

## APPENDIX A

## QUALITATIVE RISK ASSESSMENT REPORT PREPARED BY CHIRON AVIATION CONSULTANTS

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**FINAL REPORT**

**LAL LAL WIND FARM**

**AVIATION OBSTACLE LIGHTING**

**QUALITATIVE RISK ASSESSMENT**

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**CCP39 QRA**

**19 January 2021**  
**Updated**  
**7 June 2021**



**Chiron Aviation Consultants**  
**Essendon Vic 3040**  
**Australia**

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## EXECUTIVE SUMMARY

The Lal Lal Wind Farm has been constructed and comprises 60 turbines with a maximum tip height of 161m above ground level. Victorian Planning Permit PL-SP-050461 C dated 27 September 2018 refers. The wind farm has been fitted with an Aircraft Detection Lighting System to control aviation obstacle lighting.

Chiron Aviation Consultants has conducted a Qualitative Risk Assessment to assess the risk to aviation safety of the Lal Lal Wind Farm. Given that the wind farm has been constructed, it is agreed that the risk to aircraft safety, by day is acceptable. This risk assessment concentrates on aircraft flying in the vicinity of the Lal Lal wind farm at night.

The risk assessment demonstrates that the Lal Lal Wind Farm is a LOW risk to aviation and is therefore *not a hazard to aircraft safety*. The wind farm is depicted on the appropriate aeronautical charts, therefore its location is known to pilots and they are required to plan their flights accordingly.

Aircraft flying at night are required to be at or above a published or calculated lowest safe altitude which ensures a minimum height of 1000ft above the tallest obstacle on the highest terrain along the planned route. The Lal Lal Wind Farm is located sufficiently distant from Ballarat and Avalon aerodromes such that, at night, it does not impact on an aircraft in the process of descending to land or climbing after take-off. Obstacle lighting, therefore, is not mitigating a risk and is not required.

An aircraft flying in accordance with visual flight rules is required to remain in visual meteorological conditions. If there are non or marginal visual meteorological conditions, such as smoke or fog around the Lal Lal Wind Farm the pilot in command is required to turn away to maintain the required visibility and clearance from cloud. Obstacle lighting, therefore, is not mitigating a risk and is not required.

There are no Aviation Safety regulations requiring aviation obstacle lighting on tall structures beyond the Obstacle Limitation Surface of a regulated aerodrome. The Civil Aviation Safety Authority may only recommend, not mandate, obstacle lighting on tall structures beyond the obstacle limitation surface of a regulated aerodrome. There are no Civil Aviation Safety Regulations or advisory publications concerning the obstacle lighting of wind farms. Likewise, there are no Civil Aviation Safety Regulations or advisory publications regarding the use of Aircraft Detection Lighting Systems.

The Lal Lal Wind Farm is not sited within the Obstacle Limitation Surface of any regulated aerodrome and is assessed as a LOW risk to aviation. Therefore, it is *not a hazard to aircraft safety*.

Aviation obstacle lighting is not required on the Lal Lal Wind Farm.

If an aerodrome operator changes an aerodrome's available facilities, then all existing surrounding obstacles, such as the LLWF, must be considered.

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## 1. INTRODUCTION

Chiron Aviation Consultants has been engaged by Herbert Smith Freehills to provide a Qualitative Risk Assessment (QRA) regarding the need for aviation obstacle lighting of the Lal Lal Wind Farm (LLWF). It is accepted that the LLWF is conspicuous by day to pilots flying in accordance with the Visual Flight Rules and that its location and height is known to pilots because it is depicted on the appropriate aeronautical charts. Consequently, this QRA is focussed on night flying in the wind farm area.

### 1.1 Current Situation

The Lal Lal Wind Farm has been constructed and is currently equipped with an Aircraft Detection Lighting System (ADLS) which is designed to turn on the obstacle lights if an aircraft is detected within 4000m of the wind farm boundary and below 1000ft above the tallest turbine.

This is to meet condition 2 p) of the Victorian Planning Permit PL-SP-050461 C, dated 27 September 2018, which requires:

*Aviation Detection Lighting System must be installed in accordance with current Civil Aviation Safety Authority specifications or law, such that it activates only:*

- (i) If at night, when the aircraft is in the immediate vicinity of the wind energy facility;*
- (ii) During low visibility daytime conditions such as the existence of smoke and fog.*

The Australian Civil Aviation Safety Authority (CASA) does not have any regulations or advisory circulars about ADLS. CASA has no regulatory authority over aviation obstacle lighting on wind farms beyond the Obstacle Limitation Surface (OLS) of a regulated aerodrome.

The ADLS system is set up in accordance with United States of America Federal Aviation Administration (FAA) Advisory Circular AC70/7460-1L, dated 8 October 2016, chapter 14 recommendations. The distance of 4000m is being used instead of 3nm (5,560m) as recommended by AC 70/7460-1L.

The highest obstacle point in the LLWF is 2312ft (705m) above mean sea level (AMSL) or 528ft (161m) above ground level (AGL). This provides a Lowest Safe Altitude (LSALT) of  $2312 + 1000 = 3312$ , rounded up to 3400ft over the LLWF.

To meet the recommendations of FAA AC 70/7460-1L, the ADLS should activate the LLWF obstacle lights when an aircraft is within 4000m of the boundary and below an altitude of 3400ft.





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### 1.2 Location

The Lal Lal Wind Farm is in two sections, Yendon and Elaine. The location, reference Ballarat is shown in figure 1.

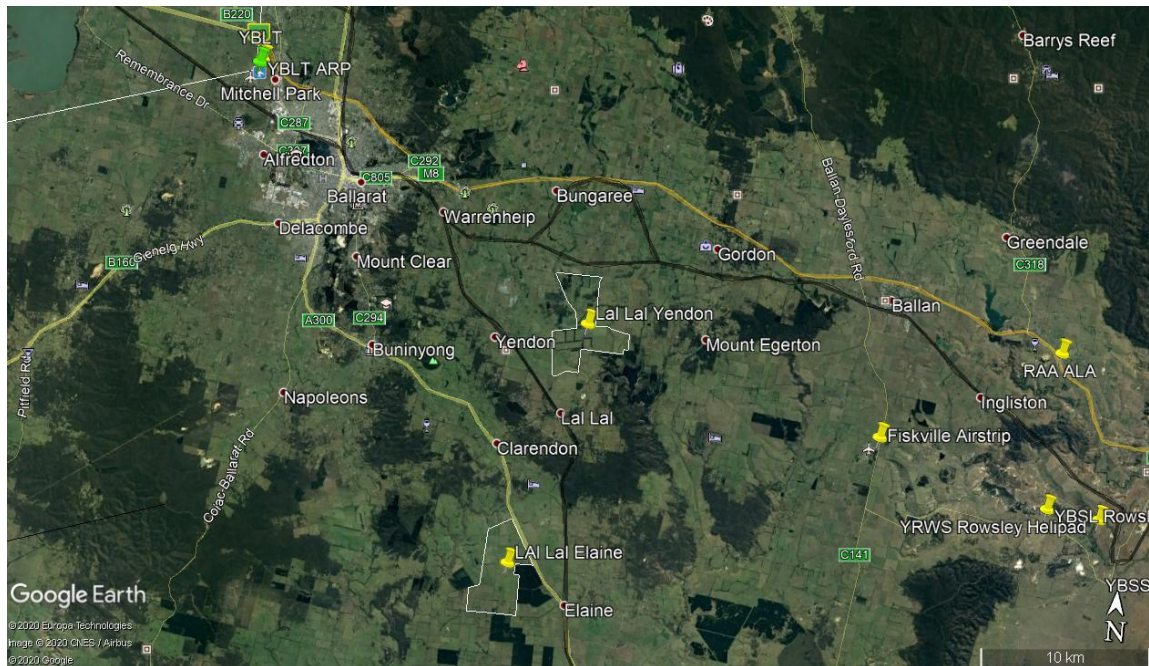


Figure 1 – Location of Lal Lal Wind Farm

### 1.3 Aerodromes and Airstrips

Aerodromes fall into three categories:

- Military or Joint (combined military and civilian)
- Regulated (Certified and Registered) and
- Unregulated (Uncertified or Aeroplane Landing Areas)

A Military aerodrome is operated by the Department of Defence and is suitable for the operation of military aircraft. A Joint User aerodrome is a Military aerodrome used by both military and civilian aircraft, for example Darwin International and Townsville International Airports.

A Regulated (Certified and Registered) Aerodrome is regulated under Civil Aviation Safety Regulation (CASR) 139.030. An aerodrome with a published instrument flight procedure must be regulated.

An Unregulated (Uncertified) Aerodrome is any other aerodrome or airstrip. These range in capability and size from having a sealed runway with lighting capable of accommodating corporate jet aircraft to a grass paddock that is smooth enough to land a single engine light aircraft or a purpose built aerial agricultural aircraft.

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Military, Joint and Regulated aerodromes are listed in the Aeronautical Information Publication<sup>1</sup> (AIP) and are subject to a NOTAM<sup>2</sup> service that provides the aviation industry with current information on the status of the aerodrome facilities. This information is held in the public domain, is available through aeronautical publications and charts and is kept current by mandatory reporting requirements.

Unregulated Aerodromes are not required to be listed in the AIP, although many are, so information about them is not necessarily held in the public domain, may not be available through aeronautical publications and charts and is not required to be reported. Where Unregulated aerodrome information is published in the AIP EnRoute Supplement Australia (ERSA)<sup>3</sup> it is clearly annotated that a *full NOTAM service is not available*.

The AIP Designated Airspace Handbook (DAH)<sup>4</sup>, at Section 20, lists *Aircraft Landing Areas (ALA) without an ERSA entry – verified*. This listing of verified ALA indicates that Airservices Australia have a registered responsible person providing verified information about the ALA. These verified ALA are also depicted on AIP Charts.

ALA can come into use and fall out of use without any formal notification to CASA or any other authority. Airstrips that appear on survey maps often no longer exist; others exist but do not feature on maps. Similarly, a grass paddock used as an ALA is not usually discernable on satellite mapping services such as Google Earth.

Military, Joint and Regulated aerodromes usually have Obstacle Limitation Surfaces (OLS) and Procedures for Air Navigation . Operations (PANS-OPS) surfaces prescribed to protect the airspace associated with published instrument approach and landing procedures. An Unregulated aerodrome or ALA cannot have a published instrument approach and landing procedure so does not have associated prescribed airspace protected by OLS or PANS-OPS. All operations into ALA, therefore, must be conducted in accordance with the Visual Flight Rules (VFR) and in Visual Meteorological Conditions (VMC).

#### 1.4 Aerodromes within 30nm (56.6km)

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There are two Regulated Aerodromes in the area:

- Ballarat (YBLT) at 11.81nm (21.87km) northwest of the Yendon section of the LLWF and
- Avalon (YMAV) at 26.78nm (49.59km) southeast of the Elaine section of the LLWF.

There are four Unregulated Aerodromes in the area:

<sup>1</sup> AIP; a mandatory worldwide distribution system for the promulgation of aviation rules, procedures, and information

<sup>2</sup> NOTAM (Notice to Airmen); a mandatory reporting service to keep aerodrome and airways information current and available to the aviation industry worldwide

<sup>3</sup> ERSA, part of the AIP that lists aerodrome information in accordance with standards and legislative requirements to ensure integrity.

<sup>4</sup> DAH, part of the AIP that lists the pertinent details of Australian airspace and aerodromes



- Lethbridge Park (YLED) at 9.62nm (17.82km) south southeast of Yendon
- Bacchus Marsh (YBSS) at 18.54nm (34.33km) southeast of Yendon and 20.09nm (37.21km) west of Elaine
- Rowsley/Brooks Landing (YBSL) at 14.33nm (26.54km) southeast of Yendon
- An unnamed ALA at 13.7nm (25.37km) east of Elaine

### 1.5 Air Routes in the Area



Figure 2 – Air routes in the area<sup>5</sup>

### 1.6 Airspace in the Area

The LLWF is in Class G airspace below Class C airspace with a lower limit of 8500ft.

Class G airspace is non-controlled airspace where aircraft may operate without an Air Traffic Control (ATC) clearance. Aircraft may operate in accordance with either Instrument Flight Rules (IFR) or Visual Flight Rules (VFR) within Class G airspace.

Class C airspace is controlled airspace open to both IFR and VFR flights. Aircraft must have an ATC clearance and communicate with the ATC Centre.

A Control Area (CTA) is defined as a % controlled airspace extending upwards from a

<sup>5</sup> AIP Charts, ERC 2, dated 5 Nov 2020, available at [https://www.airservicesaustralia.com/aip/current/aipchart/erc1/erc12\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/current/aipchart/erc1/erc12_05NOV2020.pdf)



specified limit above the earth.<sup>6+</sup>

Within Class G airspace an aircraft flying in accordance with the Visual Flight Rules (VFR) away from a populous area is, when flying below 3000ft, required by Civil Aviation Regulation (CAR) 157 to remain at 500ft above the highest point of the terrain and any obstacle on it within a radius of 600m [300m for a helicopter] from a point on the terrain directly below the aircraft. For a wind farm this equates to 500ft above the turbine tip height, which for the LLWF this is 528 + 500 = 1028ft Above Ground Level (AGL).

There are no Prohibited, Restricted or Danger (PRD) areas, nor published flying training areas in the vicinity of the HWF.

## 2. SCOPE

To meet the requirements of Herbert, Smith, Freehills, the study required Chiron Aviation Consultants to examine the LLWF development in relation to any impacts on aviation activity in the area and undertake the following tasks.

### 2.1 Qualitative Risk Assessment

The QRA required the following tasks to be undertaken: -

- The identification and assessment of potential aviation risk elements through:
  - Reference to CASA publications;
  - Reference to the Aeronautical Information Publication (AIP);
  - Reference to the National Airports Safeguarding Framework (NASF) guidelines;
  - Consultations with key relevant stakeholders;
- Assessment of the perceived impacts of the turbines on the operation of aerodromes and airstrips in the immediate vicinity of the wind farm;
- Assessment of the perceived impacts of the turbines on aviation activity including:
  - General Aviation training;
  - Recreational/Commercial flying activity;
  - Air Ambulance Operations;
  - Police Aviation Operations;
  - Aerial Fire Fighting Operations;
  - Aerial Agricultural Operations;
  - Known highly trafficked VFR routes;
  - Night flying for light aircraft;
- Assessment of any implications for the above from topographical, weather and visibility issues;

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<sup>6</sup> AIP Enroute, ENR 1.4 . 7, dated 5 Nov 2020, available at <http://www.airservicesaustralia.com/aip/current/aip/enroute.pdf>



- Assessment of other issues as identified through stakeholder consultations and the assessment process;
- Conclusions on the degree of aviation risk posed by the above described issues with commensurate recommendations on any mitigating actions; and

An assessment of the need, against the outcomes of the Qualitative Risk Assessment, for obstacle lighting of the wind farm.

## 2.2 Obstacle Lighting Review

The OLR reviews the outcome of the QRA to determine the need or otherwise for risk mitigation by the lighting of turbines in the wind farm with aviation obstruction lighting.

## 3. METHODOLOGY

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The following methodology was used to complete the tasks outlined in the scope.

### 3.1 Qualitative Risk Assessment

A Qualitative Risk Assessment is the analysis for risks, through facilitated interviews or meetings with stakeholders and outside experts, as to their probability of occurrence and impact expressed using non-numerical terminology; for example, low, medium and high. The basis for the QRA is ASNZS ISO 31000-2018 *Risk Management – Guidelines*.

The methodology for the Qualitative Risk Assessment was as follows:

- The Australian AIP and CASA documents were reviewed to identify relevant physical and operational aviation issues that may impact on the requirement for lighting of the wind farm;
- Current topographical maps were studied to assess the local terrain and identify any local airstrips and any other relevant features;
- Key stakeholders, including local operators, recreational aviation groups and State Government Police Air Wing, Air Ambulance and Fire Services, were identified, contacted, and interviewed to ascertain the extent of local aviation activity in the vicinity of the proposed wind farm. See Appendix A for a Stakeholder List. This included any informal low flying areas and highly trafficked unpublished air routes that may exist within the vicinity of the proposed wind farm;
- Based on the above, the nature of any impacts as a consequence of the operation of the wind farm was considered and discussed in regard to;
  - General Aviation training;
  - Recreational and sport aviation activities;



- Approved low flying activities (including aerial agricultural applications)
  - Any known highly trafficked VFR routes; and
  - Emergency Services (air ambulance, police and fire service);
- In addition, further consideration was given to the consequences (for the above elements) of the potential influence of topography and poor weather; and

Consideration of the National Airports Safeguarding Framework (NASF), Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers*<sup>7</sup> in relation to the QRA findings.

### 3.2 Obstacle Lighting Review

The Obstacle Lighting Review investigates the current Australian standards and regulatory requirements for obstacle lighting of wind farms. From this review an assessment of the need or otherwise for aviation obstruction lighting is made.

The methodology for the Obstacle Lighting Review was as follows: -

- Review the Australian regulatory requirements and standards;
- Review the NASF Guidelines for wind farms; and

From the QRA, assess the need for aviation obstruction lighting as a risk mitigator.

## 4. QUALITATIVE RISK ASSESSMENT

The expression 'in the vicinity of the aerodrome' is considered by CASA to mean within the boundaries of either the OLS or the PANS-OPS surfaces of regulated aerodrome. An OLS extends to 15km from the runway threshold. PANS-OPS surfaces are required to be obstacle free.

The NASF Guideline D considers 30km (16.2nm) from a regulated aerodrome to be 'in the vicinity'.

Within Victoria, from March 2019, the current Victorian Planning and Policy Guidelines for wind energy facilities, at section 4.3.6 Aviation Safety Issues, considers aerodromes within 30km of the wind farm.

More generally the impact on any regulated aerodrome within 56km (30nm) of a wind farm is considered. The 30nm encompasses the PANS- OPS surfaces for any published Instrument Approach Procedures (IAP) at a regulated aerodrome.

The QRA is assessing the existing conditions and facilities at these aerodromes.

<sup>7</sup> NASF Guideline D, dated 15 July 2012, available at [https://www.infrastructure.gov.au/aviation/environmental/airport\\_safeguarding/nasf/files/4.1.3\\_Guideline\\_D\\_Wind\\_Turbines.pdf](https://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/files/4.1.3_Guideline_D_Wind_Turbines.pdf)





Should the operator of any of these aerodromes decide to change their available facilities, then they must take into account the existing surrounds, including existing obstacles such as wind farms, high terrain, forests, powerlines and other existing constraints.

#### 4.1 Regulated Aerodromes within 30nm

There are two Regulated Aerodromes in the area:

- Ballarat (YBLT) at 11.81nm (21.87km) northwest of the Yendon section of the LLWF and
- Avalon (YMAV) at 26.78nm (49.59km) southeast of the Elaine section of the LLWF.

Both aerodromes are equipped with runway lighting and instrument approach procedures making them suitable for IFR and VFR at Night operations.

The LLWF is beyond the OLS and below the PANS-OPS prescribed airspace of both aerodromes.

#### 4.2 Identified Unregulated Aerodromes within 30nm

There are four Unregulated Aerodromes (ALA) in the area:

- Lethbridge Park (YLED) at 9.62nm (17.82km) south southeast of Yendon section
- Bacchus Marsh (YBSS) at 18.54nm (34.33km) southeast of Yendon and 20.09nm (37.21km) west of Elaine sections
- Rowsley/Brooks Landing (YBSL) at 14.33nm (26.54km) southeast of Yendon section
- An unnamed ALA at 13.7nm (25.37km) east of Elaine section

None of these unregulated aerodromes are equipped with runway lighting, therefore night operations are not permitted. None of these aerodromes has an OLS.

Should any of these aerodromes decide to install lights and the other upgrades required for night operations, they will have to take into account the existence of the LLWF and other wind energy facilities, forests, powerlines and other existing obstacles. Similarly, if a current Unregulated aerodrome decides to become a Regulated aerodrome the operator has to take into account all the existing obstacles and a raft of other conditions that may impact on operations. The LLWF is an existing obstacle.

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### 4.3 Airspace

The LLWF is in Class G airspace below Class C airspace with a lower limit of 8500ft.

Aircraft operating to the Instrument Flight Rules (IFR) or Visual Flight Rules (VFR) can operate in Class G airspace without the need for an Air traffic Control (ATC) clearance.

### 4.4 Relevant Air Routes

The LLWF sits below the air routes listed in Table 1.

Route	Segment	LSALT
Grid		4800
V126	ML . ESDIG	3900
V279	WENDY . ML	3900
W382	WENDY - LLOYD	3900
W571	ESDIG . VIOLA	4500
W657	ESDIG . IRVAK	3500

Table 1 – Published LSALT

The LLWF does not impact on any LSALT for nearby published air routes.

### 4.5 Night Flying

Aircraft flying at night under either IFR or VFR at Night (NVFR)<sup>8</sup> are protected by published or calculated LSALT. Descent below the LSALT for a VFR at Night flight is restricted to within 3nm (5.4km) of the destination aerodrome and with it in sight.

Where an IFR aircraft is using a published instrument approach procedure it is protected by PANS-OPS surfaces.

The aerodromes at YBLT and YMAV are equipped with Pilot Activated Lighting (PAL) and non-precision RNAV (GNSS) Instrument Approach Procedures and therefore are available for night operations by aircraft in accordance with either IFR or VFR at Night procedures.

The LLWF does not affect the PANS-OPS airspace associated with the instrument approach procedures at YBLT and YMAV.

The LLWF is beyond the Circling Area (3nm) for both YBLT and YMAV, therefore aircraft operating VFR at Night and landing at either aerodrome will not be affected by the LLWF.

Night operations into YBLT and YMAV are not affected by the LLWF.

The known unregulated aerodromes (ALA) do not have runway lighting, therefore night

<sup>8</sup> VFR at Night NVFR is a separate and specific pilot operational rating. See CASR Part 61.





operations are not permitted.

Aircraft operating at night over the LLWF are required to be at or above the calculated LSALT of 1000ft above the tallest turbine tip on the highest terrain. This is an altitude of 3400ft.

VFR at Night operations are required to remain in VMC. The pilot in command must change course to remain in VMC or land at the nearest suitable aerodrome.

#### 4.6 General Aviation Flying

General aviation flying in single engine aircraft is usually conducted by day in accordance with the Visual Flight Rules (VFR) which requires adherence to Visual Meteorological Conditions (VMC).

Wind turbines, by their size and colour are highly conspicuous and therefore not an issue for VFR flight by day.

#### 4.7 Recreational and Sport Aviation

Recreational and Sport aircraft, particularly ultra-lights registered with Recreational Aviation Australia (RA-Aus) are limited to daytime flight in accordance with the Visual Flight Rules (VFR). This requires the aircraft to remain clear of cloud and a minimum of 500ft above the ground or highest obstacle. These aircraft are not permitted to fly at night.

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#### 4.8 Flying Training

Flying training is conducted in accordance with VFR for a major part of the ab . initio course. In the latter stages of training student airline pilots progress to night flying in accordance with VFR at Night procedures and then to IFR training. Flying training is usually conducted in light General Aviation (GA) aircraft such as Cessna C182 or Diamond DA40 aircraft.

As discussed previously night flying is undertaken at or above the LSALT and therefore is above the LLWF.

The flying schools contacted all advised that wind farms are known obstacles and training flights are planned accordingly. This applies at night where more stringent planning requirements exist regarding the calculation of LSALT for the intended flight route. It is all part of the training process for obtaining a VFR at Night, or IFR pilot rating.

The flying school at Bacchus Marsh does not conduct night flying training from the aerodrome because it is not equipped for night operations. Their night flying training is conducted from Moorabbin airport.



RA-Aus sport flying training at Lethbridge Park is conducted by day only.

#### 4.9 Approved Low Flying Activities

There are no published flying training areas within the vicinity of the LLWF.

#### 4.10 Aerial Applications Activity

Aerial applications activity does not normally occur at night in Victoria.

#### 4.11 Known Highly Trafficked Areas

There are no known highly trafficked areas in the vicinity of the LLWF.

#### 4.12 Emergency Services Flying

All Emergency Services flying is subject to ongoing dynamic risk assessment throughout the flight. The safety of the aircraft and its crew is paramount. Emergency Services flying is approved for low level operations such as search and rescue.

##### 4.12.1 Police Air Wing

The Police Air Wing helicopters are capable of IFR flight and flown by suitably IFR rated pilots who are also qualified for low level flight and the use of Night Vision Imaging Systems (NVIS).

From previous work done by the author for other wind farms in Victoria the Police Air Wing utilise dynamic risk assessment for all operations and the pilot in command has the final say as to whether the operation is aborted because of the risk to the aircraft and crew. For low level night operations, the aircraft are equipped with Night Vision Imaging Systems (NVIS) enabling the pilot to see in reduced light conditions. For the final descent and landing the night searchlight is used to illuminate the landing area.

##### 4.12.2 Helicopter Emergency Medical Services

The Helicopter Emergency Medical Service (HEMS) utilise helicopters capable of IFR flight. For low level night operations, the aircraft are equipped with Night Vision Imaging Systems (NVIS) enabling the pilot to see in reduced light conditions. For the final descent and landing the night searchlight is used to illuminate the landing area. All HEMS operations are subject to a dynamic risk assessment and the pilot in command has the final say as to whether the operation is aborted due to the risk to the aircraft and crew.

The HEMS Senior Base Pilot made the comment that *"There are lots of them (wind*



farms) around and we are conscious of their locations. The presence of a wind farm will not stop our operations, we know they are there and fly accordingly.”<sup>9</sup> The presence of tall obstacles influences the cruising level of the helicopters in known aircraft icing conditions due to the capabilities of the aircraft anti-icing equipment.

A HEMS Base pilot at Warrnambool<sup>10</sup> described a low level night flight from Warrnambool to Melbourne where the flight was planned to avoid the wind farms enroute. As an added safety measure the NVIS was used. As the aircraft passed southeast of Ballarat, the sky lit up with a bright red glow.+ This interfered with their normal night vision and concerningly did not show up in the NVIS. The pilot stated that the safety of the flight was not compromised, however the surprise lighting did create concern for the crew. An additional concern was that the red lights did not show up in the NVIS, indicating that the red light used is outside the wavelength required for the NVIS. The Department of Defence requires LED aviation obstacle lighting to be within the wavelength range of 665 to 990 nanometres. Normal red LED lighting is below this wavelength range, thus requiring additional InfraRed transmitters to be collocated with the red LED lights. Civil Aviation uses military grade (needs the same wavelengths) NVIS.

#### 4.12.3 Fixed Wing Air Ambulance

Fixed wing Air Ambulance operations in Victoria are undertaken in twin engine turbo-prop aircraft in accordance with IFR. The aircraft are usually Beechcraft Super Kingair (BE200) which have a MTOW of 5700kg and use suitable aerodromes. The primary use of these aircraft is for patient transfer from regional to major city hospitals. The LLWF will not affect fixed wing Air Ambulance operations due to the nature of the operations and the aircraft size.

The Senior Base Pilot made the comment that “The wind farm does not need lights. In solid IMC (Instrument Meteorological Conditions) you can’t see them (the lights) and in marginal conditions the lights flare and create a distraction.”<sup>11</sup>

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#### 4.13 Fire Fighting

Firefighting is a multi-faceted operation utilising multiple resources and equipment appropriate to the circumstances. A fire ground is a dynamic place where resources are continually being reassigned to have the best effect. Aerial firefighting is just one of the resources available and its use may or may not be appropriate to the current fire ground situation. There will be times when aerial firefighting is not possible due to turbulence, smoke, strong wind, or erratic fire behaviour.

##### 4.13.1 Aerial Firefighting

Aerial firefighting at night is restricted to a small number of suitably equipped helicopters flown by two (pilot and co-pilot) appropriately rated pilots. Given the limited number of

<sup>9</sup> Stakeholder interview Senior Base Pilot, HEMS Victoria.

<sup>10</sup> Stakeholder interview Warrnambool Base Pilot, HEMS Victoria.

<sup>11</sup> Stakeholder interview, Senior Base Pilot, Pelair, Fixed Wing Air Ambulance.



suitable aircraft and the nature of aerial firefighting close to or within a wind farm, aviation obstacle lighting of the LLWF is of no consequence.

As with any aerial activity, the pilot in command has the final say on whether the flight continues. As was graphically demonstrated in the 2019 - 2020 fire season, an intense fire creates its own severe weather system with pyrocumulonimbus cloud and severe turbulence<sup>12</sup>. Such conditions are dangerous for both large and small aircraft<sup>13</sup> and preclude the use of aerial firefighting.

#### 4.14 Topographical and Marginal Weather Conditions

The topography of the area of the LLWF is generally hilly. As such the area is subject to areas of low cloud. It is an area known for periods of forecast marginal and/or non - Visual Meteorological Conditions (VMC). Pilots flying VFR are aware of this and plan their flight accordingly to maintain the required VMC.

VMC are the weather conditions required for VFR flight. At or below either 3000ft AMSL or 1000ft AGL, these are: -

- Clear of cloud;
- In sight of the ground or water; and
- With a forward visibility of 5000m<sup>14</sup>.

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The rules governing VFR flight require that pilots maintain the required visibility, remain clear of cloud and not fly into marginal or non VMC situations by turning away and terminating the flight at the nearest suitable aerodrome. Consequently, aviation obstacle lights are not required during periods of non . VMC as there will be no VFR flights in the area, therefore there is no risk to mitigate.

Aircraft operating under VFR at Night are required to remain in VMC and fly at or above a published or calculated LSALT for the route, until within 3nm (5.65km) of the destination aerodrome and with it in sight. This LSALT is 1000ft above the tallest obstacle on the highest terrain within 10nm of the flight path. The only exception is an appropriately authorised low-level flight, such as a HEMS aircraft.

There are no aerodromes close to the LLWF, therefore aircraft in the vicinity will not be descending to land or climbing after take-off, consequently these aircraft are required to be at or above the LSALT.

Flying into marginal or non VMC weather is entirely avoidable. It should be noted that

<sup>12</sup> Flight Safety Australia, Beware of bushfire clouds, 9 Jan 2020 available at <https://www.flightsafetyaustralia.com/2020/01/beware-of-bushfire-clouds/>

<sup>13</sup> Flight Safety Australia, Turbulence on day of tanker crash, 25 Sep 2020 available at <https://www.flightsafetyaustralia.com/2020/09/turbulence-on-day-of-tanker-crash/>

<sup>14</sup> AIP ENROUTE, page ENR 1.2 . 4 date 9 NOV 2017. <http://www.airservicesaustralia.com/aip/current/aip/enroute.pdf>



a non-instrument rated pilot flying in cloud almost always has a fatal outcome.<sup>15</sup>

Aircraft operating under Instrument Flight Rules (IFR) can operate in poor weather conditions and in cloud which precludes visual acquisition of obstacles and terrain. These operations are protected by PANS OPS surfaces and LSALTs that keep the aircraft clear of obstacles and terrain.

#### 4.15 NASF Guidelines

The National Airports Safeguarding Framework . Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations (Wind Farms)/Wind Monitoring Towers* provides guidance for the siting and marking of the turbines and meteorological monitoring towers associated with wind farms.

##### 4.15.1 Notification to Authorities

The turbines and meteorological monitoring towers used in the LLWF have been reported to Airservices Australia and the RAAF in accordance with AC 139-08(1) *Reporting of Tall Structures*. The LLWF position is marked on aeronautical charts.

##### 4.15.2 Risk Assessment

The NASF Guideline has the following requirements for a risk assessment.

26. *Following preliminary assessment by an aviation consultant of potential issues, proponents should expect to commission a formal assessment of any risks to aviation safety posed by the proposed development. This assessment should address any issues identified during stakeholder consultation.*

The risk assessment for the LLWF indicates that the overall risk to aviation is LOW. A risk assessment of LOW indicates that the wind farm is *'not a hazard to aircraft safety.'*

27. *The risk assessment should address the merits of installing obstacle marking or lighting. The risk assessment should determine whether or not a proposed structure will be a hazardous object. CASA may determine, and subsequently advise a proponent and relevant planning authorities that the structures have been determined as:*

- (a) Hazardous but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking;  
or*
- (b) Hazardous and should not be built, either in the location and/or to the height proposed as an unacceptable risk to*

<sup>15</sup> Accidents involving Visual Flight Rules pilots in Instrument Meteorological Conditions, Australian Transport Safety Bureau, 22 August 2019, available at <http://www.atsb.gov.au/publications/2019/avoidable-accidents-4-vfr-into-imc/>



*aircraft safety will be created; or*

*(c) Not a hazard to aircraft safety.*

By day, the LLWF turbines are conspicuous by their size and colour. The LLWF does not impact on any LSALT in the area. Night operations for aircraft do not occur below the LSALT for IFR and VFR at Night. IFR aircraft are protected by the LSALT and PANS-OPS prescribed airspace at each aerodrome. Where an approach to land is undertaken operating to VFR at Night, descent below the LSALT does not occur until within 3nm of the airport and in VMC. The nearest aerodrome equipped for night operations is Ballarat, 11.42nm (21.15km) northwest of the Yendon section and 16.26nm (30.12km) north northwest of the Elaine section.

Given the above, the LLWF does not require obstacle lighting as the risk to aviation is LOW and no additional mitigating strategies are required.

Overall, the risk assessment demonstrates that the LLWF is a LOW risk to aviation and is therefore *not a hazard to aircraft safety*.

*28 If CASA advice is that the proposal is hazardous and should not be built, planning authorities should not approve the proposal. If a wind turbine will penetrate a PANS-OPS surface, CASA will object to the proposal. Planning decision makers should not approve a wind turbine to which CASA has objected.*

The LLWF does not penetrate any OLS or PANS-OPS surfaces either civil or military, therefore CASA has no reason to determine that it is hazardous.

#### **4.15.3 Lighting of Wind Turbines**

*33 Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.*

*34. The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:*

*(a) hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*

*(b) not a hazard to aircraft safety.*

The LLWF is not sited within the OLS of any regulated aerodrome, does not penetrate any PANS-OPS airspace and is assessed as a LOW risk to aviation. Therefore, it is *not a hazard to aircraft safety*.

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#### 4.16 QRA Findings

Risk Element	Assessed Level of Risk	Comment
Airport Operations	LOW	
Aircraft Landing Area Operations	LOW	Not fitted with lights, therefore no night operations.
Known Highly Trafficked Routes	LOW	None identified
Published Air Routes	LOW	Nil impact
PRD Airspace	LOW	Nil exists in the area
Promulgated Flying Training Areas	LOW	Nil exists in the area
GA Flying	LOW	
Night Flying	LOW	
Emergency Services Flying	LOW	
Recreational and Sport Aviation	LOW	
GA Pilot Training	LOW	Night training flights are planned above the LLWF
Weather and Topographical Issues	LOW	

Table 2 – Risk Assessment Summary

## 5. OBSTACLE LIGHTING REVIEW

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### 5.1 Australian Regulatory Framework for Obstacle Lighting of Wind Farms

The Civil Aviation Safety Authority (CASA) has limited regulatory authority to require the lighting of obstacles (tall structures) away from an aerodrome. This is particularly applicable to wind farms, which are generally beyond the Obstacle Limitation Surface (OLS) of certified or registered aerodromes. It must be noted that Civil Aviation Safety Regulations (CASR) Part 139 . Aerodromes are applicable to Regulated (certified and registered) aerodromes only [Military and Joint User apply the same general form].

CASA can only make recommendations regarding the lighting of wind farms, and not determinations/directions mandating lighting of wind farms that are not in the vicinity [beyond the OLS] of a regulated aerodrome. It is noted that in the Senate Select Committee on Wind Turbines (2015) CASA provided evidence to the Committee about the limited role it plays in regulating airspace around wind farms.

*We know our responsibilities and the power of our legislation, which is very limited. For the most part, wind turbines are built away from aerodromes and certainly away from federally leased aerodromes. So the only power we have is to make a recommendation to the planning authority about whether the turbine is going to be an obstacle and, if we decide it is an obstacle, we can make a recommendation as to whether it should be lighted and marked. This is the extent of our power.<sup>16</sup>*

<sup>16</sup> Senate Select Committee on Wind Turbines, Final Report, August 2015, paragraph 5.38





In my experience, CASA has emphasised the view that *“it is a matter for the appropriate Land Use Planning Authority to consider the implementation of our recommendations”* regarding aviation obstacle lighting of wind farms.

### 5.1.1 Civil Aviation Safety Regulations

The Civil Aviation Safety Regulations (CASR) Part 139 . Aerodromes, Section E contains the regulations governing obstacles. These regulations are applicable to the protection of airspace and aircraft operations in the vicinity of regulated aerodromes. They are not applicable to obstacles that are beyond the vicinity of aerodromes; that is, beyond the OLS.

### 5.1.2 Advisory Circular AC 139.E-05 v1.0

Advisory Circular AC 139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome* was issued in May 2021.

The purpose of this AC is to provide guidance on matters that should be considered when assessing a wind farm development and other tall structure so that all necessary measures can be taken to protect aviation safety.

The introduction to the general guidance section, sets out CASA's role in the approval process for wind farms.

Specifically:

*2.2.1 CASA provides advice about lighting of wind farms and other tall structures in submissions to planning authorities who are considering a wind farm or tall structure proposal.*

*2.2.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.*

Outside the vicinity of an aerodrome is defined as being beyond the Obstacle Limitation Surface (OLS) of a Certified aerodrome. Uncertified aerodromes do not have an OLS.

Section 2.4 - Obstacles outside the vicinity of a CASA Certified aerodrome nominates that an aeronautical study, section 2.4.2.2, will identify any aviation safety risks and the need for mitigation of those risks. The aeronautical study should:

- Assess the impact of the wind farm on aviation activity
- Conduct a risk analysis using AS/NZS ISO 31000:2018 *Risk Management and Guidelines*
- Consult with nearby aerodromes (certified and uncertified) operators and aircraft operators known to fly in the area (low flying activities that may include fire spotting and control)
- Consult with Airservices and the Department of Defence to determine whether any nearby aeronautical communications, navigation or surveillance equipment may be affected



- Provide details of proposed mitigation to ensure an acceptable level of safety analysis of the effectiveness of each risk control measure
- Recommend operating procedures/restrictions or other measure to mitigate risks.

This QRA has assessed the items above, except for Communications, Navigation or Surveillance facilities which is not necessary since the LLWF has been constructed.

### 5.1.3 **Manual of Standards Part 139 – Aerodromes**

The Manual of Standards (MOS) Part 139 provides amplification and methods of compliance to the CASR Part 139 Aerodromes. As the Lal Lal Wind Farm is beyond the vicinity of any military, or regulated aerodrome MOS 139 does not apply.

### 5.1.4 **National Airports Safeguarding Framework**

The Australian National Airports Safeguarding Advisory Group (NASAG) produced a set of guidelines called the National Airports Safeguarding Framework (NASF) in 2012.

The purpose of the National Airports Safeguarding Framework (the Safeguarding Framework) is to enhance the current and future safety, viability and growth of aviation operations at Australian airports, by supporting and enabling:

- the implementation of best practice in relation to land use assessment and decision making in the vicinity of airports;
- assurance of community safety and amenity near airports;
- better understanding and recognition of aviation safety requirements and aircraft noise impacts in land use and related planning decisions;
- the provision of greater certainty and clarity for developers and landowners;
- improvements to regulatory certainty and efficiency; and
- the publication and dissemination of information on best practice in land use and related planning that supports the safe and efficient operation of airports.

Guideline D *Managing the Risk to Aviation Safety of Wind Turbine Installations [Wind Farms] / Wind Monitoring Towers* provides information regarding wind farms. This guideline provides the following information: -

33 Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical risk assessment.

34. The risk assessment, to be conducted by a suitably qualified person(s), should examine the effect of the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:

(a) hazardous, but that the risks to aircraft safety would be



*reduced by the provision of approved lighting and/or marking; or*

*(b) not a hazard to aircraft safety.*

The LLWF is not sited within the OLS of any regulated aerodrome and does not penetrate any PANS-OPS airspace. It is assessed as a LOW risk to aviation and is therefore *not a hazard to aircraft safety*.

Given the above, the LLWF does not require obstacle lighting as the risk to aviation is LOW and no additional mitigating strategies are required. As noted previously, several IFR rated pilots have made the statement that obstacle lighting cannot be seen in solid Instrument Meteorological Conditions, therefore it is not required.

VFR flights are required to remain in VMC and therefore they will not be flying in low cloud or with a visibility less than 5000m. Consequently, a VFR flight by day will not be near the wind farm if these conditions exist locally. Consequently, obstacle lighting is not required.

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### 5.2 Obstacle Lighting Summary

The LLWF is not sited within the OLS of any regulated aerodrome and does not penetrate any PANS-OPS airspace. It is assessed as a LOW risk to aviation and is therefore *not a hazard to aircraft safety*.

The LLWF does not require aviation obstacle lighting because the lighting does not mitigate a risk since the LLWF is not a hazard to aircraft safety.

## 6. CONCLUSIONS

The QRA demonstrates that the LLWF is assessed as a LOW risk to aviation and is therefore *not a hazard to aircraft safety*. The LLWF is depicted on the appropriate aeronautical charts, therefore its location is known to pilots and they are required to plan their flights accordingly.

Should an aerodrome operator decide to change their available facilities, for example install runway lights for night operations, then they must take into account the existing surrounds which include existing obstacles such as wind farms, high terrain, forests, powerlines and other existing constraints. The LLWF is an existing obstacle.

The processes outlined in Advisory Circular AC 139.E-05 v1.0 have been undertaken in this QRA. The LLWF is assessed as a low risk to aviation and is therefore not a hazard to aviation safety.

Aircraft flying at night are required to be at or above a published or calculated lowest safe altitude which ensures a minimum height of 1000ft above the tallest obstacle on the highest terrain along the planned route. The location of the LLWF is such that, at night, it does not impact on an aircraft in the process of descending to land or climbing after



take-off at either Ballarat or Avalon aerodromes. Obstacle lighting, therefore, is not required as it is not mitigating a risk.

During periods of marginal or non VMC an aircraft flying in accordance with visual flight rules is required to remain in visual meteorological conditions. If there is smoke or fog around the LLWF the pilot in command of a VFR flight is required to turn away to maintain VMC, therefore obstacle lighting serves no purpose and is not required.

There are no CASA regulations requiring aviation obstacle lighting on tall structures beyond the OLS of a regulated aerodrome. CASA may only recommend, not mandate, obstacle lighting on tall structures beyond and OLS. There are no CASA regulations or advisory publications concerning the obstacle lighting of wind farms. Likewise, there are no CASA regulations or advisory publications regarding the use of Aircraft Detection Lighting Systems.

Aviation obstacle lighting of the Lal Lal Wind Farm is not required.

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## **APPENDIX A**

### **Stakeholder List**

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## APPENDIX A

The following organisations were consulted.

Stakeholder	Contact
RMIT Aviation, Bendigo and Point Cook	Operations Manager (Chief Flying Instructor)
TVA Flying School Bacchus Marsh	Operations Manager (Chief Flying Instructor)
STA Flying School Ballarat	Operations Manager (Chief Flying Instructor)
Police Air Wing	Senior Base Pilot
Fixed Wing Air Ambulance (Pelair)	Senior Base Pilot
Helicopter Emergency Medical Service	Senior Base Pilot
HEMS Warrnambool	Base Pilot

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## ***APPENDIX B***

### ***Glossary of Terms And Abbreviations***

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## APPENDIX B

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### Glossary of Terms and Abbreviations

#### AERONAUTICAL STUDY GLOSSARY

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies. A full list of terms and abbreviations used in this report is included as an Appendix.

**AC** (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

**Aeronautical study** is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

**AHD** (Australian Height Datum) is the datum to which all vertical control for mapping is to be referred. The datum surface is that which passes through mean sea level at the 30 tide gauges and through points at zero AHD height vertically below the other basic junction points.

**AIP** (Aeronautical Information Publication) is a publication promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. It contains details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, the AIP may be issued by CASA or Airservices Australia.

**Air routes** exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under Instrument Flight Rules (IFR).

**Airservices Australia** is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

**Altitude** is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

**AMSL** (Above Mean Sea Level) is the elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level datum. In aviation, the ellipsoid known as World Geodetic System 84 (WGS 84) is the datum used to define mean sea level.

**ATC** (Air Traffic Control) service is a service provided for the purpose of:

- a. preventing collisions:
  1. between aircraft; and
  2. on the manoeuvring area between aircraft, vehicles and obstructions; and
- b. expediting and maintaining an orderly flow of air traffic.

**CASA** (Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation



safety standards. As Australia is a signatory to the ICAO *Chicago Convention*, CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

**CASR** (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework (*Regulations*) within which all service providers must operate.

**Civil Aviation Act 1988** (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

**ICAO** (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention*.

**IFR** (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, %a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying, +such as an IFR or VFR flight plan.

**IMC** (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

**LSALT** (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

**MOS** (Manual of Standards) comprises specifications (*Standards*) prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

**NASAG** (National Airports Safeguarding Advisory Group) set up in May 2010 to implement the Australian Government's National Aviation Policy White Paper, *Flight Path to the Future* initiatives relating to safeguarding airports and surrounding communities from inappropriate development. NASAG comprises representatives from state and territory planning and transport departments, the Civil Aviation Safety Authority (CASA), Airservices Australia, the Department of Defence and the Australian Local Government Association (ALGA) and is chaired by the Department of Infrastructure and Transport (DoIT).

**NASF** (National Airports Safeguarding Framework) is the published guidelines from the NASAG.

**NOTAMs** (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.



**Obstacles.** 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.

**OLS** (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

**PANS-OPS** (Procedures for Air Navigation Services - Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS-OPS may vary from country to country.

**PANS OPS Surfaces.** Similar to an Obstacle Limitation Surface, the PANS-OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to penetrate the OLS, they cannot be permitted to penetrate any PANS-OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

**Prescribed airspace** is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

**Regulations** (Civil Aviation Safety Regulations)

**VFR** (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules.

**VMC** (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima

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## ABBREVIATIONS

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table:

Abbreviation	Meaning
AC	Advisory Circular (document support CASR 1998)
ACFT	Aircraft
AD	Aerodrome
AHD	Australian Height Datum
AHT	Aircraft height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALA	Aircraft Landing Area
Alt	Altitude
AMSL	Above Minimum Sea Level
A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DITCRD	Department of Infrastructure, Transport, Cities and Regional Development
DIRDC	Department of Infrastructure, Regional Development and Cities See DIRCRD above
DIRD	Department of Infrastructure and Regional Development. (Formerly Department of Infrastructure and Transport)
DoIT	Department of Infrastructure and Transport. Also called %Infrastructure+ (Formerly Department of Infrastructure, Transport, Regional Development and Local Government (DITRDLG) and previously the Department of Transport and Regional Services (DoTARS))
DITRDLG	See DoIT above
DOTARS	See DITRDLG above
ELEV	Elevation (above mean sea level)



Abbreviation	Meaning
ENE	East North East
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point
ft	feet
GA	General Aviation
GNSS	Global Navigation Satellite System
GP	Glide Path
IAP	Instrument Approach Procedure
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe Altitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
SSR	Monopulse Secondary Surveillance Radar
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NASF	National Airports Safeguarding Framework
NDB	Non Directional Beacon
NE	North East
NM or nm	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North East
NOTAM	NOtice To AirMen
NVG	Night Vision Goggles
NVIS	Night Vision Imaging System (included equipment fitted to the aircraft)
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude



Abbreviation	Meaning
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services . Aircraft Operations,
PRM	Precision Runway Monitor
PROC	Procedure
PSR	Primary Surveillance Radar
QNH	An altimeter setting relative to height above mean sea level
Rnnn	Restricted Airspace . promulgated in AIP as R with 3 numbers
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes · replaced by the MOS Part 139 · Aerodromes
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
SSR	Secondary Surveillance Radar
STAR	Standard ARrival
TAR	Terminal Area Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
V <sub>n</sub>	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range

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## APPENDIX B

## REGULATIONS AND REQUIREMENTS REPORT PREPARED BY CHIRON AVIATION CONSULTANTS

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**FINAL REPORT**

**LAL LAL WIND FARM**

**AVIATION OBSTACLE LIGHTING**

**REGULATIONS AND REQUIREMENTS**

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**CCP39 REG**

**19 January 2021**  
**Updated**  
**7 June 2021**

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### EXECUTIVE SUMMARY

It is my opinion that the Lal Lal Wind Farm (LLWF) does not require aviation obstacle lighting. Permit condition 2 p) is not required on the basis that there is no additional aviation safety risk to mitigate. This is reflected in the Qualitative Risk Assessment for the LLWF<sup>1</sup>, which accompanies this report.

The regulations governing the flight of aircraft require that, at night an aircraft must fly at or above a published or calculated Lowest Safe Altitude (LSALT). This requires the aircraft to be at least 1000ft above the tallest obstacle on the highest terrain and within the navigation tolerances applicable to the aircraft flight. A pilot in command (PIC) must be suitably endorsed to fly at night and the aircraft must be suitably equipped for night navigation. The PIC is required to plan the flight before departure and consider such things as weather, terrain and obstacles, suitability of aerodromes, available navigation aids and LSALT for the intended route. Given the flight planning undertaken and that the LLWF location is promulgated on the aeronautical charts the PIC flying at night will remain clear.

CASA can only make recommendations regarding the lighting of wind farms, and not determinations/directions mandating lighting of wind farms that are not in the vicinity [beyond the OLS] of a Regulated (certified or registered) aerodrome. CASA provided evidence to Senate Select Committee on Wind Turbines (2015) about the limited role it plays in regulating airspace around wind farms.

*We know our responsibilities and the power of our legislation, which is very limited. For the most part, wind turbines are built away from aerodromes and certainly away from federally leased aerodromes. So the only power we have is to make a recommendation to the planning authority about whether the turbine is going to be an obstacle and, if we decide it is an obstacle, we can make a recommendation as to whether it should be lighted and marked. This is the extent of our power.<sup>2</sup>*

In my experience, CASA has emphasised the view that *“this is a matter for the appropriate Land Use Planning Authority to consider the implementation of our recommendations”* regarding aviation obstacle lighting of wind farms.

The original planning permit for LLWF, PL-SP/05/0461, 30 April 2009 at section 2 o) refers to *“Aviation obstacle lighting may be installed but only if they meet the following requirements, except with the further written consent of the Minister for Planning.”* This was amended in planning permit PL-SP/05/0461/A, 20 March 2017 to read at section 2p), *“Aviation detection lighting system must be installed in accordance with current Civil Aviation Safety Authority specifications or law, such that it is activated only*

- (1) If at night when an aircraft is in the vicinity of the wind energy facility*
- (2) During low visibility daytime conditions such as the existence of smoke and fog.”*

<sup>1</sup> Lal Lal Wind Farm, Aviation Obstacle Lighting Qualitative Risk Assessment, Chiron Aviation Consultants, 18 December 2020

<sup>2</sup> Senate Select Committee on Wind Turbines, Final Report, August 2015, paragraph 5.38



There are no CASA specifications or laws governing the use of ADLS. Similarly, there are no CASA laws requiring the obstacle lighting of wind energy facilities beyond the OLS of a regulated aerodrome. There is no requirement for aviation obstacle lighting to activate during low visibility daytime conditions such as smoke or fog, except as part of an aerodrome lighting system.

It is the author's opinion that there is a misunderstanding of CASA's powers, laws and requirements regarding the need for aviation obstacle lighting, particularly when the wind energy facility is beyond the Obstacle Limitation Surface of a Regulated Aerodrome.

The author notes that the nearby Mortlake South WEF, which has similar sized turbines was used as an example for the inclusion of an "aviation detection lighting system" at the LLWF. The Planning Permit for the Mortlake South WEF now prohibits the use of aviation obstacle lighting.

The author also notes that the aviation obstacle lights at the LLWF have not been available since at least 27<sup>th</sup> November 2020 and will not be available until 29<sup>th</sup> July 2021. NOTAM C518/21 review C87/21 refers.

CASA has issued an Advisory Circular AC 139.E-05 v1.0 *Obstacles (including wind farms) outside the vicinity of a CASA certified aerodrome*, dated May 2021. This Advisory Circular, at the opening section states:

*2.1.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.*

This AC provides advisory information regarding the process for ascertaining if a wind farm is a hazard to aircraft safety. It also provides information to proponents and planning authorities about who is responsible for deciding if a wind farm requires aviation obstacle lighting.

AC 139.E-05 v1.0, in the author's opinion, reinforces that aviation obstacle lighting is not required on the LLWF.

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## 1. INTRODUCTION

Chiron Aviation Consultants has been engaged by Herbert Smith Freehills to provide an expert opinion on the Civil Aviation Safety Authority (CASA) requirements, specification or law applied regarding aviation obstacle lighting of the Lal Lal Wind Farm (LLWF).

## 2. EXPERTISE TO MAKE REPORT

My area of expertise is airspace and air traffic management. I also have expertise in the area of aircraft maintenance planning and aircraft performance. Through these activities I have an extensive knowledge of aviation regulations.

I have undertaken Aeronautical Impact and Qualitative Risk Assessments as well as Obstacle Lighting Reviews for wind farm projects in Victoria, New South Wales, South Australia and Western Australia. These have included investigations into the impact of wind farms on the operation of Aeroplane Landing Areas and the use of aerial agricultural applications activity. Additionally, I have undertaken Aviation Impact Assessments and Glare Analyses for large scale solar farms as well as Qualitative Risk Assessments for high voltage transmission lines in Victoria and Western Australia.

A common requirement of all these analyses is a thorough knowledge of aviation legislation and regulations and the ability to apply them to the task at hand. I have also taught %air legislation+ (rules and regulations) and %basic aero knowledge+ (how aeroplanes fly) as part of my time as an Air Traffic Services Senior Instructor.

I am a Certified Air Ground Radio Operator with CASA Aviation Reference Number (ARN) 435274.

## 3. EXPERT QUALIFICATIONS

My qualifications:

- Diploma of Air Traffic Control
- Bachelor of Education

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My qualifications and expertise are set out in Appendix B.

## 4. LIST OF ABBREVIATIONS

Abbreviations used in this statement, and the meanings assigned to them for the purposes of this statement are detailed in the following table.

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Abbreviation	Meaning
AC	Advisory Circular (document supporting CASR 1998)
ADLS	Aircraft Detection Lighting System
ADS-B	Automatic Dependent Surveillance - Broadcast
AHD	Australian Height Datum
AIA	Aeronautical Impact Assessment
AIP	Aeronautical Information Publication
AIS	Aviation Impact Statement
AIS	Aeronautical Information Service
ALA	Aeroplane Landing Area
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
CAAP	Civil Aviation Advisory Publication
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation 1988
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation 1998
Cat	Category
CTA	Controlled Airspace
CTR	Control Zone . airspace surrounding a controlled aerodrome
DAP	Departure and Approach Procedures (charts published by AsA)
DME	Distance Measuring Equipment
DR	Dead Reckoning (navigation procedure)
ERSA	Enroute Supplement Australia
FAA	Federal Aviation Administration . United States of America
ft	Feet . International unit of altitude
GA	General Aviation
GNSS	Global Navigation Satellite System
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
km	kilometres
LAT	Latitude
LLWF	Lal Lal Wind Farm
LONG	Longitude
LSALT	Lowest Safe Altitude
m	metres
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
NASAG	National Airports Safeguarding Advisory Group

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Abbreviation	Meaning
NASF	National Airports Safeguarding Framework
NDB	Non Directional Beacon
nm	Nautical Mile (= 1.852 km)
NOTAM	NOtice To AirMen
OLR	Obstacle Lighting Review
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services . Aircraft Operations
PIC	Pilot in Command
PSR	Primary Surveillance Radar
QRA	Qualitative Risk Assessment
RNP	Required Navigation Performance
RNAV	aRea NAVigation (self-contained navigation system)
RPT	Regular Public Transport
RWY	Runway
SFC	Surface
SSR	Monopulse Secondary Surveillance Radar
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	Very high frequency Omni directional Range
YBLT	Ballarat Regulated Aerodrome
YBSL	Rowsley/Brooke Landing ALA (Unregulated aerodrome)
YBSS	Bacchus Marsh ALA (Unregulated aerodrome)
YLED	Lethbridge Park ALA (Unregulated aerodrome)
YMAV	Avalon Regulated Aerodrome

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## 5. AIRSPACE

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An appreciation of Australian Airspace is necessary to clarify the flight rules and other requirements associated with aviation in Australia. The Civil Aviation Safety Authority (CASA) is the safety regulator for Australian aviation. Airservices Australia is the provider of air traffic services including Air Traffic Control (ATC), Aviation Rescue Fire Fighting Services (ARFFS) and Aeronautical Information Services (AIS).

Australian airspace is classified into five classes. Four of these are controlled airspace (CTA)<sup>3</sup>, where an airways clearance from Air Traffic Control (ATC) is required:

- Class A . Controlled airspace available to Instrument Flight Rules (IFR) aircraft only and has a lower limit of F180 (18,000ft) and a maximum limit of FL600 (60,000ft)

<sup>3</sup> AIP ENR 1.4 . 1 Section 1 [https://www.airservicesaustralia.com/aip/current/aip/enroute\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/current/aip/enroute_05NOV2020.pdf)



- Class C . Controlled airspace available to IFR and VFR aircraft. Has a lower limit of FL125 (12,500ft), except for specified control area steps into controlled aerodromes, and has an upper limit of FL180
- Class D . Controlled airspace available to IFR and VFR aircraft. Applies to control zones (CTR) (the area immediately surrounding a controlled aerodrome) and associated control area steps. Class D CTR extends from ground level to an upper limit of 4,500ft.
- Class E . Controlled airspace available to IFR and VFR aircraft. Has various lower limits depending on location. Generally, along the Australian East Coast the lower limit is 8,500ft, with an upper limit at the base of Class A or Class C airspace.

A Control Area is defined as a % controlled airspace extending upwards from a specified limit above the earth.<sup>4+</sup>

The fifth class of airspace is non controlled airspace.

- Class G<sup>5</sup> . non-controlled airspace, is where aircraft operate without an ATC clearance. Aircraft may operate in accordance with either IFR or VFR within Class G airspace.
- Within Class G airspace an aircraft flying in accordance with the VFR away from a populous area is, when flying below 3000ft, required by Civil Aviation Regulation (CAR) 157<sup>6</sup> to remain at 500ft above the highest point of the terrain **and any obstacle on it** within a radius of 600m [300m for a helicopter] from a point on the terrain directly below the aircraft.

Additionally, there are Prohibited (P), Restricted (R) and Danger (D) Areas, known as PRD airspace, used protect facilities and limit the access of civil aircraft.<sup>7</sup>

The Lal Lal Wind Farm (LLWF) is situated in Class G airspace, which extends from ground level to the lower limit of Class C airspace above, at an altitude of 8,500ft.

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### 6. FLIGHT RULES

An appreciation of the flight rules applicable to aircraft flight is required to understand the need or otherwise for the installation of aviation obstacle lighting on tall structures.

There are two sets of flight rules applying to aircraft flight. Each applies in all categories of airspace with the exception that VFR flight is not considered practical above FL200 (20,000ft) above the Australian Height Datum (AHD) and in Class A airspace.

<sup>4</sup> AIP Enroute, ENR 1.4 . 7, sec 3, available at [https://www.airservicesaustralia.com/aip/current/aip/enroute\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/current/aip/enroute_05NOV2020.pdf)

<sup>5</sup> AIP ENR 1.4 . 7 Section 4 [https://www.airservicesaustralia.com/aip/current/aip/enroute\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/current/aip/enroute_05NOV2020.pdf)

<sup>6</sup> Civil Aviation Regulations CAR 157 <https://www.legislation.gov.au/Details/F2020C00784>

<sup>7</sup> AIP ENR 1.4 . 10 Section 5 [https://www.airservicesaustralia.com/aip/current/aip/enroute\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/current/aip/enroute_05NOV2020.pdf)



The flight rules applying to each flight is dependent on several factors including pilot ratings, aircraft equipment level, category of flight (from regular public transport to private recreational), airspace category and weather.

## 6.1 Visual Flight Rules

The Visual Flight Rules (VFR) are contained in Civil Aviation Regulations 1988 (CAR), Part 12, Division 3<sup>8</sup>.

### CAR 171 VFR Flight

- (1) A flight conducted in accordance with the provisions of this Division is classed as a flight under the Visual Flight Rules
- (2) Where an aircraft cannot be flown in accordance with the Visual Flight Rules, the pilot in command shall comply with the Instrument Flight Rules contained in Division 4 of this part, or land at the nearest suitable aerodrome.

### CAR 172 Flight Visibility and Distance from Cloud

- (1) The pilot in command of an aircraft must not conduct a VFR flight at a height of, or less than 2,000ft above ground or water if:
  - a. The pilot is not able to navigate by reference to the ground or water; and
  - b. CASA has not directed that the flight may be conducted at a height of 2,000ft or less.
- (2) Subject to sub regulation (4), the pilot in command must not conduct a VFR flight if:
  - a. The flight visibility during that flight is not equal to or greater than the applicable distance determined by CASA; and
  - b. The vertical and horizontal distances from cloud are not equal to or greater than the applicable distances determined by CASA.

(2A) CASA may determine applicable distances for the purpose of sub regulation (2)

(2B) CASA must notify the distances determined under sub regulation (2A) in AIP or NOTAMS.

The distances determined for VFR in accordance with sub regulation (2) are specified in the Aeronautical Information Publication (AIP) at section ENR 1.2<sup>9</sup>.

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<sup>8</sup> Civil Aviation Regulations 1988, Part 12, Rules of the Air. available at <https://www.legislation.gov.au/Details/F2020C00784>

<sup>9</sup> AIP ENR available at [https://www.airservicesaustralia.com/aip/pending/aip/enroute\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/pending/aip/enroute_05NOV2020.pdf)



For Class G airspace at low level, the Visual Meteorological Conditions (VMC) are:

Type of aircraft	Height at which applicable	Applicable distance for Flight Visibility	Applicable distances for Vertical and Horizontal Distance from Cloud	Conditions
Aeroplanes, helicopters, and balloons	At or Below whichever is the higher of  (a) 3000ft AMSL  (b) 1000ft AGL	5,000m	Clear of cloud and in sight of ground or water	Radio must be carried and used on the appropriate frequency

Table 1 – Class G Airspace Visual Meteorological Conditions<sup>10</sup>

AIP ENR 1.2 Visual Flight Rules also specifies a VFR flight may only be conducted; in VMC, provided that, when operating at or below 2,000ft above the ground or water, the pilot is able to navigate by visual reference to the ground or water, at sub-sonic speeds and in accordance with the airspace speed limitations specified in ENR 1.4. For Class G airspace below 10,000ft this is 250 knots IAS.

Section ENR 1.2 also states that *“Unless the pilot in command is authorised under CASR Part 61 to conduct a flight under IFR or at night under VFR and the aircraft is appropriately equipped for flight at night or under the IFR, a VFR flight must not be conducted at night. A VFR flight must not depart from an aerodrome unless the ETA for the destination (or alternate) is at least 10 minutes before last light (a time determined by latitude and is before civil twilight) allowing for any required holding.”*

#### CAR 174 Determination of visibility for VFR flights

- (1) Flight visibility shall be determined by the pilot in command from the cockpit of the aircraft while in flight.
- (2) Subject to regulation 257, the pilot in command of an aircraft operating under the Visual Flight Rules is responsible for determining the visibility for the take-off and landing of the aircraft.
- (3) In determining visibility for the purposes of this regulation, the pilot in command shall take into account the meteorological condition, sun glare and any other condition that may limit his or her effective vision through his or her windscreen.

#### CAR 174B VFR flights at night

- (1) The pilot in command of an aircraft must not fly the aircraft at night under the VFR

<sup>10</sup> AIP ENR 1.2 . 4, section 2.5 Visual Meteorological Conditions

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at a height of not less than 1000ft above the highest obstacle located within 10 nautical miles of the aircraft in flight if it is not necessary for take-off or landing.

## 6.2 Instrument Flight Rules

The Instrument Flight Rules (IFR) are contained in Civil Aviation Regulations 1988 (CAR), Part 12, Division 4.

### CAR 175 Instrument Flight Rules

- (1) a flight conducted in accordance with the provisions of this Division is classed as a flight under the Instrument Flight Rules.
- (2) Subject to sub regulation (3), the pilot in command of an aircraft that is flying in weather conditions other than VMC must comply with the IFR.
- (3) Sub regulation (2) does not apply to a pilot in command of an aircraft that is flying for the purpose of landing at the nearest suitable aerodrome under sub regulation 171(2).

### CAR 178 Minimum height for flight under IFR

- (1) Subject to sub regulation (4), the pilot in command of an aircraft flown along a route segment for which there is a published lowest safe altitude (LSALT) must not fly the aircraft at a height lower than the published lowest safe altitude.
- (2) Subject to sub regulation (4), the pilot in command of an aircraft flown along a route segment for which there is no published lowest safe altitude must not fly the aircraft at a height lower than the lowest safe altitude calculated in accordance with a method for determining the lowest safe altitude that is determined by CASA under sub regulation (6).
- (3) An offence against sub regulation (1) or (2) is an offence of strict liability
- (4) An aircraft may be flown along a route segment at a height less than the height that is applicable under sub regulation (1) or (2)
  - a. During take-off or landing
  - b. During arrival or departure if the aircraft is being flown
    - i. At a safe height above the terrain and
    - ii. In accordance with any instructions published in AIP or
  - c. During an authorised instrument departure procedure or authorised instrument approach procedure or
  - d. If the aircraft is being flown by day in VMC or
  - e. If the aircraft is being flown in accordance with instructions for air traffic control.

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- (5) This regulation has effect subject to regulation 157 [low flying]
- (6) For the purpose of these regulations, CASA may, in writing determine any or all of the following
- A method of calculating a lowest safe altitude
  - An instrument approach procedure
  - An instrument departure procedure.

The calculation of lowest safe altitude is detailed at AIP GEN<sup>11</sup> Section 4 at page 3.3-6 (5 Nov 2020 issue).

#### Paragraph 4.1

A pilot using GRID LSALT for obstacle clearance is responsible for determining the allowance for navigation error that should be applied, considering the limitations of navigation aids or method of navigation being used for position fixing. This navigation error allowance must be applied to the proposed track. The highest GRID LSALT falling within the area covered by the determined navigation error must be used.

#### Paragraph 4.2

For routes and route segments not shown on AIP aeronautical charts, the lowest safe altitude must not be less than that calculated in accordance with paragraph 4.3 within the area defined in the following paragraphs 4.6 to 4.9.

#### Paragraph 4.3

Unreported obstacles up to 360ft (110m) may exist in navigation tolerance areas. The LSALT must be calculated using the following method

- Where the highest obstacle is more than 360ft above the height determined for terrain, the LSALT must be 1,000ft above the highest obstacle
- Where the highest obstacle is less than 360ft above the terrain, or there is no charted obstacle, the LSALT must be 1,360ft (415m) above the elevation determined; except that
- Where the elevation of the highest terrain or obstacle in the tolerance area is not above 500ft, the LSALT must not be less than 1,500ft (457m)

#### Paragraph 4.6 - For routes defined by Radio Navigation Aids or to be Navigated by DR

The area to be considered must be within an area of 5nm surrounding and including an area defined by lines drawn from the departure point or enroute radio aid, 10.3° each side of the nominal track (where track guidance is provided by a radio navigation aid), or 15° each side of the nominal track (where no track guidance is provided) to a limit of 50nm each side of track, thence paralleling track to abeam the destination and then converging to a semicircle of 50nm radius centred on the destination.

<sup>11</sup> AIP GEN available at [https://www.airservicesaustralia.com/aip/pending/aip/general\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/pending/aip/general_05NOV2020.pdf)

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On shorter routes, where these lines are displaced by less than 50nm abeam the destination, they shall converge by a radius based on the lesser distance. Where the lines thus drawn come at any time within the coverage on an enroute or destination radio aid the aircraft is equipped to use, they will converge by straight lines to that aid. The minimum angle of convergence which must be used in this case is  $10.3^{\circ}$  each side of track.

#### Paragraph 4.7 For Routes Operated Under the RNP 2 Navigation Specification

The area to be considered must be within an area of 5nm surrounding and including the departure point, the destination, and each side of the nominal track.

#### Paragraph 4.8 For Other Area Navigation Operations

The area to be considered must be within an area of 5nm surrounding and including an area defined by lines drawn from the departure point not less than  $15^{\circ}$  each side of the nominal track to a maximum of

- a. 8nm for a flight under the RNP 4 navigation specification
- b. 7nm for flight under an RNAV navigation specification having a GNSS input, or
- c. 30nm for flight under a non GNSS area navigation specification.

Thence paralleling track to abeam the destination and converging by a semicircle of the same radius centred on the destination.

#### Paragraph 4.9 For Aircraft Flown at Night Under VFR

The area to be considered must be

- a. The area specified in paragraphs 4.6, 4.7 or 4.8 for aircraft navigated by means of radio navigation system, or
- b. Within a radius of 10nm from any point along the aircraft's nominal track.

However, the pilot of an aircraft who has positively determined by visual fix that a critical obstruction has been passed may nevertheless descend immediately to a lower altitude, provided that the required obstacle clearance above significant obstructions ahead of the aircraft is maintained.

#### Paragraph 10

An aircraft must not be flown at night under the VFR, lower than the published lowest safe altitude calculated in accordance with this section except:

- a. During take-off and climb in the vicinity of the departure aerodrome
- b. When the destination aerodrome is in sight and descent can be made within the prescribed circling area of 3nm radius of the destination, or
- c. When being vectored (under ATC instruction)

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### 6.3 Low Flying CAR 157

Civil Aviation Regulations, Part 11 . Conditions of Flight, Division 2 . Flight Rules, at Regulation 157 specifies<sup>12</sup>:

(1) The pilot in command of an aircraft must not fly the aircraft over:

- (a) any city, town, or populous area at a height lower than 1,000 feet; or
- (b) any other area at a height lower than 500 feet.

Penalty: 50 penalty units.

(2) An offence against subregulation (1) is an offence of strict liability.

Note: For strict liability, see section 6.1 of the Criminal Code.

(3) A height specified in subregulation (1) is the height above the highest point of the terrain, and any object on it, within a radius of:

- (a) in the case of an aircraft other than a helicopter- 600 metres; or
- (b) in the case of a helicopter- 300 metres;

from a point on the terrain vertically below the aircraft.

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(3A) Paragraph (1)(a) does not apply in respect of a helicopter flying at a designated altitude within an access lane details of which have been published in the AIP or NOTAMS for use by helicopters arriving at or departing from a specified place.

(4) Subregulation (1) does not apply if:

(a) through stress of weather or any other unavoidable cause it is essential that a lower height be maintained; or

(b) the aircraft is engaged in private operations or aerial work operations, being operations that require low flying, and the owner or operator of the aircraft has received from CASA either a general permit for all flights or a specific permit for the particular flight to be made at a lower height while engaged in such operations; or

(c) the pilot of the aircraft is receiving flight training in low-level operations or aerial application operations, within the meaning of Part 61 of CASR; or

(d) the pilot of the aircraft is engaged in a baulked approach procedure, or the practice of such procedure under the supervision of a flight instructor or a check pilot; or

(e) the aircraft is flying in the course of actually taking off or landing at an aerodrome; or

(f) the pilot of the aircraft is engaged in:

- (i) a search; or
- (ii) a rescue; or

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<sup>12</sup> Civil Aviation Regulation 157, Low Flying available at <https://www.legislation.gov.au/Details/F2020C00031>



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- (iii) dropping supplies;
- in a search and rescue operation; or
- (g) the aircraft is a helicopter:
  - (i) operated by, or for the purposes of, the Australian Federal Police or the police force of a State or Territory; and
  - (ii) engaged in law enforcement operations; or
- (h) the pilot of the aircraft is engaged in an operation which requires the dropping of packages or other articles or substances in accordance with directions issued by CASA.

The key point of CAR 157 is that the height specified is above the highest object on the highest terrain.

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### 6.4 Flight Rules Summary

The flight rules specify the lowest safe altitude to be used by a pilot in command when flying an aircraft to either the VFR or IFR. The LSALT calculations include vertical and lateral dimensions. If a flight cannot fly over an obstacle with the required vertical clearance, it must fly around it with the required lateral clearance. If neither vertical nor lateral options are possible, then the flight must turn back along the safe route flown.

The pilot in command is required to plan the flight prior to departure. This pre-flight planning must include, but is not limited to, weather, hours of daylight, aerodrome suitability, lowest safe altitudes, navigation and communication facilities, NOTAMS and airspace requirements. Consequently, through studying the appropriate aeronautical charts, the pilot in command will know the location and height of wind farms and other tall structures along the flight planned route. The flight will be planned accordingly to ensure tall structures such as wind turbines are avoided.

The LSALT to be used by IFR and VFR at Night, is that published on aeronautical charts, or calculated for a particular route segment, and is a minimum of 1,000ft above the highest obstacle within the LSALT tolerance for the intended flight path.

VFR at Night must remain in Visual Meteorological Conditions (VMC).

For VFR by day, an aircraft must remain in VMC and fly at least 500ft above the highest point of the terrain and any object on it.

The pilot in command must ensure the flight, VFR by day or night and IFR, remains clear of a wind farm by either flying the aircraft at the regulated height above it or at the regulated distance away from it.

For take-off and descent an IFR flight uses PANS-OPS airspace. A VFR at Night flight cannot descend below the LSALT until within 3nm of the aerodrome and with it in sight. A VFR by day flight must remain at least 500ft above the tallest obstacle until in the aerodrome circling area.



## 7. REPORTING OF TALL STRUCTURES

The recommended method of compliance for reporting of tall structures and hazardous plume sources is detailed in CASA Advisory Circular (AC) 139-08 v2.0, March 2018, *Reporting of tall structures and hazardous plume sources*<sup>13</sup>. This AC requires the reporting of tall structures to Airservices Australia.

Airservices Australia, under CASR Part 175 is now the responsible authority for maintaining the vertical obstacles database. RAAF Aeronautical Information Service, per the previous version of AC 139-08(0) issued in April 2005, is no longer responsible for maintaining the tall structures database.

The Civil Aviation Safety Regulations 1998 (CASR) referred to in AC139-08 are, Part 139 Aerodromes and Part 175 Aeronautical Information Management.

Part 139 Aerodromes<sup>14</sup> is applicable to Regulated Aerodromes only. The application of CASR Part 139 is limited to within the Obstacle Limitation Surface (OLS) for the regulated aerodrome. An OLS is a series of arcs extending to up to 15,000m from the end of each runway and comprises several horizontal planes at different levels.

Part 175 Aeronautical Information Management Part 175 E . Aeronautical information management . objects and structures that affect aviation safety<sup>15</sup> sets out the requirements for reporting such objects. This part ensures that tall structures such as wind turbines are reported and promulgated via the AIP, aeronautical charts, and NOTAMs to inform pilots of the location and height for flight planning purposes including the calculation of LSALT.

The LLWF has been reported and is depicted on the relevant aeronautical charts<sup>16</sup>. Therefore, the aviation community knows the location and height of the LLWF and will flight plan to remain clear of it. Consequently, the risk to aviation safety from the LLWF is low and no further mitigation is required.

## 8. OBSTACLE LIGHTING OF WIND FARMS

CASR Part 175 requires that tall structures be reported to AsA for inclusion in the AIP and on aeronautical charts.

Where a wind farm is beyond the OLS of a Regulated aerodrome CASR Part 139 - Aerodromes does not apply. The LLWF is beyond the OLS for any regulated aerodrome.

The prescribed airspace associated with instrument flight is specified in the International Civil Aviation Organisation (ICAO) documents, annexe 14. The Procedures for Air

<sup>13</sup> CASA AC 139-08 v2.0 available at <https://www.casa.gov.au/files/139c08pdf>

<sup>14</sup> CASA Part 139 is available at [https://www.legislation.gov.au/Details/F2020C00935/Html/Volume\\_4#\\_Toc53389774](https://www.legislation.gov.au/Details/F2020C00935/Html/Volume_4#_Toc53389774)

<sup>15</sup> CASR Part 175 is available at [https://www.legislation.gov.au/Details/F2020C00935/Html/Volume\\_4#\\_Toc53389774](https://www.legislation.gov.au/Details/F2020C00935/Html/Volume_4#_Toc53389774)

<sup>16</sup> AIP Charts, Visual Navigation Chart (VNC), Melbourne, 5 Nov 2020 available at [https://www.airservicesaustralia.com/aip/pending/aipchart/vnc/Melbourne\\_VNC\\_05NOV2020.pdf](https://www.airservicesaustralia.com/aip/pending/aipchart/vnc/Melbourne_VNC_05NOV2020.pdf)



Navigation Services . Aircraft Operations (PANS-OPS) [ICAO document 8168] details the construction of airspace required to protect IFR flights. This includes the fact that it is obstacle free airspace. That is; a wind turbine, or other tall structure, is not permitted to penetrate a PANS-OPS surface.

The LLWF does not penetrate any OLS, PANS-OPS, LSALT or other prescribed airspace.

The location of the LLWF is beyond the OLS of any Regulated Aerodrome and is beyond the suggested obstacle free area recommended in CAAP 92-1(1) *Guidelines for Aeroplane Landing Areas*<sup>17</sup>, for Unregulated Aerodromes. Therefore, a flight in the vicinity of the LLWF is neither descending to land, nor climbing after take-off, so it must be at or above the LSALT. Consequently, the LLWF is safely below the aircraft flight path and therefore is not an obstacle, so does not require aviation obstacle lights.

Aviation obstacle lighting of wind turbines is discussed in the National Airports Safeguarding Framework (NASF) Guideline D *Managing the risk to aviation safety of wind turbine installations (wind farms)/wind monitoring masts*<sup>18</sup>. This guideline was published in July 2012. It is a guideline and has no regulatory force, and as the name implies it refers to airports.

CASA can only make recommendations, not determinations/directions regarding the lighting of wind farms that are not in the vicinity [beyond the OLS] of a regulated aerodrome. CASA provided evidence to Senate Select Committee on Wind Turbines (2015) about the limited role it plays in regulating airspace around wind farms.

*We know our responsibilities and the power of our legislation, which is very limited. For the most part, wind turbines are built away from aerodromes and certainly away from federally leased aerodromes. So the only power we have is to make a recommendation to the planning authority about whether the turbine is going to be an obstacle and, if we decide it is an obstacle, we can make a recommendation as to whether it should be lighted and marked. This is the extent of our power.*<sup>19</sup>

In my experience, CASA has emphasised the view that *it is a matter for the appropriate Land Use Planning Authority to consider the implementation of our recommendations*<sup>20</sup> regarding aviation obstacle lighting of wind farms.

To my knowledge CASA has never undertaken a risk analysis as recommended by NASF Guideline D paragraphs 33 and 34 to determine whether aviation night lighting should be included on wind farms not in the vicinity of an aerodrome.

Wind turbines, by their size and colour are considered, by day, to be conspicuous objects

<sup>17</sup> Civil Aviation Advisory Publication 92-1(1) *Guidelines for Aeroplane Landing Areas*, July 1992, available at <https://www.casa.gov.au/files/921pdf>

<sup>18</sup> NASF Guideline D is available at

[https://www.infrastructure.gov.au/aviation/environmental/airport\\_safeguarding/nasf/files/4.1.3\\_Guideline\\_D\\_Wind\\_Turbines.pdf](https://www.infrastructure.gov.au/aviation/environmental/airport_safeguarding/nasf/files/4.1.3_Guideline_D_Wind_Turbines.pdf)

<sup>19</sup> Senate Select Committee on Wind Turbines, Final Report, August 2015, paragraph 5.38

<sup>20</sup> Communications between the author and CASA Aerodromes and Airspace about several wind farms Australia wide over the last 5 years.



that do not need additional risk mitigation<sup>21</sup>.

Given the regulated LSALT clearance requirements for aircraft flying VFR at Night or IFR, aviation obstacle lighting is not mitigating a risk and is therefore not required.

The pilot in command of a VFR aircraft by day is required to remain in VMC, therefore the aircraft will not be in the vicinity of the LLWF if it is obscured by smoke, fog or other low visibility conditions causing non VMC. Consequently, aviation obstacle lighting is not mitigating a risk and is therefore not required.

In my opinion, aviation obstacle lighting is not required for the Lal Lal Wind Farm.

## 8.1 National Airports Safeguarding Framework (NASF)

The National Airports Safeguarding Advisory Group (NASAG) promulgated the National Airports Safeguarding Framework (NASF) in July 2012.

Guideline D *Managing the risk to aviation safety of wind turbine installations (wind farms)/wind monitoring towers* was published in July 2012 to provide guidance for to State/Territory and local government decision makers, airport operators and developers of wind farms to jointly address the risk to civil aviation arising from the development, presence and use of wind farms and wind monitoring towers.

This is a risk based approach to the hazard to aviation safety posed by wind turbines and meteorological monitoring towers. Risk is a function of hazard and likelihood. A high impact hazard with a minimal likelihood is a LOW risk<sup>22</sup>.

Guideline D Paragraph 9 advises

*State/Territory and local governments are primarily responsible for land use planning in the vicinity of all airports.*

Guideline D Paragraph 27 . *Risk Assessment* - advises

*The risk assessment should address the merits of installing obstacle marking or lighting. The risk assessment should determine whether or not a proposed structure will be a hazardous object. CASA may determine, and subsequently advise a proponent and relevant planning authorities that the structure(s) have been determined as:*

- (a) Hazardous, but that the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*
- (b) Hazardous and should not be built, either in the location and/or to the height proposed as an unacceptable risk to aircraft safety will be*

<sup>21</sup> NASF Guideline D paragraph 30

<sup>22</sup> ASNZS ISO 31000-2018 *Risk Management –Guidelines*.

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created; or

(c) Not a hazard to aircraft safety.

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Guideline D Paragraph 33 . *Wind Farm lighting* - advises

*Where a wind turbine 150m or taller in height is proposed away from aerodromes, the proponent should conduct an aeronautical assessment.*

Guideline D Paragraph 34 advises

*The risk assessment, to be conducted by a suitably qualified person, should examine the effect the proposed wind turbines on the operation of aircraft. The study must be submitted to CASA to enable an assessment of any potential risk to aviation safety. CASA may determine that the proposal is:*

- (a) Hazardous, but the risks to aircraft safety would be reduced by the provision of approved lighting and/or marking; or*
- (b) Not a hazard to aircraft safety.*

The author has, as part of this task, conducted a qualitative risk assessment for the LLWF<sup>23</sup>. The risk assessment concluded that the LLWF *was not a hazard to aircraft safety*, therefore, since there was no risk to mitigate, aviation obstacle lighting was not required.

Guideline D Paragraphs 35, 36 and 37 provide some guidance on obstacle lighting standards for wind turbines. The type of lighting to be used when CASA has recommended aviation obstacle lighting is *medium intensity red*. Steady red light may be used where there is opposition to the use of flashing lights.

The characteristics of a medium intensity red light is found in the CASA MOS 139 . Aerodromes at Chapter 9 *Visual Aids Provided by Aerodrome Lighting*, section 9.4 *Obstacle lighting*<sup>24</sup>. Paragraph 9.4.3.4 (f) [v1.14 Jan 2017 MOS] states that: -

*To prevent obstacle light shielding by the rotation blades, 2 lights must be provided on top of the generator housing in a way that allows at least 1 of the lights to be seen from every angle in azimuth.*

The new MOS [11 September 2019], at Chapter 9, Division 4 Obstacle Lighting, Section 9.31 Location of Obstacle Lighting, paragraph (8)(d), requires the obstacle lighting to be visible from every angle in azimuth (*This is to prevent obstacle light shielding by the rotating blades of a wind turbine and may require more than 1 obstacle light to be fitted.*)

CASR Part 139 . Aerodromes and the associated MOS 139 were amended on 13 August 2020. The date on the current MOS 139 is 11 September 2019<sup>25</sup>. The new

<sup>23</sup> Lal Lal Wind Farm, Aviation Obstacle Lighting Qualitative Risk Assessment, Chiron Aviation Consultants, 10 Nov 2020.

<sup>24</sup> CASA MOS 139 version 1.14 January 2017 **Note this has been updated.**

<sup>25</sup> CASA MOS 139 2019 version . rectified authorised version, registered 11/09/2019 F2019L01146  
[https://www.legislation.gov.au/Details/F2019L01146/Html/Text#\\_Toc17467267](https://www.legislation.gov.au/Details/F2019L01146/Html/Text#_Toc17467267)





section for *Visual Aids Provided by Aerodrome Lighting* remains as Chapter 9 Division 4. It is more descriptive than the MOS it replaces.

The MOS Part 139 only applies to Regulated Aerodromes. Both old and new MOS refer to wind turbines that infringe the OLS.

Guideline D Paragraph 38 provides the following information:

*In some circumstances, it may be feasible to install obstacle lights that are activated by aircraft in the vicinity. This involves the use of radar to detect aircraft within a defined distance that may be at risk of colliding with the wind farm. When such an aircraft is detected, the wind farm lighting is activated. This option may allow aviation safety risks to be mitigated where obstacle lighting is recommended while minimising the visual impact of the wind farm at night.*

This is the only mention of a system that resembles ADLS.

In my opinion, the advice given in NASF Guideline D had been followed and had established that the LLWF was not a hazard to aircraft safety, therefore aviation obstacle lighting was not required.

## 8.2 Aircraft Detection Lighting System (ADLS)

There are no CASA specifications or law regarding Aircraft Detection Lighting systems. There are no Advisory Circulars

There is a United States of America Federal Aviation Administration (FAA) Advisory Circular on Obstruction Marking and Lighting (AC 70/7460-1) which includes a section on ADLS. This is an advisory publication only with no regulatory authority.

There is no European Aviation Safety Authority (EASA) AC on ADLS

In my opinion, aviation obstacle lighting is not required on the LLWF, therefore the planning permit specification of an *aviation detection lighting system* is not necessary.

## 9. PLANNING APPROVAL – PANEL REPORTS AND PERMITS

A chronology of the Planning Panel Reports and subsequent Planning Permits is of use in that it shows where changes regarding the requirement for aviation obstacle lights on the LLWF occurred. It does not show the reason for the change from *may have aviation obstacle lights* to an *aviation detection lighting system must be installed*.

### 9.1 Panel Report – February 2009

AC 139-18(0) is referred to in the *Lal Lal Wind Energy Facility Permit Application PL-SP/05/0461* and *Native Vegetation Removal Permit Application PL07/067 – Panel*



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Report dated February 2009.

The panel report notes

*“... .. that AC 139-18(0) was withdrawn in September 2008 and they understood that a new set of guidelines will be prepared after a safety study and consultation with stakeholders.”*

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CASA has not issued a new advisory circular on this subject.

The panel report makes the following statement at page 112, paragraph 2 of section 10.2.1 *Policy and Regulatory Framework*;

*“There is no legal requirement to comply with a CASA determination that aviation lighting be included on a WEF outside the defined limits or obstacle limitation surfaces of any aerodrome.”*

This situation still applies. CASR Part 139 only applies within the OLS of a Regulated Aerodrome. PANS-OPS airspace cannot be penetrated by obstacles, therefore wind turbines do not exist in PANS-OPS airspace.

In the author's experience, CASA has emphasised the view that *“it is a matter for the appropriate Land Use Planning Authority to consider the implementation of our recommendations”* regarding aviation obstacle lighting of wind farms<sup>26</sup>.

At footnote 34 of the above panel report (February 2009) the following statement is made;

*“Previous Panels have commented that CASA cannot require lighting if the project is outside an aerodrome Obstacle Limitation Surface. However, if a WEF is declared a hazard to aviation, then Clause 5.6 Circular AC139-18(0) suggests the Proponent and decision making body may be liable in the event of a collision.”*

In my opinion, the Panel, in its 2009 report, is inferring certain credence to an advisory publication, (AC 139-18(0)), that it knows was withdrawn in September 2008 and no longer has any status. Also, to the best of my knowledge this premise has not been tested at law.

### **9.1.1 CASA Advisory Circular AC 139-18(0) - WITHDRAWN**

CASA Advisory Circular AC 139-18(0), *Obstacle Marking and Lighting of Wind Farms* was issued in July 2007 and withdrawn in October 2008 on advice from the CASA Office of Legal Counsel who deemed the content was beyond CASA's powers.

This AC had been withdrawn before the February 2009 Panel Hearing for the LLWF.

<sup>26</sup> The author has a decade of experience in conducting Aeronautical Impact Assessments across Australia and this is the common response from CASA.



Advisory Circulars provide advice only, not regulatory requirement.

This AC was current during the later stages of the LLWF project development and, I assume, may have influenced the proponent's views about the need or otherwise of aviation obstacle lighting on the LLWF.

The preamble of the AC provides its purpose:

*This Advisory Circular (AC) provides general information and advice to:*

- (a) Proponents of wind farms (including single wind turbines), and*
- (b) Planning authorities with jurisdiction over the approval of such structures.*

*This AC also provides specific advice on measures to reduce the hazard, and how to implement them<sup>27</sup>.*

## 9.2 Planning Permit – April 2009

The original LLWF Planning Permit, PL-SP/05/0461, was issued on 30 April 2009.

In the Specifications, section 2, at paragraph o) the permit states:

*Aviation obstacle lighting may be installed but only if they meet the following requirements, except with the further written consent of the Minister for Planning:*

- i. They are restricted to a pair of red medium intensity, intermittent obstacle lights on any wind turbine*
- ii. The lights are to be baffled so as to restrict the vertical spread of light to not more than 3 degrees (approximately) with not more than one degree (approximately) below the horizontal*
- iii. All lights within each section or stage of the wind energy facility must illuminate in unison, and*
- iv. The activation and de-activation of the lights is to be triggered by a luminance sensor with a trigger luminance of 50 candela per square metre (or as otherwise required by the Civil Aviation Safety Authority or law).*

It is noted that aviation obstacle lighting **may** be installed, not **must** be installed; that is, the installation of aviation obstacle lighting is at the discretion of the wind farm proponent. It is also noted that, if aviation obstacle lighting is installed, it is to be controlled by a luminance sensor.

It is the author's opinion that this permit condition is not consistent with the 2009 Panel Report, which accepts that AC 139-18(0) has been withdrawn; that CASA has no authority to require obstacle lights outside the OLS and that the proponent's aeronautical

<sup>27</sup> Author's personal copy of withdrawn AC139-18(0)



assessment advises that the LLWF poses ~~minimal~~ risk to aviation.<sup>28</sup> Given these conditions it is reasonable to accept that aviation obstacle lighting is not required.

### 9.3 CASA Letter to DELWP - 5 November 2015

On 5 November 2015, CASA Manager Aerodromes, wrote to the DELWP Senior Planner, advising that CASA had received a copy of the consultants report (dated 17 March 2015) regarding the proposal to increase the turbine tip height from 130m to 161m and reduce the number of turbines from 64 to 60.

Within the letter CASA notes that the proposed Wind Turbines:

- Will not penetrate any OLS surfaces
- Will not penetrate any PANS-OPS surfaces
- Will not have an impact on nearby designated air routes
- Will not have an impact on prescribed airspace
- Is wholly within Class G airspace
- Will not have an impact on existing local aviation activities.

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This is followed by the unsupported statement:

*CASA considers the proposal to be a hazard to aviation safety, but the risks to aircraft safety would be mitigated by the provision of approved lighting.*

CASA provides absolutely no evidence to support their contention that the wind turbines will be a hazard to aviation safety, nor to counter the already accepted information in the previous paragraph.

An earlier Panel Report, February 2009, notes that:

*There is no legal requirement to comply with a CASA determination that aviation lighting be included on a WEF outside the defined limits or obstacle limitation surfaces of any aerodrome.*

The author agrees with this February 2009 Panel Report statement and reiterates that CASA does not have regulatory authority regarding aviation obstacle marking outside the Obstacle Limitation Surface (OLS) of a certified aerodrome. The author has seen similar communications from CASA regarding other wind farms. In each case the Planning Authority decided that aviation obstacle lighting was not required. This situation has occurred in Victoria, South Australia and Western Australia where the respective planning authorities have decided aviation obstacle lighting is not required.

The author is of the view that the CASA recommendation is non - binding.

<sup>28</sup> LLWF . Aeronautical Assessment for Westwind Energy, 9 November 2009, page 14. Listed - ADLS Further addendum #1



## 9.4 Panel Report – February 2017

The 2017 Panel Report provides the background from the 2009 report and notes that:

- The WEF guidelines require consideration of aircraft safety, including the views of CASA where the proposal is within 30km of an airfield. [This is incorrect it only considers Certified or Registered Aerodromes. Uncertified aerodromes are not considered]. Wind turbines should not penetrate an OLS [only certified and registered aerodromes have an OLS]. The LLWF is not within such an area.
- The MOS 139 addresses the operation of [certified and registered] aerodromes.
- The AC 139-18(0) had been withdrawn
- There is no legal requirement to comply with a CASA determination [that should be recommendation] that aviation lighting be included on a WEF outside the defined limits or OLS of any aerodrome [see above re OLS]
- Planning permits for WEFs in Victoria have generally included a condition requiring night lighting of turbines greater than 110m in height in accordance with CASA recommendations.

The Panel noted the original permit condition 2 o) regarding aviation obstacle lighting and accepted that the applicant did not seek any change to that condition.

Evidence was given that aviation lighting would ultimately be determined by CASA. Further evidence was given that the current lighting, as per condition 2 o) was acceptable and that the current CASA requirements were for steady red low intensity lighting at night (as per section 9.4 of the MOS Part 139). The MOS requires medium intensity red light on wind turbines (MOS 139, section 9.4 paragraph 9.4.3.4A dated January 2017).

Contrary evidence was tendered that the additional height would increase the visibility of the aviation lighting at night, and that a strobing effect would occur when the blade passed in front of the light. To meet the requirement that aviation obstacle lighting on wind turbines is visible in all angles of azimuth, two appropriately spaced lights, such that only one is obscured by a passing blade, are required on the generator housing of a wind turbine. This minimises any strobing effect, as one light is always visible.

The Lal Lal Environment Protection Association sought that any permitted height increase requires the installation of aviation obstacle lighting that is activated when an aircraft is in the immediate vicinity (an aviation detection lighting system or ADLS [ADLS is the abbreviation for aircraft detection lighting system.]) This is in reference to the Mortlake South WEF, which has similar sized turbines, and relevantly provides that: -

*“The aviation obstacle lighting must be installed such that it is activated only:*

- If at night, when an aircraft is in the immediate vicinity of the wind energy facility;*
- During low visibility daytime conditions such as the existence of smoke and fog.”*

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In their discussion the panel stated "... already greater than 110m required for compliance with CASA recommendations." In the author's opinion this statement is incorrect. The only CASA reference to a structure greater than 110m is the requirement for the proponent to notify it to CASA. *"CASA will ultimately provide guidance with the CASA Manual of Standards specification currently in place when the WEF is constructed."*

This statement ignores the fact that this panel, and the previous one, accepted that there was no legal requirement to comply with a CASA determination [recommendation] and that for a WEF outside the OLS of a certified or registered aerodrome CASR Part 139 . Aerodromes, does not apply.

The Panel then recommended that a new permit condition be made such that

*Aviation detection lighting system must be installed in accordance with current Civil Aviation Safety Authority specifications or law, such that it is activated only:*

- i. *If at night, when an aircraft is in the immediate vicinity of the wind energy facility*
- ii. *During low visibility daytime conditions such as the existence of smoke and fog.*

## 9.5 Planning Permit – March 2017

The LLWF Planning Permit, PL-SP/05/0461/A, was issued on 27 March 2017 to accommodate an increase in turbine tip height to 161m AGL.

In the amendment application there was no request to amend any conditions or specifications relating to aviation obstacle lighting<sup>29</sup>.

In the Specifications, section 2, at paragraph p) the permit now states:

*Aviation detection lighting system must be installed in accordance with current Civil Aviation Safety Authority specifications or law, such that it is activated only:*

- iii. *If at night, when an aircraft is in the immediate vicinity of the wind energy facility*
- iv. *During low visibility daytime conditions such as the existence of smoke and fog.*

## 9.6 Subsequent Action by the Proponent

In e-mail correspondence from the LLWF proponent to CASA Air Navigation, Airspace and Aerodromes section the proponent seeks clarification and advice from CASA<sup>30</sup>.

<sup>29</sup> Planning Permit Amendment Application, Jacobs, 15 August 2016 [ADLS document #3]]

<sup>30</sup> Email chain dated 4 April 2017. ADLS Addendum document #1





The proponent writes, on 3 April 2017:

*We have recently received an amendment to our planning permit for the Lal Lal wind farm (near Ballarat in Victoria). As part of the original permit, we had hazard beacons approved for the project. Without further consultation, the Minister for Planning has introduced a new specification for those hazard beacons, which reads as follows:*

*Aviation detection lighting system must be installed in accordance with current Civil Aviation Safety Authority specifications or law, such that it is activated only:*

- i. If at night, when an aircraft is in the immediate vicinity of the wind energy facility*
- ii. During low visibility daytime conditions such as the existence of smoke and fog.”*

The email then seeks advice regarding current CASA specifications on lighting activation systems based on aircraft proximity.

The response from CASA, dated 4 April 2017, is to the effect that: - *CASA has no authority beyond the OLS of a certified or registered aerodrome (now a regulated aerodrome) and that the final decision as to whether an obstacle is lit and or marked or not away from an aerodrome, remains with the approving (planning) authority.*

CASA then states:

*The CASR and MOS Part 139 do not have any ‘specification or law’ regarding aircraft activated lighting. I am aware that such systems do exist, but CASA has not seen one installed within Australia to date. I am not aware as to whether such a system could be configured to activate the lights during daylight in low visibility conditions.*

A subsequent letter from the CASA Branch Manager, Airspace and Aerodromes, dated 30 July 2019, to Vestas, the ADLS supplier, states: -

*CASA confirms there is no requirement for an approval by CASA before you commission the radar activated lighting system. The use of radar activated lighting is detailed in Guideline D of the National Airports Safeguarding Framework (NASF)<sup>31</sup>*

The NASF (National Airports [note Airports . not Airspace] Safeguarding Framework), Guideline D at paragraph 38 refers to *Alternatives to fixed obstacle lighting*. The paragraph states:

*In some circumstances, it may be feasible to install obstacle lights that are activated by aircraft in the vicinity. This involves the use of radar to detect aircraft within a defined distance that may be at risk of colliding with the wind farm. When such an aircraft is detected, the wind farm lighting is activated. This*

<sup>31</sup> Letter from CASA Airspace and Aerodromes to Vestas, ADLS #6





*option my allow aviation safety risks to be mitigated where obstacle lighting is recommended while minimising the visual impact of the wind farm at night.*

That is all that NASF Guideline D has to say on the matter.

As previously discussed, there are no Civil Aviation Safety Authority specifications or law for Aircraft Detection Lighting Systems (ADLS). There were none in existence when the condition was made and there are none in existence now.

Likewise, there is no CASA law requiring aviation obstruction lights on WEF beyond the OLS of a Regulated aerodrome.

### **9.7 CASA Advisory Circular AC 139.E-05 v1.0 May 2021**

CASA have issued Advisory Circular AC 139.E-05 v1.0 *Obstacle (including wind farms) outside the vicinity of a CASA certified aerodrome*, dated May 2021.

This Advisory Circular, at the opening section states:

*2.1.1 CASA provides advice about lighting of wind farms and other tall structures in submissions to planning authorities who are considering a wind farm or tall structure.*

*2.1.2 Regardless of CASA advice, planning authorities make the final determination whether a wind farm or a tall structure not in the vicinity of a CASA regulated aerodrome will require lighting or marking.*

This AC provides advisory information regarding the process for ascertaining if a wind farm is a hazard to aircraft safety. It also provides information to proponents and planning authorities about who is responsible for deciding if a wind farm requires aviation obstacle lighting.

This AC states at paragraph 2.2.4.1 that Civil Aviation Safety Regulations Part 139 *Aerodromes* regulates obstacles within the vicinity of a certified aerodrome, that is, within the Obstacle Limitation Surface for that aerodrome.

This AC, in the author's opinion, reinforces that aviation obstacle lighting is not required on the LLWF.

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## 10. SUMMARY OF OPINIONS

The LLWF does not require aviation obstacle lighting because the wind farm is not a hazard to aircraft safety, therefore obstacle lighting does not mitigate an aviation risk. This view is supported by the qualitative risk assessment undertaken for the LLWF. Previous aviation assessment reports undertaken during the planning application and amendment process also support this view.

The CASA regulations that were applicable when the original planning permit was issued are still applicable to the final [version C] planning permit. There have been no amendments to either Civil Aviation Regulations 1988 (CAR) or Civil Aviation Safety Regulations 1998 (CASR) that change those relevant regulations in force since 2009.

The LLWF is beyond the OLS and PANS-OPS airspace of any Regulated Aerodrome, therefore the requirements of CASR Part 139 . Aerodromes do not apply. This is accepted by the various Planning Panels that considered the LLWF.

The airspace classification over the LLWF remains as Class G, as it was in 2009. There are no PRD areas, nor published flying training areas over the LLWF. The LSALT of air routes over the LLWF have not changed and are not impacted by the height of the turbines.

The flight rules governing the requirement for pilots in command to plan and execute a flight to remain clear of the LLWF remain the same as in 2009.

There are no CASR governing the use of, or requirements for, Aircraft Detection Lighting Systems. Similarly, there are no AC on the subject.

The 2009 Planning Panel report, as used to guide the Planning Permit number PL-SP/05/0461, accepts that there is no legal requirement to comply with a CASA determination regarding obstacle lighting on a wind turbine that is beyond the OLS of a Regulated aerodrome and refers to the withdrawal of AC 139-18(0) and that it has not been replaced. The report also notes that the proponent's aeronautical assessment advises that the LLWF poses %ivial+risk to aviation. It is the author's opinion that there should never have been a permit condition requiring aviation obstacle lighting for the LLWF.

It is the author's opinion that there is a misunderstanding of CASA's powers, laws and requirements regarding the need for aviation obstacle lighting, particularly when the wind energy facility is beyond the Obstacle Limitation Surface of a Regulated Aerodrome.

There is reference in the 1 February LLWF Planning Panel Report, at page 58, to the Mortlake South WEF, which has similar sized turbines, and relevantly provides that : -

*"The aviation obstacle lighting must be installed such that it is activated only:*

- (i) If at night, when an aircraft is in the immediate vicinity of the wind energy facility;*
- (ii) During low visibility daytime conditions such as the existence of smoke and fog."*

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The current Planning Permit 2008/0538/A, dated 12 December 2019, for the Mortlake South Wind Energy Facility has condition 7 which states:

*Aviation obstacle lighting must not be installed unless written consent of the Minister for Planning has been obtained.*

The Mortlake South WEF has a maximum turbine tip height of 186m AGL.

The author has been involved with several WEF in Victoria with tip heights greater than 161m which have conditions prohibiting the installation of aviation obstacle lighting. To the author's knowledge there are no Victorian WEF, other than LLWF, that have aviation obstacle lighting. There is one WEF approved that has six turbines fitted with aviation obstacle lighting activated by the Pilot Activated Lighting system at a nearby certified aerodrome, such that they activate as part of the aerodrome lighting system.

The author notes that the LLWF aviation obstacle lights have been turned off as per the NOTAMs below.

NOTAM C1564/20 REVIEW C1391/20  
OBST LGT 500FT AGL NOT AVBL  
PSN 373808S 1440123E (LAL LAL WIND FARM)  
APPRX BRG 113 MAG 13NM FM BALLARAT AD (YBLT)  
CTC TEL 0428 609 846  
FROM 11 270629 TO 01 311900  
HN

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NOTAM C87/21 Review C1564/20 extended the period to 30/04/2021.

C518/21 REVIEW C87/21  
OBST LGT 500FT AGL NOT AVBL  
PSN 373808S 1440123E (LAL LAL WIND FARM)  
APRX BRG 113 MAG 13NM FM BALLARAT AD (YBLT)  
CTC TEL: 0428 609 846  
FROM 04 282241 TO 07 292100

These NOTAMs advise the aviation community that the LLWF lights are not available during hours of darkness from 27<sup>th</sup> November until at least 29<sup>th</sup> July 2021.

A cursory search of the Australian Transport Safety Bureau occurrence database indicates no reported occurrences of near collision with wind turbines.

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## **APPENDIX A**

### **Document List**

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## APPENDIX A

Document Number	Title
1	LLWF EPC (executed 27.04.18)
2	Lal Lal Wind Farm Initial Panel Report
3	Amendment Application
4	Moorabool Planning Scheme Amendment Panel Report
5	Application to amend Planning Permit . Mortlake South
6	CASA Approval to Vestas . Lal Lal Wind Farm . July 2019
7	Letter to Casa re Aviation safety lighting . 31 July 2017
8	YWF_SM_0037 Aviation lighting topo layout
9	EWf_SM_0037 Aviation lighting topo layout
10	0087-9557_V00 . Vestas IntelliLight Final Test Report - Yendon
11	0090-2116_V00 . Vestas IntelliLight Elaine Test Report
12	0051-6926_V02 - TSS Aviation Lights Orga L550 Red
13	0082-0263_V04 . Site Specification . Lal Lal . Yendon
14	0085-2803_V00 - Site Specification . Lal Lal . Elaine
15	0085-3139_V02. Vestas IntelliLight Site Specific Risk Analysis. LLWF-Yendon
16	0085-3900_V02. Vestas IntelliLight Site Specific Risk Analysis. LLWF-Elaine
17	Appendix C . 4.1.3_Guideline_D_Wind_Turbines
18	0084-7216_V00-Vestas IntelliLight Test flight-Flight plan and flight log-Yendon
19	0086-2302_V00- Vestas IntelliLight Test flight-Flight plan and flight log-Elaine
20	0086-8670_V00- Vestas IntelliLight LLWF 3 vs 4 radars
21	0097-8224_V01- 2020_July_IntelliLight_Status_Lal Lal-Yendon
22	0097-8223_V01- 2020_July_IntelliLight_Status_Lal Lal-Elaine



Document Number	Title
27	SP-45906-PM-RP-0013 . ACMA_AL_Transmit_Recieve_20190211_2030468
28	SP-45906-PM-RP-0012_1 . ACMA Frequency Licence-10591523-1
29	SP-45906-PM-RP-0011_1 . ACMA Frequency Licence-10591519-1
30	Pages from LLWF-EPC Contract-Schedule 2-Specifications-Section15.9
31	Vestas IntelliLight Brochure

Addendum Document No	Title
1	Correspondence with CASA
1A	NASF Guideline D
2	Email containing information submitted to CASA on 31 July 2017
2A	Vestas IntelliLight
2B	LLWF - Letter to CASA re aviation safety lighting 31 July 2017
2C	2017-06-05 Vestas IntelliLight for Lal Lal Wind Farm . Layout Presentation
2D	YWF_SM_0037_Aviation Lighting Layout . Topo
2E	EWf_SM_0037_Aviation Lighting Layout . Topo
2F	CASA Lighting Plans
3	LLWF Aviation Detail Report

Other Data Document Number	Title
1	Lal Lal Wind Farm Aviation Obstacle Lighting Qualitative Risk Assessment
2	CASA MOS 139 Aerodromes version 1.14 January 2017 . <b>superseded</b>
3	CASA MOS 139 Aerodromes rectified authorised version registered 11/09/2019



4	Civil Aviation Regulations 1988
5	Civil Aviation Safety Regulations 1998
6	Aeronautical Information Publication 5 November 2020 Book
7	Aeronautical Information Publication 5 November 2020 Charts
8	Aeronautical Information Publication 5 November 2020 EnRoute Supplement
9	Lal Lal Wind Energy Facility Permit Application PL-SP/05/0461 . Panel Report February 2009
10	Lal Lal Wind Energy Facility Planning Permit PL-SP/05/07461 30 April 2009
11	Lal Lal Wind Energy Facility Planning Permit PL-SP/05/0461/A 27 March 2017
12	Lal Lal Wind Energy Facility Planning Permit PL-SP/05/0461/C 27 September 2018
13	FAA AC 150/5345-43J Specification for Obstruction Lighting Equipment
14	FAA AC 70/7460-1L Obstruction Marking and Lighting
15	Mortlake South WEF Planning Permit 2015/23858/A 8 January 2019
16	CASA Letter to DELWP 5 November 2015

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## **APPENDIX B**

*Curriculum Vitae  
Ian Jennings*

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## APPENDIX B

### Appendix B . Curriculum Vitae

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Name	<i>Ian Jennings</i>
Date of Birth	15 June, 1949
Nationality	Australian
Education	<ul style="list-style-type: none"><li>▪ Diploma of Air Traffic Control . Airservices Australia</li><li>▪ Bachelor of Education . LaTrobe University <i>Majors in Adult Education and Curriculum Studies</i></li><li>▪ Further Certificate of Business Studies (Management) . Kangan Batman TAFE <i>Majors in Personnel and Industrial Relations</i></li><li>▪ Certificate IV Workplace Training and Assessment . Airservices Australia</li><li>▪ Diploma of Electronic Engineering (<i>partially complete</i>) . RMIT</li></ul>
Certifications	<ul style="list-style-type: none"><li>▪ Aviation Safety and Lead Auditor . Aviation Compliance Solutions</li><li>▪ Incident Investigators Course (<i>Air Traffic Services</i>) . Airservices Australia</li><li>▪ Understanding Risk Management . Emergency Management Australia</li><li>▪ DAMP (Drug &amp; Alcohol) Supervisor . Civil Aviation Safety Authority</li><li>▪ Understanding Environmental Management . SIA Global</li><li>▪ Certified Air . Ground Radio Operator - CASA</li></ul>
Professional Associations	<ul style="list-style-type: none"><li>▪ Member Risk Management Institution of Australasia</li></ul>

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### Key Skills and Attributes

- Extensive knowledge and understanding of aviation regulatory requirements
- High level technical literacy with the ability to understand and explain complex technical literature
- Leadership and People Management
- Project Management
- Training Design, Development and Delivery
- Risk Management
- Safety Management
- Aviation safety auditing and incident investigation

### Career Overview

Ian has an extensive background in Air Traffic Services having spent 25 years with Airservices Australia in a variety of operational and management positions. He has a detailed understanding of Air Traffic Control/Management, airspace and aerodrome issues, particularly in his previous role as an ATS Centre Group Leader. He has held positions as a Manager responsible for ATS training, personnel standards and licensing. He was part of a management team tasked with major airspace consolidation and transition of air traffic services on the east coast of Australia to the TAAATS/Eurocat system. In this role he gained experience in developing courses and simulator exercises for training and rating air traffic services staff.

Ian has 10 years experience in the corporate charter airline industry providing aircraft facility management, maintenance control and planning, aircraft modification project management and technical services management.

More recently Ian has consulted in the across diverse aviation fields from training Air Traffic Services personnel in Fiji, determining design aircraft performance requirements for airport upgrades to conducting aeronautical impact and qualitative risk assessments for tall structures including wind farms.

A common requirement of all these positions is a thorough knowledge of aviation legislation and regulations and the ability to apply them to the task at hand. Ian has also taught ~~air~~ legislation+ (rules and regulations) and ~~basic aero~~ knowledge+ (how aeroplanes fly) as part of his time as an Air Traffic Services Senior Instructor.

In addition, Ian holds tertiary qualifications in education, training and management

Ian's consulting activities with have ranged from aeronautical assessments, Qualitative Risk Assessments, to aircraft maintenance system audits, training development and organisational reviews.

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## Employment History

*From* **2017 - Present**

*Position/Company* **Owner and Principal Consultant – Chiron Aviation Consultants**

*Relevant Work Experience* lan\$ recent consulting activities have included the following:

- Aeronautical Impact, Qualitative Risk and Obstacle Lighting Assessments for wind farm projects in WA, SA, NSW and Vic;
- Aeronautical Impact, Qualitative Risk and solar glare assessments for large solar farms projects in WA, SA, and Vic;
- Aeronautical Impact, Qualitative Risk and Obstacle Lighting Assessments for high voltage transmission line projects in WA, and Vic;
- Provide Expert Witness evidence for wind farm projects to the Victorian Civil and Administrative Tribunal, Planning Panels in Victoria and the Environment, Resources and Development Court in South Australia;

*From* **2016 - 2017**

*Position/Company* **Senior Managing Consultant – Landrum & Brown**

*Relevant Work Experience* Provision of management and aviation consultancy services in support of Landrum & Brown\$ airspace, airports and airworthiness projects.

lan\$ recent consulting activities have included the following:

- Aeronautical Impact, Qualitative Risk and Obstacle Lighting Assessments for wind farm projects in WA, SA, NSW and Vic;
- Provide Expert Witness evidence for wind farm projects to Planning Panels in Victoria and the Environment, Resources and Development Court in South Australia;
- Recruit and train staff, oversight facility set-up and commence the Certified Air-Ground Radio Service at Ballina Byron Gateway Airport;

*From :* **2011 - 2016**

*Position/Company:* **Principal Consultant - Ambidji**

*Relevant Work Experience :* Provision of management and aviation consultancy services in support of Ambidji\$ airspace, airports and airworthiness projects.

lan\$ recent consulting activities have included the following:

- Aeronautical Impact, Qualitative Risk and Obstacle Lighting Assessments for wind farm projects in WA, SA, NSW and Vic;
- Establish design aircraft performance requirements for proposed airport upgrade at Dili Airport, Timor Leste;

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- Airspace review and Air Traffic Control training associated with the introduction of ADS-B surveillance equipment in Fiji;
- Aeronautical Impact Assessments of proposed land developments in the vicinity of Melbourne Airport;
- Maintenance System audit and organisational review for West Wing Aviation;

*From :* **2009 - 2011**

*Position/Company:* **Base Manager and Maintenance Controller – LUFT Aviation Charter Pty Ltd**

*Relevant Work Experience :* Established the position and consolidated the maintenance control of four large corporate jet aircraft. Undertook a complete audit of all maintenance records that identified significant anomalies. These were rectified in order to establish, and demonstrate to the Regulators, the airworthiness of the aircraft. Managed the daily operations of the aircraft, hangar and airside facilities. Established close working relationships with the airport authorities, local and overseas maintenance organisations, manufacturersqTechnical Representatives and spare parts suppliers to facilitate the safe and expeditious use of the aircraft.

*From :* **2001 - 2009**

*Position/Company :* **Technical Services Manager – Executive Airlines Pty Ltd**

*Relevant Work Experience :* Established the Technical Services Section to manage the acquisition, distribution, control and storage of technical and regulatory data required for the maintenance of jet and turboprop aircraft. Provided technical, regulatory, risk management and safety input into the management of the maintenance and airside operations facilities. Provided project management for the modification and maintenance of a specialised aircraft used for hydrographical survey by the Royal Australian Navy. Provided ad-hoc in-house training on a variety of technical and operational topics. Conducted regular audits of Operational and Maintenance System manuals to ensure continued compliance with regulatory and manufacturersqrequirements and specification.

*From :* **1994 - 2001**

*Position/Company :* **Air Traffic Services – Melbourne - Airservices Australia**

*Relevant Work Experience :* As a key member of the management team tasked with major airspace consolidation and transition of air traffic services on the east coast of Australia to the TAAATS/Eurocat system. This project required;

- Airspace design;
- Risk assessment and management;
- Training design and delivery (simulator and classroom);
- Staff training and assessment;

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- Internal and external liaison regarding service delivery;
- Management of staff during the change process.

As Manager Melbourne Flight Service managed 180 Air Traffic Services staff during a period of major organisational change and uncertainty. This involved;

- Budget control and forecasting . approx. \$8 million annually;
- All aspects of staff management including rosters, overtime and leave;
- Successfully implementing major new work practices resulting from a national Enterprise Bargain industrial agreement;
- Industrial relations issues . including instructing an Industrial Officer in the Industrial Relations Commission for a satisfactory outcome;
- Successfully resolving a specific workplace harassment case;
- Management of work related injury cases;
- Successfully implementing remedial action associated with OH&S (workplace safety) issues;
- Staff suspension and counselling action related to air safety incidents;
- Air safety incident investigation;
- Liaising effectively with all levels of management within the organisation, with external organisations including clients, regulators and government.

As Group Leader Melbourne Flight Service managed 60 Air Traffic Services staff during a period of major airspace and procedural change. This involved;

- All aspects of staff management;
- Development of airspace specific operating procedures;
- Training and rating endorsement;
- Staff proficiency assessment including remedial training;
- Air Safety Incident investigation including staff suspension and training.

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*From :* **Pre 1994**

*Position/Company :* **Air Traffic Services - Airservices Australia**

*Relevant Work Experience :* As Manager Flight Service Training College managed the closure of the facility. This involved;

- Staff redeployment;
- Disposal of assets;
- Transfer of intellectual property.

As Senior Instructor Flight Service Training College managed;

- The day to day requirements of the Instructors and students;
- Content and delivery of the course;
- Performance assessment including counselling and termination.

As Simulator Manager, Flight Service Training College managed the;

- Utilisation of the simulator by multiple courses;
- Design of simulator programs to meet specific training needs;
- Updated simulator programs to reflect current procedures;
- Upgrade Simulator fidelity;
- Performance assessment including counselling and termination.

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## APPENDIX C

## CASA RESPONSE TO LAL LAL WIND FARM – 5 NOVEMBER 2015

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**Australian Government**

**Civil Aviation Safety Authority**

AIRSPACE AND AERODROME REGULATION

File Ref: EF11/1146-10

5 November 2015

Mr Michael Juttner  
Senior Planner  
Department of Environment, Land, Water and Planning  
Level 20  
1 Spring Street  
MELBOURNE VIC 3000

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Dear Mr Juttner,

**PROPOSED LAL LAL WIND FARM AMENDMENT**

CASA has received a copy of the consultant's report (dated 17 March 2015) regarding the Lal Lal Wind Farm, 20km south East from Ballarat, Victoria.

The proposal seeks to increase the overall height of the Wind Turbines from 130 m to 161 m and to reduce the number of installations from 64 to 60.

CASA notes that the proposed Wind Turbines:

- Will not penetrate any OLS surfaces
- Will not penetrate any PANS-OPS surfaces
- Will not have an impact on nearby designated air routes
- Will not have an impact on prescribed airspace
- Is wholly contained within Class G airspace
- Will not have an impact on existing local aviation activities

CASA considers the proposal to be a hazard to aviation safety, but the risks to aircraft safety would be mitigated by the provision of approved lighting.

CASA recommends that the wind farm is lit with steady red low intensity lighting at night as per Section 9.4 of the CASA Manual of Standards Part 139. Characteristics for low intensity are stated in subsection 9.4.7.

CASA will require the consultant to prepare a lighting plan for CASA's assessment indicating which turbines are to be lit. Such assessment must be prepared in accordance with the National Airports Safeguarding Framework Guideline D – Managing Wind Turbine Risk to Aircraft.

If you require further information, please call Matthew Windebank on 131757.

Yours sincerely

Dilip Mathew  
Manager Aerodromes