

**First approximation to
landing field length for
civil transport aeroplanes
(50 ft, 15.24 m screen)**

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FIRST APPROXIMATION TO LANDING FIELD LENGTH FOR CIVIL TRANSPORT AEROPLANES (50 ft, 15.24 m SCREEN)

CONTENTS

	Page
1. NOTATION AND UNITS	1
2. INTRODUCTION	2
3. LANDING FIELD LENGTH	2
4. ESTIMATION OF LANDING FIELD LENGTH	3
4.1 Air and Ground Speeds at the Screen	3
5. NOTES ON THE CORRELATIONS	4
5.1 Field-length Data	4
5.2 Choice of Parameters and Method of Analysis	5
5.2.1 Analysis to determine aeroplane ground deceleration values	5
6. REFERENCES	7
7. EXAMPLE	7
8. TABLE	9
FIGURES	10-11

FIRST APPROXIMATION TO LANDING FIELD LENGTH FOR CIVIL TRANSPORT AEROPLANES (50 ft, 15.24 m SCREEN)

1. NOTATION AND UNITS*

		SI	British
a	mean deceleration from screen until aeroplane stops	m/s ²	ft/s ²
a_{braked}	mean deceleration achieved from point where brakes are fully applied until aeroplane stops	m/s ²	ft/s ²
C_L	lift coefficient, $L/(\rho V^2 S/2)$		
g	acceleration due to gravity (9.806 65 m/s ² , 32.174 0 ft/s ²)	m/s ²	ft/s ²
h_{screen}	screen height (50 ft, 15.24 m in this Item)	m	ft
L	lift	N	lbf
m	aeroplane mass	kg	slug
S	wing area	m ²	ft ²
s	unfactored landing distance from 50 ft (15.24 m)	m	ft
V	true airspeed	m/s	ft/s
$V_{g_{screen}}$	true groundspeed at 50 ft (15.24 m) screen*	m/s	ft/s
W	aeroplane weight, mg	N	lbf
ρ	density of air	kg/m ³	slug/ft ³
σ	relative density, ρ/ρ_0		

Subscripts

<i>screen</i>	denotes value at 50 ft (15.24 m) screen
<i>stall</i>	denotes value at stall
0	denotes value at sea level in International Standard Atmosphere, ISA

Conversion Factors

1 n.mile	= 1 852 m
1 ft	= 0.304 8 m
1 kn	= 1.688 ft/s
1 kn	= 0.514 4 m/s
1 km/h	= 0.277 8 m/s

* The knot is used as an alternative speed unit in Figures 1 and 2. It is an acceptable unit in both British and SI systems.

2. INTRODUCTION

The Item presents data in Figures 1 and 2 and Table 8.1 from which quick first approximations to the landing field lengths of civil transport aeroplanes can be made. The estimation method assumes the use of typical civil-transport-certification style landing manoeuvres from a 50 ft (15.24 m) screen on to a hard, level, dry runway. The data are applicable over a wide range of ambient conditions and the effect of non-still-air conditions can be taken into account, see Section 4.1. The data in Figures 1 and 2 are based on the use of wheel brakes and aerodynamic drag (including, in Figure 2, propellers in ground fine pitch) to stop the aeroplane. See Table 8.1 regarding other means of decelerating the aeroplane.

The Item is intended for use in initial or project design work but may also be of use in checking the results of more detailed estimation methods. All types of “conventional-landing” aeroplanes are considered but the Item does not apply to aeroplanes where the powerplant provides “direct lift” or “vectored thrust” during landing.

The estimation method is based on an analysis of landing data obtained from aeroplane flight manuals and the use of true groundspeed at the screen, $V_{g_{screen}}$, and mean “brakes-on” deceleration, a_{braked} , as correlating parameters. The user should see Section 5 for details of the correlations and data used.

A more thorough analysis of the landing manoeuvre would consider separately the air- and ground-borne performances so that more detailed account could be taken of piloting technique and aeroplane aerodynamic and powerplant characteristics in both phases and the sequencing of alternative means of deceleration in the ground run.

3. LANDING FIELD LENGTH

The landing distance, s , considered in this Item is that taken to bring an aeroplane to rest from a 50 ft (15.24 m) screen on a hard, level, dry runway. Certification or operational regulations will factor this landing distance to obtain a corresponding **landing field length requirement**. For current information on what factors are to be applied, the user should consult References 1 to 7. At the time of writing, the factors are as given in Table 8.1.

The need to quote both certification and operational regulations in Table 8.1 arises from the different approaches adopted by the various national and international bodies. (A field length factor will be incorporated in data scheduled in the aeroplane’s flight manual – although in some instances it may be unity; the aeroplane operator also may be required to apply a factor to the flight manual data to take account of operational regulations.) The effect of these factors is demonstrated in the example in Section 7.