



DOCUMENT  
**GSM-G-CPL.022**

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

**CHAPTER 6 – LOADING SYSTEM CHARLIE**

Version 1.0  
January 2013

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## LOADING SYSTEM CHARLIE

### INSTRUCTIONS FOR USE

To check the loading of the aircraft before Take-Off, calculate the total weight and index units as shown in the following examples.

Plot the total weight and moment on the centre of gravity envelope chart and if the C of G location is within the envelope the loading is acceptable, if not some rearranging may be necessary.

### AIRCRAFT LIMITATIONS

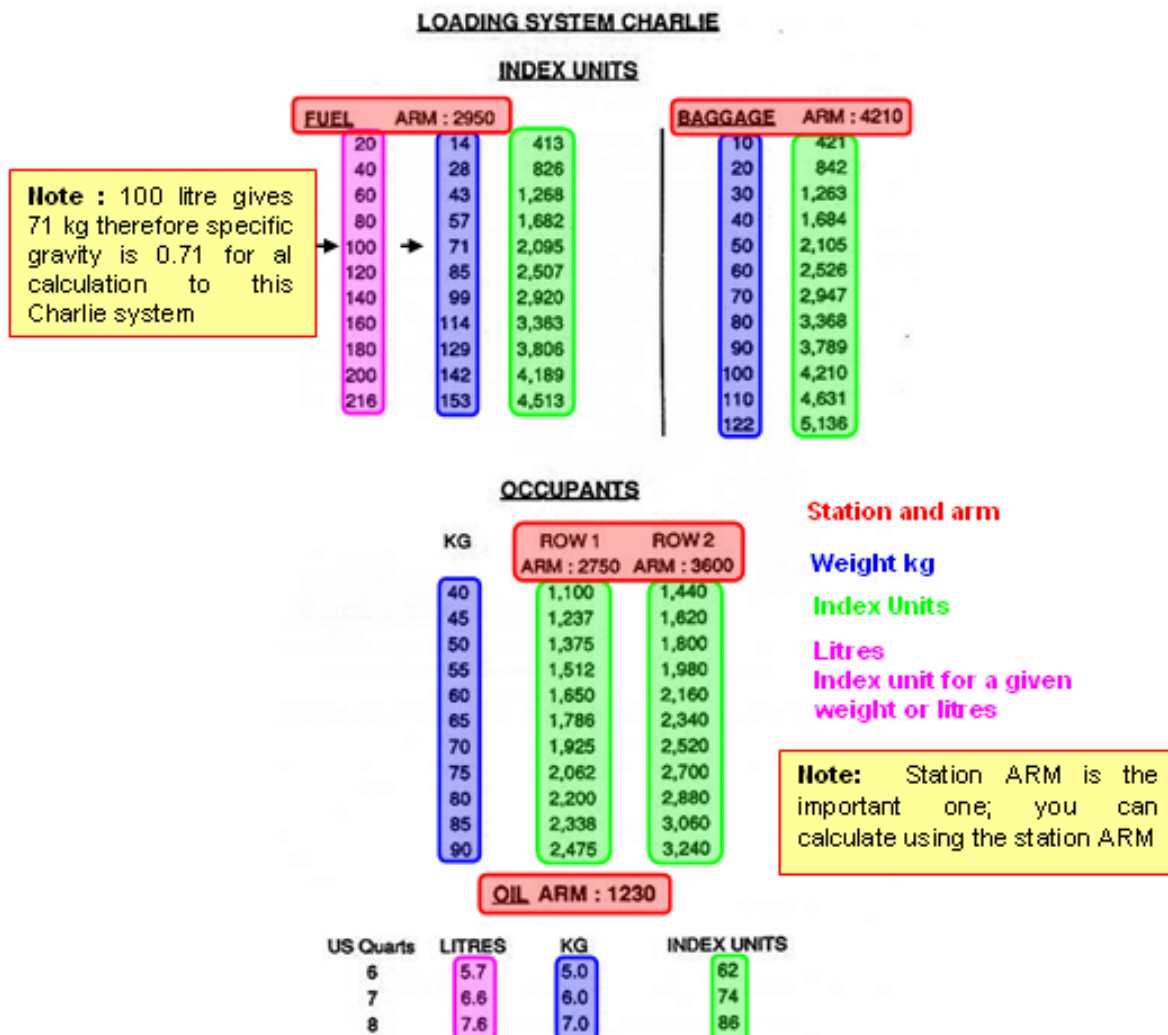
Maximum Take-off weight :

Normal category	1115 kg
Utility category	925 kg
Maximum baggage compartment	122 kg

#### Notes:

1. Aircraft empty weight includes unusable fuel and undrainable oil
2. All arms are in millimetres aft of datum
3. 1 index unit = 100 kg mm

The index unit page shows :



Example	Weight (lbs)	Arm (in)	Moment/1000in lb
Empty weight	687		19522
Oil	7		86
Row 1 (Pilot & co pilot)	140		3850
Row 2 (Pax)	160		5760
Baggage	20		820
Zero Fuel Weight	1014		30060
Fuel (141 litres)	99		2920
Take-off weight	1113		32980

Complete a load sheet with information given

Weight x Arm = Moment

Moment ÷ 100 = Index unit

Item	Weight (lbs)	Arm (in)	Moment/1000in lb
A/C	687		19522
Oil	7	1230	86
Row 1 (Pilot & co pilot)	140	2750	3850
Row 2 (Pax)	160	3600	5760
Baggage	20	4210	820
Zero Fuel Weight	1014		30060
Fuel (141 litres)	99	2950	2920
Take-off weight	1113		32980

Refer to Charlie loading system index page for Station ARM

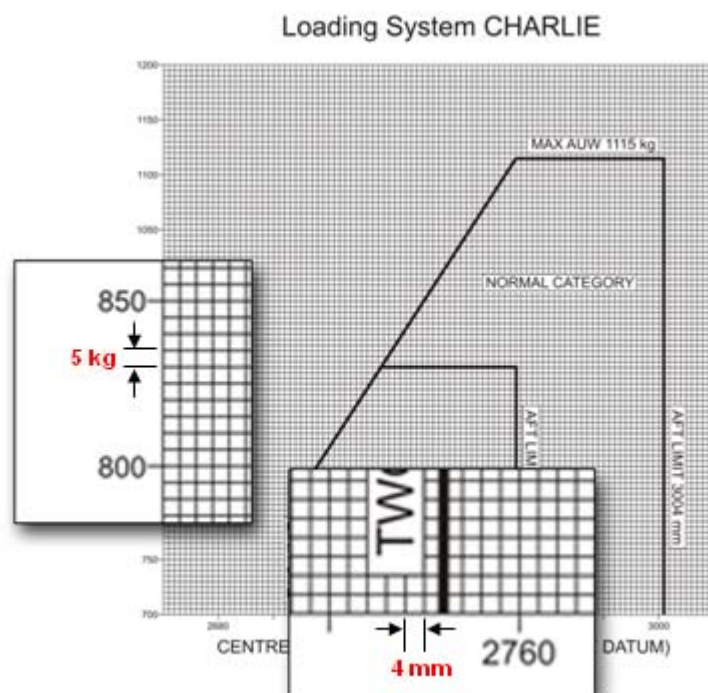
### LOADING SYSTEM CHARLIE

#### INDEX UNITS



### Charlie load system centre of gravity envelope

Charlie load system use 5 kg divisions on the vertical kilogram scale and 4 mm divisions on the horizontal millimetre aft of datum scale.



Review your load sheet, we need to plot weight and mm aft of datum (ARM) onto the C of G envelope. We have the Zero Fuel Weight and Take off Weight, but no arm for these weights, we need to calculate the arm.

Remember the formula to find the index unit.

$$\text{Weight} \times \text{Arm} = \text{Moment}$$

$$\text{Moment} \div \text{specified number (100 in this case)} = \text{Index Unit}$$

Therefore to find ARM must be :

$$\text{Index Unit} \times \text{specified number (100)} = \text{Moment.}$$

$$\text{Moment} \div \text{Weight} = \text{Arm}$$

Now with figures from Zero Fuel Weight :

$$30060 \times 100 = 3006000$$

$$3006000 \div 1014 \text{ kg} = \mathbf{2964 \text{ mm}}$$

Take off Weight :

$$32980 \times 100 = 3298000$$

$$3298000 \div 1113 \text{ kg} = \mathbf{2963 \text{ mm}}$$

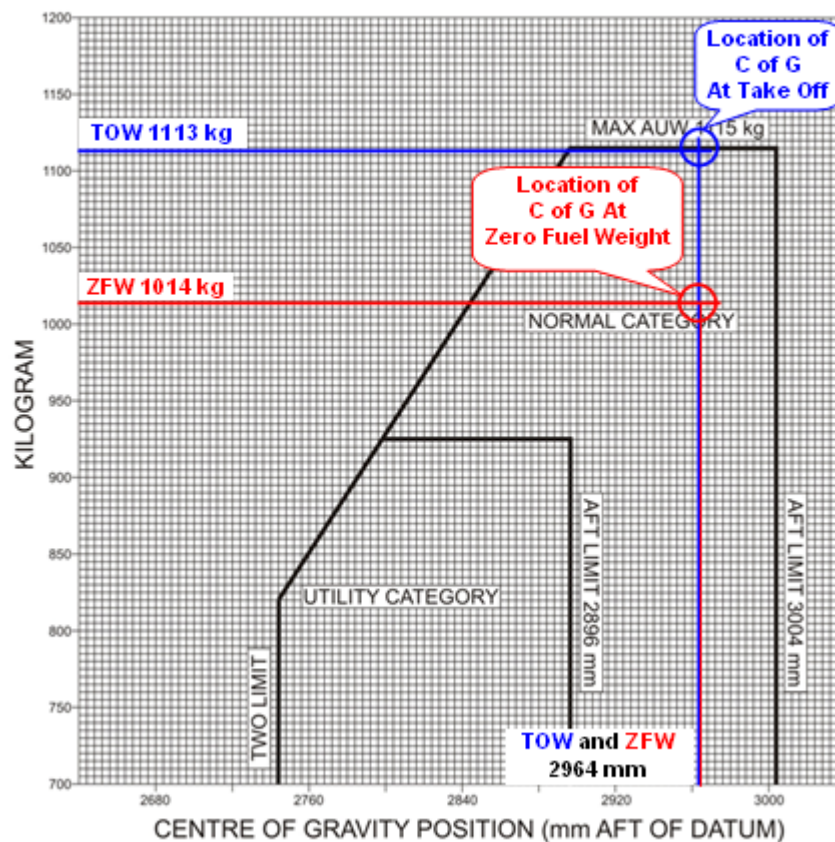
Insert these into your load sheet :

Item	Weight (lbs)	Arm (in)	Moment/1000in lb
A/C	687		19522
Oil	7	1230	86
Row 1 (Pilot & co pilot)	140	2750	3850
Row 2 (Pax)	160	3600	5760
Baggage	20	4210	820
Zero Fuel Weight	1014	<b>2964</b>	30060
Fuel (141 litres)	99	2950	2920
Take-off weight	1113	<b>2963</b>	32980

Plot Weight and Millimetres aft of datum onto the centre of gravity envelope

Zero Fuel Weight	1014	2964	30060
Fuel (141 litres)	99	2950	2920
Take-off weight	1113	2963	32980

## Loading System CHARLIE



Flight is Safe at all stages.

### Example 1

Given the following information :

Empty weight	680 kg
Index unit	19448
Full Oil	6 kg
Row 1 (Pilot & co pilot)	180 kg
Fuel	200 litres

Calculate the maximum weight that may be carried on the rear seat (row2) :

**Answers:**

- 122 kg
- 107 kg
- 90 kg
- 75 kg



### Step 1

Complete a load sheet :

Item	Weight (lbs)	Arm (in)	Moment/1000in lb
A/C	680		19448
Oil	6	1230	73.8
Row 1 (Pilot & co pilot)	180	2750	4950
Row 2 (Pax)		3600	
Baggage		4210	
Zero Fuel Weight	866	2826	24471.8
Fuel (141 litres)	142	2950	4189
Take-off weight	1008	2843	28660.8

### Step 2

Check Take off weight to see how much weight is available :

Max Take off weight : 1115 kg

Minus Take off weight : 1008 kg

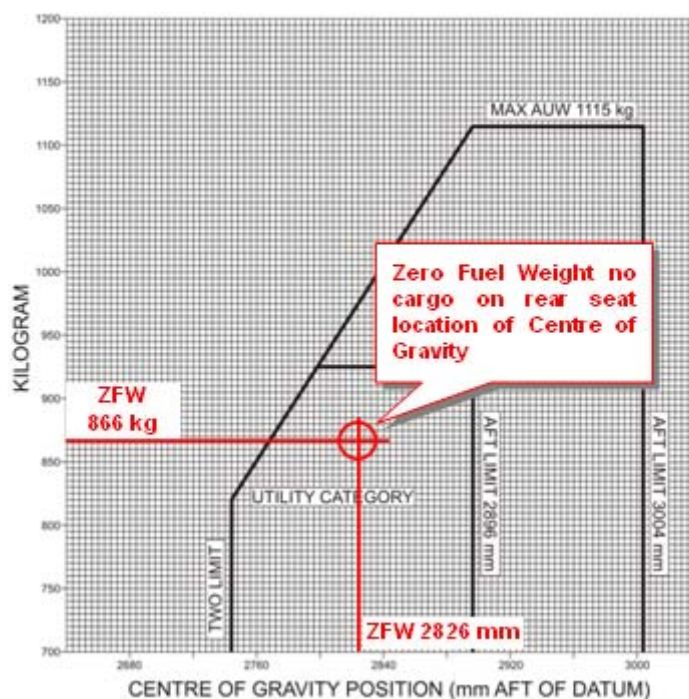
Weight available : 107 kg

Look at the possible answers attached to the question. You can eliminate answer “A” straight away.

### Step 3

Plot Zero fuel weight onto Centre of Gravity envelope :

Loading System CHARLIE





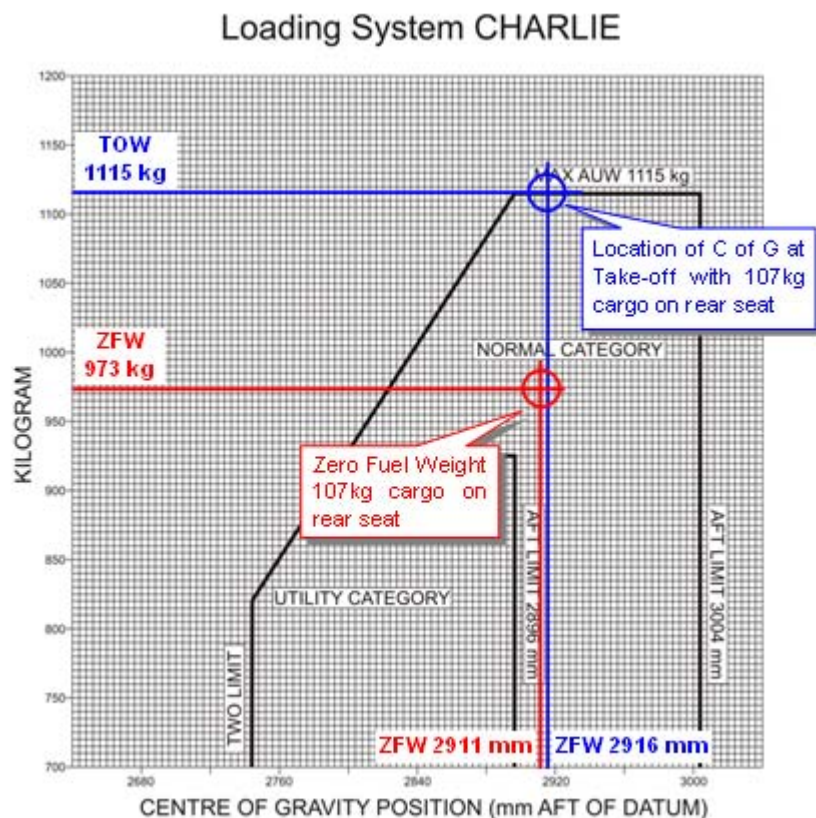
#### Step 4

Complete a load sheet with maximum weight possible on rear seat (row2) 107 kg as previously calculated.

Item	Weight (lbs)	Arm (in)	Moment/1000in lb
A/C	680		19448
Oil	6	1230	73.8
Row 1 (Pilot & co pilot)	180	2750	4950
Row 2 (Pax)	107	3600	3852
Baggage		4210	
Zero Fuel Weight	973	2911	28323.8
Fuel (141 litres)	142	2950	4189
Take-off weight	1115	2916	32512.8

#### Step 5

Plot Zero Fuel Weight and Take off weight with Maximum cargo on rear seat to confirm centre of gravity is within envelope:



**Answer:** (B) 107 kg

## Example 2

Given the following information:

Empty weight	690 kg
Index unit	19596
Full Oil	7 kg
Row 1 (Pilot & co pilot)	75 kg
Row2 (rear pax)	20 kg
Fuel	214 litres

Calculate the maximum weight that may be carried in the rear locker.

### Answers

122 kg

110 kg

90 kg

75 kg

### Step 1

Complete a load sheet :

Item	Weight (lbs)	Arm (in)	Moment/1000in lb
A/C	690		19596
Oil	7	1230	86.1
Row 1 (Pilot & co pilot)	75	2750	2026.5
Row 2 (Pax)	20	3600	720
Baggage		4210	
Zero Fuel Weight	792	2836	22464.6
Fuel (141 litres)	152	2950	4484
Take-off weight	944	2855	26948.6

### Step 2

Check Take off weight to see how much weight is available :

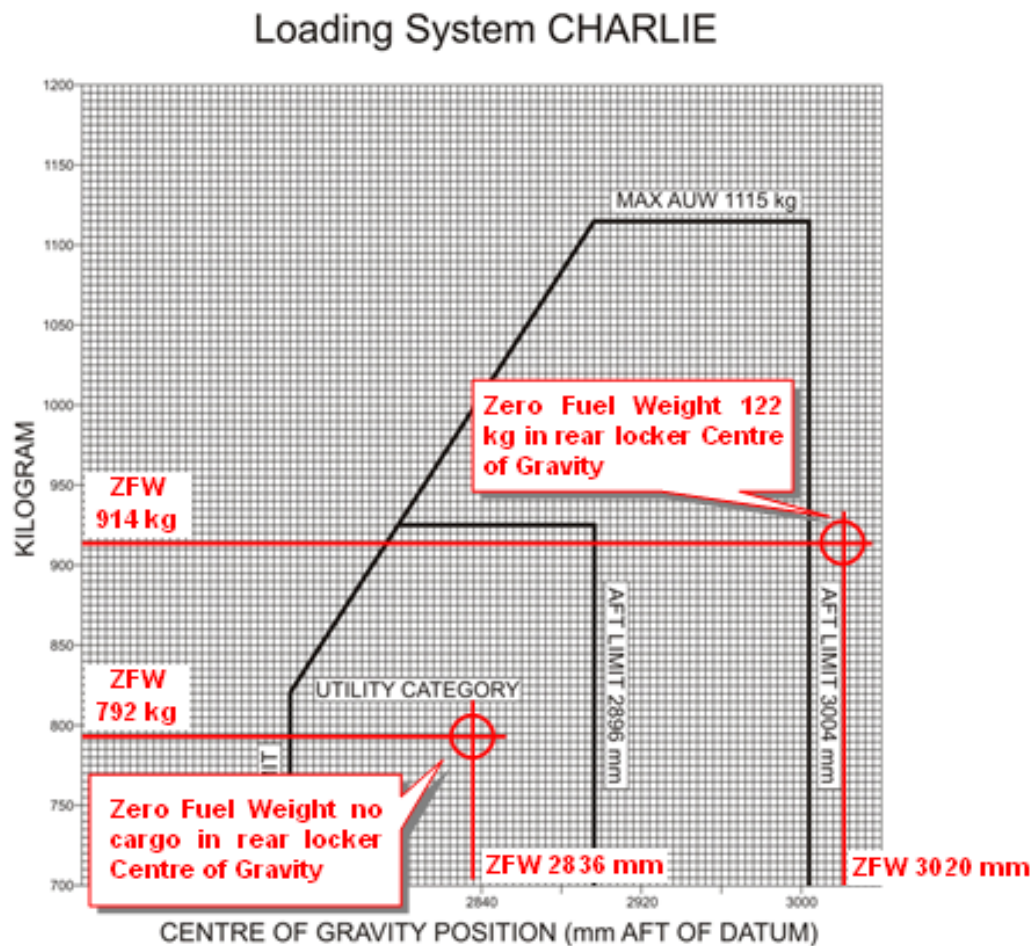
Max Take off weight :	1115 kg
Minus Take off weight :	944 kg
Weight available :	171 kg

Look at the possible answers attached to the question. You may be able to eliminate an answer straight away, though not the case in this example as 171 kg far exceeds the structural limitation of the baggage compartment.



### Step 5

Plot the new Zero Fuel Weight 914 kg (one with 122 kg in rear locker) on to the centre of gravity envelope along with the old Zero fuel Weight centre of gravity (nil in rear locker).

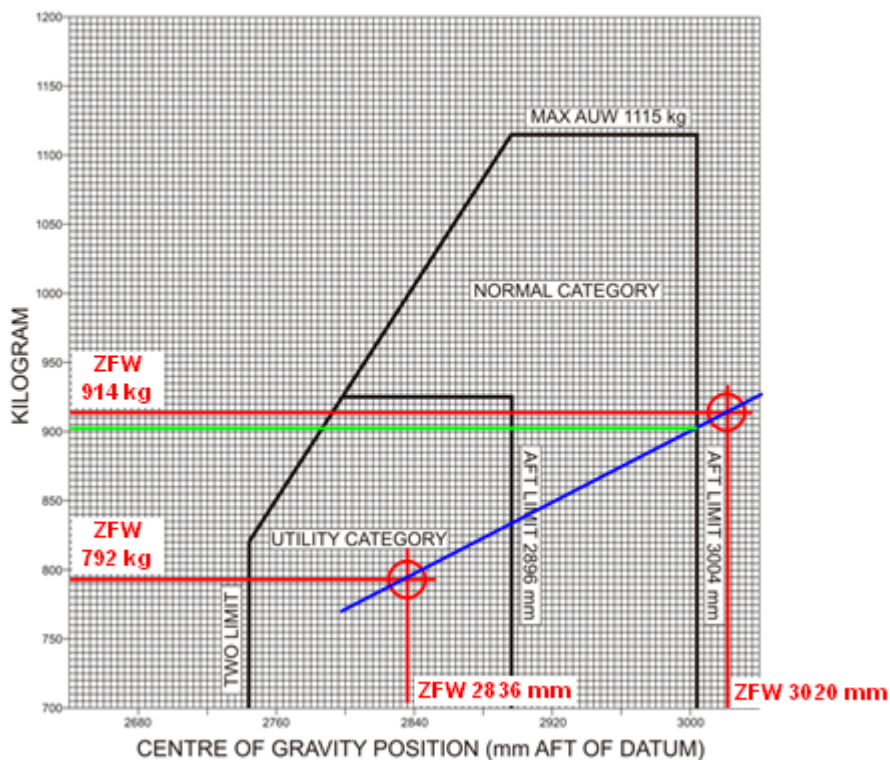




### Step 6

Draw a diagonal line between the two zero fuel weights. This line represents the changing location of C of G as weight is added to the rear locker.

Loading System CHARLIE



Where the diagonal line intersects the rear limit of the envelope draw a line left to the kilogram side of the envelope. Read off the weight, 902 kg.

From ZFW Max baggage      902 kg  
 Subtract ZFW no baggage    792 kg  
 Maximum baggage possible    110 kg

Complete a new load sheet to confirm new ZFW and TOW are in side the aft limit

Item	Weight (lbs)	Arm (in)	Moment/1000in lb
A/C	690		19596
Oil	7	1230	86.1
Row 1 (Pilot & co pilot)	75	2750	2026.5
Row 2 (Pax)	20	3600	720
Baggage	110	4210	4631
Zero Fuel Weight	914	3004	27095.6
Fuel (141 litres)	152	2950	4484
Take-off weight	1054	2996	31579.6

The completed load sheet shows Zero Fuel Weight with a 110 kg of baggage in the rear locker as 914 kg at 3004 millimetres aft of the datum, also the Take-Off weight is 1054 kg at 2996 millimetres aft the datum. Both these are SAFE, both are at or within the rear limit of the envelope of 3004 mm

**Answer:** (B) 110 kg