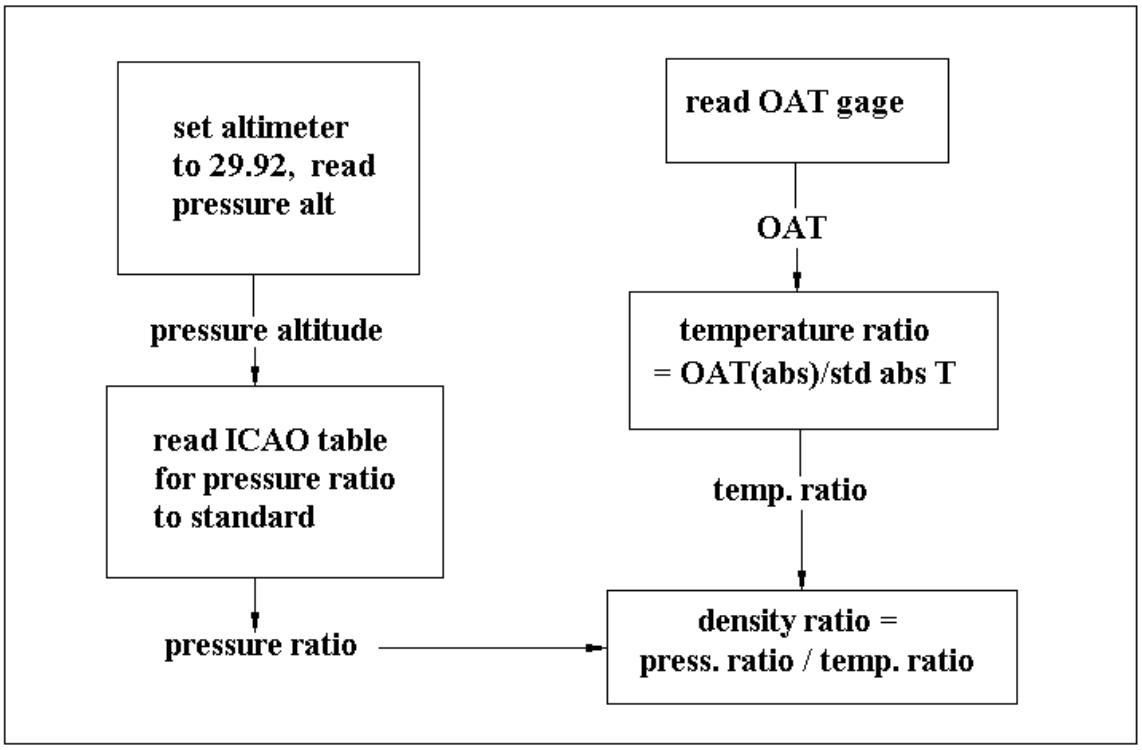
DENSITY RATIO



Density ratio is often used to "reduce" in flight data to standard conditions for making fair comparisons. It is defined to be the air density at your flight conditions divided by the density at that same geometric altitude in a "standard atmosphere", which is a global and annual average of what actually obtains. Unfortunately, it is unlikely in the extreme that any real-world conditions will also match that standard.

The most straightforward way to find density ratio is to determine your pressure altitude with your altimeter, and combine that piece of data with your observed outside ambient temperature (OAT).

Most of the time, your altimeter will best approximate geometric altitude, because you set its Kollsman window to reflect actual barometric pressure. But, if instead, you set the Kollsman window to 29.92 inches of mercury, the altitude it reads out will be pressure altitude: the altitude in a standard atmosphere where your in-flight ambient pressure obtains. Then, using any standard atmosphere table, look up the pressure ratio at your pressure altitude.

Read your OAT gage and convert its reading to absolute units (if degrees F, add 460 to obtain degrees R; if degrees C, add 273 to obtain degrees K). Divide this absolute OAT reading by the standard day absolute temperature (519 R or 288 K, as appropriate; do not mix units!). This ratio is your (absolute) temperature ratio.

Density ratio is then merely pressure ratio divided by temperature ratio.