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

Advisory Circular
AC 139-10

Revision 2

Control of Obstacles

29 April 2024

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 Civil Aviation Rule Part 139 *Aerodromes Certification, Operation and Use,* in relation to the aerodrome design standards for the obstacle limitation surfaces (OLS).

Focus

This AC is intended for the holder of an aerodrome operating certificate issued under Part 139 and any other aerodrome operator who promulgates aerodrome data and information in the aeronautical information publication (AIP).

Related Rules

This AC relates specifically to Part 139, rule 139.51, *Aerodrome Design Requirements*, specifically 139.51 (a), *Obstacle Limitation Surfaces* and Appendix D, *Obstacle Restriction and Removal*.

Change Notice

Revision 2 updates references and key information, makes the language more direct and adds a Version History.

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Version History

History Log

Revision No.	Effective Date	Summary of Changes
AC139-10, Rev 0	16 Aug 1993	Initial issue.
AC139-10, Rev 1	27 Apr 2007	Altered references to other ACs, to reflect the new numbering of those ACs in line with a project to standardise the numbering of all ACs. Reformatted this AC.
AC139-10, Rev 2	29 Apr 2024	Updates references and key information. Makes the language more direct. Adds a Version History.

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Introduction

This AC contains guidance for compliance with the Part 139 requirements for OLS at certificated aerodromes. The same guidance can be used by the operator of a non-certificated aerodrome to ensure that the use of the aerodrome is not affected by obstacles.

OLS are specified in AC139-6, *Aerodrome design requirements, (All Aeroplanes Conducting Air Transport Operations, All Aeroplanes above 5700 kg MCTOW)*, and in AC139-7, *Aerodrome Standards and Requirements— Aeroplanes at or below 5700 kg MCTOW–Non Air Transport Operations.*

An instrument approach runway will also have established obstacle-free surfaces as a basis on which the instrument procedure was designed, and the minima established. For a precision approach runway, the maintenance of the obstacle-free surface is particularly critical, to protect the minimum descent altitude established, for the regularity of aircraft movements.

This AC is not exhaustive in addressing the control of obstacles, particularly the wider spectrum of the ICAO PANS-OPS surfaces and obstruction charts. There are several publications available which address the control of obstacles, and the production of obstruction charts, in detail. They should be referred to by those who own aerodromes with precision approach runways.

The list of publications to which aerodrome operators can refer to for further information and guidance includes:

- ICAO Annex 4, *Aeronautical Charts*
- ICAO Doc 9137-AN/898, *Airport Services Manual Part 6, Control of Obstacles*
- ICAO Doc 9137-AN/898, *Airport Services Manual Part 8, Airport Operational Services*
- ICAO Doc 8168-OPS/611 PANS-OPS, Volume 2
- ICAO Annex 14, *Aerodromes - Volume I - Aerodrome Design and Operations*
- ICAO Doc 9157*, Aerodrome Design Manual - Part 6 – Frangibility*

CHAPTER 1 — AERODROME OBSTACLE LIMITATION SURFACES (OLS)

1.1 General

1.1.1 The effective use of an aerodrome may be influenced by natural features and man-made objects inside and outside the aerodrome boundary. These may result in:

(a) limitations on the distance available for aircraft take-off and landings

(b) limitations on the range of meteorological conditions in which take-off and landings can take place, or

(c) a reduction in the payload of some aircraft types, or

(d) all the above.

1.2 OLS

1.2.1 Designating OLS at an aerodrome depends on the type of operations conducted and the types of approaches available at the aerodrome, as well as the aerodrome reference code. Information on which surfaces are required for each runway is detailed in Part 139, Appendix D.

1.2.2 The aerodrome design specifications in Part 139 Appendix D.1, *Obstacle limitation surfaces,* state that all existing objects penetrating the OLS are not permitted above an approach or transitional surface except when:

- the new object or extension would be shielded by an existing immovable object, or
- an aeronautical study has determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aircraft.

AC139-6 has detailed specifications about the marking and lighting of obstacles.

1.3 Aerodrome obstacle chart Type "A"

1.3.1 The aerodrome obstacle chart Type "A", which is available at https://shop.aeropath.aero/collections/type-a-charts, represents a profile of the take-off obstruction environment on departure from a specific runway. The basic slope shown on the chart is 1.2 percent, which is below the slope of the protected take-off climb surface established for a runway intended for use by Group A aircraft.

1.3.2 Objects may penetrate the 1.2 percent (also referred to as 1:83.3)[1] slope. There is no need to remove any which are beneath the elevation of the take-off climb surface. However, aerodrome operators should consider monitoring objects such as trees, which may continue to grow above the 1.2 percent slope. In some instances, this may affect the payload of a particular aircraft type. The extent of this limitation depends on individual circumstances, but it is possible to significantly reduce the payload penalty by careful obstacle removal close to the aerodrome. Conversely, an obstacle several kilometres from the aerodrome may be the limiting factor.

[1] Refer to Part 77, Appendix A, Figure A1, Aerodrome Notification Requirements.

1.4 ICAO PANS-OPS surfaces – Visual Segment Surface (VSS)

1.4.1 The VSS is a surface constructed in accordance with the specifications of ICAO Doc 8168/PANS-OPS, Volume 2. All new and existing straight-in instrument approach procedures should feature VSS protection. The purpose of a VSS is to protect the aircraft from ground-based obstacles before landing, while the pilot transitions from flying on instruments to using the visual references available at the aerodrome. There is also useful information on VSS in the CASA AC:

AC 139-21 v1.0 - Visual segment surface: Monitoring requirements and the reporting of obstacles (casa.gov.au)

1.4.2 Instrument flight procedure obstacle-free surfaces sizes and dimensions do not usually coincide with the aerodrome design OLS. Aerodrome operators should look in PANS-OPS, Doc 8168, Volume 2 for the obstacle-free surfaces needed for instrument flight approach, for missed approach procedures, and for visual manoeuvring (circling) procedures.

CHAPTER 2 — OBSTACLE CONTROL

2.1 General

2.1.1 In accordance with Part 139, Appendices D and E, Part 77, *Objects in Navigable Airspace*, and Part 157, *Notice of Construction, Alteration, Activation, and Deactivation of Aerodromes*, when considering obstacle control, the following should not be overlooked:

(a) Objects which penetrate the approach surface are critical since they represent an erosion of the clearance between the final approach path, usually 3 degrees, and fixed or mobile obstacles on the ground.

On an approach where the approach surface is significantly obstructed, the safe operation of aircraft is ensured by raising the aerodrome approach meteorological minima. If the object penetrates the approach surface, the landing threshold is displaced, effectively reducing the available landing distance. This can have an adverse effect on the regularity of aircraft operations and could impose payload penalties on landing aircraft.

(b) The transitional surfaces are adjacent to the runway strip and approach surface. Penetration of them by an obstacle results in the reduction in the clearance available while carrying out an approach to land or during a missed approach procedure.

Such obstacles may have an adverse effect on the aerodrome meteorological minima and may need marking and lighting.

(c) Aircraft performance requirements, applicable to take-off and climb, require all aircraft to clear all obstacles by a minimum specified margin. To enable pilots to do this, aerodrome operators should make accurate obstacle information available to pilots.

For a multi-engine aircraft, that requirement includes the climb following failure of the critical engine. Objects which penetrate approach and take-off climb

surfaces do not represent a degradation of safety standards, but they may impose significant payload penalties on aircraft taking off.

(d) The inner horizontal surface is more significant for VFR operations, as its purpose is to protect airspace (i.e. leave it clear) for visual circling prior to landing.

It also provides protection for circling aircraft following an instrument approach. It does not usually represent a critically limiting surface around a large aerodrome handling IFR traffic, except in so far that it extends beneath the approach surface.

(e) The conical surface represents the obstacle limiting surface some distance from the aerodrome.

As with other areas, operators should identify and manage obstacles within the conical surface.

(f) Obstacle control, to maintain or improve the *Aerodrome Obstacle Chart - Type "A" obstacle profile*, should be based on the clear understanding of the performance requirements of the aircraft regularly using the aerodrome, or those proposed to be brought into regular use.

(g) Any obstacles which are allowed to penetrate the established PANS-OPS surfaces could raise the minimum safe altitudes of the aerodrome instrument flight procedures. This could have an adverse effect on the regularity of aircraft operations.

(h) Aerodrome operators should be aware of temporary obstacles, such as cranes or fireworks (pyrotechnics), as covered in Part 77, and put mitigations in place.

2.2 Identifying obstacles

2.2.1 Identifying obstacles requires a complete engineering survey of all areas beneath the aerodrome OLS.

2.2.2 The initial survey should produce a chart presenting a plan view of the entire aerodrome and its surroundings. The scope of the chart should be to the outer limit of the conical, approach and take-off climb surfaces. It will need to include profile views of all OLS. Each obstacle should be identified in both plan and profile with its description and height above the datum, which should be specified on the chart. Engineering field surveys can be supplemented by aerial photographs and photogrammetry to identify possible obstacles not readily visible from the aerodrome.

2.2.3 The survey specification for the aerodrome obstacle chart Type "A" is contained in AC139-9, *Notification of aerodrome data and information*, as it is data and information that should be provided for runways serving Group A aircraft.

2.2.4 Aerodrome operators should do periodic surveys to ensure the validity of the information in the initial survey. The aerodrome operator should make frequent visual observations of surrounding areas to determine the presence of new obstacles. Marking and lighting requirements such as colour, runway markings and touchdown zone marking, are specified in Part 139, Appendix E.

2.2.5 Follow-up surveys should be done whenever significant changes occur. A detailed survey of a specific area may be necessary when the initial survey indicates the presence of obstacles which may need a control programme to manage. Following completion of an obstacle control programme, the area should be resurveyed to provide corrected data on the presence or absence of obstacles.

2.2.6 Similarly, revision surveys should be done if changes are made, or planned, to the aerodrome characteristics such as runway length, elevation or orientation. No firm rule can be set down for the frequency of periodic surveys, but constant vigilance is required. Changes in obstacle data arising from surveys are to be notified to the Aeronautical Information Service (AIS) as soon as reasonably practicable for promulgation to the aircraft operators.

2.3 Methods of control

2.3.1 The viability and safety of aerodrome use by aircraft operators can be assured by establishing effective obstacle control to maintain the OLS. Control can be achieved by:

(a) height zoning protection by the local government authority

(b) establishing an effective obstacle removal programme

(c) purchasing easement or property rights, or

(d) all of these.

2.4 Height zoning

2.4.1 The objective of height zoning is to protect the aerodrome OLS from intrusion by man-made objects and natural growth such as trees.

2.4.2 Local authorities often identify height limits within their district plan that are underneath the aerodrome's OLS. The responsibility for enacting the corresponding ordinances, such as local authority by-laws or plans to give effect to these limits, is a matter between the aerodrome operator and the local authority.

2.4.3 To give effect to height zoning, a zoning map should be prepared for the guidance of the responsible local authority. The map is a composite, relating all zoning criteria to the ground level around the aerodrome. It should cover the aerodrome design OLS and, where applicable, the take-off flight path for the aerodrome obstacle chart Type "A" and any PANS-OPS surfaces.

2.4.4 Typical zoning ordinances include:

- a statement of the purpose of, or need for, the action,
- a description of the OLS which should conform to the aerodrome design surfaces and, if applicable,
- the aerodrome obstacle chart Type "A" and the PANS-OPS surfaces
- a statement of allowable heights which should conform to the specifications for these surfaces.

Provisions should be made in the ordinances for a maximum allowable height, for existing non-conforming uses, for marking and lighting of obstacles and for appeals from the provision of the ordinance.

2.4.5 Bird control could also be addressed at the same time by defining areas where the siting of gravel pits, refuse dumps, sewage outfalls, and other features which attract birds, may be subjected to restriction in the interests of aviation safety.

2.5 Obstacle removal

2.5.1 When obstacles have been identified, the aerodrome operator should make every effort to have them removed, or reduced in height so they are no longer an obstacle. If the obstacle is a single object, it may be possible to negotiate with the owner of the property to reduce the height to acceptable limits without adverse effect. Examples of such objects are a tree, a television aerial or a chimney.

2.5.2 In the case of trees, which are trimmed, agreement should be reached in writing with the property owner to ensure that future growth will not create new obstacles. Property owners can give assurance by agreeing to trim the trees when necessary or permitting access to the premises for the aerodrome operator's representative to trim them. It is important to assess the growth rate of trees and trim them low enough so that the ensuing growth will be below the obstacle surface until the surface is next due for survey.

2.5.3 Some aids to navigation both electronic, such as instrument landing system (ILS) components, and visual, such as approach and runway lights, constitute obstacles which cannot be removed. Such objects should be frangibly designed and constructed, and mounted on frangible couplings so that they will fail on impact without significant damage to an aircraft. Further guidance is available in ICAO Doc 9157, *Aerodrome Design Manual - Part 6 – Frangibility*.

2.6 Easements or property rights

2.6.1 In those areas where zoning is inadequate, the aerodrome operator may take steps to protect the OLS by other means. Examples of zoning inadequacies might be locations close to runway ends where obstacles exist. Examples of other means might be gaining easements or property rights. They should include removal or reduction in height of existing obstacles and measures to ensure that no new obstacles may be erected in the future.

2.6.2 Where agreement can be reached for the reduction in height of an obstacle, the agreement should include a written aviation easement limiting heights over the property to specific levels unless effective height zoning has been established.

2.7 Marking and lighting of obstacles

2.7.1 Where it is impractical to eliminate an obstacle, it should be appropriately marked or lighted, or both, to be clearly visible to pilots in all weather and visibility conditions. AC139-6 contains detailed specifications about the marking and lighting of obstacles.

2.7.2 Note that the marking and lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations which may be caused by the obstacle. AC139-6 specifies that obstacles should be marked and, if the aerodrome is used at night, lit up, except when the obstacle is:

(a) shielded by another obstacle, and

(b) lit by high intensity obstacle lights by day.

2.7.3 Vehicles and other mobile objects, excluding aircraft, on movement areas of aerodromes should be marked and lighted, unless they are used on apron areas only.

2.8 Obstacle shielding

2.8.1 The principle of obstacle shielding is employed to permit a more logical approach to restricting new construction and to the requirements for marking and lighting of obstacles. Shielding principles are employed when some object, an existing building or natural terrain, already penetrates above one of the aerodrome design obstacle surfaces. If the obstacle is permanent, then additional objects within a specified area around it can penetrate the surface without being obstacles. The original obstacle dominates or shields the surrounding area.

2.8.2 Further guidance material on the principle of obstacle shielding is contained in AC139-6, Chapter 4, *Obstacle Restriction and Removal*, and ICAO Doc 9137-AN/898, *Airport Services Manual*, Part 6, *Control of obstacles*.