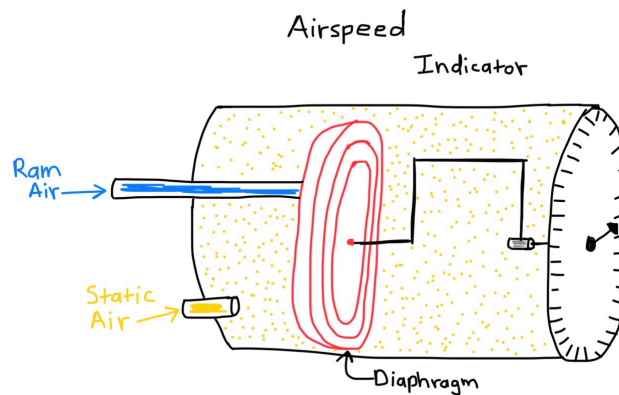
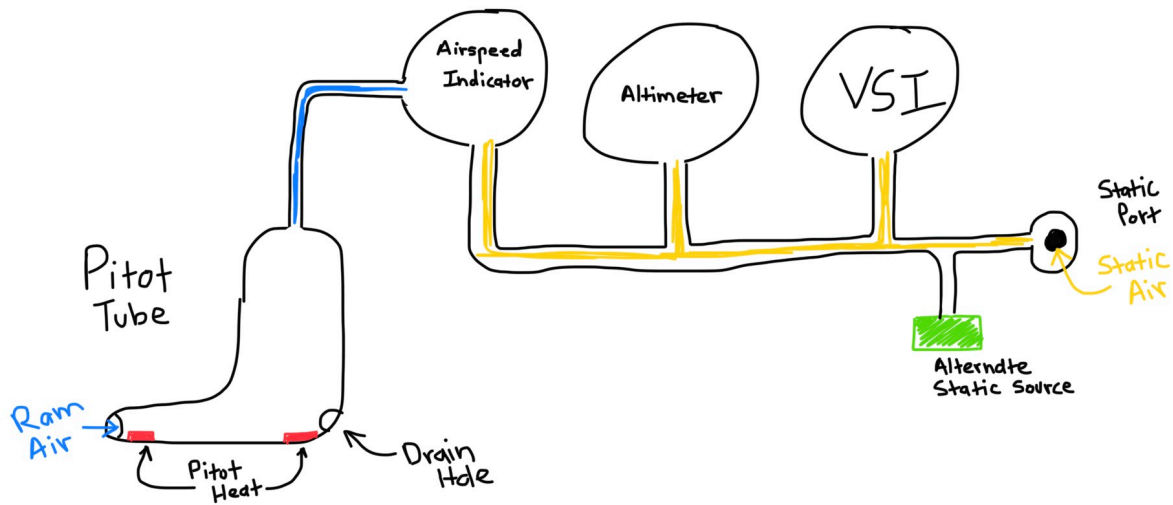


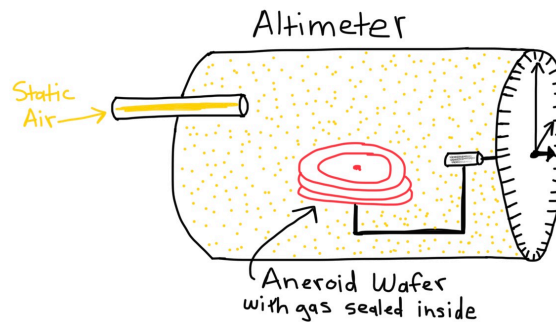
Pitot Static System

Airspeed Indicator, Altimeter, and the Vertical Speed Indicator



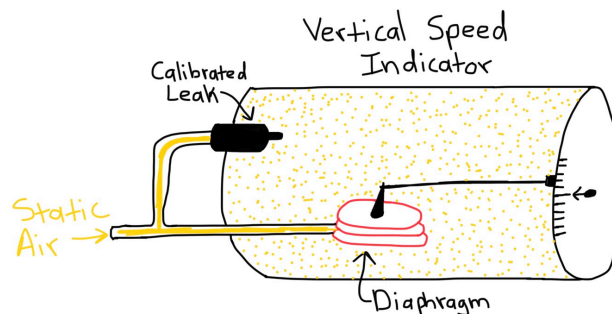
How the Airspeed Indicator Works

- Inside the casing is an aneroid diaphragm.
- The diaphragm is surrounded by static pressure from the static port, while inside the diaphragm is filled with dynamic pressure from the ram air hole.
- As the airspeed increases, the dynamic pressure increases inside the diaphragm, which causes the diaphragm to expand. As the dynamic pressure decreases, the diaphragm will compress.
- As the diaphragm expands and contracts with the changing dynamic pressure, the mechanical linkage and gears move the needle pointer to show you your indicated airspeed.



How the Altimeter Works

- Inside the casing are aneroid wafers that are sealed with gas inside them.
- As the ambient pressure enters the casing around the wafers, the gas in the wafers will expand and contract with different pressures.
- As the ambient pressure decreases (when you ascend), the wafers will expand.
- While descending, the ambient pressure in the casing will increase and contract the wafers.
- The expanding wafers apply pressure to the mechanical linkage and gears, which cause the needles to move and show your indicated altitude.



How the Vertical Speed Indicator Works

- Inside the casing is a diaphragm.
- The static pressure goes into both the diaphragm and into the casing around the diaphragm.
- The static air in the diaphragm comes directly from the static line, while the static air in the casing enters through a calibrated leak.
- As you climb, the static pressure in the diaphragm decreases immediately, while the static pressure in the case decreases gradually. This causes the diaphragm to squeeze and then gradually expand as the static pressure equalizes when the climb stops and the needle moves back to 0.
- As you descend, the static pressure in the diaphragm increases immediately, while the static pressure in the case increases gradually. This causes the diaphragm to expand and

move the needle down, then gradually contract as the static pressure equalizes when the descent stops and the needle moves back to zero.

- As the diaphragm expands and contracts, it turns gears and rods, which causes the needle to move.

Altimeter Errors

Position Error:

The position of the static port can lead to disrupted airflow during certain maneuvers, phases of flight, and wind corrections.

Elasticity Error:

Metal fatigue can happen over time with all the expanding and contracting of the aneroid wafers.

Pilot Error (Density Error):

This can occur when the pilot fails to set the current altimeter setting throughout the flight.

Static Port Blockage:

See Below

VSI Errors

Turbulence:

The VSI is inaccurate during turbulence and when maneuvering abruptly. During turbulence, it is better to just maintain an appropriate pitch, rather than chasing the needle.

Pitot Tube Blockage

- The only instrument that will be affected is the airspeed indicator.
- When you suspect a blockage, turn on the pitot heat to melt any ice that may have formed on or in the pitot tube.
- When just the ram air hole is blocked:
The airspeed will show 0 because no ram air is able to get into the diaphragm and the excess dynamic air will leak out of the drain hole.
- When the ram air hole AND drain hole is blocked:
Airspeed indicator will work like an altimeter; it will show faster as you climb altitudes and show slower as you descend. This is because the ram air in the diaphragm is trapped and as you ascend, the lower air pressure causes the diaphragm to extend. As you descend, the higher pressure compresses the static air in the diaphragm.

Static Port Blockage

- The instruments affected will be the airspeed indicator, altimeter, and vertical speed indicator.
- **Airspeed Indicator:**
The airspeed will show correct as long as you remain at the altitude at which the blockage occurred.
When you climb, the airspeed will show as slightly slower and when you descend, the airspeed will show slightly faster.
- **Altimeter:**
The altimeter will freeze at the altitude the blockage because the static air is trapped and will not change pressure to move the aneroid wafers.
- **Vertical Speed Indicator:**
The VSI will slowly return to and remain at 0.

Using the Alternate Static Source

- A lower static pressure is measured when using the alternate static pressure.
- The airspeed indicator will indicate as faster than it should.
- The altimeter will indicate a slightly higher altitude than it should.
- The vertical speed indicator will momentarily show a climb.