

Image Source: <https://www.researchgate.net/figure/Schematic-diagram-of-a-Prandtl-tube_fig2_226082529>

The above equation is derived from Bernoulli’s equation.

Let:

Solve for :

Define:

From the datasheet for mpx5010dp:

Pressure range: 10kPa

This value is larger than the anticipated 1.203kPa difference expected in testing conditions.

The maximum airspeed velocity may be thus calculated:

This value is considerably higher than will be achieved during flight testing. The mpx5010dp is an appropriate sensor for this application.

Transfer function:

Where:

Note: can be in any voltage units (V, mV, uV, etc), but they must be consistent!

This pressure is equivalent to the pressure difference:

With pressure difference determined, we may calculate wind speed with the modified Bernoulli equation from above:

Our pressure units are in kPa and must be converted to Pa obtain m/s units:

Next we must convert m/s velocity to mph:

cannot be read directly by the Arduino. We must convert the 0-1023 back to volage:

Written numerically, excluding the error term:

Use this to obtain velocity