Air Data Boom

Measuring all relevant flow parameters during flight or for other mobile & stationary applications.

- Flexible head geometry with integrated total air temperature probe and optional heater
- One-piece, robust design
- Compatible with the VectoDAQ Air Data computer

Multi-hole Probe	
Geometry	Straight
Number of holes	5 + static ring
Max. length	< 280 mm (one-part design) > 280 mm (multipart design)
Min. tip diameter	5 mm (8mm with heater)
Tip geometry	Conical or spherical
Material	Stainless steel, Titanium, Inconel
Connections	Standard 1.0 mm or 1.6 mm pressure tubes
Fastening	Square, hexagonal, one-sided flattened cylinder or custom
Reference	Reference surface normal to Z axis
Max. temperature	700°C
Angular range	Up to ±60°
Angular accuracy	Min. ±1° or better
Velocity range	3 m/s to supersonic speeds (depends on calibration)
Velocity accuracy	Min. ±1 m/s or better
Optional	Heater 40 W for anti-icing

Figure 2: Air Data Boom head

The Air Data Boom from Vectoflow has a 5-hole probe head capable of measuring flow velocity, angle of attack and angle of sideslip in a range of up to ±60°. It is typically used on aircraft and drones, but also on cars and wind turbines.

Like all probes from Vectoflow the Air Data Boom is made by additive manufacturing, thus offering high geometrical flexibility combined with high robustness. All probes are generally built out of one piece, with no internal tubing or welding, thus avoiding any internal leakage and assuring a long lifetime.

An extension can be added to the probe head to move the point of measurement upstream of the vehicle or turbine, see Figure 1.

Additionally, the probe head comprises a total temperature head (TAT) equipped with a Pt100 or a thermocouple as well as an optional heater for anti-icing.

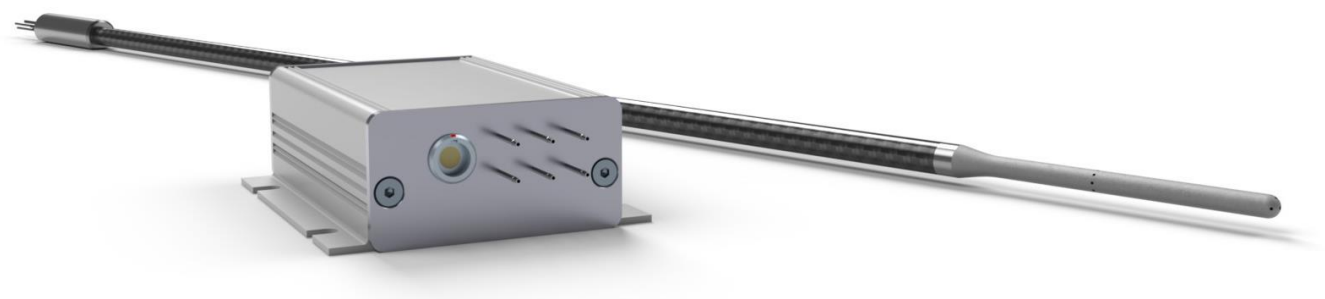

Figure 1: Example for an extended 5-hole Air Data Boom

Figure 3: VectoDAQ Air

In combination with the VectoDAQ Air Data Computer the Air Data Boom forms a highly capable measurement system for mobile applications.

Measurement error

The measurement error of the Air Data Boom basically depends on the pressure scanner used for calibration and data acquisition. Vectoflow recommends using a VectoDAQ Air Data Computer, which is designed to operate with the Air Data Boom.

The lower the flow velocity, the higher the impact of the pressure measurement error onto the determination of the flow velocity, as shown in Figure 4 (for a scanner accuracy of ± 0.05% FS). Generally, an error of 1 m/s or 1% of the measured velocity – whichever is higher – may be expected.

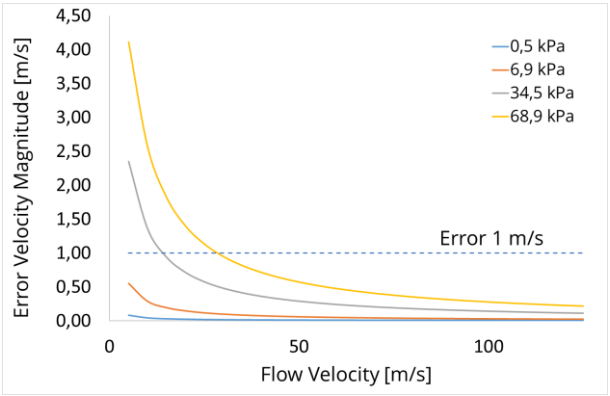

Figure 4: Dependency of velocity measurement error on pressure scanner range (0.05% FSS accuracy)

Hence, it is recommended to use the lowest possible pressure measurement range or to use a VectoDAQ with a dual pressure range for each channel, assuring a good measurement accuracy over a larger flow velocity range.

Calibration process

The calibration process is necessary for each manufactured Air Data Boom. Vectoflow has its own calibration wind tunnel, delivering flow conditions from 1 m/s up to Mach 1 (higher Mach numbers upon request). During the calibration process the probe is exposed to a steady flow with known conditions, while pitch and yaw angles are varied accordingly. The definition of the flow angles as used by Vectoflow is shown in Figure 5.

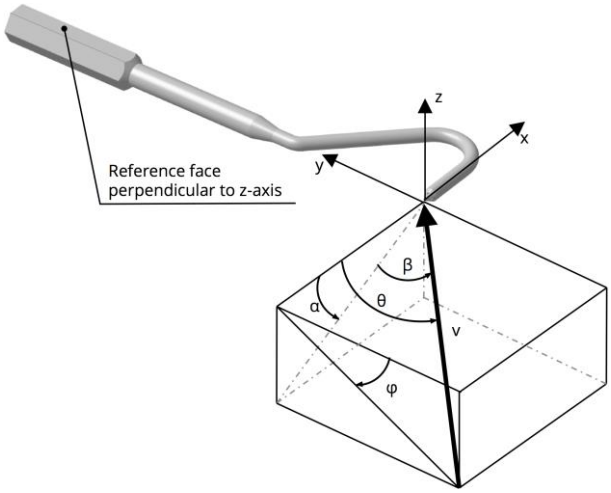

Figure 5: Flow angle definitions

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