Safety Regulation Group

Civil Aviation Authority

CAP 696

CAA JAR-FCL Examinations

Mass and Balance Manual (Aeroplanes)

Third Edition July 2006

www.caa.co.uk

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Revision History

1st Edition **August 1999**

CAP 696, CAA JAR-FCL Examinations Loading Manual, was produced to support training and examinations in JAR-FCL Subject 031 - Mass and Balance for Aeroplanes.

2nd Edition **June 2001**

The manual was reissued to incorporate CAA House Style.

3rd Edition **July 2006**

This edition has been retitled and upgraded with digitised graphics. Definitions and conversions have been rationalised and known errors have been corrected.

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Section 1 General Notes

1 Introduction

1.1 The data sheets in this manual are produced to support training and examinations in JAR-FCL Subject 031 - Mass and Balance for Aeroplanes.

1.2 The data contained within these sheets are for **training and examination purposes only**. The data must not be used for any other purpose and, specifically, **are not to be used for the purpose of planning activities associated with the operation of any aeroplane in use now or in the future**.

2 Aircraft Description

2.1 The aeroplanes used in these data sheets are of generic types related to the classes of aeroplane on which the appropriate examinations are based.

2.2 Candidates must select the correct class of aeroplane for the question being attempted.

Generic Aeroplanes		
Single-Engine Piston	certificated under CS 23 (Light Aeroplanes) Performance Class B	**SEP1**
Multi-Engine Piston	certificated under CS 23 (Light Aeroplanes) Performance Class B	**MEP1**
Medium-Range Jet Transport	certificated under CS 25 (Large Aeroplanes) Performance Class A	**MRJT1**

2.3 The same set of generic aeroplanes will be utilised in the following subjects:

- 031 - Mass and Balance - Aeroplanes
- 032 - Performance - Aeroplanes
- 033 - Flight Planning and Monitoring - Aeroplanes

3 Layout of Data Sheets

3.1 Each set of data sheets will consist of an introduction that will contain some pertinent information relating to the aircraft and the subject being examined. This data will include (but not be limited to) a list of abbreviations and some conversion factors.

3.2 This will be followed by a selection of graphs and/or tables that will provide coverage suitable for the syllabus to be examined. A worked example will accompany each graph/table and will demonstrate typical usage.

4 Definitions

Definitions given in italics are not given in ICAO, or JAA or EASA documentation but are in common use.

4.1 **Mass Definitions:**

Basic Empty Mass (Basic Mass)	*is the mass of an aeroplane plus standard items such as: unusable fuel and other unusable fluids; lubricating oil in engine and auxiliary units; fire extinguishers; pyrotechnics; emergency oxygen equipment; supplementary electronic equipment.*
Dry Operating Mass (DOM)	is the total mass of the aeroplane ready for a specific type of operation excluding usable fuel and traffic load. The mass includes items such as: i) Crew and crew baggage. ii) Catering and removable passenger service equipment. iii) Potable water and lavatory chemicals. iv) Food and beverages.
Maximum Structural Landing Mass (MSLM)	the maximum permissible total aeroplane mass on landing in normal circumstances.
Maximum Structural Take-Off Mass (MSTOM)	the maximum permissible total aeroplane mass at the start of the take-off run.
Maximum Structural Taxi Mass	*is the structural limitation of the mass of the aeroplane at commencement of taxi.*
Maximum Zero Fuel Mass (MZFM)	is the maximum permissible mass of an aeroplane with no usable fuel.
Operating Mass (OM)	*is the DOM plus fuel but without traffic load.*
Performance Limited Landing Mass (PLLM)	*is the mass subject to the landing aerodrome limitations.*
Performance Limited Take-Off Mass (PLTOM)	*is the take-off mass subject to departure aerodrome limitations.*

Regulated Landing Mass (RLM)	*is the lowest of the 'performance limited' landing mass and 'structural limited' landing mass.*
Regulated Take-Off Mass (RTOM)	*is the lowest of the 'performance limited' TOM and 'structural limited' TOM.*
Take-Off Mass (TOM)	is the mass of the aeroplane including everything and everyone contained within it at the start of the take-off run.
Taxi Mass	*is the mass of the aeroplane at the start of the taxi (at departure from the loading gate). Sometimes referred to as Ramp Mass.*
Traffic Load	is the total mass of passengers, baggage and cargo, including any 'non-revenue' load.
Useful Load	*is the total mass of the passengers, baggage and cargo, including any non-revenue load and usable fuel.* *It is the difference between the Dry Operating Mass and the Take-Off Mass.*
Zero Fuel Mass (ZFM)	*is DOM plus traffic load but excluding fuel.*

4.2 Other Definitions

Balance Arm (BA)	is the distance from the datum to the centre of gravity of a mass.
Centre of Gravity (CG)	is that point through which the force of gravity is said to act on a mass.
Datum	(relative to an aeroplane) is that point on the longitudinal axis (or extension thereof) from which the centres of gravities of all masses are referenced.
Dry Operating Index (DOI)	is the index for the position of the centre of gravity at Dry Operating Mass.
Loading Index (LI)	is a non-dimensional figure that is a scaled down value of a moment. It is used to simplify mass and balance calculations.
Moment	is the product of the mass and the balance arm

5 Conversions

All conversions are taken from ICAO Annex 5.

5.1 Mass Conversions

Pounds (lb) to Kilograms (kg)	lb x 0.454
Kilograms (kg) to Pounds (lb)	kg x 2.205

5.2 Volumes (Liquid)

Imperial Gallons to Litres (l)	Imp. Gall x 4.546
US Gallons to Litres (l)	US Gall x 3.785

5.3 Lengths

Feet (ft) to Metres (m)	ft x 0.305

5.4 Distances

Nautical mile (NM) to metres (m)	NM x 1852.0

6 Standard Mass Values

Mass Values for Passengers: 20 Passenger Seats or more

Passenger seats	20 or more		30 or more
	Male	Female	All Adult
All flights except holiday charters	88 kg	70 kg	84 kg
Holiday charters	83 kg	69 kg	76 kg
Children	35 kg	35 kg	35 kg

Mass Values for Passengers: 19 Passenger Seats or less

Passenger seats	1-5	6-9	10-19
Male	104 kg	96 kg	92 kg
Female	86 kg	78 kg	74 kg
Children	35 kg	35 kg	35 kg

Mass Values for Baggage: 20 Passenger Seats or more

Type of Flight	Baggage Standard Mass
Domestic	11 kg
Within the European Region	13 kg
Intercontinental	15 kg
All other	13 kg

NOTE: The masses above are subject to change. Candidates should therefore regard these as accurate for examination purposes only. For operational purposes refer to JAR-OPS 1.

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Section 2 Data for Single-Engine Piston Aeroplane (SEP1)

1 Aeroplane Description and Data

- Monoplane
- Single reciprocating engine
- Propeller - constant speed
- Retractable undercarriage
- Performance Class B

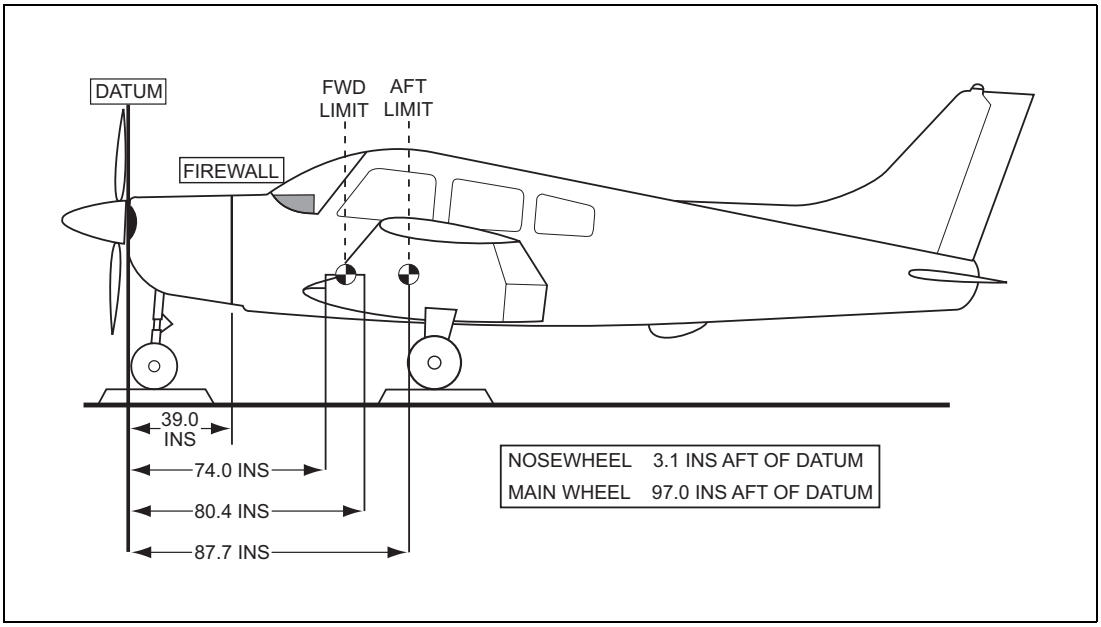

Figure 2.1 Location Diagram

Reference datum	39.00 inches forward of firewall
Centre of Gravity (CG) limits	forward limit 74.00 - 80.4 in aft limit 87.7 in
MSTOM MSLM	3,650 lb 3,650 lb
BEM	2,415 lb
BEM CG location	77.7 in
BEM Moment ÷ 100 =	1,876.46 in.lbs
Landing Gear retraction/extension	does not significantly affect CG position
Floor structure load limit	50 lb per square foot between front and rear spars (includes Baggage Zone A) 100 lb per square foot elsewhere (Baggage Zones B & C)

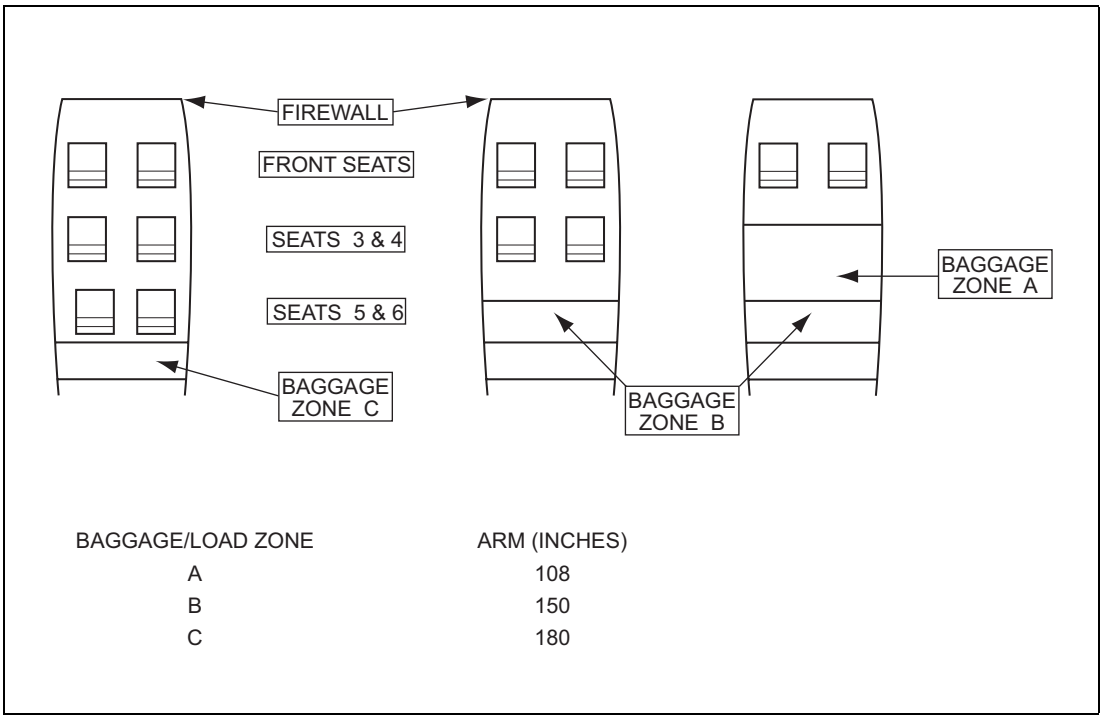

Figure 2.2 Seating and Baggage Arrangements

Leading Edge Tanks (Fuel Tank Centroid Arm=75 in Aft of Datum)					
Gallons	**Weight (lb)**	**Moment ÷ 100 (in. lbs)**	**Gallons**	**Weight (lb)**	**Moment ÷ 100 (in. lbs)**
5	30	22.5	44	264	198
10	60	45	50	300	225
15	90	67.5	55	330	247.5
20	120	90	60	360	270
25	150	112.5	65	390	292.5
30	180	135	70	420	315
35	210	157.5	74	444	333
40	240	180			

Figure 2.3 Useful Mass and Moments of Usable Fuel

2 Procedure for Mass and Balance Calculation

(Refer to Figure 2.4)

2.1 Record the Basic Empty Mass and moment in the Basic Empty Condition row. The moment must be divided by 100 to correspond to 'Useful Mass and Moments table'.

2.2 Record the Mass and corresponding moment for each of the useful load items (except fuel) to be carried in the aeroplane (occupants, baggage).

2.3 Total the Mass column and moment column. The SUB-TOTAL is the Zero Fuel Condition

2.4 Determine the Mass and corresponding moment for the fuel loading to be used. This fuel loading includes fuel for the flight, plus that required for start, taxi and take-off. Add the Fuel to Zero Fuel Condition to obtain the SUB-TOTAL Ramp Condition.

2.5 Subtract the fuel to be used for start, taxi and run-up to arrive at the SUB-TOTAL Take-off Condition.

2.6 Subtract the Mass and moment of the fuel in the incremental sequence in which it is to be used from the take-off weight and moment. The Zero Fuel Condition, the Take-off Condition and the Landing Condition moments must be within the Centre of Gravity envelope at Figure 2.5.

2.7 If the total moment is less than the minimum moment allowed, useful load items must be shifted aft or forward load items reduced. If the total moment is greater than the maximum moment allowed, useful load items must be shifted forward or aft load items reduced. If the quantity or location of load items is changed, the calculations must be revised and the moments re-checked.

Item	Mass	Arm (in)	Moment ÷ 100
1. Basic Empty Condition			
2. Front Seat Occupants		79	
3. Third and Fourth Seat PAX		117	
4. Baggage Zone 'A'		108	
5. Fifth And Sixth Seat PAX		152	
6. Baggage Zone 'B'		150	
7. Baggage Zone 'C'		180	
Sub-total = Zero Fuel Mass			
8. Fuel Loading			
Sub-total = Ramp Mass			
9. Subtract Fuel for Start, Taxi and Run Up (see Note)			
Sub-total = Take-off Mass			
10. Trip Fuel			
Sub-total = Landing Mass			

NOTE: Fuel for start taxi and run up is normally 13 lb at an average entry of 10 in the column headed **Moment (÷ 100)**

Figure 2.4 Blank Loading Manifest SEP1

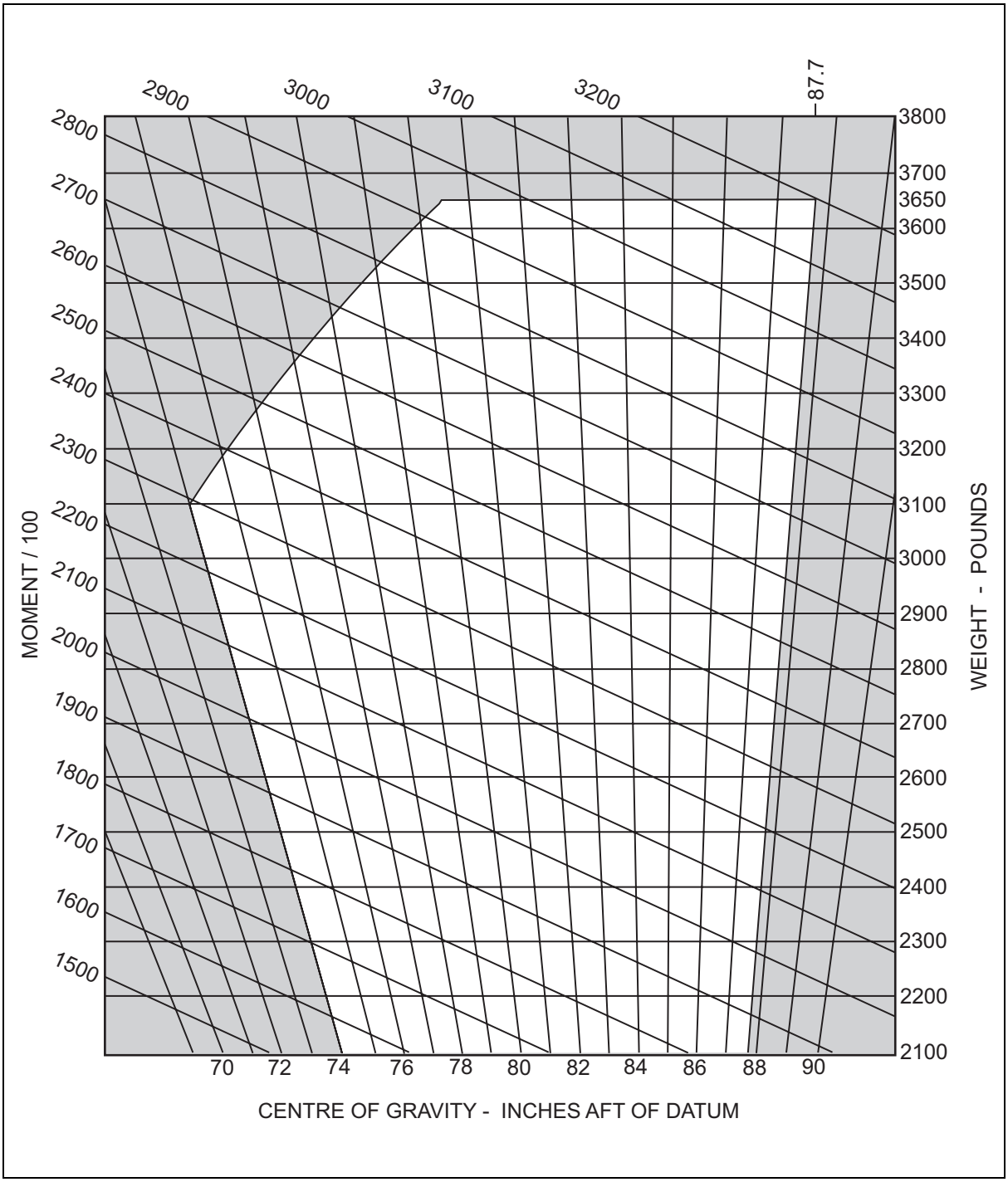

Figure 2.5 Blank Centre of Gravity Envelope

Section 3 Data for Light Twin-Engine Piston Aeroplane (MEP1)

1 Aeroplane Description and Data

1.1 Description

- Monoplane
- Twin reciprocating supercharged engines
- Counter- rotating, constant speed propellers
- Retractable undercarriage
- Performance Class B

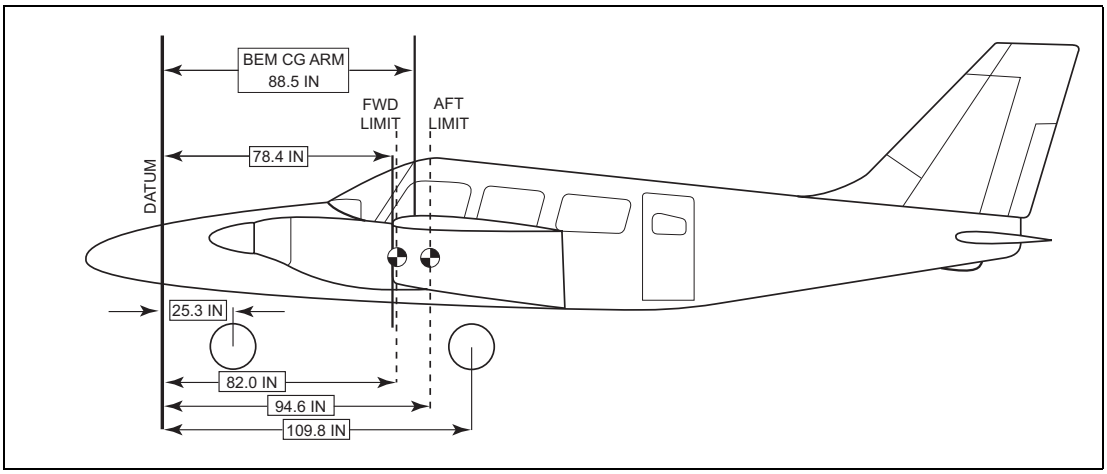

Figure 3.1 Location Diagram

Reference datum		78.4 inches forward wing leading edge at inboard edge of inboard fuel tank
CG limits	fwd	82.0 inches to 90.8 inches (subject to aeroplane mass)
	aft	94.6 inches
MSTOM		4,750 lb
MSLM		4,513 lb
MZFM		4,470 lb
BEM		3,210 lb
BEM CG location		88.5 inches
BEM Moment ÷ 100	=	2840.9 in.lbs

Gear retraction/extension does not **significantly** affect CG position

Structural Floor Loading Limit 120 lb/square foot

2 Configuration Options

2.1 Baggage/Freight Zones

	Max Mass	Arm	
Zone 1	100 lb	22.5	
Zone 2	360 lb	118.5	available **only** with centre seats removed
Zone 3	400 lb	157.6	available **only** with rear seats removed
Zone 4	100 lb	178.7	

2.2 Standard Allowances

2.2.1 Fuel relative density - an average mass of 6 lb per US gallon should be used.
Passenger and pilot mass - actual mass values should be used.

3 Procedure for Mass and Balance Calculations

See example at Figures 3.2 and 3.3. Figures 3.4 and 3.5 are provided for your use.

a) Enter all mass values in correct locations on table (Figure 3.2/3.4)

b) Calculate moments for each entry

c) Total mass values to obtain zero fuel mass

d) Total moments for zero fuel mass condition

e) Determine arm at zero fuel mass

f) Add total fuel mass and arm

g) Obtain moment for fuel load

h) Add fuel mass and moment to determine ramp mass and moment

i) Deduct start-up, taxi and run-up fuel allowance and correct moment to obtain take-off conditions.

j) Check CG position lies within envelope (chart at Figure 3.3/3.5)

k) Deduct estimated fuel burn to destination

l) Obtain estimated landing mass and moment

m) Check CG position at landing to ensure that it lies within envelope (chart at Figure 3.3/3.5)

ITEM	Mass (lb)	Arm Aft of Datum (in)	Moment ÷ 100 (in.lbs)
Basic Empty Mass	3,210	88.5	2,840.85
Pilot and Front Passenger	340	85.5	290.7
Passengers (Centre Seats) or Baggage Zone 2 (360 lb max)	236	118.5	279.66
Passengers (Centre Seats) or Baggage Zone 3 (400 lb max)	340	157.6	535.84
Baggage Zone 1 (100 lb max)	100	22.5	22.5
Baggage Zone 4 (100 lb max)	N/A	178.7	NIL
Zero Fuel Mass (4,470 lb max)	4,226	93.9	3969.55
Fuel (123 US gallons Max)	545	93.6	510.12
Ramp Mass (4,773 lb max)	4,771	93.9	4479.67
Fuel Allowance for Start, Taxi Run-up	-23	93.6	-21.53
Take-off Mass (4,750 lb max)	4,748	93.9	4458.14
Minus Estimated Fuel Burn-off	-450	93.6	-421.2
Landing Mass (4,513 lb max)	4,298	93.9	4036.94

NOTE: Maximum mass values given in this table are for **structural limits only.**

Figure 3.2 Example Loading Manifest MEP1

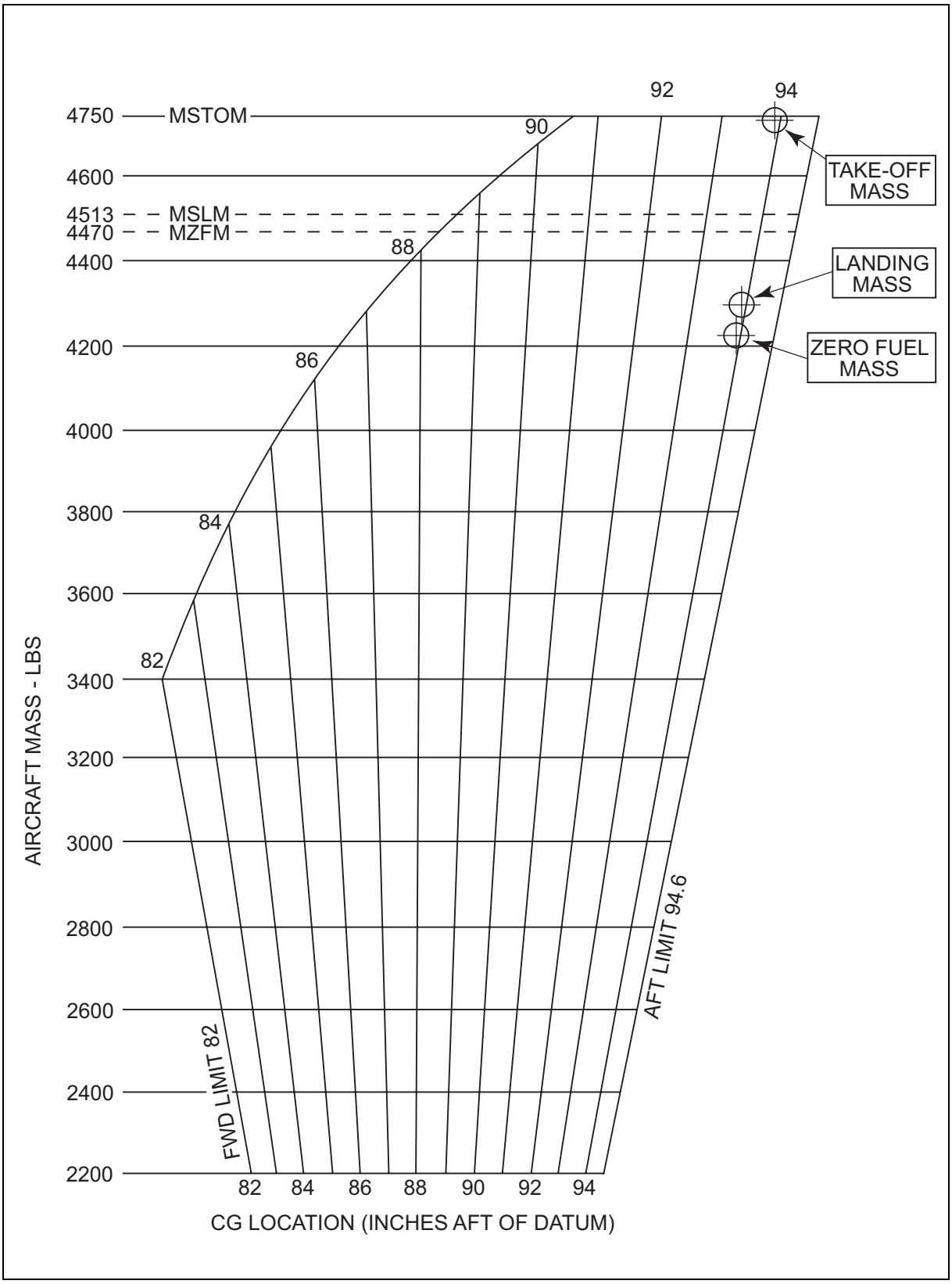

Figure 3.3 Example Centre of Gravity Envelope

ITEM	Mass (lbs)	Arm Aft Of Datum (in)	Moment ÷ 100 (in.lbs)
Basic Empty Mass	3210	88.5	
Pilot and Front Passenger		85.5	
Passengers (Centre Seats) or Baggage Zone 2 (360 lb Max.)		118.5	
Passengers (Rear Seats) or Baggage Zone 3 (400 lb Max.)		157.6	
Baggage Zone 1 (100 lb Max.)		22.5	
Baggage Zone 4 (100 lb Max.)		178.7	
Zero Fuel Mass (4,470 lb Max - Std)			
Fuel (123 gal. Max.)		93.6	
Ramp Mass (4,773 lb Max)			
Fuel Allowance for Start, Taxi, Run-up		93.6	
Take-off Mass (4,750 lb Max.)			
Minus Estimated Fuel Burn-off		93.6	
Landing Mass (4,513 lb Max.)			

NOTE: Maximum mass values given in this table are for structural limits only.

Figure 3.4 Blank Loading Manifest

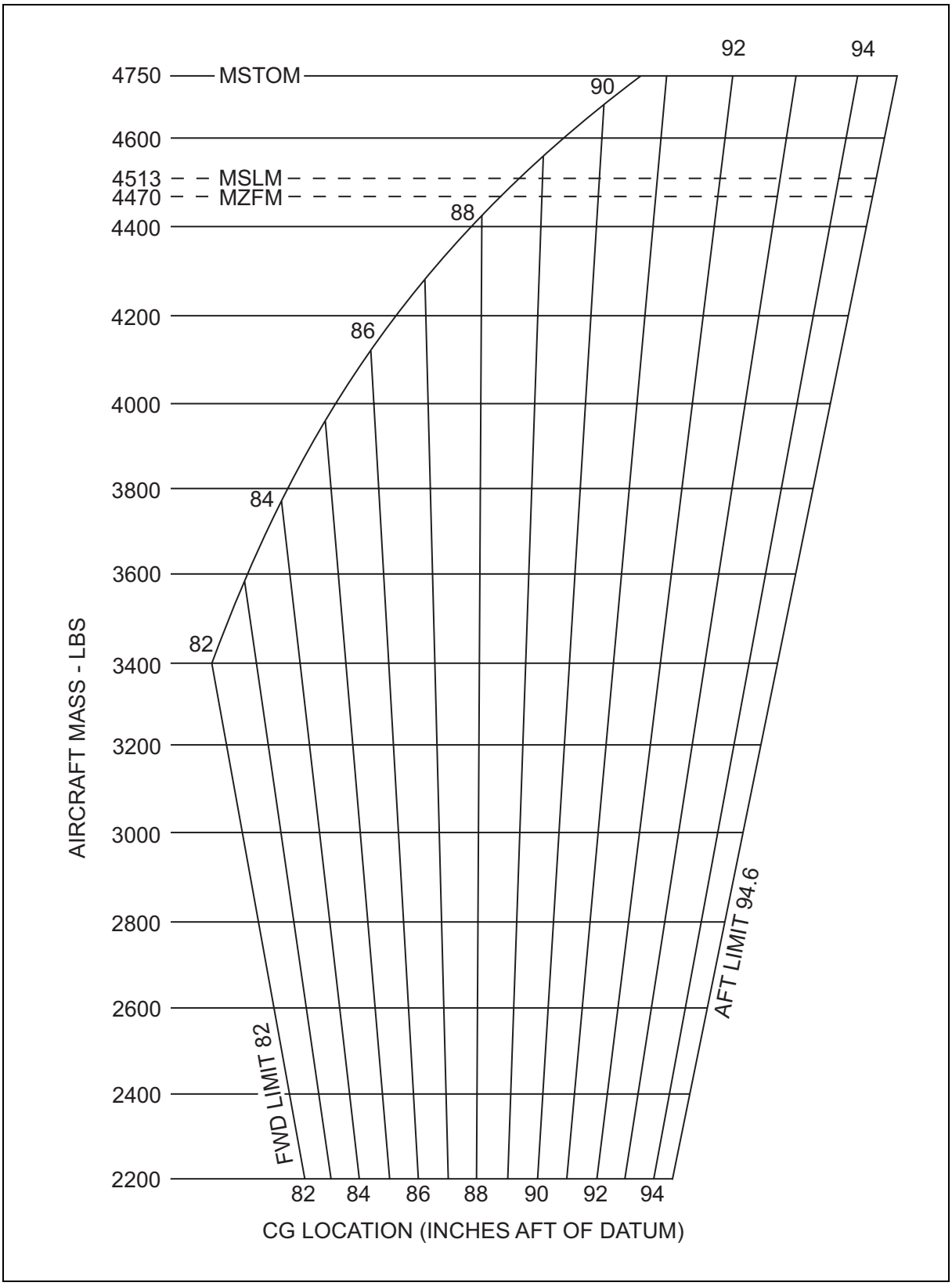

Figure 3.5 Blank Centre of Gravity Envelope

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Section 4 Data for Medium-Range Twin Jet (MRJT1)

1 Aircraft Description

- Monoplane
- Twin high-bypass gas turbine engines
- Retractable undercarriage
- Certified under FAR 25/CS 25
- Performance Class A

2 Aircraft Data Constants

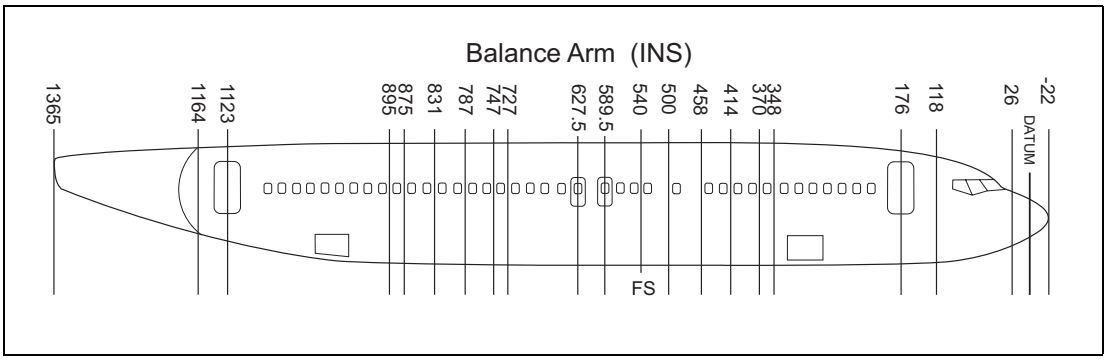

Figure 4.1 Locations Diagram

Body Station	Conversion	Balance Arm - in
130 to 500	B.S. - 152 in	-22 to 348
500A	348 + 22 in	370
500B	348 + 44 in	392
500C	348 + 66 in	414
500D	348 + 88 in	436
500E	348 + 110 in	458
500F	348 + 132 in	480
500G	348 + 152 in	500
540 to 727	B.S. + 0 in	540 to 727
727A	727 + 20 in	747
727B	727 + 40 in	767
727C	727 + 60 in	787
727D	727 + 82 in	809
727E	727 + 104 in	831
727F	727 + 126 in	853
727G	727 + 148 in	875
747 to 1217	B.S. + 148 in	895 to 1,365

Figure 4.2 Table to Convert Body Station to Balance Arm

2.1 Datum point 540 inches forward of front spar (FS)

2.2 Landing Gear Retraction/Extension negligible effect from operation of landing gear

2.3 Flap Retraction

From	To	Moment Change (kg - inches x 1,000)
5°	0°	-11
15°	0°	-14
30°	0°	-15
40°	0°	-16

Figure 4.3 Effect of Flap Retraction

2.4 Take-off Horizontal Stabiliser Trim Setting

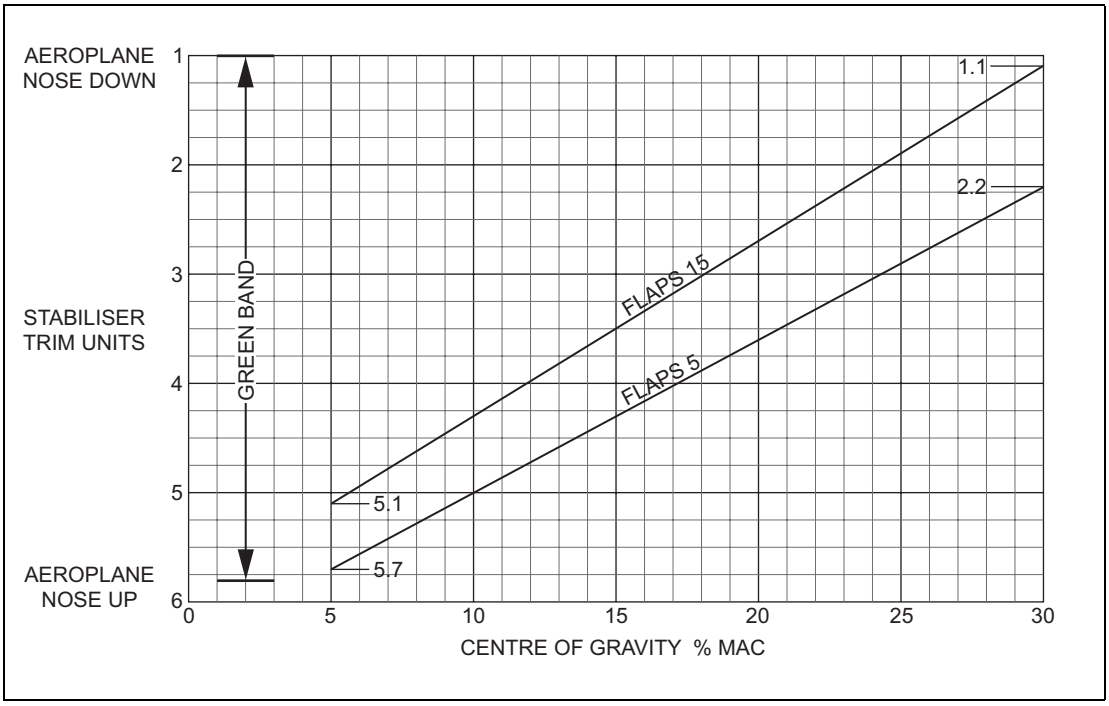

Figure 4.4 Graph of Trim Units for CG Position

2.5 Mean Aerodynamic Chord (MAC) 134.5 inches
MAC Leading edge 625.6 inches aft of datum

3 Mass and Balance Limitations

3.1 Mass Limits

3.2 Maximum Structural Taxi Mass 63,060 kg
Maximum Structural Take-off Mass 62,800 kg
Maximum Structural Landing Mass 54,900 kg
Maximum Structural Zero Fuel Mass 51,300 kg

3.3 Centre of Gravity Limits

The centre of gravity for this aeroplane must at all times be within the limits prescribed by the CG envelope shown in Figure 4.11.

4 Fuel Data

	BA (full tanks)	Volume (US Gallons)	Mass (kg)
Left Wing Main Tank 1	650.7	1,499	4,542
Right Wing Main Tank 2	650.7	1,499	4,542
Centre Tank	600.4	2,313	7,008
Max. Total Fuel (assumes 3.03 kg/US gall.)	628.8	5,311	16,092

Caution - If centre tank contains more than 450 kg the wing tanks **must** be full.

Figure 4.5 Fuel Tank Location and Maximum Volume

Location	Volume (US Galls)	Mass (kg)	BA
Wing Tank 1	4.6	14.0	599.0
Wing Tank 2	4.6	14.0	599.0
Centre Tank	7.9	24.0	600.9

Figure 4.6 Unusable Fuel Quantities

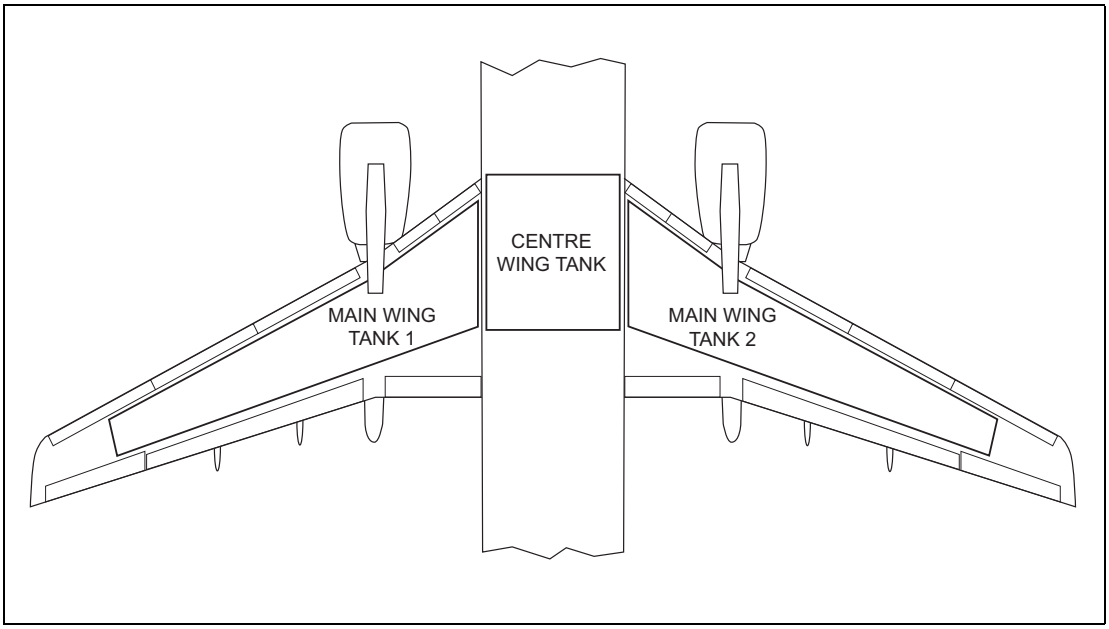

Figure 4.6a Fuel Tank Location Diagram

5 Passenger and Personnel Data

5.1 Maximum Passenger Load 141

First Class 15

Club/Business 18

Economy 108

5.2 Passenger Distribution

Figure 4.7 shows the balance arms (in inches) for the distribution of passengers. If the pax load is low, zones B, C and D are the preferred seating areas.

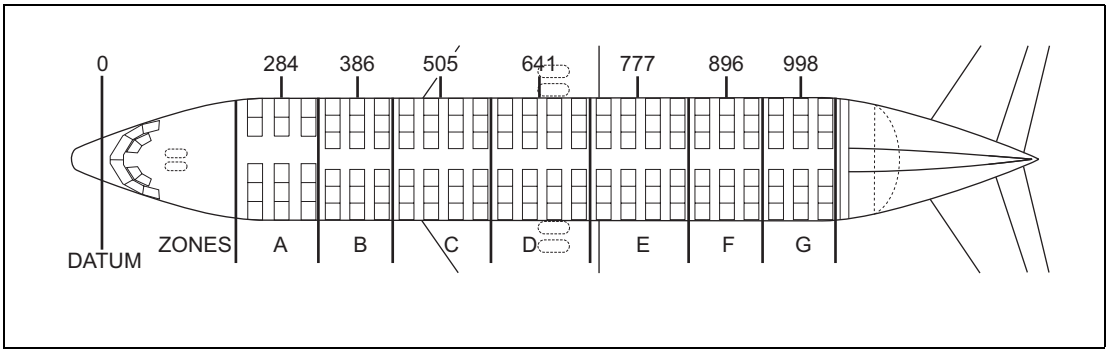

Figure 4.7 Balance Arms (in)

ZONE	NO. PAX	B.A.
A	15	284
B	18	386
C	24	505
D	24	641
E	24	777
F	18	896
G	18	998

Figure 4.8 Table of Passenger Zones, Number of Passengers and Balance Arms

5.3 Passenger Mass

Unless otherwise stated, passenger mass is assumed to be 84 kg (this includes a 6 kg allowance for hand baggage).

5.4 Passenger Baggage

Unless otherwise stated, a baggage allowance of 13 kg may be made per passenger.

5.5 Personnel

Standard Crewing

	No.	BA	Standard Mass (kg) each
Flight Deck	2	78.0	90
Cabin Staff Forward	2	162.0	90
Cabin Staff Aft	1	1,107.0	90

6 Cargo Data

Forward Cargo Compartment (Cargo Hold 1)

BA - in	228	286	343	500
Maximum Compartment Running Load (kg per inch)	13.15	8.47	13.12	
Maximum Distribution Load Intensity (kg per ft^2)	68			
Maximum Compartment Load (kg)	762	483	2059	
Compartment Centroid (BA - in)	257	314.5	421.5	
Maximum Total Load (kg)	3305			
Fwd Hold Centroid (BA - in)	367.9			
Fwd Hold Volume (cu. ft)	607			

Aft Cargo Compartment (Cargo Hold 4)

BA - IN	731	940	997	1096
Maximum Compartment Running Load (kg per inch)	14.65	7.26	7.18	
Maximum Distribution Load Intensity (kg per ft^2)	68			
Maximum Compartment Load (kg)	3,062	414	711	
Compartment Centroid (BA - in)	835.5	968.5	1,046.5	
Maximum Total Load (kg)	4187			
Aft Hold Centroid (BA - in)	884.5			
Aft Hold Volume (cu. ft)	766			

Figure 4.9 Cargo Compartment Limitations

7 Mass and Balance Calculations

7.1 Using Loading Manifest (Figure 4.10) and CG limits envelope (Figure 4.11)

a) Enter DOM and balance arm on Figure 4.10.

b) Enter all details of passenger loads and distribution on Figure 4.10.

c) Enter all details of cargo loads and distribution on Figure 4.10.

d) Calculate all moments on Figure 4.10.

e) Add up Items 1 to 11 (inclusive) to obtain the Zero Fuel Mass and ZFM moment on Figure 4.10.

f) Check ZFM does not exceed MZFM.

g) Insert fuel mass and distribution on Figure 4.10.

h) Calculate and insert the fuel moments on Figure 4.10.

i) Determine the taxi mass and moment by adding the fuel values to the ZFM values.

j) Check taxi mass does not exceed structural maximum.

k) Determine the taxi fuel mass and moment values.

l) Determine Take-off Mass and moment by subtracting the values at k) from those of i).

m) Check TOM does not exceed the MSTOM or PLTOM.

n) Determine Take-off CG BA and plot on Figure 4.11 to check it is within the envelope.

o) Determine Take-off stabiliser trim setting (if required).

p) Calculate and insert the Flight Fuel values on Figure 4.10

q) Deduct the Flight Fuel values from those at l) to determine the LM values.

r) Check landing mass does not exceed the MSLM or the PLLM.

s) Determine moment at landing mass.

t) Determine CG BA at landing and plot on Figure 4.11 to check that it is within the safe limits of the envelope.

Max Permissible Aeroplane Mass Values:

TAXI MASS - **ZERO FUEL MASS -**

TAKE OFF MASS - **LANDING MASS -**

ITEM	MASS (kg)	B.A. (in)	MOMENT kg - in/1,000	CG % MAC
1. DOM				
2. PAX Zone A		284		
3. PAX Zone B		386		
4. PAX Zone C		505		
5. PAX Zone D		641		
6. PAX Zone E		777		
7. PAX Zone F		896		
8. PAX Zone G		998		
9. Cargo Hold 1		367.9		
10. Cargo Hold 4		884.5		
11. Additional Items				
ZERO FUEL MASS				
12. Fuel Tanks 1 and 2				
13. Centre Tank				
TAXI MASS				
Less Taxi Fuel				
TAKE OFF MASS				
Less Flight Fuel				
EST. LANDING MASS				

Figure 4.10 Loading Manifest - MRJT1

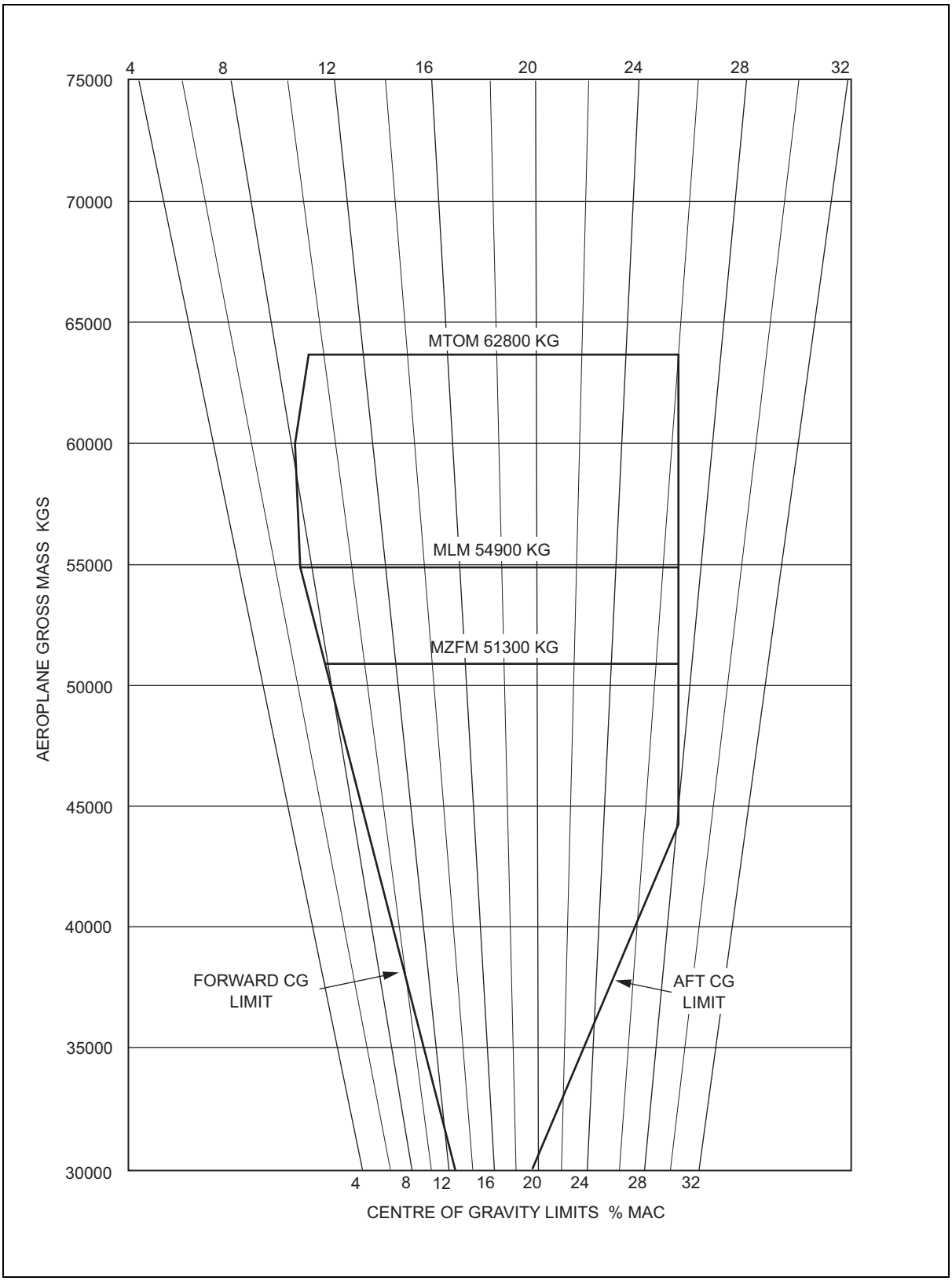

Figure 4.11 CG Envelope - MRJT1

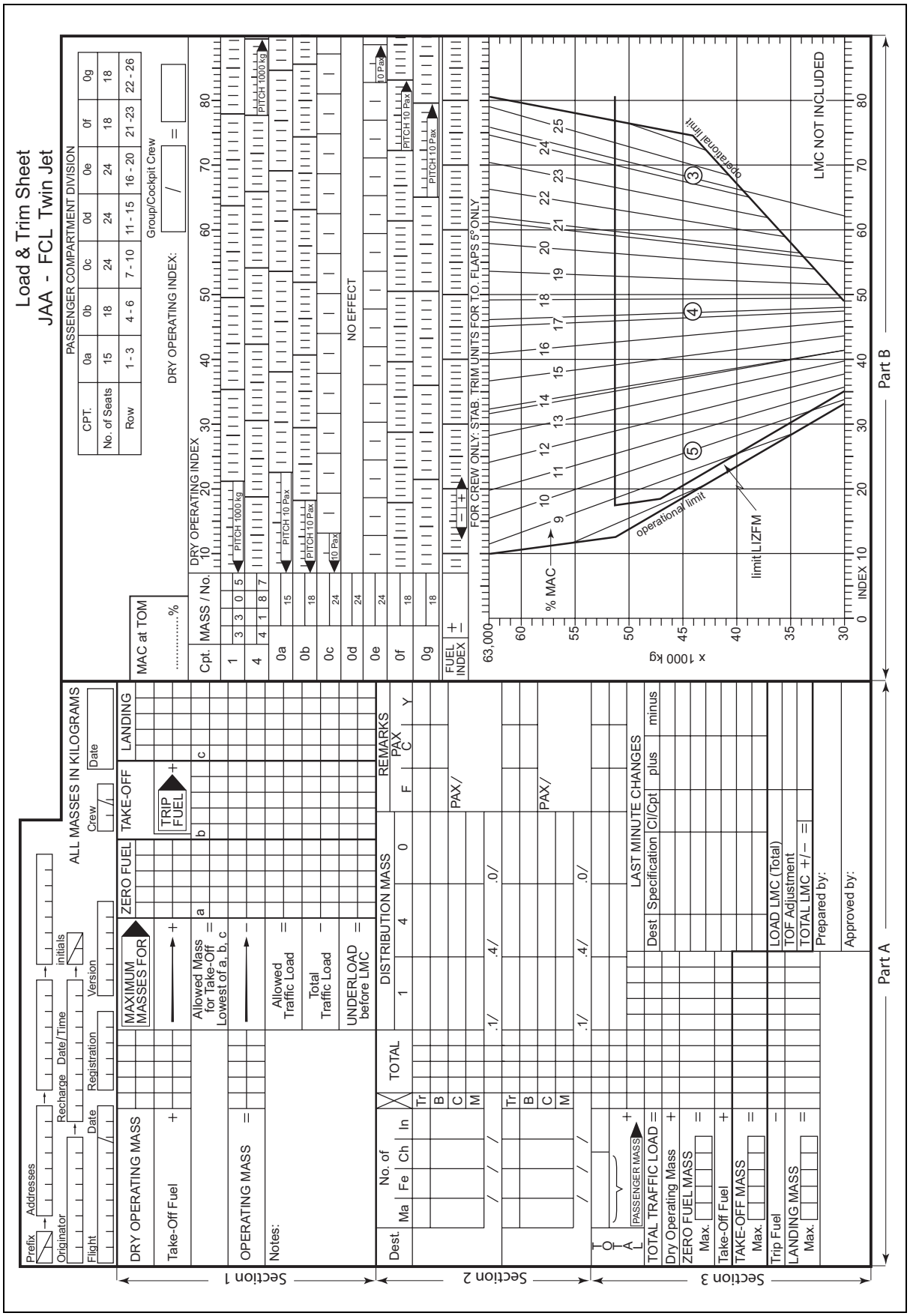

Figure 4.12 Load and Trim Sheet (Blank)

7.2 Using Load and Trim Sheet

The load/trim sheet (as shown in the example at Figure 4.12) is in two parts.

Part A (to the left) is a loading summary which should be completed as follows:

Section 1 is used to establish the limiting take-off mass; maximum allowable traffic load; underload before last minute changes (LMC).

Section 2 shows the distribution of the traffic load. In this section the following abbreviations are used:

TR	Transit
B	Baggage
C	Cargo
M	Mail
Pax	Passengers
Pax F	First Class
Pax C	Club/Business
Pax Y	Economy

Section 3 is used to summarise load and cross check that limits have not been exceeded.

The example shown uses the following data:

DOM	34,300 kg	DOI	45.0	MSTOM	62,800 kg
MZFM	51,300 kg			MSLM	54,900 kg

Passengers	130
Average Passenger Mass	84 kg
Baggage	130 items at 14 kg per piece (this example only)
Cargo	630 kg
Take-off Fuel Total	14,500 kg
Trip Fuel	8,500 kg

Part B is the trim portion

- Using data from the loading summary, start by entering the index for the DOM.
- Move the index in turn (for the mass in each cargo hold) then in accordance with the passenger distribution.
- Establish the CG % MAC at ZFM and ensure that it lies within the envelope.
- Add fuel index correction (from Figure 4.14) to obtain the TOM index and ensure that the CG lies within the envelope.
- Extract the % MAC value for the CG position at TOM.

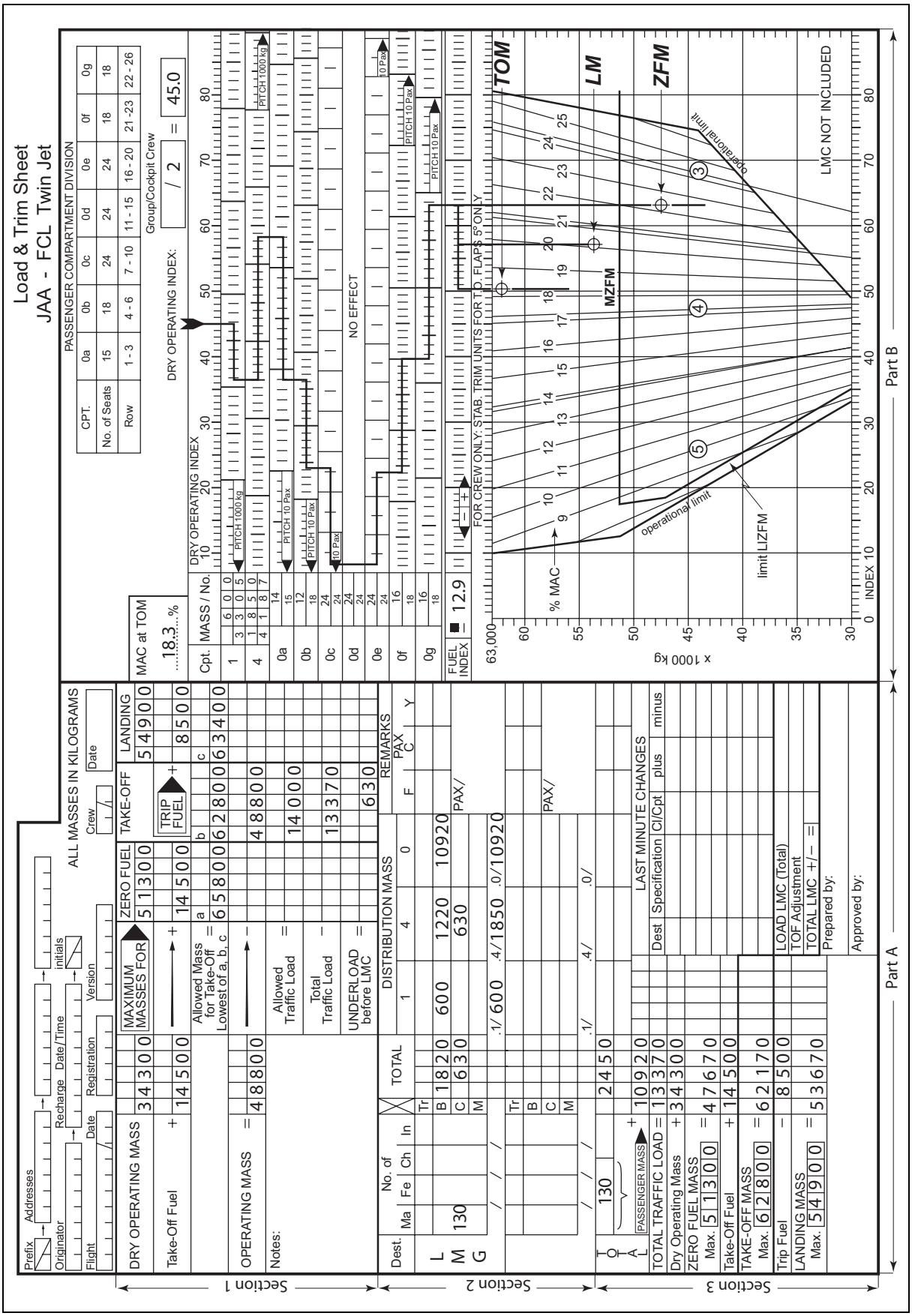

Figure 4.13 Load and Trim Sheet (Example)

Fuel Mass (kg)	Index Units		Fuel Mass (kg)	Index Units
500	-1.0		9,330	-0.3
750	-1.5		9,580	-0.9
1,000	-1.9		9,830	-1.5
1,250	-2.3		10,080	-2.1
1,500	-2.6		10,330	-2.7
1,750	-3.0		10,580	-3.3
2,000	-3.3		10,830	-3.9
2,500	-3.7		11,080	-4.5
3,000	-4.3		11,330	-5.1
3,500	-4.7		11,580	-5.7
4,000	-5.1		11,830	-6.3
4,500	-5.4		12,080	-6.9
5,000	-5.7		12,330	-7.5
5,500	-5.9		12,580	-8.1
6,000	-6.0		12,830	-8.7
6,500	-6.1		13,080	-9.3
7,000	-5.9		13,330	-9.9
7,500	-5.0		13,580	-10.5
7,670	-4.6		13,830	-11.1
7,830	-4.1		14,080	-11.7
8,000	-3.7		14,330	-12.3
8,170	-3.2		14,580	-12.9
8,330	-2.6		14,830	-13.5
8,500	-2.1		15,080	-14.1
8,630	-1.6		15,330	-14.8
8,750	-1.1		15,580	-15.4
8,880	-0.6		15,830	-16.3
9,000	-0.1		16,080	-17.1
tanks 1 and 2 full 9,080	+0.3		centre tank full 16,140	-17.3

Usable fuel quantities in lines = 20 kg (included in the tables).

Interpolation not necessary!

For mass figures not printed in these tables the index of the next higher mass is applicable.

Figure 4.14 Fuel index correction table