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Contact: pressoffice@faa.gov

FAA FACTS

Accelerating to the Future: The FAA's CLEEN Research Initiative

The Continuous Lower Energy, Emissions and Noise (CLEEN) Program is the FAA's principal environmental effort to accelerate development that will result in a fleet of new aircraft that produces less noise, fewer emissions, and uses less fuel.

Through the CLEEN Program, the FAA partners with the aviation industry via a cost-sharing approach to enable the industry to expedite integration of environmentally beneficial technologies into current and future aircraft. These technologies support the overall environmental performance goals of the FAA's Next Generation Air Transportation System (NextGen) to achieve environmental protection.

The FAA announced [CLEEN Phase III awardees](#) on September 10, 2021. For more information on the CLEEN Program, its benefits, and accomplishments to date, see the [CLEEN Program Summary and Status Report](#).

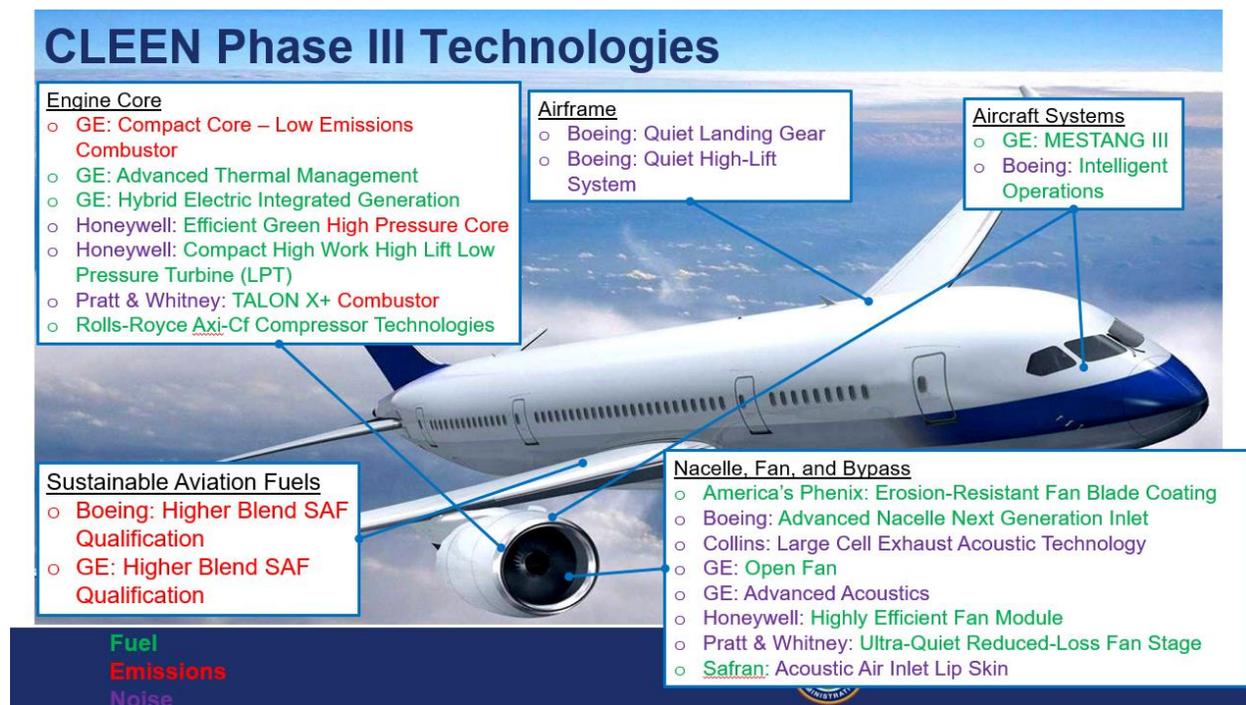
Current participants in CLEEN include: America's Phenix/Delta TechOps/GKN Aerospace/MDS Coating Technologies Corporation, Boeing, Collins Aerospace, GE Aerospace, Honeywell Aerospace, Pratt & Whitney, Rohr Inc., Rolls-Royce and Safran Nacelles.

According to analysis done by the Georgia Institute of Technology in 2021, the accomplishments from the first five-year phase of CLEEN will reduce U.S. fleet-wide fuel burn by 1.4 percent by 2030 and 2.6 percent by 2050. This will provide a cumulative savings of 9.3 billion gallons of jet

fuel. The CO2 savings from this reduced fuel burn are the equivalent of taking 781 thousand cars from the road from 2020 to 2050. In addition, technologies from the first phase of CLEEN will contribute to a 14 percent decrease in the land area exposed to significant aviation noise.

CLEEN Phase II technologies are expected to enter operational service by 2026, providing further benefits to fuel burn, emissions, and noise. An ongoing assessment of CLEEN Phase II's projected fleet-wide benefits has estimated that the program will reduce fuel consumption 2.4 percent by 2030 and 8.8 percent by 2050, bringing the contribution of CLEEN Phase I and II to 11.5 percent fuel burn reduction in the fleet by 2050.

Cumulatively, CLEEN Phases I and II are estimated to reduce consumption of fuel by 36.1 billion gallons by 2050, reducing CO2 emissions by 420 million metric tons. These CO2 reductions are equivalent to removing 3 million cars from the road from 2020 to 2050.



CLEEN Phase II Technologies

Engine Core

- ✓ GE: TAPS III Combustor
- Honeywell: Compact Combustor System
- Honeywell: Advanced Turbine Blade Outer Air Seal
- Honeywell: Advanced High Pressure Compressor
- ✓ Pratt & Whitney: High Pressure Compressor Aero-Efficiency
- ✓ Pratt & Whitney: High Pressure Turbine Aero-Efficiency & Durability
- ✓ Rolls-Royce: Advance RQL Combustor

Sustainable Aviation Fuels

- ✓ GE: Combustor Operability Evaluations
- ✓ Rolls-Royce: Fully Synthetic Fuel Evaluation

Airframe

- ✓ Aurora: D8 Double Bubble Fuselage
- ✓ Boeing: Structurally Efficient Wing

Aircraft Systems

- ✓ GE: FMS Technologies
- ✓ GE: More Electric Aircraft Systems

Nacelle, Fan, and Bypass

- ✓ Boeing: Compact Nacelle and Aft Duct Acoustics
- ✓ Collins Aerospace: Nacelle Technologies
- ✓ Delta Tech Ops / MCT: Leading Edge Protective Blade Coatings
- ✓ GE: Low Pressure Ratio Advanced Acoustics
- Honeywell: Advanced Acoustic Fan and Liners
- ✓ Rolls-Royce: Compact Nacelle Flight Test

Fuel
Emissions
Noise

- ✓ Completed Effort
- Ongoing Effort



Federal Aviation Administration

CLEEN Phase I Technologies

Engine Core

- ✓ Boeing: Ceramic Matrix Composite Exhaust Nozzle
- ✓ GE: TAPS II Combustor
- ✓ Honeywell: Engine core efficiency technologies
- ✓ Rolls-Royce: Ceramic Matrix Composite Blade Tracks
- ✓ Rolls-Royce: Dual-Wall Turbine Airfoils

Airframe

- ✓ Boeing: Adaptive Trailing Edge

Aircraft Systems

- ✓ GE: FMS-Air Traffic and FMS-Engine Integration Technologies

Nacelle, Fan, and Bypass

- ✓ GE: Open Rotor Engine Technology
- ✓ Pratt & Whitney: Ultra-High Bypass Ratio Geared Turbofan Technologies

Fuel
NO_x
Noise

- ✓ Completed Effort



Federal Aviation Administration