GOVERNMENT OF INDIA

OFFICE OF THE DIRECTOR GENERAL OF CIVIL AVIATION

TECHNICAL CENTRE, OPP. SAFDARJUNG AIRPORT, NEW DELHI-110 003

CIVIL AVIATION REQUIREMENTS

SECTION 2 - AIRWORTHINESS

SERIES 'X' PART- II

14TH MAY, 1993 EFFECTIVE: FORTHWITH

File No. 11-690/X-II/CAR/07/AI(2)

Subject : **Weight and Balance Control of Aircraft.**

1. INTRODUCTION :

Rule 58 of Aircraft Rules, 1937 requires that every aircraft shall be weighed and its centre of gravity determined. This CAR lays down the frequency of weighment and preparation of weight schedule and also the requirement about display or carriage of the weight schedule on board besides the manner of distribution and securing the load in the aircraft.

2. DEFINITIONS :

2.1 Empty Weight : Means the measured or computed weight of an aircraft, excluding the weight of all removable equipment and other items of disposable load, but including the weight of all items of fixed operating equipment or other equipment which are mandatory for all operations like fixed ballast, engine coolant, hydraulic fluid and fuel and oil quantities (both trapped and unusable) in the aircraft and engine system.

2.2 Limits of Centre of Gravity : Means the most forward and most rearward Centre of Gravity position within which an aircraft may be operated safely. These limits are specified in Certificate of Airworthiness/Flight Manual of an aircraft.

2.3 Maximum Take-off Weight : Means the maximum weight, according to its Certificate of Airworthiness or Flight Manual, at which an aircraft is permitted to take-off.

2.4 Removable Equipment : Means items of equipment which are carried on some of or on all flights, but which are not included in Empty weight and which are not mandatory for the type of operation being conducted.

3. INITIAL WEIGHMENT :

3.1 Every aircraft shall be weighed before the issue of Certificate of Airworthiness. In case a new aircraft is imported from outside the country, weight schedules issued by the manufacturer or the previous operator weight schedule based on the manufacturer's certificated weight and balance documents would be acceptable.

4. Requirements for Reweighing of an Aircraft of Maximum Take-off weight (MTOW) less than 2000 kg.

4.1 Aircraft weighing less than 2000 kg. need not be reweighed on routine basis, unless it is required to be reweighed in accordance with para 4.3 of this CAR.

4.2 **Requirements for Reweighing Aircraft of Maximum Take-off weight (MTOW) more than 2000 kg.**

Aircraft weighing more than 2000 kg. shall be re-weighed every five years unless it is required to be re-weighed in accordance with para 4.3 of this CAR. However operators may approach Regional Airworthiness Offices (through the Sub-Regional Airworthiness Offices, as applicable) for an adhoc extension of the weighment period of an aircraft by a maximum of 3 months to tide over the operational exigencies. Such requests for extension may be agreed upon by Regional Airworthiness Office, if satisfied with the reasons advanced by the operator for his request. Extension of weighment beyond 3 months may be granted by Director of Airworthiness of the concerned region under intimation to Headquarters promptly.

4.3 **Requirements for Reweighing after major Repair/ Alterations:**

An aircraft shall be required to be reweighed if it has undergone major repair, or major alteration or there has been major change in the interior arrangement of pilot/pax/cargo compartments which affect already determined weight and balance data and which cannot be accurately computed without fresh weighment. Decision of the DGCA whether the aircraft requires reweighing after major repair/ alteration, or change in interior arrangement, shall be final.

4.4 The renewal of the Certificate of Airworthiness of an aircraft shall be subjected to following of the requirements of para 4.

4. Director General of Civil Aviation may require the reweighment of an aircraft at any time if he considers it necessary.

5. **FORM OF WEIGHT SCHEDULE :**

After the aircraft has been weighed as required, the following persons shall prepare

the weight Schedule.

(i) A person specifically approved by DGCA for the purpose in any organization.

OR

(ii) A person specifically approved by Quality Manager in an organization approved under CAR 145 provided procedure for grant of such approval is documented in Maintenance Organization Exposition.

OR

(iii) A Category "B" licensed AME as reflected in item no XIV (a) Annexure to the CAR-66 licence (privileges inherited from the AME licence held prior to CAR-66 licence).

The Weight Schedule shall contain at least the following information :-

(i) Type of Aircraft.
(ii) Registration Marking and Serial No. of aircraft.
(iii) Empty weight including weight of unusable quantity of fuel and oil (kg.).
(iv) Item wise Weight and details of removable equipment (kg.) (Including wireless equipment).
(v) Maximum fuel capacity (Usable) in liters and kg.
(vi) Maximum oil capacity (Usable) in liters and kg.
(vii) Maximum commercial weight with fuel and oil tanks full.
(viii) MTOW (as per Certificate of Airworthiness/ Flight Manual) (kg.).
(xi) Empty weight Centre of Gravity.
(xii) Centre of Gravity Range and datum.
(xiii) Maximum number of passengers.
(xiv) Signature of appropriately licensed AME/ Approved person.
(xv) Date of weighment.

7. APPROVAL BY AIRWORTHINESS OFFICE :

The Regional/Sub-regional Airworthiness office shall be intimated in advance about the weighing of the aircraft who may associate with the weighing process. The weighing of the aircraft shall be done in supervision of the Quality Manager or his representative, who shall be responsible for following the documented procedures of weighment. The duly signed weight schedule shall be submitted to Regional /Sub-Regional Airworthiness Office along with the computation details and weighment printout if available. After scrutiny the weight schedule shall be approved by Regional Airworthiness Office.

8. DISPLAY OR CARRIAGE IN THE AIRCRAFT AND PRESERVATION OF RECORDS :

A copy of the approved weight schedule must be displayed at a suitable and prominent place. When carried on board it should be easily accessible to the crew/authorized person. All persons concerned directly with the loading of the aircraft shall be duly informed of the various weight figures for exercising proper weight and balance control of the aircraft. A copy of the weight schedule must be retained along with other documents of the aircraft or in the aircraft log book, till it is replaced by a fresh weight schedule.

9. COMPUTATION OF CENTRE OF GRAVITY:

9.1 For all flights, it shall be the responsibility of the Pilot-in-Command to ensure that the aircraft is satisfactorily loaded with respect to the total load, the distribution of the load and proper securing of the load in aircraft (lashing of the load). The distribution of the load shall be such that the C.G. position will remain within the specified limits at the time of take off, during the progress of the flight and at the time of landing.

9.2 In the case of scheduled operator, the responsibility for loading, lashing and computing C.G. position, for take-off and landing phases of flight as stated in the previous paragraph may be delegated to a person nominated by the operator, who is specifically trained and authorised (by the operator) for the purpose. However, Centre of Gravity position computed by the nominated person shall be signed and dated by him and the same shall be submitted to the Pilot-in-Command of the aircraft for his scrutiny and acceptance; the acceptance would be denoted by the pilot by affixing the dated signature.

9.3 In case a method other than the "direct calculating method" for the purpose of computing C.G. is employed, the same shall be submitted to the Regional Airworthiness Office for approval before adoption.

9.4 Every operator including scheduled, non-scheduled, State Government and private aircraft operator shall prepare load and trim sheet for aircraft where the manufacturer has provided necessary documentation for the purpose. The load and trim sheet shall indicate the composition and the distribution of the total load carried on board the aircraft as well as the calculated C.G. position for "take-off and landing" configurations before the commencement of the flight. Such load sheets shall be prepared and signed by the Pilot-in-Command or persons duly trained in accordance with CAR Section 8 Series 'D' Part I and responsible for supervising the loading of aircraft. In case the load and trim sheet is prepared by a person other than the Pilot-in-Command, the same shall be submitted to the Pilot for his scrutiny and signatures before the commencement of the flight. One copy of the load sheet shall be carried on board the aircraft and one copy shall be retained by the operator for record purposes for a period of altleast four months from the date of issue.

10. STANDARD WEIGHT OF FLIGHT CREW/ PASSENGERS:

10.1 For preparation of load sheet and calculation of Centre of Gravity as mentioned in para 9.4 above, the minimum standard weight (including handbag) as given below, shall be applied in all civil registered aircraft:

1.	Crew	85 (75+10) kg.
2.	Adult passenger (both Male & Female)	75 kg.
3.	Child (Between 2 years and 12 years age)	35 kg.
4.	Infant (Less than two years)	10 kg.

10.2 Notwithstanding para 10.1, the actual weight of the passenger could be considered for aircraft MTOW upto 2000 kg provided the arrangement for passenger weighment with sufficient accuracy is ensured.

11. CALIBRATION OF WEIGHING SCALES:

11.1 The weighing scales used for the purpose of weighment of passenger baggage, goods etc. shall be calibrated at specified intervals to the satisfaction of the Quality Manager/ DGCA. The Quality Manager is required to bring this requirement to the notice of the concerned persons for compliance.

11.2 The weighing scales used for the purpose of weighment of aircraft shall be calibrated at specified intervals.This requirement may be reflected in the Maintenance Organisation Exposition.

12. INSTRUCTIONS FOR SAFE LOADING:

12.1 Specific seats shall be allotted to all passengers boarding at originating stations of flights so that centre of gravity of the aircraft can be calculated accurately and the C.G. is kept within the permissible limits.

12.2 During loading, it must be ensured that aircraft cabin floor loading limitations are not exceeded.

12.3 The load must be securely tied so that there is no possibility of the load shifting in flight and disturbing the calculated C.G. position.

12.4 The load must be tied at the specified places provided in the aircraft and the tying ropes must be of sufficient strength to withstand the loads imposed on it in flight.

12.5 While placing cargo in the passenger cabin during mixed version(passenger cum freight) operation, the load must be placed ahead of the passengers in the cabin, the load must not block "emergency exit" meant to be used by the passengers

during " emergencies ".

13. OBSERVANCE OF SAFETY INSTRUCTIONS:

The safety instructions required to be observed, as detailed in para 9, 10 and 12 above, shall be observed by Pilot-in-Command of non-scheduled operators, aerial work aircraft operators including flying clubs and private aircraft operators.

In the case of scheduled operators, a comprehensive manual (Weight and Balance Manual) shall be prepared describing the safety requirements of para 9, 10 and 12 for compliance by the concerned staff.

Sd/-
(Charan Dass)
Joint Director General of Civil Aviation
for Director General of Civil Aviation