CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Advisory Circular
AC43-2

Revision 3

5 April 2025

Aircraft Empty Weight and Empty Weight Centre of Gravity—Forms CAA 2102 and CAA 2173

General

Civil Aviation Authority (CAA) advisory circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance** with the associated rule.

Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

Purpose

This AC describes an acceptable means of compliance with standards for the establishment and the calculation of an aircraft empty weight and empty weight centre of gravity (EWCG), by the use of form CAA 2102, *Aircraft Weight and Balance Report,* and form CAA 2173, *Weight and Balance Data*.

Related Rules

This AC relates specifically to Civil Aviation Rule Part 43*, General Maintenance Rules,* and Part 91*, General Operating and Flight Rules*.

Change Notice

Revision 3 updates links in the weighing procedures section, makes some minor stylistic changes and moves the *Definitions* section to the front of the AC.

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Version History

History Log

Revision No.	Effective Date	Summary of Changes
AC43-02, Rev. 0	25 December 1997	Initial issue.
AC43-02, Rev. 1	11 February 2011	Added instructions for helicopters requiring recording of a lateral centre of gravity (C of G), and instructions on the inclusion and establishing of unusable fuel. Amended the title to better reflect purpose of AC.
AC43-02, Rev. 2	18 January 2023	Corrected outdated references. Made stylistic changes in line with current ACs and added a Version History.
AC43-02, Rev.3	5 April 2025	Updates links in the weighing procedures section and makes some minor stylistic changes. Moves the Definitions section to the front of the AC.

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Definitions

For the purpose of this AC the following definitions apply:

Empty Weight

Has the same meaning assigned to it as in Part 1.

Empty Weight Centre of Gravity (EWCG)

The C of G of an aircraft in its empty weight condition.

Unusable Fuel

The quantity of fuel that cannot be safely used in level flight. This is the quantity of fuel remaining in each tank after the fuel inlet port becomes uncovered in level and balanced flight.

(This will often be detailed by aircraft manufacturers in the AFM, and/or by NAAs in data established at the time of type certification of the aircraft. For example, aircraft TCDS for a FAR 23/27 light aircraft of US origin.)

Undrainable Fuel.

The quantity of fuel that remains in the aircraft fuel tanks and fuel lines after they have been drained.

(The undrainable fuel normally only amounts to a small quantity.)

General

Rule 91.109*, Aircraft flight manual,* requires that an aircraft be operated in accordance with its aircraft flight manual (AFM). To comply with this requirement, and to operate an aircraft within the weight and Centre of Gravity (C of G) limitations of the AFM, an accurate record is required of the aircraft's empty weight and Empty Weight Centre of Gravity (EWCG).

The objective of this AC is to enable a flight crew member to determine the correct weight and C of G for the aircraft, from information contained in form CAA 2173, *Weight and Balance Data* supplement of the AFM.

All aircraft, whether new or used, will normally be required to be weighed to determine the empty weight and EWCG before issue of an airworthiness certificate. The exception to this is set out under rule 21.191(9), which states that the aircraft will not be required to be weighed where the Director is satisfied that the aircraft has been weighed within the last five years, and the empty weight and EWCG have been given accurately within the last five years by:

- a Weight and Balance Report issued by the manufacturer, or
- the National Airworthiness Authority (NAA) of the State from which the aircraft was exported.

When filling in the equipment list of form CAA 2173, list all removable items of fixed location included in the empty weight. Remove other removable items before weighing.

If components or items of equipment with a fixed location are added, removed, or repositioned in an aircraft, or if an aircraft is modified or repaired, the change in the empty weight and EWCG is to be calculated, or established by reweighing.

Any change of empty weight and EWCG is to be recorded by the certifying engineer in the aircraft logbook and a new form CAA 2173 completed.

For major modifications and repairs, the calculation of the change in weight and EWCG is to be included, or indicated as required post installation, on form CAA 337, *Design change - Application for approval of technical data (Part 21), and conformity certificate - Major modification, major repair (Part 43),* or its accompanying data package.

If changes in empty weight conditions arise from work certified by the holder of an avionic licence, who is not licence-rated or approved to certify EWCG changes, the licensed avionic engineer shall ensure that an engineer authorised to certify weight and balance takes the necessary actions for the calculation or reweighing and completion of a new form CAA 2173.

Aircraft reweighing and recalculation of the empty weight and EWCG will be required when:

- Changes have been made to the aircraft that could affect the empty weight and C of G. Examples of this include, but are not limited to:
    - a new built aircraft
    - a modification being installed
    - a major repair, or
    - an aircraft being repainted.
- The operator has reason to believe the current data is not accurate.
- The aircraft manufacturer has specific requirements detailed in the Instructions for Continuing Airworthiness (ICAs) for the aircraft. For example: Robinson Helicopters 2200 hour/12 year overhaul inspection.
- For powered aircraft with a certificated maximum seating capacity of four seats or more, where this has not been carried out on the aircraft in the preceding 10 years, as prescribed in rule 91.605(e)(10).

Note: *Air transport operators are required to have procedures in their operator's exposition detailing aircraft weighing to establish the empty weight and calculation of the EWCG.*

Weighing Procedures

Weighing procedures to be followed are that specified in the aircraft ICAs. However, the AFM may need to be referred to for details of any unusable fuel or undrainable fuel and the quantity prescribed.

If no procedures are specified for the aircraft type, the procedures to be used are specified in:

- FAA AC120-27F https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_120-27F.pdf
- UK Civil Aviation Authority CAP 562, CAP 562: Civil Aircraft Airworthiness Information and Procedures (CAAIP) | Civil Aviation Authority Leaflet 8-10, Weight and Balance of Aircraft

Note: *the links above are current at the time of publication of this AC.*

- Military documents relating to the specific aircraft type and configuration.

Weighing Equipment

Weighing equipment is to be of a type suitable for the purpose and is to be in good condition. When using electronic scales, care must be taken to ensure that there is no interference from other electronic transmitting devices (e.g. mobile phones) that may affect the accuracy of the scales.

Weighing equipment is to have been tested and certified within the previous 12 months by an accredited testing authority as meeting the following requirements:

- **Accuracy:** ±0.2% of the applied load or ±2 kg, whichever is the greater, over the temperature range for which the equipment is designed.
- **Repeatability:** Deviation from the mean by not more than 0.05% of the applied load.

Note: *Calibration of equipment is detailed in AC43-13,* Calibration of tools and test equipment for maintenance of aircraft***.**

Forms 2102 and 2173

Form CAA 2102 – Aircraft Weight and Balance Report

Weighing of aircraft must be supervised by a person certifying a release-to-service (RTS) in accordance with rule 43.101*, Persons to certify release-to-service*.

The details of the weighing, including any calculations, are to be recorded on form CAA 2102, *Aircraft Weight and Balance Report.* Every person supervising weighing of an aircraft and certifying form CAA 2102 must have previous experience of aircraft weighing and weight and balance calculation under supervision of an appropriately qualified and experienced engineer, as outlined in rule 66.57*, Recent experience requirements*.

On completion of form CAA 2102 an RTS statement is to be certified in the report by a person authorised under Part 43, and the report inserted in the aircraft logbook. In addition, Section 8 of the Empty Weight Change Record of form CAA 1464, *Aircraft Airworthiness Directives, Aircraft Modifications, Engine and Propeller Installation logbook*, is to be updated. To find this form, see the 'Aircraft logbooks' tab on the CAA website.

Certifying engineers must ensure that form CAA 2173 has been completed in accordance with this AC.

Form CAA 2173 – Weight and Balance Data

When a new empty weight or EWCG has been established, either by reweighing or by calculation, certifying persons are to:

- ensure form CAA 2173 has been completed, and
- ensure the new form CAA 2173 is inserted in the AFM.

Replacement forms CAA 2102 and CAA 2173

Replacement copies of forms CAA 2102 and CAA 2173 are available in Word and PDF format, from the CAA website under the 'Forms' tab.

Aircraft Configurations – Use of more than one form CAA 2173

It is acceptable to carry more than one copy of form CAA 2173 in cases where an aircraft / helicopter is used for multiple roles, i.e. in a standard configuration and for example with seats removed for cargo transport, or spray gear fitted in an agricultural role. The relevant forms must be clearly identified to show the configuration of the aircraft to which they relate.

Helicopters EWCG – Lateral Balance

Helicopter manufacturers may require that the helicopter be weighed to take into account lateral balance EWCG. Where this is the case, lateral C of G is to be calculated in accordance with the manufacturer's instructions and recorded on forms CAA 2102 and CAA 2173.

Where changes have been made to the helicopter that could affect the EWCG, the Lateral C of G component needs to be considered, in the case where the manufacturer requires this data to be recorded.