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Physical properties of design atmospheres



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THE PREPARATION OF THIS DATA ITEM

The work on this particular Data Item which supersedes ESDU Aero 00.01.01, was monitored and guided by the Aerodynamics Committee. This Committee first met in 1942 and now has the following membership:

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PHYSICAL PROPERTIES OF DESIGN ATMOSPHERES

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PHYSICAL PROPERTIES OF DESIGN ATMOSPHERES

1. NOTATION AND UNITS

		<i>SI</i>	<i>British</i>
g	acceleration due to gravity	m/s ²	ft/s ²
H	geopotential altitude	m	ft
H_p	pressure altitude	m	ft
H_{pi}	dividing altitude in temperature-altitude profiles	m	ft
L_i	temperature gradient between altitudes H_{pi} and H_{pi+1}	K/m	K/ft
p	pressure	N/m ²	lbf/ft ²
R	gas constant for air (287.05287 Nm/kg K, 3 089.811 4 lbf ft/slug K)	N m/kg K	lbf ft/slug K
r_e	radius of earth ($6.356\,766 \times 10^6$ m, $2.085\,553 \times 10^7$ ft)	m	ft
T	temperature	K	K
T_i	temperature at altitude H_{pi}	K	K
Z	geometric altitude	m	ft
ρ	density	kg/m ³	slug/ft ³
<i>Subscripts</i>			
i	denotes divisions in temperature-altitude profiles in Table 6.3		
std	denotes values in International Standard Atmosphere		
0	denotes sea-level values in International Standard Atmosphere.		

2. SEA-LEVEL VALUES IN INTERNATIONAL STANDARD ATMOSPHERE

<i>Quality</i>	<i>SI Units</i>	<i>British Units</i>
g_0	9.80665 m/s ²	32.174 049 ft/s ²
p_0	$1.013\,25 \times 10^5$ N/m ²	$2.116\,22 \times 10^3$ lbf/ft ²
T_0	288.15 K (15°C)	288.15 K (15°C)
ρ_0	1.225 kg/m ³	$2.376\,896 \times 10^{-3}$ slug/ft ³