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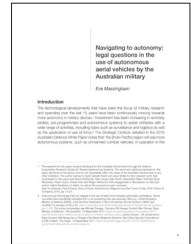
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# Navigating to autonomy: legal questions in the use of autonomous aerial vehicles by the Australian military

*Eve Massingham*

## Introduction

The technological developments that have been the focus of military research and spending over the last 15 years have been continuously moving towards more autonomy in military devices.<sup>1</sup> Investment has been increasing in remotely piloted, pre-programmed and autonomous systems to assist militaries with a wide range of activities, including tasks such as surveillance and logistics as well as the application of use of force.<sup>2</sup> The Strategic Outlook detailed in the *2016 Australian Defence White Paper* notes that ‘the [Indo-Pacific] region will see more autonomous systems, such as unmanned combat vehicles, in operation in the

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1 The research for this paper received funding from the Australian Government through the Defence Cooperative Research Centre for Trusted Autonomous Systems. The views and opinions expressed in the paper are those of the author, and do not necessarily reflect the views of the Australian Government or any other institution. The author wishes to thank Isabelle Peart and Julius Moller for their research work that contributed to this piece and Simon McKenzie, Rain Liivoja, Kate Devitt, Gwendolyn Bakx, Nicholas Dyce-McGowan, Keirin Joyce, Robert Vine and Roger Halford for their engagement in discussions on this topic and/or helpful feedback on drafts, as well as the anonymous peer reviewers. See, for example, Paul Scharre, *Army of None: Autonomous Weapons and the Future of War*, W.W. Norton & Company, 2018, pp 14–25.

2 Autonomous technology that can engage in the use of lethal force remains particularly contentious. Some countries have specifically indicated this is not something they are pursuing. See e.g., United Kingdom Ministry of Defence (MOD), *Joint Doctrine Publication 0-30.2 Unmanned Aircraft Systems*, MOD, last modified 15 January 2018, p 42, <https://www.gov.uk/government/publications/unmanned-aircraft-systems-jdp-0-302>. For some commentary see Michael Savage, ‘Humans Will Always Control Killer Drones, Says Ministry of Defence’, *The Guardian*, 10 September 2017, <https://www.theguardian.com/politics/2017/sep/09/drone-robot-military-human-control-uk-ministry-defence-policy>; James Vincent, ‘UK Government Says Humans Will Always be in Charge of Its Robot Weapons Systems: But Critics Say the Commitment is Still Limited’, *The Verge*, 12 September 2017, <https://www.theverge.com/2017/9/12/16286580/uk-government-killer-robots-drones-weapons>.

sub-surface, surface and air-environments' over the period to 2035.<sup>3</sup> In response, Australia has identified the development of 'trusted autonomous systems' as a priority area of work for Defence's strategic research.<sup>4</sup> The Australian Defence Force (ADF) is exploring a range of innovative autonomous technologies through programs such as the Trusted Autonomous Systems Defence Cooperative Research Centre. Currently funded projects include those exploring 'trusted scalable search with expendable drones', 'autonomous live reconnaissance effects assessment using AI [artificial intelligence] and machine vision' and 'cognitive [AI] algorithms to enable sensing under anti-access conditions and to navigate and conduct enhanced tactics in denied environments'.<sup>5</sup> Perhaps the highest profile project is the stealth uncrewed Boeing *Loyal Wingman* aircraft. This craft is designed to support existing crewed aircraft capabilities, as well as operate in autonomous teams, by providing surveillance and reconnaissance support, and potentially also firepower support.<sup>6</sup>

These developments raise important legal questions that must be considered in order to ensure the safety of the civilian population, especially where the devices in question can be used to apply force.<sup>7</sup> In anticipation of their further development and technological reality, this paper seeks to provide an answer to the question: what legal considerations might arise in Australia from the use of autonomous aircraft by the military?

ADF personnel, by virtue of the unique role that they play, are often specifically exempt from the application of particular laws that otherwise bind the Commonwealth of Australia and therefore the Department of Defence and its employees. This is designed to ensure that the defence of Australia is not compromised by a legal framework not designed with ADF operations in mind.<sup>8</sup>

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3 Department of Defence, *2016 Defence White Paper*, Australian Government, Canberra, 25 February 2016, p 50, accessed 16 July 2020, <https://www.defence.gov.au/WhitePaper/Docs/2016-Defence-White-Paper.pdf>. The *2020 Defence Strategic Update* restates this view about the significant role of emerging and disruptive technologies such as autonomous systems: Department of Defence, *2020 Defence Strategic Update*, Australian Government, Canberra, 1 July 2020, p 13, p 38, accessed 30 July 2020, [https://www.defence.gov.au/StrategicUpdate-2020/docs/2020\\_Defence\\_Strategic\\_Update.pdf](https://www.defence.gov.au/StrategicUpdate-2020/docs/2020_Defence_Strategic_Update.pdf).

4 Department of Defence, *2016 Defence Industry Policy Statement*, Australian Government, Canberra, 25 February 2016, pp 31–32, accessed 16 July 2020, <https://www.defence.gov.au/WhitePaper/Docs/2016-Defence-Industry-Policy-Statement.pdf>.

5 'Projects', Trusted Autonomous Systems Defence CRC, accessed 16 July 2020, <https://tasdcrc.com.au/projects-activities/>.

6 Malcolm Davis, "'Loyal Wingman' to Take Australia's Airpower into the Next Era', *The Strategist*, Australian Strategic Policy Institute, 7 March 2019, <https://www.aspistrategist.org.au/loyal-wingman-to-take-australias-airpower-into-the-next-era/>.

7 See, for example, Carrie McDougall, 'Autonomous Weapon Systems and Accountability: Putting the Cart before the Horse', *Melbourne Journal of International Law*, 2019, 20(1):58; Tim McFarland, 'Factors Shaping the Legal Implications of Increasingly Autonomous Military Systems', *International Review of the Red Cross*, 2015, 97(900):1313.

8 See for example, Section 12D of the *Work Health and Safety Act 2011* (Cth).

However, ADF personnel are clearly not immune from all Australian laws and, indeed, a number of laws are specific to them and their work. Of particular relevance for autonomous military aerial vehicles are the Defence Aviation Safety Regulations (DASR) and Division 268 of the *Criminal Code Act 1995* (Cth) (Code) concerning international crimes occurring in times of armed conflict.

This paper looks in more detail at the DASR and the Code, before turning to flag a range of civilian-focused legal frameworks (including workplace health and safety and privacy laws) which, insofar as they do apply to Defence, require consideration to ensure that the use of autonomous military aerial vehicles would not result in a violation of Australia law. The paper ultimately argues that, in the design and deployment of any new means or methods of warfare or, indeed, in any aerial craft that the ADF seeks to deploy into the future, it is imperative that these legal considerations be taken into account to ensure that the interplay between law and technology can best enhance ADF capabilities going forward.

In this paper, the Australian domestic legal framework applicable to Australian Service personnel will be discussed. This includes Australian laws applicable in Australia and, where relevant, with extraterritorial (outside of Australia) effect – including those provisions of Australian law which apply to Service personnel deployed on military operations. It also includes where Australian domestic laws have incorporated international law (specifically where the Code imports international laws concerning international crimes). These are laws that have been passed by the Australian Government and are enforceable by Australian authorities. This is distinct from international law. International law – namely the product of agreement between nations as to conduct of relations between nations and the rights and duties of actors that are the concern of the international community<sup>9</sup> – has particular relevance when Australian Service personnel cross international borders and/or engage in situations of armed conflict. While there is no specific rule regulating autonomy in airborne military operations in international law, a number of international law frameworks are particularly relevant, including The Hague Rules of Aerial Warfare and international civil aviation law.<sup>10</sup> The international law implications of the use of autonomous systems is beyond the scope of this paper.<sup>11</sup>

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9 See further, Alina Kaczorowska-Ireland, *Public International Law*, 5th ed., Routledge, 2015, chapter 1.

10 Hague Rules of Aerial Warfare, 1923; Convention on International Civil Aviation, 15 UNTS 295, 7 December 1944 (entered into force 4 April 1947).

11 For a discussion of this see, Eve Massingham, 'Radio Silence: Autonomous Military Aircraft and the Importance of Communication for Their Use in Peace Time and in Times of Armed Conflict Under International Law', *Asia-Pacific Journal of International Humanitarian Law*, 2020, 1, pp 184–208.

## Defining and regulating autonomy

Autonomy is a functionality that allows a device to operate without real-time human intervention. This is not, itself, problematic. The use of autonomous technology has long been a part of military warfare tactics and strategy.<sup>12</sup> Indeed, autonomy can clearly enhance safety – as is the case with the automation of some aircraft systems thereby allowing the pilot to focus on other tasks.<sup>13</sup> However, the impacts of autonomy may need to be addressed by some combination of law, policy and doctrine to ensure that autonomy is limited by what humans allow.<sup>14</sup> Notwithstanding various debates about the precise definition of the concept,<sup>15</sup> autonomy clearly exists on a spectrum. The systems where key functions are capable of ‘deciding a course of action, from a number of alternatives, without depending on human oversight and control’ raise the most significant legal questions.<sup>16</sup>

The intersection of law and autonomy is being examined across a range of applications of technology. As a general matter, autonomy is not specifically regulated by either domestic or international law. That is, there are no rules of law specifically dealing with autonomy as a concept,<sup>17</sup> there is no Autonomy Convention or Act. This lack of specific regulation is because the legal responses to autonomy must be concerned with the impacts of using the technology on the system as a whole, not the technology itself.<sup>18</sup> This is particularly apparent in the automotive industry. A 2017 report looking at the use of automated vehicles

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12 For a more detailed look at the long history of the use of autonomy by the military and the ‘catalysts for the UV revolution’ see Brendan Gogarty and Meredith Hagger, ‘The laws of man over vehicles unmanned: the legal response to robotic revolution on sea, land and air’, *Journal of Law, Information and Science*, 2020, 19, pp 76–82; See also, Ian Henderson and Bryan Cavanagh, ‘Unmanned Aerial Vehicles: Do They Pose Legal Challenges?’ in Nasu Hitoshi and Robert McLaughlin (eds), *New Technologies and the Law of Armed Conflict*, Asser Press, The Hague, 2013, p 195, <http://hdl.handle.net/2440/108620>.

13 Pablo Mendes de Leon, *Introduction to Air Law*, Wolters Kluwer, Alphen aan den Rijn, 2017, p 302; Christoph Torens, Johann C Dauer, Florian Adolf, ‘Towards Autonomy and Safety for Unmanned Aircraft Systems’, in Umut Durak, Jürgen Becker, Sven Hartmann, Nikolaos S Voros (eds) *Advances in Aeronautical Informatics*, Springer International Publishing, Cham, 2018, p 105.

14 See further, Catherine Easton ‘Autonomous Vehicles: An Analysis of the Regulatory and Legal Landscape’, in Lilian Edwards, Burkhard Schafer and Edina Harbinja (eds) *Future Law: Emerging Technology, Regulation and Ethics*, Edinburgh University Press, Edinburgh, 2020, p 314.

15 MOD, *Joint Doctrine Publication 0-30.2*, p 42.

16 MOD, *Joint Doctrine Publication 0-30.2*, p 13; See further, Henderson and Cavanagh, ‘Unmanned Aerial Vehicles’; Scott Maloney, ‘Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment’, *Soundings*, 2016, 11(May):5–6.

17 Although rules dealing with specific types of autonomy date at least to the First International Peace Conference where the ban on projectiles deployed from uncrewed balloons was first agreed: Prohibiting Launching of Projectile and Explosives from Balloons (HAGUE, IV, 1) Declaration signed at The Hague 29 July 1899. The Hague Convention VIII Relative to the Laying of Automatic Submarine Contact Mines, 18 October 1907 is another early example.

18 Although, generally, policy around autonomy is clearly developing. See, for example, European Commission, *On Artificial Intelligence – A European Approach to Excellence and Trust*, White Paper, 19 February 2020, [https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020\\_en.pdf](https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf).

in Australia notes that '[t]here are more than 50 federal and state/ territory pieces of legislation that are impacted in addition to the road rules' if 'high and fully automated vehicles [are] to operate seamlessly on Australian roads'.<sup>19</sup> This includes regulation of vehicle standards, Australian Road Rules, heavy vehicle regulation, insurance regulation and passenger transport legislation.<sup>20</sup>

The levels of sophistication in terms of what devices with autonomous functionality can do is increasing at a dramatic speed. This requires consideration of existing regulatory frameworks to, ultimately, ensure the safety of the population. In some fields, clarity needed to be provided to ensure that autonomous systems are not recognised as having legal personality. In copyright law, human authorship is required. The author of computer-generated literary, dramatic, musical or artistic work is the person who undertook the arrangements necessary for the creation of the work.<sup>21</sup> Another example is the use of autonomous systems in the legal profession: only 'natural persons' are eligible for admission to the legal profession and eligible to engage in legal practice.<sup>22</sup> But using technology to *support* legal processes is clearly on the rise. Computer programs may be used to make decisions under social security law in Australia;<sup>23</sup> and, a new system to streamline divorces is now available in Australia.<sup>24</sup>

More broadly, across a range of industries, work is being done to promote the development and deployment of systems utilising autonomous functionality. Gogarty and Hagger observe that 'drone technology is increasingly within the reach of public bodies, private companies and even individuals' and note the beneficial uses of the technology in areas like 'emergency and hazard management' and 'border security and customs roles'.<sup>25</sup> This has only

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19 NRMA, *Transforming Mobility: A Regulatory Roadmap for Connected and Automated Vehicles*, NRMA, November 2017, 4, pp 42–43, <https://www.mynrma.com.au/community/corporate-information/reports-and-submissions>.

20 National Transport Commission, *Automated Vehicle Program*, 10 October 2019, p 10, <https://www.ntc.gov.au/sites/default/files/assets/files/NTC%20Automated%20Vehicle%20Reform%20Program%20Approach%20%28October%202019%29%20-%20Public%20version.pdf>.

21 *Telstra Corporation Limited v Phone Directories*, (2010) 194 F.C.R. 142 [97] considering the *Copyright Act 1968* (Cth). See also, *Copyright, Designs and Patents Act 1988* (UK), s. 9(3); *Copyright Act 1994* (NZ), s. 5(2) (a).

22 See e.g., *Legal Profession Act 2007* (Qld), s. 30(1)(a); *Legal Profession Act 2004* (NSW), s. 24(1); *Legal Profession Act 2004* (Vic), s. 2.3.2(1)(a); *Legal Profession Act 2007* (Tas), s. 25(1).

23 *Social Security (Administration) Act 1999* (Cth), s. 6A. (Note that the automated debt recovery system used by Centrelink in Australia, which resulted in a legal challenge and settlement by the Government, concerned inaccurate and inconsistent income averaging which was not lawful under the Act: Paul Karp, 'Government admits robodebt was unlawful as it settles legal challenge', *The Guardian*, 27 November 2019, <https://www.theguardian.com/australia-news/2019/nov/27/government-admits-robodebt-was-unlawful-as-it-settles-legal-challenge>.)

24 'About Amica', [web page], *Amica*, accessed 17 July 2020, <https://www.amica.gov.au/about-amica.html>.

25 Brendan Gogarty and Meredith Hagger, 'The Laws of Man over Vehicles Unmanned: The Legal Response to Robotic Revolution on Sea, Land and Air', *Journal of Law, Information and Science*, 2008, 19:105, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1796486](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1796486).

become truer in the decade since this observation was made. For example, an autonomous vehicle is being used to patrol the perimeter of a prison facility in Western Australia. The vehicle ‘has a lithium battery that can support eight hours’ drive time and is equipped with multi-angle, high definition cameras, night vision, a collision avoidance system, incident alert lighting and a two-way intercom’.<sup>26</sup>

These examples therefore provide just a few indications of the ways in which autonomy is transforming our lives. Moreover, patrolling, sorting data, navigating, making administrative decisions have various potential military applications. As such, while this paper will address legal frameworks specific to the military (noted above), it will also look at the legal frameworks challenged by technological developments in society more generally.

## **Australian autonomous military aircraft**

The ADF is currently deploying a large number of uncrewed aerial vehicles/ systems (UAV)/UASs). Using UAVs for enhanced surveillance, including maritime surveillance, is a key element of the *2016 Defence White Paper*.<sup>27</sup> The Australian Army, in particular, makes extensive use of remotely piloted UAVs, mainly for surveillance and reconnaissance. In May 2018, the Department of Defence confirmed that ‘[t]he Army operate several UA[V]s, ranging from the Nano-sized reconnaissance Black Hornet to large, nine-hour endurance surveillance systems such as the Shadow 200’.<sup>28</sup> The Royal Australian Air Force (RAAF) is finalising the certification of the MQ-9B ‘Sky Guardian’ to fly in civilian airspace. This will be ‘Australia’s first armed Medium Altitude Long Endurance Remotely Piloted Aircraft System’.<sup>29</sup>

However, all of these existing devices are remotely piloted. They have varying levels of automation, but they are far from being vehicles able to navigate and carry out tasks without human oversight. They require a remote operator on a one-operating-team-per-vehicle ratio. Australia does not currently deploy highly autonomous aircraft. This is in keeping with the Australian understanding that command is not something that can be given over to machines.<sup>30</sup> The ADF in

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26 Jarrod Lucas, ‘Autonomous Vehicle to Patrol Perimeter at Eastern Goldfields Regional Prison’, *ABC News*, last modified 1 July 2020, <https://www.abc.net.au/news/2020-07-01/autonomous-vehicle-to-patrol-prison-for-the-first-time/12383646>.

27 DOD, *2016 Defence White Paper*, chapter 4.

28 Department of Defence, ‘Army Rolls Out Unmanned Aerial Systems’, [media release], Australian Government, 24 May 2018, <https://news.defence.gov.au/media-releases/army-rolls-out-unmanned-aerial-systems>.

29 Ewen Levick, ‘MQ-9B Sky Guardian Chosen Over Reaper’, *Australian Defence Magazine*, 28 November 2019, <https://www.australiandefence.com.au/news/mq-9b-sky-guardian-chosen-over-reaper>.

30 Australian Defence Force (ADF), *ADF Concept for Command and Control of the Future Force*, Version 1.0 Reference: DSN O1644248, Australian Government, 13 May 2019, p 18, <https://www.defence.gov.au/VCDF/Forceexploration/adf-concept.asp>. Also available at <https://theforge.defence.gov.au/publications/adf-concept-command-and-control-future-force>.

its doctrine defines command as ‘the authority that a commander in the military Service lawfully exercises over subordinates by virtue of rank or assignment’.<sup>31</sup> The *ADF Concept for Command and Control of the Future Force* notes that ‘command is a *fundamentally human function* that cannot be conducted by machines’ (emphasis added).<sup>32</sup> Command functions may be assisted by decision support systems, however, such systems alone cannot, it is stated, command.<sup>33</sup> In the context of autonomous weaponry, Australia has reiterated the centrality of the human decision-maker, noting that Australia’s approach ‘provides comprehensive control over any weapon system, and how and under what circumstances it can be deployed ensuring, at its core, the weapon system is driven by human direction’.<sup>34</sup>

There are, as yet, unanswered questions about what will be technologically feasible. For instance, there is a question around whether any aircraft under military command (including those with highly autonomous programming) will be a military aircraft or whether the nature of military command is such that military aircraft can never have a high level of autonomous functionality because the inherent nature of command requires a human decision-maker.<sup>35</sup> In any event, as Australia is clearly interested in, and is pursuing, this technology, it is useful to consider the legal implications, should advances in technology and political will take Australia further down the autonomy path.

There is no specific Act of Parliament in Australia dealing with defence aviation or State aircraft, which includes military aircraft.<sup>36</sup> Further, State aircraft (and therefore military aircraft as a subset of State aircraft) are excluded from much of the Civil Aviation framework.<sup>37</sup> Reference is made in the *Defence Act 1903* (Cth) to defence aviation and aircraft but not in any way that would impact on

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31 Australian Defence Force (ADF), *Australian Defence Force Doctrine Publication 00.1: Command and Control*, Australian Government, 27 May 2009, para 1.4, [https://www.defence.gov.au/adfwc/Documents/DoctrineLibrary/ADDP/ADDP\\_00\\_1\\_Command\\_and\\_Control.pdf](https://www.defence.gov.au/adfwc/Documents/DoctrineLibrary/ADDP/ADDP_00_1_Command_and_Control.pdf).

32 ADF, *Concept for Command and Control*, p 18.

33 ADF, *Concept for Command and Control*, p 18.

34 Australia’s System of Control and Applications for Autonomous Weapon Systems’ (UN Doc No CCW/GGE.1/2019/WP.2/Rev.1, 26 March 2019, p 8.

35 See further Eve Massingham, Simon McKenzie and Rain Liivoja, ‘AI and Machine Learning Symposium: Command in the Age of Autonomy – Unanswered Questions for Military Operations’, *Opinio Juris*, 1 May 2020, <http://opiniojuris.org/2020/05/01/ai-and-machine-learning-symposium-command-in-the-age-of-autonomy-unanswered-questions-for-military-operations/>.

36 *Civil Aviation Act 1988* (Cth), section 3: ‘[S]tate aircraft means (a) aircraft of any part of the Defence Force (including any aircraft that is commanded by a member of that Force in the course of duties as such a member); and (b) aircraft used in the military, customs or police services of a foreign country.’

37 *Civil Aviation Act 1988* (Cth), section 4; for example, the *Civil Aviation Regulations 1988* (Cth), section 3(5) notes ‘[s]ubject to these Regulations, these Regulations do not apply to or in relation to state aircraft or to military aerodromes’.



autonomous aerial vehicles. Defence Aviation Areas are provided for.<sup>38</sup> These areas can be designated by the Minister where necessary for the defence of Australia and for 'preventing or reducing hazards' to aircraft and 'aviation-related communications, navigation or surveillance'.<sup>39</sup> There is, therefore, a possibility that a prevalence of non-military autonomous aerial vehicles in the future may mean that these provisions are more likely to be enacted in order to reduce hazards to military aerial vehicles.

Reference is also made in the *Defence Act 1903* (Cth) to the special measures that Defence Force personnel can take against aircraft when called out to protect Commonwealth interests or to protect a State or Territory from domestic violence.<sup>40</sup> These measures include the use of force, whether the aircraft is airborne or not, that results in the destruction of the aircraft.<sup>41</sup> The provisions were initially proposed with the hosting of the Commonwealth Games in mind, passed in 2006 in the lead-up to Australia hosting the 2007 APEC Summit and amended in 2018, in light of a range of terror incidents around the world.<sup>42</sup> An increasing prevalence of non-military autonomous aerial vehicles in the future could also see these provisions relied on.

In recent times, Australians have seen Defence Force personnel supporting Australian State authorities with tasks in response to the COVID-19 pandemic and the Black Summer bushfires.<sup>43</sup> ADF support in times of domestic crisis

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38 See further *Defence Act 1903* (Cth), Part IXD.

39 *Defence Act 1903* (Cth), s. 117AC.

40 *Defence Act 1903* (Cth), Part IIIAAA, Division 2. Note that 'domestic violence' is defined in the same way as s 199 of the Constitution of Australia, although it is not actually defined therein. In a proposed 2018 amendment to the Act, it was said to include 'conduct that is marked by great physical force and would include a terrorist attack, hostage situation, and widespread or significant violence': Addendum to the Explanatory Memorandum, *Defence Amendment (Call out of the Australian Defence Force) Bill 2018*, item 2 [165A].

41 *Defence Act 1903* (Cth), s. 46(5). See also s 46(1) and (6) requiring that the actions be in response to a sudden and extraordinary emergency or that they be a reasonable and necessary execution of a written authorisation.

42 Commonwealth, Parliamentary Debate, Senate, 8 February 2006, 1 (Senator Mark Bishop) <https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=id%3A%22chamber%2Fhansards%2F2006-02-08%2F0006%22>; Simon Bronitt and Stephen Dale, "'Flying Under the Radar' – The Use of Lethal Force Against Hijacked Aircraft: Recent Australian Developments" 7(3) *Oxford University Commonwealth Law Journal*, 265, 270. Other jurisdictions, including the UK, US, France, Norway and the Netherlands, arrangements similar to section 46 in place: See Michael Bohlander, 'In Extremis – Hijacked Airplanes, "Collateral Damage" and the Limits of Criminal Law', *Criminal Law Review*, 2006, 579, 589. Although note that similar provisions have been struck down in Germany and Canada: See Oliver Lepsius, 'Human Dignity and the Downing of Aircraft: The German Federal Constitutional Court Strikes Down a Prominent Anti-terrorism Provision in the New Air-transport Security Act', *German Law Journal*, 2006, 7(9): 761, 762; Commonwealth, *Parliamentary Debate*, Senate, 26 November 2018, 8607 (Senator Kimberley Kitching).

43 RMIT ABC Fact Check, 'How is the Australian Defence Force assisting states during COVID-19?', *ABC News*, 12 August 2020, <https://www.abc.net.au/news/2020-08-12/fact-check-defence-force-coronavirus-fact-file-hotel-quarantine/12522492?nw=0>; Tom Sear, 'Bushfires are 'Australia's war' and that means we need a battle plan', *ABC News*, 7 February 2020, <https://www.abc.net.au/news/2020-02-07/australia-bushfires-adf-operation-bushfire-assist/11931704>.

are well documented (and have been the subject of some discontent).<sup>44</sup> While these examples would not constitute domestic violence situations and would not therefore invoke Part IIIAAA of the Defence Act, the role of the ADF under Part IIIAAA of the Defence Act could well be used in response to unrest that occurs as a result of these societal challenges. Again, a prevalence of non-military autonomous aerial vehicles in the future may mean that these provisions are more likely to be enacted in order to protect Australia – particularly given mistakes made with uncrewed aircraft, should they occur, are less likely to result in the loss of human life.

## **The safety of military autonomous aerial vehicles – Australian DASR**

The framework for defence aviation safety in Australia is as directed by Joint Directive 24/2016 (issued by the Chief of the Defence Force and the Secretary, Department of Defence) on the Defence Aviation Safety Framework.<sup>45</sup> The Joint Directive details the role of the Defence Aviation Safety Authority (DASA) as being responsible to the Defence Aviation Authority ‘for enhancing and promoting the safety of military aviation’.<sup>46</sup> Regulations have been made under the remit of DASA.<sup>47</sup> The DASR ‘establish a framework for the definition and implementation of common safety requirements and administrative procedures in the field of military aviation’.<sup>48</sup> They align with the European Military Airworthiness System.<sup>49</sup> DASA is responsible for the enforcement of ongoing compliance of Defence Aviation with the DASR,<sup>50</sup> but as is identified in the relevant Joint Directive ‘aviation safety is a command responsibility’ and ‘the safe operation of aviation

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44 See e.g., Department of Defence, ‘Operation Queensland Flood Assist’ [media release], Australian Government, 5 February 2011, <https://news.defence.gov.au/media/media-releases/operation-queensland-flood-assist>; Siobhan Heanue, ‘Putting troops on the frontline of pandemics, natural disasters means less time to train for war’, *ABC News*, 27 August 2020, <https://www.abc.net.au/news/2020-08-27/troops-on-pandemic-bushfire-frontline-cant-train-for-war/12593126>.

45 Australian Department of Defence (DOD), ‘Joint Directive 24/2106 by Chief of Defence Force and Secretary, Department of Defence on The Defence Aviation Safety Framework’, Australian Government, (effective 30 September 2016 to 31 December 2021 as per Joint Directive 04/2018), accessed 26 October 2020, para 16. <https://www.defence.gov.au/DASP/Docs/Advice/DASA/DIRECTIVE160819SECCDFJointDirective242016TheDefenceAviationSafetyFrameworkFOUO.pdf>.

46 DOD, ‘Joint Directive 24/2106, para 12.

47 Defence Aviation Safety Authority, ‘*Defence Aviation Safety Regulation*’, accessed 05 November 2020, <https://www.defence.gov.au/DASP/DASR-Regulations/Default.asp>.

48 Defence Aviation Safety Authority, *Defence Aviation Safety Regulations*, (1 June 2020) (DASR), Basic Regulation, Preamble para 1.

49 Defence Aviation Safety Authority, ‘*Defence Aviation Safety Regulation*’, accessed 05 November 2020, <https://www.defence.gov.au/DASP/DASR-Regulations/Default.asp>

50 *Defence Aviation Safety Assurance Manual*, part 2, chapter 5 <https://www.defence.gov.au/DASP/Docs/Manuals/DASA-Manual/Manual/index.htm#24492.htm>

systems rest with the command chain'.<sup>51</sup> Importantly, the DASR is a framework specifically designed with a simple and regular (six monthly) update cycle under the direction of the DASA and thus has some flexibility to allow it to be able to reflect relatively rapid technological developments.<sup>52</sup>

Currently autonomous aircraft are excluded from deployment by the ADF under the DASR. The regulations require that a UAV be controlled by a qualified remote pilot and that remote pilot 'intervention' be possible at 'all stages of the flight'.<sup>53</sup> The DASR clarifies that:

[I]ntervention refers to an action, command or input by the [remote pilot] to dictate the UA's flight actions. In all situations (apart from when link is lost), the [remote pilot] should be able to alter the flight path of the UA or perform any other suitable actions as necessary to ensure safe flight.<sup>54</sup>

(The express exception that applies when the communication link is lost recognises that communications protocol challenges can arise when it comes to remotely piloted craft.)<sup>55</sup> The first step in allowing autonomous aerial vehicles to be operated by the ADF would require the amendment or repeal of those sections of the DASR specifically requiring remote pilot intervention.<sup>56</sup>

Under the system used by the ADF,<sup>57</sup> Uncrewed Aerial Systems (UASs) fall into three categories: certified, specific and open.<sup>58</sup> Certified craft are described by the European Union Aviation Safety Authority as having 'requirements comparable to those for manned aircraft'.<sup>59</sup> Most significantly, they must be operated by a qualified military pilot. Specific category craft require an operating permit or to

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51 DOD, 'Joint Directive 24/2106, para 16.

52 Defence Aviation Safety Authority, 'Introduction to Defence Aviation Safety' Guidebook, Edition 2.1, February 2019, p 2 ('Note to readers'), <https://www.defence.gov.au/DASP/Docs/Manuals/BetterPracticeGuide/Introduction-to-Defence-Aviation-Safety-Guidebook.pdf>; 'Notice of Proposed Amendments', *Defence Aviation Safety Authority*, accessed 16 July 2020, <https://www.defence.gov.au/DASP/DASR-Regulations/DASRNPA/Default.asp>.

53 A qualified remote pilot is '[t]he person in direct command/control of the UAS, including manipulating flight controls or programming waypoints during flight' as defined in the glossary of terms; DASR, Air Operations, UAS.35(a)(7), UAS.35(b)(10), UAS.35(c)(11), UAS.35(d)(10), UAS.34(e)(6).

54 DASR, Air Operations, GM UAS 35.A(7).

55 DASR, Air Operations, GM UAS 35.A(7).

56 The DASR are therefore the relevant regulations going to the airworthiness of the UAVs being utilised by the ADF, including military aircraft with some levels of automation. DASR, Air Operations, UAS.35(a)(7), UAS.35(b)(10), UAS.35(c)(11), UAS.35(d)(10), UAS.34(e)(6).

57 See further DASR, Air Operations, UAS.20, UAS.30, UAS.40.

58 See further DASR, Air Operations, UAS.20, UAS.30, UAS.40.

59 'Proposal to Created Common Rules for Operating Drones in Europe', *European Aviation Safety Authority*, September 2015, p 3, [https://www.easa.europa.eu/sites/default/files/dfu/205933-01-EASA\\_Summary%20of%20the%20ANPA.pdf](https://www.easa.europa.eu/sites/default/files/dfu/205933-01-EASA_Summary%20of%20the%20ANPA.pdf).

be operational under a 'Standard Scenario' which is a pre-authorised use based on there being multiple uses of a UAV 'in a similar operating environment, and where the required risk control can be clearly identified by the Authority'.<sup>60</sup> Open category allows 'micro', 'very small' and 'small' craft to be operated on the basis of a number of principles associated with them being low risk, for example, operated below 120m, within line of sight, not near the general public, or away from runway approach paths.<sup>61</sup> Regulations exist both for the weaponisation of a UAV by the ADF and for the carriage of passengers.<sup>62</sup> Weaponisation is 'any form of ordnance adopted/included/attached to a Defence owned or operated UAS for the purpose of applying a kinetic effect to personnel and/or equipment'.<sup>63</sup>

The regulations for each category of UAV, and for the weaponisation and carriage of passengers by a UAV, incorporate a range of international legal principles for aviation safety. The UAV cannot, for example, obstruct another aircraft,<sup>64</sup> interfere with a public safety or emergency operation,<sup>65</sup> create a hazard in any way, or operate in a restricted area (without permission). Further, '[t]he operator of a UAS must report any identified UAS aviation safety event'.<sup>66</sup> All data and access to support initial and ongoing compliance assurance of UAS operations must be made available to DASA.<sup>67</sup> For the carriage of passengers DASA approval is required. This approval is given on a case-by-case basis with the 'level or safety presented by manned aircraft airworthiness' being the benchmark.<sup>68</sup> DASA is only concerned with weaponisation from the perspective of aircraft safety, rather than the operational use of weapons, and as such 'does not aim to prescribe any limitation on a Commander's decision of when or how to employ those weapons'.<sup>69</sup> Amendments to existing legal frameworks would need to be made to allow for the use of autonomous military aircraft by the ADF. However, once the remote pilot requirement is removed from the legal framework, there is nothing inherent about an autonomous system that would make compliance with the other DASA provisions impossible.

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60 DASA, Air Operations, UAS.30.C.

61 DASA, Air Operations, UAS.40. Note *Civil Aviation Safety Regulations 1998* (Cth), s. 101.238.

62 The DASA uses the term UAS. As defined in the glossary of terms an Unmanned Aircraft Systems (UAS) UAS is defined as: '[t]he entire system consisting of the unmanned aircraft (UA), Remote Pilot Station (RPS), communications/data links, networks, launch and recovery systems, and personnel required to fly/control the UAS.'; DASA, Air Operations, UAS.50(a); DASA, Air Operations, UAS.50(b).

63 DASA, Air Operations, GM UAS.50.A.

64 See, for example, DASA, Air Operations, UAS.35(a)(3), UAS.35(b)(4), UAS.35(c)(6), UAS.35(d)(5).

65 See, for example, DASA, Air Operations, UAS.35(b)(3), UAS.35(c)(5), UAS.35(d)(4), UAS.40(a)(2)(iv).

66 DASA, Air Operations, UAS.50(a).

67 DASA, Air Operations, UAS.70(a).

68 DASA, Air Operations, GM UAS.50.B.

69 DASA, Air Operations, GM UAS.50.A (1).

The current version of DASR reflects Defence's current thinking about using UAS – emphasising the transport of goods and ultimately people but with weaponisation also clearly in mind. To give effect to ADF's objectives will require some balance between retaining human command of ADF operations – in particular, the use of force – and maximising the potential of autonomous systems. Given the observations made above about regularity and relative ease of amendments to the DASR, it would seem highly likely that the DASR will undergo amendments in the coming years to ensure that the ADF is best able to use the technology at its disposal.

### **The use of force by military autonomous aerial vehicles – applicable domestic criminal law for war crimes**

The *International Criminal Court Act 2002* (Cth) and the *International Criminal Court (Consequential Amendments) Act 2002* (Cth) which amended the Code introduced the possibility of prosecutions in Australia for the commission of international crimes. This includes crimes committed by Australian Service personnel anywhere in the world during armed conflict in violation of the laws and customs of war. Chapter 8, Division 268 of the Code deals specifically with war crimes and significant penalties of up to 25 years imprisonment apply. Crimes include attacks which cause destruction and appropriation of property,<sup>70</sup> attacking civilians or civilian property,<sup>71</sup> attacking personnel or objects involved in a humanitarian assistance or peacekeeping mission,<sup>72</sup> and attacking undefended places.<sup>73</sup>

Division 268 is reflective of the international law obligations that bind Australia as a signatory to the Geneva Conventions of August 1949 and a variety of other international law treaties that prohibit the use of specific means and methods of warfare during times of armed conflict.<sup>74</sup> Where military autonomous aerial vehicles are weaponised, so as to allow for the possibility of the use of force in operational situations of armed conflict, the question of legal accountability under the laws of armed conflict is one that has attracted significant attention.<sup>75</sup> Like the Code itself, these laws do not specifically regulate autonomy. The most

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70 *Criminal Code Act 1995* (Cth), s. 268.29.

71 *Criminal Code Act* ss. 268.35 and 36.

72 *Criminal Code Act* s. 268.37.

73 *Criminal Code Act* s. 268.39.

74 For example, Australia is a party to a wide range of weapons law treaties: ICRC, *States Party to the Following International Humanitarian Law and Other Related Treaties as of 23-Oct-2020* (26 October 2020) <https://ihl-databases.icrc.org/ihl>.

75 Although note the caution from McDougall questioning the relevance of accountability in the debate: Carrie McDougall, 'Autonomous Weapon Systems and Accountability: Putting the Cart before the Horse', *Melbourne Journal of International Law*, 2019, 20(1).

quintessential example of an autonomous weapon, the landmine, is specifically prohibited by treaty.<sup>76</sup> Sea mines are also regulated.<sup>77</sup> However, autonomy as a concept or specific component of a weapon is not regulated by treaty. States are currently engaged in a series of discussions about how laws of armed conflict (LOAC) might accommodate or prohibit certain autonomous weapons systems.<sup>78</sup> Specific regulation in the future is a possibility, but for now it seems unlikely that states would agree to a treaty regulating autonomous weapons systems given their differing views.

Instead, the rules of international law applicable in armed conflict (international humanitarian law) concern the means and methods of warfare that can be used in armed conflict. In sum, any means and methods of warfare employed (which includes weapons) must not be indiscriminate, cause unnecessary suffering or widespread, long-term and severe environmental damage.<sup>79</sup> They must be capable of being used in compliance with the principles of distinction between combatants and civilians (and between military objectives and civilian objects),<sup>80</sup> and proportionality when deployed.<sup>81</sup> At all times, there is an obligation to take appropriate precautions in attack.<sup>82</sup>

These are legal obligations held by individuals.<sup>83</sup> They are not obligations that can be 'outsourced' to autonomous aerial military platforms. As such, in any decision-making by the ADF to employ military autonomous aerial vehicles in situations of armed conflict it is imperative that those operating the relevant platform can be confident that they can comply with their individual legal obligations. Specially, these legal obligations are drawn, under domestic law, from the Criminal Code Division 268. This has significant potential strategic, tactical and logistical implications for the ADF and must therefore be recalled in

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76 *Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction*, Oslo, 18 September 1997.

77 The Hague Convention VIII Relative to the Laying of Automatic Submarine Contact Mines of October 18, 1907.

78 Group of Government Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems established at the 2016 Fifth Convention on the Prohibitions or Restriction on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects (CCW) Review Conference.

79 Protocol Additional to the Geneva Conventions of 12 August 1949 and relating to the Protection of Victims of International Armed Conflicts, 8 June 1977 (entered into force 7 December 1978) 1125 U.N.T.S. 3 (AP1) arts. 35, 51(4)(b) and (c); Jean-Marie Henckaerts and Louise Doswald-Beck, *Customary International Humanitarian Law*, Cambridge University Press, Cambridge, 2005, 'CIHL Study', vol 1, rules 45, 70, 71.

80 API, art. 51(4); CIHL Study, rule 1.

81 API, art. 57 (2)(b); CIHL Study, rule 14.

82 API, art. 57; CIHL Study, rules 15–21.

83 Law and the Future of War, *Submission to the ADF Concept for RAS 2040*, University of Queensland, 31 July 2020, [https://www.defence.gov.au/VCDF/Forceexploration/\\_Master/docs/Submission-to-the-RAS-2040-13August2020.pdf](https://www.defence.gov.au/VCDF/Forceexploration/_Master/docs/Submission-to-the-RAS-2040-13August2020.pdf).

the design, commissioning and employment of any military autonomous aerial platform.

## **Principally civilian-focused domestic laws**

Higher levels of autonomy in defence systems will require consideration of their impact on a number of principally civilian-focused legal frameworks including workplace health and safety law, privacy law, noise regulations, spectrum management, public liability and environmental laws.<sup>84</sup> A key concern is who is responsible when something goes wrong and results in damage or injury to the public. As Gogarty and Hagger point out, the law of negligence requires that developers, manufactures, systems engineers and operators ‘take reasonable care to avoid or reduce the likelihood of foreseeable harm’.<sup>85</sup> However, as they also observe, in relation to autonomy, ‘the ability of negligence to reach into the maze of complexity and extract a responsible party is likely to be limited’.<sup>86</sup> The determination of fault that is required for negligence actions would be particularly difficult where complex software is involved. There are scholars looking at this issue (particularly in relation to autonomous cars, for example),<sup>87</sup> but the law of negligence does not seek to provide all the answers.

This part of the paper considers a number of these issues with specific reference to the unique characteristic of autonomous aerial vehicles: the use of resources that are desired by both the military and by the civilian population (such as the radiofrequency spectrum); and the reality of a series of unknowns, and unintended consequences, that this technology may bring. In doing so, the paper looks to ascertain the legal challenges for consideration in the design and ultimate deployment of military autonomous aerial vehicles by the ADF.

## **Ubiquitous nature**

A key value-add of military autonomous aerial vehicles will be their ability to operate around the clock, for example, to constantly scan their environment from a surveillance and intelligence gathering perspective. Being able to do this will pose regulatory challenges with respect to matters of significant interest to the public. Noise emissions, even if they are lower than those of more traditional aircraft, are likely to present problems in terms of their persistent nature. The

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84 With respect to UAVs, the same point has been made by Maloney, ‘Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment’ and Gogarty and Hagger, ‘The Laws of Man over Vehicles Unmanned’.

85 Gogarty and Hagger, ‘The Laws of Man over Vehicles Unmanned’, p 123.

86 Gogarty and Hagger, ‘The Laws of Man over Vehicles Unmanned’.

87 Jan Dr Bruyne and Jochen Tanghe, ‘Liability for Damage Caused by Autonomous Vehicles: A Belgian Perspective’, *JETL*, 2017. 8(3).

capacity of autonomous aircraft to collect, record and transmit images and other information about an individual's private activities without their consent is apparent.

The federal government has recently commissioned a review of remotely piloted aircraft (RPA) noise to consider the 'community noise impact of [RPA] operations, the size, frequency and nature of [RPA] operations (recreational and commercial), and existing safety regulations administered by the Civil Aviation Safety Authority (CASA)' and 'examine State and Territory regulations that commonly cover noise from equipment operating in urban environments'.<sup>88</sup> This review does not cover noise from military UAVs,<sup>89</sup> however, it is an indication that the problem of noise is recognised. Indeed, noise emissions have drawn attention in the southern suburbs of Brisbane and Canberra, where *Wing*, a drone company which is a member of the Alphabet Inc. (more commonly known by its subsidiaries' name 'Google') group of companies, has been testing delivery-drone services.<sup>90</sup> ABC News reports that the noise – which from 15 metres away measures 69 decibels (exceeding the daytime noise standard for residential areas of 45 decibels) – 'is equivalent to a loud television, a busy office or a leaf blower'.<sup>91</sup> The noise attracted complaints from throughout the neighbourhoods hosting the trial. *Wing* uses the following language to describe the autonomy of their drones:

[O]ur unmanned traffic management (UTM) software plans a route designed to avoid obstacles and meet regulatory requirements. Once planned, the UTM software indicates to the aircraft that it is safe to fly to the customer's delivery location. The aircraft automatically monitors its systems to make sure it is safe to fly and will prevent takeoff or automatically take contingency actions if a problem is detected. Our trained pilots oversee everything to make sure the system is operating smoothly.<sup>92</sup>

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88 'Review of the Air Navigation (Aircraft Noise) Regulations 2018 – Remotely Piloted Aircraft: Issues Paper', Australian Government, September 2019, [https://www.infrastructure.gov.au/aviation/environmental/aircraft-noise/files/Issues\\_Paper-Review\\_of\\_Air\\_Navigation-Aircraft\\_Noise\\_Regulations\\_2018-RPA.pdf](https://www.infrastructure.gov.au/aviation/environmental/aircraft-noise/files/Issues_Paper-Review_of_Air_Navigation-Aircraft_Noise_Regulations_2018-RPA.pdf); 'Noise Regulation for Remotely Piloted Aircraft (RPA) – Drones', Australian Government, last modified 23 March 2020, [https://www.infrastructure.gov.au/aviation/environmental/aircraft-noise/noise\\_regulation\\_for\\_rpa\\_drones.aspx](https://www.infrastructure.gov.au/aviation/environmental/aircraft-noise/noise_regulation_for_rpa_drones.aspx).

89 'Review of the Air Navigation (Aircraft Noise) Regulations', p 2.

90 Jack Snape, 'Google-Affiliated Drone Delivery Company Clashes with Government over Safety and Noise Concerns', *ABC News*, 21 November 2019, <https://www.abc.net.au/news/2019-11-21/google-affiliated-drone-delivery-company-clashes-with-government/11722380>; Jackson Gothe-Snape, 'Google-Affiliated Drone Delivery Service Found to be Exceeding Noise Limits', *ABC News*, 20 November 2019, <https://www.abc.net.au/news/2019-09-12/canberra-delivery-drone-noise-levels-revealed/11503262>

91 Gothe-Snape, 'Google-Affiliated Drone Delivery Service Found to be Exceeding Noise Limits'.

92 'About Delivery', *Wing*, accessed 17 July 2020, <https://wing.com/about-delivery/>.



This description seems to suggest a relatively high level of automation, although currently human oversight of the system is maintained – limiting to some extent its ubiquity. It provides a good example of some of the concerns that increasing autonomy in military aerial platforms may give rise to.

Currently, noise from military operations is not regulated. The *Air Navigation Act 1920* (Cth) and *Air Navigation (Aircraft Noise) Regulations 2018* (Cth), which require aircraft to have noise certificates, do not apply to military aircraft.<sup>93</sup> Similarly, Australian State and Territory regulations, which include a number of rules pertaining to noise restrictions, do not apply to ‘Commonwealth jurisdiction aircraft’.<sup>94</sup> Rather, the management of noise from ADF bases is governed by policy which explains that Defence works ‘with local communities to reduce noise impacts whilst balancing operational and training requirements’.<sup>95</sup> The Air Force, states its commitment to ‘undertake flying operations in a manner which is considerate of local communities, whilst maintaining the safe operation of the aircraft’.<sup>96</sup> For example, the RAAF Base at Amberley on the outskirts of Brisbane has a Noise Management Plan, which sets out the details of the RAAF aircraft permanently based there as well as the aircraft that would result in the most ‘common foreseeable variation to the regular flying schedule’.<sup>97</sup> The plan asserts that ‘[w]here possible, RAAF Base Amberley will advise the local community of non-routine flying events’.<sup>98</sup> ‘Fly Neighbourly procedures’, which are articulated in the Noise Management Plan seek to demonstrate how the community and operational and training requirements are balanced.<sup>99</sup> Future autonomous aerial vehicles will be significantly less noisy than the existing Super Hornets, Hercules and Orions, for example; however, their potential persistent nature will require, at least at the policy level, consideration of how the ADF will ensure this neighbourly balance. This is relevant not just for the wellbeing of the human neighbours of the ADF. Aircraft noise may also pose risks to livestock, as identified by the NSW Environmental Protection Authority.<sup>100</sup>

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93 *Air Navigation Act 1920* (Cth), art 2B; *Air Navigation (Aircraft Noise) Regulations 2018* (Cth), art 5.

94 *Environmental Protection Regulation 2005* (ACT), div. 2.1, p 9.

95 ‘RAAF Base Amberley: Noise Mitigation’, Australian Department of Defence, accessed 17 July 2020, <https://www.defence.gov.au/aircraftnoise/Amberley/Noise.asp>.

96 ‘RAAF Base Amberley: Noise Mitigation’, Australian Department of Defence.

97 RAAF Base Amberley: Base Aircraft Noise Management Plan’, Australian Department of Defence, 2 December 2019, para. 7; para. 14, [https://www.defence.gov.au/aircraftnoise/\\_Master/Docs/nfpm/amberley/RAAF-Base-AMB-BANMP.pdf](https://www.defence.gov.au/aircraftnoise/_Master/Docs/nfpm/amberley/RAAF-Base-AMB-BANMP.pdf)

98 RAAF Base Amberley: Base Aircraft Noise Management Plan, para 11.

99 RAAF Base Amberley: Base Aircraft Noise Management Plan, para 16(a).

100 ‘Guidelines on EPA Use of Unmanned Aircraft’, NSW Environment Protection Authority, September 2018, p 10, <https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/epa/18p0775-guidelines-epa-use-unmanned-aircraft.pdf>.

Privacy is a right that necessarily interacts with the potential for the enjoyment of other rights and, in particular, with security considerations. It can be a difficult right to balance effectively.<sup>101</sup> It is clear that in the age of autonomy this will become increasingly problematic and there may well be shifts in the understanding of the right to privacy. Today, we are all carrying personal private trackers in the form of our mobile smart phones that have the capacity to store extensive information about our activities. Post-9/11 we have, as a society, mostly all accepted that we are comfortable with more surveillance of our actions in order to counter terrorist acts. Since the outbreak of COVID-19, many also appear to have accepted that we are comfortable with some surveillance on public health grounds.<sup>102</sup>

Maloney, examining this issue of privacy in the maritime environment, notes the obligations of the ADF under the *Privacy Act 1988* (Cth).<sup>103</sup> They flag that ‘the possibility exists that in the future Commonwealth agencies including Defence may one day be liable to pay compensation to individuals whose privacy is breached by the use of UAV or other activities’.<sup>104</sup> This would arise because military surveillance operations may result in the collection of data about private organisations and individuals in violation of the legislation. Indeed, in February 2018, it became a requirement for Australian Government agencies to report eligible data breaches.<sup>105</sup> This means that the ADF may be involved in situations where they have to report data breaches. The Privacy Act is binding on the ADF (it is binding on the Crown,<sup>106</sup> and it extends to apply to acts or practices done or engaged in by the Department of Defence outside Australia and its Territories,<sup>107</sup> insofar as those acts are in breach of Australian Privacy Principles (APP) or a registered APP code required by foreign domestic law). The Privacy Act covers

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101 See further Des Butler, ‘The Dawn of the Age of the Drones: An Australian Privacy Law Perspective’, *University of New South Wales Law Journal*, 2014, 37(2): 443–48 with the examples of trespass to land and private nuisance.

102 Over 6 million Australian’s have downloaded the COVIDSafe application: Sophie Meixner, ‘How many people have downloaded the COVIDSafe app and how central has it been to Australia’s coronavirus response?’ *ABC News*, last modified 2 June 2020, <https://www.abc.net.au/news/2020-06-02/coronavirus-covid19-covidsafe-app-how-many-downloads-greg-hunt/12295130>.

103 Maloney, ‘Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment’.

104 Maloney, ‘Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment’, p 11.

105 *Privacy Act 1988* (Cth), Part III C.

106 *Privacy Act 1988* (Cth), s. 4.

107 *Privacy Act 1988* (Cth), ss. 5B(1) and 6(1).

both incidentally and deliberately collected information. Information collected must be collected by lawful and fair means and must be stored.<sup>108</sup>

There are restrictions on operating UAVs too close to people. For example, the *Civil Aviation Safety Regulations 1998* (Cth) prevents the operation of UAVs (or other craft without a certificate of airworthiness) over populous areas or within 30 metres of a person unless very specific criteria are met.<sup>109</sup> These rules currently exist for safety reasons, not privacy. However, the reality of UAVs, and even more so with autonomous aerial vehicles if they are operating 24/7, is that there will be unintentional collection of information by intentionally deployed UAVs for legitimate purposes.<sup>110</sup> In any event, imagery can be collected from significant distances. The very nature of surveillance means that images and information about people and their activities will be collected. This will include both information sought by the military, for military purposes, but also information about the activities of individuals – both innocuous and also potentially problematic for them from a personal or criminal perspective. Defence will need to have policies in place to deal with personal information and engage in privacy impact assessments to ensure that in any deployment of a military autonomous aerial platform they are not acquiring private information that is not a necessary part of the remit of the deployment.<sup>111</sup>

### **Drawing on dual-use resources**

Autonomous military aircraft will draw on resources used by the civilian population in order to operate. This includes airspace but also less thought of resources, such as the radiofrequency spectrum. In using airspace, as has already been discussed, autonomous military aircraft will have to share this resource consistent with law and public policy. This will require regulatory and policy decisions to be made with a strong focus on safety and privacy.

RPAs rely on a communication link between the aircraft and the pilot. While autonomous functionality may reduce the need for a link to base, it may increase the need for communication between devices. The nature of autonomous aircraft is that they may require the use of these communications services in order to

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108 See *Privacy Act 1988* (Cth), sch 1, s. 3.5 ('Australian Privacy Principles') which states that 'An APP entity must collect personal information only by lawful and fair means.'; Pursuant to the Archives Act 1983 (Cth). See also Maloney, 'Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment', p 12.

109 *Civil Aviation Safety Regulations 1998* (Cth), div. 101.F.2, regs 101.245, 101.280.

110 Butler, 'The Dawn of the Age of the Drones: An Australian Privacy Law Perspective', p 437, p 442.

111 See, for example, the guidance in Queensland for a Privacy Impact Assessment and the idea of designing privacy considerations into the planning process: 'Undertaking a Privacy Impact Assessment', Office of the Information Commissioner Queensland, accessed 30 July 2020, <https://www.oic.qld.gov.au/guidelines/for-government/guidelines-privacy-principles/privacy-compliance/overview-privacy-impact-assessment-process/undertaking-a-privacy-impact-assessment>.

operate. For example, as Wang and colleagues note, '[a]n efficient, flexible and adaptable spectrum resource sharing method is distinctly important' for swarm technology.<sup>112</sup>

The radiofrequency spectrum is allocated for a range of uses including broadcasting; meteorological and space research and operation; as well as aeronautical and maritime navigation.<sup>113</sup> The spectrum is therefore an economic resource that requires management.<sup>114</sup> A range of industries are globally advocating for engagement in spectrum management.<sup>115</sup> Demand on the spectrum is increasing.<sup>116</sup>

In Australia, radiofrequency spectrum is regulated by the *Radiocommunications Act 1992* (Cth). The Act imposes penalties on persons using radiocommunications when not authorised by a relevant licence under the Act.<sup>117</sup> The Act binds the Crown and, except where the 'contrary intention appears ... applies outside Australia' to 'members of the crew of Australian aircraft, Australian vessels and Australian space objects; and ... Australian aircraft, Australian space objects and Australian vessels'.<sup>118</sup> The Act does not apply to acts or omissions by Defence members 'the purpose of which relates to ... research for purposes connected with defence' or 'intelligence'.<sup>119</sup> Exempt Defence activities also include functions in relation to a facility jointly operated by the Commonwealth and other nations (such as Joint Defence Facility Pine Gap).<sup>120</sup> Defence is clearly exempt from a number of provisions insofar as Defence is operational.<sup>121</sup> Article 26 provides that the bulk of the licensing and general regulatory provisions have no application if the acts or omissions relate to military command and control,

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112 Ximing Wang et al, 'Machine Learning Empowered Spectrum Sharing in Intelligent Unmanned Swarm Communication Systems: Challenges, Requirements and Solutions' *IEEE Access*, 8, 12 May 2020, 89839–89840, <https://doi.org/10.1109/ACCESS.2020.2994198>.

113 'Australian Radiofrequency Spectrum Allocations Chart', Australian Communications and Media Authority, accessed 20 May 2020, <https://www.acma.gov.au/sites/default/files/2019-10/Australian%20radiofrequency%20spectrum%20allocations%20chart.pdf>.

114 'Our Role to Manage Spectrum', Australian Communications and Media Authority, last modified 27 October 2019, <https://www.acma.gov.au/our-role-manage-spectrum>.

115 Jasmeet Judge and Elen Daganzo, 'Spectrum Management for Scientific Uses in US and Europe', Conference Paper, IGARSS 2018 – 2018 IEEE International Geoscience and Remote Sensing Symposium, 22–27 July 2018, <https://ieeexplore.ieee.org/abstract/document/8518230>.

116 Particularly fuelled by mobile phone usage Predicted total economic value of USD 14.5 billion for 2011–2012: 'Mobile Nation: The Economic and Social Impacts of Mobile Technology', Deloitte, February 2013, p 19, <https://amta.org.au/files/Mobile.nation.The.economic.and.social.impact.of.mobile.technology.pdf>,

117 *Radiocommunications Act 1992* (Cth), art. 46. Except in cases of emergency, see art. 49.

118 *Radiocommunications Act 1992* (Cth), art. 13; *Radiocommunications Act 1992* (Cth), art 16(1).

119 *Radiocommunications Act 1992* (Cth), art. 24.

120 *Radiocommunications Act 1992* (Cth), art. 25.

121 *Defence (Special Undertakings) Act 1952* (Cth), art. 26 substantially re-enacts *Radiocommunications Act 1983* (Cth), s. 8(1) of the, the explanatory memorandum of such notes that 'Clause 8 provides that Regulations may exempt certain defence, police, civil defence, etc. personnel from the operation of some of the provisions of the Bill.'

intelligence or weapons systems. However, it is clear that there are ways in which the Act would apply to the ADF. In particular, this would be the case when ADF personnel are operating in the domestic civilian environment. For example, current ADF support projects to the enforcement of coronavirus restrictions are arguably not exempt.<sup>122</sup> Therefore, there is a need to make better use of the spectrum and Defence should be involved in the conversation, especially as Defence has allocations across the spectrum.<sup>123</sup>

### Unknown impacts

Technological developments – many of which are yet to be realised – will result in unknown impacts. Some legal frameworks have already responded to some unforeseen challenges of UAVs. Maloney, for example, raises the issue of the safety of the work practices of drone operators who may be operating the controls for long periods at a time.<sup>124</sup> As Maloney identifies, workers compensation law has developed to include references that would cover the work of drone operators. ‘Drone operators viewing planned strikes’ is listed in the relevant instrument as an activity that constitutes ‘being exposed to repeated or extreme aversive details of traumatic events’, which is a factor that can connect post-traumatic stress disorder with ‘the circumstances of a person’s relevant service’.<sup>125</sup> Negative health consequences for remotely piloted drone operators may be reduced or eliminated by autonomous craft. However, just as the post-traumatic stress disorder cases arising from drone operators was not initially foreseen, there will be implications of higher level automation requiring legal solutions that are also not foreseen.

Workplace health and safety remains one area where this is likely. Indeed, the approach to defence aviation is intrinsically linked to workplace health and safety.<sup>126</sup> The *Defence Work Health and Safety Strategy 2017–2022* acknowledges that ‘[a]t times during overseas operations there may be circumstances where our people are exempt from some provisions of the

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122 ‘Australian Defence Force Personnel Arrive at State Line to Assist in Coronavirus Border Control’, *ABC News*, 12 July 2020, <https://www.abc.net.au/news/2020-07-12/adf-arrives-at-south-australia-victoria-border-to-support-police/12447204>.

123 ‘Australian Government Held Spectrum Report’, Department of Communications and the Arts, 5 April 2019, <https://www.communications.gov.au/documents/australian-government-held-spectrum-report>.

124 Maloney, ‘Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment’, p 12.

125 Statement of Principles Concerning Posttraumatic Stress Disorder for the Purposes of the *Veterans’ Entitlements Act 1986* and *Military Rehabilitation and Compensation Act 2004*, Australian Repatriation Authority, Instrument No. 82 of 2014. See also Maloney, ‘Legal and Practical Challenges Associated with the use of Unmanned Aerial Vehicles in the Maritime Environment’, p 12.

126 DOD, ‘Joint Directive 24/2106’.

[Act]'.<sup>127</sup> Further, the Chief of the Defence Force has issued a declaration under Article 12D(2) of the *Work Health and Safety Act* (Cth)<sup>128</sup> exempting Defence members from provisions regarding health and safety representatives, committees and consultation obligations, as well as from the right to cease unsafe work.<sup>129</sup> However, the ADF clearly has obligations under both the *Work Health and Safety Act 2011* (Cth) and the *Public Governance Performance and Accountability Act 2013* (Cth). For a significant amount of the day-to-day activities for Defence it is clear that health and safety obligations are the same as for other entities of the Crown. The question is whether there is anything about the nature of an autonomous vehicle – including how the vehicle alters the system in which it has been embedded – that means that work health and safety needs further consideration. In the civilian space at least, the federal government seems to have answered this question in the affirmative. The 2014 inquiry by the Australian Government into drones and the regulation of air safety and privacy focused primary on the issue of privacy. However, recommendation 1 concerns safety in the air. The recommendation was for broader 'future consultation processes ... so as to include industry and recreational users from a non-aviation background.'<sup>130</sup> As such, it is perhaps the interplay between defence and civil autonomous vehicles that is likely to be the most pressing concern for the ADF in terms of work health and safety.

Other possible unknown impacts could include those on the environment. Environmental and biodiversity protections may need to be considered in light of the increasing use of military autonomous aircraft. For example, the NSW Environmental Protection Agency has identified the potential for 'risks to the unmanned aircraft from on-the-ground conditions (for example when operating in proximity to mine blasting or during a bushfire, which can impair visibility)' and 'risks posed by unmanned aircraft operating in certain environments (for example ignition risk from unmanned aircraft being present at a hazardous incident)'.<sup>131</sup> A remotely piloted device allowing an operator to manage such risks is arguably less problematic than an autonomous device unintentionally igniting the landscape.

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127 Australian Department of Defence, 'Defence Work Health and Safety Strategy 2017–2022', Australian Government, September 2017, p 2, [https://www.defence.gov.au/whs/\\_Master/docs/policy/Final\\_WHS-Strategy\\_FAweb\\_Oct2017.pdf](https://www.defence.gov.au/whs/_Master/docs/policy/Final_WHS-Strategy_FAweb_Oct2017.pdf).

128 *Work Health and Safety Act 2011* (application to Defence activities and Defence members) Declaration 2012.

129 *Work Health and Safety Act 2011* (application to Defence activities and Defence members) Declaration 2012, schs. 1 and 2 referencing the *Work Health and Safety Act 2011*, ss 38, 39, 47–79, 84–89.

130 Commonwealth of Australia House of Representatives Standing Committee on Social Policy and Legal Affairs, 'Eyes in the sky: inquiry into drone and the regulation of air safety and privacy', July 2014, p 14.

131 NSW Environment Protection Authority, 'Guidelines on EPA Use of Unmanned Aircraft', p 10.

Without a specific autonomous device in mind and an in-depth understanding of its capabilities, it is difficult to determine if, and how, the law will be challenged by autonomy. As well as unknown impacts, there will also be unintended consequences. Autonomy may have significant positive outcomes to offer the military but discussions about how society should best deploy this technology will continue. Autonomous vehicles create ‘an arguably novel situation, wherein artificial intelligence acts on behalf of a human with life-or-death consequences. It is unclear how courts, regulators, and the public will react’.<sup>132</sup> This statement was made almost a decade ago about traffic accidents involving robotic cars, and the sentiment is equally applicable to autonomous military operations still.

Finally, the legal challenges and unknowns posed by autonomy are not just about the use of autonomy itself or the interaction of autonomous devices with other autonomous devices, but rather the interaction of autonomy with more traditional human-controlled devices. In the context of the safety of UASs, Bakx and Nyce have raised the question of how to integrate crewed and uncrewed (remotely piloted) systems.<sup>133</sup> This query is perhaps even more pronounced in respect of autonomous systems. Recognition of the challenges of increasing levels of autonomy, not just for the platform itself but for its interaction with other platforms in the landscape, gives rise to additional legal questions. As noted elsewhere,<sup>134</sup> this is something recognised by International Civil Aviation Organization (ICAO) regarding the potential challenges for integrating a ‘fully autonomous aircraft’ (as compared with remotely piloted ones, where the remote pilot can ensure the ‘safe and predictable operation of the aircraft’) into the international civil aviation system.<sup>135</sup> Autonomous functionality may not itself be problematic in an individual aircraft; however, the autonomous functionality of an aircraft may create as yet unknown challenges for piloted aircraft and other non-autonomous users of the air and the land or water beneath it.

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132 Sven A Beiker, ‘Legal Aspects of Autonomous Driving’, *Santa Clara Law Review*, 2012, 52(4): 1152.

133 Gwendolyn C H Bakx and James M Nyce, ‘UAS in (Inter)national Airspace: Resilience as a Lever in the Debate’, Conference Paper, 5th Symposium on Resilience Engineering, 24–27 June 2013.

134 Massingham, ‘Radio Silence’, pp 184–208.

135 International Civil Aviation Organization, ‘Unmanned Aircraft Systems’ (Circular 328-AN/190, 2011), 3, para 2.2.

## Conclusion

Australia is pursuing ‘trusted autonomous systems’ as a priority area of work for Defence’s strategic research.<sup>136</sup> This will provide many potential opportunities for Defence to engage in operations in ways that are smarter, more efficient and safer than have been possible before, in contrast to the dull, dirty and dangerous work that autonomy seeks to overcome. These new ways will raise legal concerns. It may be that, in fact, autonomy allows the military to more easily meet legal obligations. As others have asked, ‘if autonomous vehicles achieved such a degree of sophistication and safety’ would the law in fact require their use.<sup>137</sup> Realising the full potential of the opportunities presented by autonomous military aircraft for the ADF will require consideration of the legal concerns. Without an appreciation of these legal frameworks, the Navy, Army and Air Force will not be in a position to safely and effectively get their autonomous assets to the starting line of an armed conflict. Without a proper analysis of the gaps that pose challenges to the ADF in their day-to-day operations, these gaps will not be addressed.

In this paper, the path towards greater levels of autonomy being deployed by the ADF has been canvassed from a legal perspective. In particular, the relevant domestic DASR and domestic criminal laws, as well as the implications of the non-military specific domestic legal frameworks that impact on the military’s day-to-day operations have been highlighted. In the design and deployment of any new means or methods of warfare or, indeed, in any aerial craft that the ADF seeks to deploy into the future, it is imperative that these considerations be taken into account.

Aircraft with high levels of autonomy that would enable them to operate independently of human intervention are specifically excluded from deployment by the ADF under the DASR. This means that amendments will need to be made, not just to the DASR, but potentially also to other domestic laws to ensure coexistence and effective use of resources (including intangible ones) by both the military and the civilian population in Australia. However, even though some amendments may be necessary and suitable, in the end all autonomous military aircraft must be designed and relied upon with the safety of the civilian population in mind. And while the interplay between law and technology may enhance some ADF capabilities, it may also limit the ability of the ADF to make use of other technological developments of the future.



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<sup>136</sup> Australian Department of Defence, *Defence Industry Policy Statement*, pp 31–32.

<sup>137</sup> Chris Jenks and Rain Liivoja, ‘Machine Autonomy and the Constant Care Obligation’, *ICRC Blog*, 11 December 2018, <https://blogs.icrc.org/law-and-policy/2018/12/11/machine-autonomy-constant-care-obligation/>, noting Dan Saxon, *International Humanitarian Law and the Changing Technology of War*, International Humanitarian Law Series, vol. 41, Martinus Nijhoff, Boston, 2013.



