

UAV Challenge Outback Rescue 2009



Search and Rescue Challenge

Mission, rules and judging criteria

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Table of Contents

1	Objective	4
2	Search and Rescue Challenge	4
2.1	The Mission	4
2.1.1	Finding Outback Joe	4
2.1.2	Rescuing Outback Joe	6
2.2	Time Limit	7
2.3	The UAV	7
2.4	Adverse Weather	7
2.5	Additional Deliverables	7
2.6	The Reward	7
3	Challenge Safety	7
4	Schedule	8
5	Additional Rules	9
5.1	UAV Requirements and Limitations	9
5.2	Piloting Proficiency	10
5.3	Safety Inspections	10
5.4	UAV Controller Override	10
5.5	Flight Termination Mode	10
5.5.1	Alternate Flight Termination Systems	11
5.6	Criteria for Flight Termination	11
5.7	Flight Demonstration	12
5.8	Take-off and Landing	12
5.9	Team Sponsors	12
5.10	Liability and Insurance	12
5.11	Definition of "Completed Mission"	12
5.12	Loss of UAV Controller	12
5.13	Access to Video Stream from UAV	13
5.14	Competition Timing	13
6	Judging	13
6.1	Short Technical Report (Deliverable 1)	13
6.2	Technical Report and Video (Deliverable 2)	14
6.3	Oral Presentation	14
6.4	Mission Performance (Flying)	15
7	Awarding of Prizes	15
8	Guidelines for Spectrum Compliance	16
8.1	The ACMA, Spectral Planning and Licensing	16
8.2	Class Licensing and The Challenge	17
8.3	Guidelines for Using Class Licences	17
8.4	ISM Frequencies	18
8.5	FINAL NOTE TO COMPETITORS	18
9	Disclaimer	19

Major Revision Record

Revision 1.1

- Addition of Guidelines for Spectrum Compliance (New Section 8)
- Updates on CASA requirements
- Update to table 2 to reflect new CASA requirements

Revision 1.2

- Change of insurance deadline

Revision 1.3

- Added Section 5.14 describing competition timing.

1 Objective

The goal of the 2009 UAV Outback Challenge is to demonstrate the utility of *Unmanned Airborne Vehicles* (UAVs) for civilian applications. The competitors will be required to develop a UAV that could save lives by quickly and cost effectively delivering medical supplies to critically ill patients in the Australian Outback.

The Challenge will provide valuable experience to student and private entrants, in the design, construction and operation of UAVs. This experience will help create a future generation of aerospace professionals - all focused on the fastest growing component of the international aerospace industry.

The event comprises of 3 flying categories. These are the:

- Airborne Delivery Challenge (open to high schools),
- Robot Airborne Delivery Challenge (open to high schools), and
- Search and Rescue Challenge (open to all)

2 Search and Rescue Challenge

The Search and Rescue Challenge is open to worldwide entrants – university students, privateers and hobbyists. Small companies will be permitted to enter at the discretion of the UAV Outback Challenge Technical Committee provided they are shown to be participating in the spirit of the competition. Teams will be assessed for their eligibility to enter this category on application.

Employees of organisations who are official sponsors of the 2009 UAV Challenge are permitted to enter the Search and Rescue Challenge BUT will not be eligible to win any of the prize money.

2.1 The Mission

Outback Joe is lost in the Australian outback and desperately needs assistance. Teams must deploy a UAV to find him and deliver an emergency package via an air-drop.

2.1.1 Finding Outback Joe

The system must be capable of finding Joe in the *Search Area*, located near Kingaroy airport. The UAV must fly through a defined corridor of approximately 1 nautical mile (nmi) in length and 0.2nmi in width to the Search Area. The *Mission Boundary*, allocated for the competition, is approximately 2 x 3nmi. The rural search area for locating Outback Joe will be 0.5nmi within this boundary. If at any time the UAV flies outside the Mission Boundary for the competition, the UAV's mission will be terminated by the *Range Safety Officer (RSO)*.

Figure 1 shows a schematic of the Mission Boundary and Search Area. The corresponding GPS coordinates are given in Table 1.

The airspace within the mission boundary will be specially allocated by CASA for the event and teams must not fly below 200ft (excluding takeoff and landing at the airport). Teams that wish to fly above 400ft must seek approval from CASA, through the UAV Challenge Organising committee, for the event. Additionally, teams are limited to a maximum height of 1500ft by the competition organisers. The organisers are to ensure that the airspace application to CASA requests that the airspace boundary described in the applicable NOTAM provides an additional safety zone around the mission boundary so as to provide separation between competition participants and other airspace users.



Figure 1: Mission Boundary (MB) and Search Area (SA).

Table 1: Search and Rescue boundary coordinates.

Boundary Point	South (WGS 84 Degrees:Minutes:Seconds)	East (WGS 84 Degrees:Minutes:Seconds)
MB-1	26°34'39.21"	151°50'12.79"
MB-2	26°34'38.31"	151°50'25.24"
MB-3	26°34'53.44"	151°50'31.02"
MB-4	26°34'42.55"	151°50'50.89"
MB-5	26°35'58.16"	151°51'10.39"
MB-6	26°36'33.16"	151°52'29.07"
MB-7	26°38'43.72"	151°52'55.39"
MB-8	26°38'36.86"	151°49'49.26"
SA-1	26°36'57.00"	151°50'35.00"
SA-2	26°37'2.76"	151°51'59.19"
SA-3	26°38'12.81"	151°52'15.83"
SA-4	26°38'7.48"	151°50'28.24"

The target for the search will be a human shaped dummy wearing light khaki clothes and an Akubra hat. The dummy will not be moving and will be positioned in a typical resting pose for a tired and lost bush walker visible from the air.

A simulated heat signature will be located next to the dummy. The heat lamp used will be a Videotec IR50WFL11:

http://www.videotec.com/dep/IR_EN_0703.pdf

This lamp will be facing directly upward and run continuously during the Search and Rescue Challenge competition hours.

After the search for Outback Joe is complete, the GPS coordinates representing his location must be provided to the judges by the team (in WGS 84 Degrees:Minutes:Seconds format).

For safety reasons, teams will only be allowed to drop the emergency package if the team's chosen GPS position is within 100m of Outback Joe.

Teams will be allowed three attempts to provide the correct location of Outback Joe to the Judges. If a team fails to locate Outback Joe on the third attempt the team will be asked to command their UAV to return to the airport.

2.1.2 Rescuing Outback Joe

Once Joe has been located, the air vehicle must safely deliver a life saving drink to him (minimum of 500ml). There are no restrictions on the deployment device, however a competition scrutineer on the range must be able to open the container by hand and measure the quantity of drink delivered. The drink must be an unopened container suitable for human consumption – examples include a bottle of water or soft drink. The emergency package (containing the drink) must be dropped as closely as possible to Outback Joe, without touching him.

Only one drop will be allowed. Teams must only drop a single object – no scattering of bottles are allowed!

After the drop, the team will command their UAV to return to Kingaroy airport for landing.

2.2 Time Limit

A time of 1 hour is allowed for the entire mission. This includes all time for setup, launch, the mission, landing and recovery/pack-up. While the air vehicle is returning to Kingaroy airport, judging of the drop accuracy will be performed. Multiple attempts are allowed in the time allocated. i.e. a team may command their UAV to return to the airport. However, severe point penalties will be incurred for having a UAV flying past the 1 hour time limit.

2.3 The UAV

The air vehicle must comply with the specifications in Section 5.1. Teams are restricted to use one air vehicle only for the one hour mission.

2.4 Adverse Weather

Postponement of the competition due to adverse weather conditions will be at the judges' discretion. Flying will be delayed if the 10 minute average wind speed exceeds 25kts at the airport. Two adverse weather days have been built into the schedule (Table 2).

If in the unlikely event that it is impossible to have all teams fly in the competition during the event days (including the adverse weather days) due to adverse weather, the competition will be declared Cancelled and no prizes awarded.

2.5 Additional Deliverables

In addition to the points awarded for the mission, entrants will also be graded on a technical report and video (Section 6.2). The report will outline a team's design, methodology for package deployment and operational and safety procedures. An oral presentation must also be given at the competition (Section 6.3).

2.6 The Reward

The winning team will receive \$50,000 if the mission is completed. The definition of a "completed mission" can be found in Section 5.11.

In the event of more than one team completing the mission, the team with the highest points total will win. In the case of a tie, joint winners will be declared and the prize money will be equally split among the winning teams.

3 Challenge Safety

Safety is a priority for the UAV Outback Challenge, and the rules and regulations contained in this document have been put in place with safety in mind. The safety

mechanisms that have been put in place include: ensuring compliance with CASR101; air vehicle safety inspections and structural verification; UAV controller override capability; flight termination mode; and a proven history of safe flight operations.

Entrants are reminded that during their research and development phase, all test flying must comply with the relevant CASA regulations. **Participants must ensure they contact their local CASA regional office to ensure that they are in compliance.**

The rules outlined in Section 5 will be strictly enforced in order to reduce the risk associated with holding the UAV Outback Challenge. The organising committee may disqualify any entry that they deem to pose an unreasonable safety hazard to people and infrastructure.

Additionally, a *Mission Termination* device must be used by all entrants in the Search and Rescue Challenge. This device provides another layer of safety for the general public in the surrounding area to the Challenge and prevents the air vehicle from flying well beyond the Mission Boundary. Refer to Section 5.5 for full details.

4 Schedule

Table 2 below sets forth the overall competition schedule:

Table 2. 2009 UAV Outback Challenge schedule

Activity	Date
Registration <i>Registration details will be on the UAV Challenge website.</i>	closes on 29 May 2009
Deliverable 1: Flight Safety Review (short Technical Report) <i>A short technical report (Section 6.1) on the UAV design concept and proposed safety methodology must be provided.</i>	29 May 2009
CASA Applications Due <i>The Outback challenge organising committee will, on behalf of all participating teams, apply for the relevant approvals for operations on or near to an aerodrome and an area of operations not above 3000' amsl in class G airspace. The application may initially be submitted to CASA without the names of the participants being included. The cost for this service will be met by the organising committee and not passed onto the participants as was previously indicated.</i>	03 Aug 2009
Deliverable 2: Flight Readiness Review (Technical Report and Video) <i>A technical report (Section 6.2) must be provided. The underlying objective of this report is to convince the organising committee that the team has developed a reliable and safe UAV system, along with the appropriate operating</i>	28 Aug 2009

Activity	Date
<p><i>procedures.</i></p> <p><i>A Video must also be supplied that includes a flight demonstration of the dropping mechanism that will deliver the payload.</i></p>	
<p>"Go" "No-Go" Announcement of Teams</p> <p><i>Final approval to participate in the 2009 UAV Outback Challenge given to teams. The final approval to participate will be based on several aspects of the technical report, predominantly the demonstrated ability to operate within the competition safety standards.</i></p>	7 Sep 2009
<p>CASA Application Update</p> <p><i>The Organising committee are to submit an update to CASA advising them of the names of the participants for inclusion in the airspace approvals for the Outback challenge.</i></p>	7 Sep 2009
<p>Team Insurance Deadline</p> <p><i>Teams must provide documentation illustrating their insurance coverage. More details of insurance requirements and options will be posted on the UAV Challenge website. Teams that have not submitted this documentation by this date may be disqualified from the competition.</i></p>	11 Sep 2009
<p>Search and Rescue Challenge</p> <p><i>Orientation, Safety Briefing and Inspections, Oral and Documentary Video Presentation</i></p>	28 Sep 2009
<p>Search and Rescue Challenge</p> <p><i>Competition day and Awards</i></p>	29 Sep 2009
<p>Adverse Weather Days</p> <p><i>Two adverse weather days are allocated in case judges decide wind, rain or other adverse conditions interfere with the running of the competition. Note that the 30 Sep is when the Airborne Delivery Challenge is run and flying opportunities on this day will be limited.</i></p>	30 Sep and 1 Oct 2009

5 Additional Rules

5.1 UAV Requirements and Limitations

UAV entries will be subject to the following requirements and limitations:

1. Must not be a commercial off-the-shelf UAV complete system (ie: UAV with all avionics already integrated);
2. Must be capable of *autonomous* flight;
3. Must be free flying;
4. Maximum gross weight (MTOW) must be less than 100 kg (rotary) or 150kg (fixed wing) as per CASR101;
5. Must have continuous radio communication with the *UAV Controller*; and

6. Platform and onboard systems can be commercial off the shelf or custom made.

5.2 Piloting Proficiency

UAV controller must be MAAA bronze-wing standard or **equivalent**. The onus of proof is on the UAV Controller and he/she may be asked to demonstrate their proficiency at the competition before they are allowed to fly a mission.

5.3 Safety Inspections

All UAVs will undergo rigorous safety evaluations leading up to the Challenge. Physical inspections will occur during the orientation, practice days and competition days. These inspections must be passed before the UAV will be permitted to fly. All decisions by the organising committee in relation to airworthiness are final.

Safety inspections will include (but not be limited to) the following:

- Structural verification of the UAV to ensure structural integrity including,
 - Components adequately secured and fasteners tightened
 - Propeller structure and attachment integrity
 - Inspection of all electronic wiring
 - Controls move as expected
 - Payload general integrity
- UAV controller override;
- Radio range checks with motor off and on;
- Flight termination system tested;
- UAVs will be weighed to ensure they fall within the weight restrictions;
- Video evidence and flight logs of flight tests demonstrating safe operations; and
- Flight demonstration.

Specific details on these safety tests will be provided to teams closer to the event date.

5.4 UAV Controller Override

For safety reasons, all UAVs must provide an override capability where the UAV can be changed from autonomous flight to a manually flown radio mode.

5.5 Flight Termination Mode

All must implement a flight termination mode. Teams must design and construct this device with the following conditions:

- Preliminary design details must be provided in the Flight Safety Review Technical Report (Deliverable 1).
- The device must be onboard the UAV and be a completely independent device from all other onboard systems (separate power supply, processor, etc).
- The device must be able to command the servos to the servo positions as listed below, OVERRIDING any other onboard system.
- The device must receive a heart-beat like signal from the onboard computers/communications link at least every 5 seconds, so that the flight

termination mode is initiated if the heart beat signal is not received.

- The device must be able to be activated from the ground by the UAV Controller at the command of the judges.

All points above must be demonstrated to the judges prior to every flight conducted at Kingaroy.

The flight termination servo positions for fixed-wing UAVs are:

- Throttle closed;
- Full up elevator;
- Full right rudder;
- Full down on the right aileron;
- Full up on the left aileron; and
- Full flaps down (if applicable).

The flight termination servo positions for rotary-wing UAVs is to simply close the throttle.

In the case of lighter than air vehicles, strategies should be included that note how the air vehicle can be brought to ground in the case of failure, noting maximum crosswinds and the estimated maximum distances that the vehicle could exceed the Mission Boundary.

5.5.1 Alternate Flight Termination Systems

Teams may choose to implement an alternate flight termination strategy to that proposed in Section 5.5.

It should be noted that any alternative systems will only be considered if it can be demonstrated that the system proposed will operate to the same or increased level of safety as the flight termination system specified by the organisers.

Teams who wish to use an alternate flight termination strategy must demonstrate (with actual figures from real testing) the maximum distance their air vehicle could reach outside the mission boundary, if the flight termination system was activated at the boundary, and the air vehicle was travelling at maximum velocity and maximum altitude. Crosswinds should also be considered and specified.

In the event a Commercial off the Shelf Flight Termination System is used, teams must also provide manufacturer evidence supporting the proposal at Deliverable 2.

5.6 Criteria for Flight Termination

The Challenge judges may request a flight to be terminated or a flight may be terminated automatically by the onboard system for a variety of reasons. These are:

- If the UAV goes outside the Mission Boundary;
- If the communications link is lost for more than 5 seconds;
- If the UAV is deemed to be out of control by the judges;

- If the onboard systems lock up (the independent flight termination system - does not receive the heart beat signal)

Missions must be IMMEDIATELY terminated by the teams upon request of the judges. This will be done through the ground station interface.

5.7 Flight Demonstration

Before attempting the Challenge, all teams must demonstrate their UAVs in flight to the Judges. A circuit must be flown in piloted mode and autonomous mode to demonstrate the competency of the UAV and the UAV controller. The details of this circuit will be given to the teams on the practise days of the Challenge.

5.8 Take-off and Landing

Teams will have access to the sealed runway at Kingaroy.

5.9 Team Sponsors

Teams must advise the organising committee of their sponsors and the terms of the sponsorship. Full disclosure of sponsors and funding sources must be provided as part of the technical report. Sponsors should be aware that footage of a team's UAV could form part of the official 2009 UAV Outback Challenge documentary and promotional materials.

5.10 Liability and Insurance

It will be mandatory for all teams to implement their own insurance, including Public Liability insurance for both flight testing and competition flights. The organising committee are required to sight a Certificate of Currency from each team.

Information on insurance required and insurance that can be purchased through the organisers of the competition will be available on the UAV Outback Challenge official website.

Teams will have to prove that they have insurance cover BEFORE the organising committee will allow the team to fly at the competition.

5.11 Definition of "Completed Mission"

A Search and Rescue Challenge mission is considered complete if:

1. The UAV does not cross the mission boundary.
2. The emergency package comes to rest within 100m of Outback Joe.
3. The emergency package does not touch Outback Joe.
4. At least 500mL of water is recovered by the scrutineers on the course.
5. The UAV returns to the airport and lands.

5.12 Loss of UAV Controller

In the case that a team's designated UAV Controller (pilot) is unable to fly the UAV on the competition or scrutineering day for any reason (such as sickness, etc), then the judges have the discretion to allow another suitably qualified pilot (Section 5.2) to take their place.

5.13 Access to Video Stream from UAV

The UAV Challenge Organisers request that teams that have a live video stream at the ground station from their UAV provide access to this stream so that it can be recorded or broadcast to the crowd at the airport.

5.14 Competition Timing

The order of flying on the competition day will be determined by drawing team names out of a hat. In the event of a team finishing their mission before the end of their one hour time slot (due to exceptional performance or due to an unforeseen termination of the mission), we will ask the next team to begin their mission ahead of schedule. However, a team will be given 15 minutes notice of this (in time to prepare off the field). Hence, this will only occur if a team finishes more than 15 minutes ahead of their normal end time.

6 Judging

A team of at least three judges will determine compliance with all rules. Judges will be professional staff from within the UAV industry. Official times and measurements will be determined by the judges.

The judges will evaluate and score each of three elements, which will form the total Team score. The three elements are as follows:

- Technical Report (Deliverable 1): no points (go/no-go)
- Technical Report and video (Deliverable 2): max 15 points
- Oral Presentation: max 15 points
- Mission Performance: max 120 points

Each element is a prerequisite before progressing onto the next. All decisions by the Competition Judges are final.

6.1 Short Technical Report (Deliverable 1)

Each Team is required to electronically submit a Short Technical Report in PDF format that describes the proposed UAV system design and safety considerations. The UAV Outback Challenge organisers want to know how a team will minimise risk and operate as safely as possible.

The technical report must address the following:

1. Overall design of the UAV system
2. Risk Assessment
3. Risk Management Approach

There are no points awarded for this deliverable. Instead this is a go/no-go checkpoint.

6.2 Technical Report and Video (Deliverable 2)

Each Team is required to electronically submit a Technical Report in PDF format and a flight demonstration video in a common video format.

The technical report must use the following headings:

4. Executive Summary (1 page)
5. Introduction (1 page)
6. Design Approach and Rationale (3 pages)
7. Risk Management Approach (2 pages)
8. Flight Test Results and Discussion (2 pages)
9. Conclusions (1 page)

One page is also allowed for the title page and one for that table of contents (gives total maximum page count of 12). No appendices are allowed.

The report and video will be assessed as follows:

Technical Report and Video (total of 15 Points)	
Scoring Components	Max Points
Executive Summary	2
Design approach and rationale	2
Risk Management Approach	2
Flight test results and discussion	2
Quality of writing	3
Overall style/presentation	2
Overall quality of video	2
Late submissions	MINUS 5 points per day
Over page limit (12 pages)	MINUS 2 points per page

6.3 Oral Presentation

Each Team will deliver a presentation (not exceeding 12 minutes, plus 3 minutes of questions from the judges) highlighting:

- their approach,
- system design,
- expected performance and
- what they have learned from the process.

Unique or innovative features and safety approaches should be included. Judging will be based on briefing effectiveness.

Each team will be allocated a presentation time (when they register at Kingaroy airport on the first day of the Challenge flying event).

Teams MUST be ready to present at their allocated time.

All presentations will finish at the end of the allocated time slot regardless of when they started. For example, if a team is 5 minutes late, they will only have 7 minutes to present.

Teams MUST supply their own laptop with the presentation load. Challenge organisers will provide a VGA projector and screen. Teams must test their computer compatibility with the data projector at registration.

The presentation will be assessed as follows:

Presentation (total of 15 Points)	
Scoring Components	Max Points
Quality and clarity of the oral presentation	4
Quality and clarity of the presentation slides	4
Does the presentation convey the overall team's achievements	4
Ability to answer questions	3

6.4 Mission Performance (Flying)

For the Search and Rescue Challenge, the mission performance will be assessed as follows:

Mission Performance (total of 120 Points)	
Scoring Components	Max Points
Pre-flight checks, team communication and organisation	5
Takeoffs (safety and controllability)	5
Autonomous take-off (yes/no)	10
Landing (safety, controllability and condition of UAV)	10
Autonomous Landing (yes/no)	10
Accuracy of payload drop (measured from where it rests)	Points = $0.5 \times (100 - d)$, where d is distance in m from Outback Joe (max points 50, min 0) If you hit Outback Joe – NO POINTS
Autonomous "Joe" detection and dropping of emergency supply package	30
Time penalty	Minus 2 point for each minute over the hour
Fly outside the Mission Boundary	Disqualified

7 Awarding of Prizes

A team will only be awarded the first place prize if they successfully complete the defined mission in the time allocated. If more than one team successfully completes

the mission, the team with the highest overall points will be awarded the first place prize.

In the case of a tie on points, a count back system will be implemented as follows:

1. Team with the fewest number of drop requests wins.
2. Team with the shortest mission time wins (measured from start of the 1 hour mark until the landing of the UAV at the airport).
3. If there is still a tie, joint winners will be declared and the prize money will be equally split among the winning teams.

8 Guidelines for Spectrum Compliance

The following information has been summarised from the official ACMA website (refer below) and correspondence with the Authority, on behalf of the UAV Challenge Organising Committee for the UAV Outback Challenge.

Please note that the following information should only be considered as GUIDELINES designed to assist competitors in understanding the issue of spectrum compliance. Each team should ensure they understand and comply with all relevant spectrum regulations prior to their Deliverable 2 submission.

8.1 The ACMA, Spectral Planning and Licensing

The Australian Communications and Media Authority (ACMA) are the Australian federal regulatory body responsible for radio-communications compliance and manage the access to the radiofrequency spectrum within Australia.

As an independent Statutory Authority to the Commonwealth of Australia, the ACMA manages the spectrum in accordance with the Radiocommunications Act 1992, as outlined by the Ministry of Communications, Information Technology and the Arts.

While the ACMA encourages competitiveness and self-regulation of the RF spectrum, spectral planning provides the overall Statutory framework for the allocation and administration of radiofrequency transmissions for different types of services, as granted under the Act. This is done to maximise the efficient use of the spectral resource and minimise interference of adjacent channels.

The Australian Radiofrequency Spectrum Plan (ARSF)2009 is the latest spectrum plan used in Australia and is based upon the outcomes of the International Telecommunication Union (ITU) World Radiocommunication Conferences. As Australia is an obligatory member of the ITU, the ARSF must be drafted so that it takes into account the spectral allocations moved by the ITU.

The ARSF is used in conjunction with frequency and administrative band plans to structure the available RF spectrum for use within Australia.

In order to utilise the RF spectrum, a relevant licence must be obtained from the ACMA for anyone who makes use of a transmitter, as implied under the Act. The licensing of operators using RF devices falls under several different categories:

- Apparatus Licence – based on the type of service provided by the communication link.
- Spectrum Licence – based on the area the communication link is routed.
- Class Licence.

Both Apparatus and Spectrum Licences are issued on an individual basis and there are subsequent Licence fees incurred, as well as the need for direct consultation with the ACMA by the licensee over the terms and conditions of the Licence.

Class Licences cover designated parts of the spectrum set aside for shared access by the general populous. Users of devices under a Class Licence conform to a common set of conditions applicable to all users and do not need to register or pay the ACMA for the Licence.

Under the current regulatory framework, there are no “un-licensed” bands for RF communication purposes.

All radiofrequency bands are subject to frequency and power restrictions, as defined within the applicable Licence category. This includes Class Licences.

8.2 Class Licensing and The Challenge

Class Licences are a common choice of Licence given the ease of their use and the wide range of readily-available communication devices that fall within the operational conditions of the various Licences.

Class Licences vary according to the type of services provisioned under the Licences, the bandwidth of frequencies each Licence is defined over and the maximum allowable transmitted power over that bandwidth.

As such, not all Class Licences are applicable for UAV operations from legal, technical and safety perspectives.

The Technical Committee has deemed the following Class Licences, or parts thereof, applicable to the UAV Challenge for competitors to use in their link budget designs:

- Radiocommunications (Low Interference Potential Devices) Class Licence 2000
- Radiocommunications (Radio-Controlled Models) Class Licence 2002

8.3 Guidelines for Using Class Licences

Competitors are entitled to use the aforementioned Class Licences for their radio links, on the provision that they act in accordance with the conditions defined under the Licence.

In general, this requires competitors to conform to:

- The class of transmitter specified by the Licence (eg. Digital modulation, Frequency hopping).
- The maximum radiated power for that frequency band. This is usually expressed in Effective Isotropic Radiated Power (EIRP).

If competitors fail to meet the conditions specified by the Class Licence, they are no longer deemed to be acting in accordance with it. Unless competitors gain another type of Licence from the ACMA to do so, it is classified under the Act as an illegal activity.

The ACMA has stated to the Technical Committee that devices used under the Radio communications (Low Interference Potential Devices) Class Licence 2000 must be low interference. They are within their right, should circumstantial evidence be provided, to turn off any transmitter causing potential interference and prevent further usage of the offending device.

8.4 ISM Frequencies

Several of the Industrial, Scientific and Medical (ISM) bands fall under the Radio communications (Low Interference Potential Devices) Class Licence 2000 and devices used for radio communication purposes across these frequency bands are subject to the provisions outlined by the Class Licence.

It should be noted that the frequency range for the 900MHz ISM band for Region 3 (Australia) is different to other parts of the world and competitors should take this into consideration when designing their system.

Furthermore, the ACMA warns that radio communication services operating over ISM frequencies cannot be afforded protection from interference caused by non-radio communication ISM applications. As such, the suitability of using ISM bands for radio applications should be assessed by competitors (refer NOTE § 3 of the LIPD Class Licence).

8.5 FINAL NOTE TO COMPETITORS

Spectrum compliance is an issue that the organisers of the UAV Challenge take very seriously. Failure to comply with spectrum regulations during the event will constitute in Disqualification from the competition.

It is the responsibility of each team to ensure their UAV operations are spectrum compliant for the UAV Challenge.

Details of frequency management at Kingaroy will be provided during competitor orientation and safety briefing.

For more information regarding spectrum planning, licensing and frequency allocation, please refer to the ACMA website available at:

www.acma.gov.au

9 Disclaimer

This document is subject to change and the current rules document will be available from the challenge website. Registered participants will be notified of any changes.