

Project 47



Clean-sheet engine design and performance for supersonic transport aircraft

Massachusetts Institute of Technology

PI: Steven Barrett, Raymond Speth, Jayant Sabnis, Choon Tan

Students: Prashanth Prakash, Laurens Voet

PM: László Windhoffer, FAA

Cost Share Partner(s): Byogy Renewables Inc.

Objective:

- Assessing the environmental performance of clean-sheet and derivative engines for supersonic transport (SST)
- Evaluating the suitability of LTO emission certification standards for supersonic transport using variable noise reduction systems (VNRS)

Project Benefits:

- Development of a roadmap for technology to mitigate the environmental signature of modern supersonic transport engines that do not rely on afterburning technologies.

Research Approach:

- Identify the operating requirements for SST propulsion systems
- Develop framework for tracing the fuel burn, noise and emissions of engines for SST to their design parameters
- Quantify and compare fuel burn, noise and emissions characteristics of clean-sheet and derivative engines

Major Accomplishments (to date):

- Evaluated design space constraints of derivative vs clean-sheet engines (presented at SciTech 2021)
- Developed a model for noise-optimal take-off trajectory using VNRS (presented work at NASA 2021 Acoustics Technical Working Group meeting)
- Collaborated with A10 on estimating the impacts of VNRS on climb-out emissions from SST using VNRS (presented to WG3 as working paper)

Future Work / Schedule:

- Impact of vehicle and mission on clean-sheet and derivative environmental performance