KINGDOM OF BAHRAIN
Ministry of Transportation
and Telecommunications

مملكة البحرين
وزارة المواصلات والاتصالات

CIVIL AVIATION PUBLICATION

CAP 37

AIRCRAFT WEIGHT (MASS) & BALANCE (CENTRE OF GRAVITY)

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REVISION RECORD

CAP 37 AIRCRAFT WEIGHT (MASS) & BALANCE (CENTRE OF GRAVITY)

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List of Effective Pages

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Appendices

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WEIGHT (MASS) & BALANCE (CENTRE OF GRAVITY)

1. PROVISIONS

The Annex 6, Part I, Chapter 5 and Annex 6, Part III, Section II, Chapter 3 and ICAO DOC 9760 require that aeroplanes and helicopters be operated in accordance with a comprehensive and detailed code of performance in compliance with the applicable standards including mass limitations and centre of gravity limitations as specified in the aircraft flight manual. To satisfy this requirement, operators are required to develop and maintain a mass and balance programme.
Article 40 of the Civil Aviation Law 14 of 2013 requires that "When issuing or rendering valid a Certificate of Airworthiness of an aircraft, the Civil Aviation Authorities shall ensure, that the weight of the aircraft, and the location of its Centre of Gravity have been established, at such times, and in such a manner, as required by these Authorities." And

Article 37 of the Civil Aviation Law 14 of 2013 requires that the operator of the aircraft prepare a weight schedule showing the Basic Weight and Centre-of-Gravity (C of G) of the aircraft, i.e. Weight and Centre of Gravity Schedule. In the case of aircraft not exceeding 5700 kg Maximum Takeoff Weight Authorized (MTWA), the Weight and Centre-of-Gravity Schedule may take the form of a Loading and Distribution Schedule.

ANTR-OPS Subpart J stipulates the requirements and the manner in which the weight & balance the same required to be controlled.

ANTR M, M.A.301/M.A.305/M.A.708/M.A.901, requires preparation of mass and balance statement as part of continuing airworthiness management and its report to form part of continuing airworthiness records.

Note: The terminology "Weight & Balance" / "Mass & Centre of Gravity" / Weight (mass) & Balance (C.G) are one and the same used in this CAP.

2. INTRODUCTION

The primary purpose of aircraft mass and balance control is safety. A secondary purpose is to achieve the utmost in efficiency during operation of the aircraft. Improper loading reduces the efficiency of operating an aircraft and can be the cause of a failure to start or complete a flight. The empty mass and corresponding centre of gravity of all civil aircraft is determined at the time of initial certification. The condition of the aircraft at the time of determining empty mass and centre of gravity should be one that is well defined and can be easily repeated.
The obligations are vested with the CAMO for compliance with the weight & balance and weighing requirement as stipulated in ANTR M. As & when the aircraft weighed as required by the maintenance programme or following repair / modification / painting and weight & balance prepared by the CAMO, BCAA will ensure the standards for acceptance.

A Weighing Record containing records of the weighing and the calculations involved should be made available to BCAA. This Weighing Record must be acceptable to the operator considering the experience and competence of the organisation carrying out weighment and the serviceability and accuracy of the weighing equipment.

The Aircraft Weighment, Weighing Report preparation and Weight and Balance Schedule preparation shall be performed by a person specifically authorized by either BCAA or the Quality Manager of the organization approved under ANTR M after having completed the required training for the said purpose, and procedure for grant of such approval is documented in Continuing Airworthiness Organization Exposition.

The persons requiring authorization for weighment, preparing weighing report and Weight & Balance Schedule preparation shall undergo Weigh & Balance course conducted by the manufacturer or an organization acceptable to BCAA.

The Weight and Balance Schedule are accepted by BCAA.

A Weight and Balance Schedule details the Basic Weight and C.G position of the aircraft, the weight and lever arms of the various items of load including, fuel oil and other fluids.

The procedure for weight and balance control shall be documented in the CAME and /or the CAME Procedures Manual acceptable to BCAA.

3. DEFINITIONS

(a) 'Design landing mass' means the maximum mass of the aircraft at which, for structural design purposes, it is assumed that it will be planned to land. The maximum permissible total aircraft mass upon landing under normal circumstances.

(b) 'Design take-off mass' means the maximum mass at which the aircraft, for structural design purposes, is assumed to be planned to be at the start of the take-off run. The maximum permissible total aircraft mass at the start of the take-off run.

(c) 'Maximum Total Weight Authorised (MTWA)' means the Maximum Total Weight Authorised for the aircraft and its contents, at which the aircraft may take off anywhere in the world, in the most favourable circumstances in accordance with the Certificate of Airworthiness or Flight Manual.

(d) '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.

Note: The terminologies, 'Design take-off mass', 'Maximum Total Weight Authorised (MTWA)'and 'Maximum Take-off Weight' (2, 3 & 4 above) by practice might be used by the industry differently, but the meaning it represents are one and the same.

(e) 'Design taxiing mass' means the maximum mass of the aircraft at which structural provision is made for load liable to occur during use of the aircraft on the ground prior to the start of take-off

(f) 'Maximum Mass' means the maximum certificated take-off mass.

Note: The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

(g) 'Basic Weight' means the weight of the aircraft and all its Basic Equipment, plus that of the declared quantity of unusable fuel and unusable oil. In the case of turbine engine aircraft and aircraft with a Maximum Total Weight Authorised (MTWA) of which does not exceed 5700 kg (12 500 lb), it may also include the weight of usable oil.

(h) '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.

(i) 'Basic Equipment' means the equipment and the un-consumable fluids (e.g. coolant and hydraulic fluid) which is common to all roles for which the operator intends to use the aircraft.

(j) 'Disposable Load' means the weight of all persons and items of load, including fuel and other consumable fluids, carried in the aircraft, other than the Basic Equipment and Variable Load.

Note: To obtain the total loaded weight it is necessary to add to the Basic Weight the weights of those Variable and Disposable Load items which are to be carried for the particular role for which the aircraft is to be used.

(k) 'Dry Operating Mass' means the total mass of the aircraft ready for a specific type of operation excluding all usable fuel and traffic load. This mass includes items such as crew and crew baggage; catering and removable passenger service equipment; and potable water and lavatory chemicals.

(l) 'Maximum Zero Fuel Mass' means the maximum permissible mass of an aircraft with no usable fuel. The mass of the fuel contained in particular tanks must be included in the zero-fuel mass when it is explicitly mentioned in the Aircraft Flight Manual limitations.

(m) 'Variable Load' means the weight of the crew, of items such as the crew's baggage, removable units, and other equipment the carriage of which depends upon the role for which the operator intends to use the aircraft for the particular flight.

(n) '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.

(o) 'Removable Equipment' means the 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.

(p) 'Weight (Mass) & Balance (C.G) Schedule' means the document prepared in respect of an individual aircraft to provide basic weight and center of gravity information for loading that aircraft.

Note 1: *Mass is the amount of matter or substance that makes up an object.*

Note 2: *Weight is the Gravitational force with which the Earth attracts the masses towards its center.*

Note 3: *Maintain the unit of measurement (Metric Unit of Measurements or Imperial Unit of Measurememts) throughout the fleet and on all documents related to the Weight & Balance. Operator may introduce provision for mentioning both systems of unit of measurement, however, system should be designed such that the mixing of such system in any single document is avoided.*

4. WEIGHING REQUIREMENT

The mass and centre of gravity of aircraft should be determined prior to the initial issuance of the Certificate of Airworthiness. In certain cases, an updated determination of mass and centre of gravity may not be required prior to the issuance of a Certificate of Airworthiness such as newly manufactured aircraft where the determination of mass and centre of gravity has been previously determined by the manufacturer and recorded. Another example where an aircraft may not require re-weighing pending issuance of a Certificate of Airworthiness is the importation of an aircraft where the aircraft has been previously weighed prior to importation with any changes to mass computed and recorded in the mass and balance report. Mass and balance control provides mathematical proof that the aircraft's mass and balance are within limits. Mass and balance information can be obtained from the aircraft specifications, aircraft operation limitations, aircraft flight manual and mass and balance report. The removal or addition of equipment affects the aircraft's empty mass and centre of gravity limits, and mass calculations are necessary to ensure the changes are within the aircraft's mass and balance limits.
The accumulated effects of modifications and repairs on the mass and balance must be accounted for and properly documented. Furthermore, aeroplanes must be reweighed if the effect of modifications on the mass and balance is not accurately known.

The applicant for the issuance or renewal of the Certificate of Airworthiness should be required to provide the current mass and balance report of the aircraft to the State of Registry. The mass and balance report is normally obtained by weighing. If the changes in mass and balance are negligible, computed and recorded, the accurate mass may continue to be obtained by calculation from the previous aircraft weighing. A sample of a mass and balance report is referenced in Appendix A to this chapter. Mass and balance records should be complete, current and maintain a continuous record of changes of empty mass, arm and empty centre of gravity limits for each aircraft. The mass and balance record should contain details of all modifications affecting either the mass or balance of the aircraft.

5. WEIGHING INTERVALS

(a) prior to initial entry into service; and

(b) thereafter at intervals of 4 years if individual aircraft masses are used; and

(c) 9 years if fleet masses are used.

6. PERIODIC DETERMINATION OF MASS

(a) General

Over a period of time and use an aircraft will have a tendency to gain mass because of the accumulation of dirt, grease and oil in areas of the aircraft not readily accessible for washing and cleaning. Other reasons include the repainting of aircraft, installation of new equipment and accomplishment of modifications and repairs. The mass gained in any given period of time will depend on the function of the aircraft, its hours in flight, atmospheric conditions, the type of landing fields the aircraft operates from and their operating environment. For this reason, periodic aircraft weighing is desirable and usually required by their national regulations for operators. Operators are subject to standards that require their aircraft to be properly loaded and not to exceed the mass and balance limitations during operations. Therefore, operators normally require mass and balance instructions and periodic determinations of mass and balance to ensure safe and efficient operations. The aircraft should be re-weighed at periods determined by the BCAA or as stipulated in the national regulations. Re-weighing of the aircraft is dependent on several factors: the date of last weighing, history of the aircraft or embodiment of modifications. Consultation with the BCAA is recommended if clarification is needed on re-weighing based on the history of the aircraft or incorporation of modifications.
The common changes that occur during the life of the aircraft are caused by repairs and modifications. The air operator is responsible for ensuring the mass and balance records are updated whenever a change occurs to the aircraft mass and balance. The operator is responsible for monitoring the weight growth of the aircraft through a systematic and documented manner acceptable to BCAA and the revision to the Weight (mass) & Balance (C.G) Schedule applied when the weight and / or the C.G position exceeds the limits given below.
Further to the provisions above, if the BCAA or the operator is of the opinion that adequate mass control has not been exercised over an aircraft during the modification, the BCAA may require that a new empty mass and empty centre of gravity position be determined for the aircraft.

(b) Individual Aircraft Weighing Method

The weight / mass of the aircraft is determined periodically either by

(i) Weighing or

(ii) Calculation, if the operator is able to provide the necessary justification to prove the validity of the method of calculation chosen, whenever the cumulative changes to the dry operating mass exceed ± 0·5% of the maximum landing mass or the cumulative change in CG position exceeds 0·5% of the mean aerodynamic chord.

(c) Fleet Aircraft Weighing Method

(1) For a fleet of the same model and configuration, an average operational fleet mass may be utilized if the operating mass and centre of gravity (CG) position are within established limits acceptable to the BCAA.

(2) The following fleet weighing method is one of the means to establish an operator's fleet empty mass and CG. The operator should consult with the BCAA before establishing how many aircraft should be weighed in each weighing cycle. An air operator's fleet empty mass may be determined by weighing aircraft according to the following criteria:

i) for aircraft fleets of one to three aircraft, weigh all aircraft;

ii) for fleets of four to nine aircraft, weigh three aircraft plus at least 50 per cent of the number of aircraft greater than three; and

iii) for fleets of more than nine aircraft, weigh six aircraft plus at least 10 per cent of the number of aircraft greater than nine.

(3) The aircraft in the fleet having the longest time since last weighing should be selected. Thereafter a rotation programme should be incorporated to ensure all aircraft in the fleet will be weighed periodically. Reestablishment of the air operator's empty fleet mass or operating fleet mass and CG may be accomplished by calculation based on the current empty mass and CG or weighing of aircraft at periodic intervals as approved by the BCAA.

(i) For a fleet or group of aeroplanes of the same model and configuration, an average dry operating mass and CG position may be used as the fleet mass and CG position, provided that the dry operating masses and CG positions of the individual aeroplanes meet the tolerances specified in sub-paragraph (ii) below.

Furthermore, the criteria specified in sub-paragraphs (iii), (iv) and (c)(4) below are applicable.

(ii) Tolerances

(A) If the dry operating mass of any aeroplane weighed, or the calculated dry operating mass of any aeroplane of a fleet, varies by more than ±0·5% of the maximum structural landing mass from the established dry operating fleet mass or the CG position varies by more than ±0·5 % of the mean aero-dynamic chord from the fleet CG, that aeroplane shall be omitted from that fleet. Separate fleets may be established, each with differing fleet mean masses.

(B) In cases where the aeroplane mass is within the dry operating fleet mass tolerance but its CG position falls outside the permitted fleet tolerance, the aeroplane may still be operated under the applicable dry operating fleet mass but with an individual CG position.

(C) If an individual aeroplane has, when compared with other aeroplanes of the fleet, a physical, accurately accountable difference (e.g. galley or seat configuration), that causes exceedance of the fleet tolerances, this aeroplane may be maintained in the fleet provided that appropriate corrections are applied to the mass and/or CG position for that aeroplane.

(D) Aeroplanes for which no mean aerodynamic chord has been published must be operated with their individual mass and CG position values or must be subjected to a special study and approval.

(iii) Use of fleet values

(A) After the weighing of an aeroplane, or if any change occurs in the aeroplane equipment or configuration, the operator must verify that this aeroplane falls within the tolerances specified in sub-paragraph (c)(2)(ii) above.

(B) Aeroplanes which have not been weighed since the last fleet mass evaluation can still be kept in a fleet operated with fleet values, provided that the individual values are revised by computation and stay within the tolerances defined in sub-paragraph (c)(2)(ii) above. If these individual values no longer fall within the permitted tolerances, the operator must either determine new fleet values fulfilling the conditions of sub-paragraphs (c)(2)(i) and (c)(2)(ii) above, or operate the aeroplanes not falling within the limits with their individual values.

(C) To add an aeroplane to a fleet operated with fleet values, the operator must verify by weighing or computation that its actual values fall within the tolerances specified in sub-paragraph (c)(2)(ii) above.

(iv) To comply with sub-paragraph (c)new (2)(i) above, the fleet values must be updated at least at the end of each fleet mass evaluation.

(4) Number of aeroplanes to be weighed to obtain fleet values

(i) If ‘n’ is the number of aeroplanes in the fleet using fleet values, the operator must at least weigh, in the period between two fleet mass evaluations, a certain number of aeroplanes defined in the

Table below:

For fleets of—	**An operator must weigh (at minimum)—**
1 to 3 aircraft	All aircraft
4 to 9 aircraft	3 aircraft, plus at least 50 percent of the number of aircraft greater than 3
More than 9 aircraft	6 aircraft, plus at least 10 percent of the number of aircraft greater than 9

(ii) In choosing the aeroplanes to be weighed, aeroplanes in the fleet which have not been weighed for the longest time shall be selected.

(iii) The interval between 2 fleet mass evaluations must not exceed 48 months.

7. PROCEDURES FOR DETERMINING MASS

(a) Aircraft mass determination should be performed by a person authorized to perform weighment, weighing report preparation and mass & balance calculations on behalf of the air operator or aircraft owner. Aircraft should be prepared for mass determination in accordance with manufacturer's instructions.

(b) Two independent determinations should be made, and the aircraft longitudinal datum line should be horizontal. The load should be completely removed from the weighing equipment between determinations. The aircraft gross masses as determined by the two measurements should be consistent. If not, the measurements should be repeated until the gross masses, as determined by two consecutive and independent measurements, are consistent.

(c) Prior to the initial issue of a Certificate of Airworthiness for each aircraft, a list of equipment included in the empty mass should be established. If an operating mass is used, a similar list of removable equipment and disposable load included in the operating mass should also be established. Where a change occurs in the items included in either the empty mass or, if applicable, the operating mass of an aircraft, the appropriate list should be amended by the operator.

(d) Normal precautions, consistent with good practices in the mass determination procedures, should be taken, such as:

i) aircraft and equipment should be checked for completeness in accordance with the preceding paragraph,
ii) fluids should be properly accounted for,
iii) mass determination should be carried out in a closed building, to avoid the effect of wind and
iv) the scales used should be properly calibrated and used in accordance with the manufacturer's instructions.

(e) Any equipment used for weighing must be properly calibrated, zeroed, and used in accordance with the manufacturer's instructions. Each scale must be calibrated either by the manufacturer, or by an appropriately authorised organisation within 2 years or within a time period defined by the manufacturer of the weighing equipment, whichever is early.

(f) Since a certain model of weighing equipment is used for initial and periodic weighing of aeroplanes of widely different mass classes, one single accuracy criterion for weighing equipment cannot be given. However, the weighing accuracy is considered satisfactory if the following accuracy criteria are met by the individual scales/cells of the weighing equipment used:

(i) For a scale/cell load below 2 000 kg – an accuracy of ± 1%;

(ii) For a scale/cell load from 2 000 kg to 20 000 kg – an accuracy of ± 20 kg; and

(iii) For a scale/cell load above 20 000 kg – an accuracy of ± 0·1 %.

(g) An aircraft weight and balance report should be completed and certified by an authorized person signing the report. Data recorded should be sufficient to enable the empty mass and empty mass centre of gravity position to be accurately determined.

(h) The empty weight and empty weight centre of gravity position should be determined by the person determined in the preceding paragraph or operator of the aircraft in accordance with the recorded results of the measurements.

8. WEIGHT AND BALANCE REPORT

The Weight and Balance Report is intended to record the essential loading data to enable a particular aircraft to be correctly loaded, and to include sufficient information for an operator to produce written loading instructions in accordance with the provisions of the ANTR-OPS, Subpart J. The Weight and Balance Report applies to the aircraft in the condition in which it is to be delivered from the manufacturer to the operator. The Weight and Balance Report must include the following items:

(a) Reference number and date.

(b) Designation, manufacturer's number, nationality and registration marks of the aircraft.

(c) A copy of the Weighing Record.

(d) A copy of the Weight and Balance Schedule including the Basic Equipment List if this is separate from Part A of the Schedule. The contents of the weight Schedule is given below.

(e) A diagram and a description of the datum points which are used for weighing and loading, and an explanation of the relationship of these points to the fuselage frame numbering systems and, where applicable, to the Standard Mean Chord (SMC).

Note: SMC is also referred to as the Mean Aerodynamic Chord (MAC).

(f) Information on the lever arms appropriate to items of Disposable Load. This will include the lever arms of fuel, oil and other consumable fluids or substances in the various tanks (including agricultural material in hoppers), which, if necessary, should be shown by means of diagrams or graphs, lever arms of all passengers in seats appropriate to the various seating layout, mean lever arms of the various baggage holds or compartments.

(g) Details of any significant effect on the aircraft c.g., of any change in configuration, such as retraction of the landing gear.

The format of the Weight & Balance Report is attached as Appendix -A

9. WEIGHT & BALANCE SCHEDULE

Operators shall prepare the Weight & Balance Schedule adhering to the procedures enumerated above and forward the same to BCAA for acceptance.

Operators must also issue a revised Weight and Balance Schedule when it is known that the weight and/or C.G has changed in excess of the maximum figure in the previously accepted value by BCAA.

If the aircraft has not been physically re-weighed, the revised Weight and Centre-of-Gravity Schedule must state that it has been calculated on the basis of the last Weight and Balance Report and the known weight and C.G changes. A record of the calculations involved should be retained for future reference.

10. CONTENTS OF THE WEIGHT & BALANCE SCHEDULE

A Weight and Balance Schedule details the Basic Weight and C.G position of the aircraft.

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 Authorized person by CAMO / Operator.
(xv) Date of weighment.
(xvi) Reference number of the Weight and Balance Report & Date of report, or other acceptable information upon which the Schedule is based.

A sample of the Weight & Balance Schedule is attached as Appendix B.

11. DOCUMENTATION

A copy of the Weight & Balance Schedule is retained by the operator with a copy sent to BCAA and includes any related list of Basic Equipment.

Aircraft not exceeding 5,700 kg (12,500 lb) MTWA, a copy of the Weight & Balance Schedule must be included in the Flight Manual.

The Weight & Balance Schedule must be displayed or retained in a stowage which is identified in the aircraft. A similar arrangement is often used for larger types of aircraft.

All records of the weighing, including the calculations involved, must be available to BCAA. The records are retained by the aircraft manufacturer, overhauler or operator, and when the aircraft is weighed again, the previous weighing records must not be destroyed but retained with the aircraft records. Operators must maintain records of all known weight and C.G changes which occur after the aircraft has been last weighed.

Copies of any documentation received by BCAA should be placed in the aircraft file.

12. LOAD & TRIM SHEET - COMPUTATION OF CENTRE OF GRAVITY

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.

2. 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.

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 BCAA for acceptance before adoption.

4. Every 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, authorised 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 acceptable to BCAA.

5. In the case where a method other than the manual calculating method for the purpose of computing C.G. (Load & Trim Sheet preparation for each flight) is employed, the same shall be submitted to the BCAA for acceptance before adoption.

Terminology used for representing the load on the aircraft and its location and the trim required to be applied on the aircraft may be either “Load & Trim Sheet” or “Load Sheet” and may differ operator to operator.
The Sample of a Load & Trim sheet attached as Appendix-D for reference purpose. The operator may choose to use the customized format best suitable for their systems & operation.

13. WEIGHT & BALANCE SCHEDULE ACCEPTANCE PROCEDURE

The Weight & Balance Schedule prepared by the operator / CAMO is submitted along with the checklist (attached as Appendix – C). The Checklist is reviewed by the BCAA inspector for its correctness & completeness.
The Acceptance of the Weight Schedule is communicated to the operator once it meets the requirements.

14. RECORD KEEPING

All records pertaining to approval of weight Schedule (for all configuration) and their subsequent approvals shall be maintained by the operator for the period mentioned under the continuing airworthiness requirement. All records must be accessible to the BCAA.

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Appendix 1

Sample Weight & Balance Report

Mass Control Certificate

Date issued . . . . . .

Aircraft mass and centre of gravity determination

Date of Weighing: _____

Aircraft registration: _____

Aircraft type: _____

Aircraft serial number: _____

Name of operator: _____

Place of determination of mass: _____

Reason for determination of mass: _____

Empty Weight (Mass) of the Aircraft: ----------
Empty Weight (Mass) C.G of the Aircraft ----------aft of datum
Empty Weight (Mass) Index ----------

Weighing Operation Performed by (Name, Authorisation No.) ----------
Weighing Report Prepared by (Name, Authorisation No.) ----------
Weighing Report Checked by (Name, Authorisation No.) ----------

Note 1: The Weight & Balance report given here is a sample. Operators may devise a format suitable for their system maintaining the intent of this sample format.
Note 2: The units of measurement may be as being used by the operator

Empty Weight lever arms

Reaction (wheel, jack, point, etc.)	*Average scale reading (kg)*	*ARM (cm)*	*Moment (cm-kg)*
Left main gear:			
Right main gear			
Sub-total			
Nose/tail gear			
Total (as measured)			

Items included in empty mass:

1. .....
2. …….
3. ……
4. ……
5. ……

Note: items can either be listed in a separate sheet and attached to this form or refer the document wherein the complete equipment is listed.

Remarks:

Weighing Report Prepared by (Name, Authorisation No.) ----------

Aircraft Weight and Balance Determination

COLUMN I			
Items included but not part of empty mass	Mass (kg)	ARM (cm)	Moment (cm-kg)
TOTAL			

COLUMN II			
Items included but not part of empty mass	Mass (kg)	ARM (cm)	Moment (cm-kg)
TOTAL			

Aircraft mass record

Description	Net mass (kg)	ARM (cm)	Moment (cm-kg)
Total (as measured)			
Less total Wt. / mass from Column I			
Plus total Wt. / mass from Column II			
Net empty Weight / mass			

Forward C.G ……..cm from datum line
Aft C/G ……..cm from datum line
Index Formula:

Index:

Appendix 2

Note: The format is for the sample purpose, Operator may device a suitable format to suit their exiting format / system. However, the Weight Schedule shall contain all parameters mentioned hereunder.

Sample of the Weight & Balance Schedule

Weight & Balance Schedule		
Aircraft Type:	**Regn. No.:**	**Aircraft MSN.:**

Sl. No.	Description	Weight in Kg. / Lbs.
A	**Aircraft Empty Weight:** The weight may include the items listed under ……(Specify the document title. If any item required in addition to the referred document, list out such additional equipment)	
B	**Weight of Removable Equipment:** (Items that are required to conduct any flight. Mandatory equipment need not be included. Aircraft items that may be removed for certain types of operation may be specified.)	
C	**Summary of Weight & Balance**	
1	Maximum All Up Weight / Maximum take off weight (MTOW) (Refer to…….)	
2	Weight of Crew members + Baggage (85 Kg per crew) (…. Crew + … Cabin attendants)	
3	Maximum Usable Fuel Quantity (……. Ltrs) (Sp. Gravity = ...kg/l)	
4	Maximum Pay Load with fuel tanks full [D1-(A+B+C2+C3)]	
5	Maximum Zero Fuel Weight (MZFW)	
6	Maximum Aircraft Landing Weight (MLW)	
7	Maximum Number of Passengers	
8	Datum is located at ……. meters forward of …….	
9	Empty Weight CG ……. meters aft of datum. (C G =..... % MAC)	
10	C.G Range: FWD Limit: ……. % MAC; Flight Manual Section Reference: …… AFT Limit: ……. % MAC; Flight Manual Section Reference: ……	

Prepared by	Name: Designation: Authorisation No. Signature with Date:	**Accepted by**	BCAA Inspector Name: Designation: Signature with Date:

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Appendix 3

Sample Checklist for Weight & Balance Schedule Acceptance

Note: The checklist describes the minimum requirement for the purpose of acceptance by BCAA. Operators may develop more extensive checklist to suit their conditions.

Details of the Operator / CAMO

Name of the Operator	
Name of the authorized person(s) for Weighment, Preparation of Weighing Report and Weight & Balance Schedule	
Weight Schedule prepared based on	Weighment / Computation
Date of Previous Weighing	
Date of present Weighing	
Type of Aircraft	
Registration Number of the Aircraft	

Sl. No.	Item of Verification	SAT / UNSAT	Operator / CAMO comments	BCAA Comments
1	Is the specific Weight and Balance Manual and its latest Revision available?			
2	Is the initial Weighing Report available?			
3	Is the weighing carried out by the authorized person			
4	Is the weighing facility adequate in terms of closed hanger, weighing equipment and other supporting facility as required by the manufacturer recommended weighing procedures			
5	Is the weighing equipment calibrated as per the operator and / or the equipment manufacturer. Give the details of calibration of each such equipment			
6	Is the weighing procedure documented and approved by their quality department			
7	Are the Weight Growth system records and data available and its input applied since last weighing / re-computation			
8	Is the aircraft configuration			

	confirmation carried out before weighing			
9	Has the aircraft weighed with all required / documented / equipment & fluids forming part of their Empty Weight / Dry Operating Weight / Basic Weight as applicable.			
10	Confirm each independent weighing are recorded to ensure the determination of accurate weighing data.			

Enclosure:

1. Weight & Balance Manual
2. Weighing Report

Weight & Balance computation Carried out by:

Authorisation Number: **Signature:**

BCAA Purpose

Recommendation:

Name of the Inspector Reviewed:

Signature of the Inspector with Date:

Signature of the Chief of Airworthiness with Date:

Appendix 4
Sample format of Load & Trim Sheet

Note: The format is purely for the sample purpose only, Operator may device a suitable format to suit their exiting format / system.