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DOCUMENT TITLE

AUS OPERATIONS, FLIGHT PLANNING AND PERFORMANCE

CHAPTER 7
ECHO C of G CALCULATIONS

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ECHO C OF G CALCULATIONS

WEIGHT AND BALANCE LIMITS

To ensure safe flight the aircraft must be within weight and balance limits. Pilots must ensure that throughout the flight:

- The maximum weight is not exceeded
- The C of G is within the limits.

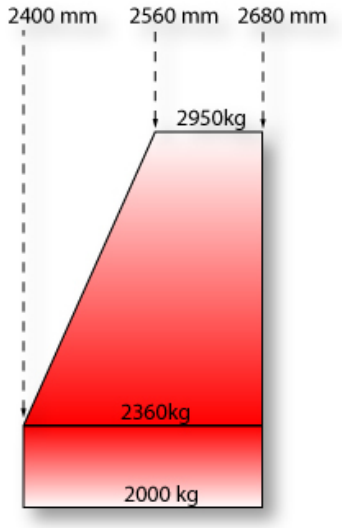
The relevant data can be found in aircraft Flight Manuals. Notice that weight and balance data may be given in either kg and mm or in lbs (pounds) and inches.

In this course, the ECHO Mk IV is used as an example. Other aircraft loading systems follow the same principle.

WEIGHING AIRCRAFT

The basic empty Centre of Gravity and the Basic Empty Weight (BEW) of an aircraft are found by accurately weighing it with approved scales and taking measurements from the datum to the points of weighing. The aircraft must be horizontal and level. The data must be included in Flight Manuals and can only be done by a person who has the authority to do so.

C OF G LIMITS



Look at the Echo Mk lV diagram on Page 15.

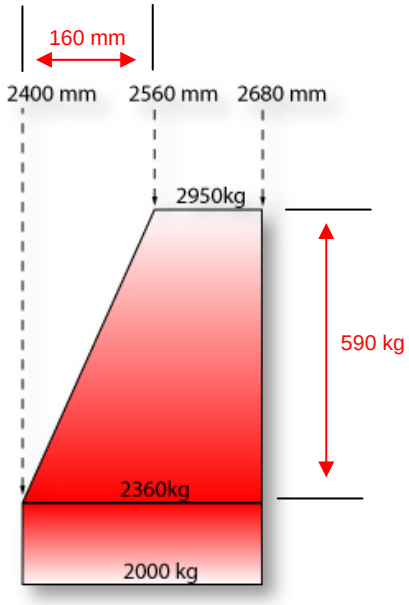
Notice that the AFT limit of the C of G is 2680mm aft of the datum for every gross weight. Its position does not change.

Notice also that the FWD limit of the C of G is 2400mm aft of the datum at a gross weight of 2360kg but is located 2560mm aft of datum if the gross weight is 2950kg. This means that the C of G FWD limit changes as the gross weight changes.

The position of the FWD limit at any given gross weight is found by Calculation.

The formula and the reasoning behind it are as follows

C of G Forward limit Calcutation



Problem :

The C of G FWD limit moves rearwards as the gross weight increases from 2,360 kg to 2,950 kg.

Reasoning :

The FWD limit at 2950 kg is 2,560 mm aft of datum.

The FWD limit at 2360 kg is 2,400 mm aft of datum.

Fomula;

The C of G FWD limit moves rearward 160mm as the gross weight increases by 590kg from 2,360 kg to 2,950 kg.

The FWD limit moves rearward 160 mm per 590 kg increase.

160mm / 590 kg = 0.27118 = 0.271 mm per kg increase above 3,360 kg.

From this we can derive the following formula:

The FWD limit = 2,400 + (Gross weight - 2,360) x .271 mm

Example 1

Problem :

What is the FWD limit of the C of G at a gross weight of 2,800 kg?

Calculation :

Use the formula derived from the last example and substitute the new gross aircraft weight.

Fwd Limit = 2,400 + (2,800 - 2,360) x .271 mm

= 2,400 + 440 x .271

= 2,400 + 119.24

= 2,519.24

Answer :

The FWD limit of the C of G is **2,519.24mm aft of datum**.

Example 2

Problem :

What is the FWD limit of the C of G at 2,720 kg gross weight?

Calculation :

FWD Limit = 2,400 + (2,720 - 2,360) x .271

= 2,400 + 360 x .271

= 2,400 + 97.56

= 2,497.56 mm

Answer :

2,497.56 mm aft of datum.