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Non-dimensional graphical method for the analysis of measurements of steady level speed, range and endurance: aircraft with turbo-jet and turbo-fan engines



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NON-DIMENSIONAL GRAPHICAL METHOD FOR THE ANALYSIS OF
MEASUREMENTS OF STEADY LEVEL SPEED, RANGE AND ENDURANCE:
AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES

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NON-DIMENSIONAL GRAPHICAL METHOD FOR THE ANALYSIS OF MEASUREMENTS OF STEADY LEVEL SPEED, RANGE AND ENDURANCE: AIRCRAFT WITH TURBO-JET AND TURBO-FAN ENGINES

1. NOTATION AND UNITS*

		<i>SI</i>	<i>British</i>
a	speed of sound	m/s, kn	ft/s, kn
C_L	lift coefficient, $\frac{L}{\gamma p_0 \delta M^2 S/2}$		
c	specific fuel consumption, Q/F_N	kg/N/s	lbf/lbf/s
D	airframe drag	N	lbf
F_N	net thrust (see ESDU 69006 for thrust definitions)	N	lbf
g	acceleration due to gravity	m/s ²	ft/s ²
H	geopotential altitude	m	ft
H_p	pressure altitude	m	ft
L	lift	N	lbf
m	aircraft mass	kg	slug
M	Mach number, $V/a = V/(a_0\sqrt{\theta}) = V_e/(a_0\sqrt{\delta})$		
N	engine speed	rev/s	rev/s
p	static pressure	N/m ²	lbf/ft ²
Q	engine fuel consumption	kg/s	lbf/s
S	wing area	m ²	ft ²
T	ambient temperature	K	K
V	true airspeed	m/s, kn	ft/s, kn
V_e	equivalent airspeed, $V\sqrt{\sigma}$	m/s, kn	ft/s, kn
W	aircraft weight, mg	N	lbf

* As in previous Items, British units make use of a weight breakdown for the aircraft, but it should be noted that SI units make use of a mass breakdown. The theory presented in Sections 3 and 4 is written in British units, but applies equally in SI units provided that the substitution $W = mg$ is made. The SI units used have not necessarily received universal acceptance for the particular applications, *i.e.* other multiples and sub-multiples may be used. Note that although the knot is given as an alternative unit of speed some of the equations only apply if time units are not mixed.