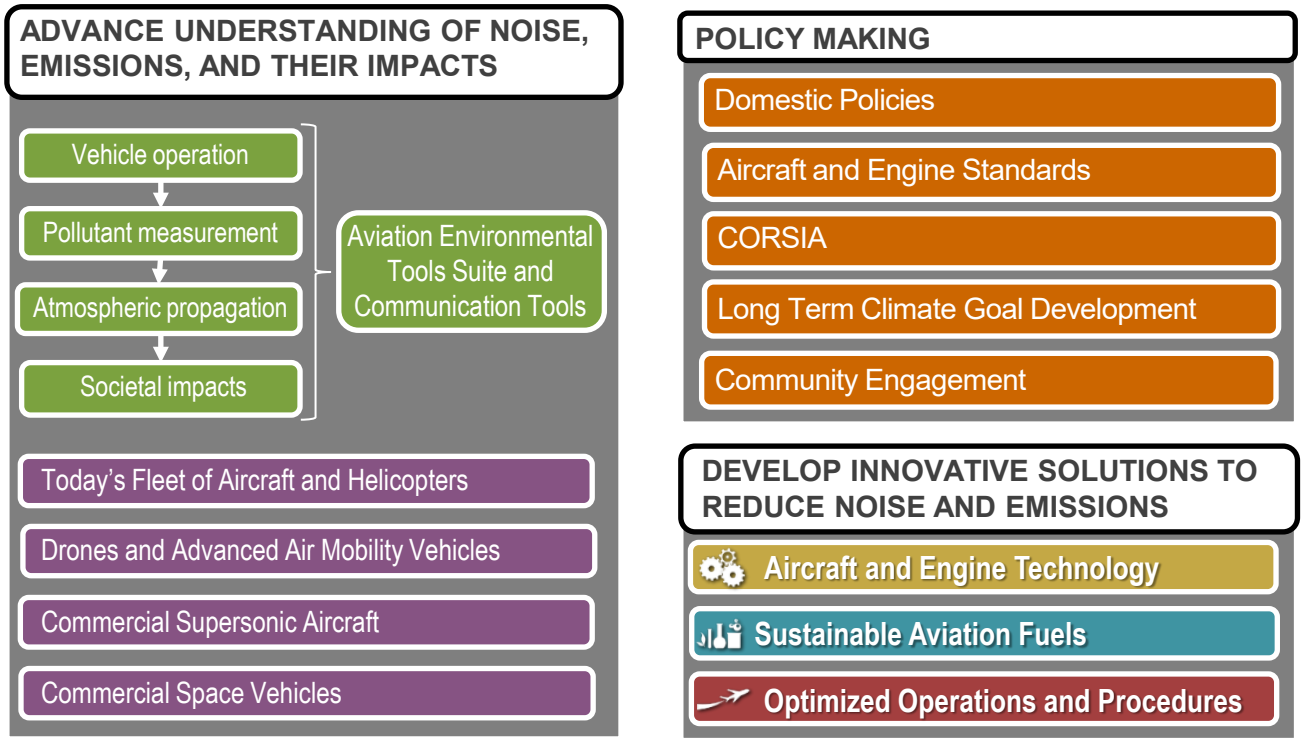
- Office within APL, responsible for broad range of environmental policies
- About 50 staff members
- Responsible for roughly one-third of FAA RE&D Budget (FY22 budget)

Environmental & Energy (E&E) Strategy

E&E Mission: *To understand, manage, and reduce the environmental impacts of global aviation through research, technological innovation, policy, and outreach to benefit the public*

E&E Vision: *Remove environmental constraints on aviation growth by achieving quiet, clean, and efficient air transportation*

E&E Program:



ASCENT Aviation Sustainability Center
www.ascent.aero/

CLEEN Continuous Lower Energy, Emissions & Noise Federal Aviation Administration
www.faa.gov/go/cleen/

CAAFI®
www.caafi.org/

the VOLPE center

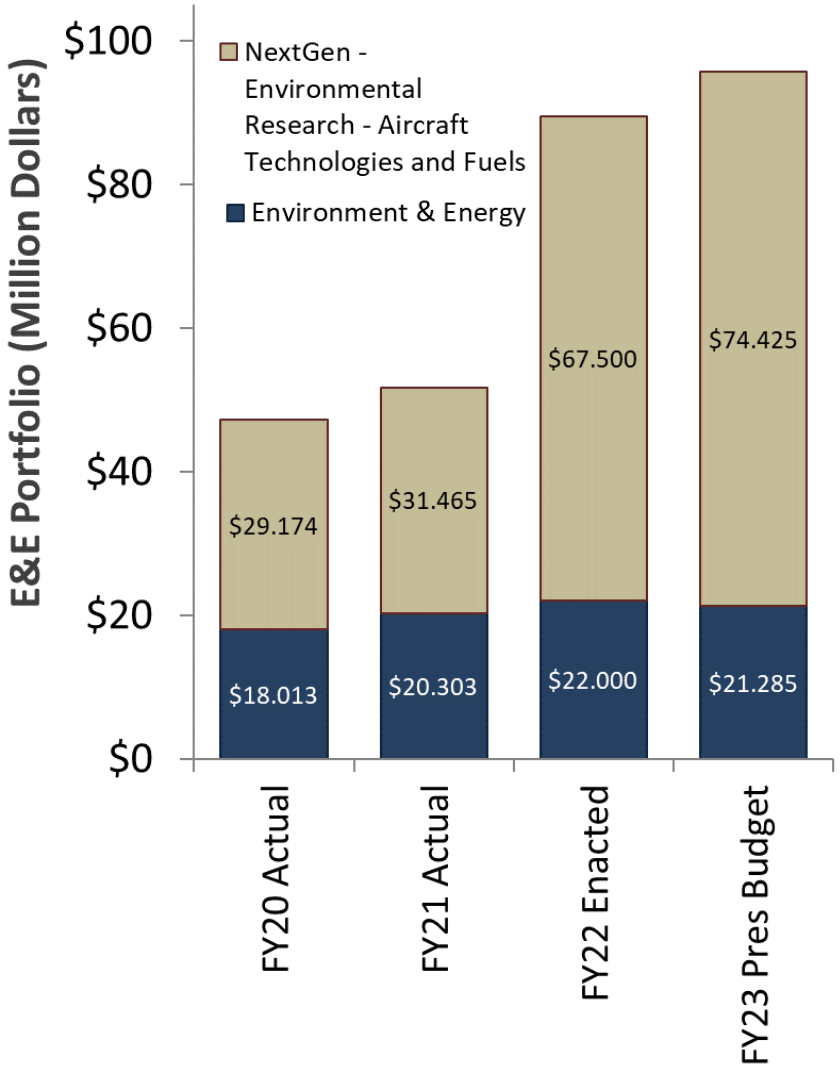
Environmental & Energy R&D Portfolio

RE&D Environment & Energy Budget Line Item*

- Improved understanding of noise and emissions and their impacts
- Analytical tool development
- Analysis to inform decision making

RE&D NextGen – Environmental Research – Aircraft Technology and Fuels Budget Line Item**

- Accelerated development of aircraft and engine technologies with reduced fuel burn, noise and emissions
- Testing, analysis and coordination activities related to Sustainable Aviation Fuels ($16M in FY22 budget)



*Budget Line Items: A12.a (FY20), A.T (FY21), A11.u (FY22), A11.T (FY23)

** Budget Line Items: A12.b (FY20), A.U (FY21), A11.v (FY22), A11.U (FY23)

FY23 President's Budget: https://www.faa.gov/about/budget

Federal Aviation Administration

CLEEN Program

Through the Continuous Lower Energy, Emissions, and Noise (CLEEN) Program, FAA are working in a public-private partnership with industry to accelerate maturation of certifiable aircraft and engine technologies.

- Technological innovation will be essential to enable environmentally sustainable growth and maintain U.S. global leadership.

- FAA have been operating CLEEN Program since 2010 (initially set up during Bush administration)

- FAA announced CLEEN Phase III on Sept 9, 2021

- Summary of CLEEN accomplishments over first two phases (10+ years) available online

CLEEN Phase III Technologies

For more information on CLEEN program: http://www.faa.gov/go/cleen

For the CLEEN Phase 3 Press Release:
https://www.faa.gov/newsroom/faa-awards-100m-develop-next-generation-sustainable-aircraft-technology

For a summary of CLEEN Accomplishment:
https://www.faa.gov/newsroom/continuous-lower-energy-emissions-and-noise-cleen-program?newsId=22534

Federal Aviation Administration

ASCENT Center of Excellence

For 18 years, FAA Office of Environment and Energy has relied on university centers of excellence to:

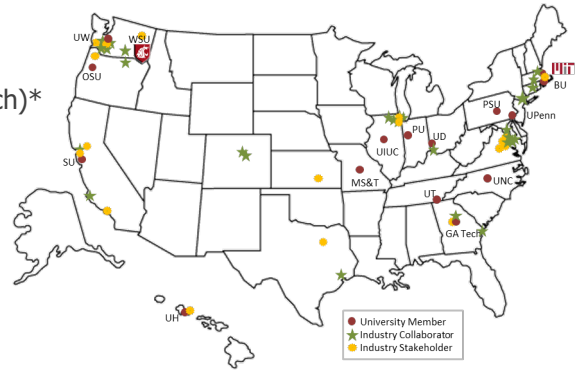
- Provide knowledge to inform decision making on environment and energy matters;
- Enable the introduction of innovative solutions to cost-effectively mitigate the environmental impacts of aviation; and
- Support the instruction of hundreds of professionals with knowledge of the environmental challenges facing aviation (*674 students supported and counting*).

ASCENT Research Portfolio

- In 2013, FAA established ASCENT to conduct research on environment and alternative jet fuels
- Portfolio covers broad range of topics on Alternative Jet Fuels, Emissions, Noise, Operations, and Analytical Tools
- Currently overseeing a large increase in the COE portfolio

Lead Universities:
Washington State University (WSU)
Massachusetts Institute of Technology (MIT)*

Core Universities:
Boston University (BU)*
Georgia Institute of Technology (Ga Tech)*
Missouri University of Science and Technology (MS&T)*
Oregon State University (OSU)
Pennsylvania State University (PSU)*
Purdue University (PU)*
Stanford University (SU)*
University of Dayton (UD)
University of Hawaii (UH)
University of Illinois at Urbana-Champaign (UIUC)*
University of North Carolina at Chapel Hill (UNC)*
University of Pennsylvania (UPenn)*
University of Tennessee (UT)
University of Washington (UW)



Multiple international partners

Advisory Committee (57 orgs)
5 airports
4 airlines
9 NGO/advocacy
8 aviation manufacturers
10 feedstock/fuel manufacturers
21 R&D, service to aviation sector

ASCENT Support

Federal Aviation Administration
Transport Canada
NASA
Environmental Protection Agency
Defense Logistics Agency - Energy
U.S. Dep't of Energy
U.S. Dep't of Agriculture
Air Force Research Laboratory

ASCENT Alternative Jet Fuels Research Portfolio

https://ascent.aero/topic/alternative-fuels/

ASCENT Alternative Jet Fuels Projects

- 001 - Alternative Jet Fuel Supply Chain Analysis
- 025-030 & 034 - National Jet Fuel Combustion Program
- 031 - Alternative Jet Fuels Test and Evaluation
- 032 (COMPLETE) - Worldwide LCA of GHG Emissions from Petroleum Jet Fuel
- 033 - Alternative Fuels Test Database Library
- 052 - Comparative Assessment of Electrification Strategies for Aviation
- 065 - Fuel Testing Approaches for Rapid Jet Fuel Prescreening
- 066 - Evaluation of High Thermal Stability Fuels
- 067 - Impact of Fuel Heating on Combustion and Emissions
- 073 - Combustor Durability with Alternative Fuel Use
- 078 (NEW) - Contrail Avoidance Decision Support and Evaluation
- 080 (NEW) - Hydrogen and Power-to-Liquid (PtL) Concepts for Sustainable Aviation Fuel Production

In Development

- 081 - Measurement and Prediction of non-volatile particulate matter size and number emissions from Sustainable and Conventional Aviation Fuels
- 087 - Measurement of nvPM size, number and compositional emissions, for Boeing eco-Demonstrator aircraft burning Sustainable Aviation Fuel
- 088 - Evaluation of Jet Fuel Composition on Non-metallic Fuel System Components
- 089 - Characterization of Compositional Effects on Dielectric Constant
- 090 - World Fuel Property Survey
- 093 - Collaborative Research Network for Global SAF Supply Chain Development

Additional projects forthcoming

- Testing to support efforts to approve fuels at blends above 50% blend wall in today's fleet
- Examine means to cost effectively maximize environmental benefits of sustainable aviation fuels

CLEEN / ASCENT Budgets

	FY21 Actual	FY22 Enacted	FY23 President's Budget
A11.s Environment and Energy			
CLEEN	$0	$0	$0
ASCENT	$7,500,000	$8,500,000	$7,500,000
Other	$12,803,000	$13,500,000	$13,785,000
Total	$20,303,000	$22,000,000	$21,285,000
A11.t NextGen – Environmental Research – Aircraft Technologies and Fuels			
CLEEN	$19,000,000	$37,500,000	$42,000,000
ASCENT	$9,500,000	$26,565,000	$27,000,000
Other	$3,965,000	$3,435,000	$5,425,000
Total	$32,465,000	$67,500,000	$74,425,000

*Budget Line Items: A.T (FY21), A11.u (FY22), A11.T (FY23)

** Budget Line Items: A.U (FY21), A11.v (FY22), A11.U (FY23)

FY23 President's Budget: https://www.faa.gov/about/budget

FY23 Major Activities Related to SAF

Major Activities	Objective	Expected Outputs	Value Statement
Ensure Novel Jet Fuels are Safe for Use	Support the approval of novel jet fuel pathways within the ASTM International certification process through testing and coordination to ensure these fuels are safe for use	Research reports to demonstrate the safety of novel jet fuel pathways for certification by ASTM Intl and streamline the ASTM certification process to reduce the time and cost of certification	The development and approval of new fuel pathways will expand the opportunities to move towards environmental sustainability in a cost-effective manner.
Move Beyond the 50% SAF Blend Wall to Enable 100% SAF Use	Develop and test sustainable aviation fuels through ASCENT, CAAFI, and CLEEN that could be used safely in jet engines without blending with conventional petroleum-based jet fuel	Research reports to demonstrate the safety of sustainable aviation fuel pathways that can be used without blending for certification by ASTM Intl	Eliminate current limitations on environmental benefits of SAF due to current blending constraints
Maximize environmental benefits of sustainable aviation fuels	Evaluate aviation fuel supply chains within ASCENT to reduce the cost to produce sustainable aviation fuels and maximize their environmental benefits	Analyses and data to support actions by industry and government to cost-effectively produce sustainable aviation fuels with minimal life cycle GHG emissions	Enable aviation industry to cost effectively reach net zero CO_2 emissions through the use of sustainable aviation fuels
Support inclusion of Sustainable Aviation Fuels in ICAO CORSIA	Support the inclusion of sustainable aviation fuels created from waste and renewable feedstocks, and lower carbon aviation fuels created from fossil feedstocks, within the ICAO CORSIA framework	Develop robust lifecycle greenhouse gas emissions values and methods for alternative fuel pathways and sustainability criteria for use in ICAO CORSIA	High integrity international standards are needed to ensure that sustainable aviation fuels provide CO_2 reductions in a sustainable manner.

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