Man Made Obstacles Located Away From Aerodromes

Risk Review

November 2009

Developed for CASA by AeroSafe Risk Management.

DEVELOPED BY

AEROSAFE
RISK MANAGEMENT

DEVELOPED FOR:

Australian Government
Civil Aviation Safety Authority

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RISK MANAGEMENT

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Man Made Obstacles Located Away From Aerodromes

The identification and management of risks associated with man made obstacles located outside the vicinity of certified and registered aerodromes.

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EXECUTIVE SUMMARY

It has been identified that the legislative framework in Australia may not provide the Civil Aviation Safety Authority (CASA) with the appropriate authority with which to identify and manage the risk to aviation safety that is posed by man made obstacles that are located away from the vicinity of certified and registered aerodromes. This report provides a comprehensive review of how those risks associated with man made obstacles are identified and managed. The terms of reference of this report specifically relate to identifying the ICAO standards and recommended practices that address the identification and management of man made obstacles. Having identified these ICAO requirements the report provides a comparative analysis of the various international regulatory frameworks and identifies how other jurisdictions are satisfying the ICAO requirements. The report also examines the environment within Australia with respect to how those stakeholders, such as wind farm developers, are affected by the current legislative and regulatory framework relating to man made obstacles.

This report provides a review of the International Civil Aviation Organisation (ICAO) Standards and Recommended Practices (SARPS) and identifies those ICAO requirements concerning the issue of man made obstacles located away from the vicinity of aerodromes. The report identifies the legislative frameworks that exist outside Australia and how other aviation regulators are satisfying the ICAO requirements. The report also examines the local stakeholders within Australia that are concerned with the issue of man made obstacles that are located away from the vicinity of aerodromes, specifically the wind farm industry. This report was developed using a number of methods such as face to face interviews, document and legislative reviews, industry surveys, and research using information extracted from the public domain. The assessment process used to conduct the risk assessment was consistent with the AS/NZS 4360:2004 Risk Management standard.

This report identifies 7 key findings in relation to identifying and managing the risks associated with man made obstacles that are located away from the vicinity of aerodromes. The principle finding of this report is that, while the inherent aviation safety risk relating to this issue (in the context of the whole aviation industry in Australia) is within the low range, the current Australian aviation legislative framework does not satisfy the ICAO requirements with respect to the identification and management of man made obstacles that are located away from the vicinity of aerodromes. Annex 14 provides specific recommendation that require the Authority to have in place ‘arrangements’ that ensures that they are consulted with respect to constructions outside the limits of the Obstacle Limitation Surface OLS, or away from the vicinity of aerodromes. Current legislation in Australia does not allow CASA to satisfy this ICAO Requirement.

Further to this finding it has been found that current legislation (Civil Aviation Act 1988) does not specifically allow for the making of regulations concerning obstacles that are located away from the vicinity of aerodromes. The scope of the current regulations are restricted to the management of man made obstacle that are located within the vicinity of aerodromes and do not provide CASA with adequate powers to identify and manage these obstacles. There is also a high level of uncertainty around the existing data concerning man made obstacles located away from the vicinity of aerodromes and this level of uncertainty means that CASA and other interested agencies do not have an accurate picture of the aviation risks that might be associated with those man made obstacles.

Based on the key findings, this report provides 10 key recommendations that are designed to bring Australian legislation, regulations and practices in line with the best practices used internationally and ensure that the appropriate ICAO standards and recommended practices are satisfied. The principle recommendation of this report is the development of legislation that allows for the making of regulations surrounding the issue of man made obstacles that are located away from the vicinity of an aerodrome. Given that this legislative power is ratified, it is recommended that all regulations concerning objects that might affect the safety of navigable airspace should be contained within one Civil Aviation Safety Regulation (CASR) i.e. CASR Part 77 Objects that Affect the Navigable Airspace. And that all regulations pertaining to obstacles contained within CASR 139 should be rolled into CASR Part 77.

Current regulations surrounding the provision of compensation for proponents for any expenses that they incur as a result of installing mitigation measures is not consistent with international practices and provides a barrier for CASA to make further regulations regarding man made obstacles and it recommended that this compensation legislation should be repealed.

The report concludes that, not withstanding the relatively low risk to the overall aviation industry posed by man made obstacles located away from the vicinity of aerodromes, there remains a gap in the legislative framework that means CASA does not have the authority to manage the issue appropriately, and that local stakeholder such as wind farm developer are not provided with appropriate direction as to their requirements and obligations to aviation safety. By providing the appropriate legislation, regulatory framework the authority, in this case CASA, will be in a position to implement appropriate systems and processes for the identification and management of man made obstacles whether they are located in and around aerodromes or away from the vicinity of aerodromes.

The report has been structured to represent separately the findings and recommendations of the project team. The Findings and Recommendations are represented in the Executive Summary section in order to allow the quick and easy access to the information. There is a total of 7 findings and 10 key recommendations. A more detailed list of findings can be found in Annex D of this report.

Findings

NO.	FINDING
F1	**ICAO REQUIREMENTS** The current Australian legislative framework is inconsistent with ICAO Standards in relation to man made obstacles as set out in ICAO Annex 14 Volume I Chapter 4 and Chapter 6.
F2	**INTERNATIONAL LEGISLATION** The USA and New Zealand have developed a legislative framework that groups the regulations pertaining to the management of man made obstacles, wherever they are located, into one rule set (Part 77 – Objects that Affect the Navigable Airspace). Part 77 sets out the requirement for notification heights and the standards with which the regulator is required to assess objects that affect the navigable airspace.
F3	**AUSTRALIAN LEGISLATION** The current Australian legislation does not allow the making of regulations concerning man made obstacles that are located away from the vicinity of an aerodrome.
F4	**AUSTRALIAN REGULATORY FRAMEWORK** The absence in Australia of a formal or legislated framework for conducting Aeronautical Studies on man made obstacles located away from the vicinity of aerodromes means that CASA is not suitably equipped with the appropriate options for making obstacle determinations. The current Australian legislation and rule set does not address man made obstacles that are located away from the vicinity of aerodromes and is restricted to dealing with man made obstacles that are located on or within the vicinity of an aerodrome.
F5	**CURRENT AUSTRALIAN PROCESS** The RAAF AIS is the organisation in Australia charged with the responsibility to collect man made obstacle data, however the data is collected for information and charting purposes only. No Aeronautical Studies are done to determine whether the man made obstacle is a hazard to aviation. There is a high level of uncertainty around the current information that is held on man made obstacles. It can be reasonably assumed that this is due to the fact that legislation in Australia does not require the mandatory reporting of tall structures that could potentially be obstacles to navigable airspace.

F6

ADVISORY MATERIAL

CASA have one current publication, AC 129-08(0) that sets out the reporting requirements for tall structures, and a repealed AC 139-18(0) Obstacle Marking and Lighting of Wind Farms. AC 139-18(0) provided guidance specifically relating to wind farms, however did not address other man made obstacles.

F7

WIND ENERGY INDUSTRY

The wind energy industry in Australia is concerned that CASA do not have the mandate to consider options that offer alternatives to the lighting of wind farms. The wind energy industry is required to deal with the visual amenity issues caused by the requirement for lighting on wind turbines. ICAO Annex 14 Volume I Chapter 6 provides clear requirements for the marking and lighting of wind farms in the case that they are determined to be a hazard to aviation, however there is potential that a formal Aeronautical Study may determine that a wind farm in a certain location offers no hazard to aviation, thus removing the requirement for marking and lighting.

Recommendations

NO.	RECOMMENDATION

R1

AUTHORITY TO MAKE REGULATIONS

That the Civil Aviation Act is reviewed in the context of ensuring that CASA has the power to make regulations specifically concerning buildings, structures and objects that are located away from the vicinity of a certified or registered aerodrome.

R2

REMOVAL OF COMPENSATION REQUIREMENTS

That the Civil Aviation Act 1988 is reviewed in the context of removing the requirement to provide compensation for the installation of marking and/or lighting on buildings, structures and objects that have been determined to be a hazard to aviation.

R3

OPTION 1 – CREATION OF PART 77 OBJECTS THAT AFFECT NAVIGABLE AIRSPACE

This option is designed to group all obstacle related regulation within one CASR Part. It is proposed that this CASR Part is designated CASR Part 77. This brings the regulation of obstacles in Australia in line with the regulatory structure applied in the United States and New Zealand.

OPTION 2 – EXPANSION OF PART 139 TO INCLUDE OBSTACLES THAT ARE LOCATED AWAY FROM THE VICINITY OF AERODROMES

This option is designed to ensure that the current CAR Part 139 – Aerodromes sufficiently satisfies the ICAO requirements both for obstacles within the vicinity of aerodromes and for obstacles located away from the vicinity of aerodromes.

R4

ADVISORY PUBLICATION – NOTIFICATION REQUIREMENTS

That an Advisory Circular that outlines the obligations for reporting structures, buildings or objects that may affect aviation safety is published in accordance with the requirements set out in the updated Regulations.

R5

ADVISORY PUBLICATION – MARKING AND LIGHTING REQUIREMENTS

That an Advisory Circular that sets out the standards for the marking and lighting of obstacles is published in accordance with the standards set out in the updated Regulations.

R6

ONGOING EDUCATION PROGRAM FOR INDUSTRY AND PLANNING AUTHORITIES

That an ongoing education program directed to industry developers and local planning authorities is established to in order to highlight the responsibility for proponents to report their developments initially to the RAAF AIS, and ultimately to CASA for the purpose of an Aeronautical Study.

R7

INTERNAL CASA CAPABILITY

That CASA develop a capability under the Office of Airspace Regulation that manages the submission of obstacle notifications and industry submitted Aeronautical Studies, and that the establishment of this capability is based on the estimated number of submissions that would be generated by the new Regulations.

R8

SHARING OF OBSTACLE DATA

That CASA enter into a Memorandum of Understanding between RAAF AIS, GeoScience Australia and ASA in order to ensure that information on man made obstacles that constitute a hazard to aviation is shared between the organisations in a timely manner.

R9

ONLINE OBSTACLE DATABASE

That the feasibility of developing an online obstacle database is explored. The online obstacle database would be developed to allow proponents to submit proposed developments that meet the notification requirements. The database would be used by the proponents to submit any Aeronautical Studies and by CASA internally to record their determination. The results of any determinations could be released via the database and made searchable online.

R10

NATIONAL PLANNING GUIDELINES

That CASA develop a national planning policy to provide guidance to local, state and federal planning authorities on the issues relating to man made obstacles and the process for notifying CASA of any proposal that meets certain requirements.

PART 1:

Introduction and Context

Background

1. In the Australian context there are a number of legislative instruments and publications that concern themselves with the management of man made obstacles that affect navigable airspace and potentially the safe operation of aircraft using the airspace. This legislation and the associated publications however are confined to dealing with man made obstacles that are situated in the vicinity of a certified or registered aerodrome.

2. CASA has historically considered that any man made object that exceeds a height of 110m is assessed as an obstacle and as such, subject to an internal assessment as to the obstacles impact on aviation safety.

3. The legal basis for this historical practice is CASR 139.365 – Structures 110 metres or more above ground level, which requires that CASA must be informed of any object of a height of 110m or more. However, a level of ambiguity exists as to whether this regulation applies to structures that are away from the vicinity of aerodromes. The regulation itself is not specifically limited to structures that are located within the vicinity of an aerodrome, however by virtue of the fact that the regulation is placed within Part 139 – Aerodromes, it can be reasonably implied that the regulation is restricted to those structures that are located within the vicinity of an aerodrome. Part 139 – Aerodromes specifically states in CASR 139.005 that the Part as a whole applies to *"… obstacles and hazards at aerodromes"*.

4. As a result, there is a high level of ambiguity around whether current regulations allow for CASA to mandate or recommend any mitigation options for objects that affect navigable airspace, that are located outside the vicinity of a certified or registered aerodrome.

Purpose

5. The purpose of this review is to examine how risks associated with man made obstacles, including Wind Farms, which are located outside of the vicinity of certified and registered aerodromes are identified and managed.

Objectives

6. The objective of the review is to generate recommendations surrounding the content and issue of new legislation and advisory material covering planning, identification and illumination of man made obstacles.

7. The review has two primary objectives:

   - Determine how other aviation regulatory jurisdictions, such as the UK CAA, CAA NZ and FAA are handling the identification of man made obstacles and in particular their legislative framework and recent advisory material.

   - Deliver recommendations that are based on best practice from other aviation regulatory jurisdictions and informed by the results of stakeholder interviews and forums

Assumptions

8. The following assumptions have been made in relation to CASA's requirements of the review:

   - CASA is looking to achieve ICAO compliance in this area

   - CASA is looking to maximise proven practices from other regulatory authorities and better practice standards around the world, and thus not developing a separate Australian only approach

- that the recommendations from this report provides advice to CASA that may act as the basis on which legislation and advisory material will be updated
- ICAO Annex 14, Aerodromes, Volume 1 – Aerodromes has been used as the basis for evaluating the standards and practices of Australian and International practices

Limitations

9. The following limitations were encountered in researching and developing this review:
   - Aerosafe does not possess the appropriate legal expertise to advise on legislative matters and for the purposes of this report have identified areas that may require this additional expertise
   - Although there was a great focus on industry consultation during this project, there may be a number of stakeholders who did not participate in this process. Any Notice of Proposed Rule Making (NPRM) subsequent to this report will satisfy industry consultation requirements.
   - The review is limited to examining the identification and management of man made obstacles which are deemed to be located outside the control of Part 139 – Aerodromes Chapter 7 which defines the standards that control airspace around aerodromes.
   - This report does not address the affects that wind turbines may have on the operational effectiveness of navigational aids and other electronic equipment.
   - The project duration was eight weeks.

Report structure

10. This report consists of 5 parts:
    1. **Part 1: Introduction & Context**
       This section provides background to the report and sets the context under which the review is conducted.
    2. **Part 2: International Regulatory Comparative Analysis**
       This section compares the current situation in Australia with the practices and standards applied in other 'like-type' aviation regulatory jurisdictions and makes recommendations on implementing best practice in the Australian context.
    3. **Part 3: Risk Assessment**
       In the context of the regulatory comparative analysis outlined in Part 2, this section sets out in table format the corporate risk issues associated with the management of man made obstacles located away from aerodromes
    4. **Part 4: Findings and Recommendations**
       Using the Regulatory Comparative Analysis and the Risk assessment, this sections details the findings and recommendations associated with the management of man made obstacles located away from aerodromes
    5. **Annexes**
       Outlining supporting documentation.

PART 2:

International Regulatory Comparative Analysis

Overview

11. The International Regulatory Comparative Analysis examines the way that other Regulators are handling the identification and management of the risks associated with man made obstacles that are located away from the vicinity of certified and registered aerodromes. In particular this section examines the legislative framework within which other Regulators operate and looks at recent advisory material on the issue.

12. This section also examines the specific International Civil Aviation Organisation (ICAO) standards and recommended practices in relation to obstacles and visual aids denoting obstacles.

International Civil Aviation Organisation (ICAO)

13. The Convention on International Civil Aviation, signed in Chicago on 7 December 1944 (the Chicago Convention), came into force on 4 April 1947. The International Civil Aviation Organisation (ICAO) is a specialised agency of the United Nations whose mandate is to ensure safe, efficient and orderly evolution of international civil aviation[1]. The Chicago Convention provides (Article 37) for the Council of ICAO to make standards and recommended practices dealing with a wide range of matters concerned with the safety, regularity and efficiency of air navigation. ICAO Signatory States are required to comply with the standards published by ICAO as Annexes to the Chicago Convention. Article 38 of the Convention requires, where a State finds it impracticable to comply in all respects with a standard, or to bring its own regulations or practices into full accord with a standard, that notification be given to ICAO.

Annex 14 – Aerodromes Volume I

14. Chapter 4 of Volume 1 of Annex 14 deals specifically with *"obstacle restriction and removal"* in the airspace around aerodromes. The objectives of the specifications found in Chapter 4 are *"… to define the airspace around aerodromes" and states that this airspace is to be "… free from obstacles so as to permit the intended aeroplane operations at aerodromes …"*. This specification deals with identifying and managing man made obstacles that are within the vicinity of aerodromes using the concept of an Obstacle Limitations Surface (OLS). An OLS defines a series of imaginary surfaces around an aerodrome. This surface defines the limits to which obstacles may project into the airspace around the aerodrome.

15. The primary purpose of Annex 14 Volume 1 and specifically Chapter 4 – Obstacle Restriction and Removal is to ensure that obstacles around aerodromes are managed appropriately based on standard specifications. While a significant portion of Chapter 4 is concerned with outlining the specifications of an OLS, Section 4.3 – Objects Outside the Obstacle Limitation Surfaces, provides two recommendations that address the issue of obstacles that may be situated away from an aerodrome and any OLS that is associated with that aerodrome.

16. Recommendation 4.3.1 states:

"Arrangements should be made to enable the appropriate authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by that authority, in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes."

17. This recommendation could be interpreted as requiring the authority, in this case CASA, to establish a process that ensures they are consulted when there is a proposal to build a structure that is beyond the limits of the OLS. There may be some argument around the meaning of the term 'beyond the limits', however using the context set by the title of Section 4.3 – Objects Outside the Obstacle Limitation Surfaces, the term 'beyond the limits' can reasonably be interpreted as meaning objects that are located outside the outer limits of an OLS. Or in the context of this report, objects located away from the vicinity of an aerodrome.

[1] *http://www.icao.int/icao/en/anb/mais/index.html*

18. The recommendation further introduces the concept of an aeronautical study. According to Australian regulations[2] an Aeronautical Study is defined as *"… an investigation of a problem concerned with some phase of flight, and aimed at identifying possible solutions and selecting the one most acceptable from the point of view of flight safety."*

19. Recommendation 4.3.2 states:

"In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 150m or more above ground elevation should be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes. Note.— This study may have regard to the nature of operations concerned and may distinguish between day and night operations."

20. This recommendation could be interpreted as requiring that the authority consider all man made objects that extend to a height of more than 150m above the ground level as obstacles by default. The recommendation allows the authority to have in place a process that ensures these objects are subject to an aeronautical study to determine if in fact they are a hazard to the navigable airspace in which the object is situated.

21. At the time of writing this report there is a published proposed amendment to the international standards and recommended practices for Annex 14 Volume 1 – Aerodromes. The proposed amendment seeks to remove any ambiguity that provides opportunity to interpret Annex 14 as not dealing with obstacles outside of the OLS. The ambiguity is removed by stating in the Introductory Note that Annex 14 *"… contains specifications dealing with obstacles outside those limitation surfaces".* This amendment does not change the substance or content of the standards or recommended practices contained within Annex 14, it simply clarifies that the scope Annex 14 includes the specifications for dealing with objects that are beyond the limits of the OLS.

22. The amendment also seeks to update the definition of an obstacle as:

"All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) Are located on an area intended for the surface movement of aircraft; or

b) Extend above a defined surface intended to protect aircraft in flight; or

c) Stand outside those defined surfaces and that have been assessed as being a hazard to air navigation."

23. The anticipated timing for the implementation of this amendment is that it will become applicable in November 2009.

The current ICAO definition of an obstacle outlined in ICAO Annex 14 Volume I does not include those obstacles that stand outside of the OLS and have been assessed as being a hazard to air navigation. However when considering Recommendations 4.3.1 and 4.3.2 and in light of the proposed amendment, it is clear that the intention of the Recommended Practices set out in Annex 14 include obstacles located outside the OLS and thus away from certified and registered aerodromes.

[2] *CASR Part 139 - aerodromes*

Marking and Lighting of Obstacles

24. ICAO Annex 14 Chapter 6 – Visual Aids for Denoting Obstacles sets out Recommended Practices for the marking and/or lighting of obstacles. Being part of Annex 14 – Aerodromes, the context of Chapter 6 is the marking and/or lighting of obstacles that are located within the vicinity of an aerodrome, however Section 6.2 Marking of Objects and Section 6.3 Lighting of Obstacles provides standards that can be applied to obstacles that are located away from the vicinity of aerodromes.

25. Section 6.2 provides guidance on the use of colours, use of markers, and use of flags and provides examples of the marking and lighting of tall structures (Figure 1). Section 6.3 provides guidance on the use of obstacle lights, location or obstacles lights, and provides details on the characteristics of low, medium and high intensity lights.

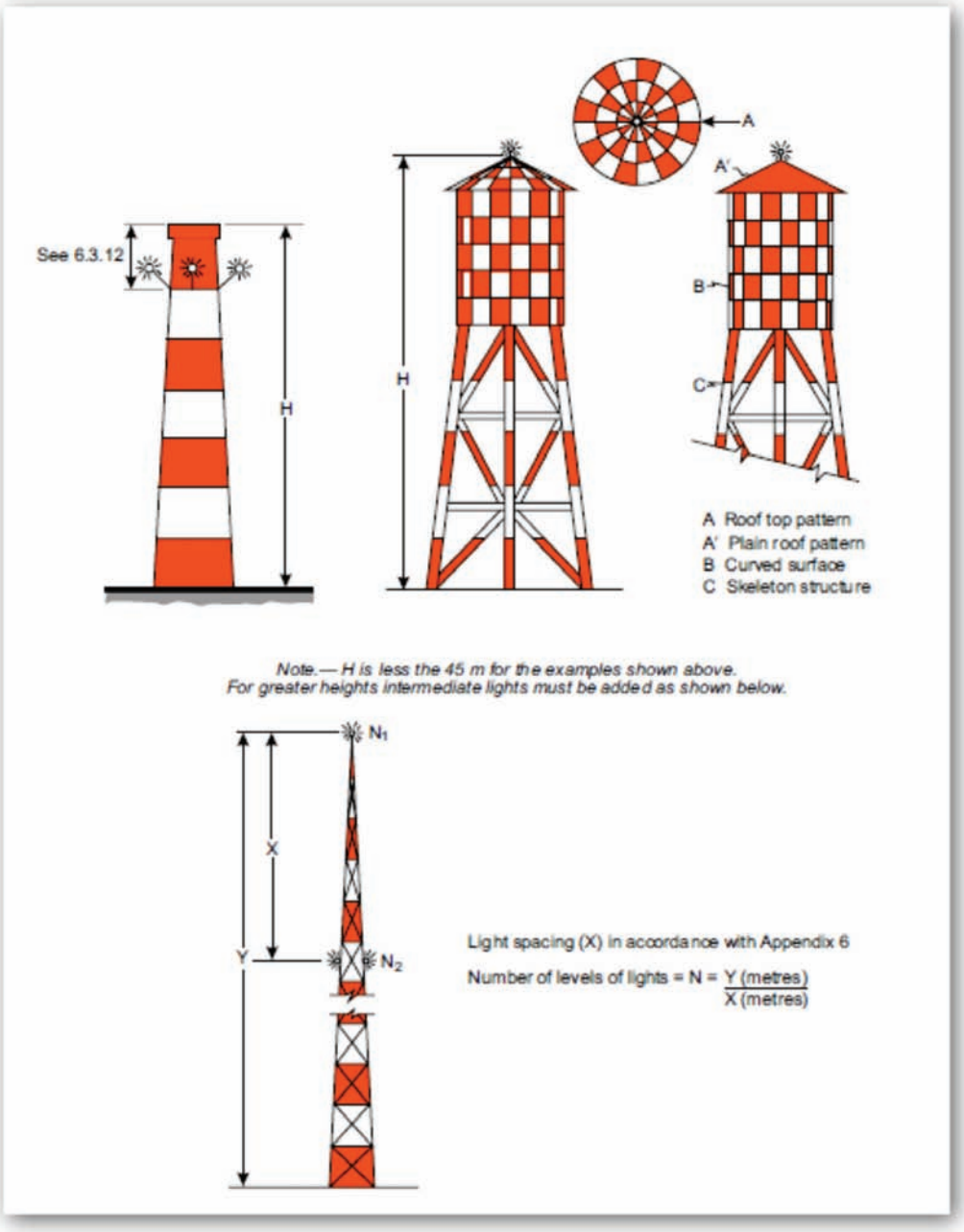

Figure 1: Examples of marking and lighting of tall structures (source: ICAO Annex 14)

26. In March 2009 Annex 14 Chapter 6 was amended to require that *"… a wind turbine shall be marked and/or lighted if it is determined to be an obstacle".* The amendment inserts Section 6.4 and provides for the marking and lighting requirement for wind farms in the event that the aeronautical study applied by virtue of Recommendation 4.3.1 and 4.3.2 determines that the wind farm is an obstacle to aircraft.

27. Recommendation 6.4.2 states:
"The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study."

28. Recommendation 6.4.3 states:
"When lighting is deemed necessary, medium intensity obstacle lights should be used. In the case of a wind farm, i.e. a group of two or more wind turbines, it should be regarded as an extensive object and lights should be installed:

a) to identify the perimeter of the wind farm;

b) respecting the maximum spacing, in accordance with 6.3.14, between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used;

c) so that, where flashing lights are used, they flash simultaneously; and

d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located."

29. Recommendation 6.4.4 states:
"The obstacle lights should be installed on the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction."

The Recommended Practices set out in Chapter 6 of Annex 14 Volume I are unambiguous in their requirement for lighting and marking of wind farms in the event that they are determined to be a hazard to aviation. There does not seem to be any option for alternative mitigation options. If a wind turbine is a hazard to aviation it must be marked and light according to the standards set out in Section 6.4.

Annex 15 – Aeronautical Information Services

30. Annex 15 is concerned with establishing the Standards and Recommended Practices for ensuring that the safety, regularity and efficiency of international air navigation is maintained by providing a standard set of aeronautical information services. Chapter 10 is concerned with establishing the standards and recommended practices for the collection of obstacle and terrain data and states the specifications for the collection of that data.

31. A range of new electronic terrain and obstacle data (eTOD) requirements were set out in Amendment 33 to Annex 15. The purpose of requiring the collection of eTOD is to ensure that terrain and obstacle data is collected in a standard format that can support the following applications:

- ground proximity warning system with forward looking terrain avoidance function and minimum safe altitude warning (MSAW) system;
- determination of contingency procedures for use in the event of an emergency during a missed approach or take-off;
- aircraft operating limitations analysis;
- instrument procedure design (including circling procedure);

- determination of en-route "drift-down" procedure and en-route emergency landing location;
- advanced surface movement guidance and control system (A-SMGCS);
- aeronautical chart production and on-board databases;
- flight simulator;
- synthetic vision; and
- aerodrome/heliport obstacle restriction and removal.

32. The sets of terrain and obstacle data are collected in accordance with the following coverage areas:

    Area 1: Entire territory of a state;

    Area 2: Terminal control area;

    Area 3: Aerodrome / heliport area; and

    Area 4: Category II or III operations area.

33. The implementation Schedule set down for members states to be in a position to collect eTOD became applicable in 2008 for Area 1 and Area 4 coverage. 2010 was the applicable date set down for the implementation of Area 2 and Area 3 requirements. A number of member states have since indicated to ICAO that the requirements relating to Area 2 will be difficult and costly to implement. Concerned that the difficulties with implementing these eTOD requirements may lead to wide-spread non-compliance, ICAO are currently reviewing the Standards and Recommended Practices relating to eTOD and expect that the outcome of this review will significantly reduce the implementation difficulties and costs, mainly through the amendment of requirements for proposed Area 2. As a result of this review it has been proposed in the latest amendment proposal that the applicability date for Area 2 and Area 3 be extended to November 2012.

The collection of obstacle data for use in the applications mentioned above and the collection of data in order to determine the level and nature of their hazard to air navigation has some synergies that might potentially allow these processes to be aligned. Chapter 10 sets out some very specific criteria for the structure and nature of the data that is collected for Aeronautical Information purposes and the nature of this data would be in line with being used for the purpose of conducting aeronautical studies.

Federal Aviation Administration (FAA)

34. The Federal Aviation Administration (FAA) is the agency that is responsible for civil aviation safety in the United States of America. The FAA issue and enforce regulations and minimum standards covering manufacturing, operating, and maintaining aircraft. This includes the certification of airmen and the airports that serve air carriers. The FAA are also responsible for the safe and efficient use of navigable airspace, operating a network of airport towers, air route traffic control centres, and flight service stations. The FAA achieve this by developing air traffic rules, assigning the use of airspace, and controlling air traffic.

35. The United States Code (USC) is the codification by subject matter of the general and permanent laws of the United States based on what is printed in the Statutes at Large. The USC is divided into 50 broad subject areas with Title 49 – Transportation being the specific code that deals with Aviation Statutes. Title 49 Subtitle VII – Aviation Programs gives the authority to the FAA to develop the rules and regulations required to ensure aviation safety within the United States.

36. In the same fashion the United States Federal Regulations are codified using the Code of Federal Regulations (CFR). Title 14 of the CFR deals specifically with the area of Aeronautics and Space. The regulations that are encompassed by Title 14 of the CFR are also known as Federal Aviation Regulations (FAR's) and these FAR's are administered by the FAA. The FAR's are organized into sections, called parts which are aligned to their organization within the CFR.

37. 49 USC Section 44718 states that *"The Secretary of Transport shall require a person to give adequate public notice … of the construction or alteration, establishment or extension, or the proposed construction alteration, establishment, or expansion of any structure … when notice will promote; a) safety in air commerce, and b) the efficient use and preservation of the navigable airspace and of airport traffic capacity at public-use airports."*

38. As a result of this legislation 14 CFR Part 77 – Objects Affecting Navigable Airspace was issued. 14 CFR Part 77 (FAR Part 77) is structured to provide direction in the following areas:

    a) The establishment standards for determining obstructions in navigable airspace;

    b) Set out the notification requirements to the Administrator of certain proposed construction or alteration;

    c) Provide for the use of Aeronautical Studies of obstructions to determine their effect on the safe and efficient use of airspace;

    d) Provide for the use of public hearings to determine the hazardous effect to air navigation by any proposed construction or alteration; and

39. FAR Part 77 is concerned with all objects that might potentially affect the safety of navigable airspace. The scope of FAR Part 77 is not limited to objects that are within the vicinity of an aerodrome. FAR Part 77 sets out two criteria for determining the types of objects that may be affected by the regulation.

    FAR Part 77 applies to:

    a) Any object of natural growth, terrain, or permanent or temporary construction or alteration, including equipment or materials used therein, and apparatus of a permanent or temporary character; and

    b) Alteration of any permanent or temporary existing structure by a change in its height (including appurtenances), or lateral dimensions, including equipment or materials used therein.

FAA Regulations (FAR Part 77) is comprehensive and sets the standards for notification and assessment of obstacles whether they are located in the vicinity of an aerodrome or away from an aerodrome (including OLS). The FAR Part 139 deals exclusively with aerodrome specifications and certification.

40. Guidance Material in the form of Advisory Circulars are published by the FAA.

    - AC 70/7460-1K – Obstruction Marking and Lighting
    - AC 70/7460-2K – Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace
    - AC 150/5190-4 – A Model Zoning Ordinance to Limit Height of Objects Around Airports
    - AC 150/5200-33 – Hazardous Wildlife Attractants on or Near Airports
    - AC 150/5345-43 – Specification for Obstruction Lighting Equipment

41. AC 70/7460-2K – Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace sets out in detail the reporting requirements of FAR Part 77. The FAA also publish a specific page on their website that deals specifically with the requirements and use of FAR Part 77[3]. This web page details the following information:

    - Relevant FAA Contacts
    - Purpose of filing a Notice
    - Who Must File
    - On-Airport Construction Vs Off-Airport Construction
    - Airport Owners and Operators
    - Permanent Vs Temporary Modifications
    - Form of Notice
    - Notification; Timing and Submittal
    - FAA Determination
    - Applicable Resources
        - o Advisory Circulars
        - o Forms
        - o Policy

42. Part 77 sets out the Notifications requirements as:
    Any person/organization who intends to sponsor any of the following construction or alterations must notify the Administrator of the FAA:

    a) Any construction or alteration exceeding 200 ft above ground level

    b) Any construction or alteration

    i. within 20,000 ft of a public use or military airport which exceeds a 100:1 surface from any point on the runway of each airport with at least one runway more than 3,200 ft.

    ii. within 10,000 ft of a public use or military airport which exceeds a 50:1 surface from any point on the runway of each airport with its longest runway no more than 3,200 ft.

    iii. within 5,000 ft of a public use heliport which exceeds a 25:1 surface

    c) Any highway, railroad or other traverse way whose prescribed adjusted height would exceed that above noted standards

    d) When requested by the FAA

    e) Any construction or alteration located on a public use airport or heliport regardless of height or location

43. The first point in these requirements sets a notifiable height of 200 ft (60m) regardless of the location. Thus in the context of the scope of this report it can be established that the requirement of FAR Part 77 is that any obstacle away from a certified and registered aerodrome is notifiable to the FAA for the purpose of conducting an Aeronautical Study that determines whether the obstacle is in fact a hazard to navigable airspace.

44. A sponsor proposing any type of construction or alteration of a structure that meets the above notification requirements is required to submit the notification at least 30 days prior to the date of the proposed construction or alteration, or on or before the date that an application for a construction permit is required, whichever date is the earliest. The FAA will acknowledge in writing the receipt of each submission.

[3] *http://www.faa.gov/airports/central/engineering/part77/*

45. Once the submission is received by the FAA it will make an assessment as to the need of an aeronautical study. An aeronautical study may also be requested by the sponsor of the proposed construction or alteration. FAR Part 77 also sets out the process by which the FAA is required to undertake the Aeronautical Study:

To the extent considered necessary, the Regional Manager, Air Traffic Division or his designee:

a) Solicits comments from all interested persons;

b) Explores objections to the proposal and attempts to develop recommendations for adjustment of aviation requirements that would accommodate the proposed construction or alteration;

c) Examines possible revisions of the proposal that would eliminate the exceeding of the standards in subpart C of this part; and

d) Convenes a meeting with all interested persons for the purpose of gathering all facts relevant to the effect of the proposed construction or alteration on the safe and efficient utilization of the navigable airspace.

46. In the case that an aeronautical study is determined to be necessary the submission is assessed against the standard that is outlined in FAR Part 77 Subpart C:

An existing object, including a mobile object, is, and a future object would be, an obstruction to air navigation if it is of greater height than any of the following heights or surfaces:

a) A height of 500 feet above ground level at the site of the object.

b) A height that is 200 feet above ground level or above the established airport elevation, whichever is higher, within 3 nautical miles of the established reference point of an airport, excluding heliports, with its longest runway more than 3,200 feet in actual length, and that height increases in the proportion of 100 feet for each additional nautical mile of distance from the airport up to a maximum of 500 feet.

c) A height within a terminal obstacle clearance area, including an initial approach segment, a departure area, and a circling approach area, which would result in the vertical distance between any point on the object and an established minimum instrument flight altitude within that area or segment to be less than the required obstacle clearance.

d) A height within an en route obstacle clearance area, including turn and termination areas, of a Federal airway or approved off-airway route, that would increase the minimum obstacle clearance altitude.

e) The surface of a takeoff and landing area of an airport or any imaginary surface established under §77.25, §77.28, or §77.29. However, no part of the take-off or landing area itself will be considered an obstruction.

47. Once the FAA has completed an aeronautical study, a determination is made regarding the impact to air navigation. One of three responses is typically issued:

a) **No Objection** – The subject construction did not exceed obstruction standards and marking/lighting is not required.

b) **Conditional Determination** – The proposed construction/alteration would be acceptable contingent upon implementing mitigating measures (Marking & Lighting, etc.)

c) **Objectionable** – The proposed construction/alteration is determined to be a hazard and is thus objectionable. The reasons for this determination are outlined to the proponent.

48. If at any time during the aeronautical study, the proposed alteration is determined to be a hazard, the study is halted with no further consideration and an objectionable determination is issued.

49. In the case of a Conditional Determination the marking and lighting standards as set out in Advisory Circular AC 70/7460-1K Obstruction Marking and Lighting. As a standard this Advisory Circular states that any temporary or permanent structure that exceeds an overall height of 200 feet (61m) above ground level should normally be marked or lit. The standard further sets out that an aeronautical study may either determine that the absence of marking and lighting will not adversely affect aviation safety, or in some cases the determination may find that there is an extraordinary hazard to aviation safety and require higher marking and lighting standards.

50. Advisory Circular AC 70/7460-1K Obstruction Marking and Lighting also provides for the requirement for reporting of lighting failure to the appropriate flight service station in order to ensure that a Notice to Airman (NOTAM) can be issued as soon as possible. Advisory Circular AC 70/7460-1K sets out the marking requirements providing guidance on paint colours, paint standards, paint patterns, markers and sets out some alternatives to marking that include; low and medium intensity white flashing lights under specific conditions. The lighting guidelines set out in Advisory Circular AC 70/7460-1K provide guidance on lighting systems, catenary lighting, inspection, repair and maintenance, non standard lights, placement factors, and the monitoring of obstruction lights. The specifications of lighting equipment is set out in Advisory Circular AC 150/5345-43E.

51. The notifications that are submitted to the FAA by virtue of the FAR Part 77 requirements are managed internally at the FAA by the Obstruction Evaluation Service. The Obstruction Evaluation Service manages approximately 60 000 notifications per year and is staffed by approximately 35 staff who are located in various offices in the USA.

52. It is anticipated that over the coming two to three years the volume of applications will increase to approximately 100,000. One of the factors driving this anticipated change is the government's incentives for alternate power source generation.

European Aviation Safety Agency (EASA)

53. The European Aviation Safety Agency (EASA) was established in order to harmonise the aviation safety requirements and practices of the different European member countries. EASA was established by the European Parliament and Council in 2008 by virtue of what is termed the 'Basic Regulation'. The 'Basic Regulation' establishes common requirements for the regulation of safety and environmental sustainability in civil aviation. It gives the European Commission powers to adopt detailed rules for the Regulation's implementation.

54. As a result of this 'Basic Regulation', the EASA was formed to address the Regulation's need for *'a single specialised expert body', which delivers appropriate expertise to EU institutions to prepare these rules and verify their implementation at national level. Thus the Agency acts as an enabler to the legislative and executive process, a body which 'is independent in relation to technical matters and has legal, administrative and financial autonomy.'*[4]

55. As EASA is a relatively new agency, it's responsibility for regulating aviation safety in the European Community is being phased in, based on the agencies ability and competency in the areas that it is responsible for regulating. In those areas that EASA considers itself not yet competent, the responsibility for civil aviation regulation and safety is left with the various national administrations of the member countries.

56. Currently The main tasks of the Agency currently include:

- Rulemaking: drafting aviation safety legislation and providing technical advice to the European Commission and to the Member States;
- Inspections, training and standardisation programmes to ensure uniform implementation of European aviation safety legislation in all Member States;
- Safety and environmental type-certification of aircraft, engines and parts;
- Approval of aircraft design organisations world-wide as and of production and maintenance organisations outside the EU;
- Authorization of third-country (non EU) operators;
- Coordination of the European Community programme SAFA (Safety Assessment of Foreign Aircraft) regarding the safety of foreign aircraft using Community airports;
- Data collection, analysis and research to improve aviation safety.

[4] *http://www.easa.europa.eu/ws_prod/g/g_faq_main.php*

57. EASA are not currently looking at the issue of managing man made obstacles away from registered and certified aerodromes, however in a few years, the Agency will be responsible for safety regulations regarding airports and air traffic management systems. It is anticipated that the issue of identifying and managing the risks associated with man made obstacles situated away from registered and certified aerodromes may be addressed by EASA in the future.

United Kingdom Civil Aviation Authority (UK CAA)

58. The United Kingdom Civil Aviation Safety Authority (UK CAA) are responsible for aviation regulation in the UK. Its activities include economic regulation, airspace policy, safety regulation and consumer protection. The National Air Traffic Service (NATS) is the organisation in the UK responsible for airspace management within the UK. NATS operates the UK's en-route air traffic service on licence to the UK CAA.

59. The primary act of parliament that regulates aviation in the United Kingdom is the Civil Aviation Act 1982. The Civil Aviation Act 1982 is supported in the UK by the Air Navigation Orders (ANO's). With respect to man made obstacles that are situated away from the planning controls of aerodromes, ANO Article 133 and ANO Article 134 deal with the lighting requirements of the obstacles that meet specific specifications. ANO Article 133 and 134 deal solely with the issue of lighting these obstacles. The issue of notification of proposed obstacles and the requirement for subsequent aeronautical studies are not addressed in these orders.

60. ANO Article 133 defines an "en-route obstacle" as any building, structure, or erection which is 150m (492 feet) or more above ground level. ANO Article 133 however specifically excludes from this definition, any building, structure or erection:

    a) which is in the vicinity of a licensed aerodrome, and

    b) to which Section 47 of the Civil Aviation Act 1982 applies.

    NB. Section 47 of the Civil Aviation Act 1983 is specifically concerned with the buildings, structures or erections that are within the vicinity of licensed aerodromes.

61. Further to the above definition, the UK AIP Part 2 En-route (ENR) Section 1.1.5.4 – Air Navigation Obstacles defines an air navigation obstacle as *"… any building or work, including waste heaps, which attains or exceeds a height of 300 ft agl". With the legal obligation to have buildings, structures or erections lit if they exceed 150m (492 feet) above ground level, the UK CAA do not have any regulatory power to require lighting below 150m. However AIP ENR 1.1.5.4 recommends that obstacles are lit if "… they are less than 150 metres (492 feet) agl in height, but are by virtue of their nature and location considered never-the-less to present a significant hazard to air navigation".*

The UK CAA does not have any regulatory power to mandate the lighting of obstacles less than 150m (492 feet) that are located away from the vicinity of aerodromes. The UK CAA operate under a policy that sees them take on an 'honest broker' role, taking a neutral position as a mediator between developers, local planning authorities and low level airspace users such as the Ministry of Defence in order to achieve a workable outcome for all parties.

62. The lighting requirements set out by ANO Article 133 are applied to objects which extend to a height of 150m or more about ground elevation. Other objects of a lesser height assessed as hazards to aviation and thus treated as obstacles are required to be marked according to the standards set out in CAP 168 – Licensing of Aerodromes. CAP 168 – Licensing of Aerodromes Chapter 4 addresses the Assessment and Treatment of Obstacles. This Chapter, as per the scope of the CAP is concerned specifically with obstacles in the vicinity of aerodromes and in particular defines those areas confined by the OLS. However, Section 12 of Chapter 4 sets out the *"… requirements for the marking and lighting of obstacles … and for the standards applicable to en-route obstacles".* The marking and lighting requirements set out in CAP 168

– Licensing of Aerodromes is very closely aligned with the marking and lighting standards set out in ICAO Annex 14 Chapter 6 – Visual Aids for Denoting Obstacles.

63. There is a UK Department for Transport Aviation Policy[5] in place that requires developers to notify the UK CAA of any building or works extending 91.4 metres (300 feet) or more above ground level. The ostensible purpose of this notification is to ensure that obstacles of a height more than 91.4m (300 feet) above ground level are published for pilots' information and noted on aeronautical maps and charts.

64. The Department of Transport Policy sets out the obstacle information that is to be supplied to the UK CAA:

- Position
- Height
- Description, and
- Developer

65. Information from the UK CAA Off-Route Section suggests that this information is passed directly to the Defence Geographic Centre. The Defence Geographic Centre is managed by the UK Ministry of Defence (MOD) Defence Geographic and Imagery Intelligence Agency (DGIA). The DGC is responsible for managing and providing the information required for the production of Aeronautical Charts in the UK.

66. If a building, structure or erection is more than 150m (492 feet) above ground level then it is automatically deemed to be a hazard to aircraft and lighting is required by virtue of ANO Article 133. For buildings, structures or erections less than 150m (492 feet) and more then 91.4m (300 feet) above ground level, the UK CAA may make recommendations for the lighting of the obstacle, however these recommendations are not enforceable. As a result the UK CAA work closely with Local Planning Authorities and the developers concerned to facilitate a workable solution.

The reporting of Wind Farm developments is handled in the same way that other high structures away from aerodromes are handled, however early notification of both the UK CAA and the MOD is encouraged. Wind Farm developments in the UK as with other countries around the world are increasing. The Off-Route Airspace Section has indicated that they receive approximately 1300 notifications per year. These notifications are generally in the form of an email or letter advising of a proposed development.

67. CAP 764 – CAA Policy and Guidance on Wind Turbines was first issued in July 2006 in response to a 2003 Department for Transport white paper *"The Future of Air Transport" which identified "… potential conflicts of interest between wind energy and aviation operations"*[6]*.* The second, and current issue of CAP 764 was released in February 2009 in order to take into account the *"… way in which Aviation Stakeholders and Wind Turbine Developers interact has matured since the release of CAP 764 in 2006".*

68. CAP 764 sets out the responsibilities of the UK CAA on this issue as:

- aerodrome and CNS Site Safeguarding[7]
- En-route CNS Safeguarding
- Airspace Management
- Approvals for Equipment and Service Provision
- Advice to Government

[5] *http://www.dft.gov.uk/pgr/aviation/safety/safeguarding/safeguardingaerodromestechni2988?page=3#a1018*
[6] *CAP 764 – CAA Policy and Guidance on Wind Turbines*
[7] *Safeguarding is a process of consultation between a Local Planning Authority (LPA) and consultees (CAP 764)*

69. While the above regulations and guidance material provide the criteria under which obstructions are required to be lit, there is no regulatory requirement in the UK that requires that developers notify the UK CAA of man made obstacles away from licensed aerodromes in the UK. The UK CAA relies on close consultation with developers and the relevant Local Planning Authority to ensure they are notified of man made obstacles.

70. Further to the lack of any requirement to notify, there is no documented process or legislated standards that might be used to assess the hazards associated with man made obstacles. The Off-Route Airspace Section of the UK CAA is responsible for the policy and planning for lower and upper airspace within the UK. One of the functions of this section is the development of policy for the lighting of obstacles outside aerodrome safeguarding areas. This responsibility is predominantly managed by one person within this section who is also responsible for a number other activities. This responsibility was not specifically designed however it developed over a period of time.

71. There is no specific process set up within the Off-Route Airspace Section. The office is informed of the construction or alteration of obstacles via local planning authorities. Local planning authorities will generally inform the UK CAA and the Ministry of Defence, via the Defence Geographic Centre, in the early stages of planning and approvals, however there is no mandated process in place requiring them to do so.

72. The British Wind Energy Association (BWEA) is the trade and professional body for the UK wind and marine renewable energy industries. The BWEA is working with UK Department of Business, Enterprise & Regulatory Reform (BERR), NATS En Route, the CAA and the UK Ministry Of Defence (MOD) to address aviation concerns. The two principles instruments that have been set up to deal with the aviation issues associated with wind farm developments are:

    - Memorandum of Understanding (MOU) to demonstrate a shared commitment to remove aviation and radar barriers in wind farm development signed by the BWEA, BERR, Department for Transport (DfT), MOD, NATS and the CAA.
    - An Aviation Plan outlined in the MOU that identifies individual work-streams that are needed to develop and implement workable solutions.

73. The MOU and Aviation Plan are largely concerned with the effects of wind farm installations on aviation radars, however the Aviation Plan explores the process of consultation between developers and industry stakeholders and offers two potential solutions for improving the consultation process[8]:

    - An e-consultation website to facilitate an easier site screening process
    - A change in CAA UK remit to allow the CAA UK to take a formal facilitation role in finding solutions for specific projects.

    These two projects have been initiated, however are still in the early stages of development and have not reached an operational level of maturity.

Civil Aviation Authority New Zealand (CAA NZ)

74. The legislation governing civil aviation operations in New Zealand is covered in the Civil Aviation Act 1990. Part 3 of the Civil Aviation Act 1990 sets out the authority of the appropriate New Zealand government minister for the making of rules (regulations) under the Act. Section 29A – Rules Relating to Airspace, specifically provides the authority to make rules regarding "… things affecting navigable airspace".

75. The New Zealand Civil Aviation Rules (CAR's) are organised into specific groupings or Parts. The specific Part that deals with Man Made Obstacles is Part 77 – Objects and Activities Affecting Navigable Airspace.

[8] *UK BWEA Aviation Plan 30th September 2008*

CAR Part 77 is composed with sections dealing with the following issues:

- Notification Requirements
- Requirement for Aeronautical Study
- Standards for Aeronautical Study
- Determination Options
- Petitions for Review of Determinations

76. CAR Part 77 imposes legal obligations on any *"… person within the territorial limits of New Zealand … proposing 1) to construct or alter a structure that could constitute a hazard in navigable airspace". CAR Part 77 also imposes obligations relating to the proposed use of lights, lasers, weapons or pyrotechnics. CAR Part 77 defines navigable airspace as "… airspace at or above the minimum flight altitude prescribed by or under the Civil Aviation Rules, including all legitimate low level operations but not including restricted, danger, and military operations areas activated for use by the New Zealand Defence Force."*

77. CAR Part 77 covers the following types of obstacles:

- **Structures** – such as buildings or masts
- **Efflux from a structure** – exhaust plumes in excess of 4.3 m/second
- **Lights** – searchlights and lasers, if these can adversely affect aircraft safety
- **Weapons firing** – projectiles
- **Pyrotechnics** – fireworks displays

78. The notification requirements as set out in CAR Part 77 specific to each of the above hazards are set out below [9]:

A structure that is to be built, or altered, that is:

- 60 m (200 ft) or higher, or
- within a Low Flying Zone (LFZ Locations), or
- within an aerodrome/heliport obstacle protection area (contact the aerodrome/heliport operator - see below).

A structure proposed to discharge efflux greater than 4.3 m/second that is:

- 60 m (200 ft) or higher, or
- within an aerodrome/heliport obstacle protection area (contact the aerodrome\heliport operator - see below).

A light, searchlight, or laser, if it can:

- adversely affect the pilot, the aircraft operation, or be mistaken as an aeronautical light.

A weapon or pyrotechnic, if the projectile has a trajectory of:

- 45 m (150 ft) or higher and within 4 km (2.25 NM) of an aerodrome or heliport, or
- 120 m (400 ft) or higher and is more than 4 km (2.25 NM) from an aerodrome or heliport.

79. CAR Part 77 sets out the specific set of standards which set the limits within which obstructions must be determined to be a hazard to navigable airspace. The Standard also sets the relevant criteria that must be considered when making a determination. This criterion includes having a consideration for issues such as instrument flight procedures, IFR obstacle clearance areas, low flying areas, and aerodrome Obstacle Limitation Surfaces. CAR Part 77 also sets the effective dates and periods of which notifications are to be made, determinations come into affect, and when determinations expire. And CAR Part 77

[9] *http://www.caa.govt.nz/airspace/Hazardous_Objects_Activities.htm#Part%2077*

makes provision for determinations to be reviewed under certain circumstances. A review will only be granted in order to *"… present new information or facts not previously considered or discussed during the aeronautical study".* Annexure B of CAR Part 77 provides standards on the marking and lighting of obstacles. These standards are consistent with the standards that are set out in ICAO Annex 14 Chapter 6 – Visual Aids for Denoting Obstacles.

The New Zealand Aviation Safety rule set is harmonised with the United States aviation safety rule set and as such CAR Part 77 is very much aligned with the United States FAR Part 77.

80. CAR Part 77 is administered within the NZ CAA by the Aeronautical Services Unit. The Aeronautical Services Unit has the responsibility for the oversight of the services supporting the New Zealand aviation system. Included in these supporting services is the responsibility for administering objects that affect navigable airspace, such as structures, fireworks, unmanned balloons, kites and model aircraft.

81. The Aeronautical Services unit conducts an Aeronautical Study on all notifications that are submitted to the unit. At the time of writing this report in the previous 12 months approximately 38 submissions were received by the Aeronautical Services Unit. In terms of staff loading it is estimated that 1 person spends approximately 1 day every two weeks dedicated to administering CAR Part 77 obstacle notification submissions and aeronautical studies. There is an increasing trend in the number of obstacle submissions due to the proliferation of wind farms in New Zealand.

82. The following process is used when conducting a CAR Part 77 Aeronautical Study:

- Public invited to comment
- Consultation with Airways New Zealand
- Consultation with local Councils
- Consultation with aerodrome Operators
- Assessment Determination is made

Transport Canada

83. Civil aviation in Canada is controlled by the Aeronautics Act 1985. The Act is administered by the Minister of Transport and Transport Canada. In 1996 Transport Canada consolidated the Air Regulations and the Air Navigation Orders into the Canadian Aviation Regulations (CAR's).

84. CAR 601.19 is the regulation that provides the authority for the Minister of Transport to order the marking and/or light any building, structure or object that is likely to be hazardous to aviation safety. Coupled with CAR 601.19, CAR 621.19 sets out the Obstruction Marking and Lighting Standards.

85. CAR 621.19 establishes that the responsibility for compliance with standards rests with *"… the persons planning to erect a building, structure or object …".* The responsibility for continued compliance is also specifically stated. Notification is required within 90 days prior to the erection of the building, structure or object via the appropriate Transport Canada Civil Aviation Office.

86. The Transport Canada Aeronautical Information Manual (TC AIM) further sets out the requirements for obstacle marking and lighting in Section AGA - 6.0 OBSTRUCTION MARKINGS. With respect to the objects that CAR 621.19 refers to the TC AIM states, "Except in the vicinity of an airport where an airport zoning regulation has been enacted, Transport Canada has no authority to control the height or location of structures. However, all objects, regardless of their height, that have been assessed as constituting a hazard to air navigation require marking and/or lighting in accordance with the CARs and should be marked and/or lighted to meet the standards specified in CAR 621.19"

87. The TC AIM also sets out the standards for the lighting and marking of objects:

    a) any obstruction penetrating an airport obstacle limitation surface as specified in TP 312, aerodrome Standards and Recommended Practices;

    b) any obstruction greater than 90 m (300 ft) AGL within two nautical miles of the imaginary centre-line of a recognized VFR route, including but not limited to a valley, a railroad, a transmission line, a pipeline, a river or a highway;

    c) any permanent catenary wire crossing where any portion of the wires or supporting structures exceeds 90 m (300 ft) AGL;

    d) any obstructions greater than 150 m (500 ft) AGL; and

    e) any other obstruction to air navigation that is assessed as a likely hazard to aviation safety.

88. The requirement for marking and lighting is voluntary, but can be enforced by an order from the minister.

Australian Experience

Regulatory Framework

89. The Civil Aviation Act 1988 is the principle legislative instrument in Australia that empowers the Governor General to make regulations with respect to aviation safety issues. There are currently two sets of regulations in effect; Civil Aviation Regulations 1988 (CAR), and the Civil Aviation Safety Regulations 1998 (CASR's). The CAR's are gradually being replaced by CASR's. Until they are completely replaced, both sets of regulations are applicable, however as the CAR's predate the CASR's, if there is any inconsistency between these two legislative instruments, the CASR's will prevail.

90. Section 98 of the Civil Aviation Act 1988 provides for the making of aviation regulations. Specific to the regulation of obstacles, Section 98(3)(g) provides for the making of regulation that prohibits, or restricts, the construction of buildings, structures or objects. The legislation also provides for the making of regulations that require the *"… marking or lighting of buildings, structures or objects (including trees or other natural obstacles) that constitute or may constitute obstructions, hazards or potential hazards to aircraft flying in the vicinity of an aerodrome."*

91. There is no specific provision under Section 98 that allows for the making of regulations that apply to objects away from the vicinity aerodromes. However, there is a general regulation power that is outlined under Section 98(1)(c) that allows the making of regulations *"for the purpose of carrying out and giving effect to the provisions of the Chicago Convention relating to safety".* In light of the ICAO requirements discussed above, it is reasonable to assume that Section 98(1)(c) could be used in order to make regulations concerning man made obstacles that are located away from the vicinity of aerodromes.

92. Section 98(3)(g) of the Civil Aviation Act 1988 provides the basis on which CASR Part 139 – Aerodromes empowers CASA to deal with objects. However as mentioned above the scope of CASR Part 139 is specifically concerned with obstacles that are located within the vicinity of certified and registered aerodromes. Other legislative instruments that deal with obstacles that are situated within the vicinity of aerodromes include; CAR 95, Civil Aviation (Buildings Control) Regulations, Airports Act and State Planning and Land Use Legislation. None of these legislative instruments address the issue of man made obstacles that are located away from the vicinity of aerodromes.

93. Section 98(4) of the Civil Aviation Act 1988 requires that any regulation made by virtue of Section 98(3)(g) requiring the removal or restriction of buildings, structures or objects shall "… provide for the payment of compensation to any person who suffers loss or damage or incurs expense in or as a direct result of the removal, marking or lighting". This requirement to provide compensation to those affected by a determination that marking or lighting is required has created reluctance within CASA for initiating any regulation that empowers them to prohibit or remove obstacles, or mandate the marking and/or lighting of obstacles. CASA funding does not cover the costs associated with such compensation.

94. CASR Part 139 defines obstacles as, *"all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight".* In line with the scope of CASR Part 139 this definition is specific to obstacles that are located in the vicinity of an aerodrome.

Advisory Publications

95. There are two publications that CASA have used to support the legislation surrounding man made obstacles:

- AC 139-08(0) Reporting of Tall Structures – April 2005
- AC 139-18(0) Obstacle Marking and Lighting of Wind Farms – December 2005 (Repealed)

96. AC 139-08(0) Reporting of Tall Structures sets out the requirements that tall structures located away from certified and registered aerodromes are to be notified directly to the Royal Australian Air Force (RAAF) Aeronautical Information Services (AIS) section. This requirement to report tall structures is based on the need to have information on tall structures available for publication on aeronautical charts.

97. The RAAF AIS requires that all tall structures that meet the following height criteria are to be reported:

- 30 metres or more above ground level for structures within 30km of an aerodrome; or
- 45 metres or more above ground level for structures located elsewhere.

98. The current process requires that sponsors of buildings, structures or objects that meet the above reporting requirements submit the details of the proposed building, structure or object via a Vertical Obstruction Report Form on the RAAF AIS website[10]. Once received the obstruction data is placed into the database and distributed on request to the Geo Science Australia, Air Services Australia and appropriate industry stakeholders. Assessment of obstacle data is limited to the height specification of each submission. No aeronautical assessment is conducted to determine whether the building, structure, or object is in fact a hazard to aviation safety. The primary users of the tall structure information collected by the RAAF AIS is Geoscience Australia and Air Services Australia.

99. Geoscience Australia is a prescribed agency within the portfolio of the Department of Resources, Energy and Tourism and one if its primary activities is the provision of key spatial information of Australia. The Tall Structures database administered by the RAAF AIS is one of the inputs to the spatial information compiled by Geoscience Australia.

100. AC 139-18(0) was repealed in September 2008. The premise of AC 139-18(0) was that CASA was to be notified of any wind farm developments that:

- Is to be constructed near an aerodrome and will infringe the OLS of the aerodrome
- Is to be of a height of 110m or more above ground level.

101. AC 139-18(0) also set out a process by which CASA would conduct an assessment of the proposed wind farm development at the cost of the developer and make a determination as to whether the wind farm represents a hazard to aviation. The determination options set out by the Advisory Circular were:

- Not hazardous to aviation
- Not hazardous to aviation provided that approved marking and/or lighting is installed
- Hazardous to Aviation, but the risks to aircraft safety are adequately reduced with the provision of approved marking and/or lighting.

102. With the repealing of AC 139-18(0), there is no provision for the undertaking of an aeronautical study to determine whether a wind farm development is in fact a hazard to aviation. The requirements for reporting wind farm developments revert to the requirements under AC 139-08(0) Reporting of Tall Structures, which

[10] *http://www.raafais.gov.au/frame.htm?obstr_form2.htm*

as stated above do not make any provision for conducting aeronautical studies to determine whether it is a hazard to aviation.

Electronic terrain and Obstacle Data (eTOD)

101. In response to the ICAO eTOD requirements set out in a previous section, Australian authorities have instigated a high level working group to examine how Australia can satisfy the eTOD requirements in its current regulatory framework. The high level working group is represented by:

- Department of Infrastructure, Transport, Regional Development and Local Government
- Civil Aviation Safety Authority
- AirServices Australia
- Geoscience Australia
- RAAF Aeronautical Information Section

102. In support of this high level working group a technical working group has been set up to examine the technical and operational issues with regard to satisfying the ICAO eTOD requirements. The technical working group is represented by:

- Civil Aviation Safety Authority
- AirServices Australia
- RAAF Aeronautical Information Section

103. At the time of writing the eTOD working groups had met once and no specific recommendations concerning Australia's response to the eTOD requirements had been made.

Industry stakeholders within Australia

Wind Energy Industry

104. With the growing evidence that human activity is changing the climate patterns of the world and Australia, there have been considerable efforts by governments, including the Australian Government, to put in place policies and strategies designed to reduce the impact to the economy, society and the environment caused by climate change. In 2001 the Australian Government established the Mandatory Renewable Energy Target (MRET) which is designed to reduce greenhouse gas emissions by encouraging additional generation of electricity from renewable energy sources. There has been significant industry pressure in recent times for the expansion of the Renewable Energy Targets established in 2001[11]. At the time of writing the Australian Government was proposing the Renewable Energy (Electricity) Amendment Bill 2009 that requires that 20% of Australia's electricity usage will be supplied by renewable energy by 2020.

105. Wind power in Australia currently provides 0.5% of Australia's electricity requirements. It is however reasonable to expect that this figure will increase in the future given the push for increased Renewable Energy Targets and the suggestion by the Clean Energy Council that the current distribution network in Australia could accommodate as high as 20% wind power generation. The international trend suggests that wind power provides 20% of Denmark's electricity usage, 5% of Germany's electricity usage, and Europe has a target to get 12% of its total electricity consumption from wind by 2010[12]. The UK's renewable energy targets require that 10% of its electricity usage is supplied by renewable energy by 2010 and 20% of the electricity usage in the UK is supplied by renewable energy by 2020[13].

[11] *Response of the Clean Energy Council to the Inquiry into the Renewable Energy (Electricity) Amendment Bill 2009*
[12] *Auswind – Wind Energy in Australia – Fact Sheet*
[13] *CAP 764 – CAA Policy and Guidelines on Wind Turbines, Appendix 2 – UK Government Renewable Energy Policy*

106. With the height of wind turbines commonly ranging from 200 to 300 feet (60 to 90 metres) to the nacelle and 150m at the maximum blade height wind farms have the real potential to extend into navigable airspace. The inherent height characteristics of wind farms mean that they often meet the criteria that define them as an obstacle to the safe operation of aircraft. This in turn brings them under legislation that requires at the very least an aeronautical study, and in some cases mandatory marking and lighting requirements.

With the latest push for the increase of renewable energy targets and the corresponding trend internationally, it can reasonably be expected that the number of developments that could potentially affect aviation airspace will increase. Indeed this is the experience of other Regulators.

107. When conducting an aeronautical study on obstacles and in particular wind farms, the authority responsible for conducting the study has the primary concern of aircraft safety when making its determination. It is the contention of the Wind Energy industry in Australia that a *" … potential for conflict with CASA arises because responsible developers and planning decision-makers must balance several potentially conflicting beneficial values and CASA is limited by its charter to focus on one, to the exclusion of others".* Wind energy developers and planning decision-makers are required to take into account the environmental impacts of any proposed wind farm development.

108. These impacts include the consideration of the visual amenity in the context of the surrounding landscape. 'Visual Amenity' is a measure of the visual quality of a wind farm site experienced by local residents. Wind Farm developers are often in a position of being required to satisfy the 'visual amenity' concerns of local residents, while in turn satisfying the lighting requirements of CASA and the local planning decision-makers, who in Australia have shown a tendency to take their lead from CASA. The principle concern of the Wind Energy industry seems to be that mitigation options other than lighting are not being considered by CASA.

109. Until recently the advice from CASA with respect to the marking and lighting of wind farms was provided by virtue of AC 139-18(0) Obstacle Marking and Lighting of Wind Farms. AC 139-18(0) was repealed in September 2008, and this has left a regulatory and policy void with respect to the requirements of wind farms that are developed in areas that are situated away from certified or registered aerodromes.

110. The position of the wind energy industry is that wind farms should be assessed on an individual basis as to whether they pose a hazard to aviation. And in the case that they do not pose a hazard to aviation then there should be no requirement for lighting or marking of the wind farm.

Regional Operators

111. Regional operators within Australia consist of regional airlines, charter operators, aeromedical operators and other aerial work operators. The operators that fly under Instrument Flight Rules (IFR) are generally considered to be flying beyond the heights were man made obstacles would be considered a significant risk. However it is the operators that fly under Visual Flight Rules (VFR) in adverse weather conditions who may be exposed to a high level of exposure to man made obstacles located away from aerodromes.

112. For example the Canberra to Goulburn route is approximately 70-80km in distance. A recent wind farm development is situated in the area north east of Lake George. This route is known for its frequent adverse weather conditions and VFR operators are known to scud run in these conditions. This situation is one that highlights the importance of ensuring that aircraft operators have access to the latest information on any obstructions that may affect the safe operation of their aircraft.

113. Another issue for regional operators is that for a variety of reasons they are sometimes in a position that requires the declaration of an emergency. In this situation it is important that the pilot of an aircraft has access to the most up to date information regarding obstacles in the area. An emergency situation is one that

requires a pilot to manage a very high workload and make decisions based on information that charts and electronic devices can provide. Having to deal with an obstacle that is located in a position that was not previously known by the pilot has the potential to adversely affect the outcome of an emergency situation.

Electricity Industry

114. The average height of a high voltage power line pylon depends on the electrical company who installs them, however the heights range from between 35m (115ft) to 40m (130ft). The Electricity Industry does not usually consult with the aviation industry when planning, developing and constructing these installations.

115. Since the judgement of Sheather vs Country Energy where it was found that Country Energy had a duty of care to the community with respect to ensuring that it's wire network was appropriately protected from the potential for an aircraft to strike its network, some electricity suppliers have taken action to assess the risk exposure of their networks against an aircraft strike. These activities however are not consistent within the electricity supply industry. This decision might have implications with respect to the proponents of other man made obstacles.

Aerial Agriculture

116. Aerial agriculture predominantly involves the application of pesticides and fertilisers to specific crops by use of over flying aircraft fitted with spraying equipment. By its nature flying for the purpose of spraying, seeding, and fertilising crops involves operating the aircraft at very low levels. Due to the low flying nature of aerial agriculture operations the industry is concerned about the impacted that the construction of man made obstacles might have on the safe operation of their aircraft.

117. In the context of man made obstacles the aerial agricultural industry are concerned with three particular hazards that are presented to low flying pilots:

- Wires
- Wind Monitoring Masts
- Wind Turbine Generators

118. The aerial agricultural industry in Australia is represented by the Aerial Agriculture Association of Australia (AAAA). The AAAA have adopted a risk based approach to aerial agricultural operations and have integrated risk management practices into their pilot training programs. The primary obstacle hazards represented above are managed on an operation by operation basis through the risk management process, however this process relies on the availability of accurate information. Of particular concern to the aerial agricultural industry is the rapid installation of the wind monitoring masts and the adhoc reporting of the installations.

119. Wind Monitoring Masts are installed to evaluate the wind resource potential at a potential site for a wind farm development. Wind Monitoring Masts generally range from a height of 10m to 80m (262 feet). Wind monitoring masts are generally supported by multiple guy wires. The aerial agricultural industry takes the view that using the risk based approach allows them to effectively manage any man made obstacles that are situated within their area of operation, however when obstacles are erected without notification this significantly increases the risk to their operations.

120. The AAAA have in place some informal arrangements with wind energy companies, however these arrangements are not widespread within the wind energy industry and notification is often given after the installation of the masts. In the same context, the AAAA are also working with the electricity industry on the issue of the marking of wires.

121. It is the position of the AAAA that any recommendations on this issue that involve the establishment of 'trigger' heights for notification and lighting requirements will not satisfy the needs of the aerial agricultural industry as the heights that they general fly are so low as to fall under these triggers.

Local Planning Authorities

122. Planning and Development approvals in Australia are administered by the various state government planning departments. Discussions with representative from the state planning authorities indicate that at a state level the issue of man made obstacles that are located away from the vicinity of an aerodrome is not specifically a factor in the planning and development approval process. Where it does become a development issue the planning authorities would take there lead from CASA.

123. The Australian Government Department of Infrastructure, Transport, Regional Development and Local Government advises the Government on the policy and regulatory framework for Australian airports and the aviation industry, manages the administration of the Government's interests in privatised airports under the Airports Act 1996, and provides policy advice to the Minister on the efficient management of Australian airspace. The Department recently published a Discussion Paper titles Safeguards for Airports and the Communities Around Them. While the scope of the Discussion Paper is restricted to the safeguarding of airports, there is some comment on issue of Wind Turbines. It is suggested in the report that *"… all proposed wind turbine sites should be notified to CASA prior to application for planning."* The Australian Government Department of Infrastructure, Transport, Regional Development and Local Government does not have jurisdiction for applying planning restrictions for man made obstacles that are outside the vicinity of a certified or registered aerodrome.

PART 3:

Risk Assessment

Purpose

124. The purpose of this risk assessment is to identify and where possible quantify the risk exposure in regard to the issue of man made obstacles that are located outside the vicinity of certified and registered aerodromes. The risk assessment component of this body of work seeks to clarify the methods by which the operational risks associated with man made obstacles could be determined. That same risk assessment methodology could also be used to examine CASA's current risk exposure with respect to the requirements outlined in ICAO standards and recommended practices. By looking at the ICAO requirements and the way in which other Regulators are addressing the issues of man made obstacles located away from the vicinity of aerodromes a comparative risk decision can be made by CASA.

125. There is a high degree of uncertainty around the level of risk that is associated with man made obstacles located away from aerodromes in Australia. This is due to the absence of any dependable information relating to the quantity and nature of man made obstacles in Australia. The lack of any legislative framework that requires the compulsory reporting of potential obstacles has meant that there is a high level of uncertainty around the information that is currently held on man made obstacles located away from Aerodromes.

126. As stated in AS/NZS 4360:2004 where no reliable data or relevant past data is available, subjective estimates may be made that reflect the degree of belief that a particular event or outcome will occur. In the case of this risk assessment that event is man made obstacle affecting navigable airspace. In order to build a suitable picture of the level of risk associated with man made obstacles located away from the vicinity of aerodromes it is important to look at how risk is defined.

Methodology

Risk Equation

127. There are many ways in which it is possible to quantify the level of risk associated with any given context. When considering the level of risk in the context of the impact that man made obstacles located outside the vicinity of aerodromes might have to aviation safety, the logical starting point would be to consider the risk equation as represented in AS4360:2004. AS4360:2004 defines risk as a function of both likelihood and a measure of consequence. In its simplest form the risk equation can be represented as:

Risk = A Function of (Consequence and Likelihood)

128. Analysis of this risk equation can be used in order to obtain an understanding of the factors that affect the level of risk. Looking at the consequence element of the equation it can be stated that consequence in the context of aviation may be represented on a scale that flows from no affect to navigable airspace, through to an extreme event that may involve a significant loss of life, in that case of an event involving regular public transport (RPT).

Consequence

129. So when making an estimate as to the consequence there are some factors that will inform any estimate that might be made. The primary factor that will inform the consequence is the type of aviation activity or flying that might bring an aircraft into the height range of a man made obstacle. The type of flying that would bring an aircraft into the height range of a man made obstacle that are located away from the vicinity of an aerodrome would be activities that involve low flying away from any point of departure or arrival. These activities may include:

- Aerial agriculture
- Cattle mustering
- General aviation pilots flying at a height that is below legal minimums
- Pipeline inspection
- Powerline inspection
- Fire fighting
- Search and rescue operations
- Military low-level flying operations
- Aircraft using non-certified/non-registered aerodromes and ALAs
- Sport and Recreational aircraft

130. It can be seen that these activities are predominately represented by one or two crew operations in aircraft that might reasonably be considered to be in the smaller class of aircraft size. When considering the consequence scale that was mentioned above it can be seen that the level of consequence of an obstacle affecting navigable airspace might reasonably be estimated to be low.

Likelihood

131. Likelihood can be considered to be a function of both the exposure to the source of risk and the probability that the outcome will occur. This relationship can be expressed in the following way:

Likelihood = A function of (Exposure and Probability)

132. The two factors that best represent exposure and probability and must be considered in order to estimate the likelihood are the number of man made obstacles that affect navigable airspace, and the number of aircraft that may be operating at a height where they may be affected by the presence of the man made obstacle. As stated previously there is a high level of uncertainty around the number of man made obstacles that affect navigable airspace. However it is reasonable to assume, with respect to the aviation activities that are represented above that the number of aircraft and flights conducted in the height range where they may be affected is quite low.

133. Given the uncertainty around the number of obstacles that exist, and the reasonable estimation of a low level of aircraft activity in the height ranges applicable to man made obstacles, it can reasonably be estimated that the likelihood of an aircraft being impacted by a man made obstacle located away from the vicinity of an aerodrome is in the low range.

Risk Level

134. Given that the estimations for both the consequence of a man made obstacle located away from the vicinity of an aerodrome affecting aviation safety and the likelihood of an aircraft being affected by a man made obstacle away from the vicinity of an aerodrome are in the low range, it can reasonably be asserted that, in the context of the wider aviation industry, the level of risk posed by man made obstacles that are located away from a certified or registered aerodrome is in the low range.

135. Not withstanding this assessment it is to be recognised that CASA operate under a public and political climate that deems any loss of life due to aircraft accident to be unacceptable and this factor should be taken into account when determining treatment strategies.

136. This assessment is based on the assumptions detailed in the above analysis and a more accurate assessment of the risk level would be obtained given more certainty surrounding the number of man made obstacles and the number of flying operations that occur within their height range.

Corporate Risk Issues Table

137. While the above risk assessment looks at the risk to aviation safety, there are a number of issues that need to be considered after comparing the current regulatory framework in Australia with the various regulatory frameworks in the UK, US, NZ and Canada. With this in mind the following table has been developed to detail the corporate risk issues that need to be considered in order to bring the Australian legislative framework in line with international standards and ICAO requirements.

CORPORATE RISK ISSUES

NUMBER	RISK ISSUE	ASSOCIATED RECOMMENDATIONS *(REFER PART 4)*
1	That CASA is required to pay compensation to sponsors of buildings, structures or objects that have been determined to be a hazard to aviation due to the existence of Section 98(3)(g) that requires the payment of compensation for any expense incurred by the installation or removal of marking or lighting	Recommendation 2
2	That the current Civil Aviation Act does not provide the appropriate authority to make regulations concerning man made obstacles that are located away from the vicinity of aerodromes leaving it open for inconsistent application of risk mitigators.	Recommendation 1
3	The lack of any height trigger that provides a clear requirement for proponents of man made obstacles to consult / notify CASA in order to determine the affect of the structure on aviation safety	Recommendation 3
4	That there is no formal process within CASA to adequately assess whether a proposed or existing structure is a hazard to aviation	Recommendation 7
5	That the current level of uncertainty around the number and nature of man made obstacles is not providing CASA with an accurate understanding of the level of risk associated with man made obstacles that are located outside the vicinity of certified and registered aerodromes	Recommendation 6
6	That current legislation within Australia is inconsistent with the Standards as set out in ICAO Annex 14 Chapter 4	Recommendation 1, Recommendation 3
7	The absence of a regulatory instrument that provides CASA with the power and authority to appropriately identify and manage the risks associated with man made obstacles that are located away from the vicinity of certified and registered aerodromes.	Recommendation 1, Recommendation 3
8	The potential that any legislation implemented may not capture or cover those buildings, structures or objects that have already been established, but have not yet been assessed by an appropriate authority as to their level of impact on aviation safety	Recommendation 3
9	Ambiguity around the ownership and accountability of the aviation risks associated with man made obstacles due to the lack of clarity around legal and regulatory responsibility of the regulator, proponents and planning authorities.	Recommendation 10
10	The current ambiguity around the aviation safety requirements of Local, State and Federal Planning authorities in the Development Approval Process	Recommendation 10

CORPORATE RISK ISSUES

NUMBER	RISK ISSUE	ASSOCIATED RECOMMENDATIONS *(REFER PART 4)*
11	The potential that sponsors of developments that meet reporting criteria for man made obstacles that are located away from the vicinity of aerodromes are not aware of their obligations to report and as a result do not make the appropriate submission.	Recommendation 6
12	The potential that the appropriate authority does not have the capacity or capability to conduct the obstacle evaluations that are required to satisfy any new legislation	Recommendation 7
13	The potential that new legislation developed to support the identification and management of man made obstacles away from aerodromes may not implemented in a timeframe that allows CASA to adequately provide the Government and the public with the assurance that the risk exposure in the near to medium future is being managed appropriately	Recommendation 11
14	The risk that aircraft operating in an area away from an aerodrome do not have access to accurate obstacle data, including charting, lighting and marking, due to inadequate systems collecting, assessing and mitigating obstacles that can affect navigable airspace	Recommendation 1, Recommendation 2, Recommendation 8
15	The potential that new man made obstacle regulation will use a blanket approach to the mitigating the impact on aviation safety of man made obstacles.	Recommendation 4, Recommendation 5
16	The potential that any advances in technology in relation to mitigation options are not addressed in the regulations and practices surrounding man made obstacles.	Recommendation 3
17	The potential for mitigation options that require Lighting and Marking of man made obstacles to affect the visual amenity of local communities.	Recommendation 4, Recommendation 5

PART 4:

Summary of Findings and Recommendations

Findings

There are a total of 7 key findings and they are represented below in the following groupings:

- ICAO Standards and Recommended Practices
- Legislation
- Regulatory Framework
- Administration
- Publications
- Wind Farms

ICAO Standards and Recommended Practices

F - 1 ICAO Requirements: The current Australian legislative framework is inconsistent with the Standards in relation to man made obstacles as set out in ICAO Annex 14 Volume I Chapter 4 and Chapter 6.

Legislative Framework

F - 2 International Legislation: The USA and New Zealand have developed a legislative framework that groups the regulations pertaining to the management of man made obstacles, wherever they are located, into one rule set (Part 77 – Objects that Affect the Navigable Airspace). Part 77 sets out the requirement for notification heights and the standards with which the regulator is required to assess objects that affect the navigable airspace.

F - 3 Australian Legislation: The current Australian legislation does not allow the making of regulations concerning man made obstacles that are located away from the vicinity of an aerodrome.

F - 4 Australian Regulatory Framework: The absence in Australia of a formal or legislated framework for conducting Aeronautical Studies on man made obstacles located away from the vicinity of aerodromes means that CASA is not suitably equipped with the appropriate options for making obstacle determinations. The current Australian legislation and rule set does not address man made obstacles that are located away from the vicinity of aerodromes and is restricted to dealing with man made obstacles that are located on or within the vicinity of an aerodrome.

Administration

F - 5 Current Australian Process: The RAAF AIS is the organisation in Australia charged with the responsibility to collect man made obstacle data, however the data is collected for information and charting purposes only. No Aeronautical Studies are done to determine whether the man made obstacle is a hazard to aviation. There is a high level of uncertainty around the current information that is held on man made obstacles. It can be reasonably assumed that this is due to the fact that legislation in Australia does not require the mandatory reporting of tall structures that could potentially be obstacles to navigable airspace.

Publications

F - 6 Advisory Material: CASA have one current publication, AC 129-08(0) that sets out the reporting requirements for tall structures, and a repealed AC 139-18(0) Obstacle Marking and Lighting of Wind Farms. AC 139-18(0) provided guidance specifically relating to wind farms, however and did not address other man made obstacles.

Wind Farms

F - 7 The wind energy industry in Australia is concerned that CASA do not have the mandate to consider options that offer alternatives to the lighting of wind farms. The wind energy industry is required to deal with the visual amenity issues caused by the requirement for lighting on wind turbines.

ICAO Annex 14 Volume I Chapter 6 provides clear requirements for the marking and lighting of wind farms in the case that they are determined to be a hazard to aviation, however there is potential that a formal Aeronautical Study may determine that a wind farm in a certain location offers no hazard to aviation, thus removing the requirement for marking and lighting.

Recommendations

Using the findings listed above and the treatment strategies outlined in the Risk Assessment Table the following recommendations have been developed. There are a total of 10 recommendations. The complex nature of the issues outlined in this report and the potential solutions are such that the recommendations have been represented in the following format:

- Legislative Framework
- Regulatory Structure
- Advisory Material
- Administration

Legislative Framework

R - 1 Authority to make Regulations: That the Civil Aviation Act is reviewed in the context of ensuring that CASA has the power to make regulations specifically concerning buildings, structures and objects that are located away from the vicinity of a certified or registered aerodrome.

R - 2 Removal of Compensation Requirements: That the Civil Aviation Act 1988 is reviewed in the context of removing the requirement to provide compensation for the installation of marking and/or lighting on buildings, structures and objects that have been determined to be a hazard to aviation.

Regulatory Structure

R - 3 Option 1 – Creation of Part 77 Objects that Affect Navigable Airspace

This option is designed to group all obstacle related regulation within one CASR Part. It is proposed that this CASR Part is designated CASR Part 77. This brings the regulation of obstacles in Australia in line with the regulatory structure applied in the United States and New Zealand.

For this option it is recommended that:

- CASA to start the process of developing new a CASR Part 77 that satisfies the recommendations outlined in ICAO Annex 14 Chapter 4
- the scope of the new CASR Part 77 includes all obstacles whether within the vicinity of an aerodrome or outside the vicinity of an aerodrome and the obstacle requirements and marking and lighting standards set out in CASR Part 139 be transferred to the new CASR Part 77
- the new CASR Part 77 include the standards for the notification of structures, buildings and objects that are in line with FAR Part 77

- the new CASR Part 77 include the following elements:

o requirement for a proponent to notify CASA of any structure, building or object and where required by CASA, to conduct an Aeronautical Study, that addresses key criteria that allows CASA to make an appropriate determination prior to any building approval.

Recommended Notification trigger height of 60m

o provides the appropriate mechanism for allowing CASA to make a determination as to the level of impact of the building, structure or object and the determination options for CASA are in line with the determination options used by the FAA; i.e. No Objection, Conditional Determination, and Objectionable

o provides CASA with the appropriate authority to mandate mitigation options such as marking and lighting in accordance with published standards.

Recommended Obstacle height standard of 150m

o requires that owners and sponsors of buildings, structures or objects that have previously been determined to require marking and lighting, notify CASA and AirServices Australia as soon as they become aware of a defective device and requires that the sponsor or owner of a building, structure or object is required to ensure the rectification of the defective device

o provides a mechanism to allow CASA to make determinations on any existing buildings, structures or objects that meet the notification requirements but have not yet undergone an Aeronautical Study

o does not restrict CASA to making determinations that only include permanent marking and lighting and takes into account the possibility of future developments in technology

R- 3 Option 2 – Expansion of Part 139 to include Obstacles that are located away from the vicinity of aerodromes

This option is designed to ensure that the current CAR Part 139 – Aerodromes sufficiently satisfies the ICAO requirements both for obstacles within the vicinity of aerodromes and for obstacles located away from the vicinity of aerodromes.

For this option it is recommended that:

- That CASA to start the process of updating CASR Part 139 to ensure it satisfies the recommendations outlined in ICAO Annex 14 Chapter 4
- That the scope of CASR Part 139 is expanded to include all obstacles whether within the vicinity of an aerodrome or outside the vicinity of an aerodrome.
- That CASR Part 139 Subpart E is expanded to include the standards for the notification of structures, buildings and objects that are in line with FAR Part 77
- That CASR Part 139 Subpart E is expanded to include the following elements:

o requirement for a proponent to notify CASA of any structure, building or object and where required by CASA, to conduct an Aeronautical Study, that addresses key criteria that allows CASA to make an appropriate determination prior to any building approval.

Recommended Notification trigger height of 60 m

o provides the appropriate mechanism for allowing CASA to make a determination as to the level of impact of the building, structure or object and the determination options for CASA are in line with the determination options used by the FAA; i.e. No Objection, Conditional Determination, and Objectionable

o provides CASA with the appropriate authority to mandate mitigation options such as marking and lighting in accordance with published standards.

Recommended Obstacle height standard of 150m

- o requires that owners and sponsors of buildings, structures or objects that have previously been determined to require marking and lighting, notify CASA and AirServices Australia as soon as they become aware of a defective device and requires that the sponsor or owner of a building, structure or object is required to ensure the rectification of the defective device
- o provides a mechanism to allow CASA to make determinations on any existing buildings, structures or objects that meet the notification requirements but have not yet undergone an Aeronautical Study
- o does not restrict CASA to making determinations that only include permanent marking and lighting and takes into account the possibility of future developments in technology

Advisory Material

R - 4 Advisory Publication – Notification Requirements: That an Advisory Circular that outlines the obligations for reporting structures, buildings or objects that may affect aviation safety is published in accordance with the requirements set out in the updated Regulations

R - 5 Advisory Publication – Marking and Lighting Standards: That an Advisory Circular that sets out the standards for the marking and lighting of obstacles is published in accordance with the standards set out in the updated Regulations

R - 6 Ongoing Education Program for Industry and Planning Authorities: That an ongoing education program directed to industry developers and local planning authorities is established to in order to highlight the responsibility for proponents to report their developments initially to the RAAF AIS, and ultimately to CASA for the purpose of an Aeronautical Study

Administration

R - 7 Internal CASA Capability: That CASA develop a capability under the Airspace and Aerodromes Regulation Group that manages the submission of obstacle notifications and industry submitted Aeronautical Studies, and that the establishment of this capability is based on the estimated number of submissions that would be generated by the new Regulations

R - 8 Sharing of Obstacle Data: That CASA enter into a Memorandum of Understanding between RAAF AIS, GeoScience Australia and ASA in order to ensure that information on man made obstacles that constitute a hazard to aviation is shared between the organisations in a timely manner.

R - 9 Online Public Obstacle Database: That the feasibility of developing an online obstacle database is explored. The online obstacle database would be developed to allow proponents to submit proposed developments that meet the notification requirements. The database would be used by the proponents to submit any Aeronautical Studies and by CASA internally to record their determination. The results of any determinations could be released via the database and made searchable online.

R - 10 National Planning Guidelines: That CASA develop a national planning policy to provide guidance to local, state and federal planning authorities on the issues and legislation relating to man made obstacles and the process for notifying CASA of any proposal that meets certain requirements.

PART 5:

Annexures

Annex A – Abbreviations

AC	Advisory Circulars
AGL	Above Ground Level
ANO	Air Navigation Orders
A-SMGCS	Advanced Surface Movement Guidance Control System
BERR	Business, Enterprise and Regulatory Reform
BWEA	British Wind Energy Association
CAA NZ	Civil Aviation Authority New Zealand
CAR (NZ)	Civil Aviation Rules
CAR (Canada)	Canadian Aviation Regulations
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulations
CFR	Code of Federal Regulations
DGC	Defence Geographic Centre
DGIA	Defence Geographic and Intelligence Agency
EASA	European Aviation Safety Agency
eTOD	Electronic Terrain and Obstacle Data
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
ICAO	International Civil Aviation Organisation
LFZ	Low Flying Zone
MOD	Ministry of Defence
MOU	Memorandum of Understanding
MOS	Manual of Standards
MSAW	Minimum Safe Altitude Warning
NATS	National Air Traffic Service
NOTAM	Notice to Airman
OLS	Obstacle Limitation Surface
RAAF	Royal Australian Air Force
SAFA	Safety Assessment of Foreign Aircraft
TC AIM	Transport Canada Aeronautical Information Manual
UK CAA	United Kingdom Civil Aviation Authority
USC	United States Code
VFR	Visual Flight Rules

Annex B – Document Register

#	Document Name
1	AIS-AIMSG.1.SN.021.en
2	Aleks Pavlovic-Annex15Chapter10
3	CAR Part 77 – Objects and Activities Affecting Navigable Airspace
4	Civil_Aviation_Act_1990
5	Determination_Slopedown
6	Lighting_and_marking-of_wind_turbines
7	Part 77 Determination - Roxburgh_Determ
8	Part 77 Determination - Castle_Hill_Determ
9	Part 77 Determination - Gateway_Determ
10	Part 77 Determination - Nth_Wairarapa_Determ
11	Part 77 Determination - Ruakokoputuna_determ
12	Tall Structures Notification Form
13	AC139-08 Reporting of Tall Structures
14	AC139-018 (repealed) Obstacle Marking and Lighting of Wind Farms
15	CAAP 89W-2 Reporting of Tall Structures
16	CAR 139 – Aerodromes
17	17- CASA - Civil Aviation Regulation (Building Control)
18	MOS Part 139 - Aerodromes
19	MOS Part 139 Aerodromes Chapter 7 - Obstacle Restriction and Limitation
20	Obstacles Briefing SCC
21	Cost-Benefit-Analysis-Procedures-Manual
22	AC 70-7460-1K Obstruction Marking and Lighting
23	AC 70-7460-2K Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace
24	AC 150-5345-43E Specifications for Obstruction Lighting Equipment
25	FAR Part77
26	Form 7460-1 Notice of Proposed Construction or Alteration
27	Form 7460-2 Notice of Actual Construction or Alteration
28	OE-AAA External User Guide V3
29	OES Audio Visual Warning System - Memorandum
30	Sample Determination
31	Ammendment to Annex 14 - En-Route Obstacles
32	Annex-14-Vol1

Annex B – Document Register Continued

#	Document Name
33	Annex-15 - Chapter 10
34	Annex-15
35	Land Use Proposal Submission Form
36	Product Sheet
37	Questions for Stakeholders - Industry
38	CAR Part 621
39	Air Navigation Order 2005
40	CAP 168 Licensing of Aerodromes
41	Correspondence Relating to Civil Develpment
42	GUIDE ON WIND TURBINES Cap764
43	Off-Route Airspace Section
44	Policy - Lighting of Enroute Obstacles
45	UK AIP ENR (12 Feb 09)
46	Planning Correspondence
47	Windfarms Mitigation Paper
48	WEBLINKS
49	Fact Sheet 20% target AWEA
50	Fact Sheet - Wind Energy and Reliability - AWEA
51	Aviation Environmental Assessment - Capital Wind Farm
52	Aviation Environmental Assessment - Kyoto Energy Park
53	Aviation Hazard Assessment - The Sisters Wind Farm
54	Aviation Plan - In respect to the interaction between wind turbines and aviation interests
55	AWEA Siting Handbook - Chapter 4 Regulatory Framework
56	Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia
57	Best Practice Guidelines for the Implementation of Wind Energy Projects in Australia - Annexures
58	58- Wind Farm - NATS Mitigating the effects of Wind Turbines on NATS
59	Obstruction Evaluation for Hounsfield Wind Farm
60	Report on Impediments to Wind Farm Development
61	Clean Energy Australia - CASA letter
62	Clean Energy Australia - Response to Inquiry into the Renewable Energy (Electricity) Amendment Bill 2009
63	Mandatory Renewable Energy Target (MRET)

Annex C – Stakeholder Register

#	Organisation
1	CASA
2	FAA
3	CAA NZ Aeronautical Services Unit
4	UK CAA Off Route Policy Section
5	Airservices Australia
6	RAAF / AIS
7	Clean Energy Australia
8	Sustainability Victoria
9	Australian Constructors Association
10	Aerial Agricultural Association of Australia
11	Regional Aviation Association of Australia
12	Australian Airports Association
13	Aircraft Owners and Pilots Association
14	Recreational Aviation Australia
15	Origin Energy
16	RePower Australia
17	Integral Energy
18	NSW Department of Planning
19	QLD Department of infrastructure and Planning
20	Australian Government Department of Infrastructure, Transport, Regional Development and Local Government

Annex D: Detailed Findings

The following findings have been derived from the report in order to allow those responsible for implementation of recommendations to have a an appropriate reference. The findings are sorted according to the following categories:

- Operational
- ICAO Standards and Recommended Practices
- Legislation
- Regulatory Framework
- Publications
- Industry Stakeholders

Operational

F - 1 The principle operational issue that concerns both VFR and IFR pilots is one of knowledge. Knowing the location of a man made obstacle whether by virtue of marking, lighting, or charting, is the primary mitigator against adverse events concerning man made obstacles

ICAO Standards and Recommended Practices

F - 2 The Proposed amendment to Annex 14 Aerodromes Volume I, while seeking to clarify the scope of Annex 14, does not change the substance of the existing standards and recommended practices

F - 3 ICAO Annex 14 Volume I Chapter 4 Recommendation 4.3.1 and Recommendation 4.3.2 taken together require that member states set a height limit above which an Aeronautical Study may be taken to establish whether it is a hazard to aviation safety and in the case of Recommendation 4.3.2 requires that any object of a height greater than 150m above ground level should automatically be considered a hazard unless an aeronautical study determines otherwise

F - 4 ICAO Annex 14 Volume I Chapter 6 has recently been updated to include the marking and lighting standards for wind turbines that have been found to be a hazard to aviation by virtue of an Aeronautical Study conducted under ICAO Annex 14 Volume I Chapter 4 Recommendation 4.3.1 and Recommendation 4.3.2

F - 5 ICAO Annex 15 Chapter 10 sets out the standards for the collection of electronic Terrain and Obstacle Data (eTOD)

Legislation

F - 6 The USA legislation is compliant with ICAO Annex 14 Volume I Chapter 4 Recommendation 4.31 and Recommendation 4.3.2 by virtue of FAR Part 77 which sets out the rules for all objects that might affect navigable airspace. The scope of FAR Part 77 is for objects both within the vicinity of aerodromes and away from aerodromes

F - 7 While the legislation in the UK mandates the lighting of structures with a height greater than 150m, there is no legislation in the UK that requires the notification of existing or future objects below this height

F - 8 Canadian legislation sets out the requirements for the marking and lighting obstacles, however the responsibility for compliance rests with the person planning to erect the building, structure or object

F - 9 Legislation in NZ provides for the making of rules regarding things that affect navigable airspace and is based on United States regulations

F - 10 Current legislation in Australia does not allow the making of rules and regulations that concern man made obstacles that are located away from the vicinity of aerodromes

Regulatory Framework

F - 11 FAR Part 77 sets out specific limits for which sponsors of structures, buildings or objects are required to notify the FAA

F - 12 FAR Part 77 requires that for objects outside the vicinity of aerodromes the notification height is 200 feet or above

F - 13 FAR Part 77 includes a 'catch all' notification requirement that states that a sponsor of a construction or alteration is required to notify 'when requested by the FAA' regardless of any height limitation

F - 14 FAR Part 77 sets out a specific process that the FAA is required to take (refer Paragraph 45) when conducting an Aeronautical Study

F - 15 FAR Part 77 sets out standards under which existing and future objects would automatically be determined to be an obstruction to navigable airspace

F - 16 Consistent with ICAO Annex 14 Volume I Chapter 4 Recommendation 4.3.2 one of the standards set down by FAR Part 77 determines that any object above 500 feet at its site is considered to be an obstruction to navigable airspace.

F - 17 There are some rules in the UK AIP that recommend the lighting of objects that are less than 150m (492 feet) but are otherwise considered to be a hazard to air navigation, however this is voluntary as there is no legal power for the UK CAA to mandate marking and lighting

F - 18 The EASA do not currently address the issue of obstacles located away from the vicinity of aerodromes. The responsibility for which falls to the local Regulator

F - 19 There is no notification height requirements in Canada, the height at which Canadian standards require the lighting of a man made obstacle located away from the vicinity of an aerodrome is 150m

F - 20 Similar to FAR Part 77 the Canadian standards set that if any object is determined to be a hazard to aviation regardless of its height then it is required to be lit according to the standards

F - 21 The Canadian standards also require that any wire crossing where any portion of the wire or its supporting structure exceeds 90m (300 feet) must be marked and lit according to the standards

F - 22 NZ CAR's have been harmonised with USA FAR's

F - 23 CAR Part 77 is modelled off FAR Part 77 and addresses issues such as notification requirements, standards for determining an obstacle as a hazard, and Aeronautical Studies. Appendix B of CAR Part 77 sets out the marking and lighting requirements and standards

F - 24 CAR Part 77 Marking and lighting requirements are based in the ICAO marking and lighting standards

F - 25 CAR Part 77 was introduced in 1997 and does not allow for retrospective determinations for structures constructed prior to 1997

F - 26 CAR Part 77 does not require the ongoing maintenance of existing marking and lighting

F - 27 CAR Part 77 sets the notification height in NZ for man mae obstacles located away from the vicinity of aerodromes is 200 feet, or any height within a designated Low Flying Zone (LFZ)

F - 28 CAR Part 77 sets the height that a structure is to be determined to be a hazard to aviation as 120m (approx 400 feet)

F - 29 It is important that the Australian legislation provides for the regulatory framework that allows the collection, assessment and determination of man made obstacle data

F - 30 The absence in Australia of a formal or legislated framework for conducting Aeronautical Studies on man made obstacles located away from the vicinity of aerodromes means that CASA is not suitably equipped with the appropriate options for making obstacle determinations

F - 31 The current Australian legislation and rule set does not address man made obstacles that are located away from the vicinity of aerodromes and is restricted to dealing with man made obstacles that are located on or within the vicinity of an aerodrome

F - 32 The current Australian legislation does not allow the making of regulations concerning man made obstacles that are located away from the vicinity of an aerodrome

F - 33 Legislation exists in Australia that requires the payment of compensation to sponsors structures that are required have marking and lighting. This requirement for the state to provide compensation does not exist in any of the jurisdictions examined in this report

F - 34 The requirement in Australia to provide compensation has caused a reluctance by CASA to pursue legislative and regulatory changes concerning man made obstacles located away from the vicinity of aerodromes

F - 35 Current Australian legislation and regulations is not compliant with ICAO Annex 14 Volume I Chapter 4 Recommendation 4.31 and Recommendation 4.3.2

F - 36 Current Australian Regulations and standards (MOS 139) for the marking and lighting of obstacles are not compliant with Annex 14 Volume I Chapter 6 Recommendation 6.4.2 and Recommendation 6.4.3

Administration

F - 37 The Federal Aviation Administration (FAA) is responsible in the USA for both aviation safety regulation and airspace management

F - 38 The FAA Manages approximately 60 000 notification submissions per year (both within the vicinity of an aerodrome and outside the vicinity of an aerodrome) with an expected increase to 100 000 over the next two to three years.

F - 39 FAR Part 77 is managed internally by the FAA Obstruction Evaluation Section. The OE Section is staffed by approximately 35 members who are located various offices within the USA

F - 40 The FAA Obstacle Evaluation Section use the following model for making obstacle determinations; No Objection; Conditional Objection; Objectionable

F - 41 The UK CAA is responsible for aviation safety regulation in the UK. The National Air Traffic Service (NATS) is responsible for Airspace Management in the UK

F - 42 The UK CAA takes on a role as the mediator local planning authorities, government agencies and developers

F - 43 Similar to the current Australian arrangements, the UK Ministry of Defence (MoD) Defence Geographic Centre collects tall structure information for charting purposes

F - 44 There is no formal or legislated process in the UK CAA for conducting an Aeronautical Study

F - 45 A multi-agency Memorandum of Understanding (MOU) has been established in the UK to address aviation issues associated with wind farms, however the primary focus of this MOU is the affect that wind farms have on radar and radio installations. The issue of wind farms as a hazard to aviation safety is not specifically addressed in the MOU with regard to wind farms that are located away from the vicinity of aerodromes.

F - 46 The issue of wind farms a hazard to aviation safety that are located away from the vicinity of an aerodrome is handled internally by the UK CAA Directorate of Airspace Policy - Off-Route Airspace Section and is largely a consultative process due to the lack of legal empowerment to mandate

F - 47 CAR Part 77 is managed internally by the CAA NZ Aeronautical Services Unit who process approximately 38 notification submissions per year

F - 48 The RAAF AIS is the organisation in Australia charged with the responsibility to collect man made obstacle data, however the data is collected for information and charting purposes only. No Aeronautical Studies are done to determine whether the man made obstacle is a hazard to aviation

F - 49 Australian agencies are currently examining the legal and organisational implications of how to satisfy the ICAO eTOD requirements. There is scope to align the data collection process of eTOD with the data collection process of obstacle evaluation

F - 50 Some regulators expressed a concern that sponsors where not adequately aware of their legal requirement to notify the Regulator of their construction or alteration

F - 51 The ICAO Requirements for the collection of electronic Terrain and Obstacle Data (eTOD) is currently the subject of an inter-agency review into how Australia can satisfy the requirements. The ICAO obstacle requirements require that a member state has in place a process for ensuring they are consulted concerning objects constructed outside the OLS. There exists an opportunity to align the process concerning the collection of obstacle data.

Publications

F - 52 The two key publications produced by the FAA in relation to man made obstacles are Advisory Circular AC 70/7460-1K Obstruction Marking & Lighting and Advisory Circular AC 70/7460-2K Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace

F - 53 Publications concerning CAR Part 77 and Objects that Affect the Navigable Airspace are published on the CAA NZ website. There are no specific Advisory Circulars relating to the requirements of CAR Part 77

Industry Stakeholders

F - 54 The primary issue with wind farms in the UK is their impact on radar and radio installations

F - 55 While renewable energy (including wind farms) in Australia currently provide 0.5% of electricity usage, with the current push for renewable energy targets in Australia and the trend overseas for increased renewable energy targets it is reasonable to assume that the number of wind farm developments in Australia will increase over time

F - 56 The wind energy industry in Australia is concerned that CASA do not have the mandate to consider options that offer alternatives to the lighting of wind farms

F - 57 The wind energy industry is required to deal with the visual amenity issues caused by the requirement for lighting on wind turbines

F - 58 ICAO Annex 14 Volume I Chapter 6 provides clear requirements for the marking and lighting of wind farms in the case that they are determined to be a hazard to aviation, however there is potential that a formal Aeronautical Study may determine that a wind farm in a certain location offers no hazard to aviation, thus removing the requirement for marking and lighting.

F - 59 While regional operators are generally co nsidered to operate outside the height range of man made obstacles that are located away from the vicinity of aerodromes, there is some risk to VFR operators who might find themselves in a situation where weather has forced them to operate in this height zone.

F - 60 The principle concern for aerial agriculture operators is the rapid and unreported erection of wind monitoring masts. The AAAA is active in attempts to establish relationships with the wind energy industry and the electricity industry in order to ensure that the aerial agricultural industry is informed of man made obstacles that might affect the safety of their operations.

F - 61 Local, State and Federal planning authorities, like CASA have no authority to mandate the use of measures that mitigate aviation safety issues for man made obstacle that are located away from the vicinity of aerodromes. Aviation safety issues do not generally factor into the planning and approval process and when it does become an issue they generally take their lead from CASA.

AEROSAFE
RISK MANAGEMENT

Australian Government
Civil Aviation Safety Authority