UNIVERSITY OF BIRMINGHAM

THE SECURITY IMPACT OF DRONES: CHALLENGES AND OPPORTUNITIES FOR THE UK

Birmingham Policy Commission

The Report
October 2014

Cover images (clockwise from top left)

1. Reaper Remotely Piloted Air System. Image by Sergeant Ross Tilly (RAF); © Crown Copyright 2014.
2. Taranis in flight. Copyright © 2014 BAE Systems. All rights reserved.
3. T-Hawk Remotely Piloted Air System in Afghanistan. Image by Captain Dave Scammell; © Crown copyright 2012.
4. Mantis at Warton Copyright © 2014 BAE Systems. All rights reserved.
5. Black Hornet Nano Helicopter. Image by Richard Watt; © Crown copyright 2013.

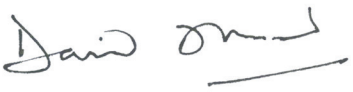
Foreword
by the Chair of the Commission

Professor Sir David Omand GCB

I was intrigued when Professor Wheeler of the University of Birmingham first approached me to discuss what he saw as significant gaps in British policy over the future use of remotely piloted aircraft, or drones (to use the popular term). The more I looked into the subject, the more convinced I became that the government was unnecessarily defensive over the use of drones by the Royal Air Force, and that this was a welcome and highly discriminating technology which, if used in accordance with domestic and international law had a great deal to offer both for future military operations and for civil use. A technology whose time had come but whose exploitation to the UK's overall benefit – including for domestic security - would be held back by a lack of central direction of policy. A technology that some nations might want to extend in directions incompatible with international law, but where the UK could if it so chooses make a difference in establishing international norms to discourage such developments. A technology too that when it comes to be used domestically could create real concerns over privacy if government does not get ahead of the argument and establish sensible policies and explain them to the public. So we agreed that this was a topic well suited to be the subject of a Birmingham Policy Commission.

Hanging over our deliberations as a Commission was the controversy generated by the use by our principal ally the United States of armed drones to pursue its campaign against al-Qaeda and its associates. As we conclude in our report this is not the first, nor will it be the last, time that UK and US methods of achieving a common objective differ. That consideration should not we believe inhibit the British government setting out its own stall on the issues.

I am very grateful to the University of Birmingham for the opportunity to grapple with these issues and as the chair of a Birmingham Policy Commission to bring together a group of experienced, knowledgeable, and rightly opinionated Commissioners across the spectrum of opinion on the subject. I am very grateful to them for their contribution and support. Having been the Deputy Under Secretary for Policy in the Ministry of Defence and the Permanent Secretary of three government departments I know from first hand experience the Gresham's law of administration that the urgent tends to drive out from the agenda what may be important in the longer term. Any organization has only so much nervous emotional energy to devote to contentious policy making, and that is where the outsiders can help with dispassionate analysis and measured recommendations. In that spirit we commend this report to all those who have interests in, and opinion on, this important subject.



Professor Sir David Omand GCB
Department of War Studies, King's College, London
david.omand@kcl.ac.uk

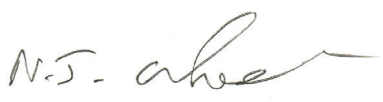
Acknowledgments

Professor Nicholas J Wheeler

The University of Birmingham would like to extend its thanks to the Commissioners for giving their time, energy, and expertise so generously to the Sixth Birmingham Policy Commission. Their valuable input throughout the process has played a key role in ensuring the success of the Commission.

Particular thanks go to the Commission Chair, Sir David Omand, whose commitment, expertise, and skilful leadership has steered the work of the Commission to produce a document which we hope will have significant impact on UK national security policy. I am particularly grateful for the support he has given me throughout this process. The University would like to thank all those who contributed to the Policy Commission by giving evidence, and offering expert advice and opinion. The high quality of these contributions helped to shape the recommendations detailed in this Report. Given the sensitive nature of the subject matter, it is not possible to name all those concerned, but in particular I would like to thank Nigel Biggar, Michael Clarke, Mary Dub, Ben Emmerson QC (UN Special Rapporteur on the promotion and protection of human rights and fundamental freedoms while countering terrorism), Alice Ross, Tom Watson, MP, the All-Party Parliamentary Group on Drones, and Chris Woods for providing comments and feedback at various stages of the drafting process.

The Policy Commission also benefitted from the expertise and commitment of a range of staff at the University of Birmingham. In particular, I would like to thank on behalf of the Commission Dr Christopher M. Wyatt, Dr Jamie M. Johnson, and Lindsay Murch for their outstanding contributions on the research side, and Catherine Edwards for her excellent co-ordination and management of the administrative side of the Commission's work. The valuable input from Dr Audrey Nganwa, Edward Thomas, Jo Kite, Rebecca Lewis, and Jane Arrowsmith is also greatly appreciated. The views expressed in this Report reflect the overall collective conclusions of the Commissioners; they should not necessarily be taken to reflect the views of their organisations or the researchers whose work is cited.



Professor Nicholas J Wheeler, University of Birmingham

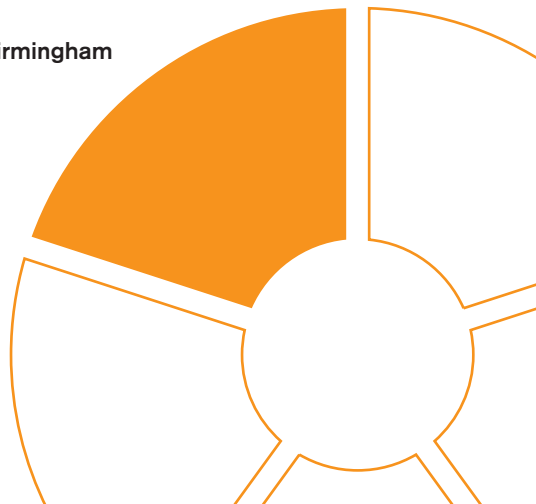


Table of Contents

Executive Summary

The purpose of this Policy Commission is to explore the issues that confront the UK government in the development, regulation, and use of RPA (Remotely Piloted Aircraft), as well as in reacting to the proliferation of this technology on a global scale. RPA now represent an increasingly important potential for the modern military as well as for civil authorities concerned with safety, security, and policing. The application of RPA technology has great economic value and social benefit in areas such as agricultural and industrial production, environmental monitoring, media, and retail. We must expect RPA to become ubiquitous in the short to medium term in the world's advanced economies, and the United Kingdom will be no exception. Our findings are aimed at helping the UK government have in place the policies to deal with the important social, political, legal, and economic consequences of the widespread arrival of RPA.

Our focus is on the military, intelligence, and policing roles that RPA perform. It is in these areas that government must take the lead and has the greatest interest in determining future developments. Attending to these matters is important for any state, but for the United Kingdom they have particular significance. The UK defence and aerospace industries are on the cutting-edge in the manufacture and design of RPA, though not yet mass producers like the United States. Retaining this technological edge is essential in a growing global market-place for these systems, as well as in supporting UK defence needs. The UK government is, and will continue to be, one of Europe's principal military powers, retaining an aspiration to play international roles in military operations, crucially alongside key allies. It therefore needs modern, technologically-advanced armed forces. Technological and fiscal challenges necessarily drive the United Kingdom towards RPA partnerships with key allies. The UK's only armed RPA, the Reaper, is purchased from General Atomics in the United States and the Taranis prototype, developed by BAE Systems in conjunction with the Ministry of Defence (MoD), is giving rise to collaboration with France on a possible joint unmanned Future Combat Air System.

We recognise, however, that there are significant obstacles to the use of RPA that must first be overcome. We highlight three.

The first challenge is in gaining wider public understanding and acceptance of the soundness of the ethical and legal frameworks within which the RAF will operate its armed RPA, including new systems as they become available. We reject the argument of those that would single out RPA technology as novel and therefore intrinsically problematic, a position driven by what many perceive as illegal US use of RPA to kill leading figures of al-Qaeda and associated jihadist groups and of the civilian casualties that have resulted. UK policy regulating the use of armed RPA in Afghanistan already meets the highest standards of distinction and proportionality under international humanitarian law, and has played a vital role in force protection. We also reject the

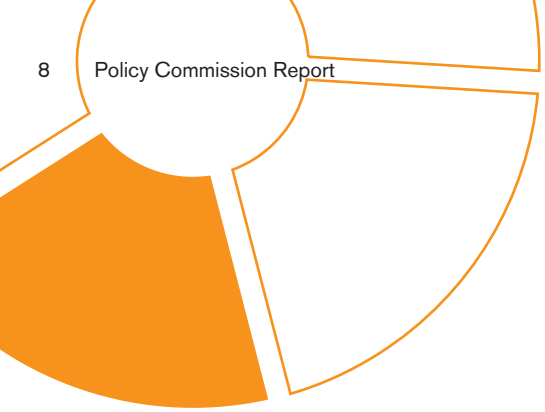
opposite view of the over-enthusiastic who would seize on the absence of a pilot at risk in the air, and the undoubted precision of the weapons that an RPA can carry, to allow future use of UK RPA for targeted killing of terrorist and insurgent leaders outside the battlefield, along the lines of the current US counter-terrorism strategy. The litmus test for the Commission of the UK's procurement, deployment, and use of armed RPA is compliance with the law. Doing more to explain to the UK public that the use of UK armed RPA, like any other weapon system, is always in compliance with national and international law, and how that compliance is achieved, is critical to winning such acceptance.

A second challenge is to deal with the fears of some that the inevitable development of more advanced RPA will eventually lead to 'killer robots', the fielding of Lethal Autonomous Weapons Systems (LAWS) that make their own targeting and weapon release decisions and thus do away with the need for a pilot on the ground. For a weapon system to be developed and used legally in armed conflict, it has to be acceptable under international humanitarian law. We support work to automate many of the sub-systems, such as navigation, that support the RPA. But we doubt it will ever be possible to programme autonomous air systems to be able to exercise distinction between legitimate and illegitimate targets. We are not persuaded that it will ever be possible to programme the laws of war into a 'killer robot'. We support the government's decision, as well as that of the US government, not to develop such systems. However, we fear not all actors will be as prudent, and we would like therefore to see the UK government take a leading role in discussions to build an international consensus around a set of norms to regulate, if not ban, LAWS.

A third challenge is around the use of RPA for domestic security. Serious issues of safety and security of airspace and regulation of domestic RPA have to be resolved first. Before police and media surveillance RPA become common in our skies, as we believe they will, the government needs to have consulted the public and established appropriate codes of conduct to safeguard the privacy of the citizen.

With the right policy choices to overcome these challenges, the Commission believes that significant benefits can be reaped – military and civilian – from RPA capabilities. We have, in our Report, ventured a description of a position of which the UK could be proud that could be achievable over the next 20 years. We set that out here since it illustrates how many dimensions the RPA issue has, and the number of different parts of national life that have to be brought together to make policy on the future of RPA in the UK. We suggest that the UK government aims at achieving the following by 2035:

- UK RPA use is viewed as an integral, essential, and normal component of UK airpower. This will have been achieved through greater openness about RPA use, and the training, oversight, and legal regulation of those who operate these systems. Improved openness will have decisively promoted greater public acceptance of the roles these new technologies play and in countering the view that their use is either novel or contentious.
- Parliament regards the deployment of UK RPA overseas in the same light as any other type of military equipment. The government accepts the need to keep Parliament informed under existing conventions applying to overseas deployments.
- UK Armed Forces will have in their inventory an effective mix of RPA capable of both advanced surveillance and the conduct of direct military operations in a wide range of scenarios which might emerge from the strategic uncertainties of the next 20 years.
- That mix will have been created by flexible investment decisions, responding to the appearance of new, powerful and disruptive technologies, and the innovations of potential adversaries. It should include RPA, or what the Royal Navy prefer to call a 'maritime reconnaissance asset', operating off the Queen Elizabeth-class carriers.
- The House of Commons Defence Committee will exercise oversight of MoD's RPA policies as for other military systems.
- Recognising that the UK military aerospace development and design capability, including stealth, will by 2035 be limited to RPA, there will be collaborative programmes in place with our French, German, and Italian allies. This will not be at the expense of cooperative procurement opportunities with the United States, and operational cooperation and exchange postings with the US Air Force (USAF) will continue.



- The UK government will have played a role in clarifying the relative applicability of international human rights law and international humanitarian law in complex conflicts. The UK position on the application of existing international law to the use of armed force will be in line with resulting international opinion.
- The UK military will continue to deploy and operate its armed forces at all times strictly within UK law and UK interpretation of international humanitarian law and human rights law. The rules of engagement for each operation or campaign will continue to reflect this. RPA will continue to be operated in accordance with the same legal principles as other combat systems, involving distinction and proportionality.
- It will be accepted internationally that arrangements need to be in place for the effective *post facto* investigation of armed forces missions, including RPA, that result in civilian casualties, except in those rare cases when this is militarily unfeasible. The UK government will have standing arrangements to that effect. Following casualties caused by armed RPA, the outcome of the government's fact-finding investigations should be made public, even if in redacted form, except where operational considerations preclude this.
- Satisfactory compensation arrangements will be available where such casualties are found to be caused by RPA or other UK weaponry. All this will have been effectively communicated to target audiences in order to minimise any alienation of civil populations in theatres of conflict where British forces are operating and especially to reduce the risk of radicalisation where there are concerned ethnic diasporas, or co-religionists in the UK.
- The UK will retain sovereign control over UK RPA and, when operating RPA from another nation, effective safeguards will be in place to ensure UK personnel will continue to apply UK rules of engagement for weapon release for the theatre in question.
- Ethics training as well as legal instruction will be compulsory for those operating and tasking RPA. RPA will be operated by uniformed military personnel only and operational use will always be supported by the availability of full-time legal advice to the command chain.
- Drawing on well-publicised national and international research and analysis into the consequences of RPA and other operations, the MoD and Permanent Joint Headquarters Staff (PJHQ) will be trained in evaluating the strategic effects of combat systems, including RPA use, on affected civilian communities and, with the UK civil authorities, any potential for blowback domestically, as well as their operational and tactical effects.
- With the hoped for ending of the post 9/11 US campaign against al-Qaeda and associated groups, the use of armed US RPA by the Central Intelligence Agency (CIA) and USAF for targeted killing outside areas of recognised armed conflict will also end, thus bringing the United States and its North Atlantic Treaty Organisation (NATO) allies into a common position on the lawful use of armed RPA. The UK will have been instrumental in creating this NATO consensus, drawing on the work of the United Nations Special Rapporteurs, and others within the wider community of engagement on this question.
- UK governments will have taken the lead internationally in the use of its RPA capability for military assistance and humanitarian purposes. The UN will be routinely authorising the use of RPA in humanitarian and peacekeeping operations for situational awareness, and the Security Council will be prepared to consider authorising the use of force to protect civilians, subject to contributing nations deciding when it is appropriate to use armed RPA for operations under Chapter VII of the UN Charter.
- The UK government will continue to impose strict export controls on the most advanced RPA technologies, but basic RPA technologies will, by 2035, be commonplace around the globe. In the event of the use by terrorist groups of small, commercially available RPA in the UK, the authorities will have successfully reassured the public about the relative significance of this terrorist tactic. They will continue to manage the threat by monitoring RPA related imports and sales in the UK, and by introducing cost-effective defensive measures.

- Agreement will have been reached on safety and security measures to allow the operation of RPA flights in European, including UK, airspace. The commercial use of RPA will have become routine in applications such as agriculture, environmental monitoring, and media broadcasting. UK small and medium enterprises (SMEs) will play a lead role in developing new civil applications.
- UK police services will have ready access to multi-spectral RPA capability for legally-authorised observation and crowd control, organised under national service delivery agreements.
- The use of RPA in the UK by the authorities for directed and area surveillance, including facial recognition software, will be regulated by a Parliamentary approved Code of Conduct under the successor to Regulation of Investigatory Powers (RIPA2000) Part 2, that protects the privacy rights of citizens in accordance with the Human Rights Act. Intelligence data obtained by RPA in the UK will be treated under the same strict data sharing policies in force as for other means of collection. The House of Commons Intelligence and Security Committee will take regular evidence on the application of the Code of Conduct, and on the arrangements for intelligence support for RPA use by the Armed Forces overseas, including the safeguards for exchange of intelligence with allies under ministerially approved guidance to ensure conformity with the UK's interpretation of international law.
- Legislation will regulate the domestic use of the larger RPA by public authorities, the private sector, and by individuals including airworthiness and pilot certification. Regulations by the Civil Aviation Authority (CAA) will continue to control RPA use in restricted airspace.
- There will be well understood and, effectively enforced, restrictions on all private RPA use to protect privacy. A media complaints system under the Royal Charter will adjudicate on *paparazzi* intrusions.
- The technologies relevant to military RPA will have continued to advance including stealth, weight reduction, advanced communications, and the automation of processes such as navigation and manoeuvring. Robotics will have rapidly developed and spread within the civilian economy. With enlightened assistance from government, academia, media, the legal profession, the moral implications of machine autonomy will be clarified and better understood.
- The UK and US governments, as well as other NATO allies and like-minded ethically concerned states, will continue their doctrine of not developing LAWS and insist on having active human control consistent with the requirements of distinction in the use of force under international humanitarian law. This position will have been endorsed at the discussions under the Convention on Certain Conventional Weapons (CCW) in Geneva.

Key findings

The key findings and policy recommendations that appear in each section of the Report are detailed below.

Chapter 1: The Strategic Context

- UK RPA operations have been shown to be highly effective in maximising operational intelligence and in contributing to kinetic operations in which the RPA acts as a force multiplier and force protector. That advantage, however, is significantly dependent on the level to which RPA capabilities seamlessly integrate across different services, and with different allies' capabilities.
- Future UK RPA operations, both Intelligence, Surveillance and Reconnaissance (ISR) and armed, based upon a legally sound mandate, can be expected to make a positive contribution to UK national security.
- Beyond their use in counter-terrorism and counterinsurgency operations, RPA also have potential (but as yet untested) roles in humanitarian crises, contributing to emergency relief efforts, ceasefire enforcement, and conflict de-escalation.
- In the context of counterinsurgency and counter-terrorism operations, RPA are likely, along with other military means such as special forces operations, to be the focus of negative local feelings towards UK and coalition forces.

- Careful decisions on the deployment and specific use of RPA need to be made on a case-by-case basis, and at a suitably senior level of command, such that an appropriate level of strategic oversight is achieved.
- We invite the MoD to do more to explain the mix of forces that the UK deploys on missions, and to reassure critics that the RPA component of the force mix will be subject to the same strict rules as other weapon systems, and that potentially negative psychological and propaganda impacts are taken fully into account.
- Supporting RPA needs to be part of the formal national tasking requirement of the UK intelligence community. Planners should not assume that at the start of any military operation, especially those without strategic warning, that the intelligence base will be sufficient to support the full capability of RPA. The early deployment of ISR RPA may be an essential step to rectify this deficiency.
- The threat to deployed UK forces and to UK interests from RPA operated by hostile groups must be expected to increase.

Chapter 2: Futures

- Over the next 20 to 30 years, successive UK governments will need to keep under review both the mix of conventional manned and unmanned systems in the UK inventory, and the type of aircraft systems to which this mix would apply.
- Since RPA will be an increasingly significant component of the operational capabilities of the British Armed Forces, the UK government should take active steps to inform the public of the likely role of RPA in UK military operations and doctrine. Such steps will help build public confidence in the UK government's overall approach to RPA.
- Technological development and procurement needs to ensure the greatest possible interoperability of RPA across the different services, and with allies.
- The UK government should continue to diversify its procurement and development of RPA in order to avoid the associated risks of sole-source acquisitions and the controversy that this has attracted. The UK government should continue to explore partnerships beyond the United States, especially with France, without jeopardizing the UK's unique position in relation to its principal ally.
- Given the scale of possible industrial and employment benefits, the UK government should develop a clearer sense of the capabilities over which it wishes to have sovereign control. The UK government should promote UK expertise in RPA and related technologies, as this will enhance the economic benefits of growth in the sector.

Chapter 3: Law

- In situations where UK forces are embedded with US or other forces, the UK government should do more by way of reassurance to explain the safeguards which are in place to ensure that embedded personnel remain compliant with international humanitarian law.
- If allied forces use UK RPA, assurances should be obtained that their use is in accordance with UK legal guidelines.
- Appropriate ministers should make periodic public statements conveying the UK government's judgement as to how the balance between international human rights law and international humanitarian law is developing in this field. Foreign and Commonwealth Office (FCO) and MoD legal advisers should communicate with other lawyers and NGOs as to what these developments imply for the legal restrictions applying to British forces in the various operational theatres in which they might be deployed. At the expert level, MoD and FCO lawyers should ensure opportunities to provide supporting detail to the legal profession, academia, and Non-Governmental Organisations (NGOs).
- Following casualties caused by armed RPA, the outcome of the government's fact-finding investigations should be made public, except where operational considerations preclude this. In such situations, the government should at a minimum explain its decision.

- The government should confirm that guidance has been issued to staff, and safeguards put in place, to ensure that in sharing intelligence with the US government and military, the UK government does not inadvertently collude in RPA or other counter-terrorist actions contrary to international law.

Chapter 4: Ethics

- There is no convincing general ethical objection to acquiring RPA, whether armed or unarmed, while the ethical acceptability of their use, like that of other weapon systems, is contextually dependent upon meeting the legal principles of distinction and proportionality.
- We do not consider that the threshold for the use of force will be lowered by the availability of RPA to UK Armed Forces, as long as Parliament plays its proper oversight function.
- Compliance with long-term legal standards removes many legitimate ethical concerns about operational employment. Available evidence suggests that the UK complies with its international legal obligations over RPA.
- Those operating UK RPA should be uniformed military personnel who should have the appropriate ethical and technical training, and the requisite educational level and maturity.

Chapter 5: Lethal Autonomous Weapons

- Against a high-technology adversary, especially in the air, where speed of response and immunity to detection and jamming matter most, a higher degree of automation in RPA would offer unparalleled capacities for achieving aerial dominance.
- Given the strategic advantages of further automation, UK governments will have to decide how far they wish to invest in this technology, given the likelihood that potential adversaries will do so.
- There remain, however, extraordinarily challenging engineering and programming tasks in order to design autonomous systems able to operate in complex and messy operational environments. Such systems would have to be able to apply the principle of distinction between what is a legitimate military target that can be attacked in accordance with international humanitarian law, and persons who require protection, including civilians, surrendering forces, and prisoners of war.
- We have doubts as to whether LAWS as a successor to RPA could ever be developed for ground operations consistently and effectively to implement the distinction between civilians and combatants, and to exercise the proportionality necessary for compliance with international humanitarian law. We support the UK and US governments' decision not to develop LAWS.
- We encourage the UK government to take a leading role in the CCW discussions in Geneva. The UK's military prowess, diplomatic influence, and extensive experience in arms control means that it is well placed to help secure a new and widely endorsed international normative framework. This would raise the stakes for any government tempted to develop LAWS, which would break existing international humanitarian law.

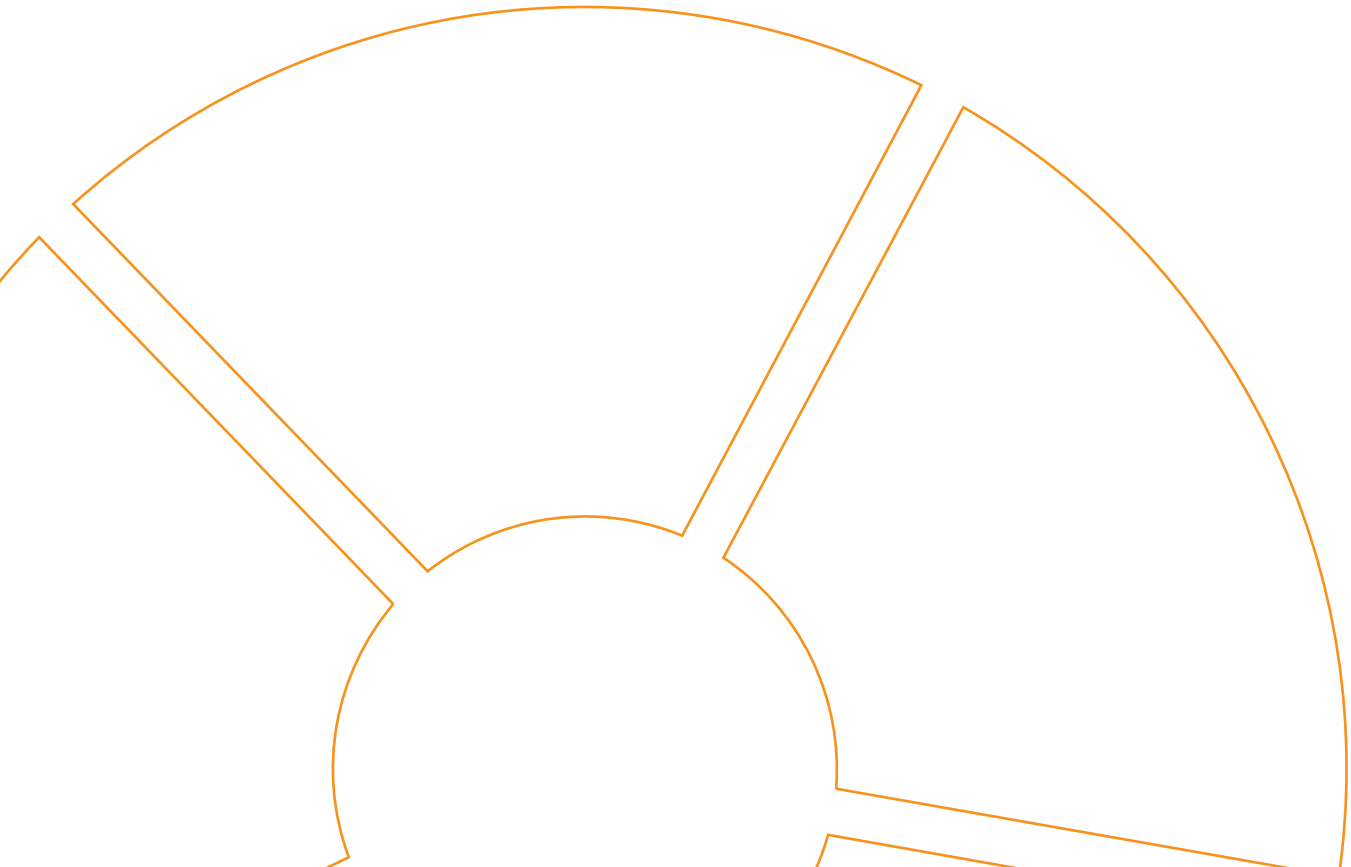
Chapter 6: Proliferation, Civil Use and Regulation

- The need to develop new procedures for RPA to operate safely in or near controlled airspace is a matter requiring urgent attention in order to ensure air safety and to assure public confidence.
- Greater efforts need to be made to publicise existing laws on the use of unmanned flying objects (this should include Chinese lanterns, radio-controlled planes, and their modern RPA counterparts).
- Building on the work already done by the CAA and international counterparts, there is a need to establish a robust regulatory framework without overly constraining civilian use.
- As the nature of British air defence changes, the Royal Air Force and the MoD should consider, with civil authorities, the implications of the malign use of RPA technology by state and non-state actors.

- With the changing nature of defence and law enforcement, traditional notions of counter-terrorism and resilience, such as target hardening and stand-off distances, need to be reconsidered in light of RPA proliferation. These questions deserve serious consideration by those responsible for Britain's resilience strategy, namely the Home Office, Cabinet Office, National Counter Terrorism Security Office, and the Centre for the Protection of National Infrastructure and with those responsible for other counter-terrorism and risk management policies.
- Policy is needed on the rules which should apply for police and security authority use of ISR RPA, for example in routinely monitoring public places for the presence of known criminals or those on counter-terrorist watch lists. A Code of Practice is needed to cover the procedures for authorising surveillance by RPA. The Home Office should accept a policy lead for promoting the efficient use of RPA by the emergency services, for the associated privacy issues and, with the Association of Chief Police Officers (ACPO), engage in public consultation.
- In the wrong hands, RPA could become a dangerous and destabilising delivery system. We doubt how far the proliferation of the various enabling technologies, except perhaps for secure high bandwidth satellite communications, can be controlled.
- We also judge that the UK government is not in a strong position to influence international behaviour over RPA exports, and it has the legitimate concerns of its own aerospace industry to consider. Nevertheless, it would be consistent with general UK policy positions and an ethical concern about international stability and the rule of law, to make every effort to support international efforts to achieve an effective international framework of export control.

Conclusion

- Striking the right tone in public diplomacy over RPA will not be easy. None of the potential problems should be minimised. In our view, a more active and co-ordinated government information policy is essential.
- There is no easy escape from taking the arguments head on, and, in particular, countering assertions in various forms that RPA should be treated in special ways which would make them systematically less available to British forces as operational assets. Nevertheless, the resulting political pressures should be manageable and, providing the UK keeps to its own legal restrictions in operating armed RPA, the global technological momentum of their spread makes it reasonable to expect that controversy will reduce in future years.




Introduction

Introduction

Why this review is timely

No aspect of modern warfare is as controversial as the use of armed drones. Everything about drone technology is contested: its novelty, legality, morality, utility, and future development. Even the choice of what to call such systems is value-laden. The capability is however here to stay, and we must manage the challenges it brings as we learn how to best exploit its military benefits and civil applications. To that end, this Report explores the policy choices that successive UK governments will have to confront and sets out a broad vision for 2035 of what might be achievable for the UK in developing and regulating an effective drone capability. We have chosen this date to match the likely introduction of new generations of drone technology and its spread into the civil sector. While 2035 might seem a long way off, work needs to start now on informing the policy choices that the UK government currently faces and will face in the near future.

Defining the issues

For many in the airpower community, there is puzzlement over why Remotely Piloted Aircraft (RPA) are treated any differently from manned aircraft. For them, RPA simply represent the inevitable culmination of a series of trends in the evolution of aviation. Civil aviation has long been familiar with automatic landing systems. Global Positioning Systems (GPS) have made automatic navigation straightforward. On-board sensors for visual, infra-red, and radar imagery have been miniaturised and provide high-resolution digital output. New, lighter and stronger materials have been developed. Miniaturisation of digital communications with high bandwidth makes command and control from a distance and real-time observation of what is seen from the air practicable. Precision-guided weapons can now have target coordinates uploaded in flight. Put these technologies together and we have the basis of the current generation of RPA, capable of both long duration surveillance and precision attack. While some of these, such as Global Hawk, can be as big as a commercial airliner, others, such as the British Army's PD100 Black Hornet, can be as light as 18 grams.[1]

For many critics, however, the use of drones signals a step-change in warfare that challenges the ethical and legal frameworks that have governed the use of force for decades – a slippery slope that intrudes upon human rights, increases the temptation to use force, and decreases the accountability of those engaged in military actions. Such concerns have been driven, in no small part, by US use of drones for targeted killing outside traditional battlefields in places like Yemen and Somalia, as well as a lack of transparency on these operations. So heated is the debate over the application of this new technology that there is no consensus over what these systems should even be called.[2]

Global Hawk

Historically, the phrase Unmanned Aerial Vehicles (UAV) has been commonplace but this usage is now seen as misleading since there is still a pilot, although on the ground not in the air. The term drone was initially a nick-name used by the military following the use of the 'Queen Bee' radio controlled aircraft used for air gunnery practice in the 1930s.[3] The constant low sound of the engines of these planes possibly contributed to their new name. But drone also has a pejorative connotation, as the 'rather mindless' worker bee, and this no doubt contributes to the rejection of the term by the military.[4] And when drone is used in the media, what is usually meant is an armed drone, usually a Predator or Reaper of the type used by the United States in Afghanistan and Pakistan, and more controversially elsewhere such as Yemen and Somalia.

We have not shied away from the term drones in the title of this Report for that is how the public – and the critics – recognise the subject: simply calling them something else will not make this usage – or the debate – go away. A quick Google search on drones reveals President Obama in his 2014 State of the Union address defending US drone strikes against al-Qaeda (AQ) terrorists, shows companies marketing drones, Amazon talking about future delivery methods by drone, Facebook explaining its drone plan to deliver internet connectivity to the developing world, and Californian farmers using drones to spray their crops.[5] The House of Commons, meanwhile, has an active All-Party Parliamentary Group on Drones (APPG)[6], the work of which has been of great value to the Commission.

The term used by the UK Ministry of Defence (MoD) is RPA, or Remotely Piloted Aircraft Systems (RPAS), to include the ground and satellite based communications components. In this Report, we have mostly used the RPA terminology recognising that two of the key audiences that we wish to engage with are the MoD and government more widely. We also want to highlight the need to prepare for the civil potential of this technology, something which the drone label may inhibit.

In part because of the controversy over what to call these new systems, we believe the UK government has found itself too much on the back foot in its defence of using and owning these aircraft. The merits of UK RPA (we will use RPAS where we specifically refer to the wider ground and communications, including satellite, links) in providing better situational awareness – and thus greater security – for UK forces in Afghanistan and the use of Royal Air Force (RAF) Reapers to offer close air support to deployed UK and allied infantry, whilst reducing the risks of civilian casualties, have often been lost in the conflation of US/UK roles, theatres, operations and names that dominate discussion of the topic. If there is one theme that has recurred in all our deliberations as a Commission, it is the need for clearer, more forthcoming public communication and transparency on the part of the UK government, and the MoD in particular. Without this, the essential and immediate groundwork for the long-term policy choices that we highlight below cannot be laid.

Many of the policy issues surrounding RPA highlighted by the Commission may take many years of effort to arrive at satisfactory outcomes. All the more reason, we believe, to intensify effort now, not least in public diplomacy on the issue, and in working with allies to establish how this new set of technologies can be harnessed in ways that will support and not undermine respect for international humanitarian and human rights law. In that spirit, and recognising the fallibility of prediction concerning future technology, we suggest that the UK government aims at achieving the following by 2035:

- UK RPA use is viewed as an integral, essential, and normal component of UK airpower. This will have been achieved through greater openness about RPA use, and the training, oversight, and legal regulation of those who operate these systems. Improved openness will have decisively promoted greater public acceptance of the roles these new technologies play and in countering the view that their use is either novel or contentious.
- Parliament regards the deployment of UK RPA overseas in the same light as any other type of military equipment. The government accepts the need to keep Parliament informed under existing conventions applying to overseas deployments.
- UK Armed Forces will have in their inventory an effective mix of RPA capable of both advanced surveillance and the conduct of direct military operations in a wide range of scenarios which might emerge from the strategic uncertainties of the next 20 years.
- That mix will have been created by flexible investment decisions, responding to the appearance of new, powerful and disruptive technologies, and the innovations of potential adversaries. It should include RPA, or what the Royal Navy prefer to call a ‘maritime reconnaissance asset’, operating off the Queen Elizabeth-class carriers.
- The House of Commons Defence Committee will exercise oversight of MoD’s RPA policies as for other military systems.
- Recognising that the UK military aerospace development and design capability, including stealth, will by 2035 be limited to RPA, there will be collaborative programmes in place with our French, German, and Italian allies. This will not be at the expense of cooperative procurement opportunities with the United States, and operational cooperation and exchange postings with the US Air Force (USAF) will continue.
- The UK government will have played a role in clarifying the relative applicability of international human rights law and international humanitarian law in complex conflicts. The UK position on the application of existing international law to the use of armed force will be in line with resulting international opinion.
- The UK military will continue to deploy and operate its armed forces at all times strictly within UK law and UK interpretation of international humanitarian law and human rights law. The rules of engagement for each operation or campaign will continue

to reflect this. RPA will continue to be operated in accordance with the same legal principles as other combat systems, involving distinction and proportionality.

- It will be accepted internationally that arrangements need to be in place for the effective *post facto* investigation of armed forces missions, including RPA, that result in civilian casualties, except in those rare cases when this is militarily unfeasible. The UK government will have standing arrangements to that effect. Following casualties caused by armed RPA, the outcome of the government's fact-finding investigations should be made public, even if in redacted form, except where operational considerations preclude this.
- Satisfactory compensation arrangements will be available where such casualties are found to be caused by RPA or other UK weaponry. All this will have been effectively communicated to target audiences in order to minimise any alienation of civil populations in theatres of conflict where British forces are operating and especially to reduce the risk of radicalisation where there are concerned ethnic diasporas, or co-religionists in the UK.
- The UK will retain sovereign control over UK RPA and, when operating RPA from another nation, effective safeguards will be in place to ensure UK personnel will continue to apply UK rules of engagement for weapon release for the theatre in question.
- Ethics training as well as legal instruction will be compulsory for those operating and tasking RPA. RPA will be operated by uniformed military personnel only and operational use will always be supported by the availability of full-time legal advice to the command chain.
- Drawing on well-publicised national and international research and analysis into the consequences of RPA and other operations, the MoD and Permanent Joint Headquarters Staff (PJHQ) will be trained in evaluating the strategic effects of combat systems, including RPA use, on affected civilian communities and, with the UK civil authorities, any potential for blowback domestically, as well as their operational and tactical effects.
- With the hoped for ending of the post 9/11 US campaign against al-Qaeda and associated groups, the use of armed US RPA by the Central Intelligence Agency (CIA) and USAF for targeted killing outside areas of recognised armed conflict will also end, thus bringing the United States and its North Atlantic Treaty Organisation (NATO) allies into a common position on the lawful use of armed RPA. The UK will have been instrumental in creating this NATO consensus, drawing on the work of the United Nations Special Rapporteurs, and others within the wider community of engagement on this question.
- UK governments will have taken the lead internationally in the use of its RPA capability for military assistance and humanitarian purposes. The UN will be routinely authorising the use of RPA in humanitarian and peacekeeping operations for situational awareness, and the Security Council will be prepared to consider authorising the use of force to protect civilians, subject to contributing nations deciding when it is appropriate to use armed RPA for operations under Chapter VII of the UN Charter.
- The UK government will continue to impose strict export controls on the most advanced RPA technologies, but basic RPA technologies will, by 2035, be commonplace around the globe. In the event of the use by terrorist groups of small, commercially available RPA in the UK, the authorities will have successfully reassured the public about the relative significance of this terrorist tactic. They will continue to manage the threat by monitoring RPA related imports and sales in the UK, and by introducing cost-effective defensive measures.
- Agreement will have been reached on safety and security measures to allow the operation of RPA flights in European, including UK, airspace. The commercial use of RPA will have become routine in applications such as agriculture, environmental monitoring, and media broadcasting. UK small and medium enterprises (SMEs) will play a lead role in developing new civil applications.
- UK police services will have ready access to multi-spectral RPA capability for legally-authorised observation and crowd control, organised under national service delivery agreements.

- The use of RPA in the UK by the authorities for directed and area surveillance, including facial recognition software, will be regulated by a Parliamentary approved Code of Conduct under the successor to Regulation of Investigatory Powers (RIPA2000) Part 2, that protects the privacy rights of citizens in accordance with the Human Rights Act. Intelligence data obtained by RPA in the UK will be treated under the same strict data sharing policies in force as for other means of collection. The House of Commons Intelligence and Security Committee will take regular evidence on the application of the Code of Conduct, and on the arrangements for intelligence support for RPA use by the Armed Forces overseas, including the safeguards for exchange of intelligence with allies under ministerially approved guidance to ensure conformity with the UK's interpretation of international law.
- Legislation will regulate the domestic use of the larger RPA by public authorities, the private sector, and by individuals including airworthiness and pilot certification. Regulations by the Civil Aviation Authority (CAA) will continue to control RPA use in restricted airspace.
- There will be well understood and, effectively enforced, restrictions on all private RPA use to protect privacy. A media complaints system under the Royal Charter will adjudicate on *paparazzi* intrusions.
- The technologies relevant to military RPA will have continued to advance including stealth, weight reduction, advanced communications, and the automation of processes such as navigation and manoeuvring. Robotics will have rapidly developed and spread within the civilian economy. With enlightened assistance from government, academia, media, the legal profession, the moral implications of machine autonomy will be clarified and better understood.
- The UK and US governments, as well as other NATO allies and like-minded ethically concerned states, will continue their doctrine of not developing Lethal Autonomous Weapons Systems (LAWS) and insist on having active human control consistent with the requirements of distinction in the use of force under international humanitarian law. This position will have been endorsed at the discussions under the Convention on Certain Conventional Weapons (CCW) in Geneva.

Structure of the report

We start our analysis in **Chapter 1** with a description of the strategic lessons that can be drawn from experience to date with the use of RPA, focusing on how the UK government has employed its small force of RPA in Afghanistan, where a combined total of over 170,000 flying hours had been logged by the end of 2013.[7] We also examine the uses to which UK RPA can be put, including in UK humanitarian and peacekeeping operations.

In **Chapter 2**, we examine the likely future course of the relevant technologies as they continue to evolve, making RPA more capable and affordable. New technologies such as stealth are being developed[8] and automated systems will be applied to reduce the need for human control of RPA missions.[9] There are collaborative opportunities for British industry – and key technologies that need to be kept in the United Kingdom through RPA programmes.

In **Chapter 3**, we reflect on the legal constraints that have governed, and should continue to govern, current and future RPA technology. We consider how the UK's obligations under international humanitarian law and international human rights law have shaped a distinctive British approach to the use of RPA. We look at the legal implications of the use of UK RPA in Afghanistan, as well as the role of UK military personnel embedded with US RPA operatives. The chapter shows how the rules of engagement (RoE) for RPA have the same legal basis as those for more traditional systems, such as manned aircraft, cruise missiles, and artillery. We commend this stance. We also examine how other approaches, such as that of the US military in using armed RPA outside recognised non-international armed conflicts in so-called 'targeted killings', have generated controversy.

As well as the legal issues, critics of 'drone warfare' have raised ethical objections to the way RPA technology has been, and can be used. We examine, therefore, in **Chapter 4** a number of ethical issues, including accusations of technological dehumanisation, and the encouragement of a video game mentality that RPA use is claimed to foster.[10] Here, we also consider the argument that without the risk to pilot or navigator in the cockpit, the temptation will be

for governments to use force more readily, without notice, both literally and politically beneath the radar.[11]

The drone today is seen by some critics as the harbinger of a new era of robotic warfare at once divorced of risk, chivalry, cost, and care. **Chapter 5** looks at the prospects for autonomous weapon systems, which we define as ones that have the following properties: *automation*, *volition*, and *intention*,[12] and whether such systems can ever be compatible with international law in terms of legitimate target discrimination and the minimisation of civilian casualties. The necessary software technology does not yet exist to meet these ends with confidence and the UK and the US governments have stated that they have no plans to develop it. This state of affairs brings into sharp relief the work of the CCW in Geneva and raises the question of whether it is desirable and feasible to pursue an international control regime, and what role the UK government might play in this potential new arena of arms control.

The numbers and types of RPA systems are rapidly growing and more nations are acquiring them. In **Chapter 6**, we examine the implications of such proliferation including civil use and the safety, security and privacy policy issues that need to be addressed if the social and economic potential of RPA technology is to be realised for the UK.

This Report examines UK policy choices, not those of other nations, but it is evident that US RPA use has generated by far the most public attention, and has prompted fears of how UK RPA might be used in the future. As we discuss in the report, the rules under which RPA are used by UK armed forces are no different from those that apply to manned aircraft. Among the armed forces and the security and intelligence communities, no-one is arguing for a departure from the long-held British approach to compliance with international humanitarian law and international human rights law. We, therefore, conclude our review with a **Conclusion** in which we discuss the public diplomacy that is needed to provide reassurance to critics, and encouragement to those who wish to realise the benefits of RPA use for the UK.

1 Northrop Grumman, *Global Hawk*, Northrop Grumman, www.northropgrumman.com/Capabilities/GlobalHawk/Pages/default.aspx, last accessed 2 September 2014; Prox Dynamics, 'PD-100 Black Hornet,' *Prox Dynamics*, www.proxdynamics.com/products/pd-100-black-hornet, last accessed 2 September 2014.

2 Kevin Gosztola, 'Don't use the "D" word: They're "UAVs" or "RPAs" but definitely not "Drones",' *The Dissenter*, 11 October 2013, dissenter.firedoglake.com/2013/10/11/dont-use-the-word-drones-theyre-uavs, last accessed 2 September 2014; Lindsay Murch, Drone Semantics, *Institute for Conflict, Cooperation and Security Blog*, iccsprojects.blog.com/2013/06/09/drone-semantics, last accessed 2 September 2014.

3 House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use – Tenth Report of Session 2013-14, Volume I* (London: The Stationery Office Limited, 2014), p.11.

4 Owen Bennett-Jones, *Drones or UAVs? The search for a more positive name*, BBC News, 2 February 2014, www.bbc.co.uk/news/magazine-25979068, last accessed 2 September 2014.

5 Barack Obama, *State of the Union Address 2014*, The White House, 28 January 2014, www.whitehouse.gov/the-press-office/2014/01/28/president-barack-obamas-state-union-address, last accessed 2 September 2014; Amazon Prime Air, *Amazon Prime Air*, Amazon.com, www.amazon.com/b?node=8037720011, last accessed 2 September 2014; Mark Zuckerberg, 'Facebook post,' *Facebook*, 27 March 2014, www.facebook.com/zuck/posts/10101322049893211, last accessed 2 September 2014; Caleb Garling, 'Drone, drone on the range' *Modern Farmer*, 8 July 2013, modernfarmer.com/2013/07/drones-drones-on-the-range, last accessed 2 September 2014.

6 The register of the All-Party Parliamentary Group on Drones is available from: www.publications.parliament.uk/pa/cm/cmallparty/register/drones.htm, last accessed 2 September 2014. See also their blog at: appgondrones.wordpress.com, last accessed 2 September 2014.

7 Craig Hoyle, 'Hammond praises UK's remotely-piloted aircraft use,' *Flight International*, 18 December 2013, www.flightglobal.com/news/articles/hammond-praises-uk39s-remotely-piloted-aircraft-use-394242, last accessed 2 September 2014.

8 BAE Systems, 'Taranis,' *BAE Systems*, www.baesystems.com/enhancedarticle/BAES_157659/taranis, last accessed 2 September 2014.

9 John Reed, 'UAV auto take-off and landing could save serious money,' *DefenseTech*, 12 October 2010, defensetech.org/2010/11/12/uav-auto-take-off-and-landing-could-save-serious-money, last accessed 2 September 2014; Rick Lavare, 'Fear the Reaper', *Combat Aircraft*, Vol.15/6, June 2014, p.76.

10 Gary Mortimer, 'U.S. Air Force's Gorgon Stare wide-area persistent surveillance system taps mercury federal systems onboard, real-time processing technology,' *SUAS News*, 13 January 2012, www.suasnews.com/2012/01/11243/u-s-air-force%E2%80%99s-gorgon-stare-wide-area-persistent-surveillance-system-taps-mercury-federal-systems-onboard-real-time-processing-technology, last accessed 2 September 2014; Thomas Gibbons-Neff, 'Killing and the drone warrior,' *War on the Rocks*, 6 November 2013, warontherocks.com/2013/11/killing-and-the-drone-warrior, last accessed 2 September 2014; Lambèr Royakkers and Rinie van Est, 'The Cubicle Warrior: The Marionette of Digitalised Warfare,' *Ethics of Information Technology*, Vol.12/3, 2010, pp.289-296; Lindsay Murch, 'Playstation mentality: Conflation of mission and weapons platform,' *Institute for Conflict, Cooperation and Security Blog*, 12 April 2014, iccs.blog.com/2014/04/12/playstation-mentality-conflation-of-mission-and-weapons-platform-2, last accessed 2 September 2014.

11 Sarah Kreps and Micah Zenko, 'The Next Drone Wars: Preparing for Proliferation,' *Foreign Affairs*, March/April 2014), www.foreignaffairs.com/articles/140746/sarah-kreps-and-micah-zenko/the-next-drone-wars, last accessed 2 September 2014; Note by the Secretary-General, 'Extrajudicial, Summary or Arbitrary Executions' (Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions, Christof Heyns, submitted in accordance with Assembly resolution 67/168), *United Nations General Assembly A/68/382*, 13 September 2013, p.5, justsecurity.org/wp-content/uploads/2013/10/UN-Special-Rapporteur-Extrajudicial-Christof-Heyns-Report-Drones.pdf, last accessed 2 September 2014.

12 William Marra and Sonia K. McNeil, 'Understanding the Loop: Regulating the Next Generation of War Machines,' *Harvard Journal of Law and Public Policy*, Vol.36/3, 2013, pp.1139-1185.

Chapter 1

Chapter 1: Strategic Context

By and large , strategy comes into play where there is actual or potential conflict, when interests collide and forms of resolution are required…the realm of strategy is one of bargaining and persuasion as well as threats and pressure, psychological as well as physical effects, in words as well as deeds… It is the art of creating power [1]

Lawrence Freedman

Introduction

Remotely Piloted Aircraft (RPA) are already contributing to the UK's defence needs, performing an *integral* and an *integrated* role as part of the North Atlantic Treaty Organisation (NATO) deployment to Afghanistan. From that recent experience it is apparent that these unmanned platforms offer a range of new possibilities not only for military operations, but also for police and humanitarian activities, as well as new activities, such as environmental monitoring (see Chapter 6). RPA can complement existing kinetic and non-kinetic conventional military capacities, but while it is widely recognised that RPA will comprise an increasingly crucial element in the composition of UK Armed Forces, this will be as part of a mixed grouping that retains manned fixed and rotary wing aircraft assets (see Chapter 2). This chapter explores the implications of the RPA experience to date for UK strategic interests, including an overview of different RPA applications in conventional 'peer to peer' conflicts, counter-terrorism, counterinsurgency, humanitarian peacekeeping, and peace enforcement operations.

Table 1 - UK RPA Fleet [2]

Unmanned RPA	Number in inventory	Description
Reaper	10	Reaper is a medium altitude, long endurance, remotely piloted aircraft system providing ISR capabilities to UK and coalition ground forces in Afghanistan. It is the only armed RPAS used by the UK.
Hermes 450	8	Hermes 450 is a Tactical RPA providing ISR capability (principally video) in support of UK ground forces in Afghanistan. This is being replaced with Watchkeeper.
Desert Hawk III	222	Desert Hawk III is a mini RPA providing an organic ISR capability (principally video) to Platoon, Company and Battle Group level ground forces in Afghanistan.
Black Hornet	324	Black Hornet is a nano RPA providing 'over the wall' ISR capability (video). Each complete system comprises a handheld controller, a display, a base station and two Black Hornet Aircraft.
Tarantula Hawk	18	The Tarantula Hawk (T-Hawk) is a mini RPA providing clearance capability and is used for Counter-IED (Improvised Explosive Device) Convoy Protection operations.

The different purposes of RPA

RPA have two purposes: surveillance and intelligence gathering, and use as a weapons platform. Most RPA are designed for the former, which is a less obtrusive, less controversial, but still vitally important military function. In this Intelligence, Surveillance and Reconnaissance (ISR) role, on-board sensors can relay back video and still images and other intelligence for ground collation and analysis. Although so far primarily military in application, this intelligence role also has civilian analogues in border and fisheries protection, counter-narcotics and smuggling, and police use in crowd control (see Chapter 6).

Armed RPA provide a set of capabilities distinct from manned aircraft, cruise missiles, and ground forces. Long endurance, combined with remote operation and control, offer unprecedented opportunities for extended periods of 'loitering' over targets. While this does not remove current limitations of slow speed and small payload, this set of characteristics give commanders an unrivalled degree of situational awareness. Moreover, the ability to replace pilots and sensor operators for two to three shifts over the duration of a flight ensures continuous human control at a high level of alertness. As discussed in Chapter 4 on Ethics, this situational awareness enhances the level of military judgement, discrimination, and control that can be exercised in battle situations. Pilots of armed RPA are not exposed to the dangers, stresses, and time constraints that attend the operation of manned aircraft in a combat zone and, other things being equal, this can reduce the risk of harm to civilians through accidents or miscalculation. Against this, as discussed later in the Report, opponents of certain RPA operations voice moral objections and warn of the dangers of reckless use by pilots distant from the reality of the target and safe from personal risk.

UK military uses to date

The UK Armed Forces have exploited the military potential of RPA since the mid-1960s, but Cold War RPA projects, although confined to relatively simple artillery spotting rather than wider situational awareness, often experienced delays in development as well as high rates of malfunction and loss. A succession of battlefield surveillance systems, mainly operated by the Royal Artillery, were, in many cases, purchased from abroad, or collaboratively developed. MQM 57 Falconer,[3] produced by Northrop (also known as the AN/USD 1 and designated 'Observer', when it entered service with the British Army in 1964), never saw action and was replaced by the Canadair AN/USD 501 Midge. Midge was used operationally in Kuwait in 1991 and was replaced by the BAE Phoenix, which entered service in 1999, and was used by the British contingent in NATO's Kosovo Force (KFOR), as well as by British forces in Iraq from 2003. Overall, with the exception of these limited systems that were designed essentially to spot targets for artillery, the United Kingdom was slow to identify, invest in, and exploit RPA capability, certainly by comparison with the United States and Israel. As a result no armed UK RPA were available throughout the Iraq campaign.[4] One of the reasons for this slow adoption of the technology may be deep-seated institutional conservatism, a constraint on innovation that the Ministry of Defence (MoD) needs to be wary of when planning for the future manned/RPA balance.

Iraq 2003-2009

The UK's first large-scale use of RPA occurred during the military involvement in Iraq when UK ISR RPA were progressively introduced and updated. Phoenix was retired in 2006 and replaced by an interim system, Hermes 450, based on Israeli designs, with an endurance of 17 hours.[5]

British ISR RPA provided useful situational awareness, both during the 2003 invasion and in the prolonged counter-insurgency campaign that followed. It is reasonable to assume that lives were saved and UK operations were better planned and implemented as a result. As noted above, no armed British RPA were available for use in Iraq during that campaign.

Before their departure from Iraq, British forces also benefitted from the very large numbers of armed and unarmed RPA rushed into service by their US coalition partner, especially following the troop surge ordered by President Bush in 2007. In the prelude to the war, the US Air Force (USAF) had attempted to use armed MQ1 Predators to enforce the northern and southern 'no-fly zones' over Iraq, but discovered that these were vulnerable to Iraqi air defences. This limitation did not apply after the occupation and during the years of violently contested state building. The US used both the surveillance and lethal attack capabilities of RPA extensively to help counter the laying of Improvised Explosive Devices (IEDs), which were a major cause of coalition casualties.

T-Hawk Remotely Piloted Air System in Afghanistan. Image by Captain Dave Scammell; © Crown copyright 2012

In Iraq, US RPA vividly demonstrated their effectiveness in contributing to combined arms efforts during the intense positional fighting of spring 2008. For example, in the struggle for Sadr City, in concert with US helicopter gunships and ground troops, USAF Predators were able to circle low to fire Hellfire missiles, precisely suppressing the mortar and rocket teams which had been bombarding the centre of government in Baghdad's Green Zone.[6] Less visibly than in this high-intensity emergency, the progressive introduction of RPA, especially in the ISR role, added to the effectiveness of manned airpower and special forces, including British special forces personnel, a trend that has continued to the present day.[7] This seems, in particular, to have assisted the high tempo operational and intelligence fusion – *Find, Fix, Finish, Exploit, Analyze, and Disseminate* (F3EAD) – the acceleration of which, orchestrated by General McChrystal, led to crucial improvements in coalition counter-terrorist capabilities.[8]

Watchkeeper Remote Piloted Air System. Image by Andrew Linnett; © Crown copyright 2013

Libya 2011

Although no UK RPA were deployed to Libya, UK pilots embedded in the Creech Air Force Base flew armed US Reapers in the NATO campaign. At the beginning of the Libyan conflict, NATO aircraft faced sophisticated air defences and conventional ground forces. Later, as regime forces dispersed, NATO attack helicopters faced the threat of massed small arms ambushes. RPA not only contributed to force protection and target acquisition but also to Battle Damage Assessment (BDA), helping to direct NATO kinetic efforts in an effective way, enabling the whole range of deployed capabilities to tilt the balance of power on the battlefield decisively in favour of the anti-Gaddafi forces.[9] RPA were helpful in ISR, ground attack, and BDA which became important in a continuously rolling campaign of stand-off NATO air attacks in an environment in which it was essential to have the best possible situational awareness in order to reduce the risk of civilian casualties.

Afghanistan 2009-14

UK armed forces have been involved in Afghanistan since 2001, currently as part of a UN-authorised NATO-led campaign. Increasingly diverse and sophisticated RPA have been progressively introduced for ISR purposes. The Hermes 450 was brought into service under a leasing agreement in July 2007 from Thales/Elbit consortium.[10] Its eventually intended replacement, the Watchkeeper WK450, was supplied to the Royal Artillery in 2011, but was not released into service until February 2014. Smaller ISR RPA, such as Desert Hawk and the tiny, infantry platoon level, Black Hornet, were also brought into service as soon as practicable.

The highest profile UK development has been the introduction into Afghanistan of the first armed British RPA. Since 2007, unlike in Iraq, the UK military has been able to participate alongside the US military in RPA combat operations through its purchase of the US MQ9 Reapers. In addition to supporting UK troops in Helmand Province, which has been the UK military focus of ground deployment since 2006, Royal Air Force (RAF) Reapers, flying from Kandahar Airfield in southern Afghanistan, have been used more widely to assist the NATO-led International Security and Assistance Forces (ISAF). The current 10 Reapers in service can be controlled by RAF pilots based at Creech Air Force Base in Nevada and RAF Waddington in Lincolnshire. RAF Reaper armed missions include continuous force protection of UK, NATO, and allied units, and specific targeted strikes against designated enemy commanders or assets.

As ISAF has recognised, the outcome of any counterinsurgency campaign is heavily determined by political and psychological factors affecting the level of local support for the aims of the government side. Consistent with this,

the MoD has emphasised in evidence to this Commission the care it has taken in Afghan operations to limit civilian casualties. Rules of Engagement (RoE) are not generic, but are theatre and time specific. Under information released on UK RoE for the Afghan theatre, UK armed RPA are employed under exactly the same constraints as manned aircraft.[11] RoE are normally kept classified to prevent adversaries from exploiting their boundaries, but a reference to UK RoE for Afghanistan was made by Ben Emmerson, the UN's Special Rapporteur on the promotion and protection of human rights and fundamental freedoms while countering terrorism, in his September 2013 Report submitted to the UN General Assembly. He noted that the UK government, through its RoE, does not 'authorize strikes on the basis that the infliction of civilian casualties would be proportionate to a high-value military target.'[12]

As we discuss in Chapter 3, this is significantly *more* restrictive than is required by international humanitarian law, which accepts that the effect of necessary and proportionate military operations may be the unintended infliction of civilian casualties. According to the Special Rapporteur, 'It is the policy of the Ministry of Defence that weapons should not be discharged from any aerial platform unless there is *a zero expectation of civilian casualties*, and that any individual or location should be presumed to be civilian in nature unless there is clear evidence to the contrary.'[13]

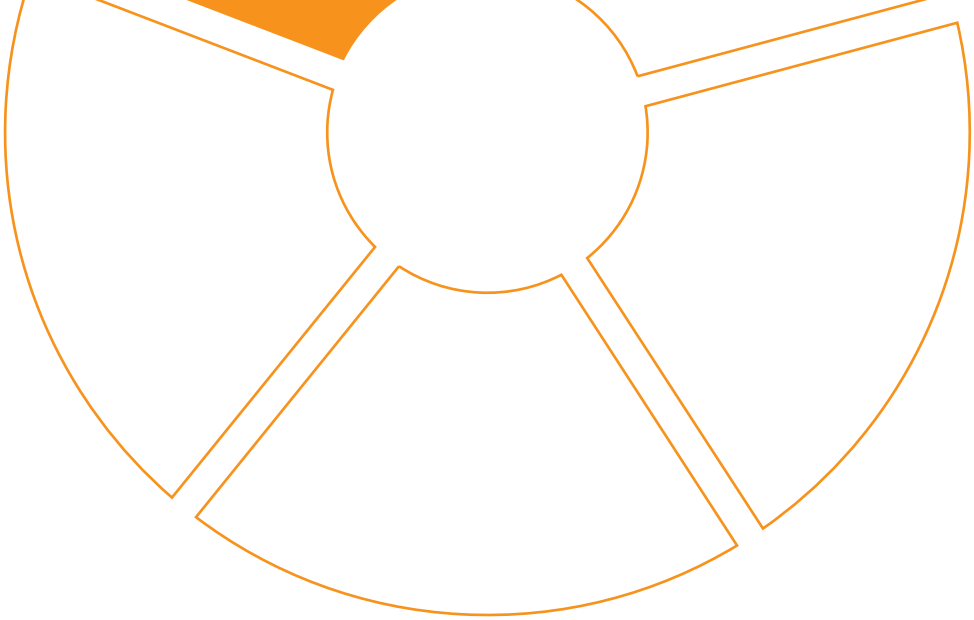
This policy of 'zero expectation' does not mean, and could never have meant, that there could be no civilian casualties as a consequence of the use of RAF Reapers in Afghanistan. In fact, in March 2011, four Afghan civilians were killed and two others injured in a UK RPA attack in Helmand. A Taliban commander was correctly identified and two trucks found to be carrying explosives and weapons were attacked, leading to the deaths of the insurgent leader and an associate. However, it then became clear that civilians had also been travelling in the vehicles. A few months later when the attack was publicised by Chris Cole, founder of Drone Wars UK, a Whitehall source was reported as saying, 'The attack would not have taken place if we had known that there were civilians in the vehicles as well.'[14] This is the only reported incident of its kind in the seven years that the RAF has been operating UK Reapers in Afghanistan.

Ben Emmerson has stated that the UK's use of RPA in Afghanistan represents something like best practice. His comments deserve quoting at length:

> *I and others who have been involved in looking at the process have seen nothing to cause us to question the truth [that] there is a very significant difference between the casualty hit rate of the use of RPAs by the United Kingdom and by the United States even within the same theatre of conflict…the civilian casualty rate in Afghanistan is much lower than it is perceived to be. And per strike, very much lower than was the position at the height of the clandestine RPA drones campaign run by America within Waziristan. I do want to make the point that the evidence of indiscriminate civilian casualties from RPAs is not so far evidence which attaches to the operations of the United Kingdom…What that means is that the United Kingdom in Afghanistan is not adopting the fall-back proportionality principle in international law, that says if we've got a high-value target, we can kill that person even if it involves killing 30 civilians. The United Kingdom does not invoke that principle in its rules of engagement or in analysing the legality of its military operations in Afghanistan.*[15]

The UK's targeting constraints in Afghanistan do not appear to have prevented UK RPA from making a significant contribution to protecting UK, NATO, and Afghan forces. They have not only eliminated some Taliban commanders, combatants, and equipment, but in both armed and ISR roles, they have inhibited movements and tactical options available to insurgents. UK RPA have also provided force protection and overwatch for troops in theatre.[16] The Afghan experience has also emphasised the value of surveillance and armed RPA in diminishing the threat to British forces from IEDs, since those attempting to place them can be detected, and their attacks disrupted. RPA will continue to be used for force protection during the draw down and withdrawal of UK and allied forces from Afghanistan.

There have nevertheless been repeated assertions that allied RPA operations in Afghanistan – both ISR and armed – have created psychological problems for the civilian population and have contributed to violent radicalisation, often referred to as 'blowback.' The evidence upon which to assess such claims is not clear cut. This is probably inevitable given the number, duration and scale of all forms of firefights and bombardments across Afghanistan, and the



methodological challenge of identifying the distinguishable impact that UK RPA operations have had on the battle for 'hearts and minds', against other uses of NATO, and specifically US firepower (for example, manned aircraft, artillery support, and night-raids by special forces). Blowback, if it occurs, cannot be unique to RPA. Without armed support from the RAF Reapers, there would presumably have been a need for increased use of other means to protect UK forces and to try to neutralise Taliban operations. Employment of special forces – often invoked as an ethically and strategically more desirable option than strikes by RPA – also has potential psychological consequences for civilian opinion.[17] Key Taliban operatives, in fact, often resort to fire-fights, even when surrounded at home, or among supporters, rather than surrender, and night raids by special forces are particularly unpopular amongst the Afghan population. Moreover, the largest and most publicised errors of NATO aerial targeting do not appear to have involved RPA, for example in Herat.[18]

Looking to future operations, it is important to note that Afghanistan has been a permissive aerial environment because of the lack of enemy air defences. Risks in air operations were tolerated because of the Taliban's lack of surface-to-air weapons. Such is the proliferation of advanced air defence systems that it would be unwise to plan for future operations on the basis of uncontested air dominance. The UK Permanent Joint Headquarters and Task Force Helmand were able to exercise tight central targeting control over air operations including RPA. Future operations may require mission command to be exercised at much lower levels to cope with fluid tactical situations. Afghanistan cannot, therefore, be taken as a reliable model in all respects for future UK campaigns involving RPA. Nevertheless, the Afghanistan experience of having near real-time overwatch by RPA over deployed ground forces is likely to lead to requests in future for larger numbers of RPA for fire support at Battlegroup level.

There has not yet been a publicly released MoD analysis of the detailed lessons learned regarding the use of RPA over the full duration of UK involvement in Afghanistan, and it will be important that this process eventually draws properly considered conclusions and disseminates them clearly. Methodological difficulties will make it hard to assess definitively both the positive and negative strategic impacts from armed UK RPA. The NATO campaign in Afghanistan was not originally designed around RPA, and the United States and other NATO allies used both RPA and conventional airpower, so that the general population and the Taliban would often not be aware who would have been responsible for particular strikes. Moreover, the US counter-terrorist RPA campaign in the Pashtun areas straddling the Afghanistan-Pakistan border has affected public opinion in both countries. Regardless of the historical judgments to come on these matters, the role of RAF Reapers in the ISAF campaign is likely to be assessed in military terms as very positive, but other, more negative factors, will need to be carefully studied and the balance assessed for guidance in future campaigns.

The use of US RPA in its counter-terrorist campaign

The United States has made innovative use of armed as well as surveillance RPA as part of its legally recognised campaigns in Iraq, and Afghanistan. It has also conducted RPA attacks across international borders in Yemen, Somalia and Pakistan, with varying degrees of real or alleged complicity from the governments concerned, and other regional states, in providing intelligence and basing. The legal justification for these US actions is disputed as discussed in Chapter 3, and there is a growing literature on possible counter-productive 'blowback' effects, including radicalisation and recruitment of terrorists and the destabilisation of friendly Middle East regimes.[19]

In Yemen, the local al-Qaeda branch in the Arab Peninsula (AQAP), long considered the most potent of such groups, has been subject to a significant number of US RPA strikes since 2011, following a plot to bring down a cargo plane in November 2010 over the United States with a timed device hidden in a printer cartridge. Since then, no significant international plot has been mounted from Yemen. High-profile terrorists killed include Anwar al-Awlaki, a US citizen, seen as one of al-Qaeda's senior leaders based in Yemen.[20] Between 682 and 902 militants are estimated to have been killed in US RPA strikes by mid-2014.[21] At least some US RPA seem to be flying from bases in Saudi Arabia[22] as well as Djibouti, and reports suggest that the US military has been joined by the Saudi Air Force in this campaign, making attacks by unmarked aircraft at night.[23]

In Somalia, US RPA strikes have been fewer. The local al-Qaeda affiliate there – al-Shabab – has mounted a number of regional operations, including the attack on the Westgate shopping centre in Nairobi, Kenya, in 2013 in which 60 people were killed, including four Britons and the bombing of a restaurant in Djibouti in 2014. These may be seen as a response to the internationally backed regional intervention (mostly conducted by Kenya and Ethiopia) in Somalia in support of the country's internationally recognized government.

In Pakistan, between 1,675 and 2,855 militants[24] have been killed during the 10-year US RPA campaign, with the highest profile casualty probably the leader of the Pakistani Tehrik-e-Taliban, Baitullah Mehsud, in 2009.[25] His successor, Hakimullah Mehsud, was similarly killed in 2013.[26]

While US RPA strikes do not appear to have stopped the flow of recruits, or to have created senior level prolonged succession crises for AQ and its local affiliates, they have limited to some extent these organisations' capacity to mount serious international operations. As a consequence of US RPA strike and ISR missions, the US Administration believes that leadership-level terrorists are now less experienced and have less authority.[27] The superior surveillance capabilities offered by RPA have allowed for 'pattern-of-life surveillance', enabling the US military to conduct controversial 'signature strikes.' These are targeted strikes, based on patterns of behaviour detected by intelligence, indicating the presence of a high value target or an impending threat.

As we discuss in Chapter 3 on Law, the approach adopted by the US government in its cross-border counterterrorist campaigns of RPA strikes is ethically and legally problematic, and we do not see a role for it in UK RPA use. Many observers would accept that, to date, the US use of armed RPA for cross-border counter-terrorism has helped contain terrorist groups in a tactical sense, and perhaps deprived them of a sense of momentum that they might otherwise exploit. But we join many other experts in doubting whether RPA alone can have a decisive effect on sophisticated international terrorist groups. On the basis of witness testimony and recent public statements by formerly well-placed officials,[28] it is evident that there is a debate in the United States as to the long-term efficacy of RPA in countering terrorist operations.[29] It has been, however, one of the few means available to the US government to mitigate, if not eliminate, the terrorist threat to US citizens and interests from territories which would otherwise remain safe havens, where recognised governments are unable, or unwilling, to enforce international law.

Additional options for the UK government from RPA in contested and chaotic environments

In certain territories, the availability of RPA might provide, subject to a proper legal basis, a wider range of options for using foreign airspace for reconnaissance and intelligence gathering. RPA of various nations are, like intelligence agencies and special forces, operating in conflict prone environments with varying degrees of permission on the part of national governments. In cases where there may be ungoverned space or areas under the effective control of armed non-state actors, we do not think that the UK government should automatically deprive itself of the best and most discreet means of assessing, tracking, and perhaps mitigating, threats to citizens and interests. RPA, which do not risk the life of a pilot, could be particularly useful in this role. There might consequently be an ethical, as well as a strategic case to ensure they are available, although their activities should be subject to cautious and careful decision-making and a proper legal basis.

Options for the RAF Reaper fleet after Afghanistan

The MoD is drawing down UK forces from Afghanistan, with the exception of a few hundred military personnel involved in training the Afghan Army. Speculation has already begun over the future role of the 10 RAF Reapers currently in Kandahar. These are now a significant national asset, both for ISR and air to ground combat. Given the urgent operational requirement for the Reapers in Afghanistan, these were deployed to theatre having been cleared for use on operations, but not having satisfied the normal tests for airworthiness and safety that would be required for aircraft operating in UK airspace. As a result, the Reapers, which are expected to continue in service until 2020, may have to be based outside of the UK. In April 2014, the then Secretary of State for Defence, Philip Hammond, suggested that new bases might have to be found for the Reapers closer to areas of crisis.[30]

There are at least three main ways in which the Reaper fleet could further UK foreign and security objectives and, by extension, contribute to the stability of the wider international environment:

(1) To provide ISR for improved national and allied situational awareness over areas of prolonged crisis

RAF Reapers could be forward-based to assist friendly governments facing violent internal conflict. This might apply to Iraq, depending on the composition of the government in Baghdad. But it is more likely to be politically acceptable when used in support of Commonwealth states such as Nigeria facing a threat from Boko Haram. Reapers are able to use their look-down capabilities to improve knowledge of developments in unstable territories whilst flying over friendly airspace or over international waters. Flying over Jordan could, as a hypothetical example, provide situational awareness of the situation in Syria. With either an internal or external ISR focus, Reapers could add to the effectiveness of military assistance teams from the UK, the European Union (EU), or NATO.

(2) Air-to-ground attack or support operations

The combat power of armed British RPA could also be directly applied to support friendly governments facing major military crisis. For example, had the Reaper fleet not been engaged in active operations in Afghanistan, it would be available to assist the US Administration in its decision to strike Islamic State (IS) forces engaged in mass atrocities against civilians in Northern Iraq.

(3) Humanitarian assistance to states and/or international organizations through ISR or the use of force in complex emergencies

Humanitarian emergencies accompany most major contemporary security crises. RPA could make an important difference in reducing human chaos, cruelty and suffering. In a humanitarian ISR role, RPA would supply critical intelligence, including imagery that can be disseminated to regional and international decision-making bodies, and UN Heads of Mission. This has already happened with the UN deployment of a RPA to the Democratic Republic of the Congo (DRC) to monitor the Chapter VII authorised military operation aimed at restoring peace and stability to the country. In a ground-breaking move, the UN leased two Falco RPA and an operational and support package from commercial companies. At the cost of *circa* $15 million per year, this capability now provides the UN with an unprecedented level of situational awareness, including a capacity to monitor the illicit supply of arms to rebel militias from neighbouring countries. The UN Under-Secretary General for Peacekeeping Operations, Hervé Ladsous, has claimed that the deployment of RPA has allowed the UN mission to 'control the frontier.'[31] A further example was the announcement by the Organisation of Security and Cooperation in Europe (OSCE) on 7 September that it would be deploying initially nationally-owned RPA to supervise the ceasefire in Eastern Ukraine, and that this would be followed by the deployment of OSCE-owned RPA.[32]

In the DRC case, less capable, cheaper, and lower profile RPA like Falco appear to be sufficient. However, we believe that RAF Reapers could also have a role to play in humanitarian emergencies when it comes to protecting civilians from the risk of mass murder and genocide, and in enforcing agreements on recalcitrant factions. The late 20th century histories of Bosnia and Rwanda, for example, might have been less tragic if armed RPA had been able to fly protective air patrols over the UN-declared Bosnian Safe Areas, and places of refuge in Rwanda for thousands of Tutsi and moderate Hutu. Now that the capability exists, in such cases of humanitarian emergency, we can expect pressure for future UK or allied RPA deployments, with or without explicit UN Security Council authorisation.[33]

In the case of armed rather than ISR RPA capability, the UN will be dependent upon its member states to provide armed RPA aircraft and the command and control systems to use them. The UK Reaper fleet is very well positioned to contribute to such missions, under a UN mandate, and successful aerial interventions of this kind would demonstrate to UK and international publics that RPA, like any other technological innovation, can be a force for good.

Threats from adversary use of RPA: new air defence vulnerabilities and responses

This chapter has necessarily concentrated on the armed and ISR implications of RPA for British forces. But it is important that the UK government, armed forces, and police service recognise the need to respond to the threats that the

acquisition of RPA by potential adversaries – state and non-state – might pose in terms of threat or actual use. More effort is needed to consider the implications of this issue in the forthcoming revisions of the UK *National Security Strategy*, the counter-terrorism strategy *Contest*, and *Protecting Crowded Places: Design and Technical Issues*,[34] part of the UK's resilience strategy. This is especially important in light of recent developments in the Middle East.

Since the formation of NATO, the provision of area air defence has evolved so that advanced member states such as the UK have been able to rely on a diminishing number of capable aircraft coordinated through the NATO Air Command and Control System, a trend which will continue through the Typhoon to the F-35 in the future. Following the end of the Cold War, the UK contribution to area defence was reduced to a bare minimum. Basing air defence on such a limited protective shield was justified by reference to the fact that long-range aircraft are possessed by only a few potential state adversaries. The perceived risk after 9/11 of having to intercept a rogue airliner hijacked by terrorists has been met by having a very small Quick Reaction Alert (QRA) force of Typhoon interceptors based at RAF Coningsby and RAF Leuchars. Following the hand over to the army of the latter, two squadrons of Typhoon aircraft are being moved to RAF Lossiemouth.[35] The potential proliferation of RPA technology, however, may require revisiting these air defence assumptions (see Chapter 6 on Proliferation and Regulation).

There are several dimensions to the proliferation challenge, in terms of threats to the homeland, and to UK forces abroad. The first of these is that air defence needs to be thought of in terms wider than simply the threat posed by the military aircraft of hostile states,[36] or of a hijacked civil aircraft being used, as in 9/11, as a flying bomb. With the potential proliferation of RPA for civil and commercial purposes, it is necessary to safeguard against such systems being used with hostile intent.[37]

At the most sophisticated level, this could involve large aerial systems such as remotely piloted light aircraft and helicopters being targeted against high value infrastructure or political targets. At a lower level, advancing technology allows individuals or crowds to be targeted in novel ways, such as swarms of micro RPA. Remotely piloted aircraft open up the aerial realm to a new range of state and non-state actors, presenting the opportunity to attack UK interests from a distance. For some adversaries, the potential for anonymity and deniability might be attractive; for others, the filming of their attacks for propaganda purposes would be a major incentive. With RPA there is no requirement to rely upon the suicide of the operator. And the growing availability of technologies such as 3D printing will add new complications to tracing, apprehending and punishing, and therefore deterring, perpetrators. While there are no obvious and easy answers to these developments, they require serious consideration by the RAF, MoD, and civil authorities.

The threat presented by hostile RPA to deployed British forces is at present greater than to the UK homeland. Static IEDs have been the largest cause of death and injury to coalition forces in Iraq and Afghanistan. The potential combination of IEDs with RPA presents a more mobile, dynamic, and elevated threat by irregular forces equipped with an aerial capability. Combined with spoofing, jamming and hacking of friendly RPA, the danger is that key tactical advantages currently enjoyed by UK and allied forces will be lost, and British casualties in overseas operations may rise to levels that prejudice public support for the mission. It may be a significant warning indicator that the forces of the IS have been reported to have used a reconnaissance drone as a force multiplier to facilitate capture of the key Syrian government airbase at Taqba.[38]

The short to medium term strategic context

As the most recent UK Strategic Defence and Security Review has recognised, we are in a period of historically unusual uncertainty over the direction of UK strategy. In this context, a flexible defence capability, robust against a range of possible futures, ought to be regarded as a premium. The capabilities that RPA provide cannot drive UK strategy, but should, nonetheless, be able to support it with multiple tactical applications in various future scenarios involving technological acceleration, disruptive breakthroughs, and countervailing adversary responses.

Much like manned military and commercial aircraft, and satellites, the utility of RPA will depend on a variety of factors, including some beyond the control of military planners. These limitations include topographic factors, such as dense foliage, which are likely to constrain the operation of armed RPA and limit intelligence gathering and surveillance; and weather factors including wind, rainfall or impaired visibility, although future technological developments may improve the robustness of the RPA itself. Utility will also depend on proximity to secure bases with the necessary maintenance facilities, although the possibility in future of having air-to-air refuelling will alleviate this requirement.

The record to date of RPA contributions to UK military operations, whether wholly British or Allied, is largely misunderstood because of the attention given to armed RPA use rather than the much more important but underreported ISR role. The joint contribution of UK RPA appears to have been strongly positive. The UK enjoys a comparative advantage, and international lead as one of only three nations which have operated RPA in an armed role, and continues to benefit from close operational involvement with high bandwidth, state-of-the-art US satellite command, control, communications, and intelligence.

RPA will also be an increasingly necessary and expected contribution to successful coalition or Alliance campaigns, and so will be essential to the deterrence and compellence roles of UK and allied militaries. The acceptability of that role will, for the next few years, partially condition – and probably divide – political attitudes towards putative campaigns. Force planners will, therefore, within limited investment resources, have to work towards an effective manned and unmanned force mix, tested against the most sophisticated methods of operational analysis in a wide range of scenarios. At the same time, the MoD will need to explain its rationale and reassure the critics that the RPA component of the force mix will be subject to the same strict rules as other weapons systems and will be able, in terms of technical capability and trained personnel, to exercise distinction in order to minimise civilian casualties.

Experience points to the value of procurement choices being based on military cost-effectiveness, taking into account the value of retaining indigenous UK capability. The involvement of UK aerospace industrial interests will, of course, extend into RPA technologies used beyond the military sector, but assisted by decisions on military research and acquisition. The technical-industrial, and politico-military background that will shape the next generation of RPA is discussed in the next chapter.

Key findings

- UK RPA operations have been shown to be highly effective in maximising operational intelligence and in contributing to kinetic operations in which the RPA acts as a force multiplier and force protector. That advantage, however, is significantly dependent on the level to which RPA capabilities seamlessly integrate across different services, and with different allies' capabilities.
- Future UK RPA operations, both ISR and armed, based upon a legally sound mandate, can be expected to make a positive contribution to UK national security.
- Beyond their use in counter-terrorism and counterinsurgency operations, RPA also have potential (but as yet untested) roles in humanitarian crises, contributing to emergency relief efforts, ceasefire enforcement, and conflict de-escalation.
- In the context of counterinsurgency and counter-terrorism operations, RPA are likely, along with other military means such as special forces operations, to be the focus of negative local feelings towards UK and coalition forces.
- Careful decisions on the deployment and specific use of RPA need to be made on a case-by-case basis, and at a suitably senior level of command, such that an appropriate level of strategic oversight is achieved.
- We invite the MoD to do more to explain the mix of forces that the UK deploys on missions and to reassure critics that the RPA component of the force mix will be subject to the same strict rules as other weapon systems, and that potentially negative psychological and propaganda impacts are taken fully into account.
- Supporting RPA needs to be part of the formal national tasking requirement of the UK intelligence community. Planners should not assume that at the start of any military operation, especially those without strategic warning, that the intelligence base will be sufficient to support the full capability of RPA. The early deployment of ISR RPA may be an essential step to rectify this deficiency.
- The threat to deployed UK forces and to UK interests from RPA operated by hostile groups must be expected to increase.

[1] Lawrence Freedman, *Strategy: A History* (Oxford: Oxford University Press, 2013), pp.xi-xii.

[2] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use – Tenth Report of Session 2013-14, Volume I* (London: The Stationery Office Limited, 2014), p.16. The last period for which figures are available was 1 April 2013, and forms the basis of this part of the submission to the HCDC and into the report. Definitions of the different classes of RPA can be found in the Glossary.

[3] Andreas Parsch, *Northrop (Radioplane) SD-1/MQM-57 Falconer*, Directory of US Military Rockets and Missiles, ND, www.designation-systems.net/dusrm/m-57.html, last accessed 3 September 2014.

[4] Michael Draper, *Sitting Ducks and Peeping Toms: Targets, Drones and UAVs in British Military Service since 1917* (West Sussex: Air Britain, 2011).

[5] Elbit Systems, *Hermes® 450 - Tactical Long Endurance UAS*, www.elbitsystems.com/elbitmain/area-in2.asp?parent=3&num=32&num2=32, last accessed 3 September 2014.

[6] Newsweek Staff, 'Military UAVs: Up in the Sky, an Unblinking Eye', *Newsweek*, 7 January 2010, www.newsweek.com/military-uavs-sky-unblinking-eye-89463, last accessed 3 September 2014.

[7] Louisa Brooke-Holland, *Unmanned Aerial Vehicles (drones): An Introduction*, Commons Library Standard Note SN06493, 25 April 2013, p.12, www.parliament.uk/business/publications/research/briefing-papers/SN06493/unmanned-aerial-vehicles-drones-an-introduction, last accessed 8 September 2014; Adam Entous, Julian E. Barnes and Siobhan Gorman, 'More Drones, Fewer Troops', *Wall Street Journal*, 26 January 2012, online.wsj.com/news/articles/SB10001424052970204624204577183234216799116, last accessed 8 September 2014.

[8] Aki Peretz and Eric Rosenbach, *Find, Fix, Finish: Inside the Counterterrorism Campaigns that Killed Bin Laden and Devastated Al-Qaeda* (New York: Public Affairs, 2012), pp.128-133.

[9] UAS Vision, *ScanEagle in Action Over Libya*, UAS Vision, 18 August 2011, archive.today/7VLB#selection-115.0-115.30, last accessed 4 September 2014.

[10] Quentin Davies, 'Written Answers – Unmanned Air Vehicles,' *Hansard*, Column 40W, 26 January 2009, www.publications.parliament.uk/pa/cm200809/cmhansrd/cm090126/text/90126w0009.htm, last accessed 3 September 2014.

[11] House of Commons Defence Committee - Written evidence from the Royal United Services Institute in *Remote Control: Remotely Piloted Air Systems – current and future UK use Tenth Report of Session 2013–14* Volume II, 25 March 2014, p.Ev w16.

[12] Note by the Secretary-General, 'Promotion and protection of human rights and fundamental freedoms while countering terrorism (Report of the Special Rapporteur on promotion and protection of human rights and fundamental freedoms while countering terrorism, submitted in accordance with Assembly resolution 66/171 and Human Rights Council Resolution 15/15), *United Nations General Assembly A/68/389*, 18 September 2013, p.23, www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/a_68_389.pdf, last accessed 3 September 2014.

[13] Note by the Secretary-General, 'Promotion and protection of human rights and fundamental freedoms while countering terrorism, p.23, www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/a_68_389.pdf, last accessed 3 September 2014.

[14] Nick Hopkins, 'Afghan civilians killed by RAF drone,' *The Guardian*, 5 July 2011, www.theguardian.com/uk/2011/jul/05/afghanistan-raf-drone-civilian-deaths, last accessed 3 September 2014; Chris Cole, 'Afghan civilians killed in UK drone strike,' *Drone Wars UK*, 6 July 2011, dronewars.net/2011/07/06/afghan-civilians-killed-in-uk-drone-strike, last accessed 3 September 2014.

[15] Ben Emmerson, 'Ben Emmerson QC and Professor Clarke parliamentary event on drones (part 1),' *United Nations Association – UK*, 4th December 2013, www.una.org.uk/media/audio/4-december-2013-ben-emmerson-qc-and-professor-clarke-parliamentary-event-drones-part-1, last accessed 3 September 2014. In a later interview with the investigative journalist Chris Woods, Emmerson was asked: 'From your study do you view what the British are doing as a reasonable blueprint for other nations to look at if they want to engage on questions of the conventional use of armed drones?' Emmerson replied, 'In the conventional context only, yes. What I can't say is where they stand on the use of armed drones outside conventional theatres of conflict. Because they themselves have refused effectively to come out and say where they stand in relation to the US position' (Emmerson interview with Chris Woods, personal correspondence, 2 July 2014).

[16] Rob Blackhurst, 'The air force men who fly drones in Afghanistan by remote control,' *The Daily Telegraph*, 24 September 2012, www.telegraph.co.uk/news/uknews/defence/9552547/The-air-force-men-who-fly-drones-in-Afghanistan-by-remote-control.html, last accessed 3 September 2014.

[17] Martine van Bijlert, *The Battle for Afghanistan: Militancy and Conflict in Zabul and Uruzgan* (New America Foundation, September 2010), p.17

[18] For example, see *Full Transcript of President Karzai's Interview with IRD*, 5 April 2014, p.3, president.gov.af/en/documents, last accessed 3 September 2014.

[19] Michael Boyle, 'The Costs and Consequences of Drone Warfare', *International Affairs*, Vol.89/1, 2013, pp.1–29, www.chathamhouse.org/sites/files/chathamhouse/public/International%20Affairs/2013/89_1/89_1Boyle.pdf, last accessed 6 September 2014; Wali Aslam, Terrorist Relocation and the Societal Consequences of US Drone Strikes in Pakistan, Oxford Research Group, June 2014, www.oxfordresearchgroup.org.uk/sites/default/files/WaliAslamReport.pdf, last accessed 6 September 2014.

[20] Arabella Thorp, *Drone Attacks and the Killing of Anwar al-Awlaqi: Legal Issues*, House of Commons Library Standard Note 6165, 20 December 2011, www.parliament.uk/business/publications/research/briefing-papers/SN06165/drone-attacks-and-the-killing-of-anwar-alawlaqi-legal-issues, last accessed 3 September 2014; Benjamin R Farley, 'Targeting Anwar Al-Aulaqi: A Case Study in US Drone Strikes and Targeted Killing', *American University National Security Law Brief*, Vol.2/1, 2012, digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1025&context=nslb, last accessed 3 September 2014.

[21] New America, *Drone Wars Yemen: Analysis U.S. Air and Drone Strikes in Yemen*, New America Security Data, August 2014, securitydata.newamerica.net/drones/yemen/analysis, last accessed 6 September 2014.

[22] Hugh Tomlinson, Iona Craig and Michael Evans, 'Leak shows CIA's secret drone base in Saudi Arabia', The Times, 7 February 2013, available at www.thetimes.co.uk/tto/news/world/americas/article3680104.ece, last accessed 6 September 2014.

[23] Iona Craig and Nico Hines, 'Saudi jets join America's secret war in Yemen, The Times, 4 January 2013, www.thetimes.co.uk/tto/news/world/americas/article3647656.ece, last accessed 6 September 2014.

[24] New America, *Drone Wars: Pakistan Analysis*, New America Security Data, August 2014, securitydata.newamerica.net/drones/pakistan/analysis, last accessed 6 September 2014.

[25] For a discussion of the significant impact of Mehsud's elimination, but also the rapidity of his replacement, see Paul Schulte, 'Going Off the Reservation into the Sanctuary: Cross-Border Counterterrorist Operations, Fourth Generation Warfare and the Ethical Insufficiency of Contemporary Just War Thinking', in David Fisher and Brian Wicker (eds.) *Just War against Terror? A Christian and Muslim Response*, (Cheltenham: Ashgate Publications, July 2010).

[26] Saud Mehsud, *Taliban plan wave of revenge attacks in Pakistan*, Reuters, 8 November 2013, uk.reuters.com/article/2013/11/08/uk-pakistan-taliban-idUKBRE9A705I20131108#comments, last accessed 6 September 2014.

[27] John Brennan, *The Efficacy and Ethics of U.S. Counterterrorism Strategy*, 30 April 2012, www.wilsoncenter.org/event/the-efficacy-and-ethics-us-counterterrorism-strategy, Last accessed 6 September 2014.

[28] BBC News, *Former US Afghan commander McChrystal warns of civil war*, BBC News, 21 January 2014, www.bbc.co.uk/news/world-us-canada-25821032, last accessed 9 September 2014; James Kitfield, *Flynn's Last Interview: Iconoclast Departs DIA With A Warning*, Breaking Defence 7 August, 2014, available at breakingdefense.com/2014/08/flynns-last-interview-intel-iconoclast-departs-dia-with-a-warning/?utm_source=Breaking+Defense&utm_campaign=0dbd79d386-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_4368933672-0dbd79d386-407339449, last accessed 6 September 2014;

[29] Jeremy Herb, *Fewer drone strikes likely result of new Obama policy, analysts say*, The Hill, 27 May 2013, thehill.com/policy/defense/301965-fewer-drone-strikes-the-likely-result-of-new-obama-policy-analysts-say#ixzz3CollYO2M, last accessed 9 September 2014; Dan Roberts, 'Obama restricts drone killings and foresees end to 'perpetual war': Increased oversight designed to bring killing programme out of legal shadows as president defends use of strikes in the past, *The Guardian*, 23 May 2013, www.theguardian.com/world/2013/may/23/obama-drone-policy-counter-terrorism, last accessed 9 September 2014.

[30] Chris Cole, Where are *British Reaper Drones Heading after Afghanistan*?, Global Research, 13 May 2014, www.globalresearch.ca/where-are-british-reaper-drones-heading-after-afghanistan/5382100, last accessed 3 September 2014.

[31] Kenny Katombe, *U.N. forces use drones for first time, in eastern Congo*, Reuters, 3 December 2013, www.reuters.com/article/2013/12/03/us-rop-congo-democratic-drones-idUSBRE9B20NP20131203, last accessed 3 September 2014.

[32] OSCE, *OSCE Chairperson-in-Office commends Special Monitoring Mission for quickly adapting to needs of ceasefire monitoring, calls on participating States to help expand the Mission rapidly*, OSCE, Bern, 7 September 2014, www.osce.org/cio/123259, last accessed 11 September 2014; Jason Hovet and Jan Lopatka, *OSCE says will use drones for ceasefire monitoring in Ukraine*, Reuters, 10 September 2014, www.reuters.com/article/2014/09/10/us-ukraine-crisis-osce-idUSKBN0H50Q920140910, last accessed 11 September 2014.

[33] John Karlsrud and Frederik Rosén, 'In the Eye of the Beholder? The UN and the Use of Drones to Protect Civilians', *Stability: International Journal of Stability and Development*, Vol.2/2, 2013, pp.1-10, www.stabilityjournal.org/article/view/94, last accessed 8 September 2014.

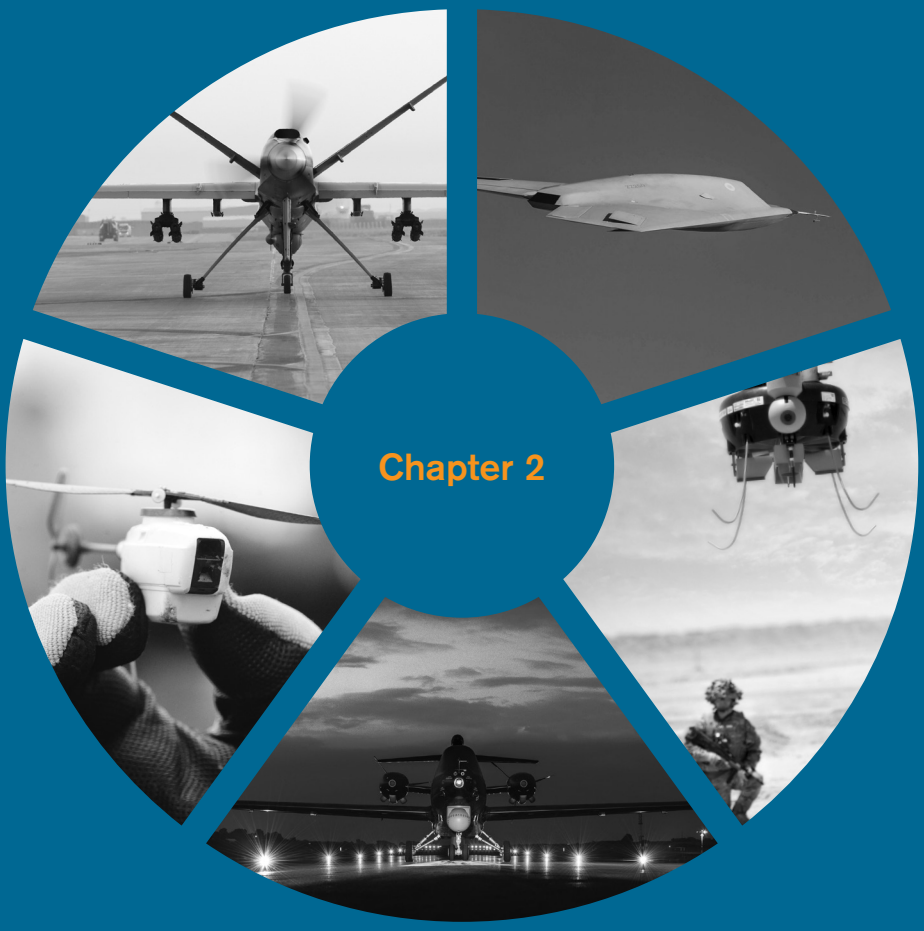
[34] Her Majesty's Government, *A Strong Britain in an Age of Uncertainty: The National Security Strategy*, Cm 7953, October 2010, (London: The Stationery Office Limited, 2010), www.gov.uk/government/uploads/system/uploads/attachment_data/file/61936/national-security-strategy.pdf, last accessed 11 September 2014; Her Majesty's Government, *Contest: The United Kingdom's Strategy for Countering Terrorism*, Cm 8123, July 2011, (London: The Stationery Office Limited, 2011), www.gov.uk/government/uploads/system/uploads/attachment_data/file/97995/strategy-contest.pdf, last accessed 11 September 2014; Her Majesty's Government, *Protecting Crowded Places: Design and Technical Issues*, Home Office, March 2014, www.gov.uk/government/uploads/system/uploads/attachment_data/file/302016/DesignTechnicalIssues2014.pdf, last accessed 11 September 2014.

[35] Ministry of Defence, *RAF's Quick Reaction Alert revealed*, Gov.UK , 20 September 2012, www.gov.uk/government/news/rafs-quick-reaction-alert-revealed, last accessed 3 September. After the closure of RAF Leuchars in 2015 the QRA task will be mounted from RAF Lossiemouth.

[36] David H. Dunn, 'Drones: Disembodied Aerial Warfare and the Unarticulated Threat,' *International Affairs*, Vol.89/5, p.1238, 1246.

[37] Dunn, 'Drones,' p.1244.

[38] Yasmin Tadjdeh, 'Islamic State Militants in Syria Now Have Drone Capabilities', *National Defense Magazine*, 28 August, 2014, www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?ID=1586 last accessed 3 September 2014.



Chapter 2

Chapter 2: Futures

Introduction

This chapter on the next generation of Remotely Piloted Aircraft (RPA) reflects a more longer-term view than is usual in government exercises such as the Strategic Defence and Security Review (SDSR) and the National Security Strategy (NSS), which typically have a duration of five years or so.[1] As we noted in the Introduction, the Commission is working to a timeline that considers where we believe the UK Government should be in terms of its RPA policy and planning by 2035, and the steps that need to be taken to realise that ambition. At this point, it is worth acknowledging that the path of technological progress into the future is variable and complex. There could be surprises. Conflict, or other national emergencies, act as a spur to innovation and could serve as a catalyst to release funding. This can alter the constraints on the deployment of weapons systems. RPA represent a disruptive technology, and the cost of the current Reaper technology and the simpler RPA may well decrease more than expected.

The balance with manned systems

It is widely anticipated within government that the number of RPA in the British Armed Forces will increase significantly.[2] This reflects an assumption that increasingly sophisticated and effective RPA will have the potential to dominate both kinetic and non-kinetic roles (e.g. Intelligence, Surveillance and Reconnaissance or ISR) in possible future military operations. While RPA are of major and growing significance to the composition of British Armed Forces, the current consensus is nevertheless that they will continue to operate as part of mixed groupings, complementing manned combat aircraft, until around 2050.[3] The exact balance of this composition will change over time, but the view of the RAF, as expressed by the current Chief of the Air Staff, Air Chief Marshal Sir Andrew Pulford, is that 'only one third of RAF [will be] unmanned in 2030.'[4] We note that this proportion could alter depending on how the technology, and therefore capability, develops in the force mix. Realistically, the pressures on defence expenditure and the cost of new, more advanced platforms coming into service will have more to do with this debate than the relative capability benefits of manned versus unmanned platforms.

Today, manned aircraft offer a significantly wider range of choices in relation to ordnance deployed in comparison to the current fleet of Royal Air Force (RAF) Reapers.[5] The range of possible ordnance options available to the manned aircraft offers flexibility in both targeting and density of strikes, which RPA are currently unable to match. At first sight, overcoming these deficiencies appears to be merely a question of strapping existing weapons either to current RPA or to new machines as they develop.[6] The political, commercial and industrial reality, however, is that the arrangements under which RPA are acquired may, and currently do, prevent the UK government from buying weapons from sources other than from the original supplier.

In considering the future of RPA use, technology is likely to be influential in three main ways. First, the military application of RPA related technologies will be subject to rapid development which will increase the effectiveness of RPA in the battlespace.[7] Second, the RPA industry will continue to grow on a global scale, including in related ground support, communications and intelligence capabilities, as well as in relation to the air vehicles themselves.[8] Third, collaboration with allies on RPA design and procurement will assume a growing importance but will be fraught with difficulties over the adoption and integration of equipment.

With the global demand for RPA already increasing, international research and development of relevant technologies is likely to expand further and will deliver a number of novel innovations. The Ministry of Defence (MoD) has accepted that 'the UK's inability to nationally fund research and procurement…means that key technologies and opportunities are increasingly being denied to UK industry', although this may be offset to the extent that 'it is likely that the civilian sector will provide any early breakthroughs.'[9] Key areas for research include all those attributes a manned aircraft has which the RPA of the future would also need. In other words, an ability to fly in contested

Reaper UAV Takes to the Skies of Southern Afghanistan. Image by PO

airspace, evasion techniques, vertical take-off and landing, stealth and camouflage modes, increased speed and duration, improved sensors, and improved lifespans, flexibility, and modularity. Within the MoD, key considerations are 'co-ordination and de-confliction' with other aircraft in congested airspace, 'competition for radio-frequency bandwidth and the ability to analyse the flood of collected data.'[10] Similar concerns are outlined in the US Department of Defense (DoD) Roadmap, which highlights automation to reduce bandwidth needs, data protection, and data exploitation. The Defence Growth Partnership (DGP) has drawn attention to British industry strengths in similar areas, with particular reference to 'intelligent systems', including 'electronics, computing and software.'[11]

The Commission has looked at various frameworks for considering technological development in the decades ahead. The most compelling analytical approach we have found is to consider the development of RPA under the headings of: sensors; airframes; propulsion; stealth; munitions delivery; maritime systems; nano, micro, mini, and small RPA; and software. The important distinction between *automated* as against *autonomous* systems is explained in Chapter 5 on Lethal Autonomous Weapons Systems (LAWS).

A(Phot) Tam McDonald; © Crown copyright 2010

Sensors

Sensors are a key area for existing and novel technology development. The aim is to develop smaller, lighter units which are easier to cool, have increasingly agile information management capabilities, and offer extended mean times between failures. The MoD has confirmed that, for the United Kingdom, automated sensors that are capable of recognising, classifying, and detecting are a 'key future capability requirement.'[12] In the near term, the emphasis will be on more energy efficient sensory capacities that can, for example, provide better Improvised Explosive Device (IED) detection capabilities. But we note that these priorities will be subject to reassessment after withdrawal from Afghanistan when more generic capabilities may need to be given higher priority.

Novel developments seem likely in the areas of improved detection of camouflaged targets, the possibility of 'bloodhound mode', which enables specific spectral signatures to be searched for and tracked, and the improved capability to discriminate between decoys and flares.[13] In addition, coping with the necessary high level of regulation of the Electro-Magnetic Spectrum (EMS) will need to be part of developments in this area.[14]

Airframes

As the RPA user community emerges from its experiences in Iraq and Afghanistan, a major preoccupation will be the prospect that future aircraft, manned and RPA, will no longer be able to count on operating in uncontested airspace. Survivability, in the form of stealth technology, higher speeds, and an ability to operate at higher and lower altitudes, will become increasingly important. Potential operations in high threat environments will mean that mission systems will need to become more sophisticated. Similarly, weapons systems available for RPA use will have to continue to develop in terms of the numbers carried on each platform, as well as their ability to act against a wide range of potential targets. New systems, in their totality, will need to be readily and rapidly deployable, including the potential to use some of them from the decks of Royal Navy warships, including the new Queen Elizabeth class carriers, as well as existing helicopter platforms.[15]

Propulsion

The current generation of RPA vehicles is powered by derivatives of conventional aero-engines or adaptations of other power plants. These have been unreliable, although improvements have been made in recent years. With increased mission duration and, more significantly, demands for electrical power to support a growing range of sensor and other payloads, future RPA will require innovative light-weight propulsion systems able to reach an area of operations, sustain a long duration mission, and return to base.

Stealth

The UK Taranis RPA, which has been tested in Australia, is a technology demonstrator which will inform future stealthy designs in RPA.[16] Both the UK and US governments' development of stealth/supersonic RPA have provided

Taranis in flight. Copyright © 2014 BAE Systems. All rights reserved

space for the development of other technologies: radar proofing and jamming, air-to-air refueling, a level of automation to overcome limited bandwidth capacity, jamming and hacking problems, and improved target tracking capabilities. Stealth will continue to be an important area of technological development, in line with the missions that RPA are expected to undertake with 'adaptive surface coatings' a key means of achieving camouflage at all wavebands.[17] Experience gained from technological developments in stealthy manned aircraft will assist in other areas of design such as weapons carriage, engine intake cross-sections, angled reflective surfaces, and masking turbine modulations.

Improved munitions delivery

RPA currently employ weapons for which they were not specifically designed.[18] Whilst this demonstrates an ability to interact with existing hardware, the potential also exists for the development of weapons specifically tailored to RPA missions and designs. The US DoD Roadmap identifies four possible developments in this area: 'weapons designed for multiple missions…weapons designed with multiple modes [to cope with different environments and weathers, and working with manned systems]… weapons designed for use within the unmanned systems environment [where RPA is pitted against RPA] [and] standardized weapons design.'[19] We note that current trends towards smaller, more precise warheads with lower blast radii are unlikely to be reversed. The issue here for planners is that more weapons may need to be launched to ensure the destruction of larger targets or a greater range of weapons may need to be carried in order to achieve mission success. This will increase the need to miniaturise other systems to keep weight and performance in balance. We also note that more sophisticated and capable future RPA might reduce any potential cost savings that current RPA might have against conventional aircraft.

The maritime dimension

We note that considerable development is taking place in the use of RPA from aircraft carriers, with the US Navy focusing on technologies for flight deck awareness and movement.[20] The US Navy's flight deck operable $1.4 billion X-47B demonstrator will be a breakthrough technology.[21] Other work is being done to exploit rotary wing helicopter-type RPA capable of being deployed on the flight decks of existing ships in place of, or in addition to, conventional helicopters.[22] Although there are no current UK plans to use Reaper sized RPA with Queen Elizabeth-class carriers, and attention is focused on the introduction of the carrier-borne F-35, we consider that it is only a question of time before a dedicated RPA carrier capability is raised as an issue. To date, this has been discussed in evidence to the House of Commons Defence Committee, but not in the response of the UK government to it.[23] In time, the debate in the United Kingdom will focus not just on the operation of RPA, but the extent to which the support function is conducted afloat. While superficially attractive as a capability, this option may have considerable cost implications for fully integrated operations.

In the slightly longer term, in potential joint and combined operations, the question of interoperability with US carriers and an RPA like X-47B might also become the chosen system, alongside the MQ-8 Fire Scout. Developments in this area are likely to focus on the compatibility of command and control systems and interoperability with other systems. There will also be practical operating issues as arising from tailhook retract system and jet-blast deflectors to enable greater stability and the improvement of Differential Global Positioning System (GPS).[24] It may, however, be possible that RPA would be able to provide additional support to limited range and endurance helicopters on the new UK Aircraft Carriers.

Nano, micro, mini, and small RPA[25]

RPA come in all shapes and sizes. The UK military has already made use of small-sized RPA such as the RQ-11 Raven and PD-100 Black Hornet which have been deployed in Afghanistan. Micro and mini, including Nano Aerial Vehicles (NAVs), are likely to be the largest growth area in the RPA market (see Chapter 6). These offer both tactical advantages and considerable reductions in running costs against their larger counterparts and other manned vehicles.[26] Major problems identified with miniature RPA include their current inability to withstand 'adverse environmental conditions such as rain, wind, [and] dust',[27] which will need to be addressed prior to wider military deployment, or civilian use. Additionally, micro RPA are being developed for use against snipers or terrorists (see Chapter 1).[28] Such developments also have application for use by police and special forces.

Although currently in the realm of science fiction and from the NAV category, RPA equipped with 'the ability to take DNA samples or possibly inject objects beneath the skin' can be envisaged in the longer term.[29] Even if the UK authorities shun such developments, they will need to have sufficient

Black Hornet Nano Helicopter. Image by Richard Watt; © Crown copyright 2013

awareness of such capabilities in the hands of potential adversaries, and be able to detect their use and deploy counter-measures if required.

Software

Improving the usability of platforms, and making them easier to update, is an important area of innovation. The development of 'Plug and Play'[30] systems that enable the flexible use of RPA via the rapid integration of customised payloads is likely to become increasingly popular and will reduce the cost of software development and maintenance.[31] RPA which can be controlled by wireless devices such as smartphones, and which disperse Wi-Fi signals, will be of use for both military and civilian markets.[32] Further down the line is 'intelligent software' which can 'learn from past experiences and make mission-level decisions', thus demonstrating the link between software development and the requirements for greater automation or even autonomous systems. Interoperability is also affected by the capacity of software. The DoD roadmap identifies middleware, multi-format discovery and processing, federated mission computing and universal payload adaptors as a means to meet the evolving needs of the US military.[33] Plug and Play and open systems concepts will make it easier to add new suppliers and new equipment not integrated into original architecture than is currently the case on the F-35.[34] Yet the development of existing systems, and the integration of new ones, will continue to be plagued by software issues. Many manufacturers, and their governments, are extremely reluctant to release raw code to customers. This would affect interoperability with allies other than the United States and could potentially affect independent UK operations.

Collaboration with allies on RPA design and procurement

The UK government has a number of collaborative programmes for RPA development, and the MoD has stated its intention to collaborate both broadly and deeply with partners in the future, increasing significantly investment in joint projects.[35] Thus far, options have largely been framed around collaboration with the United States and European Union (EU) nations but other possibilities also exist and, as noted below, cooperation with Israel could conceivably be an option in the longer term, should it not be precluded by political sensitivities.

Recent events demonstrate that progress is already being made in various collaborative formats.[36] The UK-French Summit of January 2014 led to a decision to create a new 'Future Combat Air System (FCAS) Programme.' This programme has a two-year £120m Feasibility Phase, building on design studies conducted since the last summit by the six key European industrial partners, namely Dassault Aviation, BAE Systems, Thales France, Selex, Rolls Royce and Safran.[37] The summit also created, in consultation with the US government, a 'Joint User Group' specifically for Reaper which is open to other European states operating that platform. We note that decisions on collaboration will almost certainly be driven by wider UK security and foreign policy concerns, with the default option being to work with the US government and military.

International collaboration is important for developing overarching common doctrine on use, and more importantly the arrangements needed for command and control, essential for the swift deployment of RPA in any United Nations (UN), North Atlantic Treaty Organisation (NATO) or EU sponsored operation. EU efforts to create a framework for the integration of RPA in civilian and contested airspaces will also be a key component of these arrangements.[38] The possibilities in this regard are discussed further in Chapter 6. Despite these efforts, we remain sceptical of ambitions for European-wide collaborative RPA development, since the political will to support defence programmes is lacking in most parts of the EU, especially for military capabilities such as RPA that are seen as sensitive and controversial. Industrial interests may be trying to move decisions forward, but our perception is that many European governments are unwilling to invest significant amounts in usable military capability. In an atmosphere of too many competing ideas and a tendency to reinvent, within the EU, technology which already exists, it is hard to see an EU-wide solution succeeding.

Collaboration with Israel would, at a technical level, offer the UK government greater opportunity for RPA development, but the wider political climate for future cooperation would have to be propitious. The new Thales Watchkeeper RPA is based on the Israeli Elbit Hermes 450 RPA, but there has been criticism of Israeli use of RPA in Operations 'Cast Lead', 'Pillar of Defence', and 'Protective Edge' in Gaza in 2008-9,[39] 2012, and 2014.

MoD planning identifies several national and collaborative efforts aimed at bringing in new systems.[40]

Watchkeeper is the first UK military unmanned aircraft to be certified as airworthy; it was finally cleared for UK civilian airspace in the spring of 2014.[41] Watchkeeper is only designed for ISR and it has experienced lengthy delay and cost escalation. As a result, it is likely to miss out on the conflict for which it was designed (Afghanistan), but experience has been gained for a range of future technological developments.[42] We consider that the listed improvements are all relative to the software and the technology involved is still relatively fragile.

Scavenger is not expected to be operational until 2018 and is expected to replace the Reaper in primarily the ISR role, but will also have an armed capability.[43] UK military sources suggest that, whilst Scavenger is expected to be a step forward in the design and performance of RPA technology, it is likely to draw on 'mature' (i.e. tested and reliable) technology, thereby avoiding more complex formats such as stealth, which would make it more costly and more time consuming to develop.[44]

Zephyr is in the design phase at QinetiQ and, if it moves to production, would provide the UK military with a high-altitude, long endurance unmanned aircraft (HALE). The Zephyr utilises solar power to enable it to stay aloft for extended periods of time, thus allowing it to provide persistent surveillance over the same area with the use of an autopilot.[45] The Zephyr programme utilises more innovative technologies than Scavenger and its designers, QinetiQ, have recently won awards from the Institution of Engineering and Technology.[46]

Taranis is one of the most advanced stealth demonstrator programmes in the world[47] and is said to have been undetectable in recent tests. Taranis is 'capable of not only carrying out surveillance but also engaging in air-to-air combat and air-to-surface combat as well.'[48] It has been designed to inform future UK RPA design and acquisition into the 2030s and beyond.

The RPA industry

In many respects, RPA presents a number of challenges to conventional preconceptions of the aerospace industry. A distinct RPA technology base has emerged comprising a disparate set of academic centres, 'garage-based' enthusiasts, and government research agencies. This is producing RPA platforms capable of carrying simple payloads as well as producing highly complex 'nano' systems, operating in swarms. At the other end of the spectrum, production of the larger, heavier and longer-range RPA platforms is increasingly the domain of well-established aerospace companies sensing the future wave of defence Research and Development (R&D) and production. However, these companies have been successfully challenged by 'new entrants' – the best known of which is General Atomics, producer of the Predator and Reaper.[49]

The established aerospace companies are perhaps best placed to develop the advanced RPA generation. Such companies are accustomed to building the high cost, complex combat aircraft that closely resemble RPA. They can thus sustain design teams and maintain access to military R&D funding. However, these firms may not necessarily be best placed to command the future high ground of RPA development and commercial exploitation. The future RPA industry will need to stress affordability, market sensitivity and rapidity of response to customer needs and requirements, whether military or civil. In many cases, business models will begin to stress service delivery, using an RPA platform as one aspect of a package of data collection, analysis and interpretation. Emerging RPA-dedicated technologies will increase the scale and scope of the services that will be deliverable by an RPA platform – such as longer endurance, increased on-board computation, multi-sensor payloads, and, where appropriate, tailored weapons. In many instances, except for the highest level of RPA platforms, future RPA will be based on 'dual technology' systems, thus adding to the risk of proliferation.

A second fundamental change accompanying the maturing of RPA technology is the global dissemination of RPA industrial capability. Israel is already a major player, but other countries outside the limited circle of established aerospace nations have begun to enter the business. China and Russia have also begun extensive work on high-end RPA[50] (see Chapter 6). Again, the very peak of RPA technology may be outside the technical and financial resources of many of these new entrants; but as innovative RPA building block technologies mature and become cheaper, or the use of parallel but applicable technologies are adapted to RPA use, the generality of RPA produced by the new entrants will improve significantly in terms of performance and capability. The future RPA market will not be short of competition.

The RPA market is set to continue to grow and is producing significant sales turnover (US$11bn in 2013 expected to rise to US$61bn by 2020).[51] It is noteworthy that the RPA market has expanded at a time of relative stagnation in the aerospace market as a whole.[52] That growth, however, is variable, with small RPA, along with HALE RPA, being the main beneficiaries of buoyant demand. Changing strategic environments are also likely to result in different requirements from purchasing militaries.[53]

At the smaller end of the spectrum, nano, micro, mini, and small Class I RPA have been identified as a possible area for UK investment and development.[54] Given the predicted growth in market size, it is unsurprising that employment figures in this market are also likely to grow. For example, it is expected that the RPA industry will create 70,000 jobs over the next three years in the United States. The European RPAS Steering Group (ERSG), which makes recommendations on how to integrate RPA into civil airspace, is predicated on the idea that enabling the RPA market to flourish in Europe will create highly qualified jobs in the manufacturing sector.[55]

The UK defence industry has been relatively slow in developing RPA technology and has had a mixed record in deploying even simple tactical platforms. However, thanks to a mixture of public and private investment, UK industry – led by BAE Systems – is now a leading European player in this technology. This may form the basis for future cooperative programmes with other European countries – notably France – but equally, it could form the basis for trans-Atlantic partnerships.

Much will depend on progress with European programmes; the recent UK-French agreement to consider the feasibility of a joint RPA is due to report in 2016.[56] However, progress towards a European Medium Altitude Long Endurance (MALE) has been less marked, and has yet to attract government funding.

Opening commercial airspace to RPA operation, especially the larger 'beyond-line-of-sight' controlled platforms will be essential if the RPA market is to grow as forecast. Both the US and EU governments have been working on developing control regimes and protocols that will allow integration of RPA with conventional aircraft. Again the United Kingdom has been a leading proponent in developing the basic technology and technical protocols. The UK government/industry-funded Autonomous Systems Technology-Related Airborne Evaluation and Assessment (ASTRAEA) programme has successfully completed its latest stage and awaits a decision on further funding.[57] It is generally accepted that achieving a satisfactory regime for commercial operation is likely to have reached maturity by the early 2020s.[58] While there may yet be other legal and ethical challenges to the unrestrained use of RPA over populated areas, the market for commercial/dual technology systems is likely to grow markedly during the 2020s. 'Market-pull' will encourage another round of technological innovation and will pull in more new entrants, thus leading to a further dissemination or proliferation of RPA technology. Whatever the problems posed by the existing generation of RPA platforms, the future is likely to be even more challenging.

Key findings

- Over the next 20 to 30 years, successive UK governments will need to keep under review both the mix of conventional manned and unmanned systems in the UK inventory, and the type of aircraft systems to which this mix would apply.
- Since RPA will be an increasingly significant component of the operational capabilities of the British Armed Forces, the UK government should take active steps to inform the public of the likely role of RPA in UK military operations and doctrine. Such steps will help build public confidence in the UK government's overall approach to RPA.
- Technological development and procurement needs to ensure the greatest possible interoperability of RPA across the different services, and with allies.
- The UK government should continue to diversify its procurement and development of RPA in order to avoid the associated risks of sole-source acquisitions and the controversy that this has attracted. The UK government should continue to explore partnerships beyond the United States, especially with France, without jeopardizing the UK's unique position in relation to its principal ally.
- Given the scale of possible industrial and employment benefits, the UK government should develop a clearer sense of the capabilities over which it wishes to have sovereign control. The UK government should promote UK expertise in RPA and related technologies, as this will enhance the economic benefits of growth in the sector.

[1] Her Majesty's Government, *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review* (London: The Stationery Office Limited, 2010), p.9; Her Majesty's Government, *A Strong Britain in an Age of Uncertainty: The National Security Strategy* (London: The Stationery Office Limited, 2010), p.6.

[2] Jon Lamonte, 'The future of UAVs,' *RUSI Air Power Conference*, 19-20 October 2009, www.raf.mod.uk/role/thefutureofuav.cfm, last accessed 3 September 2014.

[3] Lamonte, 'The future of UAVs.'

[4] Written evidence from the Royal Aeronautical Society, House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use – Tenth Report of Session 2013-14*, Volume II (London: The Stationery Office Limited, 2014), p.Ev w54.

[5] Airforce Technology, *MBDA conducts Brimstone live fire trials from MQ-9 Reaper*, Airforce Technology.com, 26 March 2014, www.airforce-technology.com/news/newsmbda-conducts-brimstone-live-fire-trials-from-mq-9-reaper-4203820, last accessed 3 September 2014.

[6] Defence Update, *Evolution of UAV Employed Missiles*, Defence Update, ND, defense-update.com/features/du-1-07/armedUAVs_4.htm, last accessed 3 September 2014.

[7] S. Tsach, D. Penn, and A. Levy, 'Advanced Technologies and Approaches for Next Generation UAVs', *Proceedings of International Council of the Aeronautical Sciences Congress*, Number 131, pp.1-10.

[8] See, for example, General Atomics, *Predator Aircraft Series Status Report: Military & Civilian Missions, General Atomics*, June 2012, uvs-info.com/phocadownload/02_1cca_Presentations_PvB_____/39_May-Steve_General-Atomics-AS_USA_V1.pdf, last accessed 3 September 2014.

[9] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, Joint Doctrine Note 2/11, Shrivenham, DCDC, March 2011, p.6-8.

[10] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.4-3. See also p.6-1, 6-2, and pp.6-7-6-9.

[11] Defence Growth Partnership (2013), *Securing Prosperity: A Strategic Vision for the UK Defence Sector* p11, www.gov.uk/government/uploads/system/uploads/attachment_data/file/237314/bis-13-1154-defence-growth-partnership.pdf, last accessed 3 September 2014.

[12] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.6-1.

[13] Spectral signatures are when different wavelengths indicate different kinds of ground cover/material. See NASA, *Remote Sensing: Spectral Signatures*, NASA, ND, earthobservatory.nasa.gov/Features/RemoteSensing/remote_05.php, last accessed 3 September 2014; Hyperspectral signatures enable the tracing of spectral signatures that are beyond normal vision (i.e. ultraviolet) and may be useful for tracing weapons signatures and applications like it. See S Rajendran, *Hyperspectral Remote Sensing and Spectral Signature Applications*, (New Delhi: New India Publishing Agency, 2009).

[14] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, pp.6-8-6-9.

[15] Written evidence from Defence Synergia, and Written evidence from General Atomics Aeronautical Systems, Inc. (GA-ASI) and General Atomics Aeronautical Systems United Kingdom Ltd (GA-UK), House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use – Tenth Report of Session 2013-14*, Volume II (London: The Stationery Office Limited, 2014), pp.Ev w56-59 and p.Ev w105, respectively.

[16] BAE Systems, *About Taranis*, BAE Systems, 2014, www.baesystems.com/enhancedarticle/BAES_157659/taranis;baeSessionId=DYs78jLNM-V0y4XddTyfBCSkJ4U1akwFvueshTHZrOFcx3DlQy-h!-1971317125?_afrLoop=59232734110000&_afrWindowMode=0&_afrWindowId=dimnElLV#!%40%40%3F_afrWindowId%3DdimnElLV%26_afrLoop%3D59232734110000%26_afrWindowMode%3D0%26_adf.ctrl-state%3Das61hmezc_4, last accessed 3 September 2014; Paul Rodgers, 'New Supersonic Stealth UAV Takes Off', *Forbes*, 2 June 2014 www.forbes.com/sites/paulrodgers/2014/02/06/britains-new-supersonic-stealth-drone-takes-off/,last accessed 3 September 2014.

[17] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.6-3.

[18] Department of Defense, *Unmanned Systems Integrated Roadmap FY2013-2038*, Ref 14-S-0553, DoD, 2013, p.75.

[19] Department of Defense, *Unmanned Systems Integrated Roadmap FY2013-2038*, p.7.

[20] Department of Defense, *Unmanned Systems Integrated Roadmap FY2013-2038*, p.71.

[21] Sharon Weinberger, *X-47B Stealth drone targets new frontiers*, BBC Future, 19 December 2012, www.bbc.com/future/story/20121218-stealth-drone-targets-life-at-sea, last accessed 3 September 2014.

[22] Naval Drones, *MQ-8B Fire Scout*, Naval Drones, ND, www.navaldrones.com/Fire-Scout.html, last accessed 3 September 2014.

[23] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14*, Sixth Special Report of Session 2014–15, HC 611, 29 July 2014.

[24] Written evidence from General Atomics Aeronautical Systems, Inc. (GA-ASI) and General Atomics Aeronautical Systems United Kingdom Ltd (GA-UK), House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use – Tenth Report of Session 2013-14*, Volume II (London: The Stationery Office Limited, 2014), p.Ev w105.

[25] The differences between these classes of RPA are explained in the Glossary.

[26] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.6-14; Prox Dynamics, *PD-100 Black Hornet RPS* [Personal Reconnaissance System], Prox Dynamics, ND, www.proxdynamics.com/products/pd-100-black-hornet-prs, last accessed 3 September 2014

[27] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.6-3.

[28] Aamer Madhani, 'Air Force plans to pull out big (uh, little) guns', *Chicago Tribune*, 14 September 2008, articles.chicagotribune.com/2008-09-14/news/0809130400_1_air-force-research-laboratory-mavs-air-vehicles, last accessed 3 September 2014.

[29] Robert Johnson, 'The Future of Micro Drones Could Get Downright Scary', *Business Insider*, 20 June 2012, www.businessinsider.com/the-future-of-micro-drones-is-getting-pretty-scary-according-to-alan-lovejoy-2012-6, last accessed 3 September 2014.

[30] Plug and play software and devices are designed to work when connected, without having to be reconfigured or adjusted.

[31] Ed McKenna, 'Product Focus: Sensor Payloads', *Avionics Today*, 1 August 2013, www.aviationtoday.com/av/issue/feature/Product-Focus-Sensor-Payloads_79752.html#.U_SlsdiG98F, last accessed 3 September 2014.

[32] Jenna Duncan, 'UNT researchers develop drone with Wi-Fi signal', *The Washington Times*, 13 May 2013, www.washingtontimes.com/news/2014/may/13/unt-researchers-develop-drone-with-wi-fi-signal/, last accessed 3 September 2014.

[33] Department of Defense, *Unmanned Systems Integrated Roadmap FY2013-2038*, p.31.

[34] Keith Hayward, *Unmanned Aerial Vehicles: A New Industrial System?*, Royal Aeronautical Society, 2013, p.10.

[35] Ministry of Defence, 'UK and France strengthen defence cooperation,' *Gov.UK*, 15 July 2014, www.gov.uk/government/news/uk-and-france-strengthen-defence-co-operation, last accessed 3 September 2014.

[36] Ministry of Defence, 'UK and France strengthen defence cooperation,' *Gov.UK*, 15 July 2014, www.gov.uk/government/news/uk-and-france-strengthen-defence-co-operation, last accessed 3 September 2014.

[37] UK-France Summit 2014, 'Declaration on Security and Defence,' *Gov.UK*, 31 January 2014, p.3, www.gov.uk/government/uploads/system/uploads/attachment_data/file/277167/France-UK_Summit-Declaration_on_Security_and_Defence.pdf, last accessed 3 September 2014.

[38] European RPAS Steering Group, *Roadmap for the Integration of Civil Remotely-Piloted Aircraft Systems into the European Aviation System: Final Report from the European RPAS Steering Group*, Europa.EU, June 2013, ec.europa.eu/enterprise/sectors/aerospace/files/rpas-roadmap_en.pdf, last accessed 3 September 2014; *Roadmap for the Integration of Civil Remotely-Piloted Aircraft Systems into the European Aviation System: Final Report from the European RPAS Steering Group* – Annex 2: A Strategic R&D Plan for the Integration of Civil RPAS into the European Aviation System, Europa.EU, June 2013, ec.europa.eu/enterprise/sectors/aerospace/files/rpas-roadmap-annex-2_en.pdf, last accessed 3 September 2014.

[39] Michele K. Esposito, 'The Israeli Arsenal deployed against Gaza during Operation Cast Lead,' *Journal of Palestine Studies*, Vol.38/3, 2009, p.176; Chris Cole, 'Watch Out! Watchkeepers over Wiltshire,' *Drone Wars UK*, 22 February 2014, dronewars.net/2014/02/22/watch-out-watchkeepers-over-wiltshire, last accessed 3 September 2014.

[40] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, pp.4-7-4-13; Written evidence from the MOD, House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use – Tenth Report of Session 2013-14*, Volume II (London: The Stationery Office Limited, 2014), pp.Ev w6-7.

[41] Ben Moore, *Army's new Watchkeeper drone to patrol Wiltshire skies*, BBC News, 24 February 2014, www.bbc.co.uk/news/uk-26320927, last accessed 3 September 2014; Darren Quick, *UK's Watchkeeper UAV cleared for military flight training*, Gizmag, 4 March 2014, www.gizmag.com/wathckeeper-uav-release-to-service/31123/, last accessed 3 September 2014; David Donald, *UK Watchkeeper UAS Gets Delayed Green Light*, AIN Defense Perspective, 5 March 2014, www.ainonline.com/aviation-news/ain-defense-perspective/2014-03-05/uk-watchkeeper-uas-gets-delayed-green-light, last accessed 3 September 2014.

[42] Donald, *UK Watchkeeper UAS gets delayed green light*; Chris Cole, 'Waiting for the Watchkeeper?' *Drone Wars UK*, 3 March 2011, dronewars.net/2011/03/03/waiting-for-the-watchkeeper, last accessed 3 September 2014.

[43] Written evidence from the Ministry of Defence, House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use Tenth Report of Session 2013–14*, Volume II, 25 March 2014, p.Ev w6.

[44] Angus Batey, 'British UAV officials talk future hopes, needs,' *Aviation Week*, 1 June 2012, available from: aviationweek.com/awin/british-uav-officials-talk-future-hopes-needs, last accessed 3 September 2014.

[45] Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p. 3-8; Jonathan Amos, *Zephyr solar plane flies 7 days non-stop*, BBC News, 16 July 2010, www.bbc.co.uk/news/science-environment-10664362, last accessed 3 September 2014.

[46] Royal Institute of Navigation, *Zephyr UAV wins award*, Royal Institute of Navigation, 15 November 2011, www.rin.org.uk/search.aspx?searchstr=zephyr%20UAV%20wins%20award, last accessed 3 September 2014.

[47] BAE Systems, *About Taranis*, BAE Systems, www.baesystems.com/enhancedarticle/BAES_157659/taranis?_afrLoop=197401879289000&_afrWindowMode=0&_afrWindowId=null#%40%3F_afrWindowId%3Dnull%26_afrLoop%3D197401879289000%26_afrWindowMode%3D0%26_adf.ctrl-state%3Dy5tfgr27b_41, last accessed 3 September 2014.

[48] Thomas Tamblyn, 'Taranis stealth drone goes "invisible" during tests,' *The Huffington Post*, 15 July 2014, www.huffingtonpost.co.uk/2014/07/15/taranis-stealth-drone-invisible_n_5587454.html?utm_hp_ref=uk-tech&ir=UK+Tech, last accessed 3 September 2014.

[49] Keith Hayward, *Unmanned Aerial Vehicles*, p.6.

[50] Tim Robinson, 'Year of the UCAV: Unmanned Combat Accelerates', *Aerospace*, June 2013, pp.14 to 17; Daniel Medina, 'Drone markets open in Russia, China and rogue states as America's wars wane', *The Guardian*, 22 June 2014, www.theguardian.com/business/2014/jun/22/drones-market-us-military-china-russia-rogue-states, last accessed 3 September 2014; William and Peter Finn, 'Global race on to match US drone capabilities' *The Washington Post*, 4 July 2011, www.washingtonpost.com/world/national-security/global-race-on-to-match-us-drone-capabilities/2011/06/30/gHQACWdmxH_story.html, last accessed 3 September 2014.

[51] Ami Rojkes Dombe, 'The politics of Israel's UAV industry,' *Israel Defence*, 26 March 2014, www.israeldefense.com/?CategoryID=472&ArticleID=2827, last accessed 3 September 2014.

[52] Keith Hayward, Unmanned Aerial Vehicles, pp.4-6.

[53] RP Newswire, *Unmanned Aerial Vehicle Market* (UAV) Worth $114.7B by 2023, RP Newswire, 13 February, 2014, Available from: www.prnewswire.com/news-releases/unmanned-aerial-vehicle-market-uav-worth-1147b-by-2023-245370591.html, last accessed 3 September 2014.

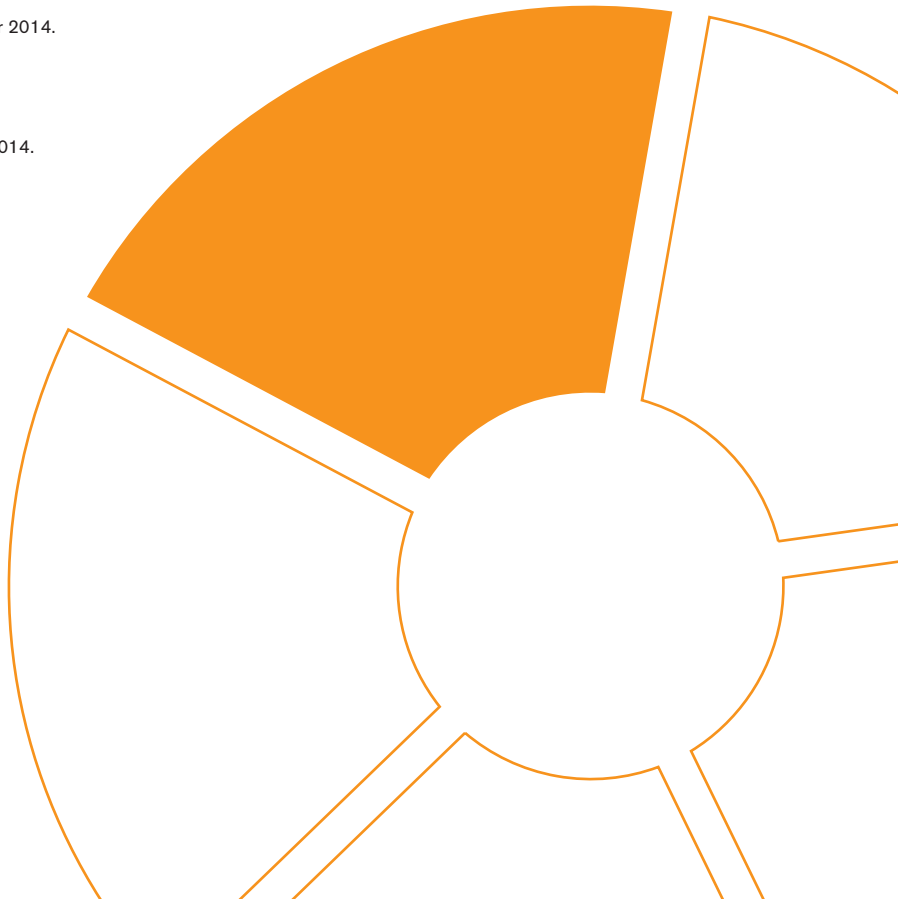
[54] S. Prior, *Small Remotely Piloted Aircraft Systems Aviation*, University of Southampton, August 2013, pp.64-65, blog.soton.ac.uk/robotics/files/2013/07/Updated-Article-2-August-2013-edition.pdf, last accessed 3 September 2014; Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.6-14.

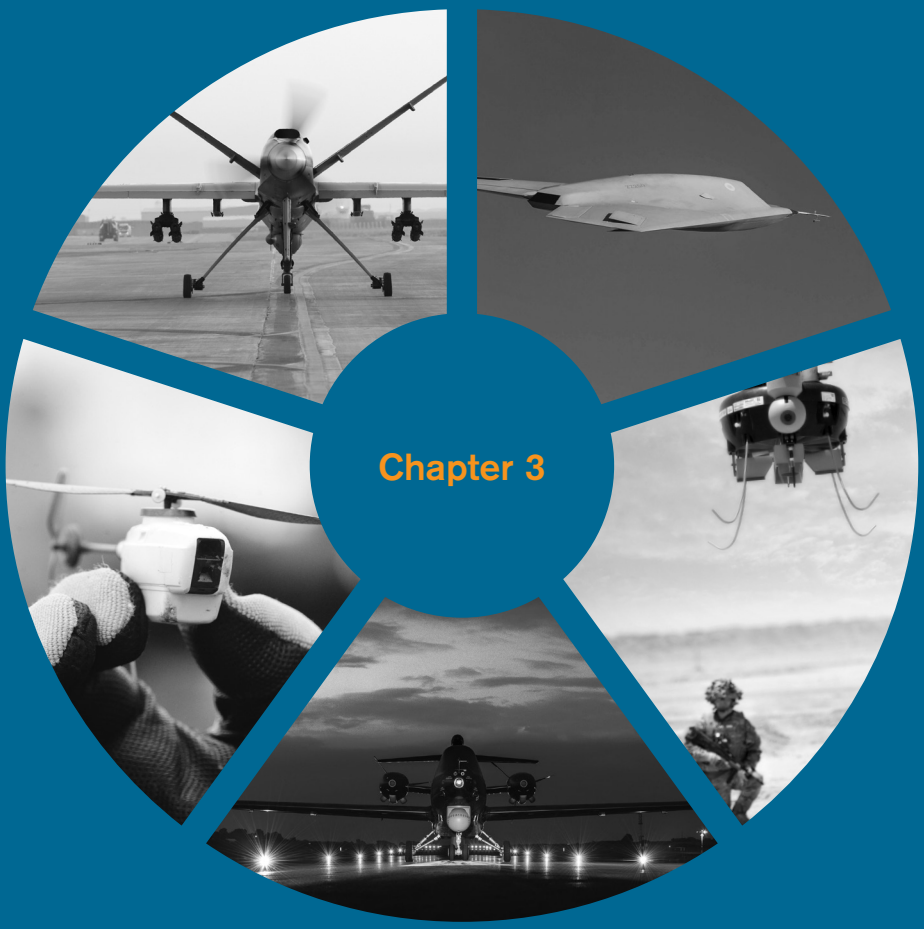
[55] European RPAS Steering Group, *Roadmap for the Integration of Civil Remotely-Piloted Aircraft Systems into the European Aviation System: Final Report from the European RPAS Steering Group*, p.5.

[56] UK-France Summit 2014, *Declaration on Security and Defence*, Gov.UK, 31 January 2014, p.14, www.gov.uk/government/uploads/system/uploads/attachment_data/file/277167/France-UK_Summit-Declaration_on_Security_and_Defence.pdf, last accessed 3 September 2014.

[57] ASTRAEA programme website: astraea.aero/, last accessed 3 September 2014. Information relating to the end of ASTRAEA www.astraea.aero/downloads/ASTRAEA_end%20_FINAL.pdf, last accessed 3 September 2014.

[58] Simon Jewell, 'Opening the airspace to UAS- ASTRAEA's next phase' Presentation given at Farnborough International Air Show 12 July 2014, Available from: www.adsfarnborough.co.uk/wp-content/uploads/sites/2/2014/07/ASTRAEA-Monday.pdf, last accessed 3 September 2014.





Chapter 3

Chapter 3: Law

Introduction

The increasing use of Remotely Piloted Aircraft (RPA) both inside and outside traditional battlefields has generated an entire field of legal debate. It is beyond the scope of this Commission to grapple with the relevant legal issues in their entirety, especially as these pertain to current US practice. The debate surrounding US use of RPA has, however, had a direct impact on the way that UK use of RPA has been perceived. In examining the legal challenges facing British use of armed RPA, this chapter will incorporate, where necessary, those elements of the US debate which are relevant in the UK context. It deals only with the use of RPA in armed conflict; we cover legal issues relating to civil and police use within the United Kingdom in Chapter 6.

UK use of armed RPA

The UK government has confirmed that, to date, it has flown armed RPA in three countries: Iraq, Libya, and Afghanistan. In all of these theatres, Royal Air Force (RAF) personnel have been embedded with the United States Air Force (USAF). In operations in Afghanistan, RAF personnel have also operated independently UK-owned Reaper RPA. In both Iraq and Afghanistan, it has been confirmed that embedded personnel have used lethal force. However, the UK government has not disclosed whether embedded UK personnel have released munitions during missions in Libya. Neither has it disclosed how many munitions embedded personnel have released in Afghanistan and Iraq.

These two very different uses of armed RPA – the first by UK forces embedded with the US military, using US aircraft and networks; the second by UK forces using UK RPA and command and control systems – raise different legal issues for the UK.

Armed RPA use by UK personnel embedded with the USAF

Despite the release of only limited information by the UK government, it is known that in both Libya and Iraq, UK personnel embedded with the USAF have operated US RPA to carry out operations.[1] The government has disclosed that, when taking Libya and Afghanistan together, approximately 2,150 armed missions have been flown between October 2006 and the end of December 2012 in those theatres using US RPA operated by UK personnel.[2] While the government has disclosed the total number of operations that British personnel have participated in across all theatres, including Afghanistan, the number of times that weapons have been released in each theatre has not been disclosed. Although the total number is known, the data for the use of US RPA by RAF-embedded personnel is, according to the UK government, 'not held centrally and could only be provided at disproportionate cost.'[3] A recent Ministry of Defence (MoD) response to a Freedom of Information (FOI) request has, however, stated that there is a review currently underway of the 'division between UK and USAF Reaper airframes used on UK sorties…for the whole period of Operation HERRICK.'[4]

In Afghanistan, where UK forces have operated as part of the International Security Assistance Force (ISAF), the MoD has explained that a UK officer is assigned to each ISAF HQ, 'with responsibility for coalition operations including the use of UK UAS [Unmanned Aerial Systems], so that UK RoE [Rules of Engagement] and policy are strictly adhered to.'[5] These officers are described as holding a 'red card' that they can use to refuse or approve a mission request involving UK-armed RPA. In the case of UK military personnel embedded with US forces in previous operations, it remains unclear whether such a 'red card' safeguard system was in place.[6]

Lord Drayson, the then Parliamentary Under-Secretary for Defence Procurement, informed Parliament in 2006 that all UK-embedded forces:

> *…remain subject to UK law and service law. They are authorised only to be involved in the planning or execution of operations that comply with British domestic and international legal obligations, including the principles of the laws of armed conflict and the use of force in self-defence. This means that they are bound by the UK's determination of the legal ambit of the armed conflict, including the determination of which armed groups constitute legitimate targets [under international humanitarian law]. Within these important constraints, UK embedded personnel act within US rules of engagement, may use US collateral damage methodology, and work to US delegated authorities.*[7]

Lord Drayson's reassurance to Parliament that RAF personnel embedded with USAF always 'remain subject to UK law and service law' is an important safeguard against the concern expressed to the Commission that embedded UK personnel might be placed in the position of having to refuse to take orders from US delegated authorities operating to different RoE in order to avoid becoming complicit in actions that are incompatible with the UK government's interpretation of international humanitarian law. An obvious conclusion here is that UK personnel must have the necessary training and guidance, endorsed by MoD lawyers, to ensure that they do not engage in prohibited actions. The MoD has assured us that such training and guidance is provided, and that embedded military personnel can turn to their parent units or the MoD for guidance and advice should such difficulties arise.

UK forces operating US RPA in Afghanistan

In response to a FOI request from Drone Wars UK, the MoD has confirmed that RAF pilots have operated US RPA in Afghanistan to conduct UK missions when RAF RPA have not been available.[8] Between 1 January 2013 and 31 December 2013, RAF pilots flew 55 UK missions with USAF Reapers in Afghanistan. During these missions, four weapons were released.[9] UK missions in Afghanistan are tasked from the ISAF Combined Air Operations Centre (CAOC) and are always conducted by a crew consisting of highly trained RAF personnel. We welcome the confirmation by MoD that, on the occasions that a US aircraft has been used to carry out a mission, any decision to release a weapon would have been taken by the UK crew following UK RoE. The MoD has said that United States or other coalition forces have not had occasion to borrow UK RPA in Afghanistan. Should such a situation arise in any future operation, it is vital that assurances are obtained that their use would be in accordance with UK legal guidelines.

UK use of UK-owned RPA in Afghanistan

UK Reaper RPA in Afghanistan became operational in October 2007. In May 2008, the aircraft were armed to provide an air-to-ground capability. From 1 May 2008 to 30 June 2014, UK Reaper aircraft flew 4,533 missions (armed and ISR) comprising over 61,000 flying hours. The MoD has informed the Commission that RAF Reapers in Afghanistan released 482 weapons during that period. We welcome the regular release of such data.

The legality of targeting in UK RPA operations in Afghanistan

The UK's military involvement in Afghanistan is through ISAF, led from August 2003 by the North Atlantic Treaty Organization (NATO). The use of force by ISAF was initially authorised under Chapter VII of the UN Charter by UN Security Council resolution 1386 of December 2001. Given the relatively uncontroversial legal basis supporting the UK's use of force in Afghanistan, the Commission does not address this issue, and the *jus ad bellum* arguments that accompany it, in any further detail. In this light, this section will focus primarily on the legality of the UK's general targeting policy and *jus in bello* issues.

The UK government, as noted in Chapter 1, has consistently maintained that its use of RPA in Afghanistan, whether armed or not, is regulated by the same laws, rules of engagement and targeting criteria as manned aircraft.[10] Despite this, concerns continue to be expressed about the legality of UK use of RPA in Afghanistan, no doubt reflecting wider concerns about the global policy being followed by the US Administration in using RPA for counter-terrorist strikes (see the Conclusion for a fuller discussion). The concerns over UK armed RPA operations appear to centre upon two specific areas: (1) the legality of targeting decisions involving the risk of civilian casualties and (2) the legal implications of an alleged lack of transparency and accountability.

International humanitarian law

International law requires, first, that in the acquisition or adoption of any weapons system, states must assess whether its use would be contrary to international humanitarian law.[11] We have no reason to doubt that UK procurement policy for RPA follows this requirement.

International humanitarian law further requires that, in armed conflict, states must ensure that the use of any weapons comply with the law with regard to targeting. Under Additional Protocol 1 to the 1949 Geneva Conventions (hereafter Protocol 1), applicable to international armed conflict, civilians[12] may not be targeted and states are legally obliged to attack only 'objects which by their nature, location, purpose or use make an effective contribution to military action.' And even if a target is defined as a legitimate military one, Article 51 (5)(b) of Protocol 1 prohibits attacks 'which may be expected

to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.'[13] Precautions must be taken to avoid attacks that breach these provisions.[14] Although Protocol I does not, strictly speaking, apply to Afghanistan because it is not an international armed conflict, Protocol II to the 1949 Geneva Conventions does apply to non-international armed conflicts like Afghanistan. The latter is regarded by the UK government as a statement of customary international law, and hence its policies with regard to the use of UK RPA comply with it. Moreover, as we discussed in Chapter 1, the RoE in Afghanistan are even more stringent than either of these Protocols would require.

The House of Commons Defence Committee has drawn attention to the argument of Public Interest Lawyers that it is 'highly likely' that the UK's use of armed RPA in Afghanistan is in breach of international humanitarian law.[15] The UK government has firmly rejected this claim, as stated in its submission to the House of Commons Defence Committee report, discussed in Chapter 1.[16] We have seen no evidence to contradict the UK government's position, but we are mindful that to evaluate the legality of any particular strike by UK service personnel operating RPA requires a factual assessment of the precise circumstances that is beyond the scope of the Commission.

International human rights law

The International Court of Justice (ICJ) has stated that 'the protection offered by human rights conventions does not cease in case of armed conflict.'[17] Ben Emmerson, the UN's Special Rapporteur on the promotion and protection of human rights and fundamental freedoms while countering terrorism, noted in his report that states were bound not only by international humanitarian law, but also by international human rights law.[18] Relevant in the UK context is the finding of the European Court of Human Rights (ECtHR) that the European Convention on Human Rights (ECHR) does apply in certain circumstances beyond a state's own territory and that a Security Council resolution does not negate this unless it is explicit in its intent to do so.[19] The legal position is nevertheless far from clear on how and when human rights law can be applied in practice within a theatre of armed conflict. For example, whether the ECHR applies extraterritorially depends upon whether a state has 'effective control over an area' and the authority of occupation and control over individuals, questions that may be hard at times to determine.[20]

The requirement most relevant in this context is the protection of life under Article 2 of the ECHR. Under Article 2(2), 'Deprivation of life shall not be regarded as inflicted in contravention of this article when it results from the use of force which is no more than absolutely necessary: (a) in defence of any person from unlawful violence; (b) in order to effect a lawful arrest or to prevent escape of a person lawfully detained; (c) in action lawfully taken for the purpose of quelling a riot or insurrection.'[21] The key issue for counter-terrorist or counter-insurgency campaigns is, therefore, whether the state in question has sufficient control

of an area or a person to have alternatives to the use of armed force, including armed RPA, such as an intervention leading to the arrest of those posing a threat, for example, persons planting an Improvised Explosive Device (IED).

International human rights law brings with it not only restrictions on how the UK government can use force, including by RPA strike, but also positive obligations to protect the right to life. In certain situations in Afghanistan, where the UK government could be held to meet the international human rights law control criteria set out in case law, Article 2(2) of the ECHR could limit the UK's use of RPA to situations which are 'absolutely necessary.' This means that even the killing of a combatant may not be legal if, for example, capture were feasible. In the particular circumstances of RPA use, arguments have been made, that since individuals can be under the 'eye' of the operator for long periods of time, the criterion of 'control' could in some cases be met and human rights law would then be applicable.[22]

There are evident problems for military commanders and individual service personnel if there is ambiguity in a particular theatre of operations as to whether the RoE permissible under international humanitarian law should be replaced by the more restrictive framework of international human rights law. The September 2013 MoD submission to the House of Commons Defence Committee, which reported in March 2014, made no mention of international human rights law and it is unclear how, or if, the UK factors that aspect into its legal analysis and military doctrine. We, therefore, urge the UK government to clarify the nature of the guidance that may be needed for future operations so that UK Armed Forces continue to operate within international law. While there may be limits to what a single government can do to clarify a major and long-running uncertainty in international law, we suggest that appropriate government ministers make periodic public statements conveying the UK government's judgement on how the balance of international law is developing in this important field, what those developments would imply for the legal restrictions applying to British forces in the various operational theatres in which they might be deployed, and what outcomes the UK government seeks from its involvement in international processes to determine the future of international humanitarian law and international human rights law. At the expert level, MoD and Foreign and Commonwealth Office (FCO) lawyers should ensure opportunities to provide supporting detail to the legal profession, academia, and Non-Governmental Organisations (NGOs).

Transparency and accountability

The belief that the UK government could be more transparent over RPA use has heightened concerns, whether justified or not, around the legitimacy of its operations. For example, the government's decision not to disclose under a FOI request from Drone Wars UK how many weapon releases from UK RPA in Afghanistan were under daily tasking orders, i.e. pre-planned, and how many were released under dynamic tasking procedures, i.e. while in flight,[23] has led to criticism that the UK government is trying to evade accountability. Tom Watson, MP, the Chair of the All-Party Parliamentary Group (APPG) on Drones has written:

> *The attitude exhibited by the Ministry of Defence seems to confirm that secrecy and obfuscation is the name of their game…Of course incidences such as these do little for the public perception that the Government is shrouding an already shady weapon in further mystery.*[24]

Refusal to disclose under FOI can be justified if it would prejudice future operational capability or relations with allies, and the public interest in protecting against such prejudice outweighs any public interest in disclosure. In this particular case, the government's decision was upheld by the First Tier Tribunal in October 2013, and the Upper Tribunal in August 2014 refused permission to appeal this decision. Nevertheless, the greatest transparency possible on such matters is essential for making an assessment of the legality of the use of RPA, and to reach judgements on accountability for civilian deaths in particular incidents. No civilian casualties have been reported by the UK government since the 25 March 2011 incident discussed in Chapter 1 involving four civilian deaths. ISAF investigates all incidents where weapons are released in the Afghan theatre and a key part of this is to assess whether there have been any civilian casualties.

In mid-September 2012, Drone Wars UK publicised details of 112 UK RPA strikes out of a total of 349 based on the RAF Weekly Bulletin.[25] This has led to the suspicion in some quarters that RAF

reports may have been 'cherry-picked'[26] to give the impression that civilian casualties have been lower than is actually the case. The RAF Weekly Bulletin has been an essential source of information for groups wishing to ensure that the government is accountable for its RPA strikes. It appeared to cease without explanation in mid-2012.[27] But we have been assured by the MoD that whilst operational updates no longer appear in the weekly format, they are included in the news section of the RAF website, and RPA operations are reported on periodically rather than weekly.[28] This is an example where transparency in volunteering information rather than waiting to respond to FOI requests would build confidence.

The UK government, in its response to the House of Commons Defence Committee's report, stated that a 'full investigation is undertaken' of 'any incident in which a civilian has been or appears to have been killed.'[29] The government has also said that, where necessary, it deploys a special investigations team 'to conduct a quick and thorough assessment of the situation' but that the resulting reports are only published 'where it is operationally secure to do so.'[30] We consider that, in general, a lack of information makes it difficult for Parliament to hold the executive to account, and recommend that the government look again at the question of whether it can be more forthcoming over the release of information in its investigations, if necessary in a redacted form.

The UN Special Rapporteur, Ben Emmerson, also argued in his September 2013 report 'on the use of remotely piloted aircraft in counter-terrorism operations':

> *…in any case in which civilians have been, or appear to have been, killed, the State responsible is under an obligation to conduct a prompt, independent and impartial fact-finding inquiry and to provide a detailed public explanation. This obligation is triggered whenever there is a plausible indication from any source that civilian casualties may have been sustained, including where the facts are unclear or the information is partial or circumstantial. The obligation arises whether the attack was initiated by remotely piloted aircraft or other means, and whether it occurred within or outside an area of active hostilities.*[31]

The Special Rapporteur is not suggesting that there should be an 'impartial fact-finding inquiry' that is independent of the military; rather, what is crucial is that the duty of investigation by the military should be independent of the chain of command of those under scrutiny. His recommendation is that such reports should be made public, but he appreciates that operational necessities may well require that reports be published in a redacted form. However, he argues that the presumption should be to release such reports. We share this view, recognising at the same time that in a major campaign, full-scale transparency may not always be achievable for operational and security reasons. The Commission notes that where the government gives operational reasons as justification for withholding information, this judgment can, if necessary, be tested by the House of Commons Defence Committee in a classified evidence session. Nonetheless, we think the government should, at a minimum, explain its decision.

In his second report in March 2014, Emmerson called upon the UK government to 'declassify and publish the results' of the ISAF investigation into the RPA strike on 25 March 2011 which was under the control of UK military personnel in Afghanistan (discussed in Chapter 1).[32] The UK government has not to date released this report, with the UK Ambassador to the UN in Geneva explaining in March 2014 that, 'any final decision on the report's disclosure lies within the ISAF chain of command as is usual on these occasions.'[33] We would like to see the government make public as much information as is practically possible. This is for legal reasons, so that accountability is assured, and there is confidence in the legal basis for any military action and its compliance with the law, and also for reasons of public diplomacy, as set out in the Conclusion.

UK-US intelligence sharing

In its March 2014 report, the House of Commons Defence Committee acknowledged 'that over the last few years there has been a growing concern in relation to the sharing of intelligence with allies and the uses to which such data may contribute.' It went on to suggest that, 'there should be greater transparency in relation to safeguards and limitations the UK government has in place for the sharing of intelligence.'[34] The UN Special Rapporteur, Ben Emmerson, has argued that the closeness of the UK-US relationship makes it 'inevitable' that British intelligence contributes to US targeting decisions in places such as Pakistan and Yemen.[35] Professor Michael Clarke, Director General of the Royal United Services

Institute and a specialist adviser to the House of Commons Defence Committee, has informed the Commission:

> *The UK could be vulnerable on the matter of complicity in some US drone attacks that may be judged illegal by the majority of other nations. The government says little or nothing about its stance on this matter since I don't believe it is practically possible to separate UK information shared with the US from that which the US would use to target individuals in what appear to be extra judicial killings. If the US came under greater international pressure in this regard, the UK's silence on the matter would be deafening. Some sort of declaration might be required that the UK never shares information that could credibly be used in such strikes; but it is difficult to see how a watertight declaration could truthfully be made, let alone be politically acceptable. The Government would find itself in a real bind in this event, and I suspect this problem is growing not diminishing.*[36]

The UK government, in its response to the Defence Committee's recommendations, restated its position that, 'All activities of the UK intelligence community are subject to careful oversight to ensure that they comply with obligations under national and international law.'[37] This reinforces the UK government's long-standing position, as expressed in the House of Commons Intelligence and Security Committee (ISC) 2007 report on Rendition. The Committee stated that: 'Where there are concerns, the Agencies seek credible assurances that any action taken on the basis of intelligence provided by the UK Agencies would be humane and lawful. Where credible assurances cannot be obtained, the Chief of SIS [Secret Intelligence Service] explained "…then we cannot provide the information. Therefore you have the dilemma [of perhaps not being able to prevent attacks] that flows from that."'[38] The Director General of the SIS further informed the ISC that:

> *We do a lot of exchange of highly sensitive intelligence in a very trusting way, but we now all of us, including the Americans, have a clear understanding of the legal constraints on that exchange…So when you are talking about sharing secret intelligence, we still trust them, but we have a better recognition that their standards, their laws, their approaches are different, and therefore we still have to work with them, but we work with them in a rather different fashion.*[39]

The UK government subsequently released its Consolidated Guidance to Intelligence Officers and Service Personnel on the Detention and Interviewing of Detainees Overseas, and on the Passing and Receipt of Intelligence Relating to Detainees in 2010, written to ensure that vital close intelligence cooperation with partners, including the United States, could continue whilst ensuring British officers did not use or share intelligence that might have been obtained via torture and thus risk their complicity in breaches of international or domestic law.[40] In that context, the government has taken the view that 'The combination of a robust legal framework, ministerial responsibility, scrutiny by the Intelligence Service Commissioners, and parliamentary accountability through the Intelligence and Security Committee, should give a high level of confidence that the system works as intended.'[41]

We do not know whether the UK government has issued comparable instructions to manage the sharing of intelligence that could be relevant to US RPA targeted strikes outside the context of the ISAF operation in Afghanistan. Armed RPA are, of course, only one military means available for delivering lethal effect, but we highlight the RPA point here, however, given the public salience of President Obama's controversial policy of using drone strikes against terrorists in Pakistan, Yemen, Somalia and elsewhere. In relation to international arrangements, we are aware that Jemima Stratford, QC, in advice to the APPG on Drones, has advised that the UK consider publishing a memorandum of understanding with any country with which it intends to share intelligence, and that such an agreement should clarify for what purposes intelligence can be used under British law, as well as how such data will be stored and destroyed.[42] Germany is said to have put in place such restrictions on intelligence sharing with the US government after it emerged in 2011 that German intelligence had been used by the US military to conduct RPA strikes against German citizens in Pakistan.[43] The APPG has told the Commission that, in its view, a strict UK/US policy on data sharing must be agreed and made public. Such a policy would ensure that data on UK citizens (or people deprived of citizenship) obtained by UK ISR operations and/or processed in the United Kingdom could not be used for targeted

lethal operations by the armed RPA of other nations where such operations would be unlawful under UK law. The APPG Chair, Tom Watson, MP, emphasised this would be especially important if Reapers, or other UK RPA, were used for surveillance in Africa, Yemen, or indeed the UK.

We certainly see an advantage in guidance to staff being put in place to ensure that when sharing intelligence with the US government and military, the UK government does not inadvertently collude in RPA or other counter-terrorist actions that could be held to be contrary to international law. Safeguarding arrangements are a form of mitigation, and may provide useful evidence of a state's intent. Failure to confirm that such safeguarding arrangements exist undermines the assurances of government and could make it harder, if issues arise, to defend the UK's actions.

The use of RPA outside conventional armed conflict

The House of Commons Defence Committee has emphasised that 'it is of vital importance that a clear distinction be drawn between the actions of UK armed forces operating remotely piloted air systems in Afghanistan and those of other states elsewhere'.[44] Although unstated, what is being referred to here is the highly controversial legal justification that has been offered by the US government for its use of armed RPA outside the areas of recognised 'non-international armed conflicts' such as Afghanistan and Iraq.[45] As noted previously, it is beyond the scope of this chapter to delve far into this debate. Nonetheless, the UK's reluctance to issue public statements that would distinguish its policy from that of the US government and military means it is necessary to lay out briefly just what the US position is.

The US government has argued specifically that its armed RPA operations in Pakistan, Yemen, and Somalia are legal (see the account of US counter-terrorist operations in Chapter 1) because the United States is in an 'armed conflict with al-Qaeda, as well as the Taliban and associated forces.'[46] This conflict began after the 9/11 attacks against the United States and, according to the US government, any actions that the United States takes to defend itself constitute 'self-defence' under both international and domestic US law. It is argued that the conflict is not geographically bound, and that the right to self-defence in Article 51 of the UN Charter covers both pre-emptive and preventive 'targeted lethal action.'[47] The US government has argued that a threat posed by an individual or group does not have to be imminent (in the traditional legal interpretation of that term) to justify such action. According to John Brennan, Director of the Central

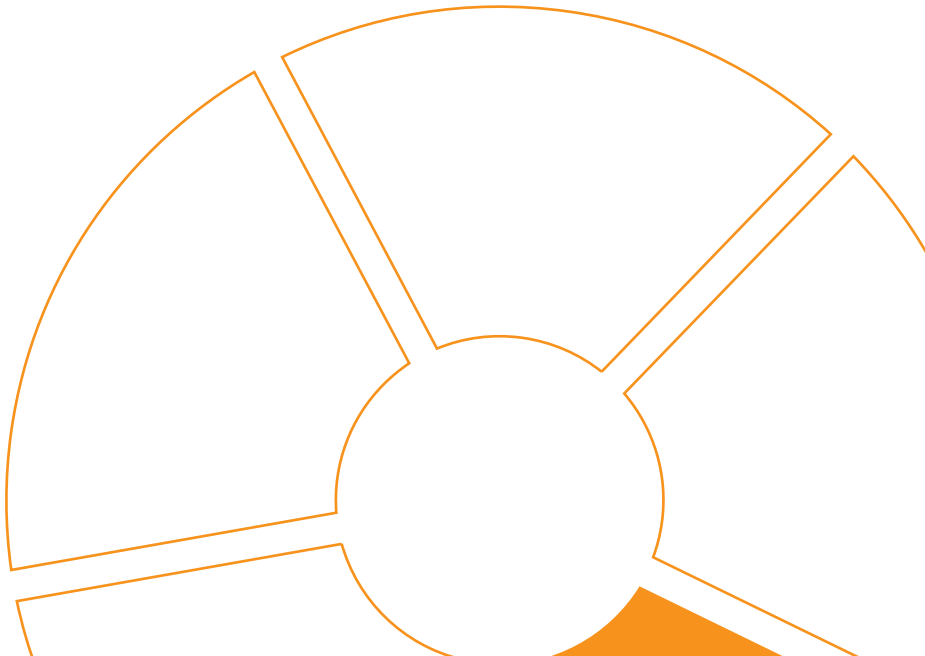
Armed RAF Reaper Aircraft Approaches Kandahar Airfield, Afghanistan. Image by Sgt Corinne Buxton RAF; © Crown copyright 2010

Intelligence Agency (CIA) and previously Deputy National Security Adviser for Counter-Terrorism, the US position is that, 'The United States does not view our authority to use military force against al-Qaeda as being restricted solely to 'hot' battlefields like Afghanistan…we are engaged in an armed conflict with al-Qaeda [and] the United States takes the legal position that — in accordance with international law — we have the authority to take action against al-Qaeda and its associated forces without doing a separate self-defense analysis each time.'[48]

In his first report of September 2013, the UN Special Rapporteur, Ben Emmerson, identified the divergences of international views on this legal position and stated that there was 'an urgent and imperative need to reach a consensus between States.'[49] The House of Commons Defence Committee in its report of March 2014 noted that Emmerson had 'identified a number of legal questions on which there is no clear international consensus.' It went on to 'recommend that the UK Government engage actively in the debate on these matters.' [50] The UK government declined the Committee's invitation. In its reply of July 2014, the government noted that, 'The report identifies a number of interesting legal questions. The UK believes that existing international law sufficiently covers the use of RPAs. We are carefully considering the recommendation of the Special Rapporteur.'[51] We reiterate the call by the Defence Committee for the government to 'engage actively' with the questions posed by the UN Special Rapporteur and the principles that should apply.

Key findings

- In situations where UK forces are embedded with US or other forces, the UK government should do more by way of reassurance to explain the safeguards which are in place to ensure that embedded personnel remain compliant with international humanitarian law.
- If allied forces use UK RPA, assurances should be obtained that their use is in accordance with UK legal guidelines.
- Appropriate ministers should make periodic public statements conveying the UK government's judgement as to how the balance between international human rights law and international humanitarian law is developing in this field. Foreign and Commonwealth Office (FCO) and MoD legal advisers should communicate with other lawyers and NGOs as to what these developments imply for the legal restrictions applying to British forces in the various operational theatres in which they might be deployed. At the expert level, MoD and FCO lawyers should ensure opportunities to provide supporting detail to the legal profession, academia, and Non-Governmental Organisations (NGOs).
- Following casualties caused by armed RPA, the outcome of the government's fact-finding investigations should be made public, except where operational considerations preclude this. In such situations, the government should at a minimum explain its decision.
- The government should confirm that guidance has been issued to staff and safeguards put in place to ensure that in sharing intelligence with the US government and military, the UK government does not inadvertently collude in RPA or other counter-terrorist actions contrary to international law.



[1] Andrew Robathan, Defence: Unmanned Vehicles, HC Deb, 24 April 2013, c905W, www.theyworkforyou.com/wrans/?id=2013-04-24b.128974.h&s=%28iraq+AND+RPAS%29+section%3Awrans+section%3Awms#g128974.r0, last accessed 3 September 2014; Robert Verkaik, 'RAF's role in US drone attacks that killed hundreds of Iraqis: MoD admits for first time that Britain helped pilot the aircraft from American bases,' *The Daily Mail*, 27 April 2013, www.dailymail.co.uk/news/article-2315932/RAFs-role-US-drone-attacks-killed-hundreds-Iraqis-MoD-admits-time-Britain-helped-pilot-aircraft-American-bases.html, last accessed 3 September 2014.

[2] Robathan, Defence: Unmanned Vehicles, HC Deb, 24 April 2013, c905W, www.theyworkforyou.com/wrans/?id=2013-04-24b.128974.h&s=%28iraq+AND+RPAS%29+section%3Awrans+section%3Awms#g128974.r0, last accessed 3 September 201

[3] Robathan, Defence: Unmanned Vehicles, HC Deb, 24 April 2013, c905W, www.theyworkforyou.com/wrans/?id=2013-04-24b.128974.h&s=%28iraq+AND+RPAS%29+section%3Awrans+section%3Awms#g128974.r0, last accessed 3 September 201

[4] MoD, Number of sorties flown by Reaper UAVs (unmanned aerial vehicles) in Afghanistan (Operation HERRICK) per year since 2008. Response to FOI request, Ref FOI2014/02630, p.1, www.gov.uk/government/uploads/system/uploads/attachment_data/file/348044/20140805_FOI_UKReaper_UAV_sorties_Afghanistan_since_2008.pdf, last accessed 3 September 2014.

[5] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use, Tenth Report of Session 2013-14*, Volume 1 (London: The Stationery Office Limited, 2014), p.43.

[6] Lord Drayson, Armed Forces: Predator Drone, HL Deb, 19 June 2006, c54W, www.theyworkforyou.com/wrans/?id=2006-06-19d.54.3&s=%28%22rules+of+engagement%22+AND+embedded%29+section%3Awrans+section%3Awms#g54.5, last accessed 3 September 2014.

[7] Lord Drayson, Armed Forces: Predator Armed Drone, HL Deb (2006) written answer, col. WA54, www.publications.parliament.uk/pa/ld200506/ldhansrd/vo060619/text/60619w01.htm, last accessed 3 September 2014.

[8] Chris Cole, *New figures show UK increasingly relying on drones for strikes in Afghanistan*, Drone Wars UK, 22 July 2014, dronewars.net/2014/07/22/new-figures-show-uk-increasingly-relying-on-drones-for-strikes-in-afghanistan, last accessed 4 September 2014; Chris Cole, *British government admits it secretly used US drones for attack in Afghanistan*, Stop the War Coalition, 9 February 2014, www.stopwar.org.uk/news/uk-government-admits-it-secretly-used-american-drones-for-attacks-on-afghanistan#.U-dJDlAYZLo, last accessed 4 September 2014.

[9] MoD Response to Freedom on Information Request, Ref: 30-04-2013-130638-007, 4 February 2014, dronewarsuk.files.wordpress.com/2014/02/20130204-cole-reaper-weapons-released-reply-u.pdf last accessed 5 September 2014.

[10] Andrew Robathan, Unmanned Air Vehicles, HC Deb (2013) written answer, col. 327W, www.publications.parliament.uk/pa/cm201314/cmhansrd/cm130612/text/130612w0001.htm, last accessed 4 September 2014.

[11] Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, Article 36, available from: www.icrc.org/applic/ihl/ihl.nsf/1a13044f3bbb5b8ec12563fb0066f226/f095453e41336b76c12563cd00432aa1, last accessed 5 September 2014.

[12] 'Civilians shall enjoy the protection afforded by this Section, unless and for such time as they take a direct part in hostilities', Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, Article 51.3; the interpretation and application of 'direct part in hostilities' may give rise to difficulties in particular cases. See Nils Melzer, Interpretive guidance on the notion of direct participation in hostilities under international humanitarian law, (Geneva: ICRC, May 2009), pp.20-40, www.icrc.org/eng/assets/files/other/icrc-002-0990.pdf, last accessed 5 September 2014.

[13] Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, Article 51.5.(b), Protocol 1, www.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=openDocument&documentId=4BEBD9920AE0AEAEC12563CD0051DC9E, last accessed 5 September 2014.

[14] Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, Article 57, Protocol 1, www.icrc.org/applic/ihl/ihl.nsf/Article.xsp?action=openDocument&documentId=50FB5579FB098FAAC12563CD0051DD7C, last accessed 5 September 2014.

[15] Public Interest Lawyers – *The Legality of the UK's Use of Armed Unmanned Aerial Vehicle (Drones)* – Opinion, Public Interest Lawyers, 3 June 2013, pp.3-4.

[16] House of Commons Defence Committee - *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14, Sixth Special Report of Session 2014–15*, HC 611, 29 July 2014, pp.4-12.

[17] International Court of Justice, Armed Activities on the Territory of the Congo (Democratic Republic of the Congo v. Uganda), Judgment, I.C.J. Reports 2005, p.243, www.icj-cij.org/docket/files/116/10455.pdf, last accessed 5 September 2014.

[18] Note by the Secretary-General, 'Promotion and protection of human rights and fundamental freedoms while countering terrorism, p.23, www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/a_68_389.pdf, last accessed 3 September 2014.

[19] European Court of Human Rights, 'Case of Al-Jedda v. The United Kingdom,' *Judgement, Application No.27021/08* (Strasbourg: European Court of Human Rights, 2011), www.justice.org.uk/data/files/CASE_OF_AL-JEDDA_v._THE_UNITED_KINGDOM.pdf, last accessed 5 September 2014.

[20] House of Lords, 'Opinions of the Lords of Appeal for Judgement in the Cause – Al-Skeini and others v. Secretary of State for Defence,' UKHL 26 (2007), www.interights.org/document/97/index.html, last accessed 5 September 2014. For a more detailed summary of how these tests are applied, see Alka Pradhan, 'European Court of Human Rights: Al-Jedda v. United Kingdom & Al-Skeini and Others v. United Kingdom, Introductory Note', International Legal Materials, Vol. 50/6, 2011, pp. 947-1050, http://www.jstor.org/discover/10.5305/intelegamate.50.6.0947?uid=3738032&uid=2&uid=4&sid=21104521482427, last accessed 5 September 2014.>

[21] European Convention on Human Rights, ND, p.6, www.echr.coe.int/Documents/Convention_ENG.pdf, last accessed 11 September 2014.

[22] Ryan Goodman, 'The Power to Capture or Kill Enemy Combatants', *The European Journal of International Law*, Vol. 24/3, 2013, pp.819-853, www.ejil.org/pdfs/24/3/2427.pdf, last accessed 4 September 2014. Set against this, the case of Bankovic, endorsed by the Judgement in the case of Al-Skeini, supports the proposition that a state cannot exercise control for ECHR purposes from the air. See Kerem Altiparmak, '*Bankovic*: an obstacle to the application of the European Convention on Human Rights in Iraq?', *Journal of Conflict Security Law*, Vol.9/2, 2004, pp.213-251.

[23] Chris Cole, *Information Tribunal – Day Two brief update*, Drone Wars UK, 25 September 2013, dronewars.net/2013/09/25/information-tribunal-day-two-brief-update/, last accessed 9 September 2014; Chris Cole, *Drone campaigners vow to pursue transparency despite losing Information Tribunal*, Drone Wars UK, 30 October 2013, 30 October 2013, dronewars.net/2013/10/30/drone-campaigners-vow-to-pursue-transparency-despite-losing-information-tribunal/, last accessed 9 September 2014. The full judgment was on 30 October 2013 and is at: dronewarsuk.files.wordpress.com/2013/10/023-301013-decision-cole.pdf, last accessed 9 September 2014.

[24] Tom Watson, MP, *Ministry of Defence on Drones: a lesson in opacity and obfuscation*, Tom Watson, MP, 3 October 2013, www.tom-watson.co.uk/2013/10/ministry-of-defence-on-drones-a-lesson-on-opacity-and-obfuscation, last accessed 6 September 2014.

[25] Drone Wars UK, *UK Drone Strike Stats*, dronewars.net/uk-drone-strike-list-2/, last accessed 5 September 2014.

[26] Sally Brammall and Emma Slater, *Details of 99 UK drone strikes in Afghanistan revealed*, The Bureau of Investigative Journalism, 1 March 2012, www.thebureauinvestigates.com/2012/03/01/details-of-99-uk-drone-strikes-in-afghanistan-revealed/, last accessed 5 September 2014.

[27] According to Drone Wars UK, 'The MoD…without explanation ceased updating the weekly RAF Operations Update page' after 15 September 2012.' See UK Drone Strike Stats, ND and has been updated since last update date in December 2012, dronewars.net/uk-drone-strike-list-2/, last accessed 5 September 2014.

[28] News section of the RAF Website, www.raf.mod.uk/news/index.cfm, last accessed 8 September 2014. The news section also contains useful information of other RPA-related activity and the latest one appears at: www.raf.mod.uk/news/archive/83-eag-ops-update--8-jun-to-21-jun-14-24062014, last accessed 8 September 2014.

[29] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14, Sixth Special Report of Session 2014–15*, HC 611, 29 July 2014, p.14.

[30] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14*, p.14.

[31] Note by the Secretary-General, 'Promotion and protection of human rights and fundamental freedoms while countering terrorism, p.23, www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/a_68_389.pdf, last accessed 3 September 2014.

[32] United Nations General Assembly Human Rights Council, Report of the Special Rapporteur on the promotion and protection of human rights and fundamental freedoms while countering terrorism, Ben Emmerson, United Nations General Assembly A/HRC/25/59, 11 March 2014, p.11, www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/a_hrc_25_59.pdf, last accessed 5 September 2014.

[33] Karen Pierce, UK Ambassador to the UN in Geneva, 22nd Plenary Meeting, 25th Regular Session of the Human Rights Council, 12 March 2014, webtv.un.org/meetings-events/human-rights-council/regular-sessions/25th-session/watch/clustered-id-contd-sr-on-religion-and-protection-of-human-rights-22nd-meeting-25th-regular-session-of-human-rights-council/3329494305001, last accessed 9 September 2014.

[34] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use, Tenth Report of Session 2013-14*, Volume 1 (London: The Stationery Office Limited, 2014), p.46.

[35] Jack Serle, *Drone strikes in Pakistan: UK complicity in US drone strikes is "inevitable" Emmerson tells Parliament*, The Bureau of Investigative Journalism, 5 December 2013, www.thebureauinvestigates.com/2013/12/05/uk-complicity-in-us-drone-strikes-is-inevitable-emmerson-tells-parliament, last accessed 5 September 2014.

[36] Personal correspondence with Professor Michael Clarke, 9 September 2014. See also APPG, *UN Special Rapporteur and Director of RUSI address APPG*, All-Party Parliamentary Group on Drones, 6 December 2013, appgondrones.wordpress.com/2013/12/06/un-special-rapporteur-and-director-of-rusi-in-parliament/, last accessed 6 September 2014; Ben Emmerson, 'Ben Emmerson QC and Professor Clarke parliamentary event on drones (part 1),' United Nations Association – UK, 4 December 2013, www.una.org.uk/media/audio/4-december-2013-ben-emmerson-qc-and-professor-clarke-parliamentary-event-drones-part-1, last accessed 3 September 2014.

[37] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14*, Sixth Special Report of Session 2014–15, HC 611, 29 July 2014, p.13.

[38] House of Commons Intelligence and Security Committee, *Rendition*, Cm 7171, July 2007, p.13.

[39] Intelligence and Security Committee, *Rendition*, p. 49.

[40] HM Government, *Consolidated Guidance to Intelligence Officers and Service Personnel on the Detention and Interviewing of Detainees Overseas, and on the Passing and Receipt of Intelligence Relating to Detainees* (London: Cabinet Office, 2010), pp.3-4.

[41] Foreign Secretary Statement to the House of Commons – GCHQ, 10 June 2013, www.gov.uk/government/speeches/foreign-secretary-statement-to-the-house-of-commons-gchq, last accessed 11 September 2014.

[42] Jemima Stratford and Tim Johnston, *In the Matter of State Surveillance*, Advice to Tom Watson, MP 22 January 2014, www.tom-watson.co.uk/wp-content/uploads/2014/01/APPG-Final.pdf, last accessed 5 September 2014.

[43] Holger Stark, 'Drone Killing Debate: Germany Limits Information Exchange with US Intelligence', *Der Spiegel*, 17 May, 2011, www.spiegel.de/international/germany/drone-killing-debate-germany-limits-information-exchange-with-us-intelligence-a-762873.html, last accessed 9 September 2014.

[44] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK Use, Tenth Report of Session 2013-14*, Volume 1 (London: The Stationery Office Limited, 2014), pp.6-7.

[45] Department of Defense, *Joint Statement for the Record on Law of Armed Conflict, the Use of Military Force and the 2001 Authorisation for Use of Military Force*, The Committee on Armed Services, United States Senate, 2013, www.lawfareblog.com/wp-content/uploads/2013/05/Taylor-Sheehan-Nagata-Gross_05-16-13.pdf, last accessed 5 September 2014.

[46] Department of Defense, *Joint Statement for the Record on Law of Armed Conflict, the Use of Military Force and the 2001 Authorisation for Use of Military Force*, p.1.

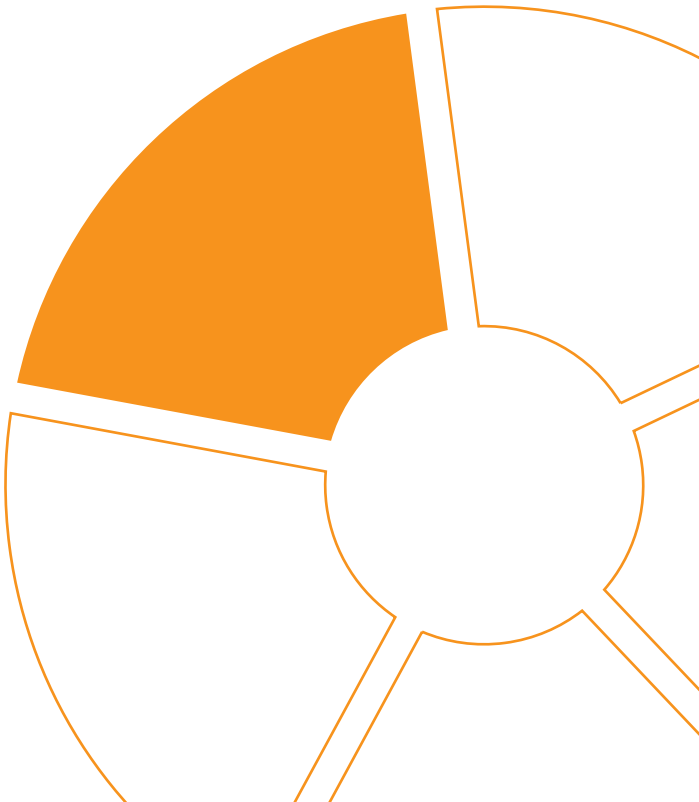
[47] Barack Obama, 'Remarks by the President at the National Defence University,' *The White House – Office of the Press Secretary*, 23 May 2013, www.whitehouse.gov/the-press-office/2013/05/23/remarks-president-national-defense-university, last accessed 6 September. Quotations are from here; Jonathan Masters, *Targeted Killings*, Council on Foreign Relations, 23 May 2013, available from: www.cfr.org/counterterrorism/targeted-killings/p9627, last accessed 6 September.

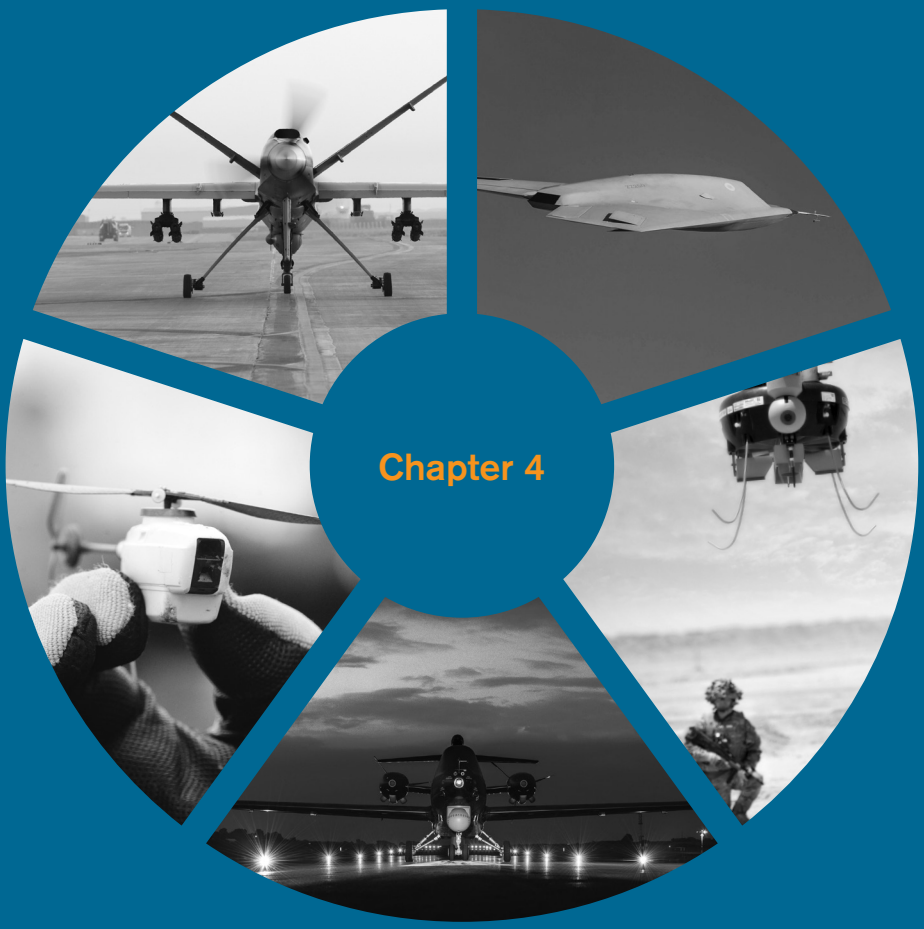
[48] John Brennan cited in Charlie Savage, 'Obama adviser discusses using military on terrorists,' *The New York Times*, 16 September 2011, www.nytimes.com/2011/09/17/us/john-o-brennan-on-use-of-military-force-against-al-qaeda.html?_r=0, last accessed 6 September 2014.

[49] Ben Emmerson, 'Report of the Special Rapporteur on the promotion and protection of human rights and fundamental freedoms while countering terrorism', *United Nations General Assembly A/HRC/25/59*, 11 March 2014, paragraph 71, p.18, www.securitycouncilreport.org/atf/cf/%7B65BFCF9B-6D27-4E9C-8CD3-CF6E4FF96FF9%7D/a_hrc_25_59.pdf, last accessed 6 September 2014.

[50] House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use, Tenth Report of Session 2013–14*, Volume I, 25 March 2014, p.6

[51] House of Commons Defence Committee – *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14, Sixth Special Report of Session 2014–15*, HC 611, 29 July 2014, p.13.





Chapter 4

Chapter 4: Ethics

Introduction

At present, Remotely Piloted Aircraft (RPA) are the most controversial conventional weapons platform in the UK Armed Forces' portfolio. The acquisition and use of armed MQ-9 Reapers has attracted significant media coverage, debate, and opposition, largely as a result of the employment of identical systems by the US government as part of its controversial campaign of cross-border counter-terrorist strikes (see Chapter 1). Widespread opposition to 'drone warfare', including the raising of ethical issues, constitutes a significant political consideration affecting procurement and strategic employment. While noting the depth and sincerity of the emotions raised by RPA, as a Commission, we have tried to address these issues dispassionately.

Debate about the aims and activities of UK Armed Forces, including the role of RPA, is a crucial element of a free and democratic society. In the Conclusion we examine the public diplomacy that the UK government needs to conduct so as to engage in the continuing debate over RPA use. A crucial element of public information is ensuring that citizens are accurately informed about the character and scope of RPA operations to enable serious debate over the ethical issues. This chapter appraises various ethical concerns about RPA which might inform that debate. It is a central conclusion of this Commission that, while they are of undeniable technological novelty, RPA under the control of a pilot on the ground do not fundamentally alter the ethical or legal challenges confronting British governments over the accumulation, deployment, and use of aerospace capability. The advent of Lethal Autonomous Weapons Systems (LAWS) would, however, raise real concerns and we examine these separately in Chapter 5.

Ethical issues relating to RPA

In the following sections, we examine the ethical issues most often raised over RPA possession and use:

Advanced societies using lethal high-technology methods to project force against less technologically advanced opponents

The use of RPA in counter-terrorism and counterinsurgency operations, such as those conducted by the United Kingdom in Afghanistan, has led to ethical criticism of the fairness and legitimacy of asymmetric warfare.[1] Feelings have no doubt been accentuated by the nature of the campaigns in Iraq and Afghanistan and, more recently, by the humanitarian damage caused by Israeli action in Gaza. Such objections need to be understood and given proper consideration, but we do not believe that they should be decisive.

We are not persuaded by the argument that warfare can only be legitimate when conducted in fair fights[2] between adversaries with equivalent technological capabilities.[3] The idea that the UK's Armed Forces should deliberately utilise less technologically sophisticated capabilities compromises the responsibility of the UK government to its own military personnel. It also potentially exposes civilians within a given area of operations to prolonged, indecisive, manpower-intensive, attritional campaigns involving less precise and discriminate methods of warfare. In this sense, technological parity between adversaries, divorced from other considerations about the justice of a conflict, is an irrelevant, and sometimes actively pernicious moral distraction. Equivalence in combat potential is, for one thing, likely to rule out any reasonable possibility of success, which has been a traditional requirement in the doctrine of the Just War.[4] In any case, currently in Afghanistan, pilots of Allied manned aircraft have faced no effective risk, given control of the skies by Western air forces, although as noted in Chapter 1, this may not be the case in future operations.

We think it essential that the technological characteristics of a weapons system should be bounded by international humanitarian law to allow the operator to achieve a proper distinction between combatants and civilians, proportionality between military effect and casualties or damage, and proper precautions in attack. Provided that these conditions of use are achieved, then we believe that the ethical and legal acceptability of any given operation ought to be dependent upon evidence of the careful regulation of violence, utilising the most precise and discriminate methods practically available.

There is certainly a case for humanitarian disarmament efforts to rid the world of injurious and indiscriminate weapons, but the Commission does not feel that RPA falls into this category. We sympathise, therefore, with concerns expressed to us by the Ministry of Defence (MoD) that there can be too ready a tendency for campaigns to stigmatise and then attempt to ban whole categories of weapons, regardless

of whether they are capable of being used with distinction. But building consistent and reliable global norms regulating military behaviour is both slow and difficult, and has to be against a range of other international concerns.

Virtual[5] war

An important moral consequence of the development of RPA is to create a weapons platform that can simultaneously reduce the level of civilian casualties whilst also decreasing the risk to intervening forces. The criticism voiced in relation to earlier Western military interventions (for example, NATO's use of force in Kosovo in 1999), that casualties among Western military personnel were being reduced at the expense of civilians in the operational theatre, what one critic dubbed 'risk-transfer militarism',[6] is seen to be less credible in an era of RPA warfare. Given this, it is unclear why the critics of RPA have not appreciated the benefits of these advanced weapons systems, both in reducing the exposure to harm of UK military personnel, and in reducing civilian casualties given the precision capabilities of RPA.

There is no doubt that moral dilemmas can occur in the conduct of modern warfare. Painful choices may sometimes have to be made between minimising losses, even to well-equipped friendly forces, and avoiding collateral casualties to civilians among whom the conflict is being fought. But armed RPA, in fact, provide ethically desirable possibilities for distinction, which cannot be offered by artillery fire, cruise missiles, or projectiles dropped or launched from manned aircraft. RPA targeting decisions can be corrected, if necessary, after many hours of continuous circling and information gathering, or have their attack plans overridden by their operators even at the last moment. This is particularly important in counterinsurgency campaigns where, due to their capacities for persistent surveillance, RPA improve the difficult process of determining combatancy in an environment where 'Insurgents consciously take actions to blend in with noncombatants.'[7]

Despite the disproportionate attention they have commanded in the media, RPA have emerged as only one aspect of a general, and irresistible, global evolution of warfare. As used so far by UK forces, they have helped to mitigate the strategic implications of other technologies which have favoured terrorists and insurgents: for example, increasingly sophisticated, self-forging and remotely detonated Improvised Explosive Devices (IEDs), shoulder fired anti-tank and anti-aircraft missiles, and cyber propaganda, mobilisation, or intimidation.

In this wider context, British service personnel are often forgotten in disputes over RPA. When sending service personnel into combat, governments and military commanders have a duty to afford them as much protection as possible. It is also often overlooked that their opponents are primarily responsible for the conflict in the first place.[8]

It is neither intellectually convincing today, nor plausible in historical perspective, to argue that the side with high, even suicidal, commitment in a conflict is automatically morally superior to opponents with high capital investments, more advanced equipment, and a greater concern for the survival of their troops.

39 Squadron Reaper Pilot at Creech Air Force Base. Image by SAC Andrew Morris; © Crown copyright 2009

It would otherwise be necessary to assert that, in the Second World War, the Japanese Imperial Army had a moral advantage over Allied opponents by their greater willingness to accept human casualties to achieve objectives for which the British and US forces relied upon firepower. Limiting losses of UK forces is crucial to the domestic legitimacy, and hence sustainability, of future campaigns.

As discussed in Chapter 2, the evolution of RPA will go far beyond the increasing availability of now well-known Medium Altitude Long Endurance (MALE) armed RPA like Reaper and Predator. Warships and even small army units are already using early generation RPA for Intelligence, Surveillance and Reconnaissance (ISR) purposes. The enhanced situational awareness provided by RPA will systematically assist the deployment of aircraft, ships, fighting vehicles, and soldiers, while also enhancing their kinetic effects.

The continually expanding capabilities offered by unarmed RPA will impact on the enemy with much the same lethal asymmetric advantage – and therefore moral consequence – as additional guns or rocket launchers, especially against less technically capable opponents. Multiplying unarmed eyes in the sky, meanwhile, is likely to result in improved situational awareness and so will potentially allow for greater protection of civilian lives and a reduction of collateral destruction.

Lowering the threshold for the use of force

Arguments based upon fears of the lowered threshold to war assert that RPA operations, since they do not risk the life of a pilot and provide a capability that reduces the exposure of ground forces, make the use of force an easier option for decision-makers. We are not persuaded by this position and feel it should not condition specific UK government choices. Nor should it be forgotten that there are cases where the use of force to protect civilians is the right option ethically-speaking. And the availability of armed RPA makes it easier for governments in that circumstance to do the right thing.

It is the moral and political responsibility of the UK's political system, and Parliament above all, to rein in any alleged propensity to resort too easily to force, or to prolong needlessly a military operation. We see no reason why the government should be unable to make informed strategic decisions over the use of military assets, including RPA. The 2013 House of Commons vote against military action in Syria, and the likely pressure to reveal the advice of Attorneys General, as a result of the intervention in Iraq, are two factors that will affect future practice in the direction of caution. The House of Commons Defence Committee is able to take evidence from the MoD to satisfy itself on the judgments made, and the Parliamentary Intelligence and Security Committee can examine the intelligence supporting the government's decisions. Solutions to many political apprehensions about RPA lie within Parliament's own grasp.

These restraints should be seen in a context in which RPA, including armed variants, are an acceptable component of the UK order of battle. We have heard no evidence that would support a judgement that the acquisition of new, remotely piloted capabilities by British forces would lead automatically to their excessive or reckless use. We think that it would be wrong to put individual UK service personnel at greater risk of death or injury, or expose the UK armed services to operational failure, in order to reduce the temptation for UK governments to use the military instrument excessively and incorrectly. Pushed to its logical conclusion, the argument against the adoption and use of RPA implies a general predisposition against the offensive operational capabilities of the UK Armed Forces, something far from the democratically expressed position of any major political party, and far from our alliance obligations to NATO.

There is a further consideration of some potential ethical importance. As noted earlier, we believe that RPA, including armed RPA, can help minimise UK casualties, and not just losses to aircrew. The prospect of low or no friendly casualties may be particularly important for humanitarian missions, which might not otherwise be conducted in the absence of direct national interests. A successful and popular RPA-supported intervention, involving, for instance, the surveillance and documentation of war crimes, and the armed protection of civilians, could indeed help to dispel the negative reputation that currently surrounds armed RPA.

UK RPA exports

In the wrong hands, RPA could become a dangerous and destabilising delivery system. We have doubts about how far the proliferation of the various enabling technologies, except perhaps for secure high bandwidth satellite communications, can be controlled. We also judge that the UK government is not in a strong position to influence international behaviour over RPA exports, and it has the legitimate concerns of its own aerospace industry to consider. Nevertheless, it would be consistent with general UK policy positions and an ethical concern about international stability and the rule of law, to make every effort to support international efforts to achieve an effective international framework of export control. And even if that is not successful, there are sound ethical reasons why the UK government should (as discussed in Chapter 6) take a considered line over licensing decisions for RPA and their components, even at some cost to UK commercial interests. The UK government claims to have the most stringent export control mechanisms in the world and RPA, especially in view of the way they could be used by terrorists, are worth treating with particular caution.

Collateral mental health consequences of armed RPA use

The problematic health and psychological effects of continuous RPA operations on populations 'living under drones' have been highlighted in a number of studies.[9] Although such findings, if fully corroborated, would not necessarily rule out occasional use of armed RPAs, widespread distress and damage

to mental health would be a potentially serious ethical concern. Evidence presented to the Commission, however, suggests that armed British RPA can be operated so that they are, in effect, invisible and inaudible almost all the time and thus not noticeable to the general public. We accept, however, that such operation is not always possible. The UK government should, therefore, look to assist, and if necessary help initiate, efforts to produce reliable scientific findings regarding the psychological impact of RPA on civilian populations. This would assist the public diplomacy we recommend to reach out to especially concerned diaspora communities in the United Kingdom.

Counter-productive strategic consequences

The UK has an ethical obligation to make military choices that are as prudent as possible. It needs to consider, therefore, the potential 'blowback' of RPA use, highlighted most recently in a 2014 report by the Stimson Centre.[10] Inflicting crippling attrition on murderous insurgents or international terrorist groups, within the limits of international law, may be ethically desirable in itself – unless it leads to enhanced recruitment, a strengthening of the capabilities or a deepening of fanaticism among such groups. The problems of judgement and measurement here are formidable.

We do not regard it as axiomatic that any and all use of armed RPA will eventually prove counter-productive. But even if, as we argue above, the case for armed RPA is at least as strong, ethically and legally, as for manned aircraft, it will be necessary to take into account the psychological and strategic consequences of widespread beliefs or feelings that they *are* in some way more morally objectionable. For instance, the Commission encountered repeated warnings of the additional emotions which are raised by 'drone warfare'. Consequently, we think there is an ethical as well as an operational case for enhanced research on the intersection of psychological, cultural and strategic factors relating to remotely controlled military systems, in order to guide judgements in this area. The United Kingdom should have the existing doctrine, organisation, and available institutional capacities in British ministries, agencies, and armed forces capable of reaching reasonable conclusions on the information available. The development of the targeting policy for a particular campaign would be the natural stage at which such considerations should be examined and reviewed, and that appropriate subject matter experts could be invited to join this process.

Concerns over the ethos of UK RPA operations

We have no reason to doubt the ethos with which UK drone operations are currently prosecuted and the institutional concern for responsibility, legality, proportionality, and distinction in their use. We do not accept that British military officers operating RPA automatically develop a callous 'video game' mentality. Whilst RPA operators do not have the opportunity to exercise in the course of their duties the typical military virtue of physical courage,[11] they do get to exercise other important military virtues such as prudence, circumspection, and judgment, not least with regard to minimising civilian casualties.[12] As one of the Royal Air Force (RAF) personnel flying Reapers has put it:

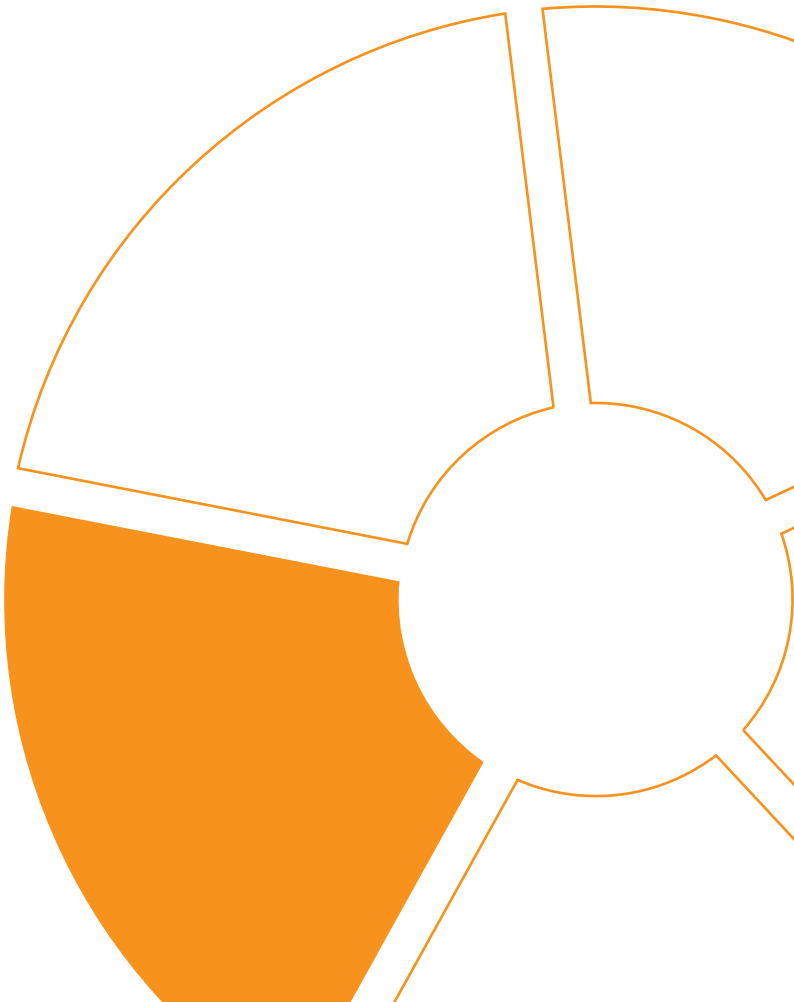
> *I feel that the certain knowledge that everything we do is being watched by many others: general officers, legal advisors, operations officers etc. in the command centre makes us more, rather than less, aware of the consequences of the actions we take. We have the capability to see (unlike in a fast-jet) the effect of our weapon strikes in relatively close-up detail. Also, if the troops on the ground take photos of the strike effects they often send them to us as feedback. No matter how explicit these photos are I personally look at them all. Not because of some voyeuristic tendency but because I believe that if you cannot face the reality of what you do in killing a human being then you should not be part of that process.*[13]

It is obviously important that this ethos should be conscientiously and self-critically maintained. For this reason, we would oppose any suggestion that British RPA be operated by anyone other than uniformed personnel subject to military discipline. We believe the operation of UK RPA by uniformed personnel is a critical component to maintaining this ethos, and that those operating armed UK RPA should continue to have the appropriate technical and ethical training, and the requisite educational level and maturity, as is the case today.[14]

A study in 2013 by Jean L. Otto and Bryant J. Webber of the USAF investigating the health effects on US RPA operators showed no differences in mental health issues, including post-traumatic stress disorder, anxiety disorders, and depressive disorders between pilots of manned aircraft on the one hand, and RPA on the other.[15] There is evidence that risks of unethical behaviour amongst military personnel may indeed be increased, not by distance and safety, but by personal fear, and loss of comrades. In 2006, for example, the US Military Health Assessment Team discovered an overall correlation between close-proximity, anger and the ill-treatment of enemy personnel.[16] Nonetheless, given the newness of RPA operations, and the limited data available from US operations,[17] the UK government should monitor its own pilots through similar studies to ensure the mental health impacts of RPA operations on RPA pilots are fully understood.

Key findings

- There is no convincing general ethical objection to acquiring RPA, whether armed or unarmed, while the ethical acceptability of their use, like that of other weapon systems, is contextually dependent upon meeting the legal principles of distinction and proportionality.
- We do not consider that the threshold for the use of force will be lowered by the availability of RPA to UK Armed Forces, as long as Parliament plays its proper oversight function.
- Compliance with long-term legal standards removes many legitimate ethical concerns about operational employment. Available evidence suggests that the UK complies with its international legal obligations over RPA (see the previous chapter).
- Those operating UK RPA should be uniformed military personnel who should have the appropriate ethical and technical training, and the requisite educational level and maturity.



[1] Western forces reliance on aerial power has resulted in accusations of cowardice by the Taliban and Osama Bin Laden. Thomas Hegghammer, *Al-Qaida Statements 2003-2004 – A Compilation of Translated Texts by Usama bin Ladin and Ayman al-Zawahiri*, FFI/RAPPORT-2005/01428, (Norway: Forsvarets forskningsinstitutt (Norwegian Defence Research Establishment), 2005), p.12, rapporter.ffi.no/rapporter/2005/01428.pdf, last accessed 6 September 2014.

[2] Paul Schulte, 'Morality and War,' in Yves Boyer and Julian Lindley, (eds.), *The Oxford Handbook of War* (Oxford: Oxford University Press, 2012), pp.99-115.

[3] Royal Aeronautical Society Air Power Group, 'The "Drone" Debate: The Ethics of Armed Unmanned Aircraft,' *Aerospace* (November, 2013) pp.14-19.

[4] Charles Guthrie and Michael Quinlan, *The Just War Tradition: Ethics in Modern Warfare*, (London: Bloomsbury, 2007).

[5] Michael Ignatieff, *Virtual War: Kosovo and Beyond*, (New York: Picador USA, 2001); James Der Derian, *Virtuous War: Mapping the Military-Industrial-Media-Entertainment Network*, (New York: Routledge, 2009).

[6] Martin Shaw, 'Risk-transfer Militarism, Small Massacres and the Historic Legitimacy of War', *International Relations*, Vol.16/3, December 2002, pp.343-359.

[7] Rebecca J. Johnson, 'The Wizard of Oz Goes to War: Unmanned Systems in Counterinsurgency', in Bradley Jay Strawser (ed.), *Killing by Remote Control: The Ethics of an Unmanned Military* (Oxford: Oxford University Press, 2013), p.169.

[8] We are grateful to Professor Nigel Biggar, Regius Professor of Moral and Pastoral Theology, Christ Church College, Oxford, for his insight on this issue.

[9] Marion Birch, Gay Lee and Tomasz Pierscionek, *Drones: The Physical and Psychological Implications of a Global Theatre of War* (London: Medact, 2012), www.medact.org/wp-content/uploads/2012/10/report-drones-2012.pdf, last accessed 7 September 2014; International Human Rights and Conflict Resolution Clinic at Stanford Law School and Global Justice Clinic at NYU School of Law, *Living Under Drones: Death, Injury, and Trauma to Civilians From US Drone Practices in Pakistan*, (No place of publication given: Stanford Law School and Global Justice Clinic at NYU, 2012), www.livingunderdrones.org/wp-content/uploads/2013/10/Stanford-NYU-Living-Under-Drones.pdf, last accessed 7 September 2014; All-Party Parliamentary Group on Drones. *Psychological Terror? Lessons from Pakistan and Yemen on the Psychological Impact of Drones, All Parliamentary Group on Drones, 5 March 2013*, 5 March 2013, appgondrones.wordpress.com/appg-meetings/psychological-terror-lessons-from-pakistan-and-yemen-on-the-psychological-impact-of-drones-5-march-2013/, last accessed 7 September 2014.

[10] The Stimson Centre, *Recommendations and Report of the Task Force on US Drone Policy* (Washington, DC: The Stimson Centre, 2014), pp.30-31, www.stimson.org/images/uploads/research-pdfs/task_force_report_FINAL_WEB_062414.pdf, last accessed 7 September 2014.

[11] P.W. Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century* (New York: The Penguin Press, 2009), pp.332-333.

[12] We are grateful to Professor Nigel Biggar, Regius Professor of Moral and Pastoral Theology, Christ Church College, Oxford, for his insight on this issue.

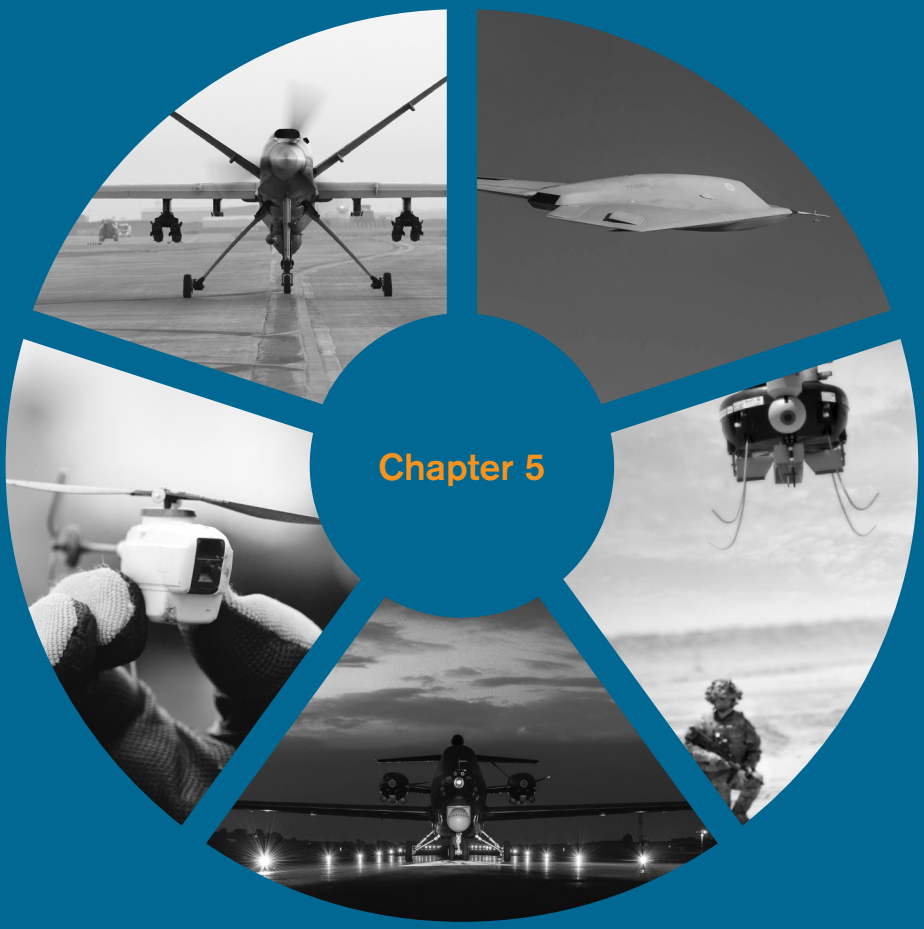
[13] Peter Lee, 'Remoteness, Risk and Aircrew Ethos', *Air Power Review*, Vol.15/1, 2012, p.15, www.airpowerstudies.co.uk/sitebuildercontent/sitebuilderfiles/aprvol15no1.pdf, last accessed 7 September 2014.

[14] David Whetham, *Military Ethics Training and Education Survey and Recommendations for the Nigerian Armed Forces*, MoD, July 2014.

[15] Jean L Otto, Bryant J Webber – 'Mental health diagnoses and counseling among pilots of remotely piloted aircraft in the United States Air Force', *Medical Surveillance Monthly Report*, Vol.20/3, March 2013, pp.3-8, www.afhsc.mil/viewMSMR?file=2013/v20_n03.pdf, last accessed 7 September 2014.

[16] Office of the Surgeon Multinational Force Iraq and Office of the Surgeon General United States Army Medical Command, *Mental Health Advisory Team (MHAT) IV Operation Iraqi Freedom 05-07 Final Report*, 17 November 2006, www.combatreform.org/MHAT_IV_Report_17NOV06.pdf, last accessed 7 September 2014.

[17] James Dao, 'Drone Pilots Are Found to Get Stress Disorders Much as Those in Combat Do', *The New York Times*, 22 February 2013, www.nytimes.com/2013/02/23/us/drone-pilots-found-to-get-stress-disorders-much-as-those-in-combat-do.html?_r=0, last accessed 9 September 2014.



Chapter 5

Chapter 5: Lethal Autonomous Weapons Systems

Introduction

This Commission has so far considered Remotely Piloted Aircraft (RPA) currently in use in operational theatres and the next generation that will emerge in the medium term from programmes already underway. This chapter is concerned with the long-term developments in technology looking beyond 2035 that will enable the possible emergence of autonomous military systems without a pilot on the ground involved in manoeuvring the RPA, target identification, and weapons release. At that point, the system is no longer remotely piloted and the term RPA becomes inappropriate. Popularly, the term 'killer robot' is used to describe such systems, particularly by those opposed to their development on legal and ethical grounds. Here, we shall refer to them as Lethal Autonomous Weapons Systems (LAWS).

Legal and ethical dimensions

When adopting any weapons system, the UK government must assess whether that system can be used in compliance with international humanitarian law in regard to distinction, proportionality, and precaution in attack.[1] In the context of LAWS, the legal argument turns on the question of whether it is possible for such a system to exercise the necessary judgement to comply with these rules. If, for example, the system was unable to discriminate effectively and reliably between legitimate military targets and persons and facilities granted protection under international law, then it could not be used without risking violation of the law. The Commission takes the view that it is not possible in the foreseeable future to programme international humanitarian law into an autonomous weapons system.

Advocates of LAWS open up the possibility of a future in which LAWS could be faster in response and more able than humans to expose themselves to danger in order to reduce casualties to civilians, friendly forces, and conceivably also to enemy military personnel. Given the UK Armed Force's commitment to protecting civilians in armed conflict, it could be argued that were such weapons available, it would be unethical not to employ those weapons which would result in the fewest deaths. But given the programming challenge of ensuring that LAWS could undertake ethical and legal decisions in complex and messy operational environments, there are doubts as to whether LAWS could replace RPA and manned aircraft in ground attack missions. Indeed, the complexity of modern computer programmes makes it difficult to anticipate with any degree of certainty how LAWS will act within a given context. There is therefore the danger that LAWS 'will face unanticipated situations and may act in an unintended fashion.'[2]

A further objection to LAWS is that, even if they could be programmed to comply with international humanitarian law, they would still fail the test of the 'laws of humanity and the requirements of the public conscience' that is embodied in the Preamble to the 1899 Hague Conventions, often referred to as the 'Martens Clause.'[3] Devoid of moral reasoning and the capacity for

compassionate or empathetic encounters with others, it has been argued by, for example, the International Committee of the Red Cross (ICRC), that LAWS would simply lack some of the inherently human restraints on killing. They would, in other words, lack the humanity to rise above the moral minimum.

A further compelling argument relates to the issue of legal and ethical accountability for violations of international humanitarian law. Given the absence of human control over the operation of LAWS, it is unclear where responsibility would lie for any unlawful actions by weaponised robots, and none of the anticipated responses are persuasive. A prominent advocate for a ban on LAWS, the international non-governmental organisation (INGO), Human Rights Watch (HRW), has argued that it is impossible to conceive of a 'fair and effective way to assign legal responsibility for unlawful acts committed by fully autonomous weapons.'[4] This critical limitation led the UN Special Rapporteur on extra-judicial, summary or arbitrary executions, Christof Heyns, to conclude in his report to the Human Rights Council of April 2013 that:

> *The question of legal responsibility could be an overriding issue. If each of the possible candidates for responsibility identified above is ultimately inappropriate or impractical, a responsibility vacuum will emerge, granting impunity for all LAR [Lethal Autonomous Robots] use. If the nature of a weapon renders responsibility for its consequences impossible, its use should be considered unethical and unlawful as an abhorrent weapon.*[5]

We recognise that there is a school of expert opinion that believes the necessary advances to enable autonomy can be made in computer and robotic science. It has been argued by Ronald C. Arkin, a leading roboticist, that morally programmed LAWS may well be able to 'exceed human performance with respect to IHL [international humanitarian law] adherence.'[6] He sees 'no fundamental scientific barriers to the creation of intelligent robotic systems that can outperform humans with respect to moral behaviour…By merely stating these systems cannot be created to perform properly and ethically does not make it true.'[7] However, the Commission is unpersuaded by these arguments and shares the cautious view taken so far by the UK government. In a House of Commons debate, Alistair Burt, then Parliamentary Under-Secretary for Foreign and Commonwealth Affairs, said on 17 June 2013 that, 'We cannot develop systems [LAWS] that would breach international humanitarian law, which is why we are not engaged in the development of such systems and why we believe that the existing systems of international law should prevent their development.'[8] He went on to emphasise that 'whether or not this is the case, the UK's position on not wishing to develop such weapons is absolutely clear.'[9] This position had earlier been laid out emphatically by Lord Astor, Parliamentary Under-Secretary at the Ministry of Defence (MoD), on 26 March 2013 when, in response to a question on the future thinking in MoD on LAWS, he stated, 'let us be absolutely clear that the operation of weapons systems will always – always – be under human control.'[10]

Distinguishing automated and autonomous systems

Assuming that UK policy is based on having human control over the operation of RPA weapons systems, there is still considerable potential for the application of automation, and a need, therefore, not to conflate automation with autonomy.

An automated system is one that can follow a series of programmed commands. There currently exists a range of automated capacities within both civilian and military contexts. Automation in civil aviation includes automatic landing systems for use in fog, automated navigation, anti-collision systems, and engine controls. For RPA, automation is underway in areas such as take-off/landing and navigation. While capable of carrying out a number of fixed functions, automated systems lack the capacity for independent decision-making in complex and dynamic environments. If an automated system encounters a problem it can only follow a script, such as return to base, or stop and wait for assistance; it is not yet capable of devising more creative solutions in order to effectively cope with demanding circumstances.

Systems where there is no active and direct human intervention across the various stages of a given decision-making process are not necessarily autonomous, and may, rather, be highly automated. Examples of complex automated systems include Phalanx, Iron Dome and other Counter Rocket, Artillery and Mortar (C-RAM) active defence systems. In most cases, these can be operated with a human override, but the urgency

of the tactical situations in which they are employed means that the system is automated as the default position, and the environment in which they are being used does not involve the legal issues over distinction discussed in the previous section.

Current automated systems are based on deterministic algorithms which follow a logical line of conditions, which if met, will result in known and totally consistent outcomes. Providing there are adequate safeguards and stringent checks on the work of the software engineers, policy makers and target clearance bodies should have confidence that these systems will perform in their chosen environments within their appropriate rules of engagement. A distinction for armed RPA is, nevertheless, often made between 'person *in* the loop' systems, such as the current generation of RPA where the operator is in full control, and 'person *on* the loop' systems, in which targets are automatically selected by the RPA, with the human operator simply having the ability to override the 'kill switch' to stop firing from proceeding.[11] It should be noted that Phalanx, Iron Dome, and C-RAM systems are defensive, and so a person on the loop possesses advantages over systems designed in the offensive role. To be within the legal framework in the latter case, great care will be needed to ensure that the human operator, with whom legal and ethical responsibility rests, has the information and decision time to satisfy the requirements of distinction.

Within the fields of robotics and computer science, there are different schools of thought as to when automation becomes so advanced that it constitutes autonomy. For the purpose of this review, we take the view that automated systems may range along a spectrum from simple systems that complement an active human operator to sophisticated systems in which a human operator may perform a very limited role, if any at all, such as automated landing systems. However, there is an absolute cut-off point beyond which a weapons system is autonomous. Put simply, a weapons system is either autonomous or it is not – there is no spectrum of autonomy.[12]

An autonomous weapons system will not only display highly-developed automated functions, it must also demonstrate volition and intention.[13] Volition means that the system is capable of making its own choice of target and of deciding whether to engage based on its own perceptions and understanding of the surrounding environment. Taken to its logical conclusion, the Commission was told, an autonomous system would effectively be capable of choosing to change sides. To show intention, the system needs to be capable of planning how to complete its tasks in a complex, ambiguous, and dynamic environment. We would caution that volition and intention do not equate to a capacity for distinction and proportionality as defined under international humanitarian law.

To summarise, an automated weapons system is capable of carrying out complicated tasks but is incapable of complex decision-making. Automated systems are limited to deterministic decisions in which the range of possible responses to a given event is strictly pre-determined. By contrast, an autonomous system will not simply follow pre-programmed pathways. Instead, it is capable of exhibiting learning and non-deterministic decision-making in response to the pressures of complex and evolving environments. By this definition, there are, at present, no autonomous air systems in existence, let alone ones responsible for decisions that could lead to the loss of life.

Part of the Israeli 'Iron Dome' missile defence system.

The future development of advanced air systems

While the dangers of future battlefields dominated by 'killer robots' with independent authority over life and death decisions may well still be the realm of dystopian science-fiction, there are a few relatively narrow environments where the programming of advanced automation is already apparent. One example is the Israeli Iron Dome that shows the feasibility of having a system that will detect and shoot down simple incoming rockets without the need for human decision, and where the time taken to have a person in the loop would make interception impossible.

Looking ahead, another environment for further advanced automation is air to air combat where the advantage is likely to go to the side that can field automated systems. The classic dog-fighting scenario may have given way to a long-range beyond line of sight (BLOS) duel, utilising expensive and highly capable air-to-air missiles. But should rules of engagement (RoE), shortage of missiles or sheer tactical surprise necessitate air-to-air combat, it is received wisdom that the manoeuvring advantage lies 'with the fighter pilot who [can] make faster and more accurate decisions than his opponent.'[14] According to a recent analysis by Captain Michael Byrnes, a US Air Force (USAF) officer with extensive experience of operating Reapers and Predators, automated systems would be able to outperform manned equivalents across every facet of combat decision-making. This is because, while human pilots 'average 200-300 milliseconds to react to simple stimuli…machines can select or synthesize and execute manoeuvres, making millions of corrections in that same quarter of a second.'[15]

While a sensitive issue within the defence community, highly automated RPA for air defence would also offer potential benefits over manned aircraft in terms of aircrew training and readiness levels. Novice human pilots require a significant investment of time and money in order to gain the experience and skills required to make them effective pilots. Once this level has been achieved, a high-degree of preparedness for unexpected deployments requires continuous training to ensure the retention of key skills. In part due to increasing pressures on defence spending, it is inevitable that piloting skills amongst air personnel will atrophy during extended periods without combat operations. Unlike human equivalents, the automated systems 'can "sit on the shelf" for extended periods of time and remain exactly as sharp as they were the day they were pulled from service.'[16] Further, unlike with human pilots, where the loss of a pilot necessarily entails the disappearance of generic and more theatre-specific expertise, future RPA will be capable of learning from the destruction of an aircraft in combat and could instantaneously 'and in near real time commits adaptations to other UCAVs [Unmanned Combat Aerial Vehicles] in the fight. Opponents may find that the same tactic never works twice against these systems.'[17]

Greater automation would also reduce the pressure on the various enabling systems and technologies that are vital to operating the current generation of RPA.[18] Reliable communications with RPA to establish effective control of the vehicle is essential and this can be difficult to maintain in both remote and contested airspaces. The existing pressures on bandwidth are likely to increase as more sophisticated sensory equipment, producing huge amounts of data which must be accurately collated, accessed and interpreted, become ubiquitous across current and future generations of RPA.

There is a broad consensus that the development of far greater levels of automation is inevitable in the future of aerial power. The economy and precision of computerised decision-making processes would give such aircraft a significant and decisive advantage over traditional manned platforms.[19] The real questions are when the requisite technology will be available, by whom it will be developed, under what constraints, and whether the technology will advance to the point where some nations will wish to field genuinely autonomous air combat systems. The distinction requirement under international humanitarian law would, however, always remain.

Highly developed automaticity – but short of autonomy – would also be valuable when considering the use of RPA in swarms which hypothetically allow a single pilot to operate multiple RPA.[20] A range of automated measures,

such as anti-collision software, might permit such usage. While some doubt the cognitive capacities of human operators to simultaneously maintain effective control and adequate situational awareness over multiple units,[21] others have envisaged more 'decentralised'[22] RPA architectures in which a human operator oversees the execution of an automated operation. Mary L. Cummings has noted through experimental research that the development of automated software could 'mitigate cognitive overload and reduce workload' for human operators of swarms.'[23]

The current generation of RPA is not well suited to operating in contested airspace in which communications may be intentionally disrupted or 'jammed'. Were this to happen, the RPA either remains in its position where it may be vulnerable to hostile fire or it returns to base, which may inadvertently reveal the location of friendly forces to an enemy.[24] These challenges highlight the desirability of ever-more independent software on board RPA that allow better automated responses to such situations. However, as demonstrated by the widely reported capture, parading, and reverse engineering of a US Lockheed Martin Sentinel RQ-170 by the Islamic Republic of Iran, there are inherent dangers with regards to the loss of advanced RPA in relation to both its hardware but also, crucially, the software, on which much of its capability depends.[25]

International control of LAWS

A global coalition of NGOs across some twenty-five countries aimed at stopping 'Killer Robots' was launched in April 2013. That coalition is committed to pre-emptively banning LAWS. In the same month, Christof Heyns called for a moratorium on the development and deployment of autonomous weapons while an international commission considered the issue. In May 2014 a meeting of UN experts in Geneva under the auspices of the Convention on Certain Conventional Weapons (CCW) focused its deliberations on emerging technologies in LAWS. A further meeting is planned for November 2014. Whether or not these talks lead to progress towards international agreements to limit LAWS, the MoD has informed the Commission that the UK government does not support either a moratorium on development or a prohibition on use.

An effective international agreement to prohibit the weaponisation of autonomous technologies is argued by some to be unobtainable because even if the formidable definitional issues could be overcome, i.e. automation versus autonomy; maritime and air versus land; military, civil and dual use and so on, there is a fundamental verification challenge in relation to a global ban. The difficulty of verifying that states are in compliance with such a ban would be exceptionally demanding given the developments in the civil sector of robotics and related technologies. The Commission recognises that research will, and should, continue into the various enabling military technologies relevant to LAWS, e.g. neuroscience, computing, and nanotechnology, all of which have possible economic, industrial, social, agricultural and medical applications. The Commission is, therefore, aware of how complex maintaining a ban would be in the face of civilian technological breakthroughs in these spheres, and the wider normalisation of autonomous systems. However, the dual-use challenge between civil/military applications has not prevented robust arms control agreements in the nuclear and chemical fields, and so we would not want to dismiss prematurely the possibility of an agreement at Geneva.

RQ 170/180 Artist Impression

Even if governments could be satisfied on the verification question, there remains a question of compliance. States that wish to keep the military option of LAWS available may not support a ban, and even if they did, they may withdraw from a treaty if the technology to develop LAWS becomes available. The likelihood that some states will refuse to enter into a treaty could lead others to stay outside for fear of being militarily disadvantaged in the future.

UK Ministers have argued, as noted above, that the existing legal framework already prevents the development and use of LAWS. We consider that this position is not necessarily shared by all nations, and encourage the UK government to take a leading role in the CCW discussions in Geneva. The UK government could help secure a new and widely endorsed international normative framework that would helpfully raise the stakes for any government tempted to develop LAWS that would be in breach of existing international humanitarian law.

Key findings

- Against a high-technology adversary, especially in the air, where speed of response and immunity to detection and jamming matter most, a higher degree of automation in RPA would offer unparalleled capacities for achieving aerial dominance.
- Given the strategic advantages of further automation, UK governments will have to decide how far they wish to invest in this technology, given the likelihood that potential adversaries will do so.
- There remain, however, extraordinarily challenging engineering and programming tasks in order to design autonomous systems able to operate in complex and messy operational environments. Such systems would have to be able to apply the principle of distinction between what is a legitimate military target that can be attacked in accordance with international humanitarian law, and persons who require protection, including civilians, surrendering forces, and prisoners of war.
- We have doubts as to whether LAWS as a successor to RPA could ever be developed for ground operations consistently and effectively to implement the distinction between civilians and combatants, and to exercise the proportionality necessary for compliance with international humanitarian law. We support the UK and US governments' decision not to develop LAWS.
- We encourage the UK government to take a leading role in the CCW discussions in Geneva. The UK's military prowess, diplomatic influence, and extensive experience in arms control means that it is well placed to help secure a new and widely endorsed international normative framework. This would raise the stakes for any government tempted to develop LAWS, that would break existing international humanitarian law.

[1] Article 36, Protocol 1 requires that '[i]n the study, development, acquisition or adoption of a new weapon, means or method of warfare,' a state 'is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable' to that state. Just because a weapon is autonomous the weapon system is not itself illegal unless it cannot be used in conformity with international humanitarian law. As Kenneth Anderson and Matthew C. Waxman have argued, 'the fact of autonomy itself – the fact of machine selection of target and engagement with it – does not violate the law of armed conflict.' 'Law and Ethics for Autonomous weapon Systems Why a Ban Won't Work and How the Laws of War Can', Hoover Institution 2013, P.11, media.hoover.org/sites/default/files/documents/Anderson-Waxman_LawAndEthics_r2_FINAL.pdf, last accessed 7 September 2014.

[2] Peter Asaro, 'On Banning Autonomous Weapon Systems: human rights, automation, and the dehumanization of lethal decision-making', *International Review of the Red Cross*, Vol.94/886, Summer 2012, p.691, www.icrc.org/eng/assets/files/review/2012/irrc-886-asaro.pdf, last accessed 7 September 2014.

[3] Rupert Ticehurst, 'The Martens Clause and the Laws of Armed Conflict', *International Review of the Red Cross*, No.317 (no volume given), 30 April 1997, www.icrc.org/eng/resources/documents/misc/57jnhy.htm, last accessed 7 September 2014.

[4] Human Rights Watch and the International Human Rights Clinic, *Losing Humanity: The Case against Killer Robots*, Human Rights Watch, November 2012, p.42, www.hrw.org/sites/default/files/reports/arms1112ForUpload_0_0.pdf, last accessed 7 September 2014.

[5] United Nations General Assembly, *Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions*, Christof Heyns, Human Rights Council, Paper A/HRC/23/47, 9 April 2013, p.15, www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/Session23/A-HRC-23-47_en.pdf, last accessed 7 September 2014.

[6] Ronald C. Arkin, 'Lethal Autonomous Systems and the Plight of the Non-combatant', *AISB* (Artificial Intelligence and the Simulation of Behaviour) *Quarterly*, No.137, July 2013, p.4, www.cc.gatech.edu/ai/robot-lab/online-publications/aisbq-137.pdf, last accessed 7 September 2014.

[7] Ronald C. Arkin, 'Lethal Autonomous Systems and the Plight of the Non-combatant'.

[8] Alistair Burt, HC Deb. Lethal Autonomous Robotics, 17 June 2013, Column 735.

[9] Alistair Burt, HC Deb. Lethal Autonomous Robotics, 17 June 2013, Column 738.

[10] Lord Astor, HL Deb. Armed Forces: Autonomous Weapon Systems, 26 March 2013, Column 960.

[11] Human Rights Watch and the International Human Rights Clinic, *Losing Humanity*, p.2.

[12] This understanding of the relationship between automation and autonomy renders the term 'Fully Autonomous Robot' (FAR) redundant as there is no such thing as *full* autonomy.

[13] Marra and McNeil, 'Understanding "The Loop": Autonomy,' p.13.

[14] Marra and McNeil, 'Understanding the Loop: Regulating,' p.10.

[15] Capt Michael W. Byrnes, USAF, 'Nightfall: Machine Autonomy in Air-to-Air Combat', *Air & Space Power Journal*, May–June 2014, p.57, www.airpower.maxwell.af.mil/digital/pdf/articles/2014-May-Jun/F-Byrnes.pdf, last accessed 7 September 2014.

[16] Byrnes, 'Nightfall,' p.57.

[17] Byrnes, 'Nightfall,' p.54.

[18] Within the MoD, specific areas of concern relate to 'aircraft co-ordination and de-confliction, competition for radio-frequency bandwidth and the ability to analyse the flood of collected data'. Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.4-3. Similar concerns are outlined in the DoD Roadmap which highlights bandwidth issues, data protection and exploitation as particular areas of concern. DoD, *Unmanned Systems Integrated Roadmap*, 2013-2038, 2013, pp.15-18.

[19] United States Air Force, *Unmanned Aircraft Systems Flight Plan, 2009-2047* (Washington DC: United States Air Force, 2009), p.16, 43.

[20] Mary L. Cummings, 'Operator Interaction with Centralised Versus Decentralised UAV Architectures,' in Kimon P. Valavanis and George J. Vachtsevanos (Ed.s) *Handbook of Unmanned Aerial Vehicles* (New York: Springer, forthcoming).

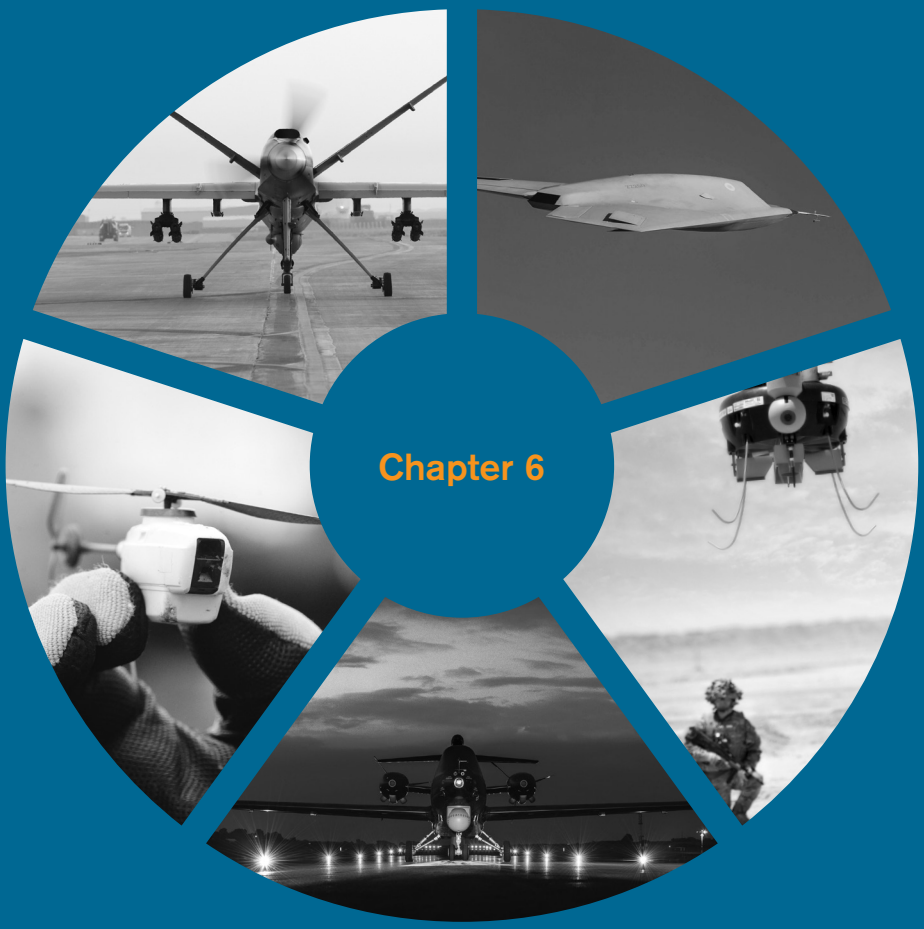
[21] Singer, *Wired for War*, p.126; Andrew S. Clare and Mary L. Cummings, 'Task-Based Interfaces for Decentralised Multiple Unmanned Vehicle Control,' *Association for Unmanned Vehicle Systems International*, 2011, pp.1-9, web.mit.edu/aeroastro/labs/halab/papers/ClareCummingsAUVSI2011.pdf, last accessed 7 September 2014; Cummings, 'Operator Interaction with Centralised Versus Decentralised UAV Architectures', Forthcoming; Mary L. Cummings and Paul J. Mitchell, 'Predicting Controller Capacity in Remote Supervision of Multiple Unmanned Vehicles,' *IEEE Systems, Man, and Cybernetics – Part A: Systems and Humans*, Vol.38/2, March 2008, pp.451-460; ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=4445761, last accessed 7 September 2014; Mary L. Cummings, Andrew S. Clare and Christin S. Hart, 'The Role of Human-Automation Consensus in Multiple Unmanned Vehicle Scheduling,' *Human Factors: The Journal of the Human Factors and Ergonomics*, Vol.52/1, 2010, pp.17-27, hfs.sagepub.com/content/52/1/17.full.pdf+html, last accessed 7 September 2014.

[22] Cummings, 'Operator Interaction with Centralised Versus Decentralised UAV Architectures.'

[23] Cummings, 'Operator Interaction with Centralised Versus Decentralised UAV Architectures.'

[24] Singer, *Wired for War*, p.127.

[25] BBC News, *Iran "building copy of captured US drone" RQ-170 Sentinel*, BBC News, 22 April 2012, www.bbc.co.uk/news/world-middle-east-17805201, last accessed 7 September 2014.



Chapter 6

Chapter 6:
Proliferation, Civil Use, and Regulation

Introduction

The proliferation of Remotely Piloted Aircraft (RPA) on a global scale is already underway and will have domestic and international security implications for the United Kingdom and its allies. A decade ago, this technology was largely confined to the United States, Russia, and Israel. Today, if the full range of such systems, including micro-drones is included, the number of countries that can field such capability is over 70.[1] In addition, non-state groups have already used RPA systems both for surveillance and for attempts to attack their targets.[2] Domestically, the civil use by emergency services and commercial enterprises of RPA has so far been held back by Civil Aviation safety regulations but that is likely to change and we can expect a rapid growth in civil RPA use thereafter.

To date, the US government has restricted the export of its most sophisticated systems to its closest allies, including the United Kingdom and South Korea, but there is already a growing demand for smaller systems (see Chapter 2), and we must expect in future that nations such as Russia and China will exploit this market. Israel has already created an advanced RPA industry with a number of export customers and has shown less reluctance in exporting armed versions to allies than other states. Looking ahead, there is every likelihood in the absence of decisive international action that the RPA market will be less regulated than it is now.

Much of the initial growth will come in smaller systems, including those that are not strictly speaking 'remotely piloted', but instead use pre-programmed flight paths or else are guided by line of sight control. The satellite and high bandwidth communications technology to operate the larger RPA, such as the medium-altitude long endurance (MALE) Predator and Reaper, means that these systems are likely to remain among the minority of new RPA on a global scale, though the Chinese and Russian governments are investing heavily in this technology. In addition, we can already see a market developing for the delivery of a RPA service by commercial providers, with varying degrees of state support, including the associated command and control elements on availability contracts, developments we see in the fields of private military security companies and aerospace.

The realm of security also includes civil aviation. Throughout, it is important to bear in mind that the proliferation of RPA means that such systems have to be safely integrated into civil airspace. For this to happen effectively, measures have to go beyond 'sense and avoid' technologies[3] and will also have to encompass airworthiness. These, and other measures, will also have to be incorporated into a national and international regulatory framework that is both rigorous and proportionate.[4]

To explore these new challenges for UK security policy, this chapter focuses on the changing nature of the control of UK airspace; the potential misuses of RPA in UK airspace; the potential use of RPA against UK military forces and operations; civil and UK emergency service use; issues of privacy; and the scope for international regulation of this new technology.

Commercial delivery drone with the package

The changing nature of UK airspace: the use and control of new air systems

Until recently, practical applications for model aircraft were limited in scope and range due to their technological limitations, meaning that there was little prospect of their encroaching on controlled airspace. Similarly, crop dusting or other commercial uses took place a long way from and at lower altitude than other air activity. Military, recreational, and commercial use of RPA now has the capacity and the potential to operate in the vicinity of other aircraft or fixed structures, raising significant safety, security, and privacy concerns.

Current UK regulations are set by the Civil Aviation Authority (CAA) which prohibits the flying of radio controlled aircraft within 30 to 150 meters of a structure or a controlled airspace.[5] The use of RPA over 20kg is not generally allowed in the UK, but under that weight RPA can be used within line of sight of the operator and with permission of the CAA. The operation of UK military RPA has, to date, been restricted to the specific military controlled air space where the risk of conflict with civil users does not arise. However, given the expected expansion of RPA fleets in the UK Armed Services that position is likely to be unsustainable. Enforcing regulation against breaches is likely to become a major policy issue. For example, awareness and observance of current regulations in relation to model airplanes is limited in practice.[6] In addition, small, commercially available, RPA are clearly being flown, including for the taking of photographs, in, often possibly inadvertent, breach of the rules. The scale of such practices is likely to increase, especially as enforcement to date has not been much in evidence.

Future regulation of UK and European airspace is being dealt with by the CAA, the Department for Transport and the ASTRAEA (Autonomous Systems Technology Related Airborne Evaluation & Assessment) consortium,[7] which is a 'UK industry-led consortium focusing on the technologies, systems, facilities, procedures and regulations that will allow autonomous vehicles to operate safely and routinely in civil airspace over the United Kingdom.'[8] Regulation is designed to be an enabling process, assuming that all sides understand the utility and economic necessity of a strong RPA market.

Congestion and interference with domestic aircraft

The UK's Air Traffic Control (ATC) system currently uses three main technologies: radar, anti-collision warning systems on aircraft, and voice instructions to pilots. None of these are adequate to cope with the expansion of RPA. While some types of military RPA are large enough to be detected on radar, many smaller systems are not. Some larger RPA carry standard transponders like fast-jet military aircraft, but there is no guarantee that smaller RPA will be equipped with this technology. Voice communication from air

traffic control to aircrew operates through radio communication, and in the case of large RPA is reliably conveyed by satellite. However, problems may arise over control of small RPA when the operator is relying on the telemetry images transmitted back from its camera. As the number of RPA increases across all categories, the challenge will be to hold the operator accountable for the use of these systems. As a result, the present rule that aircraft be able to 'see and avoid' and 'sense and avoid' potential collisions is going to become increasingly difficult to maintain. US experience is already indicating a growing risk of collisions. Indeed, loss of control and crashes have been more prevalent so far than for manned aircraft.[9] Currently all aircraft need an airworthiness certificate and pilots require a licence. While military RPA operators are well trained to operate specific systems, no such rules apply to commercial or recreational use of RPA, where operators with little expertise or training could cause crashes and collisions.

The potential misuses of UK Airspace

The security threat posed by individuals misusing RPA is a serious one, whether for criminal or terrorist purposes. While the hazards presented by inadvertent or accidental misuse of RPA, or the consequences of their malfunctioning are becoming better understood, more thought needs to be given to their employment for malign purposes in the domestic environment. As a small number of cases have demonstrated, RPA present a potentially new and useful tool to those of criminal, including terrorist, intent. For criminals, RPA have significant potential for providing situational awareness of a property or area, for example in providing information to gangs on the control of anti-smuggling patrols at borders, the movement of police or security guards, the movements of goods or individuals, and the progress of pursuers. They are the ideal lookouts for burglars, train robbers, and poachers. Larger systems may be useful forms of transport for smugglers. Armed with rudimentary explosives or firearms, they could also be used to delay pursuers or as the instruments of attack, murder, and assassination. In the same way, RPA equipped with rudimentary Improvised Explosive Devices (IEDs) would make effective terrorist devices. Fast, cheap, available micro RPA, in particular, are difficult to defend against, given their ability to fly past and over obstacles to find their target.

Traditional thinking with regard to the defence of buildings, for example, has concentrated on perimeter defence and entry point control. RPA offer the prospect that these defences might simply be bypassed. Similarly, vulnerable targets might be hardened to withstand attack from outside, but it is entirely possible that in a public space like a shopping centre or sporting stadium, an attack could be launched from within.[10]

Crowds at sporting events or rallies could be vulnerable in a similar way if a future terrorist group were to look for means of dispersing chemical or biological agents. While such a scenario has so far not posed a real danger to UK citizens, as noted below, it is a threat that the UK authorities took seriously during the 2012 Olympics. As one commentator has

warned, the 'Dispersal of [a] chemical or especially biological agent is ideally suited for a UAV [Unmanned Aerial Vehicle]; its flight stability permits the release of agent evenly along a line of contamination.'[11] What is true of the vulnerability of crowds and building is also true of convoys and cars.

As David H. Dunn has argued, 'even drones without a payload represent a potential threat that is as yet unaccounted for in conventional risk assessments. Their size, cost and ease of use make small drones ideal devices to be swarmed against vulnerable targets. By virtue of either their kinetic energy alone or their ability to function as mechanical bird strikes, drones pose a significant threat to commercial airliners.'[12] In the immediate future, the relative cheapness, increasing ubiquity, and availability of RPA means that uncontrolled access to the air will never have been easier.

While military RPA are equipped with secure communication between the aircraft and operator, through secure satellite controls and communications, this is not the case for commercial or recreational RPA that have insecure telemetry from operator to RPA. These communications are consequently vulnerable to hacking by third parties who could then commandeer the RPA (known as 'spoofing') directing it to malign intent, stealing it or crashing it, thereby placing it beyond use, or for reverse engineering.[13]

In light of the proliferation of different kinds of RPA, the implications for resilience and security strategy are important. We understand that there is a cross-government Working Group that sits to assess these concerns, and we welcome this step and encourage all the civil authorities with a potential interest, such as the Cabinet Office, Home Office, Department for Transport, National Counter Terrorism Security Office, and the Centre for the Protection of National Infrastructure, to ensure that this work is joined up with other aspects of policy, such as the Contest counter-terrorist strategy, the national risk register, as well as the National Security Strategy (NSS). Some experience of how to counter these possible threats was gained from the planning for Olympics 2012 and this includes combined planning at the local level using the National Counter Terrorism Security Office.

The use of RPA against deployed UK military forces by state and non-state actors

RPA use by an opponent - state or non-state - could be targeted against deployed UK forces overseas. UK military operations could be disrupted if individual officers, weapons systems, and above all rear bases were to be targeted by airborne IEDs. Similarly, kamikaze strikes on high value civil targets could cause asymmetric levels of damage. In such circumstances, countermeasures would have to be developed and deployed rapidly, and ought to be a consideration in future force planning. In many cases, countermeasures would be available, but it is not possible to guard against every eventuality on every occasion.

Another aspect of the future threat from adversary use of RPA is informational. Enemy RPA with the right sort of programmed electronics could conduct information operations, jam signals, and download data. The risks from such spoofing and deception have long been recognised in military doctrine; RPA provide a cheaper more accessible way for an adversary to deploy such capability. In counter-insurgency operations, units could even be induced to fire upon civilians, provoking outrage and acting as a recruiting sergeant for the insurgent forces.

RPA technology can, and almost certainly will, be used in future campaigns for hostile intelligence gathering against deployed UK forces, especially when conducted in conjunction with forms of cyber warfare, and this will make it harder than at present to maintain operational security for British or coalition operations.

UK emergency service use

Since October 2012, a National Police Air Service (NPAS) has provided a regionally coordinated 24 hour service of air support for police services in the UK. At present, the service involves manned rotary or fixed wing aircraft (not RPA), since, as explained above, CAA regulations limit RPA use to small lightweight vehicles. In launching the NPAS, the then Minister of State for Policing, Criminal Justice and Victims, Damien Green, called for RPA to be treated 'like any other piece of police kit' and was reported as expecting them to become a common sight over the streets of Britain – used more frequently, for instance, in situations that would normally call for helicopter backup.[14]

A number of police services have trialled or used lightweight RPA. Sussex Police at Gatwick, for example, have deployed the Aeryon Skyranger system, in order

to test how effective it could be in beaming high quality pictures to officers on the ground. The advantages of RPA to the police were articulated by former Superintendent Brian Bracher who, when Gatwick Airport Commander, stressed that being able to 'collect evidence and monitor events from a distance would help us detect crime and prosecute offenders.'[15] It also allows for greater monitoring and, echoing the view of the military, they could also 'be used in situations where deploying patrols would put officers or the public at risk'.[16] Returning to the cost-effectiveness of the RPA, he also saw it as easy to deploy and capable of staying in the air for longer than existing means.[17] Benefits such as these also apply to other areas of interest, such as nuclear power stations. There have been twelve complaints concerning infringement of the airspace surrounding British nuclear power stations but, due to lack of evidence, only one prosecution, in August 2013. As reported to the House of Commons on 2 September 2014 by Robert Goodwill, Parliamentary Under-Secretary at the Department for Transport, this involved the use of an RPA.[18]

A number of UK Fire Services have also used lightweight RPA for observation. West Midlands Fire Service was the first to bring RPA into operation with the MD4-200 system; this use is governed by a CAA licence, and associated regulations (Standing Order Guidance for Close Circuit Television and Standing Order 02/16 Data Protection Act.18). The West Midlands Fire Service cite several examples of its use, including a serious warehouse fire, where the RPA was able to provide live video footage subsequently used as evidence in the police investigation.[19]

Privacy

The spread of civil RPA technology has significant implications for how privacy and security are weighed in the balance in a domestic context. Some uses of RPA by the police, such as searching for missing persons, will be unproblematic. Others, such as the use of RPA-borne sensors for intelligence-gathering, raise question such as the justification required, and the level at which operations of this kind should be authorised.

In the case of use by the authorities of Intelligence, Surveillance and Reconnaissance (ISR) RPA, we believe that there should be a review of whether current legislation and codes of practice regulating CCTV and directed surveillance by the police will be adequate.[20] Whilst technically, there is nothing that a RPA can do which cannot be done by a manned aircraft/helicopter, the ability to conduct quiet and persistent observation is greatly enhanced by the surveillance capabilities of a RPA. The police are aware of this potential, but so far have been focusing resources on their more conventional helicopter capability. As noted by the All-Party Parliamentary Group on Drones (APPG) there are, nevertheless, a handful of police forces that are using or trialling RPA, and this is likely to lead to wider use.

One of the capabilities that aerial surveillance already offers, from manned helicopters or RPA, is real time high definition digital video surveillance streamed to the ground observer. It is already becoming possible to run facial recognition software on digital images and thus, for example, spot a known suspect in a crowd. Although not yet fully developed to a state in which operational use would be cost-effective, it is only a matter of time before facial recognition can be effectively combined with digital images streamed from surveillance RPA. A policy issue, therefore, that will need to be tackled soon is the question of which rules should apply for police and security authorities when using such systems, for example, in routinely monitoring public places for the presence of known criminals or those on counter-terrorist watch lists. We note in passing that lightweight RPA surveillance is also likely to become the weapon of choice for paparazzi in search of intimate photographs of celebrities.

More generally, RPA use is in its infancy and there are going to be a number of legal grey areas as this technology and use rapidly develops.[21] As Mark Piesing puts it:

> *Sooner or later there will inevitably be a case when the privacy of a celebrity is invaded, a drone crashes and kills someone, or a householder takes the law into their own hands and shoots a drone down… The first cases to reach court will be around invasion of privacy, illegal use by saboteurs, or will be brought by civil liberties groups unhappy with how police are using drones.*[22]

The issue has been well described by Alex Marshall, the Association of Chief Police Officers (ACPO) lead for the National Police Air Service (NPAS), shortly after its launch:

Whenever UAVs/drones are mentioned, it tends to result in newspaper headlines and leads to a number of UAV suppliers contacting me with offers to demonstrate and sell their latest products. This burst of understandable commercial interest is always matched by a similar number of contacts expressing understandable objections to drones on civil liberties grounds. These post-publicity contacts demonstrate the wide distance between those who hold views on this subject…But should civil authorities open a debate on the use of UAVs, then I would be happy to engage in it with an open mind.[23]

For the British Government to remain ahead of the curve, aspects of civil use such as privacy concerns will need careful consideration and public consultation. At present, there is a dearth of centrally available information on even the extent and nature of police use of RPA. The APPG submitted Freedom of Information requests[24] to all UK police services on RPA use and the policies being followed, but responses were very patchy. The lack of centralised data collection was confirmed in an answer to a Home Office Parliamentary Question, which noted that it was an 'operational matter for individual police forces, within the regulations set by the Civil Aviation Authority.'[25] On the question of which police services owned drones, the Home Office has told Parliament that:

There is no requirement for police forces to report the trialling, acquisition or use of remotely piloted aircraft systems to the Home Office. The Government are aware that the following forces have acquired or made use of such systems. Merseyside; Staffordshire; Essex; Wiltshire; and West Midlands. It is the responsibility of the forces concerned to ensure that they comply with Civil Aviation Authority regulations.[26]

We believe that this approach is short-sighted given the potential that RPA represent and the policy implications of their domestic use, and suggest that the Home Office should accept the policy lead on these issues.

The international regulation of RPA technology

There are currently approximately 80 countries in the process of either developing or producing RPA and related technologies,[27] and even a cursory study of specialist international websites suggests that this number will grow significantly by the end of this decade. The potential complexity of military export activity is clearly enormous, and as we discussed in Chapter 2, there are important policy issues for the UK government to resolve in terms of the UK's long-term industrial base in RPA technology. But there is also a question as to how far the UK government wants to become a military exporter in this area, and how far it wants to lead in developing new forms of regulation. The UK government only owns its Royal Air Force (RAF) Reapers because of the willingness of the US government to export the relevant technology. The recent sale by China of its home-grown Pterodactyl armed RPA to the United Arab Emirates demonstrates that major states will be players in the market for high-end RPA.

The United Kingdom is, so far, a second-tier player in RPA development, although the Ministry of Defence (MoD)-funded BAE stealth technology demonstrator programme Taranis, represents an advanced future indigenous system that may eventually lead to a joint UK-French production model. Even if the UK government were to press for a tight regulation of this market, it is already evident that attempts to prevent others entering it will simply stimulate states to produce national models, as with Turkey's response to the US refusal to sell the Turkish government armed RPA. On any realistic appraisal this will not be an easy market to limit, and the Commission has not learned of any convincing new proposals for reaching widely applicable and effective international accords.

The UK's current position on the international regulation of RPA technology centres on adherence to the 1987 Missile Technology Control Regime (MTCR). The regime currently has 34 members and the UK government is a founding member. The MTCR aims 'to restrict the proliferation of missiles, complete rocket systems, unmanned air vehicles, and related technology for those systems' and is an informal and voluntary association of countries which share the goals of non-proliferation of unmanned

delivery systems capable of delivering weapons of mass destruction.'[28] The regime seeks to coordinate national export licensing efforts intended to prevent proliferation. There is also the Waasenaar Agreement in which the UK government takes an active role and which is intended to prevent destabilising accumulations of conventional arms and dual-use goods and technologies, including RPA.[29] But it is to be expected that developing countries will oppose attempts by advanced industrial states to deny them access to a military technology that is not necessarily connected with WMD, and which is entirely capable of lawful operation.

Key findings

- The need to develop new procedures for RPA to operate safely in or near controlled airspace is a matter requiring urgent attention in order to ensure air safety and to assure public confidence.
- Greater efforts need to be made to publicise existing laws on the use of unmanned flying objects (this should include Chinese lanterns, radio-controlled planes, and their modern RPA counterparts).
- Building on the work already done by the CAA and international counterparts, there is a need to establish a robust regulatory framework without overly constraining civilian use.
- As the nature of British air defence changes, the RAF and the MoD should consider, with civil authorities, the implications of the malign use of RPA technology by state and non-state actors.
- With the changing nature of defence and law enforcement, traditional notions of counter-terrorism and resilience, such as target hardening and stand-off distances, need to be reconsidered in light of RPA proliferation. These questions deserve serious consideration by those responsible for Britain's resilience strategy, namely the Home Office, Cabinet Office, National Counter Terrorism Security Office, and the Centre for the Protection of National Infrastructure and with those responsible for other counter-terrorism and risk management policies.
- Policy is needed on the rules which should apply for police and security authority use of ISR RPA, for example in routinely monitoring public places for the presence of known criminals or those on counter-terrorist watch lists. A Code of Practice is needed to cover the procedures for authorising surveillance by RPA. The Home Office should accept a policy lead for promoting the efficient use of RPA by the emergency services, for the associated privacy issues and, with ACPO, engage in public consultation.
- In the wrong hands, RPA could become a dangerous and destabilising delivery system. We doubt how far the proliferation of the various enabling technologies, except perhaps for secure high bandwidth satellite communications, can be controlled.
- We also judge that the UK government is not in a strong position to influence international behaviour over RPA exports, and it has the legitimate concerns of its own aerospace industry to consider. Nevertheless, it would be consistent with general UK policy positions and an ethical concern about international stability and the rule of law, to make every effort to support international efforts to achieve an effective international framework of export control.

1 Louisa Brooke-Holland, *Unmanned Aerial Vehicles (drones): An Introduction, Commons Library Standard* Note SN06493, 25 April 2013, p. 3, pp.16-17, www.parliament.uk/business/publications/research/briefing-papers/SN06493/unmanned-aerial-vehicles-drones-an-introduction, last accessed 7 September 2014.

2 BBC News, *Hezbollah admits launching drone over Israel*, BBC News, 11 October 2012, www.bbc.co.uk/news/world-middle-east-19914441, last accessed 7 September 2014.

3 The ability to detect and avoid another airborne object.

4 House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – Current and Future UK use: Government Response to the Committee's Tenth Report of Session 2013–14* (London: The Stationery Office, 2014), p.4.

5 Article 167 of the Civil Aviation Authority's *Air Navigation: The Orders and Regulations* on 'Small Unmanned Surveillance Aircraft', Civil Aviation Authority, *Air Navigation: The Orders and Regulations* (Norwich: The Stationery Office, 2014), Section 1, Part 22, p. 6):
1) The person in charge of a small unmanned surveillance aircraft must not fly the aircraft in any of the circumstances described in paragraph (2) except in accordance with a permission issued by the CAA.
2) The circumstances referred to in paragraph (1) are:
a) over or within 150 metres of any congested area;
b) over or within 150 metres of an organised open-air assembly of more than 1,000 persons;
c) within 50 metres of any vessel, vehicle or structure which is not under the control of the person in charge of the aircraft; or
d) subject to paragraphs (3) and (4), within 50 metres of any person.
3) Subject to paragraph (4), during take-off or landing, a small unmanned surveillance aircraft must not be flown within 30 metres of any person.
www.caa.co.uk/default.aspx?catid=1995&pageid=16012, last accessed 7 September 2014.

6 Awareness of this law and observance of it is limited in practice. While convictions have been made in the UK, securing these will not always be easy. In the first recorded case, this was only made possible by the RPA in question having its owners name and address taped to it. Charles Arthur, 'UK's first drone conviction will bankrupt me, says Cumbrian man,' *The Guardian*, 2 April 2014, www.theguardian.com/world/2014/apr/02/uk-first-drone-conviction, last accessed 7 September 2014. The US experience is that prosecution of RPA owners is difficult due to their inability to be identified or traced. Although the number of convictions for improper RPA use remains small, judging by the American experience this does not fully reflect the potential for dangerous use. To date, the US Aviation Safety Reporting System has reported over 50 incidents involving infractions of airspace regulation by RPA, including 15 incidents where they flew dangerously close to airports or passenger aircraft. In addition to this, there were 236 unsafe incidents reported to the American Federal Aviation Authority (FAA) since 2009 by licensed users, such as US Customs and Border Protection. 23 of these RPA were reported to have crashed. Craig Whitlock, 'Close encounters on rise as small drones gain in popularity,' *The Washington Post*, 23 June 2014, www.washingtonpost.com/sf/investigative/2014/06/23/close-encounters-with-small-drones-on-rise, last accessed 7 September 2014. As the number of RPA users increases, the potential for more such incidents will increase with them.

7 House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use: Government Response to the Committee's Tenth Report of Session 2013–14, Sixth Special Report of Session 2014–15*, pp.5-6.

8 The ASTRAEA website is available from: astraea.aero.

9 Whitlock, 'Close encounters on the rise as small drones gain in popularity'.

10 David H. Dunn, 'Drones: Disembodied Aerial Warfare and the Unarticulated Threat,' *International Affairs*, Vol.89/5, 2013, p. 1244; HM Government, *Protecting Crowded Places: Design and Technical Issues* (London: Home Office, Centre for the Protection of National Infrastructure and the National Counter-Terrorism Security Office, March 2014), pp.10-13. The Annexes reinforce this point, for example Annex B: 'Typical counter-terrorism design attributes – design of hostile vehicle mitigation measures', pp.27-32. Thinking has remained consistent, with an emphasis on perimeter and entry point defence, and has remained consistent across all recent iterations of the policy. Such orthodoxy is likely to be challenged in coming years.

11 Dennis Gormley, *Unmanned Air Vehicles as Terror Weapons: Real or Imagined?*, The Nuclear Threat Initiative, 1 July 2005, www.nti.org/analysis/articles/unmanned-air-vehicles-terror-weapons/, last accessed 7 September 2014, cited by Dunn, 'Drones,' p.1244.

12 Dunn, 'Drones,' p.1245.

13 BBC News, *Researchers use spoofing to "hack" into a flying drone*, BBC News, 29 June 2012, www.bbc.co.uk/news/technology-18643134, last accessed 7 September 2014.

14 Ian Steadman, *Minister endorses use of drones by British police*, Wired, 1 October 2012, www.wired.co.uk/news/archive/2012-10/01/british-police-more-drones, last accessed 3 September 2014.

15 Huffington Post UK, 'UK Police 'Skyranger' Drones To Patrol Skies Above Gatwick Airport After Major Disasters', *Huffington Post*, 12 March 2014, www.huffingtonpost.co.uk/2014/03/12/uk-police-drones-gatwick_n_4949862.html, last accessed 7 September 2014.

16 Huffington Post UK, 'UK Police 'Skyranger' Drones To Patrol Skies'

17 Huffington Post UK, 'UK Police 'Skyranger' Drones To Patrol Skies'.

18 HC Deb, 2 September 2014, c225W.

19 All-Party Parliamentary Group on Drones, *Background note on civil use of drones in the UK*, APPG, ND, p.3, appgondrones.files.wordpress.com/2013/06/appg-background-note-civil-drone-use-in-the-uk.pdf, last accessed 7 September 2014.

20 Part 2 of HM Government, *Regulation of Investigatory Powers Act 2000* (London: The Stationery Office, 2000), pp.30-55, www.legislation.gov.uk/ukpga/2000/23/part/II, last accessed 7 September 2014.

21 Mark Piesing, *The legal turbulence hindering drones in the UK*, Wired, 20 February 2014, www.wired.co.uk/news/archive/2014-02/20/shoot-down-drones, last accessed 7 September 2014.

22 Piesing, *The legal turbulence hindering drones in the UK*.

[23] Alex Marshall, *Drones*, ACPO, 9 October 2012, www.acpo.police.uk/ThePoliceChiefsBlog/201210AlexMarshallblog.aspx, last accessed 7 September 2014.

[24] All-Party Parliamentary Group on Drones, *Background note on civil use of drones in the UK*, p.1

[25] Lord Taylor of Holbeach, HL Deb., Drones, 6 February 2013, Col WA62, www.publications.parliament.uk/pa/ld201213/ldhansrd/text/130206w0001.htm, last accessed 7 September 2014.

[26] Lord Taylor of Holbeach, HL Deb., Unmanned Aerial Vehicles, 11 March 2013, Col WA42, www.publications.parliament.uk/pa/ld201213/ldhansrd/text/130311w0002.htm#13031129001186, last accessed 7 September 2014.

[27] Louisa Brooke-Holland, *Unmanned Aerial Vehicles (drones): An Introduction*.

[28] Missile Technology Control Regime, *Introduction and Objectives*, Missile Technology Control Regime, ND, www.mtcr.info/english/objectives.html, last accessed 11 September 2014; www.mtcr.info/english/index.html, last accessed 11 September 2014.

[29] The Wassenaar Agreement has its own website, where it states that: 'The Wassenaar Arrangement has been established in order to contribute to regional and international security and stability, by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing destabilising accumulations. Participating States seek, through their national policies, to ensure that transfers of these items do not contribute to the development or enhancement of military capabilities which undermine these goals, and are not diverted to support such capabilities.' www.wassenaar.org/introduction/index.html, last accessed 7 September 2014.


Conclusion

Conclusion: Public Diplomacy

Introduction

Our report concludes with this chapter on Public Diplomacy, given the importance we attach to the proper presentation of the arguments surrounding the acquisition and use of Remotely Piloted Aircraft (RPA) and related systems. These represent an increasingly important capability for the modern military as well as civil authorities concerned with the security of the public. The commercial application of this technology is capable of bringing great benefit to the United Kingdom, but we are also mindful of the downside risks and dangers of this technology in the wrong hands. The UK government needs to have in place the policies to help it manage the important national, regional, and international security implications. We set out in the Introduction our vision of where the United Kingdom should be aiming as a nation in harnessing this technology, and provided some suggestions as to how to navigate towards this goal. In this closing chapter, we look in particular at how UK governments should respond through their public diplomacy to the challenges and opportunities surrounding the use of RPA as an integral component of the UK's Armed Forces and military operations.

In looking ahead to the likely choices for UK governments, and reflecting on winning the case for the 2035 horizon scanning vision that we set out in the Introduction, we want to end our Report with some thoughts on how future UK governments can best secure support in formulating and implementing policy on RPA. We focus on four key issues: (1) the case for making explicit UK policy on the legal and ethical considerations relating to RPA, including attitudes to US policy; (2) the desirability of explaining and being more open about the use of UK RPA and intentions for future development; (3) the need to prepare the UK public for increased domestic use and to reassure the public about the handling of safety, regulatory and privacy issues that such use will entail; and (4) the value of explaining the difference between the desirability of increased automation of systems supporting RPA operations and the problems of any move toward autonomous systems, a distinction which, in turn, opens up the question of what the UK government says about the current Geneva discussions on restricting the development of Lethal Autonomous Weapons Systems (LAWS). Finally, we outline some political shocks to which UK governments may have to respond at short notice and that deserve some thought now.

Making explicit UK policy on the law and ethics of RPA

The UK government has acquired a wide range of RPA for various roles, and has new systems in development (see Chapter 2). Most of these are unarmed and are for Intelligence, Surveillance and Reconnaissance (ISR) at various altitudes. These have generated few political waves. But the UK government's decision to acquire and operate the US-made Reaper in an armed role has elevated the issue of 'drone warfare' to a new level of public consciousness in the United Kingdom. The French Government, by contrast, has only chosen, so far, to operate the Reaper in an ISR role and does not deploy it in any combat situation at the time of writing. It is US use of armed RPA outside conventional conflicts for the purposes of targeted killing which has grabbed the headlines and become the focus of criticism by governments, UN human rights bodies, and Non-Governmental Organisations (NGOs). The US government has increased the number of US RPA strikes since Barack Obama came to power in 2009, and the President continues to authorise a civilian CIA campaign against suspected terrorist or insurgent targets in Northwest Pakistan, Yemen, and Somalia. These operations have achieved a sinister cultural and political salience which has obscured the fact that the US military has employed its Reapers in both ISR and armed roles in conventional missions in Afghanistan alongside UK RPA. The perception that RPA have been used without differentiation between ISR and armed use, coupled with little concern for the theatre of operations, has become identified in a significant and vocal section of the public discourse as the totality of 'drone warfare'. This has perceptible effects on domestic British opinion. Data from the 2014 Pew Research survey indicated that British opposition to 'US drone strikes' had risen from 51 to 59 per cent since 2013, despite continuing high approval of US-led efforts to fight terrorism.[1]

The UK government, as noted in Chapters 1 and 3, has consistently maintained that its use of RPA in Afghanistan, whether armed or not, is regulated by the same laws, rules of engagement, and targeting criteria as conventional aircraft. Despite some suggestions to the contrary,[2] there is no evidence available to us that the UK military – including embedded personnel with the US Air Force (USAF) –

have used RPA to target anyone other than combatants. UK civilian and military authorities have not been persuaded that there is any case to relax the constraints of international humanitarian law when it comes to the use of RPA. Neither do UK authorities believe that there is anything novel about RPA to justify them being treated as intrinsically different, as a new and dangerous moral and strategic phenomenon, despite claims that to refuse to do so is politically myopic and intellectually dishonest. We endorse the government's approach in that respect and recommend that it be emphasised more vigorously through its public diplomacy.

The broader point worth emphasising here is that the UK government did not establish specific Rules of Engagement (RoE) in the Afghan theatre once the RAF began to use armed RPA; rather, the RoE were those already judged appropriate to the theatre, and were applied in just the same way to manned aircraft or any other weapons platform then being used by UK military personnel in the conflict. The government should do more to communicate this point. NGOs such as Drone Wars UK, Remote Control Warfare, and the Bureau of Investigative Journalism play a valuable role in publicising issues to hold ministers to account. But any evident tendency to exaggerate differences between RPA as compared with other UK weapon systems needs to be resisted, and it is our view that the government should do more to win the argument that the use of RPA – armed and ISR – is taken very seriously but is intrinsically no more sensitive an issue than the use of other weapon systems.

As discussed in Chapter 3, there will undoubtedly be continued pressure from British based NGOs to gain specific details of the circumstances and casualties resulting from British RPA operations, at least in situations other than high-intensity warfare. This has also been a key theme of the official report by the House of Commons Defence Committee and the parliamentary activities of the All-Party Parliamentary Group on Drones (APPG), as well as the proposals put forward by the UN Special Rapporteur, Ben Emmerson. We believe more openness should be the default position and the government's public diplomacy must respect the concerns expressed by such bodies. We accept, nonetheless, that meeting requests for greater transparency are demanding for the Ministry of Defence (MoD), and perhaps even impossible to meet in certain operational situations, especially if it places those trying to collect such information on the ground at increased risk. Statements of 'collateral damage' may rest on judgements of involvement, intention and identity that will be hard to establish with certainty in remote areas inaccessible to UK military personnel. At the same time as more openness is adopted, constraints and unavoidable limits need to be properly explained.

We expect NGO pressure to continue to be brought to bear upon the UK government to do more to distance itself from the US campaign of remote targeted killing outside the battlefield. As noted above, the public impact of such campaigns stems, in part, from the mistaken conflation of UK and US armed RPA operations. But the story of UK RPA use is a different one to that of the United States, and the Commission sees considerable merit in the UK government doing more to communicate effectively its own policy on the use of armed force, including RPA use. The UK government should not in our view shy away from that for fear that its policy for use of UK RPA will be compared and contrasted with the different legal interpretations and policies being followed by the US government and cause difficulties for the UK in Washington. It is not the first, and it will not be the last, time that the two allies have differed in such areas. The UK simply does not accept the specific US legal justification for using RPA for the targeted killing of AQ-related terrorist targets. This difference can be stated, whenever necessary, without denouncing the different conclusions that the US government has reached and without acrimonious dispute. The historical record shows that the relationship in defence, security and intelligence is strong enough to survive policy difference. Indeed, there is no reason why both nations should not continue to work together on advanced RPA capabilities for their armed forces (see Chapter 2).

Increased openness on the UK's use of RPA and intentions for future developments

British governments will face pressing decisions over RPA: their development, acquisition, regulation, physical deployment, and operational use. These decisions will necessarily need to respond to the political pressures surrounding the use of armed RPA. Lack of information will breed suspicion and even hostility to the direction of policy. It needs to be explained to the public, for example, that the Afghan experience has shown

A Reaper UAV at Kandahar Airfield in Afghanistan. Image by Sgt Pete Mobbs RAF; © Crown copyright 2008

the value of armed RPA in protecting British forces in combat situations. When under attack, British ground forces have in some situations been able to call upon precision fire support from Reapers – all the more valuable when conventional air support might not have been available. The armed forces need reassurance that a comparable capability can be assumed for future deployments of UK forces and that RPA will be available for all purposes consistent with the objectives and RoE for the operation, as well as being available for reconnaissance and intelligence gathering missions.

Given the spread of RPA and the extreme improbability of other governments agreeing to their prohibition, we place the chances of a complete international ban on drones and 'drone warfare' at next to zero. None of the witnesses examined by the Commission judged that the UK could influence the spread of RPA technology by unilateral renunciation. As RPA become an increasingly global military phenomenon, we consider, given recent experience in Afghanistan, it would in practice be impossible to build domestic support for a self-denying insistence that British forces be deprived of the military advantages of RPA. This is a conclusion of long-term importance. The future of RPA will not be confined to Reapers in counterinsurgency. Armed RPA will form an integral part of the aerospace potential of advanced countries, including against enemies with sophisticated air combat and air defence systems and this reality needs to form part of the government's public diplomacy on the issue, taking head on those commentators opposing RPA.

Increased domestic use of RPA and the need for reassurance over safety, security, and privacy

As RPA become more common in the skies over the United Kingdom, the government will come under pressure to explain the regime under which these systems are allowed to operate. There will undoubtedly be comparisons of domestic police deployment of ISR RPA, as discussed in Chapter 6, as similar to military use of the same and this fact may make the arguments for domestic use harder. Concerns over the implications for privacy of new technological developments such as cyber surveillance and Google Glass, together with safety issues involving airspace management are, however, likely to be more significant here than any cross connection with military technologies. Such privacy considerations are likely to be the subject of legal challenge and political controversy. A public sense of anxiety over government intrusion into personal privacy, accentuated by the revelations of Edward Snowden in the sphere of interception, could further develop through employment of RPA for surveillance by the police, including the development of computerised facial recognition systems to operate with high definition streaming video from RPA. As Chapter 6 notes, there will also be privacy issues for the government to deal with over media use of small RPA. The Commission recommends that the government should try to address these arguments before widespread domestic deployment. For example, it will be essential to explain in advance the legal environment and the practical authorisation processes for the domestic police and MI5 use of RPA before systems are widely deployed. A Code of Conduct for police and intelligence domestic RPAS use should be prepared and published, similar to the Codes of Practice for directed surveillance and covert human sources published under RIPA2000.

Future UK stance on RPA proliferation and Lethal Autonomous Weapons

RPA are predicted to remain a rapidly expanding component of the international aerospace industry. But, at least as much as any other weapon system, they could have destabilising consequences if sold to the wrong recipients. An important part of the public argument that the UK government needs to make is that it will be playing a responsible and active role within the international system about their export. As discussed in Chapter 5, we also believe that the government should take a more active stance in Geneva in the discussions about Lethal Autonomous Weapons Systems (LAWS). There needs to be careful public presentation of the essential difference between the desirability of further development of automation applied to RPA and the serious legal and ethical problems associated with LAWS.

Preparing to counter potential political shocks

In the final part of this chapter, we explore a number of 'wild cards' that could heighten public concerns over RPA, and in so doing, would present UK governments with new public diplomacy challenges.

After an attack on the UK or UK interests overseas there is likely to be a deliberate attempt by jihadists to produce demoralising 'proof' that Western or British military responses, especially use of armed RPA, have been directly counter-productive. It must be expected too that the web-sites and communiqués of violent jihadists will continue to contain extreme language, referring to rage and revenge resulting from RPA strikes as motive and justification for their attacks. This narrative will have to be anticipated and countered. The strongest arguments are likely to be those that painstakingly and authoritatively point to the indiscriminately murderous consistency of Islamist violence against Middle Eastern Muslims as well as Westerners, even before the RAF began using armed RPA, and its continuation even when the UK is no longer conducting strikes. One or more of the additional countries that will undoubtedly acquire armed RPA in the next two decades may resort to high profile assassinations of émigrés or opponents in other states, or indiscriminate tactical use, creating widespread international revulsion. In this case, it will be necessary to emphasise, once again that international legal norms need to be preserved and strengthened. The UK is committed to setting an example through its compliance with international law.

It should also be anticipated, in a tactic of *hostile mimesis*, that terrorists may attempt to use some form of model or light aircraft as a weapon to try to bring home to the British electorate the sense of a global religious war in which the United Kingdom is vulnerable.[3] It will be important to prepare to react quickly and to reassure the public that defensive technologies such as jammers and high-energy laser and defence systems, capable of taking on swarms[4] as well as hostile individual RPA, will provide important counter-measures to the terrorist RPA threat.

The downing over the Soviet Union in 1960 of a U2 manned reconnaissance aircraft created a serious diplomatic incident, led to the collapse of the Paris Summit between President Eisenhower and Chairman Khrushchev, and demonstrated the diplomatic impact of unexpected events. RPA are already used where manned aircraft would not be employed in zones of geopolitical confrontation and are held to carry a lower risk of diplomatic damage in the event of mechanical failure or hostile action leading to a crash, but nevertheless the risk needs to be recognised. The Israeli Air Force repeatedly shoots down RPA infringing national aerospace, and while this Report was being written, was reported to have had one of its own RPA shot down near suspected Iranian nuclear facilities.[5] The US government is also believed to have lost an advanced stealth surveillance RPA over Iran.[6] North Korean (Democratic People's Republic of Korea) surveillance RPA have recently crashed inside South Korea, and both China and Japan operate RPA systems in the area of disputed control in the South China Sea. Like most intelligence operations, the circumstances of these revealed intrusions are generally ambiguous, and, more or less convincingly denied or disputed. What cannot be ruled out is a combination of circumstances in which an incident involving a UK RPA could have far-reaching consequences and would need a swift response from ministers.

Key findings

- Striking the right tone in public diplomacy over RPA will not be easy. None of the potential problems should be minimised. In our view, a more active and co-ordinated government information policy is essential.
- There is no easy escape from taking the arguments head on, and, in particular, countering assertions in various forms that RPA should be treated in special ways which would make them systematically less available to British forces as operational assets. Nevertheless, the resulting political pressures should be manageable and, providing the UK keeps to its own legal restrictions in operating armed RPA, the global technological momentum of their spread makes it reasonable to expect that controversy will reduce in future years.

1 Pew Research, *Global Opposition to U.S. Surveillance and Drones, but Limited Harm to America's Image: Chapter 1: The American Brand*, Pew Research Global Attitudes Project, 14 July 2014, www.pewglobal.org/2014/07/14/chapter-1-the-american-brand/#u-s-drone-strikes-increasingly-opposed, last accessed 8 September 2014.

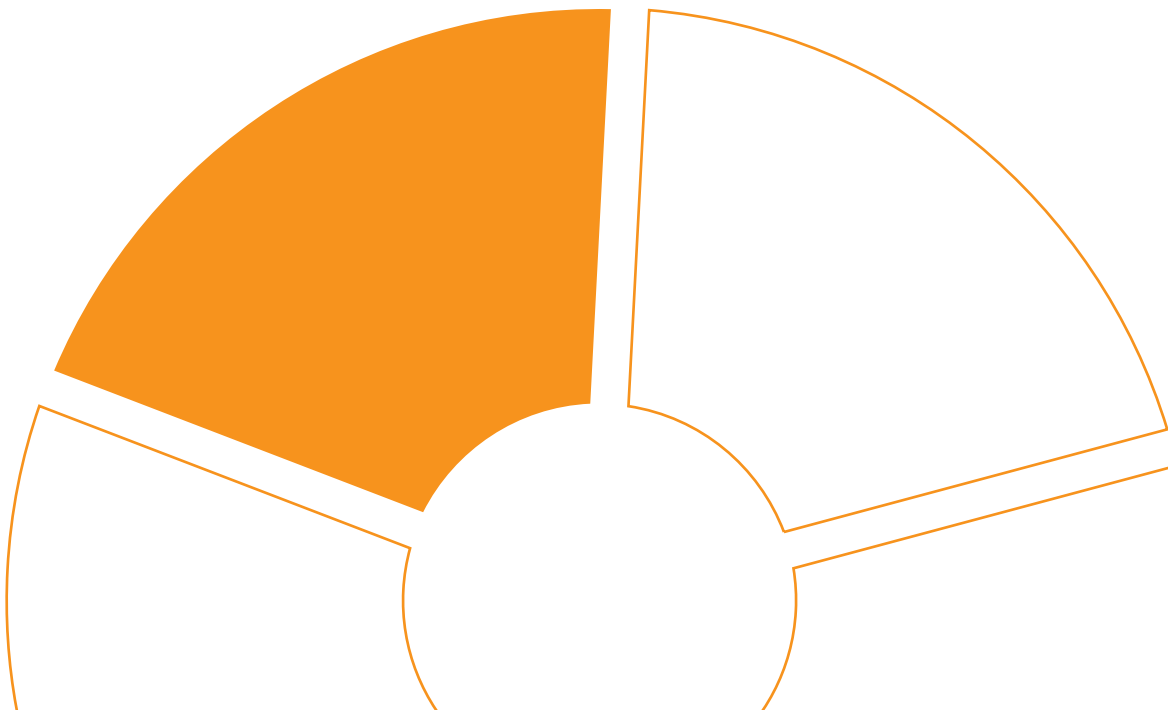
2 Written evidence from The Baptist Union of Great Britain, The Methodist Church and The United Reformed Church, House of Commons Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use Tenth Report of Session 2013–14*, Volume II, 25 March 2014, p.Ev w16.

3 Christopher Hope, 'British 9/11 fears over private planes, Government terror adviser warns', *The Telegraph*, 23 June 2008, www.telegraph.co.uk/news/2182507/British-911-fears-over-private-planes-Government-terror-adviser-warns.html, last accessed 8 September 2014.

4 ASD News, *MBDA Germany Successfully Tests 40 KW High-Energy Laser Demonstrator*, Aerospace and Defence News, 14 September 2012, www.asdnews.com/news-44953/MBDA_Germany_Successfully_Tests_40_KW_High-Energy_Laser_Demonstrator.htm, last accessed 8 September 2014.

5 Catherine Philp, 'Israeli 'spy' drone sparks fury in Iran', *The Times*, 26 August 2014, www.thetimes.co.uk/tto/news/world/middleeast/article4186593.ece, last accessed 8 September 2014.

6 Scott Shane and David E. Sanger, 'Drone Crash in Iran Reveals Secret U.S. Surveillance Effort, *The New York Times*, 7 December 2011, www.nytimes.com/2011/12/08/world/middleeast/drone-crash-in-iran-reveals-secret-us-surveillance-bid.html?_r=0, last accessed 8 September 2014.




Appendices

Appendix A: List of Commissioners

Chair

Professor Sir David Omand GCB	Visiting Professor, Department of War Studies, King's College, London

Academic Lead

Professor Nicholas J. Wheeler	Professor of International Relations, Director of the Institute for Conflict, Cooperation and Security (ICCS), University of Birmingham

Commissioners

Sir Brian Burridge	Vice President, Strategic Marketing, Finmeccanica UK
Professor David H. Dunn	Professor of International Politics, University of Birmingham
Ms Jennifer Gibson	Staff Attorney, Reprieve
Dr Peter Gray	Senior Research Fellow in Air Power Studies, University of Birmingham
Professor Keith Hayward	Head of Research, Royal Aeronautical Society & Associate Fellow, Royal United Services Institute
Lt. Gen. (Retd.) Sir Paul Newton	Director of Strategy and Security Institute, University of Exeter
Mr Paul Schulte	Senior Visiting Fellow, Centre for Defence Studies, King's College, London & Honorary Professor, Institute for Conflict, Cooperation and Security
Sir David Veness	Honorary Professor of Terrorism Studies, Centre for the Study of Terrorism and Political Violence, University of St Andrews
Professor Mark Webber	Professor of International Politics, University of Birmingham
Ms Elizabeth Wilmshurst	Associate Fellow, International Law, Chatham House
Professor Stefan Wolff	Professor of International Security, University of Birmingham

Institute for Conflict, Cooperation and Security (ICCS)

Ms Catherine Edwards	Institute Manager
Dr Jamie M. Johnson	Research Assistant
Ms Lindsay Murch	Research Assistant
Dr Christopher M. Wyatt	Research Associate

Appendix B: Key Questions

Legal

- What do you understand the legal position to be with regard to British use of RPA for (a) observation and surveillance and (b) for the delivery of lethal effect?
- What are the different issues arising in relation to use in peacetime, international armed conflict and non-international armed conflict?
- To what degree, if any, does the use of RPA in armed conflict introduce additional or different legal considerations from those arising for manned aircraft, cruise missiles, long-range artillery or the use of special forces?
- Are there developments likely in international law that should be taken into account in future UK RPA policy?
- Do your answers apply equally in respect of HM armed forces and possible commercial operators? Is it legally important that those operating armed RPA should be serving members of HM Armed Forces?
- What do you think are likely to be the most important legal considerations in the development of the use of RPA across the world, given the forecast spread of next generation RPA that will be cheaper and easier to operate and that will range from tiny hand-launched micro-drones to large aircraft size?
- Would any of your answers be different in relation to any future development and use of fully autonomous systems?

Ethical

- Leaving aside the requirement to comply with national and international law, which will be dealt with by other witnesses, what do you consider to be the main ethical questions to be taken into account in framing UK policy towards the future use of RPA for (a) observation and surveillance and (b) for the delivery of lethal effect?
- To what degree, if any, do these uses of RPA introduce additional or different ethical considerations than exist for manned aircraft, cruise missiles, long range artillery or the use of special forces?
- How should ethical considerations influence the education, training and selection of those who will operate RPA?
- How far do additional ethical considerations arise with fully autonomous systems?
- What are the ethical implications of using RPA at distance and with superior force?

Operational

- How would you assess RPA in terms of
  - general efficacy
  - compared to manned fixed wing aircraft and
  - accuracy vis-a-vis civilian casualties and collateral damage? How profoundly do these judgements vary between types of operational scenario and how should that affect potential UK choices?
- What role do you see RPA playing in a mixed force belonging to the armed forces of a single nation such as the UK?
- How would you differentiate the roles of intelligence gathering and more kinetic uses in the ways RPA are used?
- How and when do you see the operationalisation of fully autonomous systems in the future? In which national Armed Forces?

Political/Policy

- What role do you see RPA playing in counterterrorism for the UK, allies or others?
- Now that the era of large-scale interventionary campaigns of contested state building seems to be ending with the withdrawal from Afghanistan, how do you see UK or allied counterinsurgency doctrine developing and how important will RPA be in it?
- For the UK, how important is the BAE's supersonic and stealth Taranis likely to be for future national air power and aerospace industrial policy? What additional or alternative collaborative European or transatlantic RPA procurement options might be possible or desirable?
- Whatever the actual differences between manned airpower and RPA do you think there are special symbolic, psychological and political consequences among various international audiences from operational employment of RPA in different scenarios and theatres?

If there are, how can those consequences be assessed and how should their strategic impact be taken into account in decisions on how and when to use RPA?

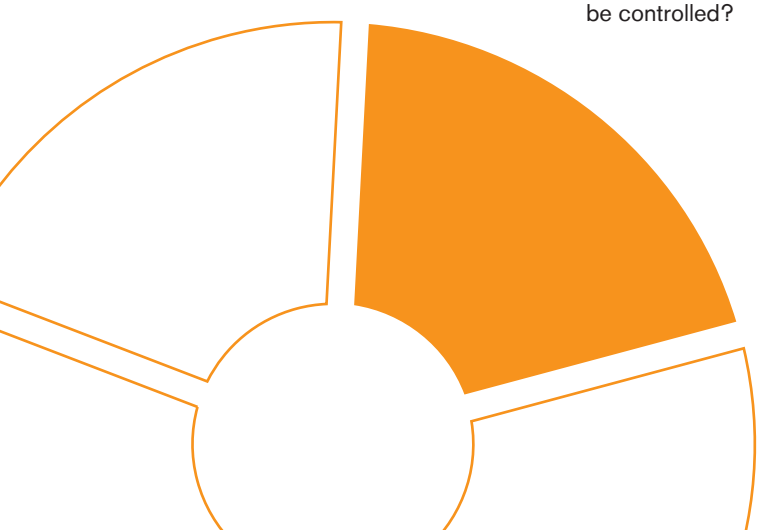
- Do you see any additional need for Ministerial approvals for RPA use over and above what would apply to other air systems and what measures should be in place to ensure accountability for use, especially as smaller and increasingly tactically indispensable RPA might cascade down to unit level?
- How do you see policy regarding inter-operability with allies, such as MAJIIC2 (Multi-intelligence All-source Joint ISR Interoperability Coalition), developing over the coming decade?
- Since it is possible that organisations like the UN will have their own unmanned combat aerial vehicles, what additional legislation and policy do you think will be required to ensure that inter-state governance is commensurate with the requirements of the law applying to Armed Conflict and that officials are accountable? Would additional measures be necessary if such RPA had only a surveillance capability?

Proliferation

- How do you see developments in RPA speed, loiter time and stealth taking place over the next quarter of a century and how will this affect policy making regarding their deployment and use?
- What uses do you envisage for swarm technology as it develops in the Twenty-First Century?
- What uses do you envisage non-state armed groups being able to make of RPA and what sort of red teaming should be done, what additional counter-proliferation or counter-terrorist measures should be taken and which counter-RPA technologies might have to be introduced?
- How should Governments protect developments in autonomy and securely share those developments with allies?

Regulation

- Is the Missile Technology Control Regime an appropriate instrument to regulate the proliferation of RPA technology? If it is, will it remain so?
- If new regulations are necessary and feasible, which particular technologies or performance specifications should be controlled?
- What measures need to be taken in order to regulate security and military RPA in civilian airspace
- Given the legal debate about RPA, how effective do you think Article 36 of the 1977 Protocols Additional to the Geneva Conventions of 1949 is in ensuring that weapons like RPA at the development and procurement stages comply with the Law of Armed Conflict/International Humanitarian Law?
- It is argued that there needs to be more transparency in the use of RPA. Do you agree? Can more transparency be achieved in the design, development, deployment and supervision of autonomous systems?
- In your opinion, what measures, if any, should be taken to regulate the development of autonomy in RPA technology? How would they be verified? If they are practicable and desirable, how and where could negotiations be started to give the best chance of success?
- Is the law on accountability for intended and unintended consequences of the lethal use of drones satisfactory?
- Would decisions by the UK to restrain RPA research, acquisition or operation be likely to change emerging international practice: as an individual nation? As part of NATO? As an EU Member? As one of the P5?



Appendix C: Work Programme

The Policy Commission heard and deliberated on evidence from a range of sources, agreed conclusions and recommendations, and explored these through a variety of tools, including consultations and group discussions. The work took place in three phases: **Phase One** involved establishing the Policy Commission and scoping its topic; **Phase Two** involved hearing and deliberating evidence from a range of expert witnesses and sources; and **Phase Three** focused on agreeing conclusions and recommendations and exploring them through a range of public and private workshops.

Phase One (September – December 2013)

Activities included:

- Developing the idea for the Policy Commission with University of Birmingham academics and partners.
- Appointing the Commissioners.
- The Birmingham Perspective: 'The ethics of warfare part 3: How does drone warfare change the debate?' by Professor Stefan Wolff – www.birmingham.ac.uk/research/impact/perspective/drones.aspx.
- The Birmingham Brief: 'The Security Impact of Drones: Challenges and Opportunities for the UK' by Professor Nicholas J. Wheeler – www.birmingham.ac.uk/news/thebirminghambrief/items/2013/09/The-security-impact-of-drones-challenges-and-opportunities-for-the-UK.aspx.
- Launching the Policy Commission with debates at the Labour and Conservative Party Conferences (23 and 30 September 2013).
- Commissioners' meetings to agree the content and process of the Policy Commission.

Phase Two (January – May 2014)

Activities included:

- Three one-day workshops to hear and deliberate on evidence from policy-makers, practitioners and academics:
- Workshop 1: Legal and Ethical considerations (22 January 2014).
- Workshop 2: Political and Operational considerations (3 March 2014).
- Workshop 3: Regulatory and Proliferation considerations (28 April 2014).
- Researching literature and data in the public domain.
- Global consultation exercise, inviting written evidence from interested parties.
- Reviewing written evidence submitted to the Commission.
- Consultation meeting hosted by Malvern Labour Party, attended by current and former employees of QinetiQ, and local community groups (21 March 2014).
- Commissioners' meetings to scope the content and format of the report.

Phase Three (June-October 2014)

Activities included:

- Finalising the findings and recommendations of the Commission.
- Meeting with representatives from the MOD (9 July 2014, 12 August 2014).
- Commissioners Sir David Omand, Paul Schulte and Professor Nicholas J. Wheeler presented draft findings to the All-Party Parliamentary Group on Drones (9 July 2014).
- Consultations with key figures including Ben Emmerson QC, UN Special Rapporteur on promotion and protection of human rights and fundamental freedoms whilst countering terrorism (12 August 2014).
- Launch of the Policy Commission Report (22 October 2014).

Appendix D: Glossary

ACPO	Association of Chief Police Officers
AGL	Above Ground Level
APPG	All-Party Parliamentary Group
AQ	al-Qaeda
AQAP	al-Qaeda in the Arabian Peninsula
ASTRAEA	Autonomous Systems Technology-Related Airborne Evaluation and Assessment
ATC	Air Traffic Control
BAE	British Aerospace
BDA	Battle Damage Assessment
BLOS	Beyond Line of Sight
CAA	Civil Aviation Authority
CAOC	Combined Air Operations Centre
CAS	Chief of the Air Staff
CCTV	Closed Circuit Television
CCW	Convention on Certain Conventional Weapons, also abbreviated to CCWC
CIA	Central Intelligence Agency
COIN	Counterinsurgency
C-RAM	Counter Rocket, Artillery and Mortar
CT	Counter Terrorism
DCDC	Development Concepts and Doctrine Centre
DCPD	Direct, Collect, Process, Differentiate
DGP	Defence Growth Partnership
DGPS	Differential Global Positioning System
DoD	Department of Defense
DRC	Democratic Republic of Congo
ECHR	European Convention on Human Rights
ECtHR	European Court of Human Rights
EMS	Electro-Magnetic Spectrum
ERSG	European RPAS Steering Group
EU	European Union
F3EAD	Find, Fix, Finish, Exploit, Analyze and Disseminate
FCAS	Future Combat Air System
FCO	Foreign and Commonwealth Office
FOI	Freedom of Information
GPS	Global Positioning System
GST	Global Strategic Trends
HALE	High Altitude Long Endurance
HERRICK	Operation HERRICK is the operation under which all British military activity in Afghanistan since 2002 has been conducted
HCDC	House of Commons Defence Committee
HRW	Human Rights Watch
ICJ	International Court of Justice
ICRC	International Committee of the Red Cross
IED	Improvised Explosive Device
IHL	International Humanitarian Law
IHRL	International Human Rights Law

INGO	International Non-Governmental Organization
IS	Islamic State. Also known as ISIS (Islamic State of Iraq and al-Sham) or ISIL (Islamic State in Iraq and the Levant).
ISAF	International Security and Assistance Force
ISC	(House of Commons) Intelligence and Security Committee
ISR	Intelligence, Surveillance and Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
KFOR	Kosovo Force
LAR	Lethal Autonomous Robots
LAWS	Lethal Autonomous Weapons Systems
LOAC	Law of Armed Conflict
LOS	Line of Sight
MAJIIC2	Multi-Intelligence All-Source Joint ISR Interoperability Coalition
MALE	Medium Altitude Long Endurance
MTCR	Missile Technology Control Regime
MoD	Ministry of Defence
NATO	North Atlantic Treaty Organization
NAV	Nano Aerial Vehicles
NGO	Non-Governmental Organization
NPAS	National Police Air Service
NSS	National Security Strategy
OSCE	Organisation for Security and Co-operation in Europe
PJHQ	Permanent Joint Headquarters
QRA	Quick Reaction Alert
RAF	Royal Air Force
R&D	Research and Development
RIPA	Regulation of Investigatory Powers Act
RoE	Rules of Engagement
RPA	Remotely Piloted Aircraft
RPAS	Remotely Piloted Aircraft System
SDSR	Strategic Defence and Security Review
SIS	Secret Intelligence Service
SME	Small and Medium-sized Enterprise
UAS	Unmanned (sometimes Uninhabited) Aircraft System
UAV	Unmanned (sometimes Uninhabited) Aerial Vehicle
UCAV	Unmanned (sometimes Uninhabited) Combat Aerial Vehicle
UCLASS	Unmanned Carrier-Launched Airborne Surveillance and Strike System
UK	United Kingdom
UN	United Nations
US	United States
USAF	United States Air Force
WCG	Weight Classification Group (civil aviation)
WMD	Weapon of Mass Destruction

Desert Hawk UAV Launch. Image by POA(Phot) Dave Husbands; © Crown copyright 2009

Soldier Using Desert Hawk 3. Image by Cpl Si Longworth RLC (Phot); © Crown copyright 2014

Note on Classification

RPA classification is by weight and the three classes of RPA identify them in ascending order, with Class I being the smallest and Class III the biggest, as the table below demonstrates. Military categorization has some crossover to that of civilian administration but there are differences. There is also a correlation to altitude flown and whether the mission is in line of sight or not.

RPA Classification Table[1]

Class	Category	Normal Employment	Normal Operating Altitude (AGL)	Normal Mission Radius	Civil Category (UK CAA)	Example Platform
Class I <150kg	MICRO <2kg	Tactical Platoon, Section, Individual (single operator)	Up to 200ft	5 km (LOS)	Weight Classification Group (WCG) 1 Small Unmanned Aircraft (<20kg)	Black Widow
	MINI 2-20kg	Tactical Sub-Unit (manual launch)	Up to 3,000ft	25 km (LOS)		Scan Eagle, Skylark, Raven, DH3
	SMALL >20kg	Tactical Unit (employs launch system)	Up to 5,000ft	50 km (LOS)	WCG 2 Light Unmanned Aircraft (20><150kg)	Luan, Hermes 90
Class II 150-600kg	TACTICAL	Tactical Formation	Up to 10,000ft	200 km (LOS)	WCG 3 Unmanned Aerial Vehicle (>150kg)	Sperwer, Iview250, Aerostar, Watchkeeper
Class III >600kg	MALE	Operational/ Theatre	Up to 45,000ft	Unlimited (BLOS)		Reaper, Heron, Hermes 900
	HALE	Strategic/ National	Up to 65,000ft	Unlimited (BLOS)		Global Hawk
	Stike/Combat	Strategic/ National	Up to 65,000ft	Unlimited (BLOS)		

[1] After Ministry of Defence, *The UK Approach to Unmanned Aircraft Systems*, p.2-7.

UNIVERSITY OF BIRMINGHAM

BIRMINGHAM POLICY COMMISSIONS

ICCS Institute for Conflict Cooperation and Security

Contact

Enquiries to Tina Aston
Institute for Conflict, Cooperation and Security (ICCS)
University of Birmingham
Birmingham
B15 2TT
Email: t.aston@bham.ac.uk
Tel: +44 (0)121 414 8398

www.birmingham.ac.uk/policycommissions

UNIVERSITY OF BIRMINGHAM
Edgbaston, Birmingham
B15 2TT, United Kingdom
www.birmingham.ac.uk