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Calibration of the 11x11-Foot Transonic Wind Tunnel at NASA Ames Research Center

Bethany White
Nasa Ames Research Center, Moffett Field

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Bethany White
Ames Research Center, Moffet Field CA

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, CA 94035

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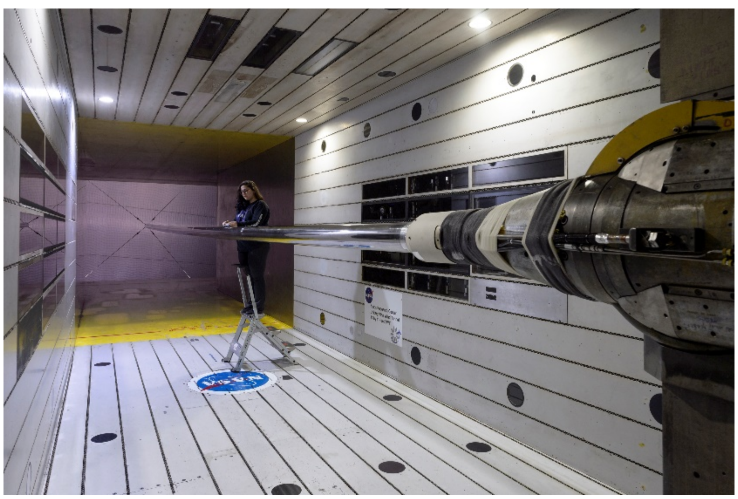
Calibration of the 11-By 11-Foot Transonic Wind Tunnel at NASA Ames Research Center

A static pipe calibration characterizing the streamwise static pressure distribution was conducted at the 11-By 11-Foot Transonic Wind Tunnel at NASA Ames Research Center. This data is used to determine the local Mach number within the test section and evaluate buoyancy corrections to axial force measurements. The 60 foot long, 6 inch diameter pipe contained 444 static pressure taps spanning the test section and nozzle regions of the tunnel. The forward end of the pipe extends into the settling chamber and is held by four cables mounting to the tunnel shell, and the aft end is fixed on the institutional model support system. A hydraulic cylinder at the aft end of the pipe provides tension on the system to reduce vibration and to keep the pipe as level as possible throughout the test section.

The previous calibration was improved upon by using pressure scanners with greater accuracy, ensuring a uniform pressure tube length for each tap to control pneumatic lag, optically tracking any streamwise movement of the pipe, and more tightly controlling the tunnel condition set points. Typically this calibration is conducted with the pipe on tunnel centerline and 33 inches below centerline for sting-mounted models and semi-span (i.e. floor-mounted) models respectively, however schedule demands permitted only the centerline calibration. The semi-span calibration is planned to be completed in the summer of 2020.



Immediately following the static pipe calibration, a shorter, 9 foot static pipe used as the calibration check standard was installed to obtain its first post-calibration pressure dataset. This short static pipe consists of 148 static pressure taps distributed along the pipe section and one total pressure tap at the end of an ogive nose. Performing the calibration test and its check standard back-to-back allows this dataset to establish a reliable baseline for future calibration check standard testing. Over time the use of a calibration check standard offers the ability to assess the stability of the calibration through statistical process control in an efficient and cost-effective manner, thereby potentially increasing the time required between full tunnel calibrations.