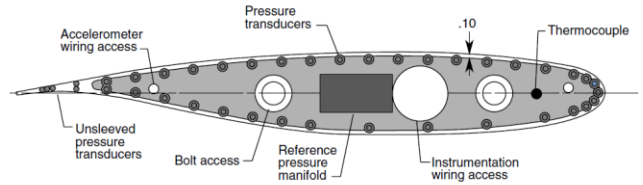
High Angle Working Group – Current Status

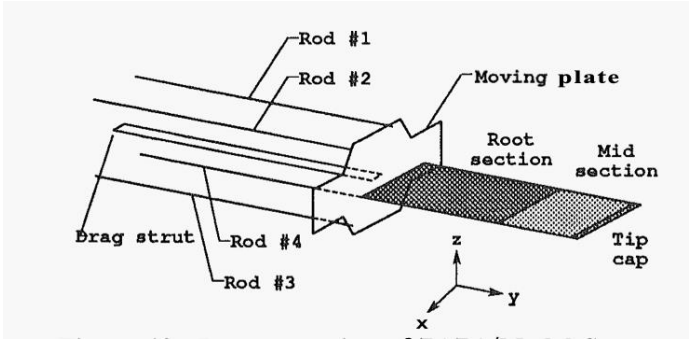
- **Leadership**
  - Pawel Chwalowski, NASA Langley US
- **Has met three times**
- **Second Thursday of every month at 10:00 Eastern time**

Point of Contact: Ben Rider (ben.j.rider@boeing.com)

High Angle Working Group – Summary

- **Focus on transonic aeroelastic flutter**
  - This WG dates back to AePW-1, held in 2012
  - Previous iterations of this WG had also considered transonic buffet
  - There will be some overlap here with the Buffet and the Static Deformation WGs
- **Utilize the Benchmark Supercritical Wing (BSCW)**
  - Tested in the NASA LaRC Transonic Dynamics Tunnel (TDT) in the early 1990's, as part of the Benchmark Models Program
  - A rigid rectangular wing attached to a pitch and plunge apparatus (PAPA)
  - Experimental flutter points at a range of Mach and AoA's
  - Finite element model available, as well as a family of unstructured meshes





High Angle Working Group: Test Case

- **AePW's 2 and 3 had considered isolated data points at relatively high Mach and AoA values: massively separated flow**
  - The spread in computational flutter predictions was very large
  - Because all we had was the experimental flutter point itself (and no other type of flow/pressure data), it was difficult to understand why/where exactly the codes were struggling
- **New strategy: consider an entire AoA-sweep at Mach 0.8**
  - 0° to 2°: attached flows, but shocks on the upper and lower surfaces
  - 3°: minor flow separation
  - 4° to 6°: massive flow separation
    - Large sensitivity to grid, time step, turbulence model, etc.; also some numerical evidence of a subcritical LCO
- **This will increase the burden of each participant, but also hopefully improve our understanding of how solvers begin to struggle with increased transonic effects**
- **Planned TDT re-test in 2025: these predictions will help guide the test plan**

Large Deformation Working Group – Current Status

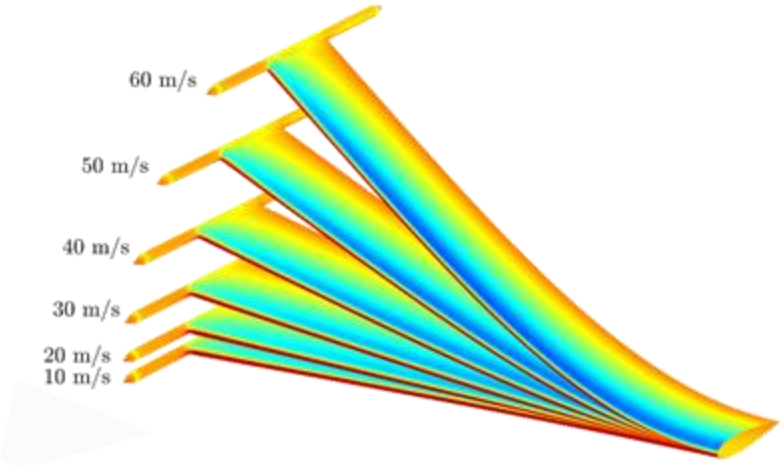
- **Leadership**
  - Rafael Palacios, Imperial College GB
- **Has met four times**
- **Third Thursday of every month at 11:00 Eastern time**

Point of Contact: Ben Rider (ben.j.rider@boeing.com)

Large Deformation Working Group – Summary

- **Focus on aeroelastic problems with structural nonlinearities**
  - Slender, high aspect ratio wings
  - The previous iteration of this WG (AePW-3) had considered Technion's Pazy Wing
  - Increased AoA → change in structural stiffness → shift in flutter boundaries

- **The current iteration of this group is still deciding where to go next**
  - Delft has experimental Pazy wing data of large-deflection unsteady response due to a sinusoidal gust
  - Technion is in the beginning research stages of a swept Pazy Wing
  - University of Michigan's EASE configuration: high aspect ratio wing, with control surfaces, attached to a PAPA



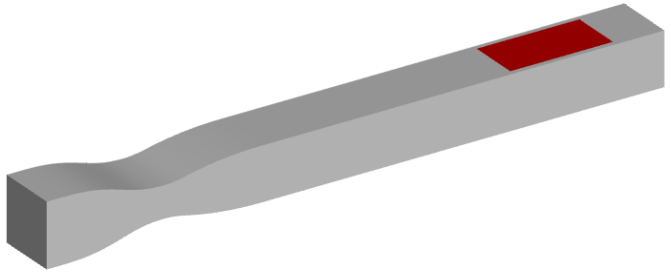
High Speed Working Group – Current Status

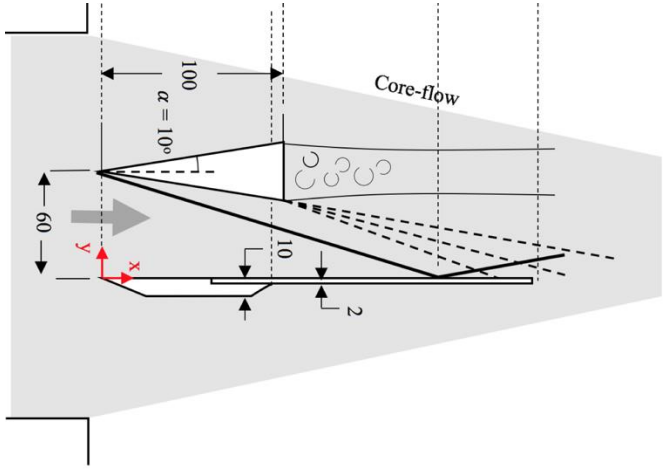
- **Leadership**
  - Kirk Brouwer, US Air Force Research Laboratory US
- **Has met three times**
- **Fourth Thursday of every-other-month at 5:00 pm Eastern time**
  - And at 8:00 am ET on the alternating months

Point of Contact: Ben Rider (ben.j.rider@boeing.com)

High Speed Working Group – Summary

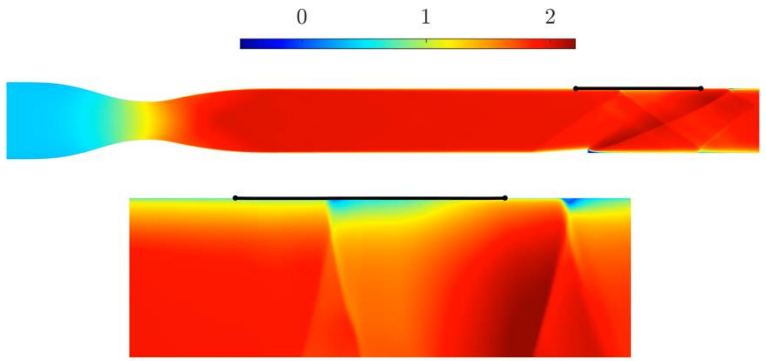
- **Focus on supersonic and hypersonic FSI problems**
- **The current iteration of this group will continue with the same 2 test cases considered in AePW-3**
  - AFRL's RC19 case: Mach-2 flow over a flexible panel
  - University of New South Wales' HyMax case: wedge-based shock impingement on a cantilevered plate at Mach 6
- **This WG got off to a relatively late-start in the AePW-3 cycle**
  - A mini-workshop was held at SciTech 2024
  - This WG has also, historically, struggled to attract interest from the broader high-speed FSI community
    - Unclear relationship with the AIAA High Speed FSI DG, e.g.
    - Issues stemming from the potentially-sensitive nature of these problems?





High Speed Working Group – Test Cases

- **RC-19**
  - Flexible panel mounted to the ceiling of a Mach 2 tunnel
  - Three tuning knobs
    - Temperature delta between the panel and its support frame
    - Cavity pressure behind the panel
    - The angle of a wedge on the floor of the tunnel
  - Panel response is very sensitive (numerically and experimentally) to these parameters



- **HyMax**
  - Wedge-based shock impingement on a cantilevered plate at Mach 6
  - Three test cases: two wedge angles, and also an oscillating wedge
  - Relatively few participants had considered HyMax in AePW-3