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Civil Aviation Safety Authority

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Drone-drone deconfliction

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Acknowledgement of Country

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Executive summary

In December 2024, the Government released an Uncrewed Aircraft Systems (UAS) Traffic Management Action Plan (UTM Action Plan). The plan included an action for CASA to provide '*initial guidance on the requirements for drone-drone deconfliction*'. This document is developed in the context of the release of Airservices Australia's (Airservices) flight information management system (FIMS), which will enable an initial tranche of UTM services and capabilities. The document provides initial guidance for industry in the absence of:

- formal regulation, and
- a deconfliction capability in the initial UTM ecosystem

We expect the UTM ecosystem to increase its deconfliction capability as it matures and evolves.

Audience

This guidance applies across the UAS ecosystem, including:

- remotely piloted aircraft operator's certificate (ReOC) holders
- remote pilot licence (RePL) holders and other remote crew members
- UAS service suppliers (USS)
- UAS traffic management (UTM) stakeholders
- other support personnel involved in USS development and UAS operations.

Purpose and overview

The purpose of this document is to establish initial guidance on the requirements for remotely piloted aircraft (RPA) deconfliction from other RPA (known as RPA-RPA deconfliction).

This guidance is expected to evolve as UTM services develop and mature.

This guidance does not apply to deconfliction between RPA and crewed aircraft. Deconfliction between RPA and crewed aircraft remains subject to existing airspace management practices.

This guidance is not a regulated standard and published rules and regulations take precedence.

The guidance is principles-based and is intended to:

- educate and set expectations of the UAS ecosystem stakeholder responsibilities in RPA-RPA deconfliction
- support initial UTM stakeholders within the context of emerging UAS services
- encourage RPA operators to adopt an engaged and constructive safety attitude. This could include meeting 'sense and avoid' equipage and best practices, and adapting to new or emerging safety mechanisms to promote safety in all operational phases
- promote consistency in how potential conflicts between RPA are identified and how operators are notified of potential conflicts prior to binding standards or regulations being established
- encourage industry to be better positioned as regulatory frameworks evolve, recognising that early adopters tend to be better placed for smooth transitions to new rules.

Guiding principles

The principles of RPA-RPA deconfliction are:

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- **Transparency:** Open, clear and honest disclosure of proposed operations.
- **Cooperation and responsiveness:** Engaging constructively with other airspace users and taking timely action when airspace conflicts or changes to their operational plan emerge.
- **Accuracy:** Providing correct, reliable and up-to-date operational information.
- **Risk-based:** Applying measures and making decisions in proportion to the potential safety and operational risks of an operation. Planning and coordination should be appropriate to the complexity of the operation.
- **Fairness:** Supporting equitable and cooperative access to airspace consistent with the object of the *Airspace Act 2007*.
- **Readiness:** Build familiarity with emerging systems and practices to enable smooth adaptation to potential future developments.
- **Future looking:** Remain mindful of longer-term end-state goals consistent with the *Aviation White Paper → Towards 2050*.

Overall, these principles support the broader UTM Framework principles and promote RPA operations maintaining an acceptable level of aviation safety.

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References

Acronyms

The acronyms and abbreviations used in this document are listed in the table below.

Table 1: Acronyms

Acronym and abbreviation	Description
4D	four dimensional
ADS-B	Automatic dependent surveillance - broadcast
ADS-B In	Automatic dependent surveillance – broadcast In
ADS-B Out	Automatic dependent surveillance – broadcast Out
BVLOS	beyond visual line of sight
CASR	<i>Civil Aviation Safety Regulations 1998</i>
FIMS	flight information management system
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
MAC	mid-air collision
ReOC	RPA operator's certificate
RePL	remote pilot licence
RPA	remotely piloted aircraft
RPAS	remotely piloted aircraft system
UAS	unmanned aircraft system (as per CASR Part 101, also includes uncrewed)
USS	UAS service supplier
UTM	UAS traffic management

Definitions

The usage of some terms within the context of this document has been clarified in the table below using notes.

Throughout the document, *RPA* is used interchangeably with *drone* and is synonymous with *UAS*.

While 'drone-drone deconfliction' is consistent with the terminology used in the Government's [UTM Action Plan](#), that document has a wider target audience whereas RPA is most commonly used within CASA's regulatory context and aligns to the *Civil Aviation Safety Regulations 1998* (CASR) Part 101.

Table 2: Definitions

Term	Definition
conflict	conflict or close proximity events where the lateral, longitudinal and/or vertical distance between different RPA, as well as their relative positions and speed, may compromise RPA safety.

Term	Definition
conflict resolution or deconfliction	Is inclusive of collision avoidance and manoeuvring to avoid other RPA traffic.
drone	Has the same meaning as RPA or UAS.
electronic conspicuity	An umbrella term for a range of devices and technologies including, but not limited to, ADS-B, which enable aircraft to broadcast their position (i.e., ADS-B Out) and, where equipped, receive the position of other aircraft to enhance situational awareness (i.e., ADS-B In).
operator	The legal entity (organisation) conducting the RPA activities. Note: There is a legal definition of this term in the CASR Dictionary.
operational intent	Similar in concept to a conventional aircraft flight plan, this phrase refers to the planned 4-dimensional volume of airspace (latitude, longitude, altitude, time) in which an intended operation is proposed to be conducted.
RPA operator	The person (remote pilot) conducting the RPA activities.
sense and avoid	The capability of an RPA to reduce the probability of conflict with other airborne aircraft and ground-based obstacles - typically via avionics equipage or remote sensor feeds. Note: This is conceptually closely related to the conventional aviation concept of 'see and avoid', where a flight crew member must, during a flight, maintain vigilance, so far as weather conditions permit, to see and avoid other aircraft (see regulation 91.325 of CASR).
UAS ecosystem	Encompasses the evolving RPAS industry sector. See also the UTM Action Plan .
UAS service supplier (USS)	A software application that provides services within the UTM ecosystem.

1 Introduction

1.1 Background

- 1.1.1 Technology is expected to play a more significant role in RPA-RPA deconfliction within all airspace volumes compared to the current deconfliction methodologies used by crewed aviation.
- 1.1.2 The separation standards for conventional aircraft are determined based on the airspace classification, flight rules, and the surveillance, navigation capability and performance parameters of relevant aircraft. Nationally and internationally, the development of RPA-RPA separation standards is not yet in place and remain under consideration. As the sector matures, it is anticipated RPA operations are likely to use similar concepts in determining their deconfliction methodologies.
- 1.1.3 The fundamental goal of airspace management is the prevention of mid-air collisions (MAC). This is achieved through 2 complementary approaches:
- **Segregation** (airspace)
 - Uses practices such as airspace volumes or classifications combined with procedures which aim to keep airspace users segregated and therefore structurally eliminate the possibility of a conflict.
 - **Separation** (aircraft or RPA/UAS)
 - Tactical conflicts are possible, but controls are applied to resolve situations where conflicts may occur.
- The responsibility to maintain deconfliction distances between aircraft can either be self-managed, where airspace users themselves are responsible, or externally managed, where a third party provides separation/traffic information in accordance with defined standards.

1.2 Safety necessity

- 1.2.1 There is a need to move toward a more integrated aviation ecosystem where new RPA concepts and capabilities operate in the same airspace volumes as conventional aircraft.
- 1.2.2 The expanding complexity of RPA operations prompts new approaches and opportunities to continue to achieve safe RPA-RPA deconfliction. The increasing need for beyond visual line-of-sight (BVLOS) operations, higher-risk environments (for example urban, higher-density environments) and the increase in the volume of RPA operations is driving this need.

1.3 What is deconfliction?

- 1.3.1 'Deconfliction' refers to a layered safety strategy designed to prevent MAC through structural and dynamic processes that identify and resolve potential conflicts between RPA operations.
- 1.3.2 Deconfliction methodologies can operate across 3 phases:
1. **Strategic.** Before an operation, using mechanisms such as airspace design, airspace user prioritisation and demand management, planning operational areas.
 - **Pre-tactical.** Pre-flight, sharing and comparing operational intent early and accurately.
 2. **Tactical.** During an operation, using mechanisms to maintain safe distances laterally, vertically and/or longitudinally from other RPA and/or obstacles, and to detect and alert.
 3. **Collision avoidance.** Resolve conflict dynamically during an operation.
- 1.3.3 Deconfliction capabilities may emerge as part of a broader UTM system, however, there isn't currently an accepted national mechanism to share operational information.

- 1.3.4 This document is developed in the context of the release of Airservices' FIMS, which will enable an initial tranche of UTM services and capabilities.
- 1.3.5 RPA operators will be able to submit operational intent (similar to a flight plan) via USS to Airservices' FIMS in specified Australian airspace once FIMS-connected UAS services are operational. Such operational intents will then be assessed to determine if there are any overlapping areas with other operators who have also lodged operational intent within the same airspace. Where there is an overlap, FIMS will notify the USS, and in turn, the USS will provide advice of the overlap to the RPA operator for them to deconflict.
- 1.3.6 In the longer-term, there may be changes to UTM services' functionalities and/or provision of additional services. For example, a future version of FIMS may provide direct engagement or deconfliction services with conflicting operations (facilitated by USS).

1.4 Future regulatory development

- 1.4.1 Technology readiness, its implementation, and industry uptake will influence the effectiveness and maturity of regulatory guidance.
- 1.4.2 The future development of regulatory standards for RPA-RPA deconfliction in increasingly complex airspace and operational applications has a wide range of dependencies, including future policy development on UTM, electronic conspicuity, detect and avoid technologies and policy, international developments (including, but not limited to, further Joint Authorities for Rulemaking on Unmanned Systems (JARUS) guidance) and airspace management.

2 Drone-drone deconfliction

2.1 Guiding principles

2.1.1 Subject to the availability of the required communications and information infrastructure, guiding principles for RPA-RPA deconfliction that apply across a UAS ecosystem are:

- **Transparency:** Open, clear and honest disclosure of proposed operations.
RPA operators should share their operational intent **clearly** and **early** through mechanisms such as the voluntary use of UTM services.
- **Cooperation and responsiveness:** Engaging constructively with other airspace users and taking timely action when airspace conflicts or changes to their operational plan emerge.
RPA operators should constructively cooperate in instances where conflicts are identified. RPA operators should apply 'sense and avoid' principles.
- **Accuracy:** Providing correct, reliable and up-to-date operational information.
RPA operators and USS should provide accurate operational intent, data and information to ensure potential conflicts can be identified and resolved.
- **Risk-based:** Applying measures and making decisions in proportion to the potential safety and operational risks of an operation. Planning and coordination should be commensurate with the complexity of the operation.
RPA operators and USS providers should actively consider risk and take actions that are proportionate to the level of risk.
- **Fairness:** Supporting equitable and cooperative access to airspace consistent with the object of the *Airspace Act 2007*.
RPA operators should engage in behaviours that support cooperative access to Australian airspace as a shared resource.
- **Readiness:** Build familiarity with emerging systems and practices to enable smooth adaptation to potential future developments.
RPA operators and USS providers should adopt procedures that enable smooth implementation of changes noting the frequently changing technology relating to RPA.
- **Future looking:** Remain mindful of longer-term end-state goals consistent with the *Aviation White Paper → Towards 2050*.
RPA operators and USS providers should consider the likely evolution towards increasingly digital and automated capabilities within the future UTM environment as UTM services develop and mature.¹

2.1.2 Overall, these principles are intended to support the broader UTM Framework principles and to promote RPA operations maintaining an acceptable level of aviation safety.

¹ The Australian Future Airspace Framework will consider the evolution of the UTM ecosystem.

2.2 Guidance

2.2.1 Recommendations for RPA operators

2.2.1.1 Table 3 outlines CASA's recommendations for RPA operators for establishing RPA-RPA deconfliction practices.

This guidance does not represent binding technical or regulatory standards. It assumes a context of dynamic UTM development, aiming to establish a shared understanding and adaption among stakeholders on roles, responsibilities, and behaviours.

Table 3: Recommendations for RPA operators

Behaviour	Relevant guiding principles	What does good look like?	Rationale	Potential long-term expectation
Sharing operational intent	• Transparency • Accuracy • Readiness • Risk-based	• Sharing of accurate operational intent information via USS as early as possible, in areas where USS deliver UTM services. • Operational intent should specify a 4D operational intent volume (latitude, longitude, altitude, time). • An operational intent volume is the volume of airspace in which an intended operation is proposed to be conducted.	• Encourage early voluntary use of UTM services where they are provided. • Enable informed operational planning for RPA operators. • Enable post-operational data analysis and inform whether ground risk was appropriately considered.	• Sharing operational intent will likely become mandatory for certain operations in the future, determined through a risk-based approach. • Operational intent data and information will likely underpin future prioritisation and automated deconfliction systems.
Using strategic coordination services	• Readiness • Transparency • Accuracy	• Routine use of strategic coordination services offered by USS, where provided, even when not yet mandatory, to maximise the safety of operations.	• Increases the safety of RPA operations. • Build operator familiarity with services that are expected, eventually, to become standard or mandatory in certain circumstances.	• Use of strategic coordination services via USS will likely become mandatory for certain operations in the future, determined through a risk-based approach.

Behaviour	Relevant guiding principles	What does good look like?	Rationale	Potential long-term expectation
Conflict detection and resolution	- Cooperation and responsiveness - Readiness - Fairness	- Development and implementation of effective tools and procedures to acknowledge and resolve conflicts both in the strategic and tactical phases. - RPA operators negotiate cooperatively and constructively to facilitate resolution of air conflicts wherever possible. - RPA operators use electronic conspicuity equipment where appropriate or required. (For example, we encourage use of ADS-B IN for all operations, and ADS-B OUT for BVLOS operations above 400ft in non-controlled airspace.)	- Increases the safety of RPA operations. - Futureproofing: puts operators in better positions for future regulatory requirements. - Embed safety culture and practices.	- To adhere to future guidance and requirements relating to resolving conflicts. - To adhere to future aircraft prioritisation criteria.
Accurate operations	Accuracy	- RPA operators monitor conformance of their operations with the notified operational intent (4D volume). - Operational intent volumes are created with sufficient margins in consideration of potential adverse weather conditions and navigation accuracy or limitations.	- To promote safe operations. - Prevent unexpected or uncoordinated operations.	- Conformance with operational intent may be monitored by USS where USS services are provided. USS may flag deviations, trigger automated alerts, revoke airspace access, or require immediate RPA operator response. - Compliance with notified operational intent volume margins.
Equipment	- Risk-based - Readiness	- RPA operators transmit electronic conspicuity information where specified for certain operations and airspace access. - As conspicuity technologies are introduced, operators conducting higher-risk operations (e.g. larger RPA; BVLOS; higher complexity operation; in more populated environments) equip	- Provides improved situational awareness and safer operations. - Future-proofing: puts operators in better positions for future regulatory requirements relating to equipment, interoperability, navigation, and data-sharing.	- Electronic conspicuity may be mandated in specific circumstances in the future for certain operations, including to obtain airspace access, informed by risk. - To adhere to future surveillance, navigation and communication performance-based requirements for airspace access. - It is likely that a range of technologies will be required depending on the type of

Behaviour	Relevant guiding principles	What does good look like?	Rationale	Potential long-term expectation
		their RPAS with subsystems that allow for electronic conspicuity. • When specified, RPA are equipped to transmit and receive data for USS surveillance and for other RPA to sense potential conflicts.		operation conducted. Note that policy surrounding this would likely be informed by how technology and RPA operations continue to advance and still needs to be determined.

2.2.2 Expectation and requirements of USS provider services

- 2.2.2.1 Each UTM service offered by a USS would be subject to expectations and requirements specific to that service, and consistent with the applicable operating rules. This would include any requirements of data providers. Where safety-critical functions are involved, CASA would typically be engaged in determining the appropriate regulatory oversight arrangements, as well as the service privileges and conditions under which the service may operate.
- 2.2.2.2 Expectations and requirements would therefore apply at the level of the individual service rather than to USS in general. USS would be expected to demonstrate conformity with the operating rules for each service they provide, with that conformity anticipated to be assessed through oversight mechanisms such as automated testing. As services mature, CASA would expect to engage with industry on the design and implementation of these mechanisms, including the use of controls that may restrict or suspend a service's participation in UTM while it remains non-conformant.

Governance arrangements

- 2.2.2.3 In addition, CASA will continue to develop requirements for USS providers to implement operational, technical, and governance arrangements broadly consistent with recognised international frameworks. For example, the implementation of practices and processes to address service performance, incident reporting, outage notification, change management, security and privacy protections, and operator support responsibilities. This is reflected in industry consensus materials such as the JARUS Specific Operational Risk Assessment (SORA) framework material Annex H SORA safety services considerations, or the GUTMA Operator–USP Service Level Agreement template.