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**AUS OPERATIONS, FLIGHT PLANNING AND
PERFORMANCE**

**CHAPTER 6
ECHO GRAPHICAL LOADING SYSTEM**

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**AUS OPERATIONS, FLIGHT
PLANNING AND
PERFORMANCE**

CONTENTS ....PAGE

**CHAPTER 6
ECHO GRAPHICAL LOADING
SYSTEM**

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**AUS OPERATIONS, FLIGHT
PLANNING AND
PERFORMANCE**

ECHO - GRAPHICAL LOADING SYSTEMS

INTRODUCTION

Most aircraft manuals have an APPROVED LOADING SYSTEM which allows the pilot to determine the position of the C of G graphically. These systems tell the pilot whether or not the C of G is within its limits. A few use arithmetic calculations and published limits.

FINDING THE MOMENT INDICES

Refer to the graph below. This table identifies the moment index for each load placed into the aircraft at the station nominated.
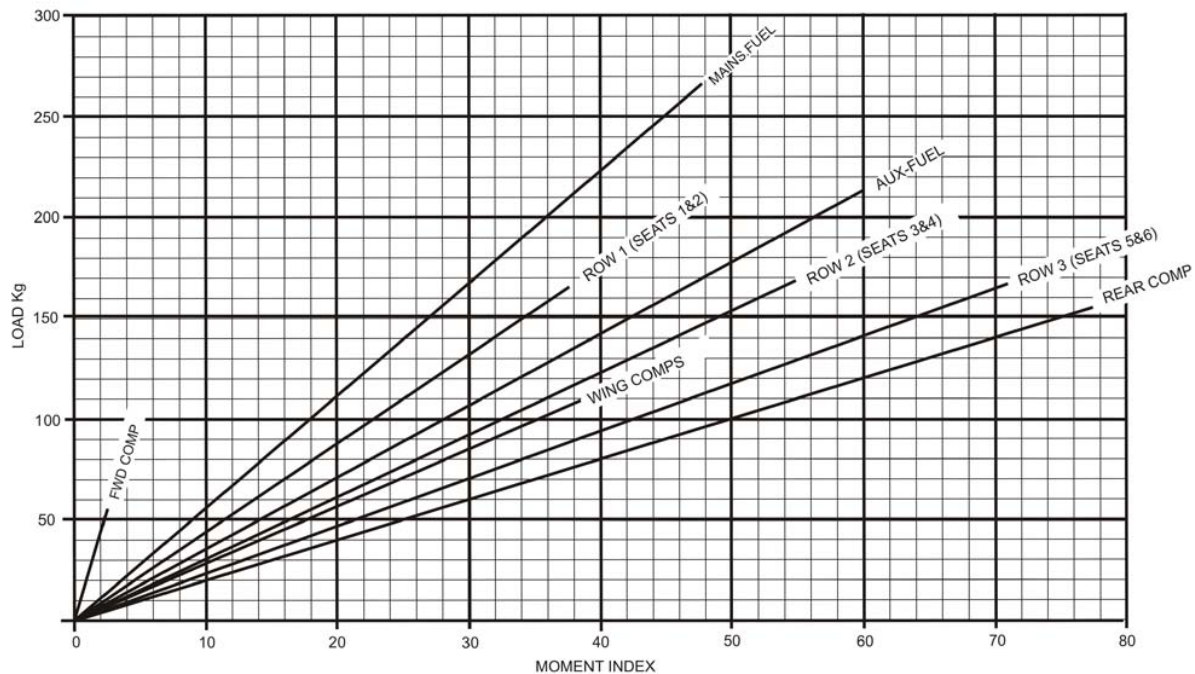

Example

Find the Moment Index for 100 kg of baggage placed into the AFT (rear) compartment.

Method :

- Mark the 100 kg line horizontally.

- Find the point where the 100kg line intersects the line which represents the rear compartment.

- From this intersection draw a vertical line until you leave the graph on the bottom.

- Where the vertical line leaves the graph, read the moment index (**50 IU**).
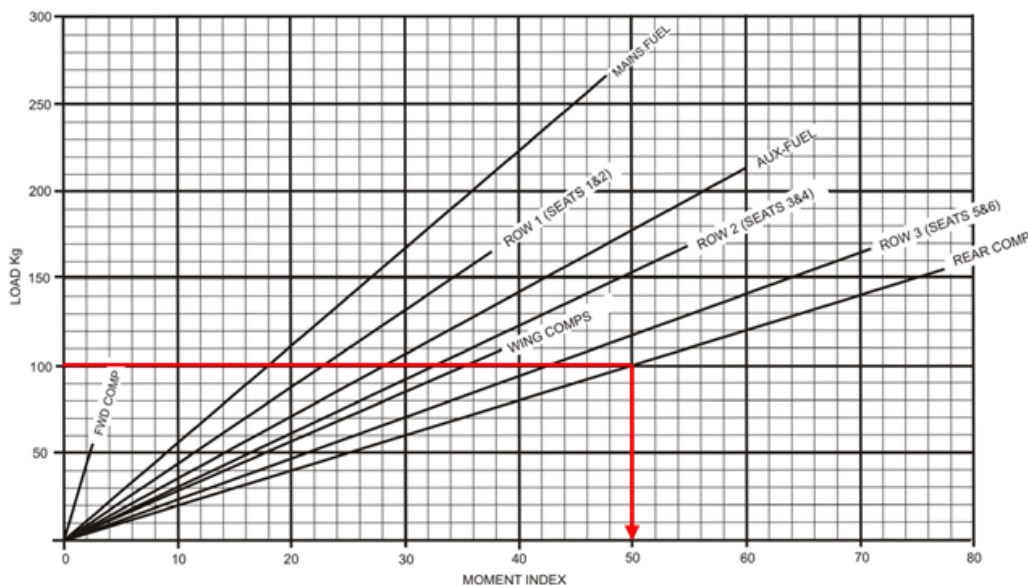
THE C OF G ENVELOPE

Refer to the Echo Mk IV graph below. It identifies the C of G position in relation to limits.
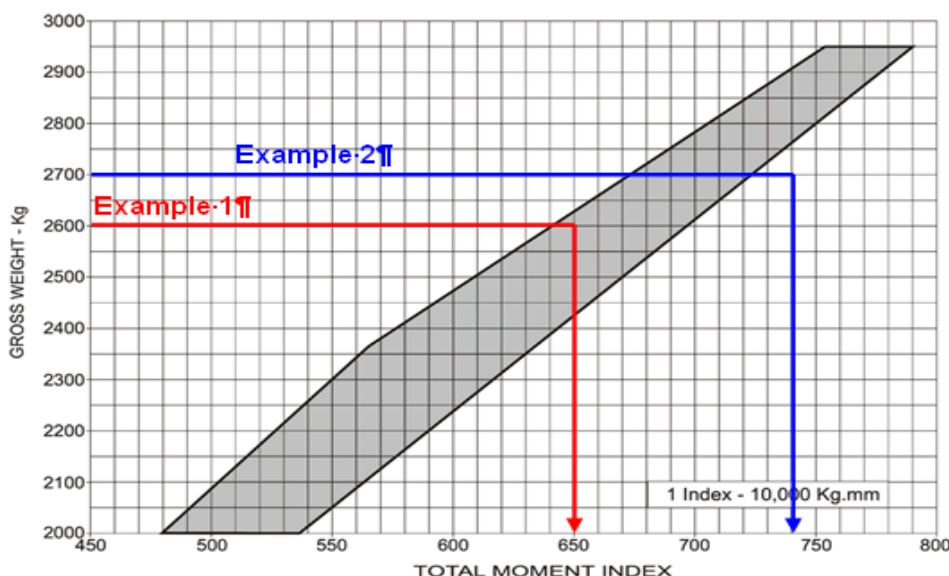
On the graph there is an area which is darker in shade. This area is the C of G envelope. The left boundary line represents the C of G forward limit; the right boundary line represents the C of G aft limit.

Example 1 – Refer to Example 1 in the graph below.

An aircraft has a Gross Weight of 2,600 kg and a Total Moment Index of 650 IU. Determine whether the position of the C of Gravity is within limits.

Draw a horizontal line marking the 2,600 kg.

- Draw a vertical line marking the 650 IU.

- The lines meet inside the C of G envelope. Therefore the C of G is within limits.

**CHAPTER 6
ECHO GRAPHICAL LOADING
SYSTEM**

**AUS OPERATIONS, FLIGHT
PLANNING AND
PERFORMANCE**

Example 2– Refer to Example 2 in the graph above.

An aircraft has a gross weight of 2,700 kg and a total moment index of 740 IU.

- Draw a horizontal line marking the 2,700 kg line.

- Draw a vertical line marking 740 IU.

- The lines cross OUTSIDE the C of G envelope. The aircraft is UNSAFE because the C of G is OUTSIDE the allowable limits.

LOAD AND TRIM CALCULATIONS

The determination of C of G limits for a flight may be done graphically.

An Echo Mk IV aircraft has a Basic Empty Weight of 1,980 kg and a Basic Empty Index of 490 IU.

The aircraft is loaded on the ramp as follows :

ROW 1	Pilot + 1 pax
ROW 2	2 pax
ROW 3	20 kg luggage
FWD Compartment	20 kg cargo
AFT Compartment	90 kg cargo
Main Tanks	Full
Aux Tanks	23 US Gal each
EFBO	60 US Gal

- Use the graph below to extract the moment indices for the different loads placed in the aircraft.
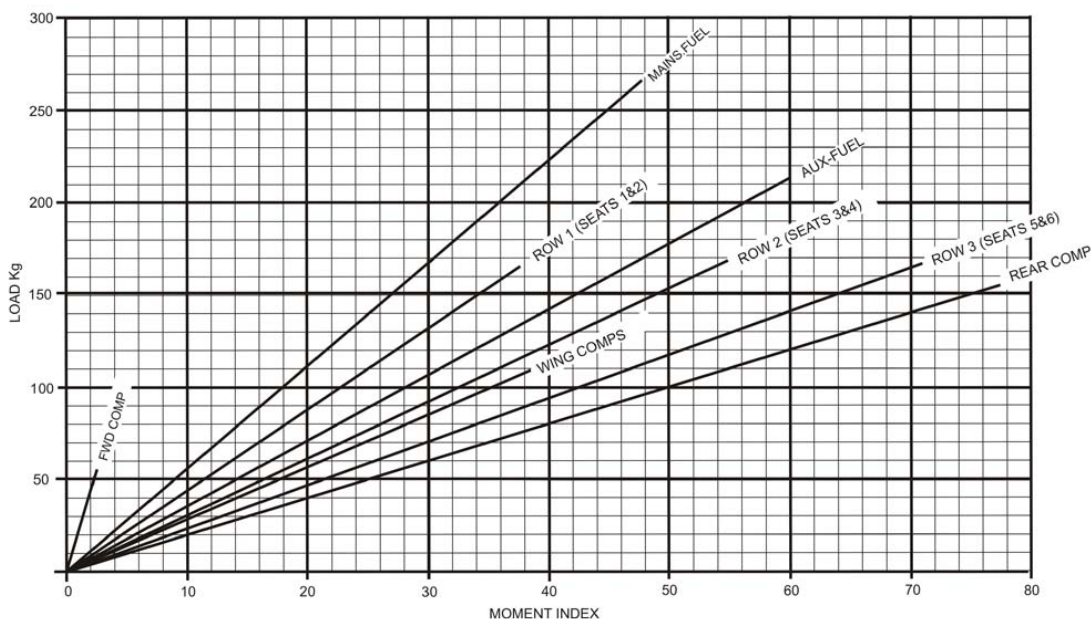
- Prepare a load sheet listing the weights and moment indices as shown below :

ITEM	WEIGHT (kg)	INDEX UNITS
Basic	1,980	490.0
Row 1	154	35.0
Row 2	154	51.0
Row 3	20	8.5
Fwd. Compartment	20	1.0
Aft Compartment	90	45.0
Wing Compartment	20	7.0
ZFW	**2,438**	**637.5**
Main	261.00	46.5
Aux	107.60	30.0
Take-off	**2,806.60**	**714.0**
FBO - Aux	-107.60	-30.0
FBO - Main	-53.8	-9.5
Landing	**2,645.20**	**674.5**

- Use the graph below to determine the C of G position **for all three of** :

  - ZFW.

  - Take-Off Weight.

  - Landing Weight.

- After plotting the C of G positions, connect them with straight lines. During the flight, the C of G moves along these lines from the take off position toward the zero fuel weight position.