NASA High Lift Common Research Model (CRM-HL) Tests

CRM-HL Ecosystem Meeting

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High Lift Common Research Model Ecosystem Meeting
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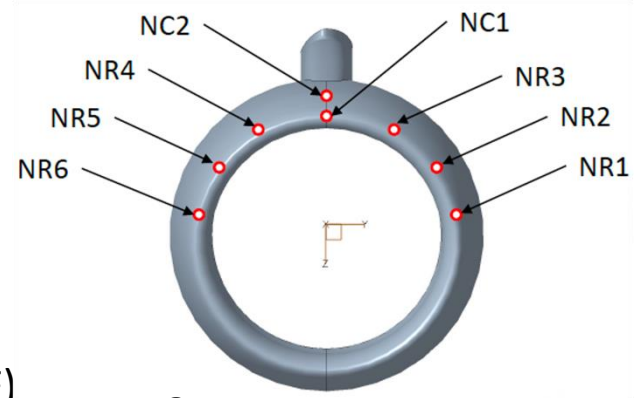
Upcoming NASA CRM-HL Tests

- NASA 2.7%-scale full-span model
  - July 2025 NTF, air only
    - Forces and moments
    - Model pressures
    - Wing deformation
  - September 2025 ETW
    - Ice testing
  - Fall 2025 NTF, cryo
    - Forces and moments
    - Model pressures
    - Wing deformation
- NASA 5.2%-scale semispan model
  - Second NTF entry, October 2026
    - Surface and off-body flow field measurements
- NASA 2.7%-scale semispan model
  - April 2027
    - Forces and moments
    - Model pressures
    - Wing deformation

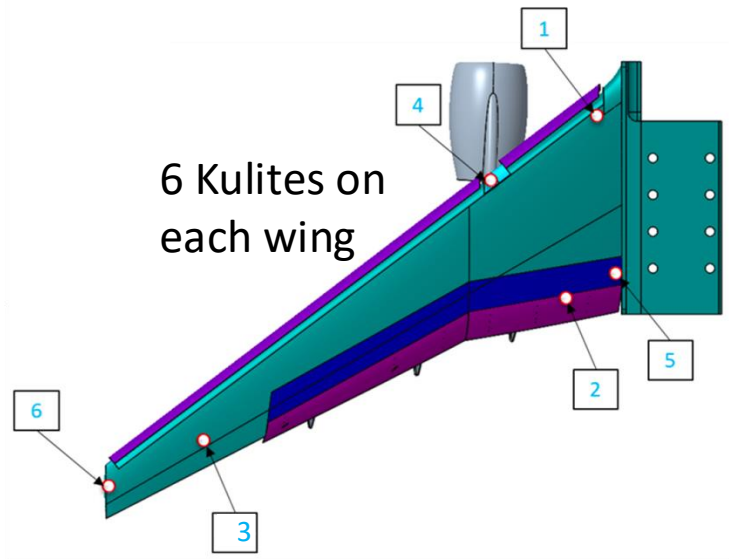
Photo Credit: NASA

NASA 2.7%-Scale CRM-HL Geometry

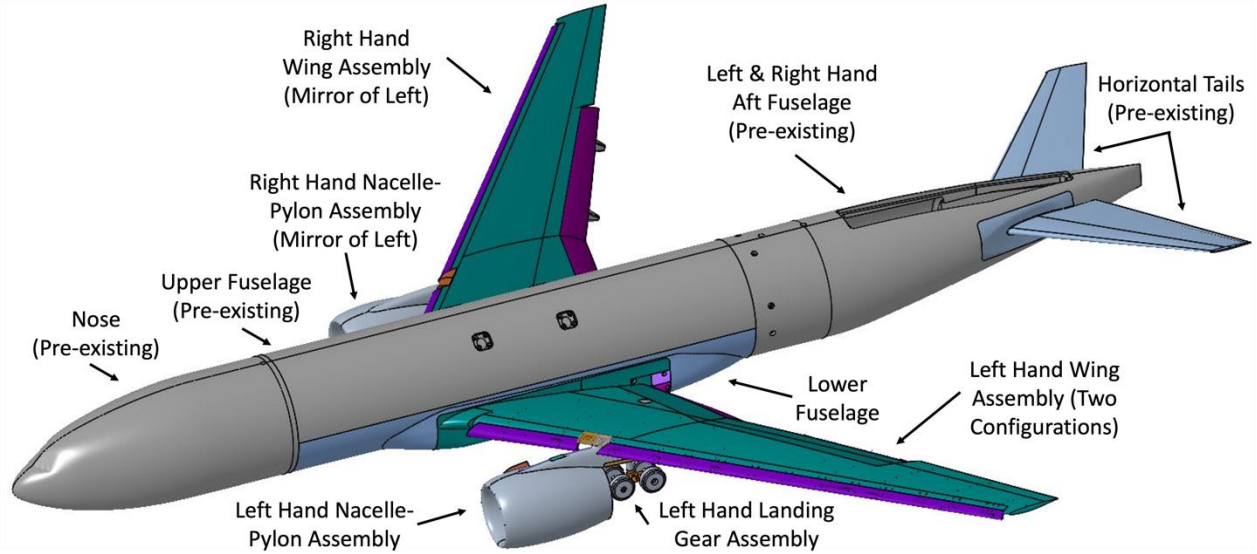
- 2.7%-scale version of the High Lift Common Research Model (CRM-HL) reference geometry
- Baseline Ecosystem configurations
  - Landing
  - Takeoff
- Full-span and Semispan model
- Designed for the National Transonic Facility (NTF)
  - Temperature: -250°F to 120°F
  - Max dynamic pressure: 380 psf
  - Angle of attack: -4° to 22°
- Modular design
  - Slat angle
  - Inboard and outboard flap angle
  - Nacelle
    - Chine radial location
  - Landing gear
  - Allows testing of other nonoriginal parts
- 3D printed NASA nacelle and landing gear
  - 8 pressure taps built into the port nacelle design



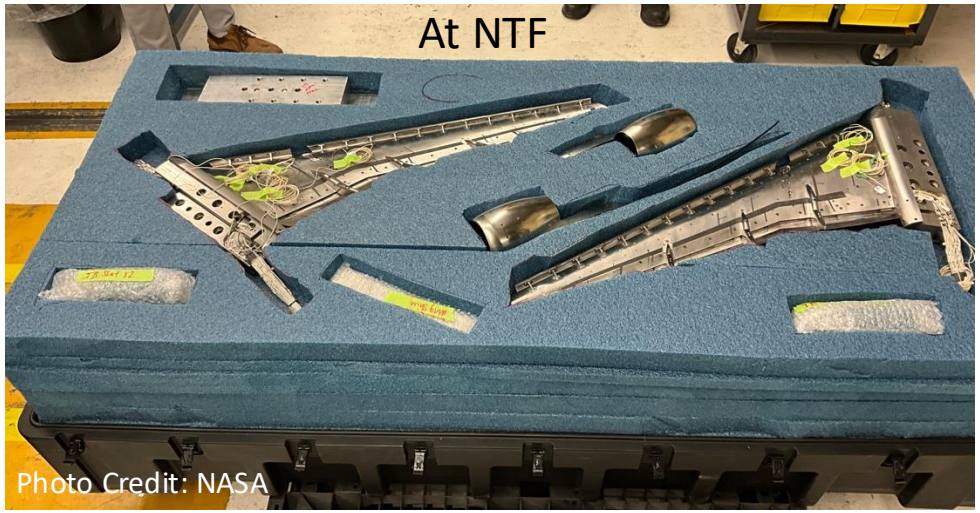
8 pressure ports on port nacelle



6 Kulites on each wing



NASA 2.7%-Scale CRM-HL Model Buyoff



NASA 2.7%-Scale CRM-HL Full-span NTF Tests

- Data collection on the model
  - Forces and moments
  - Model static pressures
  - Dynamic pressures
  - Wing deformation
  - Flow transition with pressure taps
- Comparison runs with previous tests
- Two separate entries
  - July 2025 – Air only
    - Landing
  - Winter 2025 – Air and Cryo
    - Takeoff and Landing
- Ice shapes

Configurations
Landing Baseline – Nacelle on, H-Tail off, Landing Gear off
Landing Icing
Landing – Nacelle on and off
Landing – H-tail on and off
Landing – Landing gear on and off
Takeoff – Nacelle on and off
Takeoff – H-tail on and off

Configuration	Mach	ReC $*10^6$	Gas	q psf	Notes
Landing					
	0.2	1.1			Match KHI
	0.2	1.6			Match DLR, 14x22 T668
	0.2	3.33			
	0.2	5.32			Icing, Match Q5
	0.2	5.33			
	0.2	5.49	Air		
	0.2	5.49	Cryo		
	0.2	5.9			Match ONERA
	0.2	8			
	0.2	10		high q	
	0.2	10		low q	
	0.2	12			
	0.2	14			
	0.2	16		high q	
	0.2	16		low q	
	0.26	16			Icing
	0.3	16			Icing
	0.35	16			Icing
Takeoff					
	0.23	1.8			Match DLR
	0.26	1.97			Match 14x22
	0.26	4.08			
	0.26	5.6			
	0.26	10			
	0.26	16			

Previous NASA 5.2%-Scale CRM-HL Model Tests

Photo Credit: NASA

Model checkout test at the NASA LaRC 14x22
Aug. 15 through Sep. 8, 2022

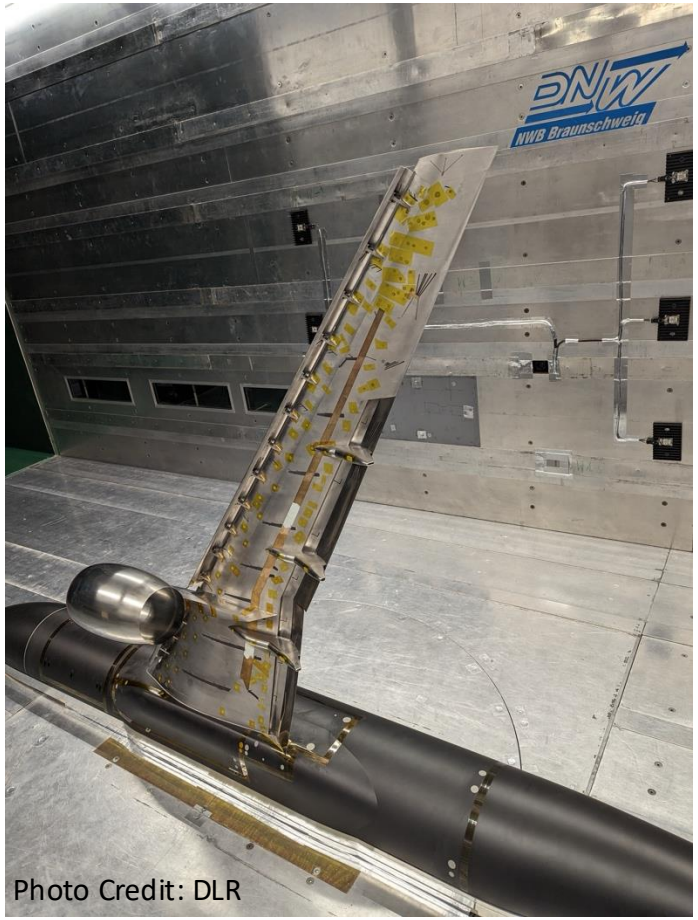


Photo Credit: DLR

DLR test at the Low-Speed Wind Tunnel at Braunschweig (NWB)
May 9 through July 6, 2023


Photo Credit: NASA

High Reynolds number test at the NASA LaRC NTF
Jan. 3 through May 23, 2024

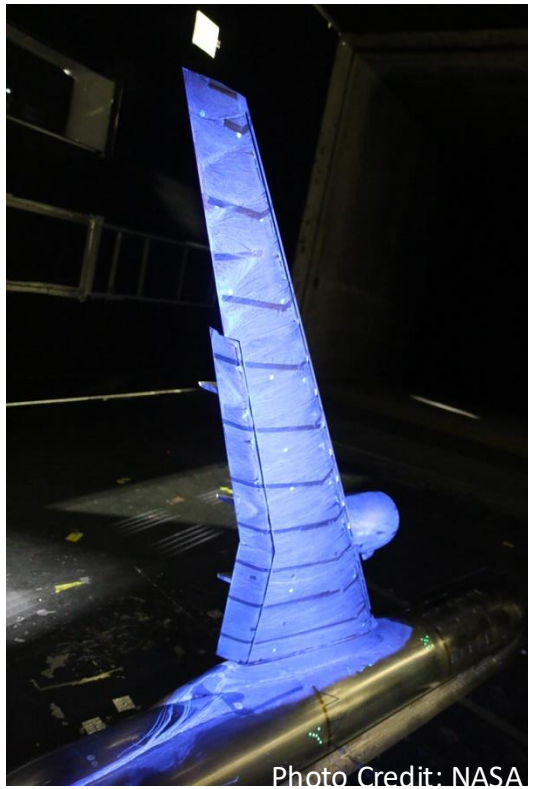


Photo Credit: NASA

Flow visualization test at the NASA LaRC 14x22
Sep. 23 through Sep. 26, 2024