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Estimation of ground run during landing

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The members of staff of the Technical Department of the Royal Aeronautical Society associated with the Performance Committee were Dr A.J. Barrett and Mr J.A. Shaw.

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ESTIMATION OF GROUND RUN DURING LANDING

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ESTIMATION OF GROUND RUN DURING LANDING

1. NOTATION AND UNITS

		Units
a	distance of centre of gravity forward of the main-wheels	ft
b	height of centre of gravity above runway	ft
C_D	total drag coefficient	—
C_L	lift coefficient	—
D	total drag	lbf
F	thrust	lbf
${}^{\dagger}G$	friction force between the wheels and the runway	lbf
G_{max}	maximum value of the friction force between the wheels and the runway	lbf
g	acceleration due to gravity, taken as 32.2 ft/sec ²	ft/sec ²
k_1	$\rho S C_L / 2$	—
k_2	$\rho S C_D / 2$	—
l	distance between nose- and main-wheels	ft
N	normal reaction at the wheel	lbf
S	wing area	ft ²
s	distance relative to the ground	ft
V	true airspeed	kn
V_m	speed at which G_{max} is reached at the main-wheels	kn
V_n	speed at which G_{max} is reached at the nose-wheel	kn
V_T	touch-down speed	kn
V_w	head wind component	kn

[†] Correlations of existing aircraft tyre-runway coefficient of friction (μ) data together with a method for estimating G are given in ESDU 05011 (Reference 1).

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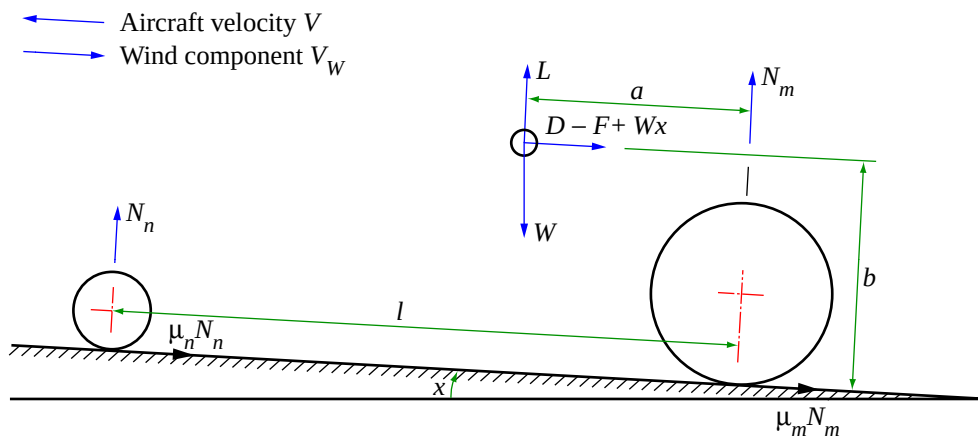
V_1	upper limit of speed for the integration of a section of the run	kn
V_2	lower limit of speed for the integration of a section of the run	kn
W	weight	lbf
x	runway gradient (positive upwards)	rad
ρ	air density	slug/ft ³
Δs	distance covered in speed interval from V_2 to V_1	ft
Δt	time to cover Δs	sec
$^\dagger \mu$	tyre-runway coefficient of friction	—

The constants A , B , E , H , J , M , defined in the equations in this Item, have different values defined by the suffix q in A_q , B_q , E_q , H_q , J_q , M_q , where q takes the values 1 to 5 to denote the particular one of the five cases under consideration.

Constants k_3 , k_4 and k_5 are defined in Section 2.

Suffixes m and n denote quantities considered at the main- or nose-wheel respectively.

[†] Correlations of existing aircraft tyre-runway coefficient of friction (μ) data together with a method for estimating G are given in ESDU 05011 (Reference 1).



Sketch 1.1

2. NOTES

The method presented in this Data Item is suitable only in the early stages of a design project. It is assumed that tyre-runway friction interaction is dealt with in an approximate way using gross assumptions: other Items in the Performance Series provide more comprehensive methods (see, for example, ESDU 05011, Reference 1).