

6. WEIGHT AND BALANCE



SECTION 6

6. WEIGHT AND BALANCE

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6.1 Introduction

This Section includes Weight and Balance Record of empty airplane, Permitted Payload Range within which the airplane may be safely operated, and a method to determine whether the operational weight and CG location will be within the permitted limits range.

Procedure for weighing the airplane and the calculation method for establishing the permitted payload range are contained in the Aircraft Maintenance and Inspection Procedures for the HARMONY Light Sport Aircraft.



6.2

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6.3 Permitted Payload Range

MAXIMUM WEIGHT OF CREW [lb]			Airplane S/N: 2014 1717						MTOW [lb]: 1320		
Date	Empty weight [lb]	C.G. [% MAC]	FUELLING						Approved		
			Fuel volume	1	0.8	0.6	0.4	0.3	0.2	Date	Signature
			Fuel volume [US gals]	30	25	20	15	10	5		
			Fuel weight [lb]	180	150	120	90	60	30		
11.14	831	13.2	55	254	284	314	344	374	404	11.14	
28			28	281	311	341	371	401	431	20/14	
0			0	309	339	369	399	429	459		
55			55								
28			28								
0			0								
55			55								
28			28								
0			0								
55			55								
28			28								
0			0								
			BAGGAGE [lb]								



6.4 Operational Weight and Balance Computation

An important part of preflight planning is to determine that the aircraft is loaded so its weight and CG location are within the allowable limits.

This is possible by using hereafter explained Loading graph method, using weights, arms, and moment indexes.

6.4.1 Computational Procedure

1. Record into the **Airplane Loading Schedule Chart** current empty weight and static moment of the airplane, which you read from the table 6.2 Weight and Balance Record.
2. Record the weight of crew, fuel, and baggage into the **Airplane Loading Schedule Chart**.
3. See the **Table of Static Moments** or **Airplane Loading Graph** to read static moments for given weights of crew, fuel, and baggage
4. Record found moments into the **Airplane Loading Schedule Chart**
5. Determine Take-off weight of the airplane – add together the airplane empty weight, crew, fuel, and baggage and record the result into the **Loading Schedule Chart**.
6. Check, whether the calculated Take-off weight does not exceed Airplane Maximum Take-off Weight 1320 lb.
If yes, then it is necessary to reduce weight of some of the useful load items (fuel, baggage).

WARNING
EXCEEDING MTOW MAY LEAD TO
DETERIORATION OF SAFETY OF FLIGHT!

7. Determine Total Static Moment of loaded airplane – add together the static moment of empty airplane, crew, fuel, and baggage and record the result into the **Loading Schedule Chart**.
8. Plot Takeoff Weight and Total Static Moment into the **HARMONY LSA CG Moment Envelope**.
9. Check, whether the intersection of Take-off weight horizontal line and Total Static Moment vertical line is inside the envelope.
If **YES**, then the flight may be safely performed as regards weight and balance.
If **NOT**, then it is necessary to change weight of some of the



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useful load items (crew, fuel, baggage) so that after a repeated computation the intersection of Take-off Weight and Total Static Moment will be inside the CG Moment envelope.

WARNING

**SAFETY OF FLIGHT PERFORMED WITH THE
AIRPLANE LOADED OUTSIDE PERMITTED
LIMITS OF WEIGHT AND STATIC MOMENTS
MAY BE DETERIORATED!**



6.5 Airplane Loading Schedule Chart

Type/Model:	Harmony LSA
Serial No.:	
Registration:	

Input data

LOADING SCHEDULE CHART		Your Aircraft			Sample Aircraft		
No.	Item	Arm (m) (1)	Weight (kg) (2)	Moment (kg.m) (3) = (1) x (2)	Arm (m) (1)	Weight (kg) (2)	Moment (kg.m) (3) = (1) x (2)
1.	Empty Airplane <i>See Weight and Balance Record delivered with your airplane</i>				0,148	364	54
2.	Crew	0,489			0,489	172	84
3.	Baggage Max.: 25 kg 55 lb	1,027			1,027	25	26
4.	Fuel Max. 120 l Density 0.72 kg/l	0,623			0,623	40	25
		TOTAL WEIGHT (kg)		TOTAL MOMENT (kg.m)	TOTAL WEIGHT (kg)		TOTAL MOMENT (kg.m)
		(7) = SUM (1+4)		(8) = SUM (1+4)	(7) = SUM (1+4)		(8) = SUM (1+4)
					601		188
C.G. (m):		= $\frac{\text{TOTAL MOMENT}}{\text{TOTAL WEIGHT}}$			= $\frac{\text{TOTAL MOMENT}}{\text{TOTAL WEIGHT}}$		0,314
C.G. (% MAC):		= $\frac{\text{C.G. (m)}}{\text{MAC}} \times 100$			= $\frac{\text{C.G. (m)}}{\text{MAC}} \times 100$		26,4

Explanation:
C.G. (m) Center of Gravity position from Datum origin (0,05615 m behind Wing leading edge)
C.G. (%MAC) Center of Gravity position in percent of Mean Aerodynamic Chord
MAC (m) Mean Aerodynamic Chord (m) 1,1855

Limits:
600 kg Maximum Takeoff Weight (with Vortex Generators - valid for the USA)
575 kg Maximum Takeoff Weight (No Vortex Generators - valid for the USA)
14 ± 5 %MAC Empty Airplane C.G. Range
13 - 33 %MAC Operating C.G. range



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Type/Model:	Harmony LSA
Serial No.:	
Registration:	

Input data

LOADING SCHEDULE CHART		Your Aircraft			Sample Aircraft		
No.	Item	Arm (in)	Weight (lb)	Moment/100 (lb in)	Arm (in)	Weight (lb)	Moment (lb in)
		(1)	(2)	(3) = (1) x (2)/100	(1)	(2)	(3) = (1) x (2)
1.	Empty Airplane <i>See Weight and Balance Record delivered with your airplane</i>				5,83	802	46,7
2.	Crew	19,25			19,25	379	73,0
3.	Baggage Max.: 25 kg 55 lb	40,43			40,43	55	22,3
4.	Fuel Max. 32 USgal Density: 6 lb / USgal	24,54			24,54	87	21,4
		TOTAL WEIGHT (lb)		TOTAL MOMENT/100 (lb in)	TOTAL WEIGHT (lb)		TOTAL MOMENT/100 (lb in)
		(7) = SUM (1-4)		(8) = SUM (1-4)	(7) = SUM (1-4)		(8) = SUM (1-4)
					1324		163
C.G. (in):		= TOTAL MOMENT TOTAL WEIGHT			TOTAL MOMENT TOTAL WEIGHT		12,345
C.G.' (%MAC):		= C.G. (in) MAC x 100 =			C.G. (in) MAC x 100 =		26,4

Explanation:
C.G. (in) Center of Gravity position from Datum origin (2,21 in behind Wing leading edge)
C.G.' (%MAC) Center of Gravity position in percent of Mean Aerodynamic Chord
MAC (m) Mean Aerodynamic Chord (m) 46,6732

Limits:
1320 lb Maximum Takeoff Weight (with Vortex Generators - valid for the USA)
1268 lb Maximum Takeoff Weight (No Vortex Generators - valid for the USA)
14 ± 5 %MAC Empty Airplane C.G. Range
13 - 33 %MAC Operating C.G. range

*) – for your empty airplane arm see Weight and Balance Record delivered with your airplane



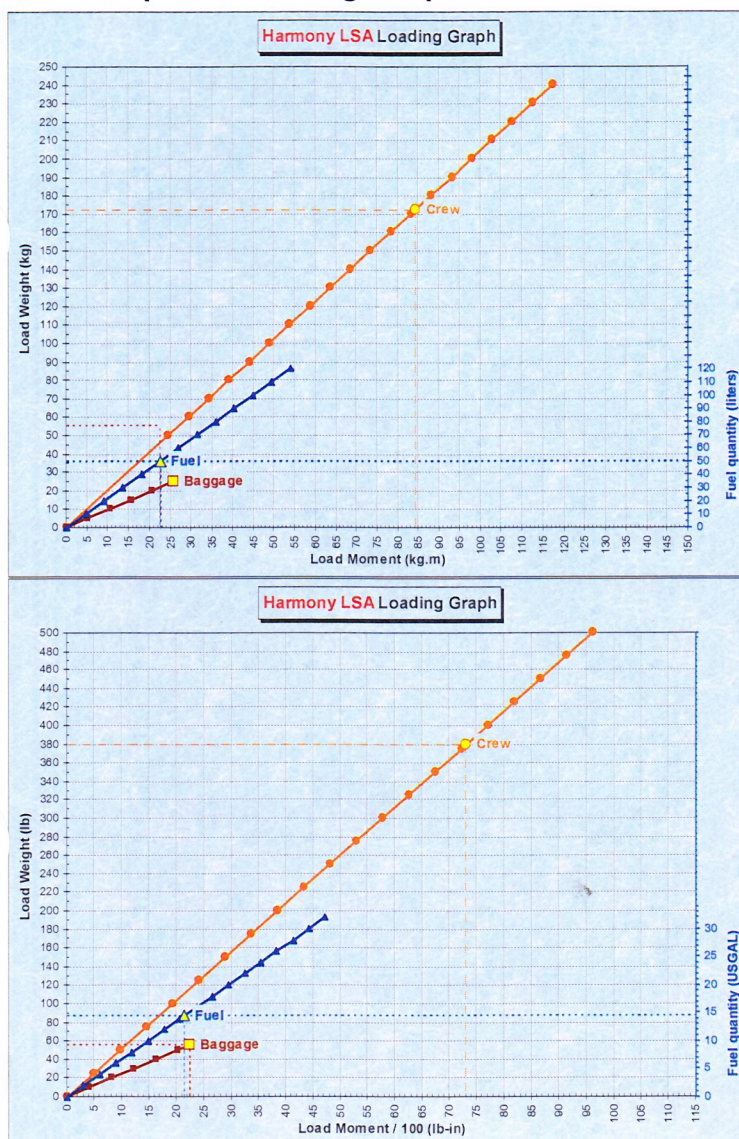
6.6 Table of Static Moments

CREW		BAGGAGE		FUEL		
Weight (kg)	Moment (kg.m)	Weight (kg)	Moment (kg.m)	Quantity (liters)	Weight (kg)	Moment (kg.m)
0	0,0	0	0,0	0,0	0,0	0,0
50	24,4	5	5,1	10,0	7,2	4,5
60	29,3	10	10,3	20,0	14,4	9,0
70	34,2	15	15,4	30,0	21,6	13,5
80	39,1	20	20,5	40,0	28,8	18,0
90	44,0	25	25,7	50,0	36,0	22,4
100	48,9			60,0	43,2	26,9
110	53,8			70,0	50,4	31,4
120	58,7			80,0	57,6	35,9
130	63,6			90,0	64,8	40,4
140	68,4			100,0	72,0	44,9
150	73,3			110,0	79,2	49,4
160	78,2			120,0	86,4	53,9
170	83,1					
180	88,0					
190	92,9					
200	97,8					
210	102,7					
220	107,5					
230	112,4					
240	117,3					

CREW		BAGGAGE		FUEL		
Weight (lb)	Moment/100 (lb-in)	Weight (lb)	Moment/100 (lb-in)	Quantity (USGal)	Weight (lb)	Moment/100 (lb-in)
0	0,0	0	0,0	0,0	0,0	0,0
25	4,8	10	4,0	2,0	12,0	2,9
50	9,6	20	8,1	4,0	24,0	5,9
75	14,4	30	12,1	6,0	36,1	8,8
100	19,2	40	16,2	8,0	48,1	11,8
125	24,1	50	20,2	10,0	60,1	14,7
150	28,9	55	22,2	12,0	72,1	17,7
175	33,7			14,0	84,1	20,6
200	38,5			16,0	96,1	23,6
225	43,3			18,0	108,2	26,5
250	48,1			20,0	120,2	29,5
275	52,9			22,0	132,2	32,4
300	57,7			24,0	144,2	35,4
325	62,5			26,0	156,2	38,3
350	67,4			28,0	168,2	41,3
375	72,2			30,0	180,3	44,2
400	77,0			32,0	192,3	47,2
425	81,8					
450	86,6					
475	91,4					
500	96,2					



6.7 Airplane Loading Graph

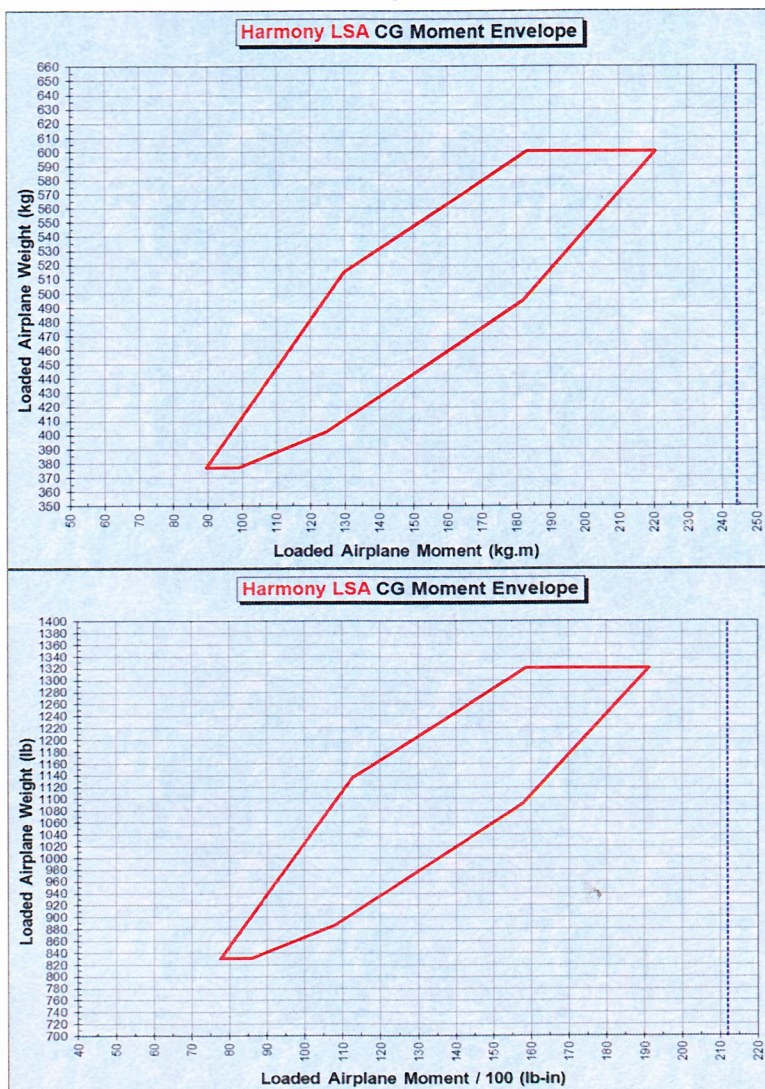


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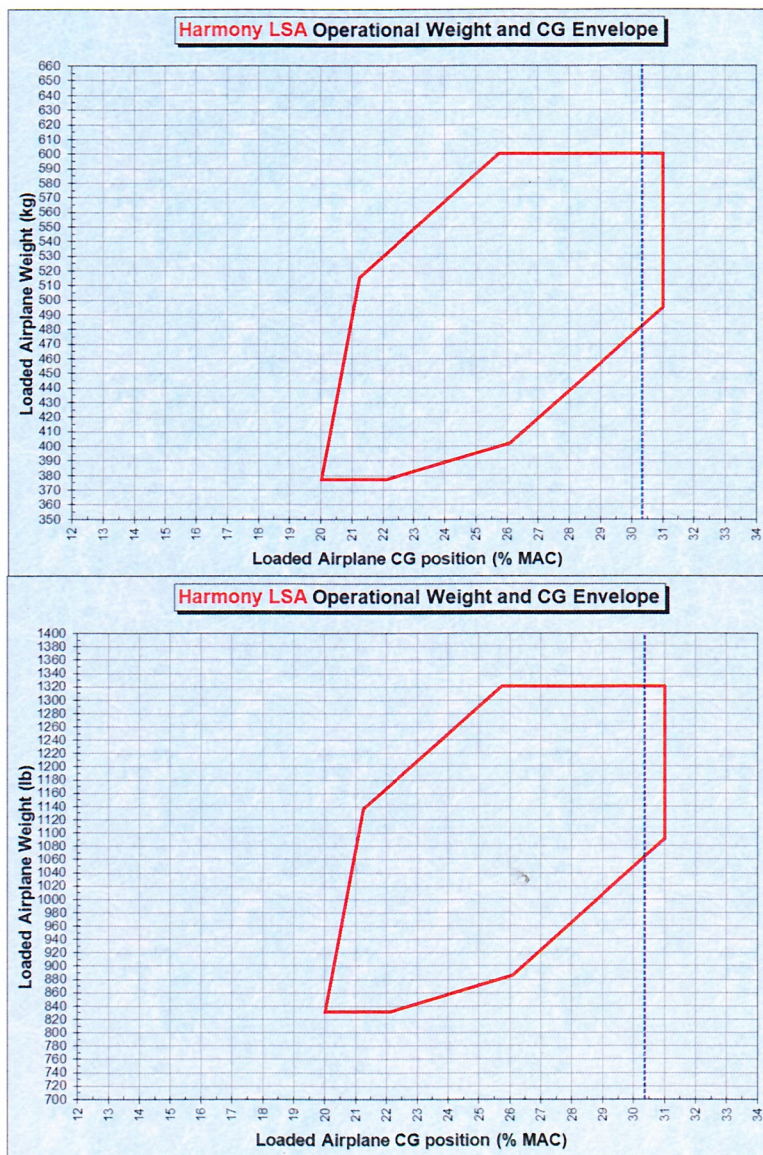


6.8 CG Moment Envelope





6.9 Operational Weight and CG Envelope





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6.10 Equipment List

The equipment installed in the airplane of particular serial number is shown in the following Equipment list.

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