



# Advisory Circular

**Subject: Viewshed Analysis for Design of Aircraft Detection System (ADS)**

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## 1.0 Introduction

- (1) This Advisory Circular (AC) is provided for information and guidance purposes. It describes an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

### 1.1 Purpose

- (1) This AC discusses viewshed analysis for an Aircraft Detection System (ADS) and provides minimum distance and height for the anticipated position of approaching aircraft that are to be detected

### 1.2 Applicability

- (1) This AC is applicable to owners of windfarms who will be installing an ADS. This AC is also available for information purposes to Transport Canada Civil Aviation (TCCA) regional personnel and the aviation industry in general.

### 1.3 Description of changes

- (1) Not applicable.

## 2.0 References and requirements

### 2.1 Reference documents

- (1) It is intended that the following reference materials be used in conjunction with this document:
  - (a) Part VI, Subpart 01, Division III of the *Canadian Aviation Regulations* (CARs) —Marking and Lighting of Obstacles to Air Navigation, Obstacles to Air Navigation, Sections 601.23 to 601.25;
  - (b) Standard 621 of the CARs - Obstruction Marking and Lighting.
  - (c) [Aeronautical Assessment Form \(AAF\) #26-0427](#)

### 2.2 Cancelled documents

- (1) Not applicable.
- (2) By default, it is understood that the publication of a new issue of a document automatically renders any earlier issues of the same document null and void.

### 2.3 Definitions and abbreviations

- (1) The following **abbreviations** are used in this document:
  - (a) **AAF** Aeronautical Assessment Form
  - (b) **ADS** Aircraft Detection System
  - (c) **CARs** *Canadian Aviation Regulations*
  - (d) **cd** Candela
  - (e) **km** kilometers

- (f) **nm** nautical miles
- (g) **TCCA** Transport Canada Civil Aviation

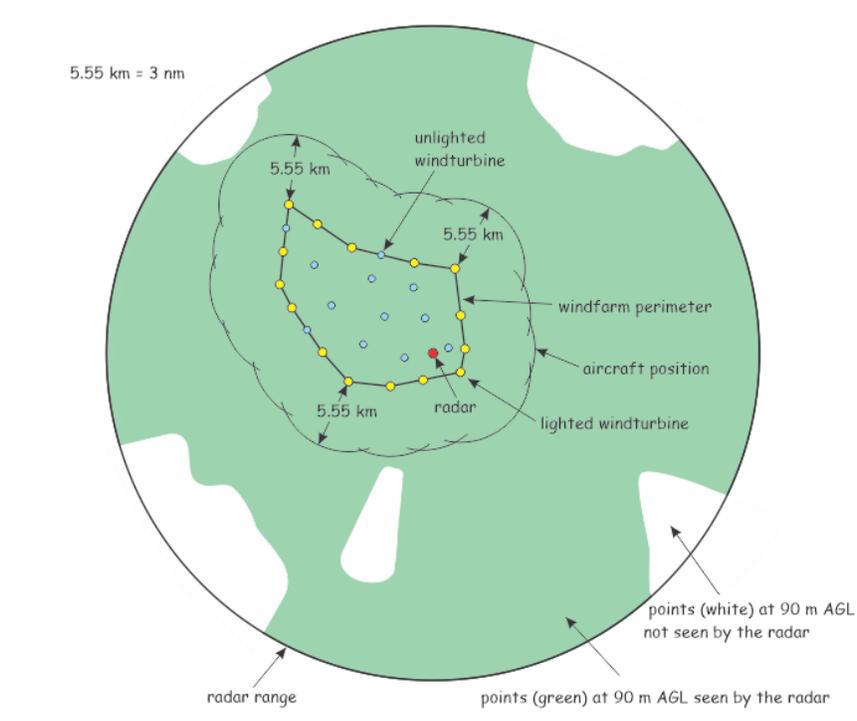
### 3.0 Background

- (1) Standard 621, Chapter 15, has requirements for an Aircraft Detection System (ADS).
- (2) The ADS is typically composed of a radar and an associated controller which turns ON the windfarm lighting when an approaching aircraft is detected. This is of benefit in reducing residential complaint due to glare that would otherwise be present should the lighting be ON continuously during twilight and night.
- (3) Chapter 15 of Standard 621 refers to detection in terms of a time period for the aircraft to reach the obstacle. However, the chapter doesn't specify the ability of the radar to actually detect the aircraft and this may be jeopardized by terrain features which mask the radar signal. The purpose of this AC is to specify a minimum distance and height for the anticipated position of aircraft to be detected. If the signal is masked, it may be necessary to raise the radar or increase the number of radars at the site.
- (4) The specification of a height dimension is not to suggest that aircraft would normally be flying at this altitude during the night. It merely serves as a parameter by which to design the ADS.
- (5) In order to confirm to that the installed ADS will successfully detect aircraft, the proponent should provide a viewshed analysis with the Aeronautical Assessment Form (AAF), using the aircraft position dimensions provided herein.

### 4.0 Discussion

- (1) A windfarm is composed of numerous windturbines and one or more Meteorological (MET) towers. The outermost windturbines define the windfarm perimeter. The twilight and nighttime protection requirement is for a CL-864 red light installed on the nacelle [and CL-810 red lights at the mid-point of the mast for windturbines of more than 150 m height] of selected windturbines. The top lights having an output of 2000 candelas (cd) can be cause for residential complaint. One solution is to install a radar based ADS which turns the lights ON when an approaching aircraft is detected. This is sometimes referred to as "on-demand lighting".
- (2) It may occur, however, that intervening terrain masks the radar signal, as shown in **Figure 1**. This can be resolved by raising the radar or installing another radar. To do so is a matter of design and is dependent upon knowing the minimum position of the aircraft. That is, the height [h] AGL and distance [D] of the aircraft from the windfarm perimeter which is created by swinging radii of D meters from windturbines on the perimeter.



**Figure 3 – Viewshed Analysis with masking resolved**

## 5.0 Summary

- (1) For purpose of ADS design, the minimum aircraft position is at a distance of 5.55 km [3 nm] from the windfarm perimeter and at a height of 90 m AGL.

## 6.0 Information management

- (1) Not applicable.

## 7.0 Document history

- (1) Not applicable.

## 8.0 Contact us

For more information, please contact:

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We invite suggestions for amendment to this document. Submit your comments to:

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