Disruptive Aerospace Innovation

Aeronautics and Space Engineering Board
National Academy of Engineering

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How Does Aurora Disrupt Aerospace?

MOBILITY PROGRAMS

Convergence of technologies is enabling a new form of passenger and cargo air mobility.

COMMERCIAL PROGAMS

Developing cargo and commercial vehicles that will use autonomy and integrated air vehicle technologies to lower operating costs.

ENDURANCE SYSTEMS

Designed multiple platforms capable of long duration, high altitude flight for commercial and military purposes.

AUTONOMY FOR DEFENSE

Traditional aerospace defense R&D. In the near-term focused on multi-vehicle collaborative behaviors.

AEROSYSTEMS

Design and design-build services of certified parts for programs of record.

AUTONOMY CORE

Building a core, certifiable architecture that will support incorporation of autonomous behaviors across multiple types of aircraft.

AEROSPACE & AUTONOMY CENTER

Aurora is expanding the Cambridge facility and moving into a new building on the MIT Campus in 2020.
The center will provide unprecedented access to world-class researchers and talent.

What Makes Aurora Unique

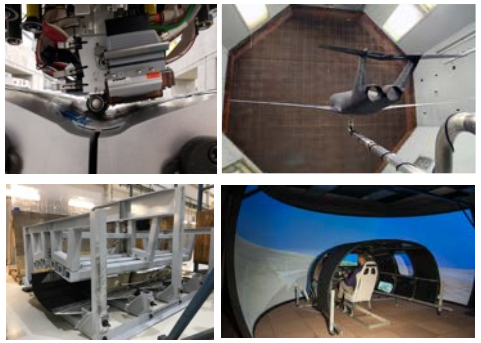
- Our primary focus is on innovation
- We effectively bridge academia, focused on research and education, to the customer world, focused on military and commercial applications
- We treat talent acquisition like professional sports teams do – we track outstanding candidates over long time frames so we can act when they become available
- Working on exciting, technologically challenging aerospace innovation attracts the best and brightest engineers to join Aurora
- As a Boeing subsidiary, we match the agility and rapid innovation of a small company with the resources, capabilities and experience of the world’s largest aerospace company

Case #1: Revolutionary Configuration for Commercial Aviation

2008-2015

MIT, Aurora, and P&W developed the D8 concept as a potential revolutionary aircraft for 2035 entry into service. A 1:11 scale powered D8 concept was tested at the NASA Langley 14- by 22- Foot Subsonic Tunnel. The test validated many of the configuration-level benefits of the concept.

CORNERS OF THE TRADE SPACE	N+1 Generation Conventional Tube & Wing (relative to B737/CFM56) (EIS 2015)	N+2 Generation Unconventional Hybrid Wing Body (relative to B777/GE90) (IOC 2020)	N+3 Generation (relative to B737/CFM56) (EIS 2030-2035)
Noise (cum below Stage 3)	- 42 dB	- 52 dB	better than - 81 dB (55 LDN at average boundary)
LTO NOx Emissions (below CAEP 2)	-70%	-80%	better than -80% plus mitigate formation of contrails
Performance: Aircraft Fuel Burn	-33%	-50%*	better than -70% plus non-fossil fuel sources
Performance: Field Length	-33%	-50%	exploit metro-plex concepts

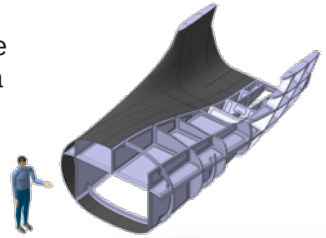


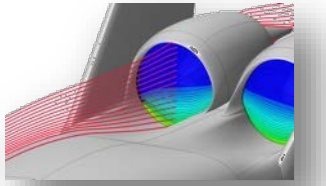
2015-2017

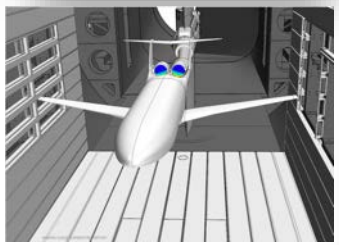
Aurora awarded contracts from NASA and FAA to develop the D8 aircraft design, conduct testing of key enabling technologies, and to complete the conceptual design of a half-scale D8 demonstrator aircraft.

2017

Developed extensive systems engineering documentation during the NASA X-Plane Phase A; completed a XD8 Systems Requirements Review (SRR) and a XD8 Concept Design Review (CoDR).





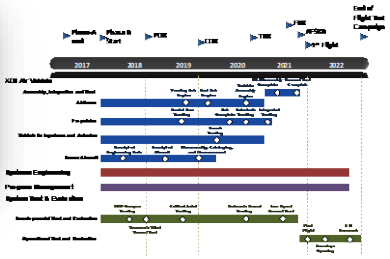


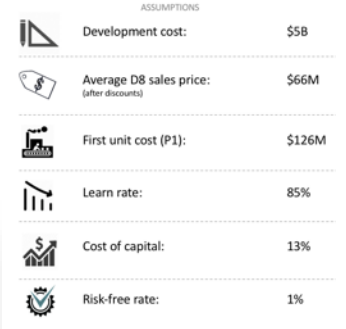
2017-2018

Aurora funded XD8 risk reduction program to systematically burn down the highest risks through design and analysis activities.

2018-2023

Aurora plans to design, build, and fly a NASA X-Plane to demonstrate operability of the configuration, verify feasibility of the design, and substantiate the performance of the configuration.





2024 and beyond

Aurora intends to leverage the NASA X-Plane program to potentially develop a commercial product with reduced operating costs for rapid market introduction.

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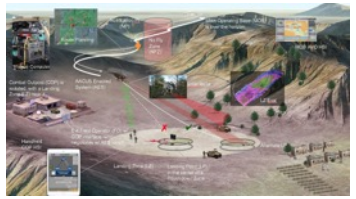
Case #2: Revolutionary Autonomy for Military Aviation

2012-2014

Aurora and it's team developed an autonomous cargo delivery system that can retrofit existing military helicopters for ONR and the US Marine Corps.



2014-2017

Aurora team wins down select and focuses on USMC UH-1 helicopter

2017

Aurora team successfully demonstrates AACUS enabled UH-1 to USMC commandant at Quantico

2018

Aurora AACUS enabled UH-1 successfully participates in USMC ITX demonstration at 29 Palms, flying 23 missions

2018-2023

Starting in 2018, Aurora and will design, build, and fly the prototype for a commercial urban mobility VTOL aircraft that leverages AACUS autonomy technology

2024 and beyond

Aurora will leverage these flight programs to develop a commercial product and win a military program of record that use the foundational technology developed under the AACUS program.

Office of Naval Research ONR Science & Technology

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Recommendations for NASA to Support Disruptive Innovation

- Focus NASA’s limited resources on disruptive aerospace technologies that can truly transform commercial aviation
- Deliver outcomes that are relevant to NASA’s stakeholders
- Stay on message
- Avoid getting drawn into to the latest technology trends as a follower
- Establish reach goals
- Inspire the next generation

Recommendations for DOD to Support Disruptive Innovation

- Develop ways of engaging innovative aerospace organizations to solve specific technological challenges or to address specific capability weaknesses
  - Our biggest challenge has often been working the wrong problem
- Build higher levels of trust between the DOD and key innovative organizations
  - Kelly Johnson's Skunk Works model involved fewer lawyers and simpler contracts
- Streamline acquisition processes for agility and innovation
  - Organizations like SCO, Big Safari and RCO are better suited to work with agile innovative organizations
- Provide continuous funding
  - Our development programs have often been plagued by major gaps in funding which creates organizational challenges
- Develop improved ways to engage FFRDCs with innovative organizations
- Rationalize R&D investments that involve multiple government agencies
- Prevent continuous requirements creep