DOCUMENT
GSM-AUS-CPL.032

DOCUMENT TITLE
**AUS OPERATIONS, FLIGHT PLANNING AND
PERFORMANCE**

**CHAPTER 10
ECHO-MEAN AERODYNAMIC CHORD**

Version 1.0
January 2013

CONTENTS ....PAGE

ECHO - C OF G POSITION AS % MEAN AERODYNAMIC CHORD (MAC)

INTRODUCTION

In some aircraft Flight Manuals the position of the C of G may be expressed as a percentage of the MAC length measured from the leading edge (LE). Before a Load and Trim Sheet can be prepared, it is necessary to find the given C of G position as a distance aft of the datum.

Refer to the ECHO Mk IV picture below :
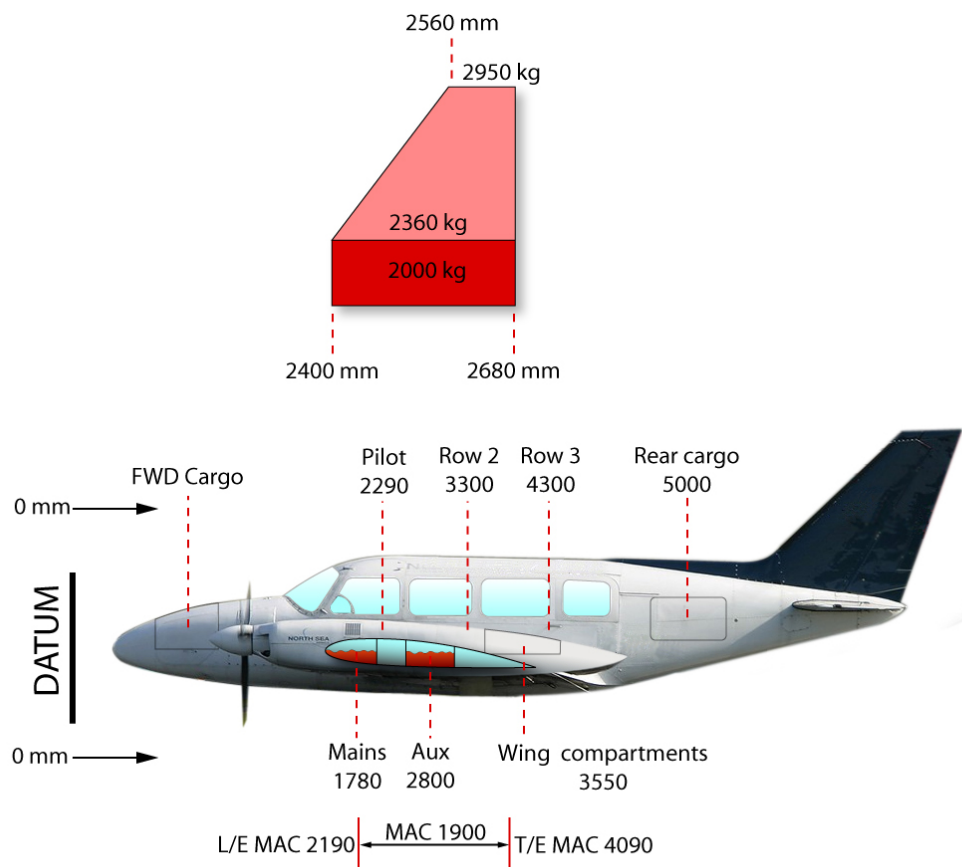
Note that the distance from the datum to the LE of the MAC is 2190mm (the LE is at station 2I90). The MAC is 1900mm long.

Calculations

Example 1

Problem

If the C of G is 2600mm aft of the datum, what % MAC would that represent?

- The C of G is aft of the LEMAC.

  To find this dimension subtract the distance between the datum and the LEMAC from the distance between the datum and the C of G.

<p align="center">2600 mm - 2190mm = 410mm.</p>

  The C of G is 410mm aft of the LE.

- Convert the 410mm into a percentage of the MAC length of 1900mm.

<p align="center">(410 x 100) / 1900 = 21.578</p>

  = 21.58%

Answer - The C of G is **21.58% of the MAC**

Example 2

Problem

On an ECHO Mk IV the C of G is 2670 mm aft of the datum. Express the C of G position as a % of the MAC.

Calculation

- Find the distance LEMAC to C of G:

<p align="center">2670mm - 2190mm = 480mm aft of LE</p>

- Convert the 480mm into a percentage of 1900mm:

<p align="center">(480 x 100) / 1900 = 25.263 = 25.26% MAC</p>

Answer : The C of G is **25.26% of the MAC.**

Example 3

Problem

If the ECHO Mk IV C of G position is 24.5% MAC, what is its position in mm aft of the datum?

Calculation

- Calculate the distance the C of G is behind the LE of the MAC. Convert the percentage into a distance in mm behind LE.

(24.5 x 1900) / 100 = 465.5 mm aft of LE

The C of G is 465.5mm ft of the LE

- Add the distance between datum and LE:

465.5 mm + 2190mm = 2,655.5mm aft of datum.

Answer :   The C of G is **2,655.5 mm aft of the datum**.

Example 4

Problem

Given the following information, calculate the C of G in % MAC for an Echo Mk IV aircraft :

Gross Weight :   2,700 kg

Total Moment :   680 IU

Calculation

- Convert the moment index into a moment:

680 IU x 10,000 = 6,800,000 kgmm

- Divide moment by weight to find C of G position aft of the datum

6,800,000 / 2,700 = 2,518.52mm ft of datum.

- Subtract the distance between the datum and LE:

2,518.52 - 2190 = 328.52mm aft of LE.

- Convert this into a percentage of the MAC length:

(328.52 x 100) / 1.900 = 17.29% MAC

Answer :   C of G is 17.29% MAC

Example 5

Problem

An ECHO Mk IV has a gross weight of 2800 kg and the C of G is located 19.10% MAC. Find the total moment of the aircraft.

Calculation

- Find the C of G position as a distance aft of LE:

(19.1 x 1900)/100 = 326.9 mm aft of LE

- Now find the distance of the C of G aft of the datum:

362.9 mm + 2190 mm = 2552.9mm aft of datum.

- Now find the total moment of the aircraft:

WEIGHT x ARM = MOMENT

2800 kg x 2552.9 mm = 7148120 kgmm

Answer : The total moment of the aircraft is **7148120 kgmm**