

Executive Introduction

This paper is my initial response to a collection of statements and diagrams that can be found in the Aviation Hazard Assessment report as published on the Epuron website for the Gullen Range Wind Farm proposal near Crookwell, and I believe that this Assessment forms part of the MPO70118 submission that is before the NSW Department of Planning.

In that Aviation Hazard Assessment the information leads the reader to believe that the wind-turbines subject to the study, namely the smaller 80m tower and 93m diameter blades, do not represent a hazard to Aviation.

They base this assessment on a collection of information presented as fact. Of note they have defined the “Generic Circuit” which they expect any diligent pilot to execute, and that such a circuit is clear of the wind-turbines.

The performance figures used for the aircraft were based at 1000’ Above Mean Sea Level and the airfield is almost 3000’ AMSL, and it appears that no account was made for Density altitude effects. The performance of the case-study aircraft would be even less under these circumstances.

There also does not appear to any account made for wind-turbine wake turbulence.

The summary in this report is the opinion of the author Ralph Holland, B. Sc., Dip Ed, Dip Com Sc. <mailto:ralph@arising.com.au>, and I believe I have presented sufficient data to back my opinions.

Generic Circuit

The “Generic Circuit” as described in the Assessment does not align with a typical circuit pattern, nor with recommended guidelines, other than it has the general shape with the appropriate legs. The spacing and the radius of turn of an aircraft in a circuit pattern depends on aircraft performance.

Slower aircraft can execute smaller or closer circuits, because they basically have more time to turn, and do not travel as far while they are turning, i.e. they can execute tighter turns for a given angle of bank than a higher performance aircraft.

Consider the following Table 1 which is how to present data extracted from the Hazard Assessment paper and additionally also consider higher performance aircraft. This table shows the necessary bank angle and subsequent gravitational loading and turn rates for typical light aircraft, should they be required or mandated to execute the circuit as outlined in the “Generic Circuit” described by Aviation Projects in the Epuron Aviation Hazard assessment.

Attachment B. Generic Circuit

Manufacturer	Type	Vy Knots	Vy m/s	radius of turn	Bank degrees	g-load	turn rate
Cessna	C150	67	34.5	204	30.7	1.16	3.2
Cessna	C172	72	37.0	204	34.5	1.21	3.5
Beechcraft	BE24	81	41.7	204	41.0	1.32	3.9
Piper	PA44-180	88	45.3	204	45.7	1.43	4.2

Table 1 – bank angle, g-load and turn rate applicable to a 204 m turn for typical aircraft climbing speeds.

Please note the following:

1. The Crookwell Aerodrome is referred to as the Kialla Airstrip in the Epuron submissions and montage on their websites, and as both the Crookwell Airstrip and Aerodrome in the Aviation Hazard Assessment. It is in fact the Crookwell Aerodrome and has had that status, I believe for over 80 years.
2. The separation part of the report was based on the performance of a basic Cessna 150 trainer, one of the low-end, poorest performing aircraft, as they state in their own words, which can be considered misleading.
3. The performance of the trainer was quoted for 1000' Above Mean Sea Level (AMSL), and yet the Crookwell Aerodrome is almost at 3000' AMSL.
4. No apparent account was made for changes in Aircraft performance due to this Altitude, nor due to the Density Altitude effects in higher temperature air.
5. A turn radius of 204 metres almost constitutes an aerobatic manoeuvre for several aircraft.
6. The angle of bank for the C150 exceeds recommended practice for a climbing turn, which ought to be executed as a rate-one turn for safety.
7. Higher performance aircraft would be expected to execute even steeper angles of bank in order for them to conform with this nominated and miss-named "Generic Circuit".
8. Such angles of bank increase loading and result in reduction in climb rates, not to mention potential reduction in visibility.
9. The omission of bank-angles and turn rates from the report, particularly when employing such a tight turn radius.

Attachment B. Generic Circuit

10. The position and spacing nominated for the cluster and wind-turbines is subject to a plus-or-minus variation of 250 metres, which I can presume would permit the placement of the larger wind-turbines, and no account of this variation in either position or height, has been taken into account in the Aviation Hazard Assessment.
11. Of note is that the separation of aircraft from the wind-turbines has been derived from this information and there is no account that these wind-turbines are moving aerodynamic structures, known by wind-farm developers to produce wake-turbulence.

Circuit Patterns for Typical Aircraft

Circuit patterns are recommended and have the same general shape, but the extents are modified to suit the performance of the aircraft that are executing them.

Executing a rate-one turn means there is some chance the aircraft can climb, and is directly related to safety. We do not want to see aerobatic turns executed at the critical phases during take-off and landings, with the potential to mishandle and exceed aircraft performance, with subsequent stalls and spins resulting in an accident, which would usually be fatal at such low level.

Large angles of bank also restrict the visibility out of the cockpit in many of these aircraft types.

Manufacturer	Type	Vy Knots	Vy m/s	rate-one angle of bank	turn radius	g-load	turn rate
Cessna	150	67	34.5	10.5	655.2	1.02	1.0
Cessna	172	72	37.0	11.2	704.1	1.02	1.0
Beech	BE24	81	41.7	12.6	792.1	1.02	1.0
Piper	PA44-180	88	45.3	13.7	860.5	1.03	1.0

Table 2 – rate-one angle of bank and resultant radius of turn for climbing aircraft

Some very simple conclusions can be drawn from table 2:

1. The typical circuit for a C150 has 655.2 metre turns, which means the specified “Generic Circuit” as described is not typical.
2. Faster aircraft need more time and room to turn.
3. The quoted aircraft to wind-turbine separation will not result from a typical circuit executed by typical aircraft.
4. The “Generic Circuit” as outlined in the Aviation Hazard Assessment does not exist.

Summary

I believe that the Aviation Hazard Assessment report should have derived the circuit patterns from typical aircraft performance i.e. from more than one aircraft type.

It is also my belief that the report should not have nominated a circuit that avoided the obstructions, but rather should have checked whether typical aircraft circuit patterns would not be obstructed.

I also believe that the nominated “Generic Circuit” is neither Generic, nor achievable under recommended guidelines.

I believe that the resultant extent of this circuit, and the Aviation Hazard report, leads the reader to conclude that aircraft can maintain a horizontal separation of between 475.3 to 764.5 meters from the three obstructions in immediate question, without consideration to aircraft performance, turbine wake-turbulence and the performance of aircraft using the Aerodrome.

I believe the separations derived from a poorer performance aircraft, namely 475.3, 529.9 and 764.5 metres are misleading and subject to error.

References:

1. Proposed Gullen-Range Wind Farm: An assessment of compliance requirements and operational impacts on Crookwell and Ashwell Airstrips. (Otherwise referred to as the Aviation Hazard Assessment on the hyperlinks http://www.epuron.com.au/PortalData/5/Resources/02_projects/02.04_gullen_range/07_0118_gullen_ea_Attachment3.5_AviationHazardAssessment.pdf).
2. The Epuron company website <http://www.epuron.com.au/desktopdefault.aspx/tabid-801/>.

Updates:

- 1.2 20080923 The turn-radius was misquoted from the Aviation Hazard Assessment report as 250 metres, when in fact it is listed at 204 m in Appendix D-1. This makes the turn-rates even higher and Table -1, and the post-amble, has been corrected.
- 1.1 20080923 Various spelling, typographic, and grammar mistakes corrected.
- 1.0 20080922 Initial draft.