

SECTION 6

WEIGHT AND BALANCE

6.1 GENERAL

In order to achieve the performance, safety and good flying characteristics which are designed into the airplane, it must be flown with the weight and center of gravity (C.G.) position within the approved operating range (envelope). Although the airplane offers a tremendous flexibility of loading, it cannot be flown with the maximum number of adult passengers, full fuel tanks and maximum baggage. With the flexibility comes responsibility. The pilot must ensure that the airplane is loaded within the loading envelope before he makes a takeoff.

Misloading carries consequences for any aircraft. An overloaded airplane will not take off, climb or cruise as well as a properly loaded one. The heavier the airplane is loaded, the less climb performance it will have.

Center of gravity is a determining factor in flight characteristics. If the C.G. is too far forward in any airplane, it may be difficult to rotate for takeoff or landing. If the C.G. is too far aft, the airplane may rotate prematurely on takeoff or tend to pitch up during climb. Longitudinal stability will be reduced. This can lead to inadvertent stalls and even spins; and spin recovery becomes more difficult as the center of gravity moves aft of the approved limit.

A properly loaded airplane, however, will perform as intended. This airplane is designed to provide excellent performance and safety within the flight envelope. Before the airplane is delivered, it is weighed, and a basic empty weight and C.G. location is computed (basic empty weight consists of the standard empty weight of the airplane plus the optional equipment). Using the basic empty weight and C.G. location, the pilot can easily determine the weight and C.G. position for the loaded airplane by computing the total weight and moment and then determining whether they are within the approved envelope.

The basic empty weight and C.G. location are recorded in the Aircraft Log Book, or the Weight and Balance Data Form (Figure 6-5) and the Weight and Balance Record (Figure 6-7). The current values should always be used. Whenever new equipment is added or any modification work is done, the mechanic responsible for the work is required to compute a new basic empty weight and C.G. position and to write these in the Aircraft Log Book and the Weight and Balance Record. The owner should make sure that it is done.

A weight and balance calculation can be helpful in determining how much fuel or baggage can be boarded so as to keep within allowable limits. Check calculations prior to adding fuel to insure against overloading.

The following pages are forms used in weighing an airplane in production and in computing basic empty weight, C.G. position, and useful load. Note that the useful load includes usable fuel, baggage, cargo and passengers. Following this is the method for computing takeoff weight and C.G.

6.3 AIRPLANE WEIGHING PROCEDURE

At the time of delivery, Piper Aircraft Corporation provides each airplane with the basic empty weight and center of gravity location. This data is supplied by Figure 6-5.

The removal or addition of equipment or airplane modifications can affect the basic empty weight and center of gravity. The following is a weighing procedure to determine this basic empty weight and center of gravity location:

(a) Preparation

- (1) Be certain that all items checked in the airplane equipment list are installed in the proper location in the airplane.
- (2) Remove excessive dirt, grease, moisture, foreign items such as rags and tools from the airplane before weighing.
- (3) Defuel airplane. Then open all fuel drains until all remaining fuel is drained. Operate engine on each tank until all undrainable fuel is used and engine stops. Then add the unusable fuel (4.0 gallons total, 2.0 gallons each wing).
- (4) Fill with oil to full capacity.
- (5) Place pilot and copilot seats in fourth (4th) notch, aft of forward position. Put flaps in the fully retracted position and all control surfaces in the neutral position. Tow bar should be in the proper location and all entrance and baggage doors closed.
- (6) Weigh the airplane inside a closed building to prevent errors in scale readings due to wind.

(b) Leveling

- (1) With airplane on scales, block main gear oleo pistons in the fully extended position.
- (2) Level airplane (refer to Figure 6-3) deflating nose wheel tire, to center bubble on level.

(c) Weighing - Airplane Basic Empty Weight

- (1) With the airplane level and brakes released, record the weight shown on each scale. Deduct the tare, if any, from each reading.

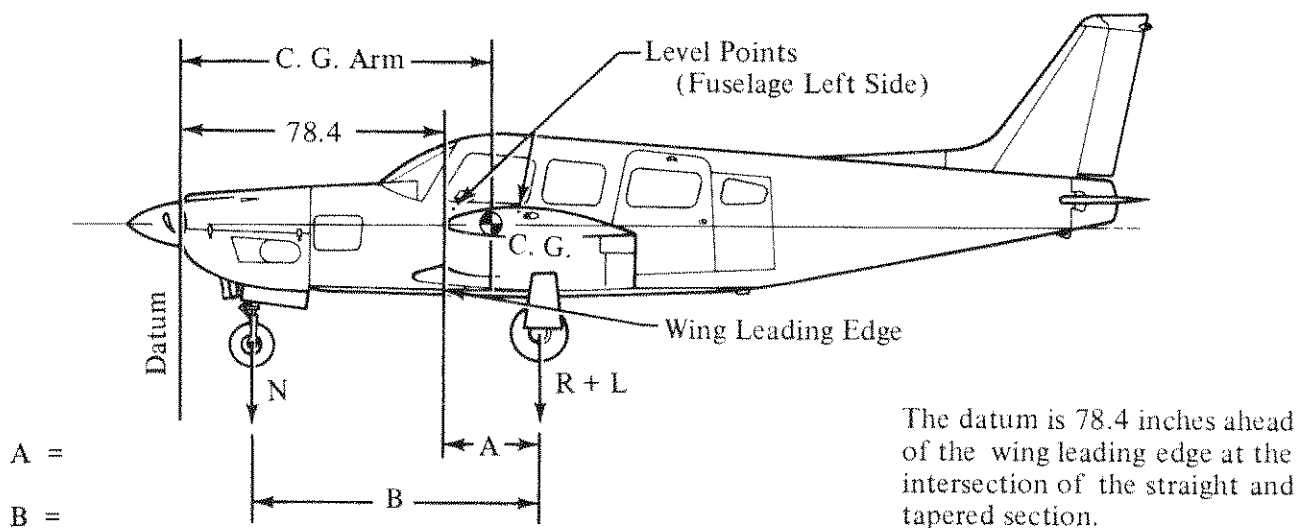
Scale Position and Symbol	Scale Reading	Tare	Net Weight
Nose Wheel (N)			
Right Main Wheel (R)			
Left Main Wheel (L)			
Basic Empty Weight, as Weighed (T)	— —	— —	

WEIGHING FORM

Figure 6-1

(d) Basic Empty Weight Center of Gravity

- (1) The following geometry applies to the PA-32R-300 airplane when it is level. Refer to Leveling paragraph 6.3 (b).



LEVELING DIAGRAM

Figure 6-3

6.3 - LOADING SYSTEM

Aeroplane Type : PIPER PA32R-300

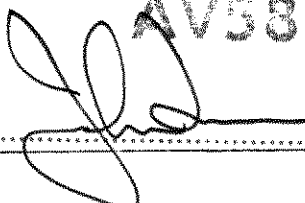
Registration Marking VH-... HMM

ISSUE	DATE
ONE TWO	23-10-88

LOAD AIRCRAFT USING LOAD-TRIM SHEET HJG/PA32R/001
ISSUE ONE.

OBSERVE FLIGHT MANUAL LIMITATIONS.

BASIC WEIGHT = 986 Kg.
BASIC INDEX = 210 units.

H. J. GREAVES
WEIGHT CONTROL OFFICER
Approval Stamp
DEPARTMENT OF TRANSPORT
AV58


HJG/PA32R/001

ISSUE 1
23-10-88

BASIC INDEX

160 200 240 280 320 360 400

BASIC WEIGHT

975

FRONT PAX (77kg/DIV)

154

CENT PAX (77kg/DIV)

154

REAR PAX (77kg/DIV)

77

FWD BAGG (40kg/DIV)

AFT BAGG (20kg/DIV)

20

FUEL (20 kg/DIV)

120

TAKE-OFF WEIGHT

1500

FUEL BURN

60

LANDING WEIGHT

1440

PIPER PA32R

LOAD-TRIM SHEET

H.J.GREAVES
21 OZONE ROAD
BAYSWATER,
VIC. 3155

CENTRE OF GRAVITY MUST FALL WITHIN ENVELOPE FOR T/O & LANDING

900kg

1100kg

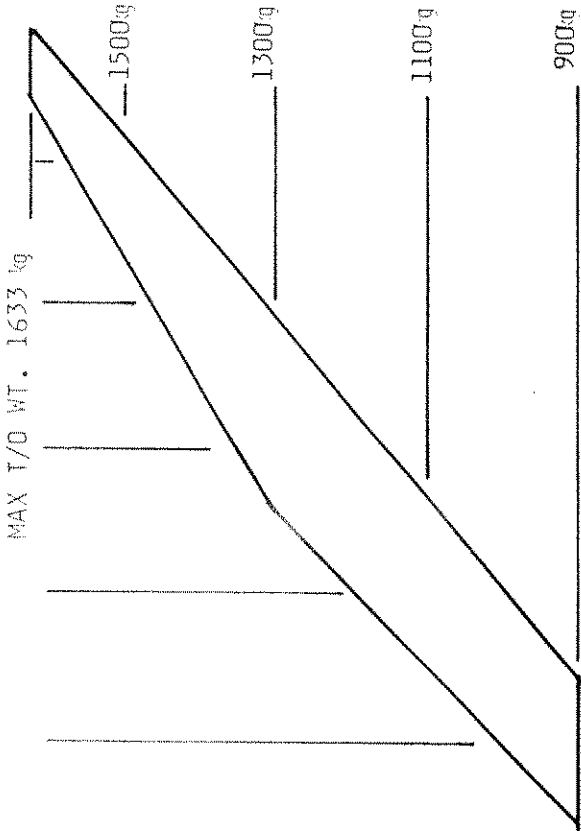
1300kg

MAX T/O WT. 1633 kg

1500kg

LAND * T/O

BASIC WEIGHT	<div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div></div>
FRONT PAX (77kg/DIV)	<div><div></div><div></div><div></div><div></div></div> <div>▲</div>	<div><div></div><div></div><div></div><div></div></div>
CENT PAX (77kg/DIV)	<div><div></div><div></div><div></div><div></div></div> <div>▲</div>	<div><div></div><div></div><div></div><div></div></div>
REAR PAX (77kg/DIV)	<div><div></div><div></div><div></div><div></div></div> <div>▲</div>	<div><div></div><div></div><div></div><div></div></div>
FWD BAGG (40kg/DIV)	<div><div></div><div></div><div></div><div></div></div> <div>▲</div>	<div><div></div><div></div><div></div><div></div></div>
AFT BAGG (20kg/DIV)	<div><div></div><div></div><div></div><div></div></div> <div>▲</div>	<div><div></div><div></div><div></div><div></div></div>
FUEL (20 kg/DIV)	<div><div></div><div></div><div></div><div></div></div> <div>▲</div>	<div><div></div><div></div><div></div><div></div></div>
TAKE-OFF WEIGHT	<div><div></div><div></div><div></div><div></div></div>	
FUEL BURN	<div><div></div><div></div><div></div><div></div></div>	
LANDING WEIGHT	<div><div></div><div></div><div></div><div></div></div>	



CENTRE OF GRAVITY MUST FALL WITHIN ENVELOPE FOR T/O & LANDING

PIPER PA32R

LOAD-TRIM SHEET

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