



ADVISORY CIRCULAR AC 139-15 v1.1

Establishment of a compass swinging site

Date November 2022
File ref D22/439699

Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory circulars should always be read in conjunction with the relevant regulations.

Purpose

This Advisory Circular (AC) provides general information and advice on the establishment of a compass swinging site at an aerodrome.

For further information

For further information, contact CASA's Personnel Licensing, Aero and Air Nav Standards (telephone 131 757).

Status

This version of the AC is approved by the Branch Manager, Flight Standards.

Note: Changes made in the current version are not annotated. The document should be read in full.

Version	Date	Details
v1.1	November 2022	Administrative review only.
(0)	February 2004	Initial AC. The content of this AC updates information previously published in the Rules and Practices for Aerodromes (RPA). As such, this AC replaces RPA Chapter 16, Section 10, Appendix I - Establishing An Aircraft Compass Swinging Site.

Unless specified otherwise, all subregulations, regulations, Divisions, Subparts and Parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

Contents

1	Reference material	3
1.1	References	3
2	General	4
3	Description of a compass swinging site	5
4	Design criteria for a compass swinging site	6
5	Preparation of a compass swinging site	7
6	Classification of compass swinging sites	8
7	Maintaining your compass swinging site	9
8	Further reading	10

1 Reference material

1.1 References

Legislation

Legislation is available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

Document	Title
CAO 108.6	Calibration of Aircraft Compasses
Part 139 MOS, Chapter 11, Subsection 11.1.20	Compass Swinging Site

2 General

- 2.1.1 All types of aircraft are fitted with magnetic compasses as navigational instruments. These compasses are required to be checked on a regular basis.
- 2.1.2 One allowable method of aircraft compass calibration is by aligning an aircraft on a known magnetic heading for the purpose of determining, and compensating, the degree of error in the compass systems. This process is commonly referred to as 'swinging the compass' and may only be conducted at a defined "compass swinging site".
- 2.1.3 At an aerodrome where extensive aircraft maintenance facilities exist - the aerodrome operator may be requested by those maintenance organisations to provide a compass swinging site.

3 Description of a compass swinging site

- 3.1.1 A Compass Swinging Site is a prepared area, with minimum magnetic abnormalities, on which an aircraft may be oriented (or swung) to various headings, for the purpose of checking the aircraft on-board compass system(s), including the standby compass.
- 3.1.2 The site should be suitable for manoeuvring the aircraft and should be free from characteristics that would significantly affect the accuracy of compass calibrations or compensations. A site having a small number of low intensity stable magnetic anomalies is acceptable, provided that the surveyed corrections are used.

Note: Underground steel tanks, pipelines, cables, steel hangars, fences, and reinforced concrete pavements are all likely to cause magnetic anomalies.

4 Design criteria for a compass swinging site

4.1.1 A compass swinging site should meet the following criteria:

- a. the site should be of sufficient size and strength to accommodate the largest aircraft expected to use the site. As a guide, use the manufactures published characteristics for the turning circles of the aircraft that the site is being designed for.
- b. the site should be located so that compass swinging may be performed without affecting other airport operations. Where possible, the site should be convenient to aircraft maintenance facilities, e.g. in an aircraft run-up bay.
- c. the site should be sufficiently level to permit satisfactory compass swinging. As a guide, the gradients should be the same as the apron gradients for the design aircraft as detailed in MOS 139.
- d. the site should be located at least:
 - i. 200 m from any large magnetic effects such as steel hangars, high voltage transmission lines (above or below ground), or railway tracks; and
 - ii. 100 m from power and communications cables (above or below ground), other aircraft, and other objects that contain ferrous material.
- e. having made a tentative selection of a site using the criteria in 6.1 (a) to (d), the site needs to be magnetically surveyed to determine whether there are any locally generated or natural magnetic anomalies.

Note: Many sites that meet the criteria in paragraph 6.1(d) are still unsatisfactory because of locally generated or natural magnetic anomalies.

- f. every effort should be made to select a site with the best magnetic characteristics, i.e. the difference between magnetic and true north must be uniform within, and in the vicinity of, the site.

Note: To determine this, a survey should be undertaken to verify that the angular difference between true and magnetic north (measured at any point) does not differ from the angular difference (measured at any other point) within the site area by more than 0.25° ~ when measured at a height of 1.5 m above the surface of the site.

5 Preparation of a compass swinging site

- 5.1.1 Any construction or maintenance work to the compass swinging site, should not cause deterioration of the magnetic characteristics.
- 5.1.2 Magnetic materials, such as reinforcing steel or ferrous aggregate, should not be used in the construction of the compass swinging site or in the construction of any pavement within a 100 m radius of the center of the site. If a drainage pipe is required within 100 m of the site, non-metallic or aluminium material should be used. Appropriate quality control procedures should be employed during the construction phase to ensure that only non-ferrous materials are used.
- 5.1.3 The site should be so constructed as to permit compass swinging in all weathers. Drainage and turfing of unpaved areas is usually adequate to ensure this.
- 5.1.4 The surface surrounding the site should be suitably stabilized against jet blast and propeller wash.
- 5.1.5 At least one precise magnetic direction, from an area of minimum magnetic anomaly, should be available as a permanent reference. Preferably, the direction selected should be from a point on the compass swinging site to a suitable distant object, and identified with a marker on the compass swinging site. The marker placard should state; the magnetic direction; the annual change in variation; the date of survey; and a description of the distant marker if such. The line of the reference direction should cross the site in such a way as to align with the aircraft fuselage centre-line during normal compass swing manoeuvres.
- 5.1.6 Another acceptable method of marking the compass swinging site is to provide pre-calibrated radials of precise magnetic direction.
- 5.1.7 The marking of a compass swinging site should not cause confusion with other airport markings, such as unserviceability markings. The preferred marking includes a circle that can be used as guidance for towing or taxiing.
- 5.1.8 Where the site has a paved surface, the words "COMPASS SWINGING SITE" should be provided. Paint is considered the best medium for marking of a paved surface.
- 5.1.9 Where the surface of the compass swinging site is grass, permanent marking should be by a narrow continuous path of non-magnetic material, such as asphalt or gravel.

6 Classification of compass swinging sites

- 6.1.1 Compass swinging sites may be established as either Class 1 or Class 2. The difference between the two classes of compass swinging site is the limits of permitted maximum deviation, to be found anywhere within the site must be within the following limitations:
- a. Class 1 - The maximum permissible deviation is $\pm 0.1^\circ$:
 - i. Compass swinging sites of this accuracy are required for carrying out refined swings, such as, swinging an aircraft in which remote-reading compasses are used as magnetic heading reference systems in conjunction with Doppler type systems.
 - b. Class 2 - The maximum permissible deviation is $\pm 0.25^\circ$:
 - i. Compass swinging sites of this accuracy are required for carrying out standard swings, i.e. swinging an aircraft in which the primary heading reference is provided by a remote-reading compass system, with a direct reading compass serving as the standby.
- 6.1.2 A compass swinging site, with a deviation greater than $\pm 0.25^\circ$, may only be used where a direct-reading compass is used as the primary heading reference.

7 Maintaining your compass swinging site

- 7.1.1 An annual physical inspection should be carried out of the compass swinging site to ensure that the markings, and boundaries, are clearly defined. It should also be used to determine whether or not any work had been done that might affect the magnetic properties.
- 7.1.2 An annual check of any magnetic variation at the aerodrome should also be undertaken. If any doubt exists, the suspect area should be given a detailed magnetic survey.
- 7.1.3 After a compass swinging site has been established, a detailed magnetic re-survey should be carried out at the following intervals:
 - a. Class 1 – every 5 years
 - b. Class 2 – every 2 years.

8 Further reading

8.1.1 Further reading on the subject of compass swinging sites can be found in the following publications:

- Civil Aviation Authority of New Zealand:
 - o Advisory Circular AC43-7 — Calibration of compasses and surveying compass swing sites.
- Civil Aviation Authority of the United Kingdom:
 - o Civil Aircraft Airworthiness Information and Procedures
 - o Part 8 — Aircraft Instruments
 - o Leaflet 8-1 — Compass Base Surveying
- Federal Aviation Authority of the United States of America:
 - o Advisory Circular AC 150/5300-13 Appendix 4 — Compass Calibration Pad