

Sustainable Flight Demonstrator (SFD)

National Aeronautics and
Space Administration



Brent Cobleigh, Project Manager
NASA SFD Project Manager
AIAA Aviation
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Why invest in Sustainable Flight Demonstrator?



- For decades Government, Industry, and Universities have been working advanced commercial aircraft concepts focused on lowering fuel burn & emissions
- To date, these configuration have not made it to market due to many factors including:
 - Competitive factors
 - Technical Challenges that extend well beyond the shape of the aircraft
 - Large cost of transitioning from drawing board to certification
- NASA launched the SFD project to:
 - Partner with industry to retire as many technical & manufacturing risks as possible
 - Inform industry decisions associated with next generation single-aisle seat class product for 2030s entry into service
 - Maximize the potential to meet U.S. environmental goals articulated in the U.S. Aviation Climate Action Plan

Blended Wing Body



Transonic Truss-Braced Wing



D-8 Double Bubble



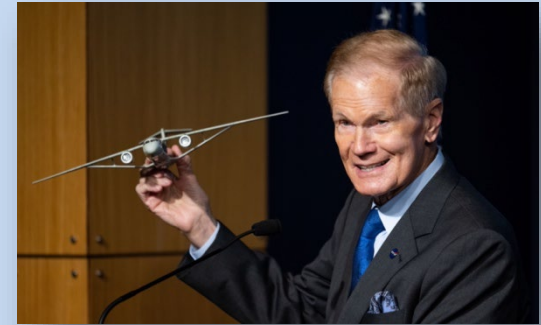
Tail-cone Thruster

Industry Partner selected through Competitive Proposals



- Selected Proposal was awarded a Funded Space Act Agreement (FSAA)
 - Boeing Company for their Transonic Truss Braced Wing (TTBW)
 - NASA providing \$425M in direct payments in addition to significant labor and facility testing resources
 - Boeing providing \$725M
- FSAA provides unique approach for project execution
 - Industry led, NASA supported
 - Industry defines requirements and project plan to maximize learning needed for future product consideration
 - Industry owns test aircraft

Announcement of SFD Award



Bill Nelson, NASA Administrator



**Bob Pearce, NASA Associate
Administrator for Aeronautics Research**

Boeing Transonic Truss-Braced Wing (TTBW)

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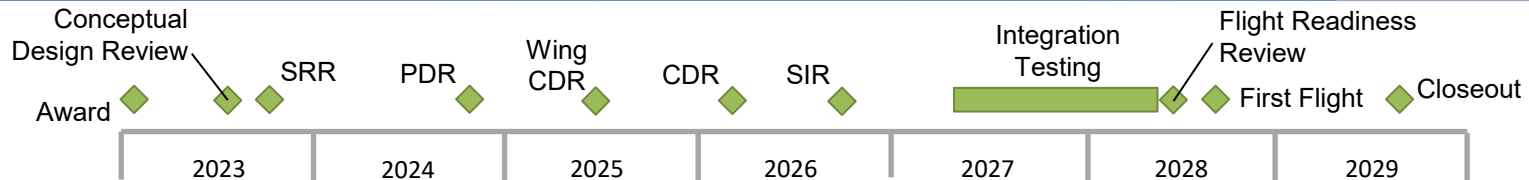
Ultra-thin, high aspect
ratio wings

High-wing allows larger
diameter propulsion systems

Strut-braced

TTBW has been jointly
studied by NASA and
Boeing for ~15 years

When combined with
expected advancements
in propulsion systems,
materials and systems
architecture, the TTBW
configuration could
reduce fuel consumption
and emissions up to 30%
relative to today's most
efficient single-aisle
airplanes.

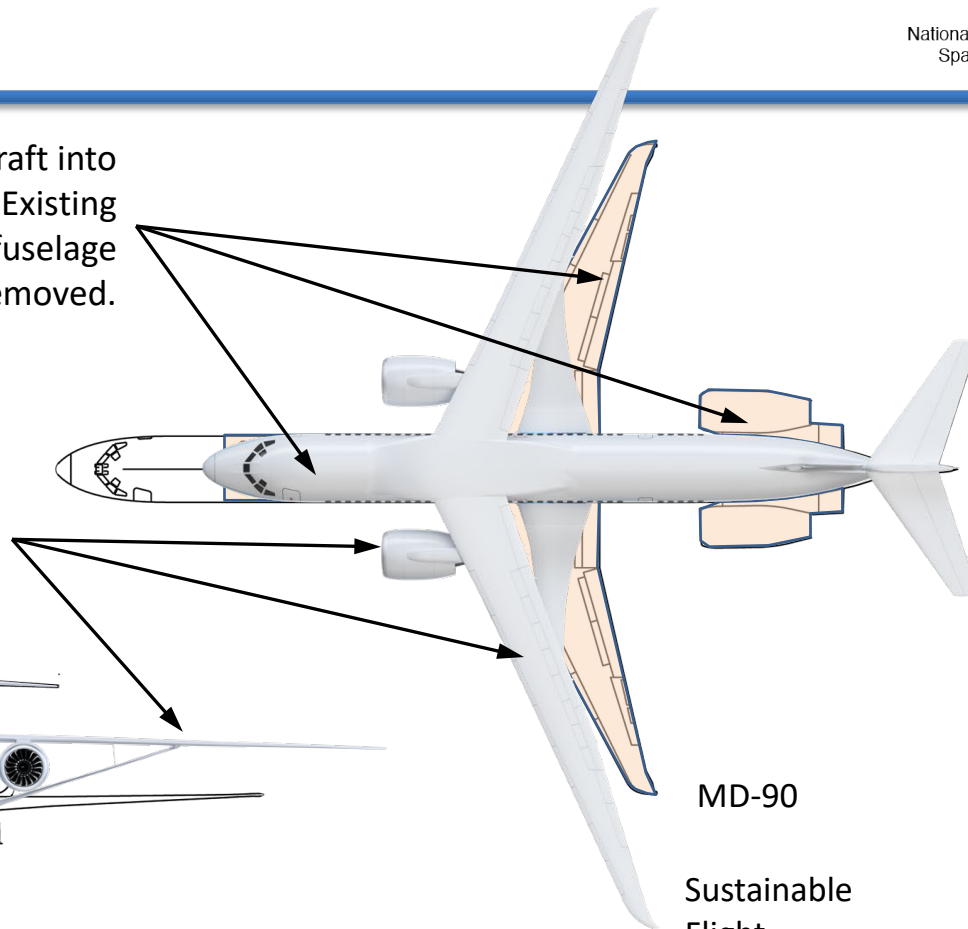


SFD Demonstrator Design



Boeing will modify MD-90 aircraft into the SFD Demonstrator aircraft. Existing wings, aft engines, and fuselage sections will be removed.

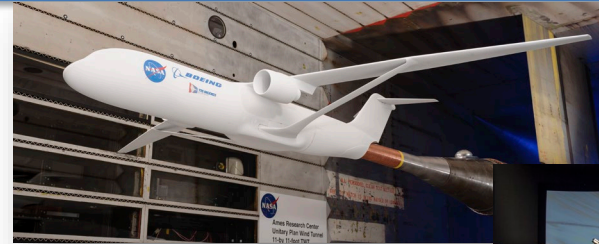
SFD modification includes addition of Transonic Truss-Braced Wing and subsystems, modern geared turbo-fan engines, and instrumentation.



MD-90

Sustainable
Flight
Demonstrator

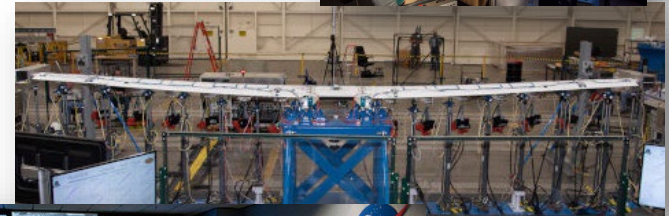
- Major testing support using NASA facilities/capabilities
 - High speed wind tunnel testing
 - Structural testing of wing components
 - Piloted simulation
 - Flight test operations
 - Acoustic testing
- NASA technical support for Boeing-led Integrated Product Teams
 - Systems engineering, computational fluid dynamics, low speed wind tunnel testing, simulation and analysis, acoustics analysis, aerodynamics, aeroelastics, structural design, flight controls, instrumentation
 - Other Subject Matter Experts to help resolve concerns/issues that arise



**High Speed
Wind Tunnel**



**Piloted
Simulation**



**Structural
Testing**



**Flight
Test
Facilities/
Capabilities**





QUESTIONS

Industry Partner selected through Competitive Proposals



- Propose an advanced single-aisle airframe design that will have significant reductions in CO₂ emissions
 - Vision System (product they would like to manufacture in 2030s)
 - Demonstrator (research aircraft that will mature high risk technologies for Vision System)

Vision System	Demonstrator	Business
Vision System Architecture	Technology Development Plans	Project Management Approach
Impact on Fuel Efficiency and CO ₂ Emissions	Demonstrator Aircraft	Schedule
Fleet Emissions Impact	Performance Assessment	Specialized Experience
Technology Assessment	ConOps (Ground Test and Flight Operations)	
Technology Development Risks	Safety & Mission Assurance	
Aviation System Compatibility	Teaming Approach	
Commercialization Plan	Facilities Utilization	