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3.3 Altitude H_c

The Mode-C altitude from the aircraft is only correct for the standard air pressure of 1013.25hPa at sea level and the standard temperature of 15° celsius. With the formulas given in ICAO document 7488/3 is it possible to convert the altitude H_c into the better approximation H. For the conversion the QNH airfield air pressure p_1 and the airfield temperatur T_1 is needed. Both values are measured constantly at the airfield and are distributed by ATIS radio broadcast to the pilots. Using ICAO Doc 7488/3 formula (12) we will first convert H_c back to air pressure and then air pressure to H.

$p_0 := 1013.25$	Standard-Air pressure in hPa
$T_0 := 273.15 + 15$	Standard-Temperature in Kelvin
$\beta := -0.0065$	Temperature Gradient for H_c between 0 und 11km (FL360)
$g_0 := 9.80665$	Gravity in m/s^2
$R := 287.05287$	constant for the mixture of gases we call "Air" in $m^2/(K*s^2)$
H_c	Mode-C Altitude in meters(!)

Conversion Mode-C altitude into air pressure with standard air pressure and standard temperature. p is the air pressure measured in the aircraft.

$$p = p_0 \cdot \left(1 + \frac{\beta}{T_0} \cdot H_c\right)^{\frac{-g_0}{\beta \cdot R}} \qquad (3.3\text{-}1)$$

After solving the equation to H and using the QNH airfield pressure and airfield temperature we get the real altitude H:

p_1	QNH airfield pressure in hPa
T_1	airfield temperature in K

$$H = \frac{T_1}{\beta} \cdot \left[\left(\frac{p}{p_1}\right)^{\frac{-\beta \cdot R}{g_0}} - 1\right] \qquad (3.3\text{-}2)$$

Note: the formulas 3.3-1 and 3.3-2 can be combined into one formula.

3.9 Literature

ICAO; Doc 7488/3 Manual of the ICAO Standard Atmosphere; ICAO