

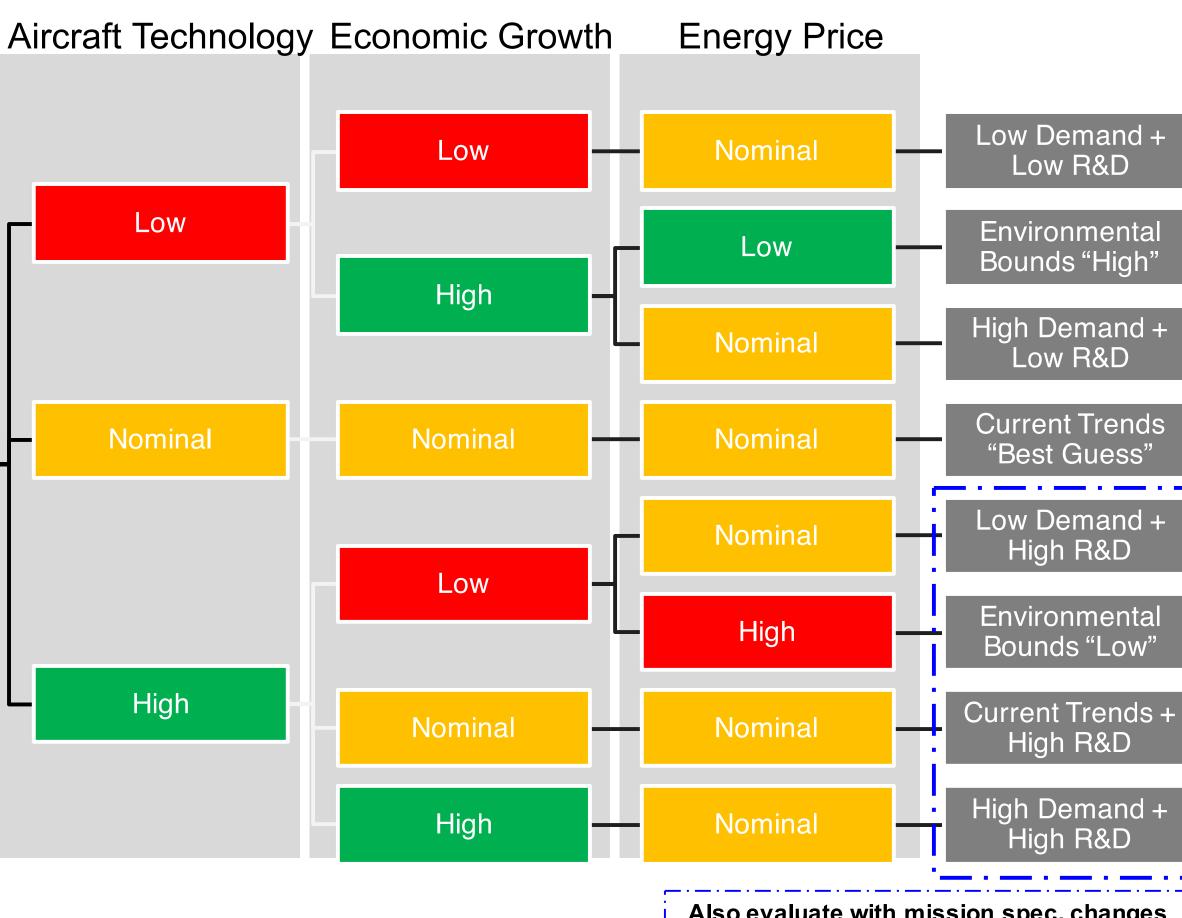


Project manager: László Windhoffer, FAA Georgia Tech (Lead University): Dimitri Mavris (PI), Jimmy Tai (Co-PI) Purdue: Daniel DeLaurentis, William Crossley (PIs) September 26-27, 2017

ASCENT 10 Phase I

Objective: Define range of scenarios that bound the demand for future aviation activity and assess the effects of different fleet composition and aircraft technology on fuel burn, emissions, and noise from aviation

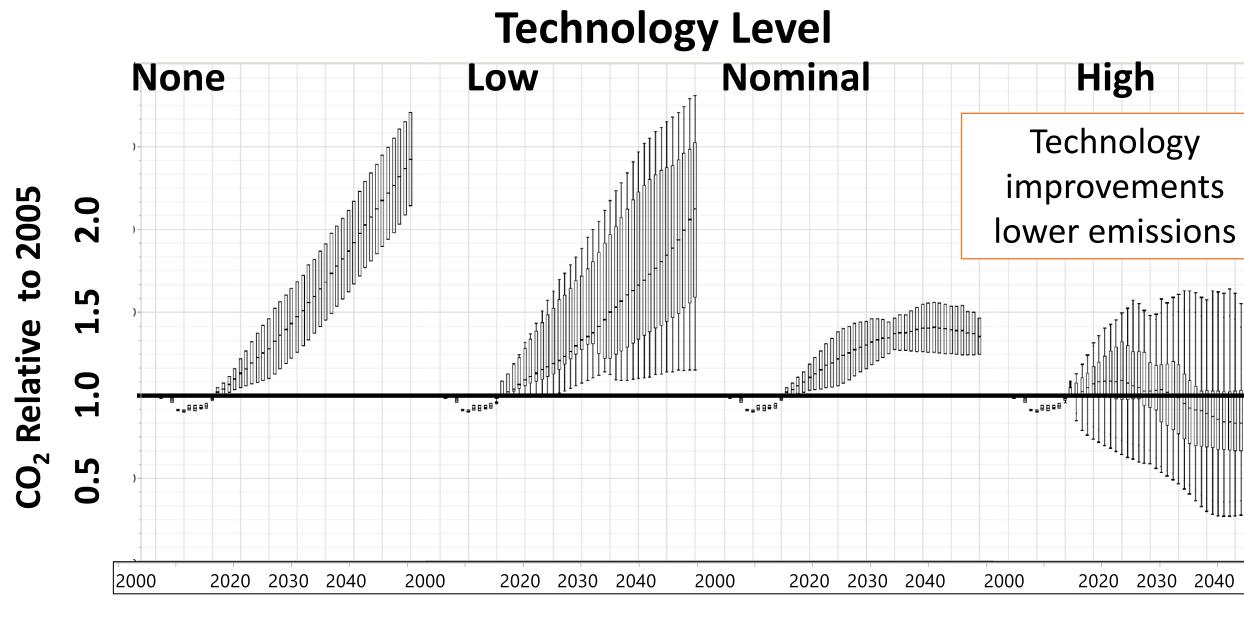
- Evaluated broad set of future scenarios out to 2050, showing potential benefits of technology on fuel burn, emissions, and noise
- Provided modeling and assessment mechanism for aircraft technology
- Supported NextGen analysis/GATBA Study



Scenarios

Also evaluate with mission spec. changes

Aggregate Simulation Results for CO₂



Project 10 Aircraft Technology Modeling & Assessment

This work was funded by the US Federal Aviation Administration (FAA) Office of Environment and Energy as a part of ASCENT Project 43. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the FAA or other ASCENT Sponsors.

ASCENT 10 Phase II: Supersonic Study

Primary Objectives:

- Assess potential environmental impact of potential future supersonic air travel (domestic & global)
- Develop demand and forecast through 2050
- Analyze existing and future supersonic technologies (e.g. traditional, low sonic boom shape profiles, etc.)
- Provide scenarios with potential changes in fuel burn, CO₂, H₂O, NO_x and noise area exposure



Fleet Assumptions & Demand **Task 1: Fleet Assumptions & Demand Assessment** Assessment Use A10 Scenarios to identify drivers of supersonic demand GT/P for domestic and international (to/from US) GT/P Develop estimates of latent demand for supersonic travel as f(performance, cost) User latent demand, perf, and cost to identify airports that could GT support supersonic travel **Preliminary Vehicle-level Impact** Develop daily flight schedules based on bounding scenario, perf, GT Assessment Task 2: Preliminary Vehicle-level Impact Assessment Develop estimates of performance and key environmental GT indicators (KEI) for current tech aircraft from prior studies Develop estimates of perf and KEI for future technology GT **AEDT & EDS Vehicle Definitions** aircraft Develop multipliers of KEI for aircraft relative to current GT technology subsonic transports Develop estimates of performance penalties due to Ρ operational restrictions GT Develop estimates of likely operating altitudes GT Fleet Level Impact Assessment

- scenarios
- Develop flight schedule



Task 1 • Determine number of aircraft needed for a different Task 2 Estimates for performance and key environmental indicators for current and future technology aircraft Task 3 • Develop recommendations on how to implement Task 4

- Perform tests with AEDT vehicle definitions
- supersonic vehicles



- Estimate LTO Emissions and Noise
- Estimate cruise water vapor

Task	Subtask
	Using A10, identify drivers of sup
1	Develop estimates of latent demand f
T	Using latent demand, identify airports that can sup
	Develop
	Develop Estimates of KEI for c
•	Develop Estimates of KEI for Fu
2	Develop multipliers of KEI for su
	Develop estimates of lik
	Test current version of AEDT ability to analyze
3	Test future supersonic vehi
_	Estimate fuel burn
4	Estimate water vapor a





LEAD Task Description SUPPORT

Y1 Y1 GT > **1**0 **3**0 4**0** Purdue 20 personic demand to/from US for bounding scenarios (U.S.) *upport supersonic flights (U.S)* op daily flight schedules (U.S.) current tech subsonic aircraft uture tech supersonic aircraft upersonic relative to subsonic kely operating altitudes (U.S) ze existing supersonic models icle AEDT definitions in AEDT for supersonic aircraft (U.S.) at likely cruise altitudes (U.S.) Estimate LTO NOx (U.S.)

Year 2:

Year 3+:

- Current Progress: Initiated Study of potential demand for supersonic flights based on prior scenarios
- Tested Concorde AEDT model

GT

- Started work on preliminary vehicle-level impacts
- Started modifications of airline network modeling

Task 4: Fleet-level Impact Assessment

		GT/P	Fleet estimates for fleet of supersonic aircraft	
		GT/P	Estimate water vapor at likely cruise altitudes	
		GT/P	Estimate LTO NOx	
		GT/P	Estimate en-route NOx	
		GT P	Estimate scaling factors of arrival and departure noise (DNL) at affected airports	
		GT	Develop estimates of points of highest # of daily overflights and using estimates of boom overpressure, predict maximum daily exposure	
		GT/P	Estimate relative impact compared to subsonic for KEI	
	Task 3: AEDT & EDS Vehicle Definitions			
		<u>Task 3:</u>	AEDT & EDS Vehicle Definitions	
		Task 3: GT	AEDT & EDS Vehicle Definitions Test current version of AEDT ability to analyze existing supersonic models	

Develop future supersonic vehicle EDS definitions

International scope version of domestic year 1 work

- AEDT and EDS development of future supersonic vehicles Detailed fleet-level impacts assessment
- KEI: Key Environmental Indicators
- **AEDT: Aviation Environmental Design Tool**
- EDS: Environmental Design Sapce
- LTO: Landing and Take-Off cycle