# Appendix C
# Airspeeds

# Correction From Instrument Reading to Indicated Airspeed

$$V_{IAS} = V_i + \Delta V_i$$

where

$V_{IAS}$ = indicated airspeed

$V_i$ = instrument reading of airspeed

$\Delta V_i$ = instrument error (usually small)

Source: Schaufele

# Correction From Indicated Airspeed to Calibrated Airspeed

$$V_{CAS} = V_{IAS} + \Delta V_p$$

where

$V_{CAS}$ = calibrated airspeed

$\Delta V_P$ = position error (usually small)

Source: Schaufele

# Correction From Calibrated Airspeed to Equivalent Airspeed

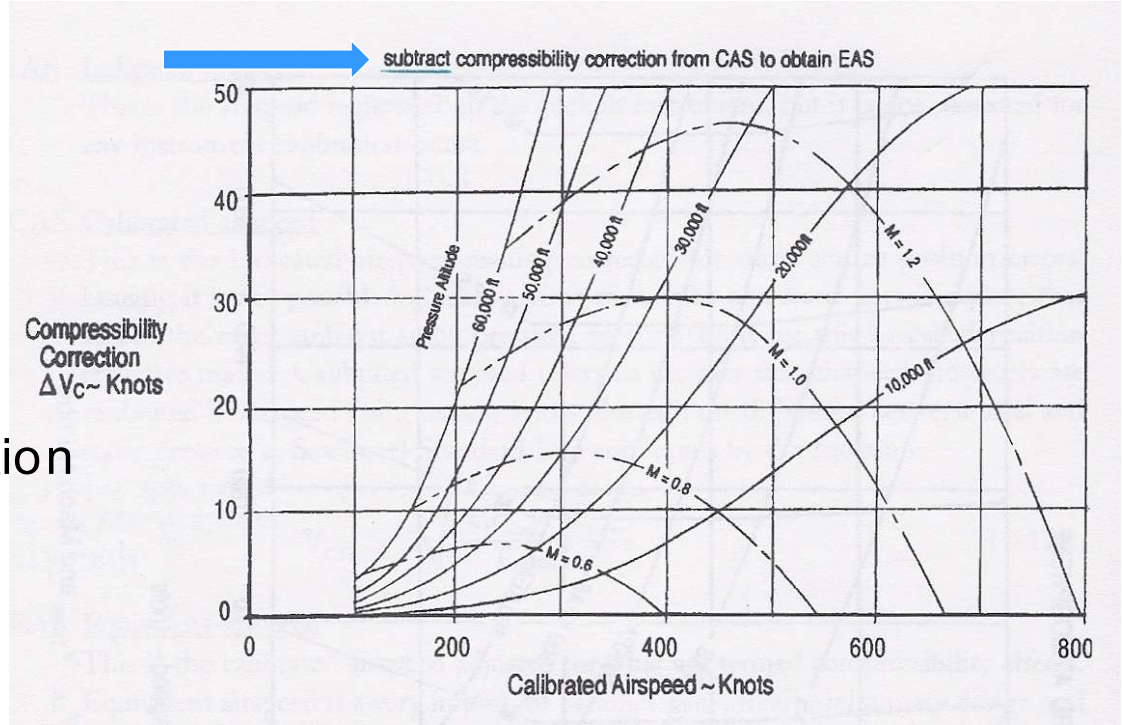
$$V_{EAS} = V_{CAS} + \Delta V_C$$

where

$V_{EAS}$ = equivalent airspeed

$\Delta V_C$ = compressibility correction

(small if M< 0.5)




Source: Schaufele

# Correction From Equivalent Airspeed to True Airspeed

Pitot-static tube on Cessna 172

ASI recognizes pressure, not density

$$p_{total} = p_{static} + q$$

$$q = \text{dynamic pressure} = p_{total} - p_{static}$$

$$= \frac{1}{2}\rho\left(V_{TAS}\right)^2 = \frac{1}{2}\rho_0\left(V_{EAS}\right)^2$$

where $\rho = \rho_{ambient}$ $\rho_0 = r_{sea\ level}$

$$V_{TAS} = V_{EAS}\frac{1}{\sqrt{\sigma}}$$

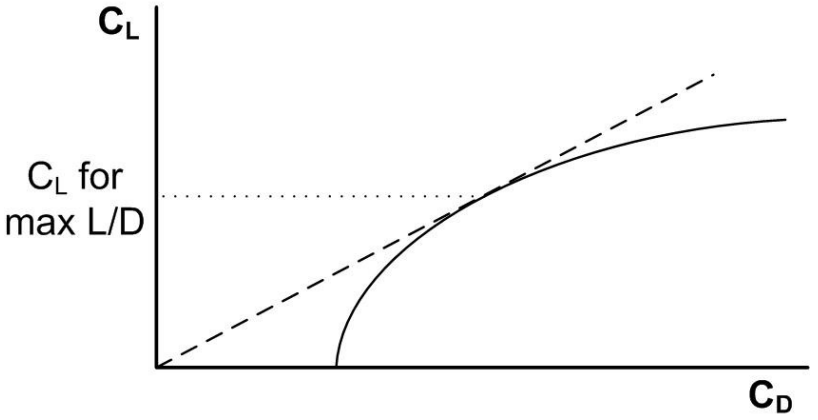
where $V_{TAS} = \text{true airspeed}$ $\sigma = \frac{\rho_{ambient}}{\rho_{sea\ level}}$

Source: Schaufele

# Climbing at Constant L/D

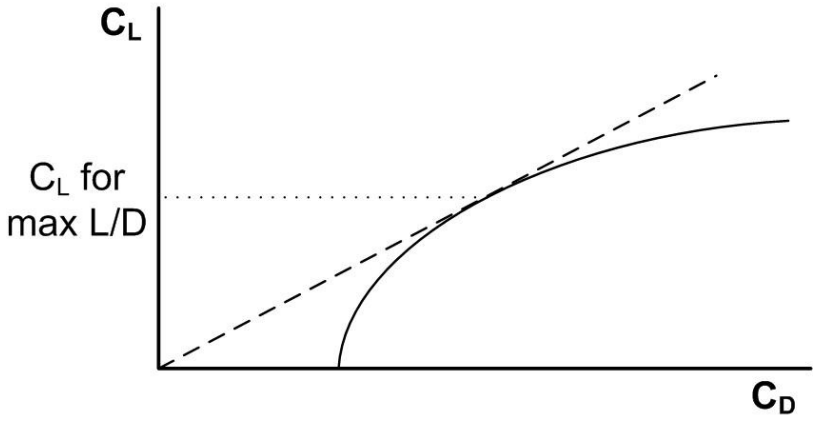
$$C_{L_{opt}} = \frac{L}{\frac{1}{2}\rho V^2 S}$$

- As airplane climbs, ρ decreases.
- V must increase to maintain constant $C_L$



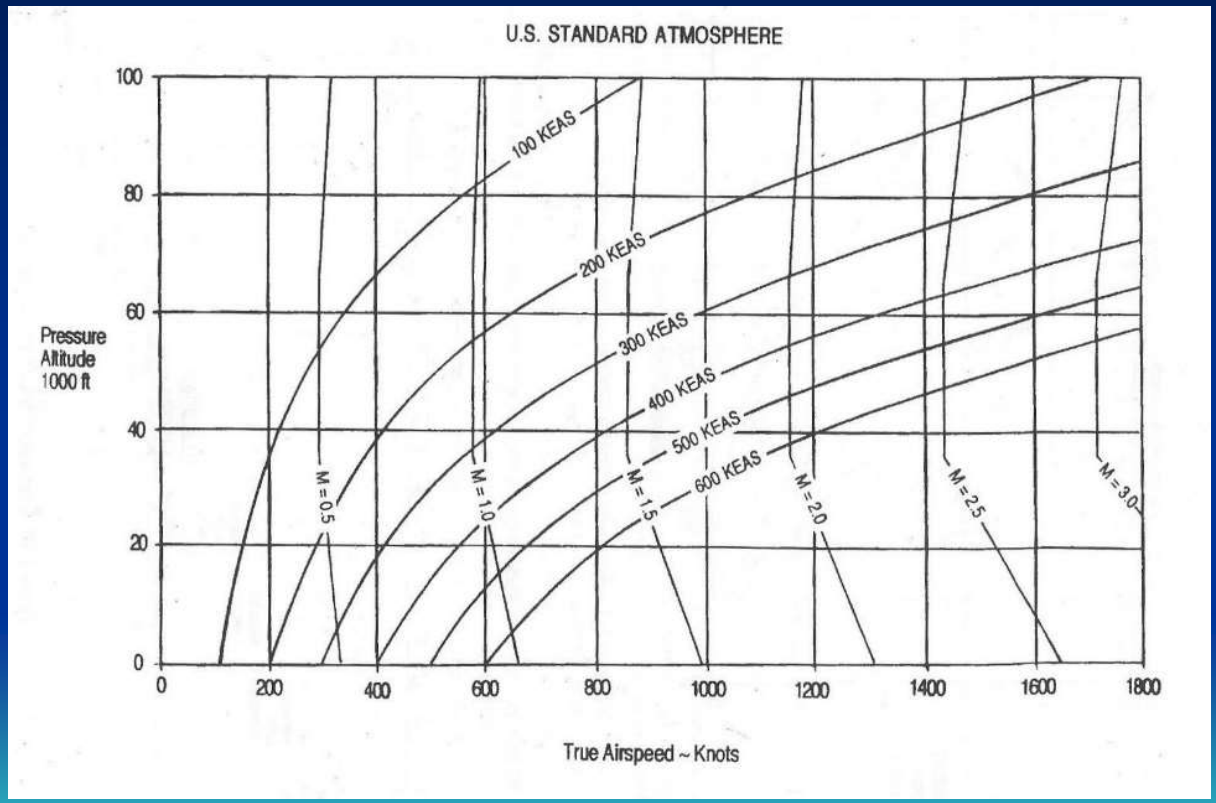
# Climb at Constant $V_{EAS}$

$$C_L = \frac{L}{qS} = \frac{L}{\frac{1}{2}\rho\left(V_{TAS}\right)^2 S} = \frac{L}{\frac{1}{2}\rho_0\left(V_{EAS}\right)^2 S}$$



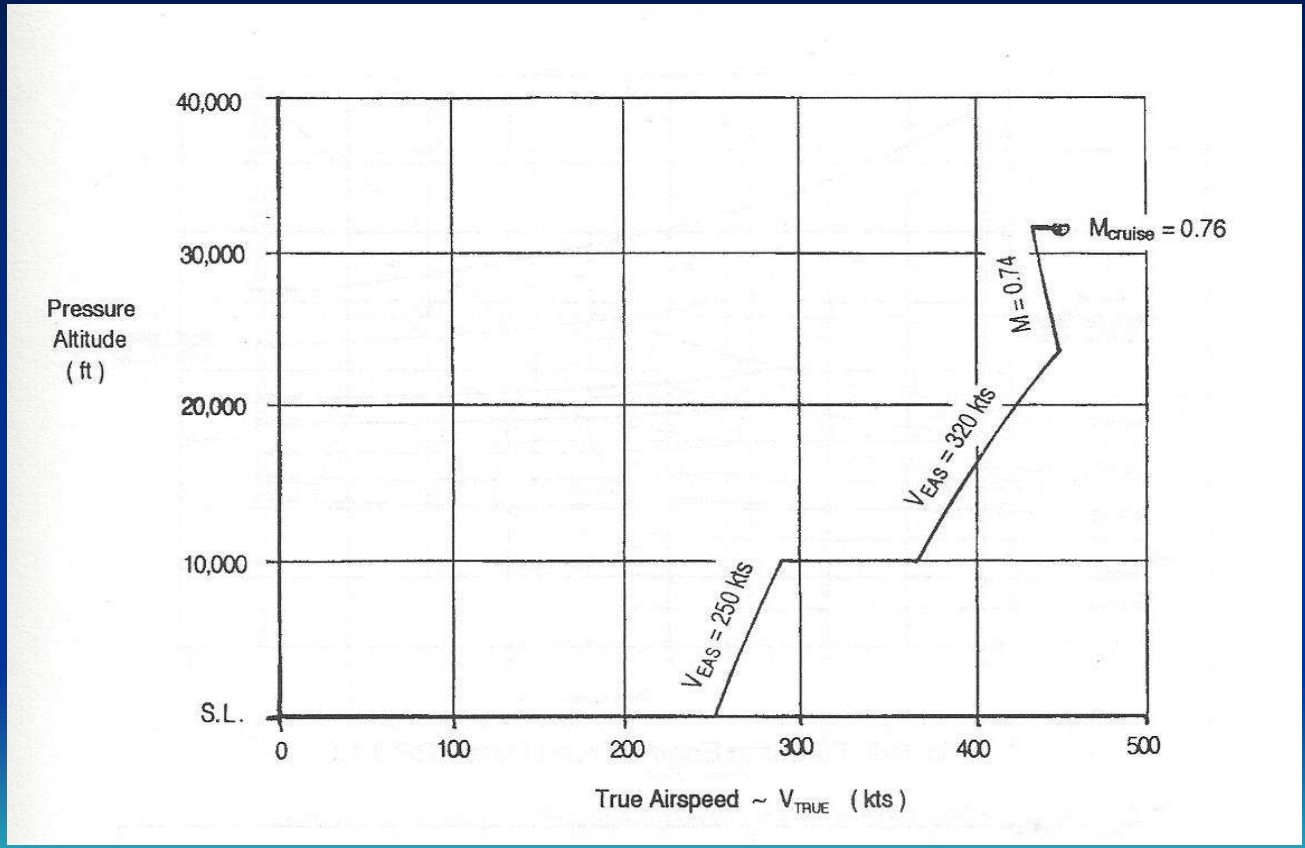

Source: Schaufele

# Relationship Between TAS, EAS, and Mach Number as Fn. Of Alt




Source: Schaufele

# DC-9 Climb Schedule




Source: Schaufele