



PERFORMANCE: FACTORS AND EQUATIONS

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PERFORMANCE: FACTORS AND EQUATIONS

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PERFORMANCE: FACTORS AND EQUATIONS

INTRO

In this guide, we supply the main factors and equations used in the ATPL performance exam.

EQUATIONS

You may have seen alternative equations to the ones provided in this guide. There are often multiple methods to reach a solution, here you will find the equations that we believe are the most useful with regards to the ATPL exam questions.

FACTORS

This exam will require you to derive figures from performance graphs.

You will sometimes be required to apply performance and/or regulation factors to your results.

Here we will show you of some of the most important factors.



PERFORMANCE: FACTORS AND EQUATIONS

KEY

ROC = Rate of climb

ROD = Rate of descent

TAS = True airspeed

GS = Groundspeed

NM = Nautical miles

FPM = Feet per minute

KTS = Knots (nautical miles per hour)

M = Metres

Ft = Feet

ASDA = Accelerate stop distance available

TODA = Takeoff distance available

TORA = Takeoff run available

Conversions

1 metre = 3.28 feet

1 Nautical mile = 6080 feet



PERFORMANCE: FACTORS AND EQUATIONS

EQUATIONS

CALCULATING CLIMB OR DESCENT GRADIENTS

$$\text{Still air gradient (\%)} = \frac{\text{ROC or ROD (fpm)}}{\text{TAS (kts)}}$$

OR

$$\text{Still air gradient (\%)} = \frac{\text{Thrust - Drag}}{\text{Weight}} \times 100$$

$$\text{Wind adjusted gradient (\%)} = \frac{\text{ROC or ROD (fpm)}}{\text{GS (kts)}}$$

DISTANCE TRAVELLED IN CLIMB OR DESCENT

$$\text{Still air distance (nm)} = \frac{\text{Height difference (ft)}}{\text{Gradient (\%)}} \times 100$$

$$\text{Ground distance (nm)} = \text{Still air distance (nm)} \times \frac{\text{GS (kts)}}{\text{TAS (kts)}}$$



PERFORMANCE: FACTORS AND EQUATIONS

EQUATIONS

OBSTACLE ACCOUNTABILITY AREA

AIRCRAFT WINGSPAN LESS THAN 60 METRES

$$\text{Semi width (m)} = (60 + 1/2 \text{ wingspan}) + 0.125D$$

D = Distance from reference zero

AIRCRAFT WINGSPAN 60 METRES OR MORE

$$\text{Semi width (m)} = 90 + 0.125D$$

NOTES



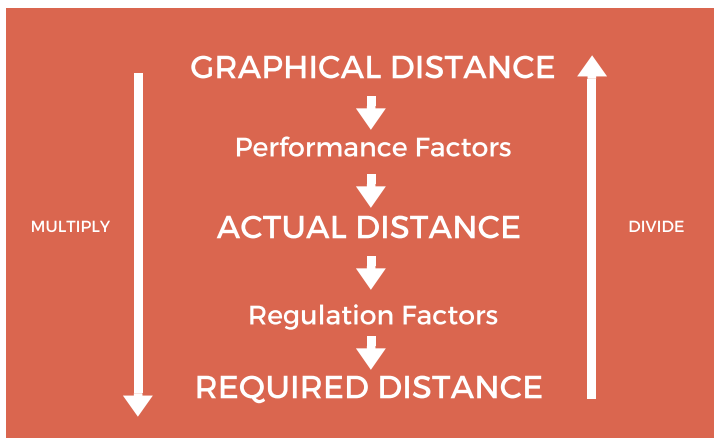
PERFORMANCE: FACTORS AND EQUATIONS

FACTORS

The graphical distance extracted from your CAP 698 will give you a landing/take-off distance based on the conditions specified on the graph.

Performance factors should be applied to find the ACTUAL landing/take-off distance and regulation factors should be applied to find the REQUIRED landing/take-off distance.

Follow the steps in the diagram below to help you find your way to the answer the exam is looking for.



PERFORMANCE: FACTORS AND EQUATIONS

TAKE OFF (CLASS B)

PERFORMANCE FACTORS

Factors applied based on the assessment of the runway condition.

- Paved wet: 1.0
- Grass wet: 1.3
- Grass dry: 1.2
- Slope: 1.05 per 1%

(5% increase per 1% slope. Only apply if take-off distance will be increased)

REGULATION FACTORS

Factors applied as required by the regulator to ensure a safety margin on take-off distances

UNBALANCED FIELD

- 1.3 not exceeding ASDA
- 1.15 not exceeding TODA
- 1.0 not exceeding TORA

BALANCED FIELD

- 1.25 not exceeding TORA

NB: Balanced field is when TODA=ASDA



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TAKEOFF (CLASS A)

REGULATION FACTOR

The regulation factors for class A are slightly more complicated. It depends upon whether we are looking at take-off distance with or without a clear way and we must also compare the take-off run with all engines operating to that with one engine inoperative.

We don't expect that you will be asked to compare each possibility to find the required take-off or accelerate-stop distance.

However to see what we are referencing please head to the CAA CAP 698 section 4 pages 7 – 8.



PERFORMANCE: FACTORS AND EQUATIONS

LANDING

PERFORMANCE FACTOR

Factors applied based on the assessment of the runway condition.

- Wet: 1.15
- Grass: 1.15
- Slope: 1.05 per 1% (only apply if landing distance will be increased.)

REGULATION FACTOR

Factors applied as required by the regulator to ensure a safety margin on landing distances

- All props: 1.43
- All Jets: 1.67





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