

NASA Advanced Air Vehicles Student Competition 2016-2017

NASA invites students to propose ideas and designs for future aircraft that use less fuel, produce less harmful emissions, and make less noise.

Technical Area 2: Subsonic Commercial Transport

Background

The current generation of commercial aircraft benefit from past NASA investments in aeronautical research that have improved fuel efficiencies, lowered noise levels and lessened harmful emissions. Although substantial progress has been made, much more needs to be done. The nation's air transportation system will continue to expand by an average of two to three percent per year over the next couple of decades, potentially increasing aviation's impact on the environment. Therefore, the next generation of environmentally responsible airliners should have lower noise, lower emissions, and less fuel burn than today's aircraft.

NASA Aeronautics explores and documents the feasibility, benefits, and technical risks associated with vehicle concepts and enabling technologies that will help mitigate the impact of aviation on the environment. Through system-level analysis, promising vehicle and propulsion concepts and technologies will be developed based on their potential benefit toward simultaneously achieving fuel burn, noise and emissions metrics as shown in the green outlined area of the table below. Students are invited to submit their ideas and designs for vehicle or propulsion concepts and technologies that will assist in meeting the Mid Term (2025-2035) goals. Those include:

- Non-conventional aircraft architectures that enable simultaneous achievement of noise, Landing Take Off (LTO) NO_x and fuel burn metrics in the Mid Term timeframe
- Drag reduction through laminar flow
- Advanced propulsion architectures (open rotor, geared and direct drive turbofans)
- Advanced composite structural concepts for weight reduction
- Low NO_x, fuel-flexible combustors
- Propulsion and airframe integration for noise reduction and fuel burn improvements

NASA Subsonic Transport System Level Metrics

TECHNOLOGY BENEFITS	TECHNOLOGY GENERATIONS (Technology Readiness Level = 5-6)		
	Near Term 2015-2025	Mid Term 2025-2035	Far Term beyond 2035
Noise (cum below Stage 4)	22 - 32 dB	32 - 42 dB	42 - 52 dB
LTO NO_x Emissions (below CAEP 6)	70 - 75%	80%	> 80%
Cruise NO_x Emissions (rel. to 2005 best in class)	65 - 70%	80%	> 80%
Aircraft Fuel/Energy Consumption (rel. to 2005 best in class)	40 - 50%	50 - 60%	60 - 80%

Undergraduate Students –Teams only

Papers are due no later than June 1, 2017

Submit a technical paper describing your design a future large commercial airliner (200 passenger or more) that simultaneously addresses all of the Mid Term goals for noise, emissions and fuel burn. The paper should include a comparison of your design with a current aircraft of similar size and range for noise, emissions, and fuel burn.

Graduate Level Students – Teams or Individuals

Papers are due no later than June 1, 2017

Submit a technical paper describing your design for a large commercial air transport vehicle (200 passenger or more) that can enter service in the 2025 to 2035 timeframe with all of the defined technology benefits given above. In addition, the graduate level vehicle design should include effective operations in the next generation air transportation system (in-route and terminal area), thus the design will achieve even more benefits through effective operations.

Submission & Evaluation

All papers will be submitted electronically in English on or before June 1, 2017. Papers will be reviewed by NASA personnel against a standard set of criteria including: creativity and innovation, literature review, baseline comparison with current aircraft of similar passenger capacity, cost and feasibility analysis, and point by point design discussion.

Eligibility & Awards

All competitors should be full time students at an accredited US institution of higher education (colleges and universities). The winning team or teams may be invited to attend a NASA sponsored event to present their paper, tour a NASA facility, and interact with NASA engineers.

Joint NASA/DLR Aeronautics Design Challenge Timeline:

Notice of Intent: Requested by Feb 1, 2017

Papers Due: June 1, 2017

Reviews: June-July 2017

Announcement of Finalists for US participants: August 2017

Announcement of Finalists for DLR participants: TBD

Technical Symposium for participants (US and DLR) to be held at or near NASA Langley Research Center, October 2017