NASA's Integrated Systems Research Program (ISRP)

Environmentally Responsible Aviation Project

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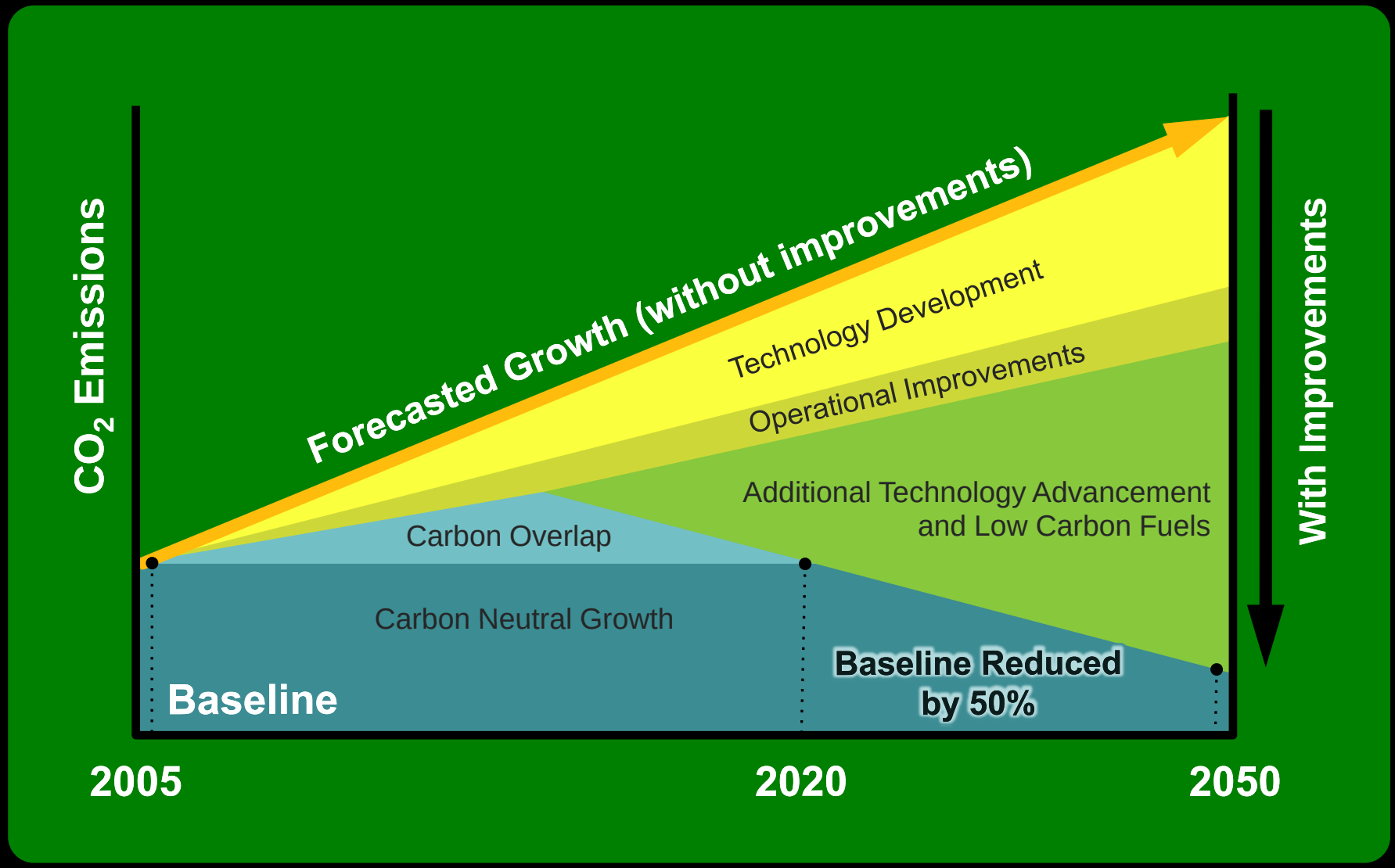
Project Manager

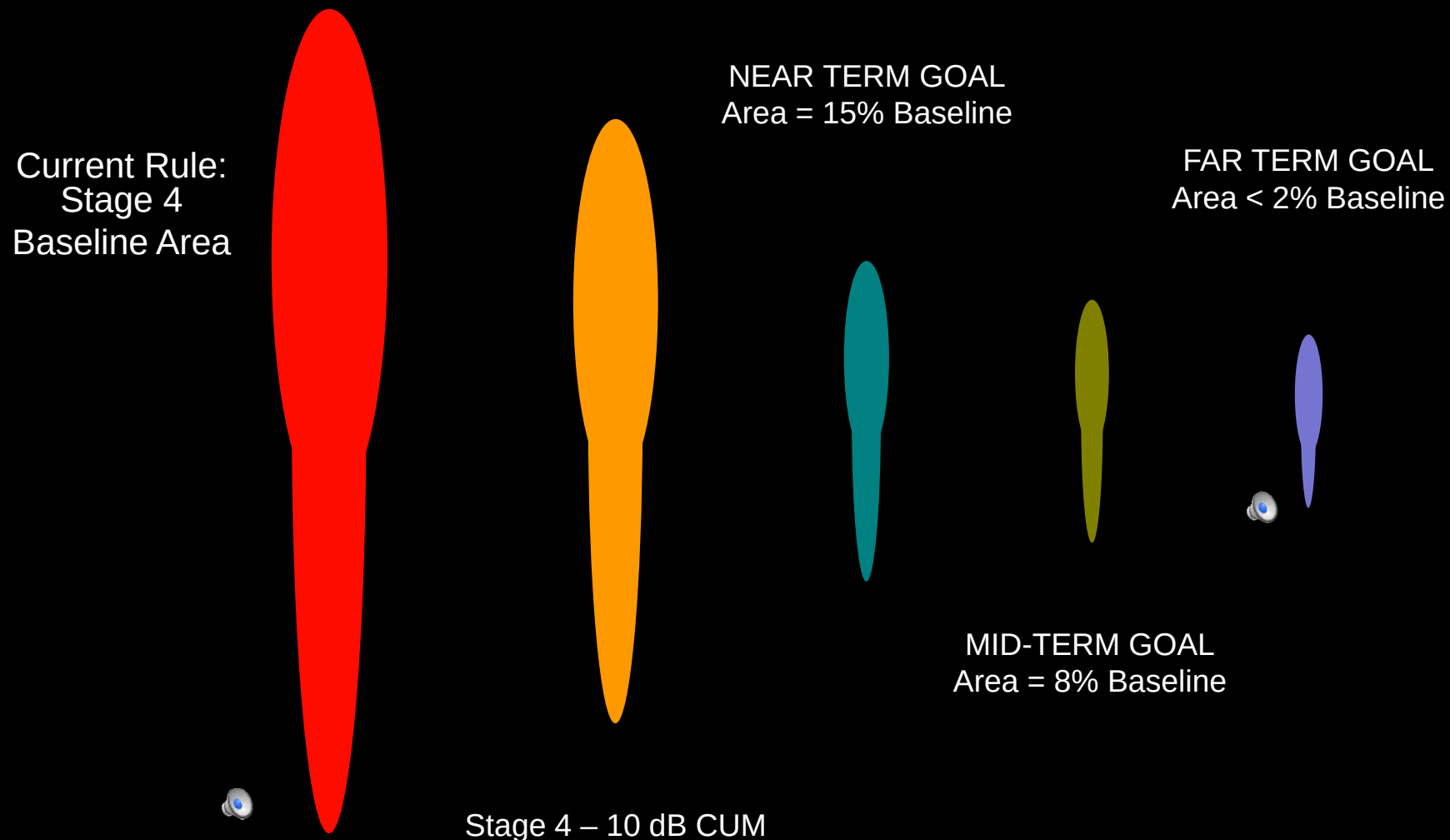
ICAO Workshop on Aviation and Sustainable Fuels
Montreal, October 19, 2011

Challenge: Significant Emissions Reductions



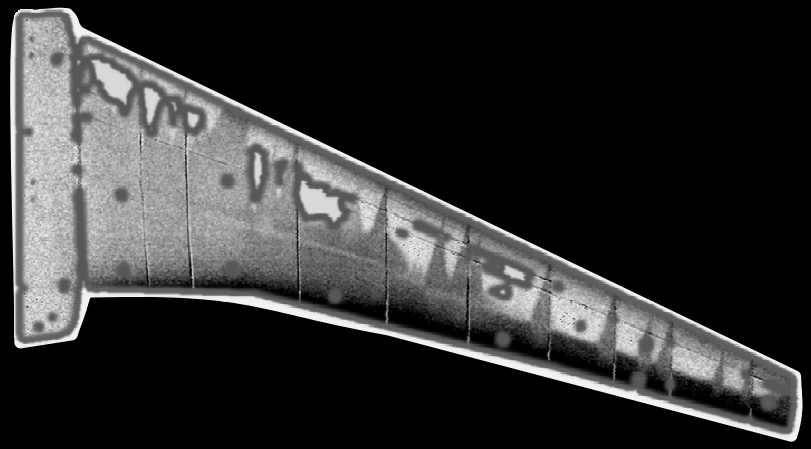
Source = IATA/FAA/AEE 2010

Challenge: Significant Community Noise Reductions



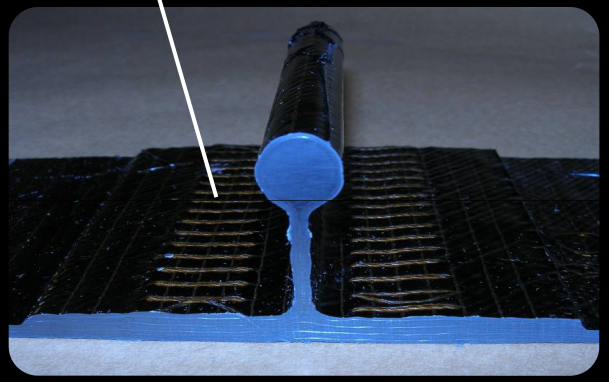
Approach: Reduce Carbon Emissions

1 DRAG REDUCTION - Via Laminar Flow



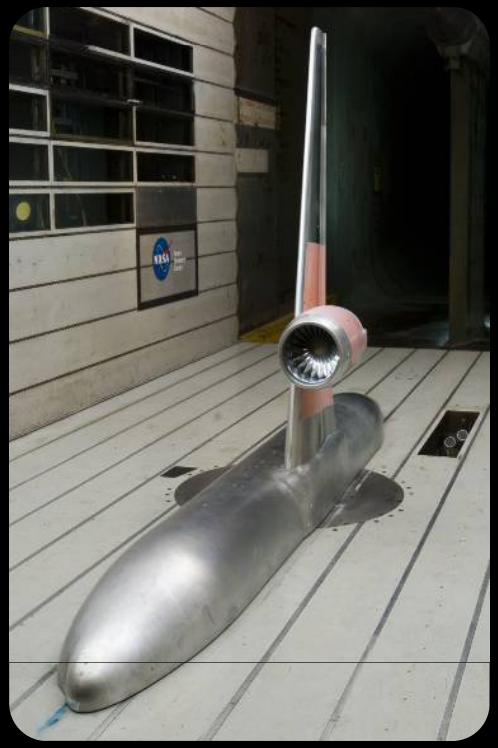
2 WEIGHT REDUCTION - Via Stitched Composites

Stitches for damage arrestment



3 SFC REDUCTION

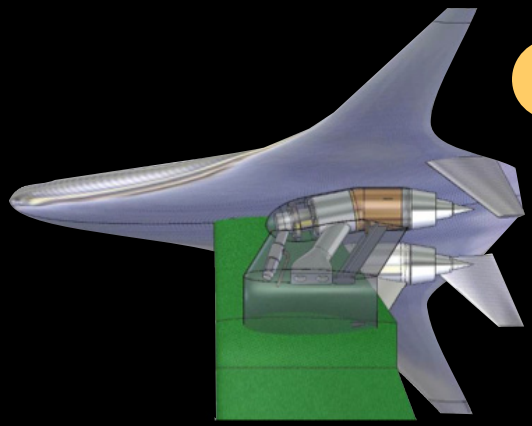
Integration of Advanced Engines for Zero Installation Drag



Approach: Community Noise Reduction

1 AIRFRAME NOISE
High-lift Systems and Landing Gear

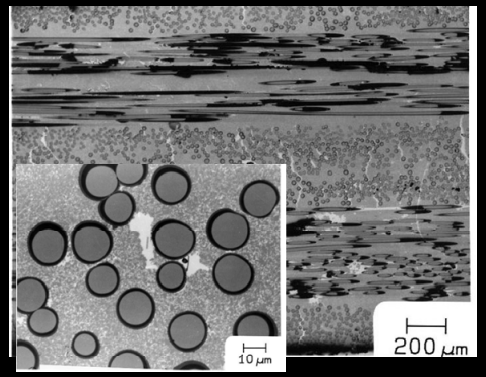
2 PROPULSION NOISE
Fan, Core and Jet Noise



3 PROPULSION AIRFRAME AEROACUSTICS
Airframe/Propulsion Interaction & Shielding

Approach: Reduce Landing Takeoff Cycle NOX

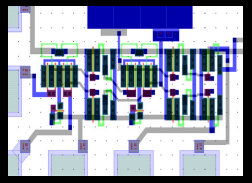
1 CMC COMBUSTOR LINER
For higher engine temps



SIC CMC Concepts

CMC combustor liner

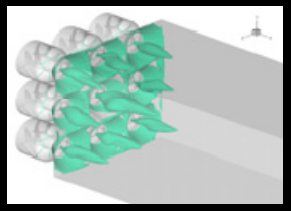
2 INSTABILITY CONTROL
Suppress combustor instabilities



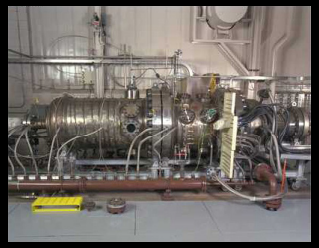
High Temperature SiC electronics circuits and dynamic pressure sensors

Fuel Modulation for high frequency fuel delivery systems

3 LOW NOX, FUEL FLEXIBLE DESIGN/TEST

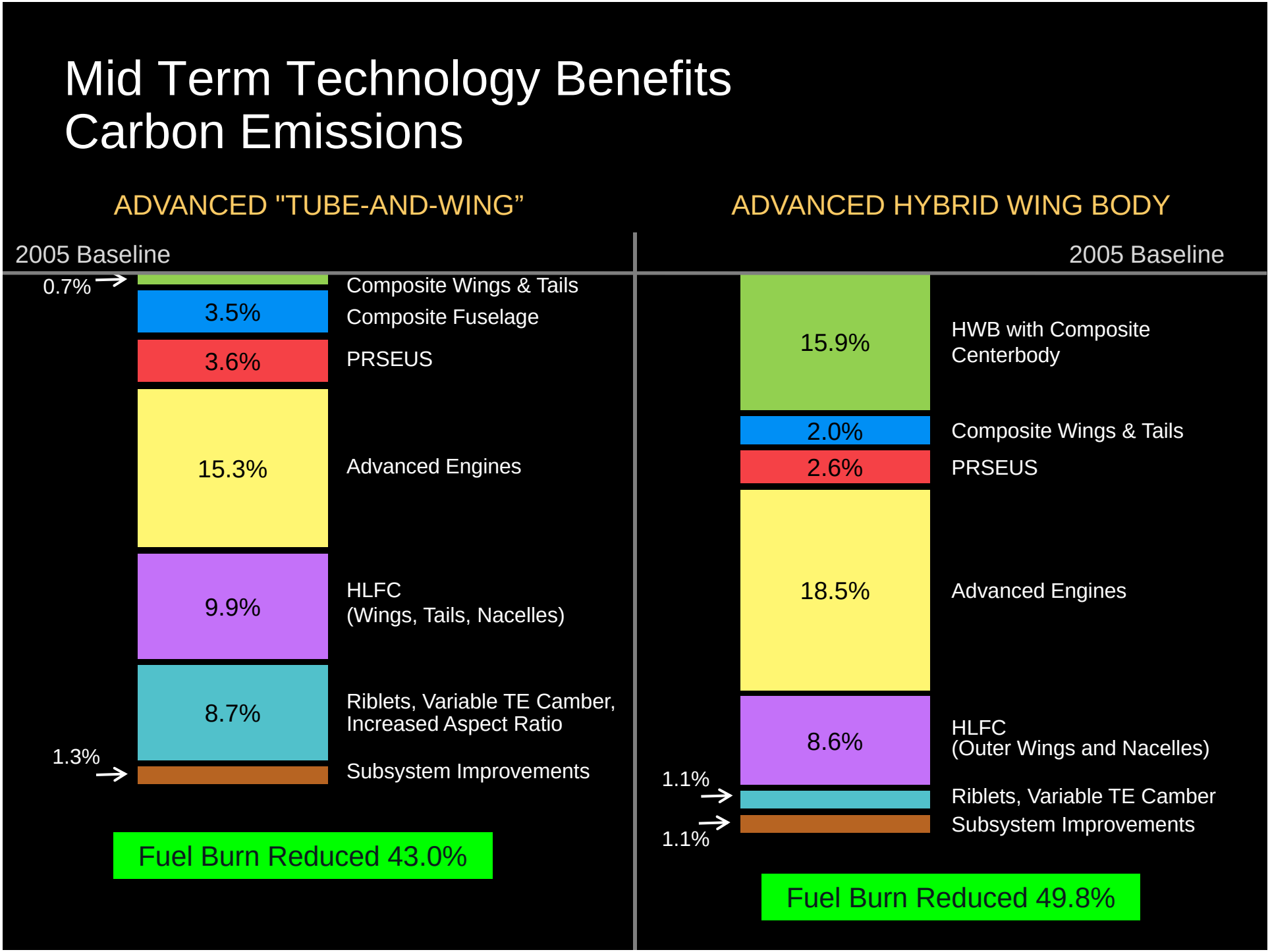


Innovative Injector Concept



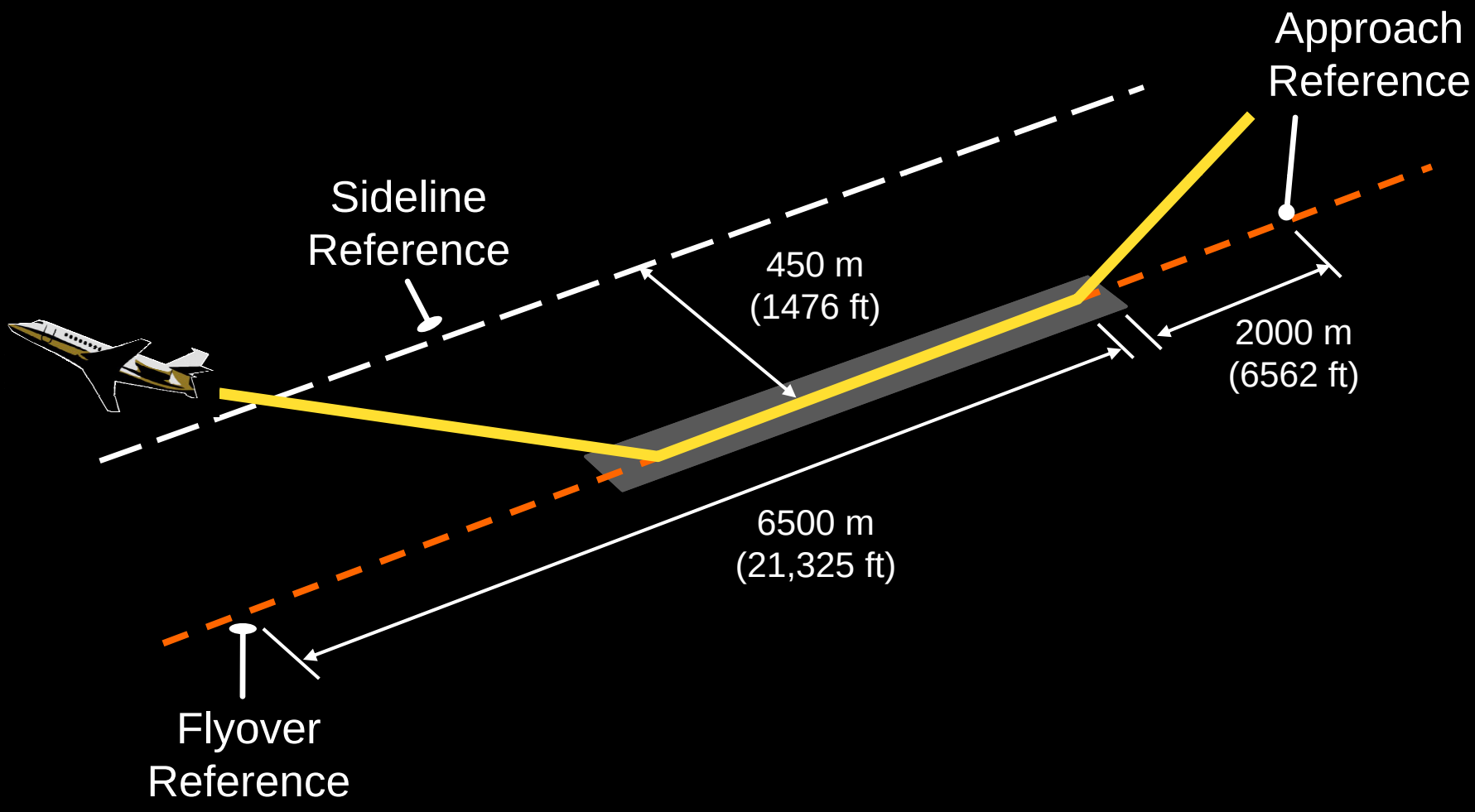
ASCR Combustion Rig

Mid Term Technology Benefits
Carbon Emissions



Mid-Term Technology Benefits
Community Noise Reduction

POTENTIAL NOISE IMPACT - TAKEOFF AND LANDING CYCLE



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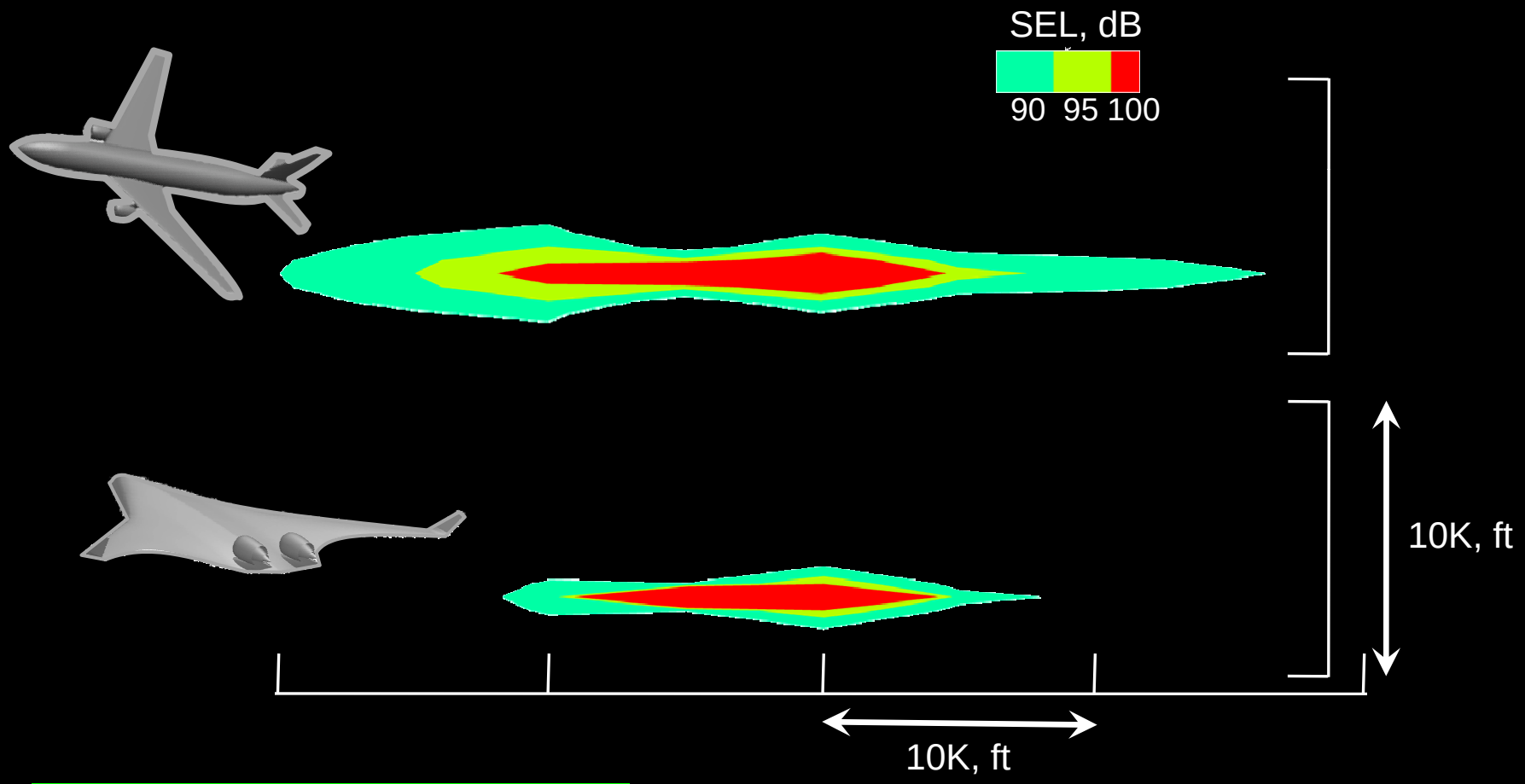

66% Reduction in Ground Area

Impact at the Fleet Level – ATIO 2011 – Jimenez, etal