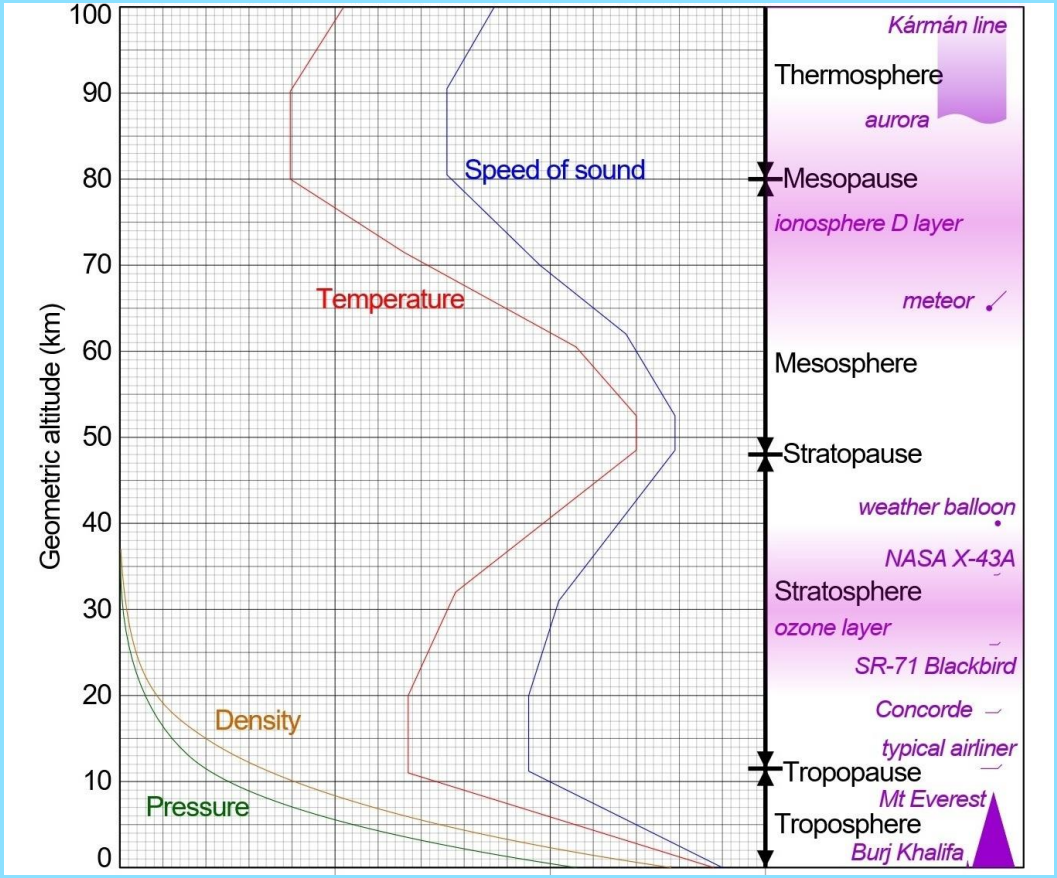
Velocità del suono

$$c = \sqrt{\gamma RT} \quad \text{dove} \quad \gamma = \frac{c_p}{c_v} \quad \text{e} \quad T = T_0 + ah$$

da cui:

$$c = \sqrt{\gamma R(T_0 + ah)} \quad \rightarrow \quad c^2 = \gamma R(T_0 + ah)$$



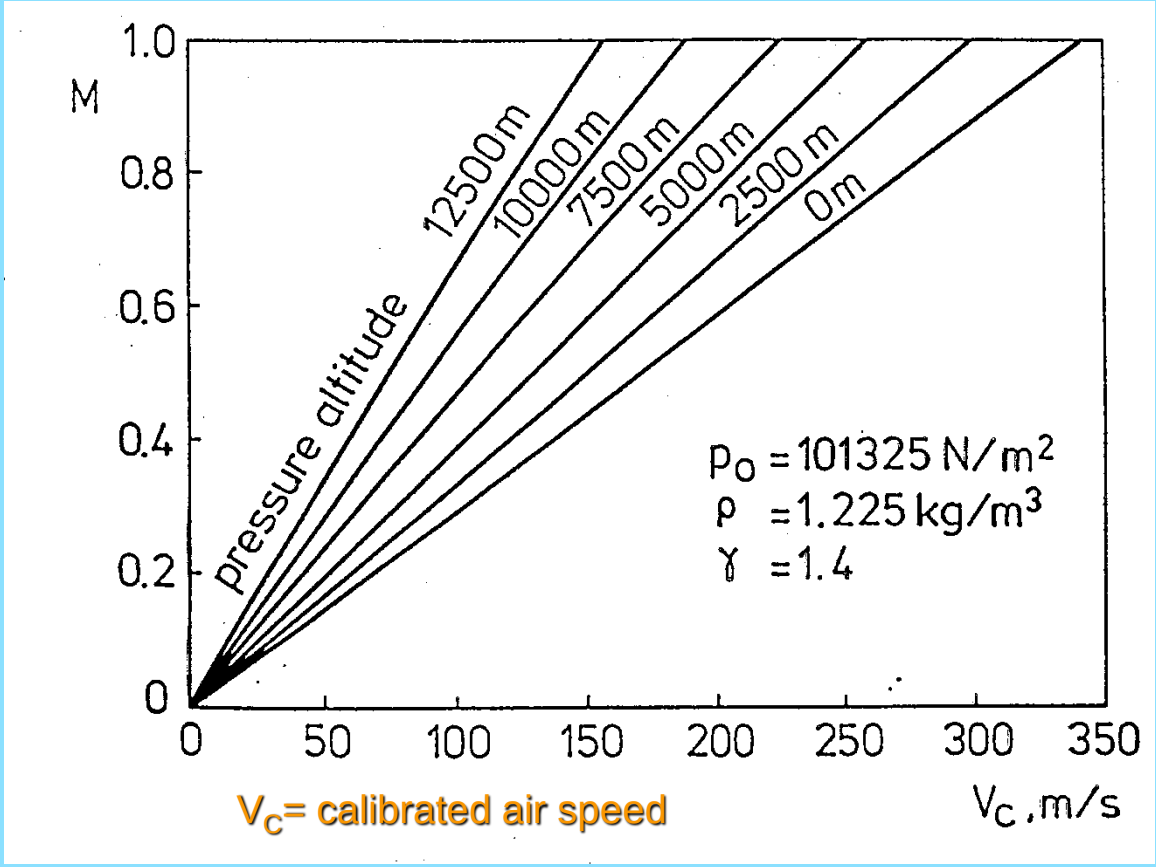
Machmetro

$$M = \frac{v}{c}$$

$$v = f(p_t - p_s)$$

$$c = f(T_s) = f(p_s)$$

$$M = f\left[(p_t - p_s),\ p_s,\ k_i\right]$$



Caso subsonico

$$p_t = p_s \left(\frac{T_t}{T_s} \right)^{\frac{\gamma}{\gamma-1}} \quad \Rightarrow \quad p_t - p_s = p_s \left[\left(\frac{T_t}{T_s} \right)^{\frac{\gamma}{\gamma-1}} - 1 \right]$$

$$p_t - p_s = p_d = p_s \left[\left(1 + \frac{\gamma-1}{2} M^2 \right)^{\frac{\gamma}{\gamma-1}} - 1 \right]$$

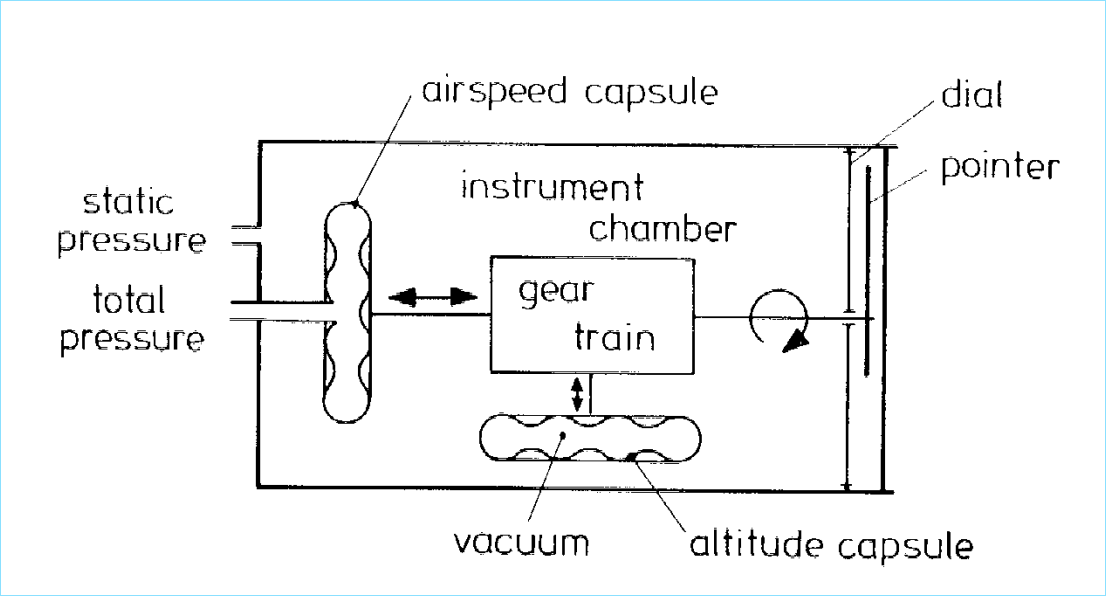
$$M^2 = \frac{2}{\gamma-1} \left[\left(\frac{p_d}{p_s} + 1 \right)^{\frac{\gamma}{\gamma-1}} - 1 \right] \quad \Rightarrow \quad M = f\left(\frac{p_d}{p_s}, k_i \right)$$

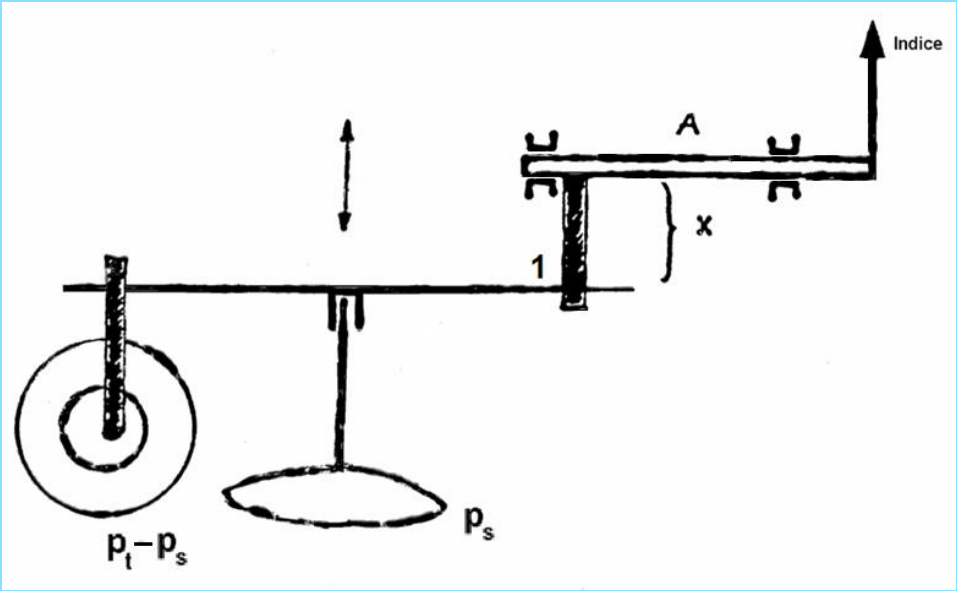
Caso supersonico

$$\frac{p_{t_2} - p_{s_1}}{p_{s_1}} = \left[\left(M^2 \frac{\gamma + 1}{2} \right)^{\frac{\gamma}{\gamma - 1}} \left(\frac{\gamma + 1}{2\gamma M^2 - \gamma + 1} \right)^{\frac{1}{\gamma - 1}} - 1 \right]$$

$$M = f\left(\frac{\Delta p}{p_{s_1}}, \; k_i \right)$$

Machmetro





$\theta =$ rotazione dell'indice

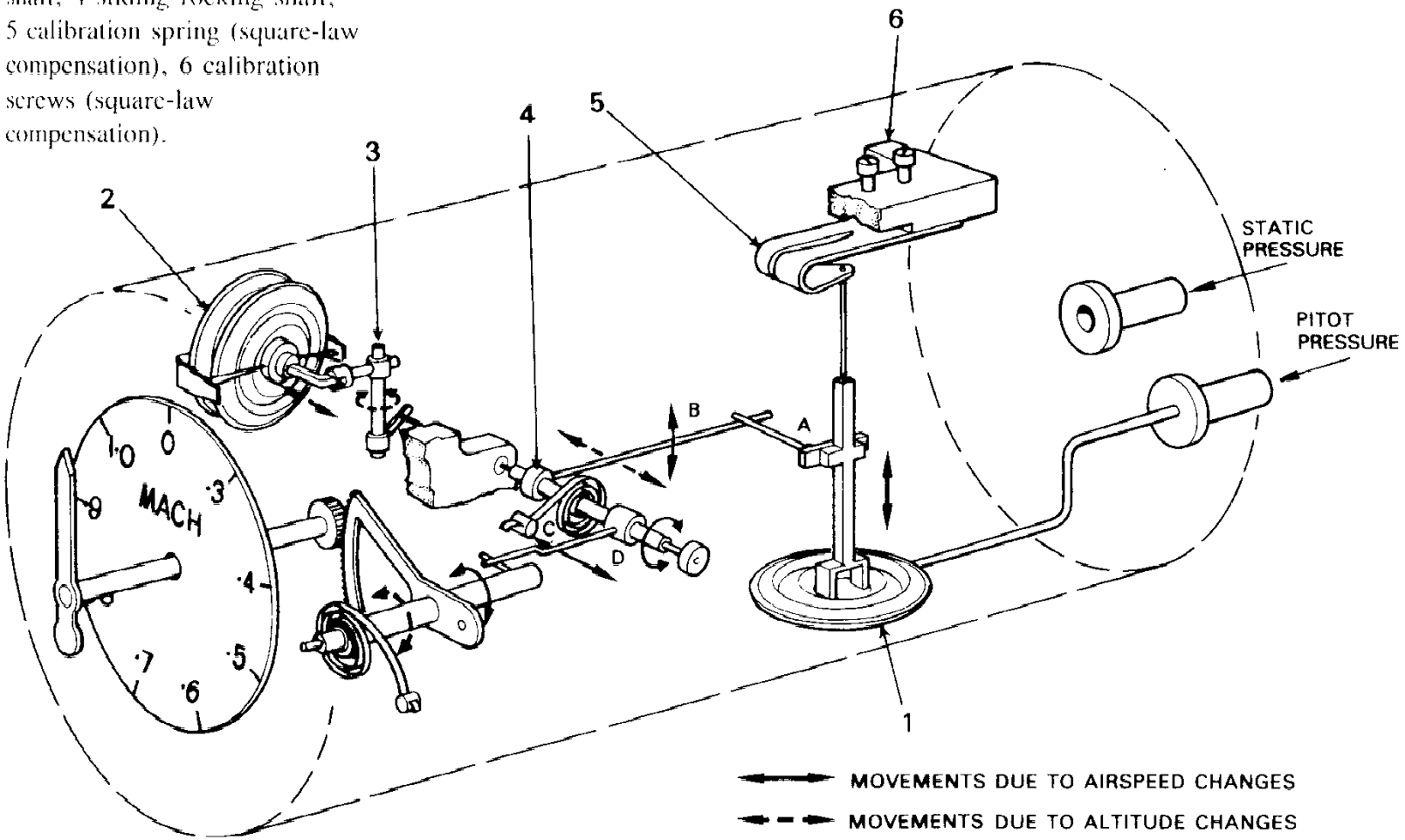
$$\theta = \frac{\text{spostamento di 1}}{\text{braccio } \mathbf{x}} = \frac{\mathbf{k}_1(\mathbf{p}_t - \mathbf{p}_s)}{\mathbf{x}}$$

$$\mathbf{x} = \mathbf{k}_2 \mathbf{p}_s$$

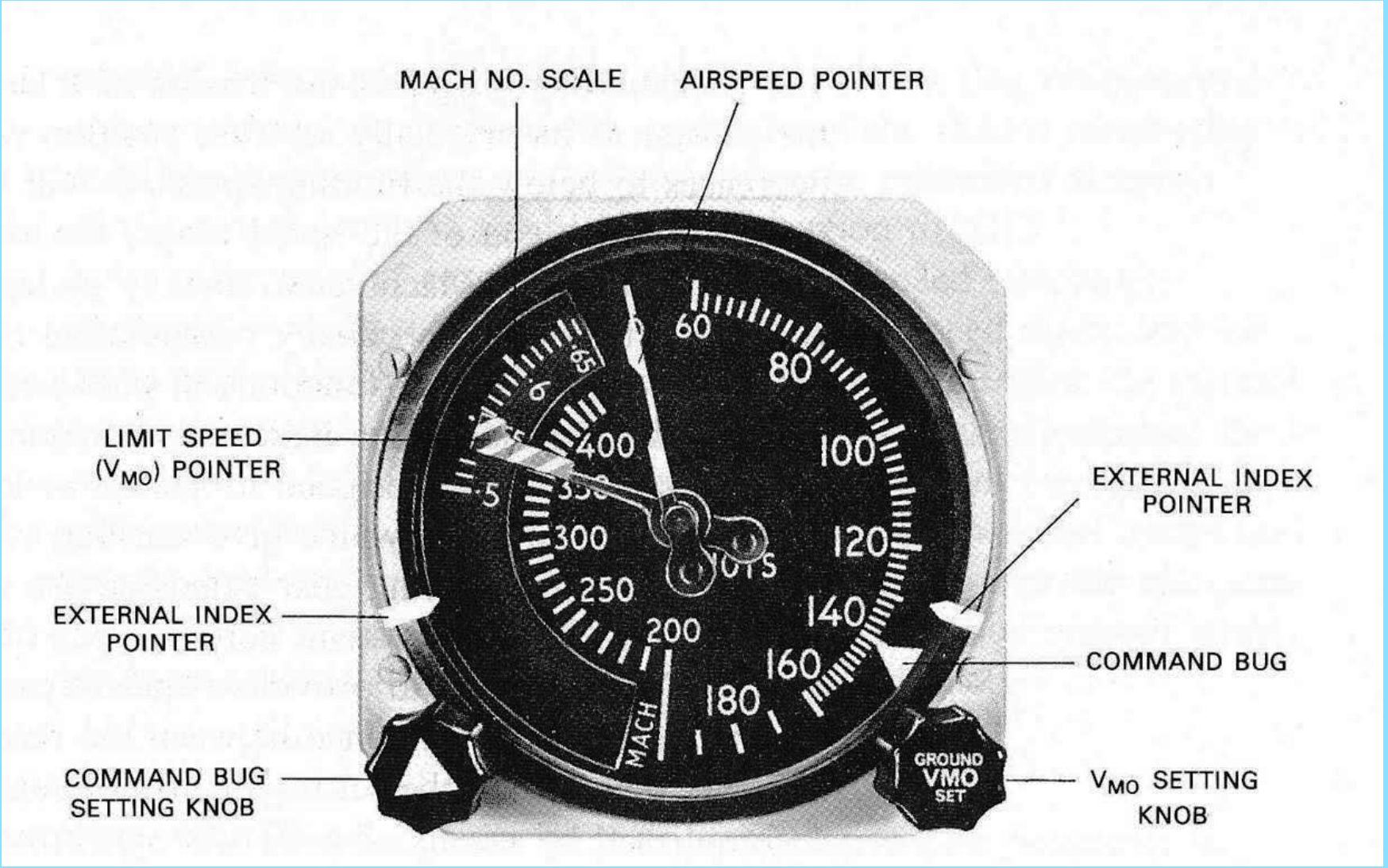
$$\theta = \frac{\mathbf{k}_1}{\mathbf{k}_2} \frac{(\mathbf{p}_t - \mathbf{p}_s)}{\mathbf{p}_s} \Rightarrow \mathbf{M} = f(\theta, \mathbf{k}_i)$$

Machmetro

Figure 2.19 Machmeter. 1 Airspeed capsule, 2 altitude capsule, 3 altitude rocking shaft, 4 sliding rocking shaft, 5 calibration spring (square-law compensation), 6 calibration screws (square-law compensation).



Anemometro Machmetro



V_{MO}= Maximum Operating Speed

Mach presentation of EFIS PFD