CHAPTER 6

Approval of Operator's Mass and Balance Control Programme

1.0 PURPOSE

This Chapter provides guidance for evaluating an operator/applicant's mass and balance control programme/procedures.

2.0 REFERENCES

3.1 Regulations 8.6.2.17 and 8.6.2.18 of the Nigeria Civil Aviation Regulations, and Regulation 9.3.1.16 of the Nigeria Civil Aviation Regulations Regulations;

3.2 NCAA-AC-AWS016

3.3 ICAO Doc 9760.

3.4 CHECKLIST: CL:O-OPS006

3.0 GENERAL

3.1 Approved mass and balance control procedures are the only means for an operator/applicant to authorize the use of other than known mass for crew, passengers, baggage, or cargo. The mass and balance control programme, including loading schedules and charts, are approved on operations specifications (OpSpecs) by an Airworthiness Inspector (AWI). This programme must be included in the operator/applicant's policies and procedures manual.

3.2 The operator/applicant may develop and submit for approval any method or procedure by which he can show that an aircraft -

3.2.1 Is properly loaded according to approved configuration (loading schedules or charts);

3.2.2 Will not exceed authorized mass and balance limitations during all ground and flight operations;

3.2.3 Will be periodically reweighed and its data re- evaluated; and

3.2.4 Will have its data recalculated, if changes necessitate.
The operator/applicant's mass and balance control procedures may either be an independently controlled document which includes all the instructions and procedures for maintenance, operations, and baggage/cargo control, or it may be included in the manual.

4.0 USE OF KILOGRAM AS THE UNIT OF MASS

4.1 In accordance with ICAO Annex 5 and the International System of Units (SI), the actual and limiting masses of aircraft, the payload and its constituent elements, the fuel load, etc are expressed in the Civil Aviation Regulations in kilogram as the unit of mass. However, in many approved Flight Manuals and other operational documentation, these quantities are published as weights in pounds in accordance with the common language.

4.2 Guidance on the application of the SI in Annex 5 to the Convention on International Civil Aviation states -

4.2.1 In common use, the term weightǁ nearly always means massǁ, thus when one speaks of a person‘s weight, the quantity referred to is mass;

4.2.2 In science and technology, the term weight has usually meant the force that, if applied to the body, would give it acceleration equal to the local acceleration of free fall. Thus, because weight is a force which is a mass time acceleration, due to gravity, a person‘s weight is conditional on his location, but mass is not;

4.2.3 Since weight is a force, in the SI system its unit of measurement is the Newton.

4.3 In common use, the term weight nearly always means mass. In the SI system, where kilogram is used it properly expresses mass. For example maximum authorized takeoff weight of 5700 kgǁ, should more properly be expressed asmaximum takeoff mass of 5700 kgǁ.

5.0 ESTABLISHED MASS AND CENTRE OF GRAVITY (CG) LIMITS

5.1 During type certification, the aircraft manufacturer must flight test mass and balance under all conditions and establish centre of gravity limits. An operator must ensure that during any phase of operation, the loading, mass and CG of the aircraft comply with the limitations specified in the aeroplane flight manual or helicopter flight manual as applicable or the operations manual if more restrictive.

5.2 If an operator/applicant proposes an unusual or complex mass and balance programme, or a programme substantially different from the Approved Aircraft Flight Manual or Pilot Operating Handbook, engineering assistance may have to be requested.

6.0 LOADING PROCEDURES

6.1 Use of Average Passenger Mass

Under Regulation 9.3.1.16 of the Nigeria Civil Aviation Regulations, an operator may use either approved standard average mass or actual mass for passengers, carry-on baggage and checked baggage and actual mass for cargo.

6.2 Determination of Actual Passenger Mass - Actual passenger mass may be determined by:

6.2.1 Scale weighing of each passenger prior to boarding the aircraft, including handbags carried on

board by the passenger; or

6.2.2 Asking each passenger his mass and adding to it a predetermined constant to provide for handbags and clothing. This constant may be approved for an operator on the basis of studies performed by the operator that consider particular routes and seasonal variations, when applicable. Personnel listing passengers on this basis should receive instructions for estimating passenger mass to reasonably confirm their accuracy.

6.3 **Carry-On Baggage** - Procedures must be provided for controlling carry-on baggage. Such procedures must include the following:

6.4 Carry-on baggage must be limited to articles that may be placed in an overhead compartment or under seats. No article may be placed in an overhead compartment that causes the mass limit of the compartment to be exceeded;
Carry-on baggage mass must either be accounted for in the same manner as checked baggage or be added to the passenger mass.

7.0 CARRY-ON BAGGAGE WHERE CARRY-ON STOWAGE SPACE IS LIMITED

7.1 An operator of aircraft with limited carry-on baggage stowage space should develop for approval by the Civil Aviation Authority, a programme that identifies how the operator would accurately identify what is carry-on baggage and what is checked baggage.

7.2 This programme should clearly explain how the operator would handle passengers who have two pieces of carry-on baggage.

8.0 AIRCRAFT MASS - WEIGHING OF AIRCRAFT

8.1 Further determination of mass, subsequent to the initial determination of the aircraft mass, should be carried out, at such times and in such manner as the Authority may require or approve.

8.2 An operator/applicant may use a contractor to weigh items required to be weighed. However, the operator/applicant is responsible for ensuring the contractor complies with the operator/applicant‘s approved mass and balance control programme. This includes ensuring scales are calibrated and tested in accordance with the operator/applicant‘s policies and procedures manual. Scales used to weigh passengers, aircraft, cargo, and baggage must be calibrated according to the national Authority responsible for weights and measures standards.

9.0 PROCEDURES

9.1 **Coordinate with the Operator/Applicant.** The operator/applicant must submit the following for review:

9.1.1 Manual or revision;

9.1.2 Mass and Balance Programme document (if not part of a manual);

9.1.3 Pertinent operator procedures;

9.1.4 Instructions for completing forms used in aircraft mass control and aircraft loading; and

9.1.5 Mathematical justification for loading provisions or schedules.

9.2 Review the Operator/Applicant's Manual/Programme Document. The AWI will coordinate with the FOI in the review of the manual which must include procedures, levels of authority, and information appropriate to the Regulations. In addition, the following must be included:

9.2.1 Manual introduction, to include:

a) Description of the philosophy and the goals of the manual;
b) Description of the division of contents between volumes, if more than one volume; and
c) List of effective pages, including dates.

9.2.2 Manual revision and distribution procedures, to ensure:

a) Current information is provided to all manual holders; and
b) Manuals are available to maintenance, operations, and ground personnel and are furnished to the Authority.

9.2.3 Definitions of all significant terms used in the programme. The definitions must reflect their intended use and include any acronyms or abbreviations unique to the manual;

9.2.4 Description of the organizational unit responsible for the control and maintenance of the mass and balance programme, to include:

a) Definitions of lines of authority; and
b) Description of the support structure.

9.2.5 Job descriptions for all elements;

9.2.6 Training programmes that include the following:

a) Maintenance personnel;
b) Operations and dispatch personnel; and
c) Ground handling personnel.

9.2.7 A means of documenting and retaining individual training records;

9.2.8 Procedures for:

a) Determining standards and schedules for calibration of aircraft scales;
b) Pre-weighing instructions and requirements;
c) Determining which aircraft are to be weighed.
d) Establishing and maintaining equipment lists for each aircraft;

e) Recording the type and serial number for each scale used, airplane mass, residual fluids, and scale tare mass;
f) Initial weighing of aircraft;
g) Monitoring and adjusting individual aircraft or fleet, empty mass, and CG;
h) Periodic reweighing of aircraft (Ensuring aircraft are configured in accordance with approved data;

9.2.9 A loading schedule consisting of graphs/tables or a special loading schedule for a calculator or computerized programme. These schedules must ensure that pertinent data is available concerning all probable mass and balance conditions of the aircraft;

9.2.10 Load documentation meeting the requirements of Regulations 8.6.2.17 and 8.6.2.18 of the Nigeria Civil Aviation Regulations, in which all required loading information shall be entered by personnel responsible for mass and balance control, including procedures for:

a) Completing the load manifest;
b) Ensuring load manifest is carried on the aircraft;
c) Retaining the load manifest for the time periods specified in the Nigeria Civil Aviation Regulations;
d) Distribution of the load manifest in accordance with the Nigeria Civil Aviation Regulations;

9.2.11 Procedures to be used by crew members, cargo handlers, and other personnel concerned with aircraft loading, for the following:

a) Distribution of passengers;
b) Distribution of fuel;
c) Distribution of cargo;
d) Verification and acceptance of actual cargo mass as listed on a bill of lading;
e) Restriction of passenger movement during flight, if applicable;
f) Dangerous goods requirements, if applicable;

9.2.12 A drawing of each cargo and/or passenger configuration to include emergency equipment locations;

9.2.13 Mathematical justification for loading provisions or schedules. This may be included under separate cover and not as part of the operator manual;

9.2.14 An alternate procedure for allowing manual computations, if a computerized mass and balance programme is utilized curn;

9.2.15 Procedures for a mass range system, if applicable, that ensures:

a) The range is typical of passengers carried on similar operations;
b) Computations for critical load considerations support the ranges;
c) Personnel responsible for loading the aircraft are required to prepare appropriate loading records;
d) The system includes methods for loading passengers whose mass are outside the range; and
e) |Loading records indicate the number of passengers within the stated range and account for passengers that do not fall within the range;

9.2.16 A system for loading non-standard mass groups, such as athletic squads or military groups and their baggage, which must utilize actual mass for both passengers and baggage;

9.2.17 Procedures to verify actual mass of cargo;

9.2.18 Standards and schedules for calibration of commercial scales used to determine baggage/cargo mass;

9.2.19 Procedures to ensure that carry-on baggage is limited to articles which may be placed in overhead compartments or under seats. Carry-on baggage mass must be accounted for in the same manner as checked baggage or added to the average passenger mass.

9.3 Review the Operator/Applicant's Operations Specifications. The AWI will review the draft Operations Specifications (OpSpecs) to ensure that it includes the following:

9.3.1 Aircraft make/model/series;

9.3.2 Type of loading schedule;

9.3.3 Loading schedule instructions for;

9.3.4 Mass and balance control procedures.
Note: The above items must be referenced by indicating the locations in the operator/applicant's manuals; e.g., volume, chapter.

9.4 Analyze the Results. Upon completion of review, analyze the results and determine whether the operator/ applicant's manual and operations specifications meet all requirements.

9.5 Meet With Operator/Applicant. Discuss any discrepancies with the operator/ applicant and advise what areas need corrective action.

10.0 RESULTS

10.1 After the review is completed the inspector will meet with the applicant or operator to discuss required Manual/programme document changes and recommendations to resolve discrepancies. This should be followed by a written notification:

10.1.1 If discrepancies are found:

a) The notice will be accompanied by a completed Activity Report listing specific discrepancies found and recommendations, outlining what will be required to correct the discrepancies; and

b) Treat re-submissions as revisions.

10.1.2 When the inspector is satisfied that the aircraft Manual/programme document meets the requirements:

a) Circle the –Apll block on the Activity report as approved and advise the Certification Project

Manager (CPM);

b) Return the original approved Manual/programme document to the applicant or operator accompanied by a letter of approval; and

c) Maintain a copy of the Manual/programme document at the Authority.

10.2 These same procedures will be followed when a to the original or approved Manual/programme document is received from the operator.