

SECTION 6

**WEIGHT AND BALANCE /
EQUIPMENT LIST**

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6.1 GENERAL

This section provides information to determine the aircraft weight and center of gravity. The performance and flying characteristics of the SA 160 aircraft can only be achieved if it is flown within the approved weight and Center-of-Gravity (C of G) envelope. In addition, flight operation outside of the approved weight and C of G envelope will have a negative impact on the aircraft flight characteristics and represent a significant risk to the aircraft and its occupants.

WARNING !



It is the responsibility of the pilot in command to ensure the aircraft is loaded properly and operated within the prescribed weight and C of G envelope. Operation outside of the authorized weight and balance limitations could cause an accident to occur.

The following sections provide information on how to determine the aircraft weight and center of gravity for safe aircraft operation. Specific information regarding the weight, moment arm of installed equipment for the SA 160 can be found in the aircraft equipment list provided with the aircraft technical records at the time of aircraft delivery.

6.3 AIRCRAFT WEIGHING PROCEDURE

At the time of delivery, Symphony Aircraft Industries provides for each aircraft the basic empty weight and center of gravity location. This data is provided on the Weight and Balance Data Form shown in Figure (6.1). The removal or addition of equipment will affect the basic empty weight and center of gravity position. As such, a weight and balance amendment or a new aircraft weight and balance will need to be performed.

The following procedure must be followed prior to weighting the aircraft;

(a) Preparation

- (1) Verify the aircraft equipment against the provided equipment.. list to ensure that the list is complete and that all equipment is installed in its proper location.
- (2) Remove all foreign items from aircraft.
- (3) Defuel aircraft, drain all remaining fuel, and add the unusable fuel again. Refer for the proper procedure in the "SA 160 Maintenance Manual, "Chapter 12 SERVICING".
- (4) Remove excessive dirt or moisture.
- (5) Top up engine oil as required to the max. oil level (7,6 liter / 8qt).
- (6) Adjust the seats to the maximum forward position.
- (7) Retract the flaps completely.
- (8) Put all control surfaces in the neutral position.

CAUTION !



Whenever the fuel system is completely drained and fuel is replenished, it will be necessary to run the engine for a minimum of three (3) minutes at 1000 RPM in order to ensure that no air remains in the fuel supply lines

(b) Leveling

- (1) Place properly calibrated scales with the corresponding load-carrying capacity under each wheel.
- (2) Using the aircraft marking for longitudinal leveling shown in Figure (6.2) level the aircraft by changing the air pressure in the nose wheel tire to center the bubble on a spirit level.

(c) Weighing Aircraft Basic Empty Weight

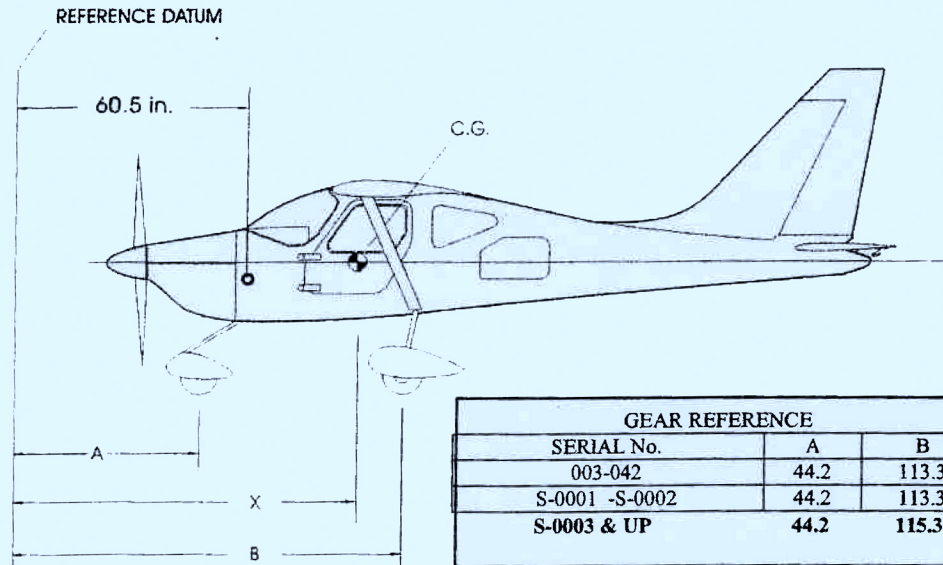
(1).With the airplane level and brakes released, record the weight shown on each scale. From the scale calibration data, deduct the tare weight, if any, from each reading. Enter values into the weight data form of Figure (6.1).

* The standard empty weight includes the required oil level (7.6 liters / 8 qt.) and 12 liters (3.1 US Gal.) unusable fuel.

AIRCRAFT WEIGHING FORM

MODEL SA 160	SERIAL NUMBER S-0015	REGISTRATION NUMBER N844SA	DATE 12/05/2006
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LEVELING DIAGRAM



AIRCRAFT AS WEIGHED

POSITION - SYMBOL	SCALE READING	SCALE ERROR	MOMENT ~ in-lbs
NOSE WHEEL -N	308.8 lbs	0	13648.96
RIGHT MAIN WHEEL -R	634.8 lbs	0	73192.44
LEFT MAIN WHEEL -L	654.8 lbs	0	75498.44
AIRCRAFT TOTAL	1598.4 lbs		162339.84

Empty Weight W_e
 $W_e = N + L + R$

Center of Gravity C of C_{we}
 $C \text{ or } G_{we} = \frac{N(A) + (R+L)(B)}{W_e}$

Empty Weight M_e ;
 $M_e = W_e \times C \text{ of } G_{we}$

BASIC EMPTY WEIGHT AND C. G.

ITEM	WEIGHT ~ lbs	C.G. ARM ~ in.	MOMENT ~ in-lbs
AS WEIGHED	1598.4 lbs		162339.84
BASIC EMPTY WEIGHT	1598.4 lbs	101.5 in.	162339.84

- The standard empty weight includes the required oil level (8 quarts) and 3.1 US Gal. unusable fuels.

Approved by: _____



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Quality Assurance

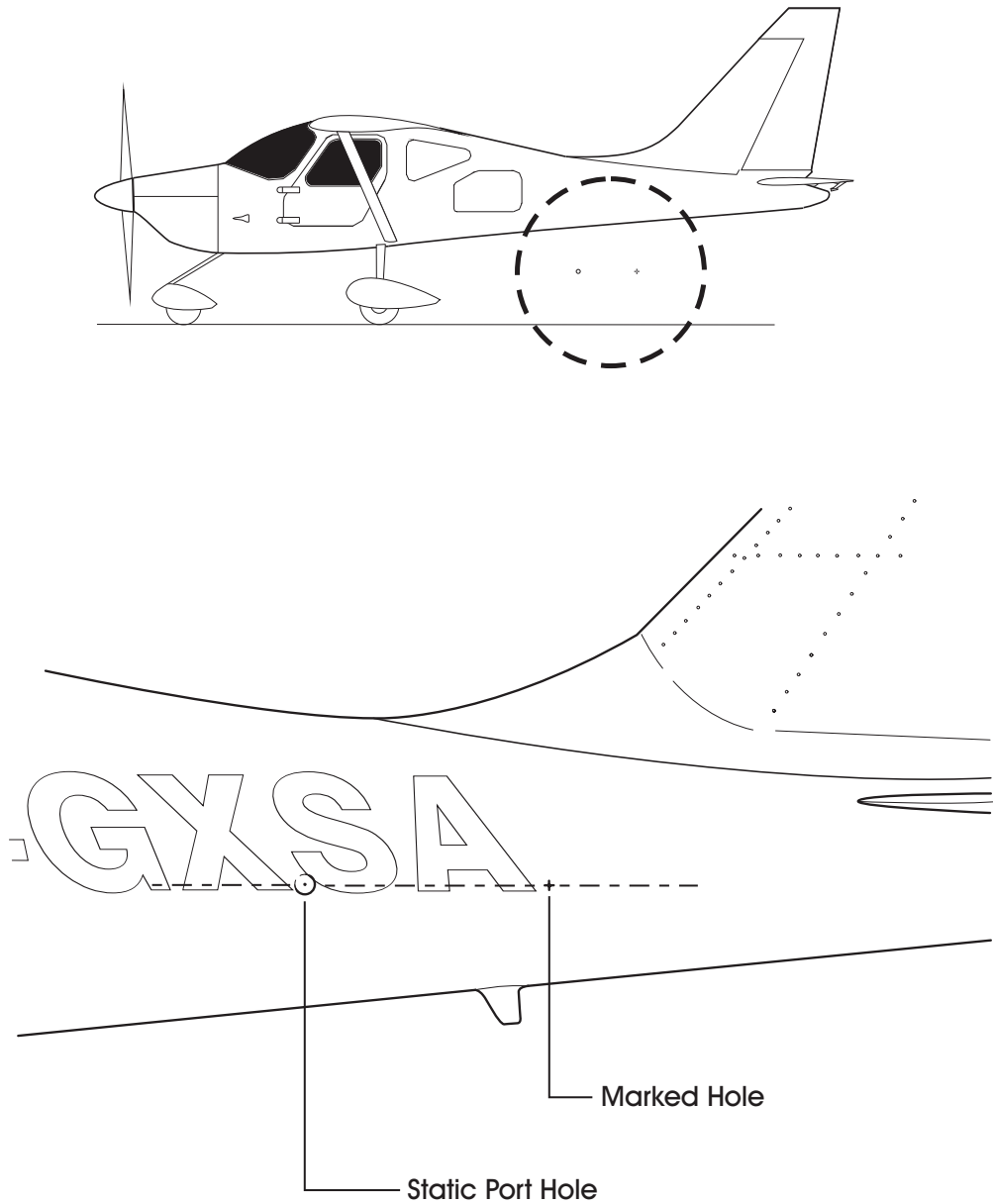


Figure 6-2
Markings for Aircraft Longitudinal Leveling

(d) Basic Empty Weight Center of Gravity

- (1) The basic empty weight W_e (as weighed including equipment noted in the equipment list, required oil level and unusable fuel) is given by:

$$W_e = N + L + R$$

where;

N = Nose wheel net weight (lbs)

R = Right main wheel net weight (lbs)

L = Left main wheel net weight (lbs)

- (2) The center of gravity C of G_{W_e} corresponding to the basic aircraft empty weight is given by;

$$C \text{ of } G_{W_e} = \frac{N(A) + (R+L)(B)}{W_e}$$

where;

A = Distance from nose wheel from reference datum 44.2 In.

B = Distance from right and left main wheel from reference datum 113.2 In.

- (3) The empty weight moment M_e corresponding to the basic aircraft empty weight and C of G_{W_e} is given by;

$$M_e = W_e \times C \text{ of } G_{W_e}$$

This data is provided for each SA 160 at time of delivery.

6.5 WEIGHT AND BALANCE DETERMINATION AND RECORD

The basic empty weight and center of gravity location data, as provided in the Aircraft Weight Form (See Figure 6.1) was determined when the aircraft was delivered at the factory. This information can be applied only to the specific aircraft serial number and registration number shown on the form.

The same values, basic empty weight, moment and C of G_{we} are listed in the first line of the Weight and Balance Record shown in Figure (6.3). This form is provided to track the current status of the aircraft basic empty weight after the addition of new equipment or aircraft modifications. Once completed this form provides the new basic weight information required for any in-flight loading calculation. The form also provides a complete history of all modifications, which affects weight or moment and is used to amend the basis empty weight and balance data.

6.7 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

The following procedure will enable the determination of the aircraft weight and C of G position for flight operation. The results obtained must be compared with the authorized weight and C of G envelope to ensure that the aircraft operation is within the prescribed limits. It is recommended that the SA 160 Weight and Balance Loading Form provided as Figure (6.4) be used to perform the calculation.

- (a) Enter the weight of all items to be loaded in the weights and balance loading form of Figure (6.4), and add each item to the basic empty weight. Write the aircraft total weight at the bottom of the table.

- (b) Determine the moment of all items to be carried by using the graph provided as Figure (6-5), or by multiplying the weight of each item by the moment arms provided in Figure (6.6). Enter the arm and moment data into the loading form. Add all resulting moment arm for each item to the empty weight moment. Write the aircraft total moment at the bottom of the table.
- (c) Divide the total moment by the total weight to determine the aircraft new C of G location
- (d) In (a) and (c) plot the weight and C of G values on the graph "Weight and Moment Limits" provided as Figure (6.7), to ensure that the point falls within the envelope, and the intended weight and C of G loading is permissible.

WEIGHT AND BALANCE LOADING FORM

	WEIGHT lbs	ARM in.	MOMENT in-lbs/100
Basic Empty Weight			
Pilot and Passenger			
Fuel (Usable)			
Baggage 1			
Baggage 2			
Ramp Weight			
Fuel for Engine Start, Taxi and Runup			
Total Loaded Aircraft (T)			

Figure 6-4

LOADING GRAPH

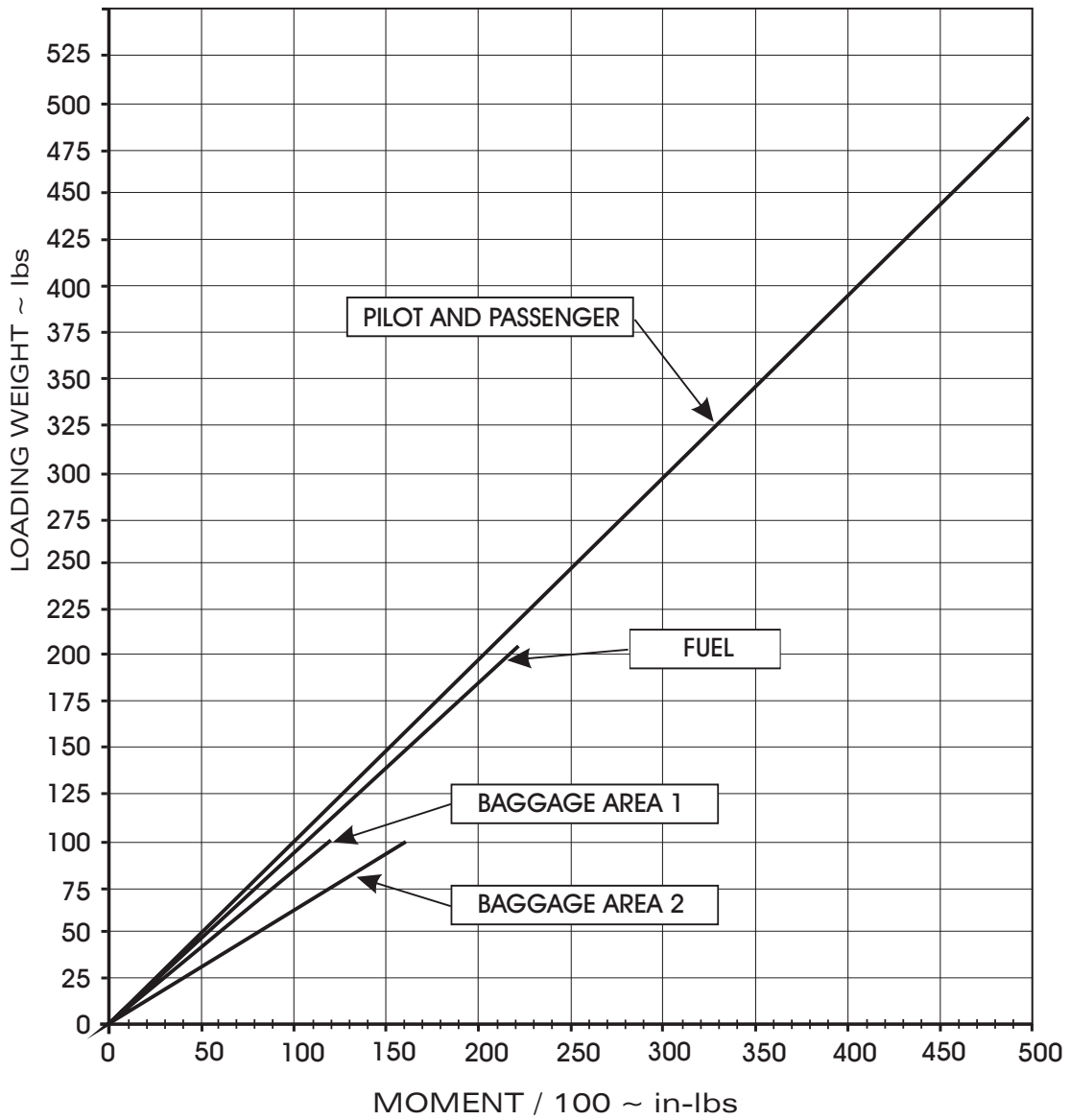


Figure 6-5

MOMENT ARM

ITEM	MOMENT ARM (in)
Pilot Passenger	101.2
Baggage #1	122.8
Baggage #2	159.1
Fuel (Usable)	107.4

Figure 6-6

WEIGHT AND MOMENT LIMITS

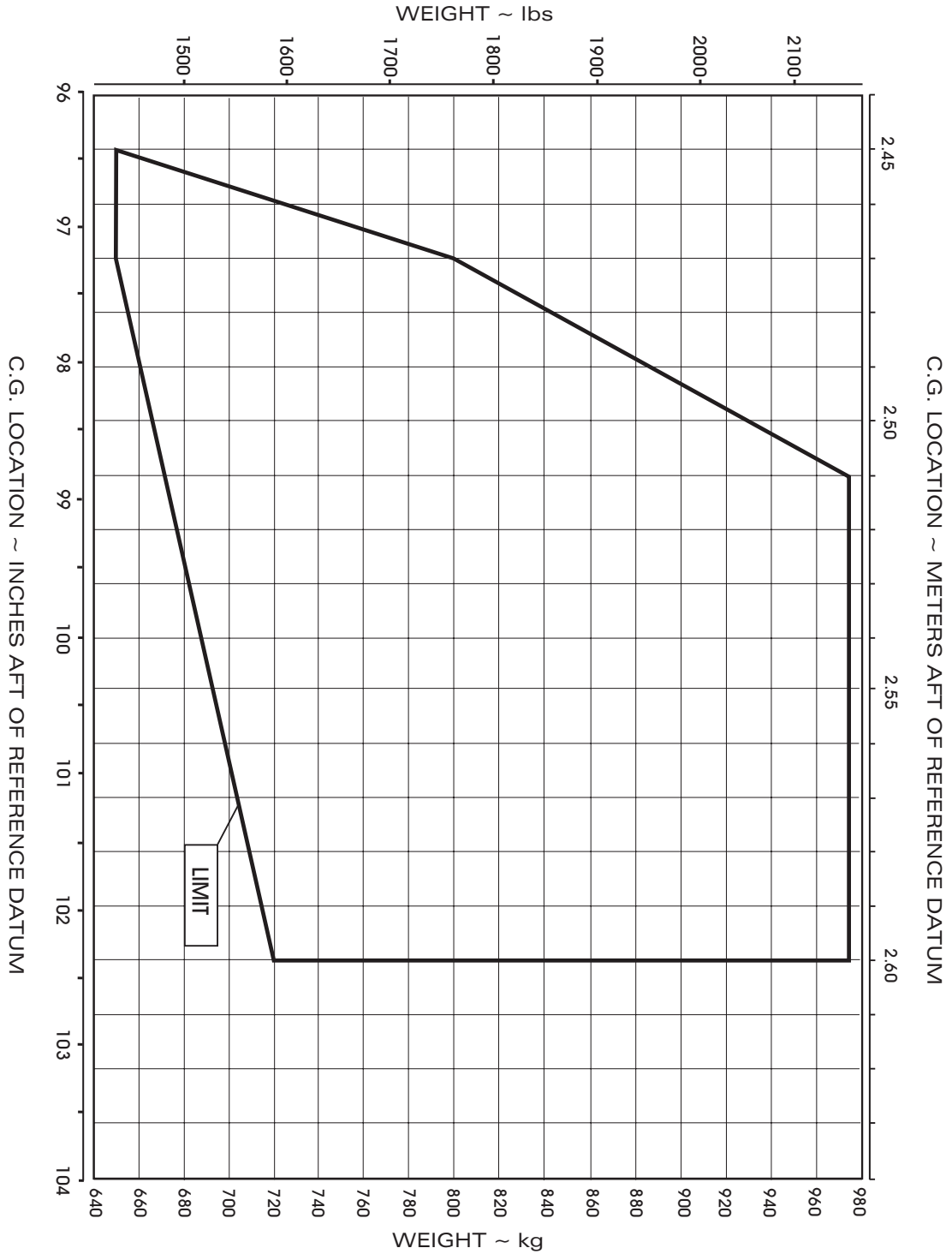


Figure 6-7

6.8 WEIGHT AND BALANCE EXAMPLE

The following example is provide as a guide for weight and balance calculation and does not reflect a specific aircraft. The weight and balance data specific to each aircraft must be performed before each flight.

Assuming the following basic data we have:

Basic empty weight :	1470 Lbs
Empty weight moment:	1449.32 in-lbs/100
C of G (Empty):	98.6inches

From the following aircraft loading information we have:

Pilot:	200 lbs
Passenger:	185 lbs
Baggage area #1:	60lbs t HE
Baggage area #2:	40lbs
Fuel:	20 USG

Using the Weight and Balance Loading Graph of Figure (6.4) and the data of Figures (6.5) and (6.6) we obtain the weight and balance data shown in Figure (6.8).

In the example the center of gravity location at take-off is found to be:

$$\begin{aligned} \text{C of G}_{\text{T/O}} &= 199510 \text{ in-lbs} / 1966. \text{ lbs} \\ &= 101.5 \text{ in} \end{aligned}$$

This point is found to be within the envelope of the graph “Weight and Moment Limits” of Figure (6.7). Hence one can find that it lies in the permissible range and therefore the planned loading is permissible.

WARNING !



The data provided in Figure (6.7) is provided in both inches/pounds and in meters/kilograms. One should ensure that consistent units are used throughout the calculation.

	WEIGHT lbs	ARM in.	MOMENT in-lbs/100
Basic Empty Weight	1470	98.6	1449.32
Pilot and Passenger	385	101.2	389.62
Fuel 30.1 Gallons Usable	120	107.4	128.08
Baggage 1	60	122.8	73.68
Baggage 2	40	159.1	63.64
Ramp Weight	2075	101.45	2105.14
Fuel for Engine Start, Taxi and Runup	-8.8	107.4	-9.45
Total Loaded Aircraft	2066.2	101.42	2095.65

Figure 6-8

6.9 EQUIPMENT LIST

The equipment list applicable to a particular aircraft serial number is included in the Serialized Equipment List is provided with the aircraft Technical Log at delivery.