

# Aerospace Systems 2019 v1.1

Formula sheet

July 2022

## Formulas

$\text{drag} = C_D \frac{1}{2} \rho V^2 A$
$\text{lift} = C_L \frac{1}{2} \rho V^2 A$
$I \text{ (motor current)} = \frac{P \text{ (motor power)}}{U \text{ (battery voltage)}}$
$T \text{ (time in hours)} = \frac{C \text{ (battery capacity in amp hours)}}{I \text{ (current)}}$
$\text{wing loading} = \frac{\text{mass of aircraft (kg)}}{\text{wing area (m}^2\text{)}}$
$\text{power loading} = \frac{\text{power (watts)}}{\text{mass (kg)}}$
$\text{pressure altitude} = \text{airfield elevation} + (\text{ISA pressure} - \text{QNH}) \times 30$
$\text{density altitude} = \text{pressure altitude} + [120 \times (\text{OAT} - \text{ISA Temp})]$
$\text{ISA temperature lapse rate} = -1.98 \text{ }^\circ\text{C per 1000 ft}$
$\text{ISA pressure lapse rate} = 1 \text{ hPa per 30 ft}$

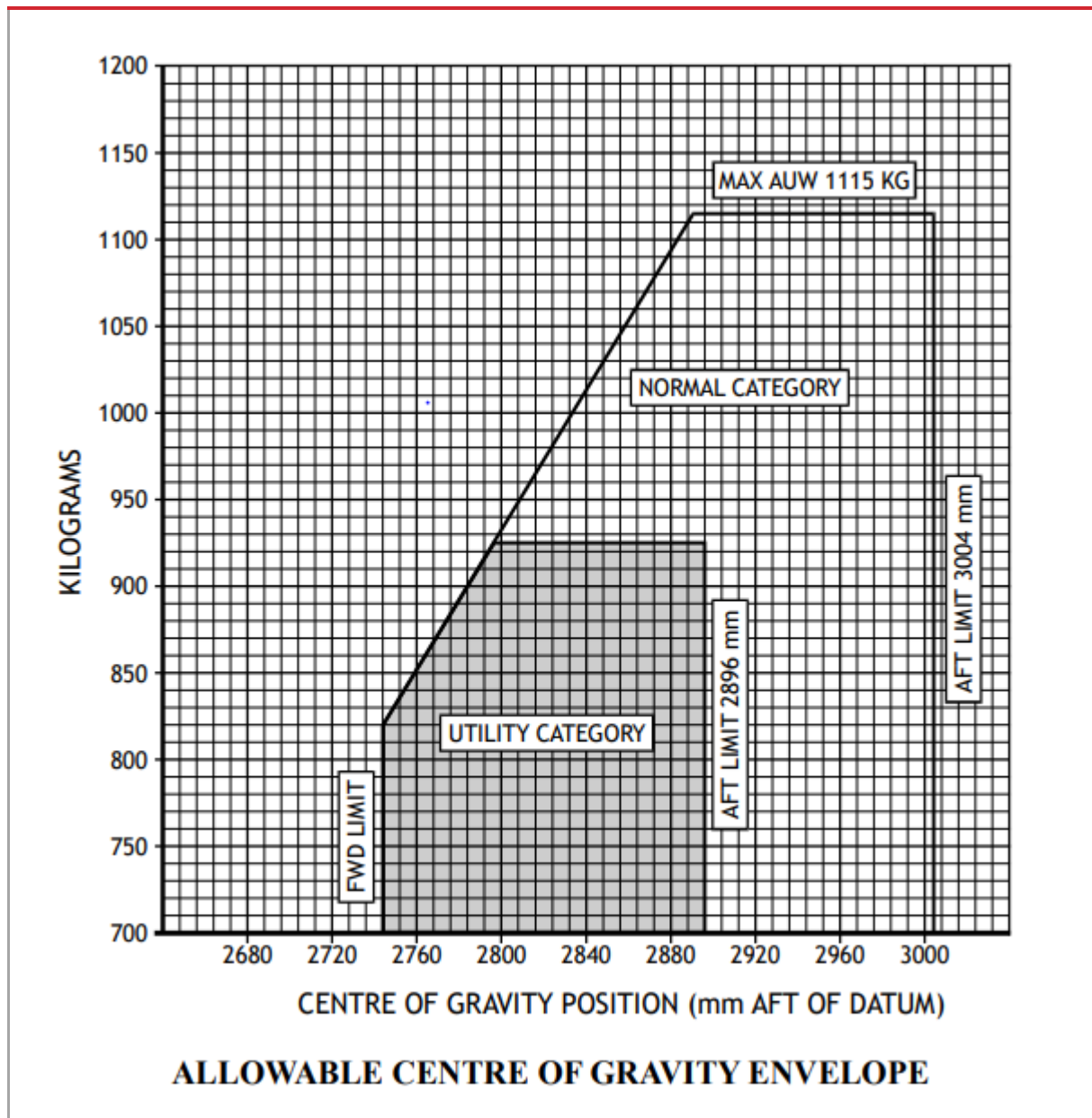
## Conversions

1 metre (m) = 3.28 feet (ft)	1 nautical mile (NM) = 1852 metres (m)
1 knot = 1 NM per hour	

## Constants

ISA pressure = 1013 hPa @ sea level	ISA temperature = 15 °C @ sea level
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# Loading chart



Source: Civil Aviation Safety Authority

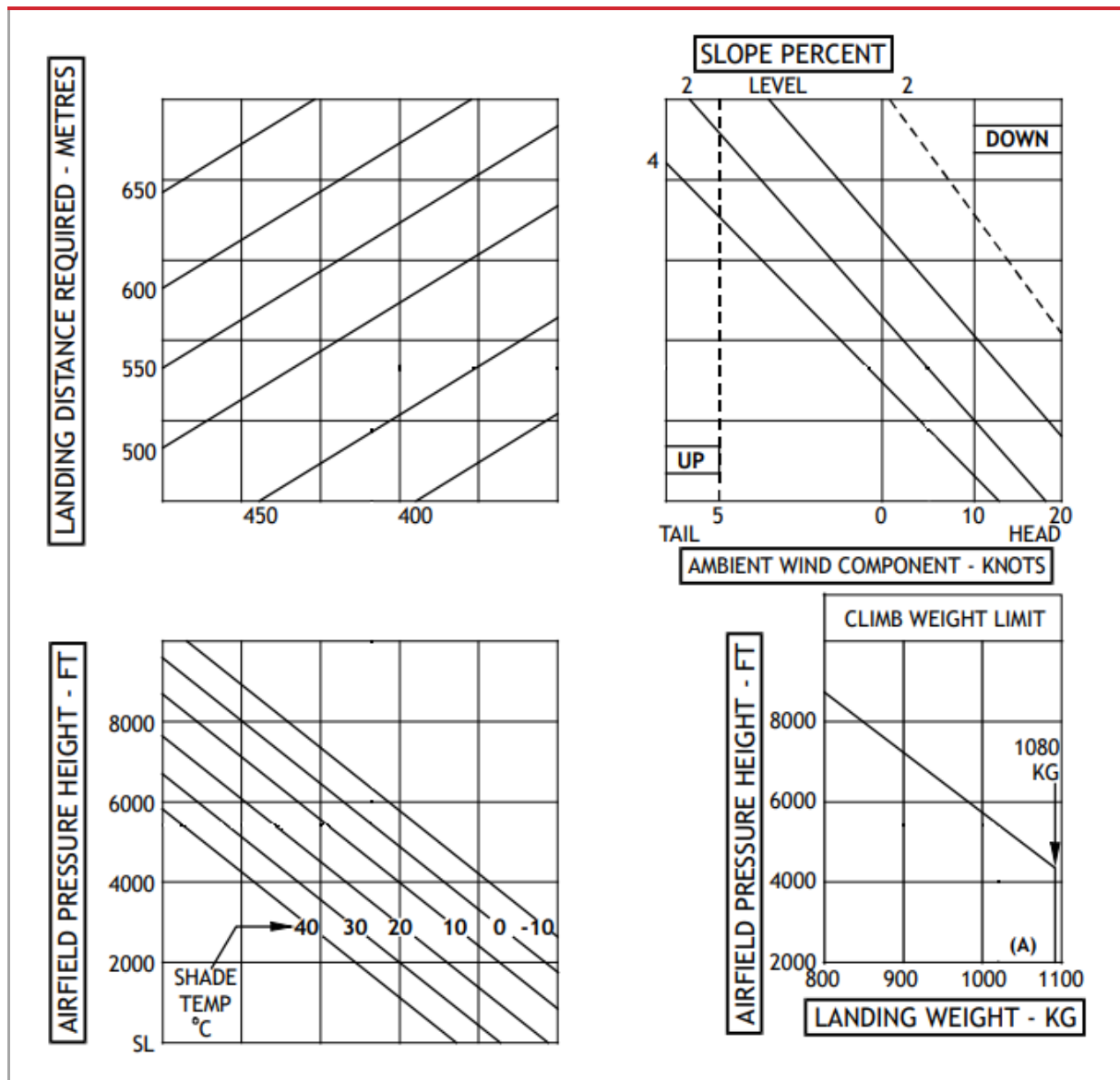
# Loading system index units (four seat aircraft)

Source: Civil Aviation Safety Authority

Fuel — Arm: 2950 mm			Baggage — Arm: 4210 mm	
Litres	Kilograms	Index units	Kilograms	Index units
20	14	413	10	421
40	28	826	20	842
60	43	1268	30	1263
80	57	1682	40	1684
100	71	2095	50	2105
120	85	2507	60	2526
140	99	2920	70	2947
160	114	3363	80	3368
180	129	3806	90	3789
200	142	4189	100	4210
216	153	4513	110	4631
			122	5136

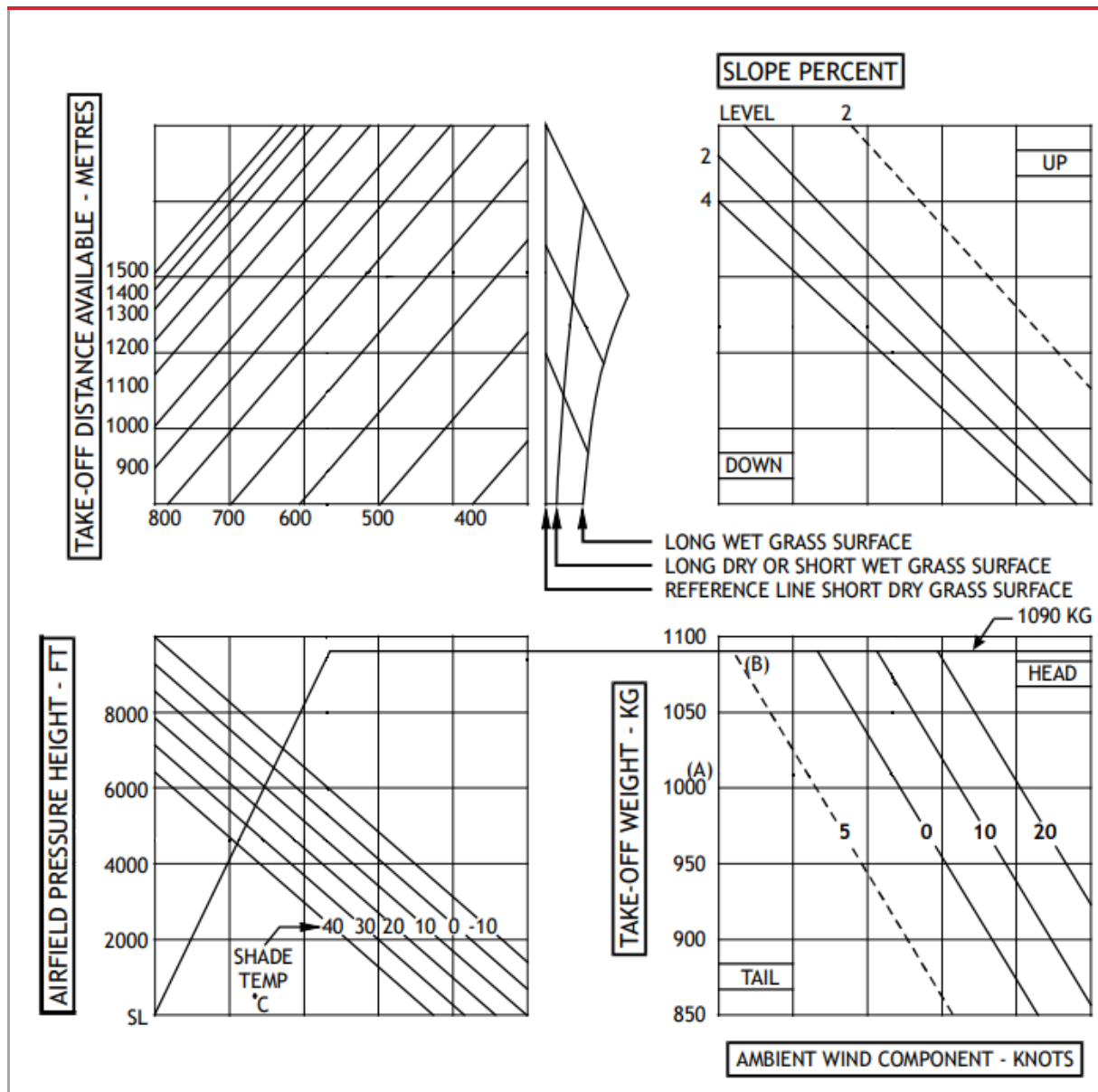
Occupants			Oil — Arm: 1230 mm		
Kilograms	Row 1 Arm: 2750 mm Index units	Row 2 Arm: 3600 mm Index units	Litres	Kilograms	Index units
40	1100	1440	5.7	5.0	62
45	1237	1620	6.6	6.0	74
50	1375	1800	7.6	7.0	86
55	1512	1980			
60	1650	2160			
65	1786	2340			
70	1925	2520			
75	2062	2700			
80	2200	2880			
85	2338	3060			
90	2475	3240			
Aircraft empty weight	687 kg		19 522 index units		
Maximum take-off weight	1115 kg				
Maximum baggage	122 kg				

# Landing chart



Source: Civil Aviation Safety Authority

# Take-off weight chart



Source: Civil Aviation Safety Authority

## Reference

Civil Aviation Safety Authority 2021, RPL, PPL & CPL (Aeroplane) Workbook Version 3.0a — 02 December 2021, Creative Commons Attribution 4.0 International, [www.casa.gov.au/sites/default/files/2021-08/rpl-ppl-cpl-aeroplane-workbook.pdf](http://www.casa.gov.au/sites/default/files/2021-08/rpl-ppl-cpl-aeroplane-workbook.pdf)

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