

Additive Manufacturing of a Wind Tunnel Force Balance

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Background

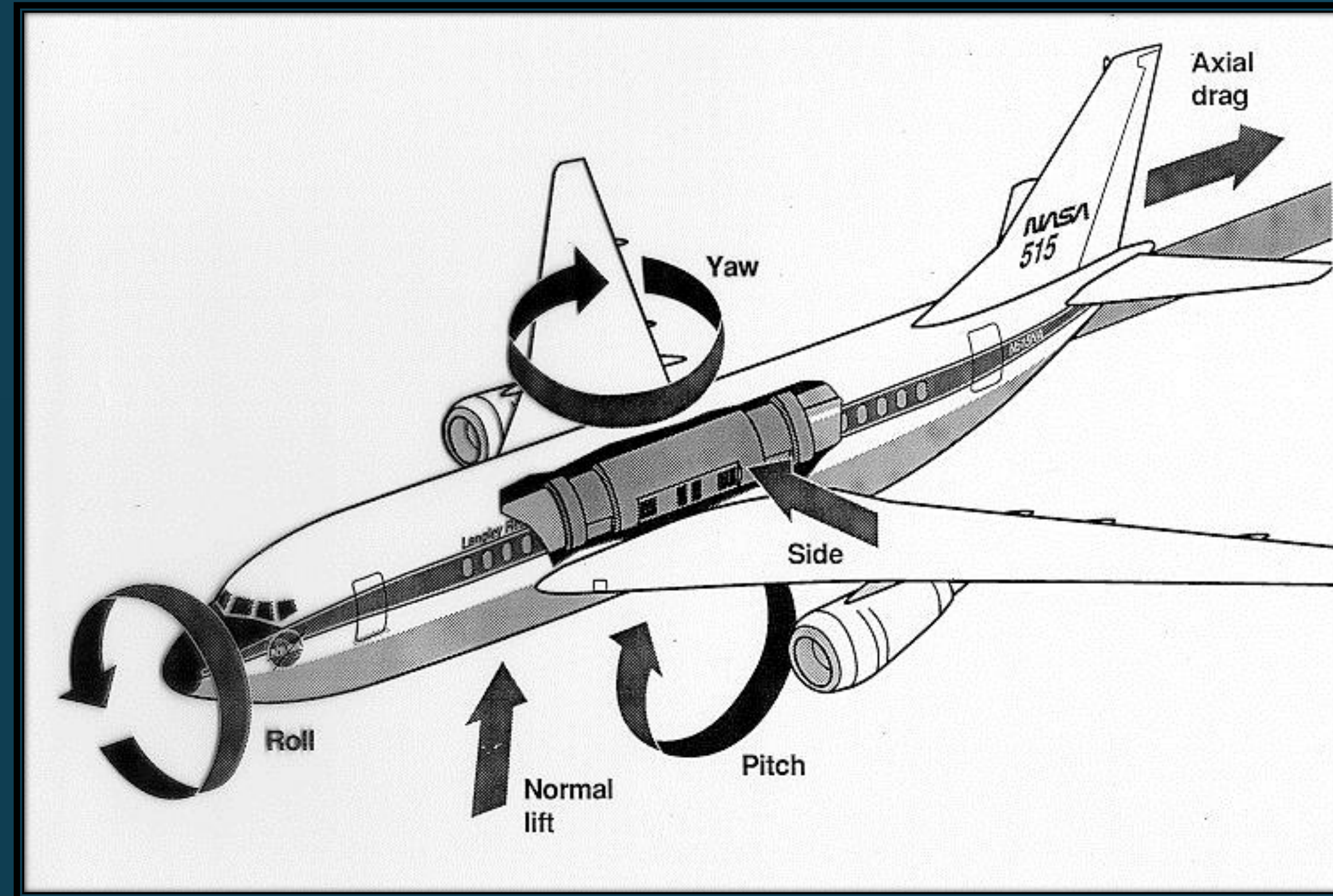
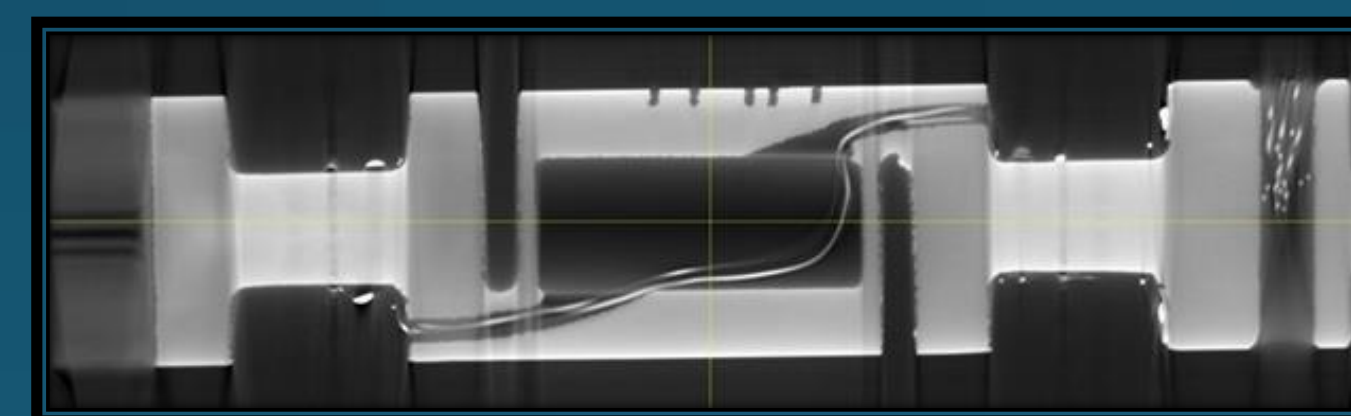
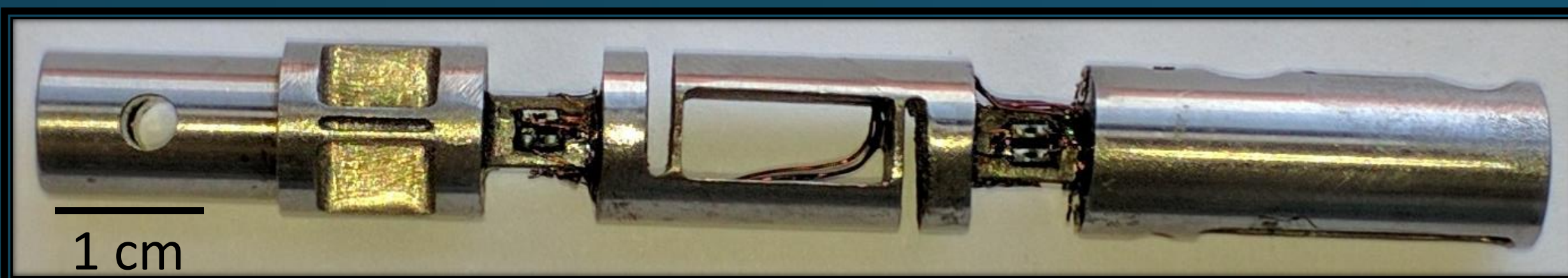


Illustration of a force transducer mounted in a wind tunnel model.

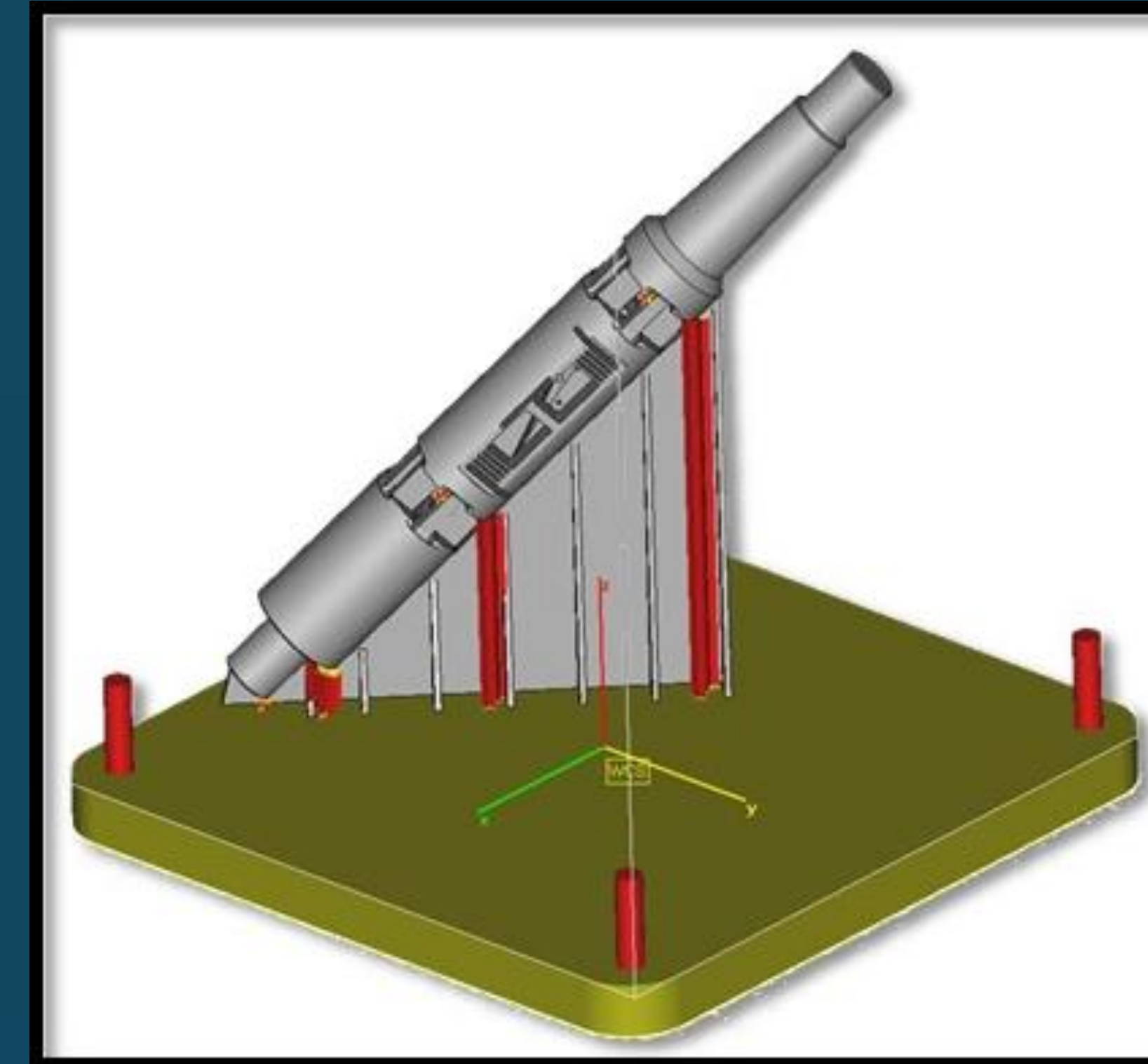
- Force balances are one of the fundamental measuring devices used in wind tunnel testing.
- Force balances must be designed for loads expected during the test.
- Current manufacturing techniques require approximately 6-12 months to manufacture a typical force balance, which can impact the test schedule.



AM force balance manufactured by Morris Technologies using an AEDC SBIR (left) optical photo (right) X-ray image.

- Morris Technologies demonstrated that they could additively manufacture (AM) a force balance using an AEDC SBIR in 2012.
- AM component made of 15-5 stainless steel showed little to no porosity.
- Unique internal features (shown in X-ray image) were incorporated demonstrating the potential for AM to enable new balance concepts.

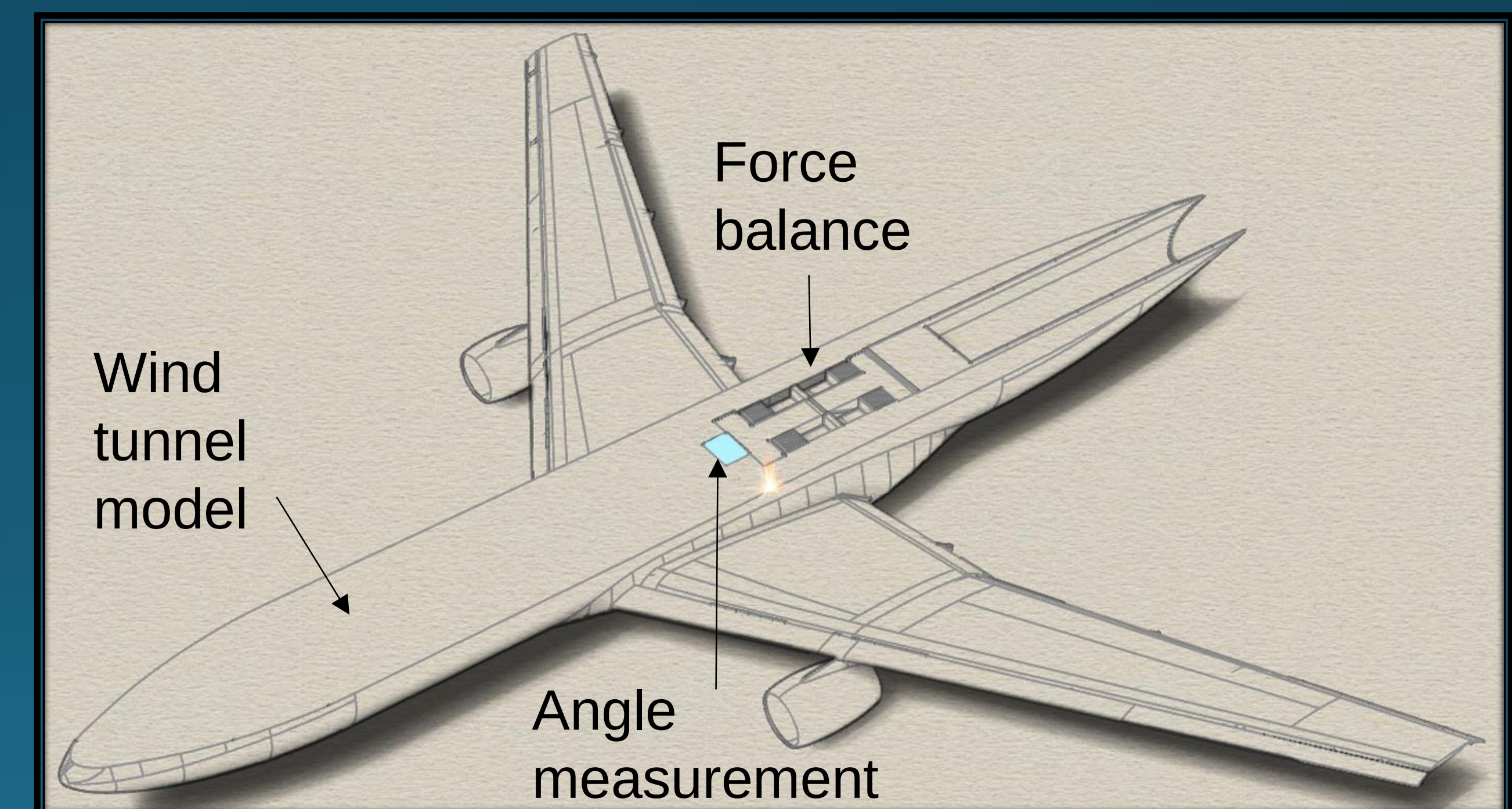
Current Work



AM force balance (left) as designed (right) printed.

- AM force balance manufactured at NASA Langley using CoCr powder.
- Working with ARL to print force balances using 17-4 powder.

Potential Impact



Simultaneous AM of a wind tunnel model and measurement systems.

- New force balance concepts manufactured in weeks not months.
- Balances manufactured on a test by test basis maximizing resolution.
- Fully leverage AM to manufacture wind tunnel models with integrated force and angle measurement systems.