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BRIEFING PAPER

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Overview of military drones used by the UK armed forces

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Summary

This note provides an introduction to the use of Remotely Piloted or Unmanned Aircraft by the UK Armed Forces. They are more commonly known as drones and have been described as the most contentious conventional weapons system currently in use.[1]

Remotely piloted or unmanned aircraft range in size from simple, hand-operated systems to high altitude, long endurance systems similar in operation to manned aircraft. They allow ground troops to look over a hill to assess enemy positions or, by loitering over an area for many hours, provide commanders with persistent surveillance of enemy positions without putting service personnel at risk.[2]

In Afghanistan (2007-2014) they were primarily used to support ground troops to provide intelligence, surveillance and reconnaissance. Only one of the five systems in the UK's current inventory can be armed: Reaper carried out air strikes in Afghanistan and since 2014 in Iraq. Two British nationals were killed in Syria by a UK Reaper aircraft in 21 August 2015. The Prime Minister said this was the first time in modern times that a British asset has been used to conduct a strike in a country where the UK is not involved in a war.[3] 2014 also saw the first deployment of a remotely piloted aircraft on maritime operations.

The forthcoming Strategic Defence and Security Review should provide some clarity on how the Government envisages how remotely piloted air systems will fit into its future force plans.[4] The UK is already actively seeking a replacement for Reaper from 2018 and the Prime Minister announced in early October 2015 plans to replace the existing fleet of 10 Reapers with more than 20 new RPAS.[5] The Ministry of Defence is also considering whether a remotely piloted aircraft could fulfil its maritime surveillance needs. Further ahead, the Government is jointly funding with France a study into the feasibility of an unmanned combat aircraft as a possible replacement for Typhoon from 2030.

Why are they contentious? Their use by the United States to conduct 'targeted killings' in Pakistan, Yemen and elsewhere has raised awareness about this relatively new technology and prompted questions about the legality, utility and morality of these systems. These questions, which are explored in this note, include: do airstrikes from remotely piloted aircraft comply with international law? Does having the capability lower the threshold to use force? Does it turn warfare into a 'video game' with operators firing missiles by remote control? How is information gathered by UK aircraft shared and used by our allies? How much of the system is automated and how much is controlled by a

"We expect unmanned aerial vehicles to form a permanent and significant part of our future aerial capability."
Philip Hammond, then Defence Secretary, 2014

1 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014 p14. This excludes the UK's nuclear deterrent which is considered a strategic and not a conventional weapon.
2 "UK eyes in the Sky" *Desider,* February 2014, p29
3 HC Deb 7 September 2015 c30
4 The quote by Philip Hammond on the top right of the page is from: HC Deb 23 January 2014 c476
5 "New investment in counter-terrorism for the UK armed forces", *Prime Minister's office,* 4 October 2015

human? Could an armed capability be developed that could operate autonomously? The latter question has prompted a global campaign to pre-emptively ban the development of 'killer robots'.

The UK Government position is that remotely piloted aircraft operate under the same rules of engagement as manned aircraft. The Government emphasises the primary role of these machines is to provide an intelligence, surveillance and reconnaissance (ISR) capability. It states that all air strikes are conducted in accordance with International Humanitarian Law (the Law of Armed Conflict). The Government says it has no plans to develop fully autonomous systems and that all present and future systems will remain under human control.

Parliamentary scrutiny of these systems during the 2010-2015 Parliament included an inquiry by the Defence Committee; debates in both Houses and scrutiny by the All-Party Parliamentary Group on Drones. Members of Parliament have called on the Government to provide greater transparency about the operational use of these systems.

Externally, an influential Birmingham Policy Commission report examined this topic in considerable depth while a NATO study explored their vulnerabilities. Both the APPG on drones and an organisation called Drone Wars UK has elicited information about RPAs usage from the Government via Freedom of Information Requests.

A note on this update

This note thoroughly revises and updates the 2013 edition that was titled: Unmanned Aerial Vehicles (Drones): An Introduction. It was published in June 2015. Section 6.3 was added in September 2015 to reflect the August air strike in Syria and it was amended on 8 October 2015 to include the Prime Minister's announcement of new Protector RPAS (see section 3.1).

Terminology

The term Remotely Piloted Aircraft or Remotely Piloted Aircraft Systems (RPA or RPAS) is the primary term used in this briefing note. Unmanned Aerial Vehicles or Systems is also used on occasion.

Scope

This note is limited to discussing remotely piloted air systems as used by the UK Armed Forces. It does not explore land or maritime unmanned systems, nor does it discuss civilian use. Information on the civilian use of RPAS can be found in *Civilian Use of Drones in the EU* by the House of Lords European Union Committee.[6]

Structure

This note provides an introduction to the systems currently in use with the UK Armed Forces and potential future capabilities. It examines restrictions on their use and rules regarding the use of weapons and

[6] European Union Committee, *Civilian Use of Drones in the EU*, 5 March 2015 2014-15, HL 122

discussions about the legality of and the campaign to pre-emptively ban the development of fully autonomous armed systems. Questions raised about their use and why they are so controversial is contained in section 7. A list of further reading is provided at the end.

1. Remotely Piloted Aircraft Systems: What are they?

> At present, Remotely Piloted Aircraft are the most controversial convention weapons platform in the UK Armed Forces' portfolio.[7]

A Remotely Piloted Aircraft is an aircraft that does not carry a human operator but is flown remotely by a pilot.

Remotely Piloted Aircraft, commonly referred to as drones, are aircraft that do not carry a human operator and are flown remotely by a pilot. They range from simple hand-operated short-range systems to long endurance, medium altitude systems.

The UK military primarily uses them for Intelligence, Surveillance and Reconnaissance (ISR) or Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR). The UK also uses Reaper to conduct air strikes.

Terminology

The terminology relating to these systems has evolved over time. They are commonly known as drones in the media and public.

The Ministry of Defence has switched from using Unmanned Aerial Vehicle/Unmanned Aerial System to Remotely Piloted Aircraft/Remotely Piloted Aircraft System. This is because it felt the term unmanned could be unhelpful because it may have caused confusion over the level of human control over the aircraft. [8] The Ministry of Defence has provided the following definitions:

> A **Remotely Piloted Aircraft** is defined as an aircraft that, whilst it does carry a human operator, is flown remotely by a pilot, is normally recoverable, and can carry a lethal or non-lethal payload.
>
> A **Remotely Piloted Aircraft System** is the sum of the components required to deliver the overall capability and includes the pilot, sensor operators (if applicable), the aircraft, a ground control station, associated manpower and support systems, satellite communication links and data links.
>
> An **Unmanned Aircraft** (sometimes abbreviated to UA) is defined as an aircraft that does not carry a human operator.
>
> An **Unmanned Aircraft System** (UAS) is defined as a system, whose components include the unmanned aircraft and all equipment, network and personnel necessary to control the unmanned aircraft.[9]

The Defence Committee noted that it may be more appropriate to use unmanned air systems to describe the systems used by the Army for ISR.[10]

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7 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p56

8 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

9 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 2

10 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14

What are they used for?

The RPAS and UAS used by the UK Armed Forces are primarily used to provide ISR or ISTAR: Intelligence, Surveillance, (Target Acquisition) and Reconnaissance. Of the five types of systems used by the Armed Forces, only one fulfils an additional role: strike. Reaper is the only system that can be armed and conduct air strikes using missiles and bombs. It is also used to provide ISR or ISTAR. Section 2 of this note lists all the remotely piloted and unmanned systems currently in use, section 3 looks ahead to future capabilities and section 4 examines how and where they have been used.

Strengths

The advantages of RPAS over manned aircraft include:

- Good for 'dull, dangerous and dirty' tasks
- Provide a persistent presence over a specific area providing still and video imagery
- Provide an intelligence, surveillance and reconnaissance capability for ground troops. For example:

  An 'over the hill' visual aid for infantry soldiers

  A persistent presence in the air to identify enemy movements e.g. placing an IED

- Reduces the manpower footprint in theatre
- Provides an additional air strike capability (Reaper only)
- Can be relatively cheap.

Weaknesses

They also have plenty of weaknesses:

- Have relatively low manoeuvrability, operate and low speed and have no or little defensive measures
- Vulnerable to attack from a sophisticated air defence network
- Currently limited to operating in a permissive or segregated airspace
- Vulnerable to cyber and communications link attack or lost data links
- The more advanced systems may require as heavy if not heavier crew requirement than manned aircraft[11]
- May not be cost effective: "If current trends continue, it is likely that the cost of complex unmanned aircraft will increase to converge rapidly with those of manned aircraft"[12]
- Vast quantity of data collected requires sophisticated data analysis to enable the data is analysed and distributed.

Section 5 explores further the vulnerabilities of RPAS.

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11 According to Air Vice-Marshal Jon Lamonte , 39 Squadron, which operates Reaper from Nevada, has a manpower to aircraft ratio greater than that of a traditional fast jet squadron; Air Vice-Marshal Jon Lamonte, Chief of Staff Strategy, Policy & Plans, RAF "The Future of UAVs: Concepts and Considerations", RUSI Air Power conference, 19-20 October 2009

12 "Joint Doctrine Note 2/11 The UK Approach to Unmanned Aircraft Systems", *Ministry of Defence Development, Concepts and Doctrine Centre (DCDC)*, 30 March 2011, 104

How many are there?

The UK operates five different types remotely piloted aircraft systems. Latest figures available are: 10 Reaper (as of June 2015); 29 Watchkeeper (8 aircraft in the forward fleet and 21 in storage as of 26 March 2015)[13]; 222 Desert Hawk III and 324 Black Hornet (as of 1 April 2013).[14] The numbers for the latter three systems are the latest available but should not be relied upon as reflecting the current fleet.

Worldwide it is estimated there are only a handful of medium-altitude, long-endurance RPAS types in the world and some states that have Reaper, like Italy, do not arm them. Ulrike Esther Franke estimates the total number of MALE remotely piloted aircraft in use around the world to be about a thousand, and that includes the largely unknown number of MALE UAVs in Israeli, Chinese and Iranian military arsenals. By contrast, she says, there are tens of thousands of smaller, tactical drones (sometimes called mini or micro UAVs).[15]

Why are they controversial?

The Birmingham Policy Commission neatly encapsulated why RPAS are so controversial: "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."[16] These issues are explored in sections 6, 7 and 8 and of this briefing note.

Current British doctrine

Joint Doctrine Publication 0-30 *UK Air and Space Doctrine*, published on 13 July 2013, is the highest level statement of UK air and space doctrine. It replaces Air Publication (AP) 3000: *British air and space power doctrine*.

In March 2013 the MoD's thinktank, the Development, Concepts and Doctrine Centre, published a Joint Doctrine Note in March 2011 entitled: *the UK Approach to Unmanned Aircraft Systems* (JDN 2/11, March 2011). The MoD told the Defence Committee some of the issues raised in this JDN have been incorporated into the new JDP 0-30. JDN 2/11 will be withdrawn once the 2015 SDSR is published.

The Ministry added the new *Future Operating Environment 2035* programme will examine issues with remote and automatic systems across defence. At the time of writing *Future Operating Environment 2035* has not been published.[17]

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13 PQ225370, 26 March 2015. The Forward Fleet comprises aircraft which are serviceable and those which are short-term unserviceable; The numbers recorded as being in "Storage" are airworthy aircraft that are currently in temporary storage.

14 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

15 M Aaronson and A Johnson, *Hitting the target? How new capabilities are shaping international intervention*, RUSI Whitehall Report 2-13, March 2013, p21

16 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p14

17 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 3

Parliamentary scrutiny

Members of Parliament have taken a keen interest in the use of RPAS or UAVS both by the UK Government and their use by other nations.

The Defence Committee published a report on remotely piloted air systems in March 2014, to which the Government responded in July 2014.[18]

The committee's report observed a "sense of public disquiet" around the use of RPAS in military operations. The Committee noted that RPAS had made a significant contribution to operations in Afghanistan and Iraq, providing enhanced intelligence, surveillance and reconnaissance support in addition to weapons use. But the Committee also argued that the MoD needed to rise to the challenge of overcoming public suspicion of RPAS and developing public understanding of the capability.

The Committee pursued this issue in its report *Towards the next SDSR: Part Three,* published on 25 March 2015. The Government has not yet responded to this report.

The Defence Committee also discussed unmanned systems in the context of maritime surveillance.[19] The Committee agreed with the MOD that in the longer-term unmanned systems could be provide a way forward for maritime surveillance.

An All Party Parliamentary Group on Drones ('APPG') was founded in October 2012 to: examine the use of drones by governments, for domestic and international, military and civilian purposes. It is chaired by Tom Watson and its vice-chairs were Baroness Stern and David Davis.[20]

Further information on debates, PQs and freedom of information requests can be found in section 7.5 of this note.

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18 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14 and Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14

19 Defence Committee, Future Maritime Surveillance, 19 September 2012, HC 110 2012-13

20 Further information about the APPG on drones can be found on its website.

2. Armed Forces inventory: current

Summary

The UK Armed Forces currently have five different types of operational remotely piloted aircraft systems. They are predominantly used in what is known as an ISR capacity: intelligence, surveillance and reconnaissance; or an ISTAR role: intelligence, surveillance, target acquisition, reconnaissance. Only one system can carry weapons.

The Army operates three RPAS and the RAF and Royal Navy one each. Most were procured as urgent operational requirements for operations in Afghanistan and have been incorporated into the services core equipment programme.

All are flown and operated by trained UK Armed Forces personnel. Reaper, the only armed RPAS, is flown by a qualified and experienced RAF pilot. This section provides a brief description of each of the operational systems in descending order of size.

2.1 Reaper

Only one aircraft carries weapons and can carry out air-to-ground strikes. This is the General Atomics MQ-9 Reaper.[21] It has been in service since 2007 when it first deployed to Afghanistan.

The RAF has ten[22] Reaper aircraft divided between two squadrons:

- 39 Squadron: formed in 2007 and based in the United States at Creech Air Force Base in Nevada
- 13 Squadron: formed in 2013 and based at RAF Waddington

Pilots undergo training at the Reaper Formal Training Unit in the United States. Training is provided through a Foreign Military Sales Agreement with the United States Air Force and is conducted at Holloman Air Force Base, USA.[23] Reaper is not authorised to fly in the UK.[24]

Reaper was acquired as an urgent operational requirement and the MOD indicated in mid-2014 that it will be brought into the RAF's core fleet and funding will be maintained until the Protector/Scavenger programme enters service towards the end of the decade (see below for more on Protector/Scavenger).[25]

Reaper is a medium-altitude, long-endurance (MALE) aircraft. It requires a prepared runway and a ground crew for take-off and landing. It is

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21 Image copyright: 45156829 by Open government Licence

22 Five were originally procured and the MOD announced plans to double the fleet in 2010. In 2008 one Reaper was permanently removed from service after crashing. The additional five aircraft deployed to Afghanistan for the first time in July 2014: "More RAF Reapers take to the skies", *RAF News article,* 3 July 2014

23 HC Deb 10 June 2013 c19W; RAF recruitment: RPAS pilot training, accessed 2 April 2015

24 "UK places into storage Reaper UAVs not involved in Iraq operations", *Jane's Defence Weekly,* 19 January 2015

25 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14

operated in flight by a pilot and sensor operator who can be located in a different country. It can fly up to 50,000 feet and has a maximum speed of 250kts. It is primarily tasked in the ISTAR role but can be armed with four Hellfire missiles and two GBU-12 500lb laser guided bombs. The weapons are released only when commanded to do so by the flight crew.

The UK and France set up a Joint User Group for Reaper operators at a bilateral summit in 2014. The Group will provide a forum to encourage interoperability and to work together on air certification, training and through life support. The first formal meeting was held in January 2015[26] and the group is open to the US and European nations operating Reaper.[27]

2.2 Watchkeeper

Watchkeeper is the Army's newest RPAS and is a core equipment capability. It replaces the Hermes 450 the Army used in Afghanistan that was bought into service as urgent operational requirement.[28] Watchkeeper is cleared to fly in segregated airspace in the UK.

Watchkeeper[29] flies up to 15,000 feet and will provide ISTAR for the Army. There are no plans to arm Watchkeeper. It requires a runway to take-off and land. The cost of acquiring the 54 aircraft, 15 ground control stations and support is approximately £1 billion.[30] As of 26 March 2015 there are 8 aircraft in the forward fleet and 21 in storage.[31] Watchkeeper will be based at Larkhill and operated by 32nd and 47th Regiments Royal Artillery.

Watchkeeper has an improved sensor payload compared to the Hermes 450 - a synthetic aperture radar/ground-moving target indicator radar. This, Defence Minister Mark Francois has said, will create "a persistent and flexible all-weather ISTAR capability with the ability to conduct surveillance through cloud and obscuration."[32]

Watchkeeper took far longer to enter service than originally expected when the contract with Thales UK was placed in 2005. It was not released to service until February 2014[33], over three years after its originally planned in service date of September 2010[34], and did not

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26 PQ 219725, 12 January 2015
27 UK France declaration on security and defence, January 2014
28 Hermes 450 was deployed in Afghanistan to provide tactical level imagery to unit and formation commanders on the ground and operated by 32 Regiment, RA. Hermes 450 is no longer in service.
29 Image copyright: 45156634 by Open Government Licence
30 HC Deb 5 September 2013 c491W; "Unmanned Air Systems", *Desider,* February 2014, p28-30
31 PQ225370, 26 March 2015. The Forward Fleet comprises aircraft which are serviceable and those which are short-term unserviceable; The numbers recorded as being in "Storage" are airworthy aircraft that are currently in temporary storage.
32 HC Deb 24 March 2014 c61W
33 HC Deb 17 March 2014 c488W
34 HC Deb 7 January 2013 c41W; HL Deb 13 October 2008 cWA30

deploy to Afghanistan until September and October 2014. Three Watchkeeper aircraft flew for a total of 146 hours in Afghanistan.[35]

The MOD has said it has identified the factors that delayed the programme and learnt the lessons for future RPAS programmes. These factors are detailed in the MOD's written evidence to the Defence Committee and include: shortfalls in suitably qualified and experienced personnel, technical issues and difficulties with airworthiness certification. In particular, the MOD admitted that an "underestimation of the challenges of delivering sufficient quality evidence to underpin the Watchkeeper System Safety Case led to the delay to the achievement of the system Release to Service."[36]

2.3 Other Army operated RPAS

The Desert Hawk III and Black Hornet are smaller, hand-launched systems designed to provide tactical video and image feeds to enable to front-line soldiers to look 'over the hill' and 'round the corner' respectively. Both were acquired as urgent operational requirements but the MOD has indicated they will be retained as core capabilities.[37]

Desert Hawk III

Desert Hawk-III[38] is a man-portable, hand launched system. It can fly for approximately one hour within a 15 km radius of its ground control station. Each Desert Hawk system comprises between eight to ten aircraft and the UK has 30 Desert Hawk III systems. Total approved cost: £70 million.[39]

Black Hornet

Black Hornet[40] is a nano-UAV, a tiny hand-held helicopter that flies less than 300 metres. It provides still images and video feed. Total approved cost: £20 million.[41] The MOD had 324 Black Hornets as of 1 April 2013.[42]

These Unmanned Aerial Systems are operated by the Royal Artillery in support of land forces on operations. They are operated by 32 Regiment, 47 regiment and 104 Regiment (Reserves).

35 Freedom of Information request published week commencing 27 April 2015, available on the GOV website.
36 A full list of factors can be found in Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1
37 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14
38 Image copyright: 45157702 by Open Government Licence
39 "Unmanned Air Systems", *Desider,* February 2014, p28-30
40 Image copyright: 45155077 by Open Government Licence
41 "Unmanned Air Systems", *Desider,* February 2014, p28-30
42 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

2.4 Scan Eagle

The only Royal Navy/Royal Fleet Auxiliary operated RPAS is **Scan Eagle**. It entered service in early 2014 and so far has been deployed on HMS Somerset, HMS Northumberland and RFA Cardigan Bay.[43] Scan Eagle's deployment on HMS Somerset for operations in the Gulf was the first time the Navy had operated an unmanned air system on maritime operations, according to then Defence Secretary Philip Hammond. He described it as a "new era of aviation and intelligence gathering in the Royal Navy."[44]

ScanEagle has a wingspan of just over 3 metres and is launched from a catapult on the deck. It can remain airborne for 12 hours operating up to 40 nautical miles from the launch platform. It provides a day or night persistent ISR and beams live video directly into the ship's operating room. It was brought in as an urgent operational requirement is provided by Boeing Defence UK on a £30 million contractor-owned/contractor-operated service contract. Navy personnel direct the ScanEagle's operations and a civilian team from the aircraft's manufacturer Boeing Insitu, fly and maintain the aircraft.[45] It is operated by 700X Naval Air Squadron (formerly the Royal Navy's 831 Flight) which was reformed at Royal Naval Air Station Culdrose in late 2014.

2.5 New classification regulations introduced in 2015

New regulations for RPAS were published in January 2015 by the Military Aviation Authority. The regulations introduce a classification system which categorise RPAs according to size, how they are operated and what risk to life they potential pose to people on the ground. The category an RPAS receives will determine the level of regulation it will have to meet, ranging from full compliance for the largest RPAS presenting the greatest risk to life down to no regulation for the smallest.

The MOD says this new classification system and regulations for RPAS has created "a much improved regulatory regime which is proportional and effective because it recognises the broad range of RPAS types and the appropriate level of regulation for each of them."[46]

The Regulations advise organisations or service seeking to bring an RPAS into use is advised to present a case to the Military Aviation Authority prior to Main Gate for classification. The regulations recommend that for RPAS procured through Defence Equipment and Support, the MOD's procurement arm, an approach to the MAA should be made prior to Initial Gate and certainly no later than Main Gate.[47]

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43 "X-men take to the Cornish skies", *Royal Navy news,* 25 November 2014
44 "Eagle scans the skies", *Desider,* April 2014
45 Royal Navy website, accessed 18 February 2015; "ScanEagle set for RN operations", *Jane's Defence Weekly,* 16 January 2014
46 "New regulations for Remotely Piloted Air Systems (RPAS) go live", *Ministry of Defence*, 19 January 2015
47 Initial Gate is when initial funds are released for a programme's assessment phase. Main Gate is when the programme is approved and funds released for manufacture.

The new categorisation divides RPAs into three classes: I, II and III. Class 1 is further subdivided into four (a, b, c and d). The MAA will categorise a RPAS on a case by case basis. The categorisation process is based initially on the minimum take-off weight combined with how the RPAS is intended to be used and where it is expected to be operated.

The minimum take-off weight (MTOW) is based on NATO RPAS MTOW classification, as provided in Annex A of RA 1600:[48]

Table 1: NATO Class and Common Taxonomy

MTOW	NATO Class	Common Taxonomy	Starting MAA category
< 200g	Class I < 150 kg	NANO	Class I(a)
200g to 2kg		MICRO <2kg	Class I(b)
2kg-20kg		MINI 2-20 kg	Class I(c)
20kg-150kg		SMALL >20 kg	Class I(d)
> 150kg	Class II 150 - 600kg	TACTICAL >150 kg	Class II
> 600kg	Class III > 600kg	MALE / HALE / Strike	Class III

Weight alone is not the defining factor in how the MAA will categorise an RPAS. The regulations say mitigating and aggravating factors are likely to be the more significant factors in understanding the risk to life to individuals. A non-exhaustive list of such factors is provided in Annex A of RA 1600:

Table 2: Categorisation of Aggravating and Mitigating Factors

Mitigating factors	Aggravating factors
Operation in visual line of sight Operation in segregated airspace Overflight of low population density Flight termination system Redundancy Frangibility of RPAS structure[49]	Extended range of operation beyond visual line of sight Operation in non-segregated airspace Overflight of congested areas / high population density Weaponisation Failure mode – high kinetic energy Complexity

All Military Aviation Authority Regulations can be found on the gov.uk website. The regulation covering the categorisation of RPAS and the specific regulations to assure their safe operation is: Regulatory Article (RA) 1600: remotely piloted air systems (RPAS).

48 RA 1600 issue 2 1 April 2015, annex A

49 A frangible object is an object of low mass designed to break, distort or yield on impact so as to present the minimum hazard to aircraft.

2.6 International regulation

There are two principle multilateral regimes that address exports of UAVs – the Missile Technology Control Regime (MTCR) and the Wassenaar Arrangement. Both are voluntary, nonbinding arrangements among like-minded supplier countries. The UK belongs to both.

The MTCR is a voluntary association of 34 countries and focuses on limiting the spread of ballistic and cruise missiles and UAVs capable of delivering weapons of mass destruction.[50] The MOD has said the UK discusses the developments of unmanned aerial vehicles/systems with MTCR partners but notes it works on a consensus basis and therefore each member must be in agreement before any changes to guidelines can be implemented.[51] The UK was a founding partner of the MTCR when it was established in 1987.

The Wassenaar Arrangement (Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies) is a voluntary association of 41 countries which want to limit the spread of certain conventional weapons.[52]

Arms exports

The Committee on Arms Export Controls has questioned the Government on its export policy regarding RPAS (referred to as UAVS in the committee report.[53] The Government said in its response:

> Unmanned Aerial Vehicles (UAVs), their technology and components, are controlled for export by both the MTCR and the WA. Export licences for all UAVs are approved in accordance with the Consolidated Criteria, which include an explicit requirement to comply with the UK's international commitments (Criterion 1) and to consider human rights and fundamental freedoms in the country of final destination (Criterion 2). The Government always acts in accordance with international humanitarian law and international standards.[54]

Further information about UK arms exports can be found Library Briefing Paper: *UK Arms Export Control Policy*.[55]

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50 "Non-proliferation: Agencies Could Improve Information Sharing and End-Use Monitoring on Unmanned Aerial Vehicle Exports", US Government Accountability Office, July 2012, GAO-12-536, p4

51 HC Deb 16 April 2012 c75W

52 "Non-proliferation: Agencies Could Improve Information Sharing and End-Use Monitoring on Unmanned Aerial Vehicle Exports", US Government Accountability Office, July 2012, GAO-12-536, p4

53 Committee on Arms Export Controls, *First Joint Report of the Business, Innovation and Skills, Defence, Foreign Affairs and International Development Committees of Session 2014–15*, HC 186, 23 July 2014 2013-14

54 *Scrutiny of Arms Exports (2014) – Government response*, Cm 8935, 15 October 2014, para 115

55 J. Lunn, UK Arms Export Control Policy, House of Commons Library Standard Note SN02729, 8 May 2015

3. UK Armed Forces inventory: Future capabilities

Summary

The Ministry of Defence is actively exploring a range of future possible remotely piloted aircraft systems. This includes:

- a replacement for Reaper
- options for maritime surveillance
- a remotely piloted maritime helicopter
- co-funding a project examining a future unmanned combat aircraft with France

The forthcoming 2015 Strategic Defence and Security Review may give some indication as to where the MOD intends to focus its efforts.

3.1 Protector/Scavenger: Reaper's replacement

Protector, the programme previously known as Scavenger, will replace Reaper from the end of this decade. Protector is the name of the programme to provide a core medium altitude, long-endurance (MALE) capability to provide ISTAR[56] and an offensive capability from 2018 to 2030. The programme, then known as Scavenger, passed initial gate in November 2013 is currently in its assessment phase.[57] The MOD has not yet decided on what capability will fulfil the programme's requirements and the Ministry has said a particular requirement is for the capability to be certified to fly in UK/European airspace.[58]

The UK and France agreed to collaborate in acquiring a MALE RPAS from 2018 as part of the work following the 2010 Lancaster House Treaties. The 2012 summit declaration announced a jointly funded contract would shortly be placed with BAES and Dassault.[59] However no contract has so far been placed and the programme looks to have fallen by the wayside. Instead, the 2014 summit declaration said the two countries will "look to develop cooperative opportunities through a 'joint user group' for REAPER, to exchange lessons learnt and work together on air certification, training, through life support and interoperability." France is separately involved in a seven-nation MALE RPAS exploration programme to develop RPAS from 2020 onwards.[60]

The current ten-strong fleet of Reaper aircraft will be replaced by a fleet of more than 20 new aircraft, to be called Protector, the Prime Minister

56 Intelligence, Surveillance, Target Acquisition, Reconnaissance
57 PQ 216428, 5 December 2014
58 Defence Committee, *Remote Control: Remotely Piloted Air Systems-current and future UK use: Government response,* HC 611, 29 July 2014 2013-14, para 12
59 UK-France declaration on security and defence, February 2012
60 The other nations are Germany, Greece, Italy, the Netherlands, Poland and Spain.

announced in early October 2015. The Prime Minister said it will have greater range and endurance than Reaper but other than that provided few details. The head of unmanned air systems at the MOD has suggested it will be an upgrade to the current Reaper (block 1) fleet but a Main Gate decision is not expected until March 2016.[61] General Atomics, which makes Reaper, are currently producing aircraft in a Block 5 configuration. It is also developing a certifiable variant of the Predator B (which was the original name of the MQ-9 Reaper) with an integrated sense and avoid system and an extended range, with a view to it be certified for flight in European airspace.

EU and NATO developments

Both the EU and NATO have identified a gap in allies and members RPAS capabilities, particularly the medium and high altitude aircraft systems that provide intelligence, surveillance and reconnaissance.

EU leaders identified RPAS as a key military capability at the December 2013 summit. The European Defence Agency is currently working on the production of technical documents to inform those member states interested in developing a medium-altitude, long-endurance (MALE) system. The present assumption is such a system will have an in-service date between 2020 and 2025.[62] The UK is not involved in the development of a European Male RPAS.[63]

The UK is not directly involved in a NATO effort to acquire a high altitude, long endurance RPAS (HALE) to provide wide-area terrestrial and maritime surveillance. 15 NATO allies are procuring five Global Hawk remotely piloted aircraft which will be operated and maintained by NATO on behalf of all 28 allies. This is called the Alliance Ground Surveillance (AGS) system and is expected to become available for operational deployment from 2017. The main operating base for the AGS system will be located at Sigonella Air Base in Italy, alongside the US Air Force Global Hawk fleet.[64]

All allies will contribute to the development of the AGS capability through financial contributions, although the UK will contribute 'in kind' by making available Sentinel, a manned surveillance aircraft. Sentinel's service life has been extended until 2018.[65] The Government said in 2012 it was not joining the consortium acquiring AGS because the UK's requirements for airborne surveillance are met mainly by Sentinel.[66]

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61 "MOD reveals Reaper derivative will be chosen for Protector", *Flight International,* 7 October 2015

62 More information on this can be found on the European Defence Agency website; in the European Council 19/20 December 2013 conclusions, EUCO 217/13; and "Defence Ministers Commit to Capability Programmes", *European Defence Agency news,* 19 November 2013; Report by the Head of the European Defence Agency to the Council, November 2014, 36526

63 See explanatory memorandum on European Council document Report by the Head of the European Defence Agency to the Council, November 2014, EM 36526

64 Further information on AGS is available on the NATO website and Northrop Grumman website.

65 PQ 206091, 1 September 2014

66 HC Deb 11 June 2012 c106W

3.2 Maritime surveillance

Maritime surveillance is an area which could, in part, be provided a remotely piloted air system.

The UK has a maritime surveillance capability gap following the decision in the 2010 Strategic Defence and Security Review to cancel the Nimrod MRA4 maritime patrol aircraft (MPA) programme.

The MOD has been exploring options for maritime surveillance ahead of the next Strategic Defence and Security Review. The AIR ISTAR Optimisation Study (AIOS) will look at the requirements and capabilities of air-based ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance). The study is considering a number of options for wide area surveillance which includes the use of unmanned aircraft and manned aircraft and the use of space-based assets. The MOD has said it does not intend to publish the results of the study.[67]

Separately the Royal Navy is developing a Maritime UAS Strategy paper looking at this topic out to 2050. This was mentioned by the Ministry to the Defence Committee in July 2013. It is unclear if and when this strategy paper will be published and the MOD said in response to a PQ in November 2014 the paper is still in development.[68]

In terms of actual equipment, the Department has confirmed it has considered the MQ-4c Triton as part of this review.[69] The Northrop Grumman MQ-4C Triton is being developed for the US Navy as a surveillance aircraft. It is based on the USAF RQ-4B Global Hawk and is expected to be a forward deployed, land-based system providing a persistent maritime ISR capability. The US Navy anticipates using it alongside the Poseidon P-8A manned aircraft and says Triton will perform ISR within a range of 2,000 nm while the P-8A aircraft focuses on its core missions and anti-surface ship warfare. The US Navy has an initial operational capability date of 2018.[70]

The UK has embedded a number of personnel with the US Navy on P-8 Poseidon aircraft as part of its Seedcorn Maritime Patrol Aircraft (MPA) programme to embed personnel in MPA capabilities of close allies to retain the necessary skills and experience of operating a maritime patrol aircraft capability.[71]

It is worth noting that Australia intends to operate a fleet of Triton and P-8A aircraft to provide maritime surveillance.[72]

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67 PQ 218393, 18 December 2014
68 Letter from Ministry of Defence to Defence Committee entitled: *Defence Committee report on future maritime surveillance: Government update,* 10 July 2013; PQ214079, 18 November 2014
69 HC Deb 16 June 2014 c366W
70 MQ-4c Triton, Naval Air Systems Command, accessed 27 March 2015
71 HC Deb 3 April 2014 c807W
72 "Avalon 2015: Australia seeks co-operative development with US on Triton UAV", *Jane's Defence Weekly*, 25 February 2015

3.3 Remotely-piloted helicopters

Rotary-wing remotely piloted air systems (helicopters) have so far not featured in the UK's inventory. However in 2013 the Royal Navy placed a £2.3 million two year contract with AugustaWestland to research a rotary-wing UAS. The programme is known as the Rotary Wing Unmanned Air System (RWUAS) Capability Concept Demonstrator (CCD). The company is developing the SW-4 Solo Rotorcraft Unmanned Air System/Optionally Piloted Helicopter[73] (RUAS/OPH) based on the EASA certified SW-4 light single helicopter. The demonstrator will focus on demonstrating radar, electro-optics, mine counter measures and hydrographic survey capabilities.[74]

The MOD has ruled out acquiring the US Navy developed MQ-8 Fire Scout system, saying it "does not meet any endorsed UK capability need."[75] Fire Scout is a rotary-wing RPAS which can operate from air-capable ships and is designed to provide ISR. The US Navy currently operates the MQ-8B Fire Scout and is developing the larger MQ-8C Fire Scout.

Further discussion of rotary and fixed-wing Remotely Piloted Air Systems in the context of maritime air power and maritime surveillance can be found in a Royal Aeronautical Society discussion paper published in July 2014.[76]

3.4 Unmanned Combat Aircraft

Could an unmanned combat aircraft fly alongside the manned Lightning II in the future?

The RAF's fast jet fleet from 2020 will consist of Typhoon and the new F-35 Joint Strike Fighter Lightning II. Typhoon is expected to leave service around 2030 and the MOD is conducting a two year Future Combat Air System (FCAS) programme to consider the most appropriate force mix of platforms and systems for combat air from 2030.

The MOD has said the options for this force mix include an **Unmanned Combat Air Vehicle (UCAV)** along with an additional buy of Lightning II, a Typhoon extension programme or a new-build manned aircraft.[77] This programme will inform the 2015 Strategic Defence and Security Review.

An unmanned combat air system is described by the Ministry of Defence as a "proposed class of Unmanned Aerial Systems with offensive and defensive capabilities on a par with current manned systems to allow

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73 'Optionally Piloted Helicopter' refers to a helicopter than can be flown by a pilot on board or can be remotely piloted.

74 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

75 HC Deb 1 November 2012 c374W

76 "Current and future maritime air power for the United Kingdom", *Royal Aeronautical Society*, July 2014

77 The others being additional buy of Lightning II, a Typhoon life extension, or an alternative new-build manned aircraft.

them to operate in contested airspace when necessary."[78] This capability does not yet exist.

The UK is jointly funding a study to explore unmanned combat air system options with France since France is looking to replace its Rafale fleet around the same timeframe as the UK will need to replace Typhoon: around 2030.

The initial agreement was made at the 2010 Lancaster House Summit. At the 2012 summit they agreed to jointly fund a study with BAE Systems and Dassault Aviation. A £120 million contract was subsequently placed In November 2014 to begin a Future Combat Air System (FCAS) Feasibility Phase study.[79] Each nation will provide additional national funding of £40 million.

The purpose of the FCAS study is to explore "concepts and options for the potential collaborative purchase of an unmanned combat air system (UCAS)." The study will focus on the development of concepts for an operational system and the maturation of key technologies that will be required for a future operational UCAS.[80] The study is expected to be completed at the end of 2016.

Both BAE Systems and Dassault Aviation have developed UCAS demonstrator prototypes for the UK and French Governments respectively. BAE Systems[81] has developed the **Taranis** demonstrator programme was formally unveiled in July 2010 and made its maiden flight in Australia in 2013. Dassault Aviation in France has developed the **Neuron** UCAV demonstrator which had its maiden flight in December 2012 and is expected to complete flight testing towards the end of 2015.[82] Both are prototype systems and neither is intended to enter production.

Tom Fillingham, Director Future Combat Air Systems at BAE Systems, has described UCAS as revolutionary rather than evolutionary. He suggests that what will differentiate future UCAS from the unmanned aircraft of today will be survivability. This is not just being difficult to detect on radar but also to have a significant chance of surviving complex hostile scenarios. This requires increasing the level of autonomy though, he adds "it is imperative that a human remains in the loop for all key decision making actions." He describes the new and emerging technologies required to support such an aircraft, for example highly secure networks and associated high-capability communications links: what he calls 'system of systems' integration.

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78 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

79 Plus industrial partners. The six industrial partners are: BAE Systems, Dassault Aviation, Thales France, Selex ES, Rolls-Royce and Safran.

80 "Preparing for future combat aerospace", *BAE Systems,* 5 November 2014

81 In partnership with the MOD and with Rolls-Royce, QinetiQ and GE Aviation.

82 Dassault Aviation is leading a six nation consortium consisting of Alenia Aermacchi (Italy), EADS CASA (Spain), Hellenic Aerospace Industry (Greece), RUAG (Switzerland), Saab (Sweden) and Thales (France). "France completes testing of Neuron UCAV", *Jane's Defence Weekly,* 11 March 2015. Further information on Neuron is available from Dassault Aviation.

Tom Fillingham describes the advantages of a UCAS when combined with manned combat aircraft like Typhoon or Lightning II:

> By placing an autonomous, low-observable UCAS close to or inside the contested/high-threat airspace, commanders will be able to deliver effects, either directly or via stand-off, that would otherwise be either impossible or too risky to achieve. Risk of platform loss, latency of action and overall utilisation of force resources would be reduced, while persistence, flexibility and effective force mass could all be increased.

He adds that through-life costs of UCAS could be "considerably lower than manned alternatives." He argues that training costs will be reduced because there will be no need for flying training beyond that provided for in the simulator: "The majority of flying hours consumed by manned combat aircraft are training hours. This would not be necessary with a UCAV system, and there would be a consequent, and significant, saving in operating, support and maintenance costs, as well as an increased airframe fatigue lifespan."[83]

3.5 The Equipment Plan

The budget for unmanned air systems falls under the Combat Air sector in the MOD's Equipment plan 2014. The MOD envisages spending £17.9bn on the combat air sector over the next ten years. This includes procurement of the Joint Strike Fighter Lightning II and Typhoon upgrades. It does not specify how much it expects to spend on unmanned air systems beyond the £130 million already committed to develop the future combat air system concept.

The 2015 Strategic Defence and Security Review is expected to give some indication as to how the MOD envisages the future air force mix of manned and unmanned aircraft.

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83 T Fillingham, "Unmanned Combat Air Systems: An Autonomous Revolution on the Horizon", RUSI Defence Systems, Jan 2015, Vol. 16, No. 2

4. Operational use of RPAS

Summary

Until 2014 unmanned and remotely piloted air systems were only deployed in support of operations in Afghanistan. Upon the end of combat operations in Afghanistan in October 2014 Reaper aircraft were transferred to the Middle East for operations in Iraq and Syria.[84] An RAF Reaper killed two British nationals in Syria on 21 August 2015, the first time a British asset has been used to conduct a strike in a country in which the UK is not involved in a war.[85]

2014 also saw the first operational deployment of an unmanned air system on maritime operations with the deployment of Scan Eagle on HMS Somerset on Operation Kipion in the Gulf.[86]

Afghanistan

In the latter years of Operation Herrick the Armed Forces operated six types of RPAs in Afghanistan: Reaper, Hermes 450, Desert Hawk III, Black Hornet, Tarantula Hawk and Watchkeeper (from September 2014). The latter deployed in the very last few weeks of operations. All were withdrawn from Afghanistan by December 2014. The Hermes 450 has since been replaced by Watchkeeper and the Tarantula Hawk is no longer in service.[87] The Government has said it has no plans to redeployed RPAS to Afghanistan following the end of combat operations in December 2014.[88]

The entire fleet had flown nearly 170,000 in support of operations in Afghanistan up to February 2014 (the fleet included Army operated Hermes 450 but does not include Watchkeeper which had not deployed during that time period).[89]

Reapers flew over 5,000 sorties in Afghanistan since first deploying in 2007 (it did not conduct air strikes until 2008).[90] The MOD has provided information on the number of weapons fired from Reapers in response to Parliamentary questions. This information includes:

- 8% of sorties flown between 2008 and July 2013 included a weapon release.[91]

84 PQ HL5185, 10 March 2015
85 HC Deb 7 September 2015 c30
86 "Eagle scans the skies", *Desider,* April 2014; PQ HL5185, 10 March 2015
87 The Tarantula Hawk was used by Explosive Ordnance Device operators to examine suspicious vehicles or structures because it can hover and stare. It takes-off and lands vertically. It was operated in Afghanistan by 32 Regiment, Royal Artillery, embedded in the Royal Engineers Counter IED task force. Withdrawal from service confirmed by author with the Ministry of Defence on 11 June 2015
88 PQ 216885, 8 December 2014
89 "UK eyes in the sky", *Desider,* February 2014, p30
90 5262 sorties between 2008 and 15 November 2014. PQ 216079, 8 December 2014
91 HC Deb 5 September 2013 c480W

- 317 precision-guided weapons were released by Reapers between 24 March 2011 and 16 June 2014. By comparison, 71 such weapons were released from fixed-wing aircraft.[92]

Iraq and Syria: 2014 to present

Reaper aircraft redeployed from Afghanistan to the Middle East for use in operations against ISIS in the Middle East in mid-October 2014. This marked the first operational use of Reaper outside of Afghanistan. Reaper is flying surveillance missions over both countries but is only authorised to carry out air strikes in Iraq. Initially two Reaper aircraft were redeployed from Afghanistan for operations in the Middle East.[93] However the MOD has since then refused to say how many Reaper have been deployed or where they are based, saying its disclosure "would or would be likely to prejudice operational capability, effectiveness or security of the Armed Forces and also relations between the United Kingdom and another State."[94] By comparison, the Government has given those details for Tornado aircraft operating in Iraq: eight aircraft operating from RAF Akrotiri in Cyprus.[95]

The Ministry of Defence has said "no UK Reaper missions have been conducted in Syria other than for surveillance purposes. No authority has been granted for the discharge of weapons from UK Reaper aircraft operating in Syrian airspace."[96]

However this position changed on 21 August 2015 when an RAF Reaper killed two British nationals, Reyaad Khan, the target of the strike, Ruhul Amin, and a third individual, in a targeted strike in Syria. The Prime Minister said the strike was lawful and authorised on the basis of self-defence, a reference to Article 51 of the UN charter. The Prime Minister said the strike was not as not part of coalition military action against ISIL in Syria but a target strike "to deal with a clear, credible and specific terrorist threat to our country at home."[97] The Prime Minister noted this action was a "new departure." See section 6.3 for further discussion of the legal argument.

Figures released under a Freedom of Information request by Drone Wars UK show:

- 87 Reaper strikes in Iraq between November 2014 and March 2015
- 184 Reaper sorties in Iraq between January and March 2015
- 30 Reaper sorties in Syria between January and March 2015
- 64 Hellfire missiles released at targets in Iraq between January and March 2015[98]

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92 PQ 200904, 7 July 2014; Other PQs giving statistics on usage can be found in Hansard: HL Deb 19 November 2013 c187WA
93 PQ 211832, 4 November 2014
94 PQ 213744, 18 November 2014; PQ 211833 4 November 2014
95 PQ 209771, 17 October 2014
96 PQ 22433, 2 February 2015
97 HC Deb 7 September 2015 c25-26
98 "New figures for British air and drone strikes in Iraq", *Drone Wars UK,* 15 May 2015

Information about air strikes in Iraq, including those conducted by Reaper aircraft, can be found on the Gov.uk website.

Libya

UK operated armed UAVs were not deployed in Libya.[99] However UK personnel embedded within a US unit flew American UAVs (Predators) during Operation Ellamy in Libya in 2011.[100]

Maritime operations

The first unmanned air system to be flown on maritime operations occured in early 2014 on HMS Somerset, on her way to the Gulf for Operation Kipion.[101] The then Defence Secretary Philip Hammond described it as a "new era of aviation and intelligence gathering in the Royal Navy."[102] ScanEagle has since been deployed on HMS Northumberland and RFA Cardigan Bay for operational deployments in 2014.[103]

99 HC Deb 6 November 2012 c204WH
100 HC Deb 26 November 2012 c29W & HC Deb 29 November 2012 c461W; see also "British pilots flew armed US drones in Libya, MoD reveals", *The Guardian*, 26 July 2012
101 "Eagle scans the skies", *Desider,* April 2014
102 "Eagle scans the skies", *Desider,* April 2014
103 "X-men take to the Cornish skies", *Royal Navy news,* 25 November 2014

5. Restrictions on use

Summary

The operational deployment of Remotely Piloted Aircraft is constrained by a number of factors.

RPA designed for medium and high-altitude flying are restricted in where they can fly because all lack the sense-and-avoid technology that enables aircraft to fly in unsegregated airspace.

Current RPAS were not designed to operate in contested airspace and so lack defences against a sophisticated enemy air defence network: the UK has so far only deployed Reaper in permissive airspace in Afghanistan and Iraq (2014-to present).

Lighter aircraft may find it difficult to operate in extreme environments because of the effect of high cross winds or icing. The dependency on satellites and datalinks means RPAS are vulnerable to failure or data link interference.

Identifying restrictions and vulnerabilities

The Ministry of Defence identified a number of constraints to the use of RPAS in evidence to the Defence committee. These include the use of airspace and safety; basing (the need for UAS to be based as close as possible to the target area to allow for the longest loiter time possible); command delay; weather and the electromagnetic environment (dependence upon data feeds).[104]

NATO released a detailed study into the vulnerabilities of RPAS in contested environments in September 2014. The study, conducted NATO's Joint Air Power Competency Centre, identified the vulnerabilities of and threats to RPAS currently in use by NATO allies. The author made more than 100 individual recommendations to enhance RPAS survivability, encompassing measures in the air, ground and cyber-domains.[105]

Restrictions on operational use: air space

The operation of unmanned aircraft within the United Kingdom is governed by the Air Navigation Order 2009. Full guidance on the use of UAVs is contained in the Civil Aviation Authority's (CAA) publication Civil Aviation Publication 722-Unmanned Aircraft System Operations in UK airspace.

All military remotely piloted aircraft (UAVs) are treated as UK military aircraft and subject to the same regulations as military aircraft. They are regulated by the Military Aviation Authority (MAA).

New regulations for RPAS were published in January 2015 by the Military Aviation Authority. This includes a new classification system and specific regulations for RPAS which the MOD says has created "a much

[104] Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

[105] Major A Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014

improved regulatory regime which is proportional and effective because it recognises the broad range of RPAS types and the appropriate level of regulation for each of them."[106]

All Military Aviation Authority Regulations can be found on the gov.uk website. The regulation covering the categorisation of RPAS and the specific regulations to assure their safe operation is: Regulatory Article (RA) 1600: remotely piloted air systems (RPAS).

Segregated airspace

Remotely piloted aircraft are only permitted to operate in UK airspace if it is considered safe for them do so. The main requirement for aircraft operating beyond line of sight[107] is to be able to avoid collisions. This requires an aircraft to be fitted with a detect/sense and avoid system or operate in segregated airspace. These terms are defined by the Civil Aviation Authority:

> **Sense-and-Avoid** is a generic term used to describe a system involving one or more sensors, which has the capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action to comply with the applicable rules. In this way, the system acts as a substitute for See-and-Avoid in manned aircraft.
>
> **Segregated Airspace**, as the name suggests, is a block of airspace specifically allocated for an unmanned aircraft's flight. Collision risks are eliminated by either preventing or strictly controlling entry to this airspace by other aircraft.[108]

In 2013 the Government said its intention was to work towards the full and safe integration of remotely piloted aircraft into the total aviation system so that they share the same airspace as their manned counterparts. This was articulated by Transport Minister Earl Atlee in 2013. However he noted there are a "number of significant technical challenges to be overcome" before this can be achieved. These primarily concern the airworthiness of the RPA and that it can avoid collisions.[109]

The Ministry of Defence is working with other departments and authorities on a cross-Government initiative to "determine the feasibility of operating both civilian and military remotely piloted aircraft systems beyond line-of-sight and in un-segregated airspace" the Government said in February 2015.[110]

In the UK the Ministry of Defence operates unmanned aircraft systems (UAS) in danger areas or segregated airspace.[111] A danger area is defined as "airspace which has been notified as such within which

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106 "New regulations for Remotely Piloted Air Systems (RPAS) go live", *Ministry of Defence*, 19 January 2015

107 Beyond line of sight operations describes operations in which the operator cannot directly see the unmanned aircraft and avoid other aircraft or objects. For flights within the visual line of sight, the pilot is expected to exercise the see and avoid principle: Civil Aviation Authority.

108 Civil Aviation Authority website, accessed 5 December 2012; Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

109 HL Deb 25 June 2013 c725

110 PQ 222430, 4 February 2015

111 HC Deb 16 December 2013 c482W

activities dangerous to the flight of aircraft may take place or exist at such times as may be notified."[112]

Watchkeeper received its full release to service in March 2014.[113] It is permitted to fly in segregated airspace and flew test flights had test flights at the Parc Aberporth facility at West Wales airport, which is in segregated airspace. In 2013 the Ministry of Defence said it had no plans to conduct operational flights for Watchkeeper in the UK.[114]

Reaper cannot fly in UK airspace.

The Army trains Desert Hawk operators at Salisbury Plain. Black Hornet does not need to be limited to segregated airspace because of its weight, size and the height at which it operates.

Further information on the civilian use of drones in UK and EU airspace can be found the following briefings:

- House of Lords European Union Committee, *Civilian use of drones in the EU*, 5 March 2015, HL 122 2014-15
- Parliamentary Office of Science and Environment, *Civilian drones*, 2 October 2014

Restrictions on operational use: contested airspace

One of the major vulnerabilities of current RPAS is that they are not designed to operate in contested airspace. That is, airspace in which they might face a sophisticated air defence network. This is a major consideration for future procurement plans: will future RPAS be expected to operate in permissive, non-permissive or hostile environments? This decision impacts on the design of future RPAS.

Current RPAs were not intended to operate in contested environments. The Vice Chief of the Air Staff of the United States Air Force noted this limitation in 2011:

> One has to remember that the current ISR fleet… is absolutely a permissive fleet… The Predator, the Reaper, the Global Hawk will not fly in contested [airspace] and will certainly not fly in denied airspace.[115]

Current medium and high-altitude aircraft have a high radar visibility, operate at relatively low speed, have limited manoeuvrability and have little or no defensive measures to defend themselves against surface-to-air missiles or enemy combat aircraft. As the NATO study notes: "signature reducing measures, warning receivers, countermeasures, high airspeeds and manoeuvrability were not a design priority."[116] An example of defensive measures is the defensive aids subsystem on the manned Sentinel R1 reconnaissance aircraft that has a missile warning

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112 HC Deb 10 July 2012 c141W
113 "Thales's Watchkeeper given Release To Service by UK Ministry of Defence", *Thales press release,* 5 March 2014
114 HC Deb 25 February 2013 c36W
115 Joe Doyle, "Rise of the Robots? Western unmanned air operations in Iraq and Afghanistan, 2001 to 2010", Air Power Review summer 2013, vol 16 no 2, p15
116 A. Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014

system, radar warning receiver, towed radar decoy and chaff and flare dispensers.[117]

UK Reapers have only flown in permissive airspace in Afghanistan (2007-2014) and Iraq (2014-present). Watchkeeper has only flown, briefly, in Afghanistan. In neither environment were they threatened by a sophisticated enemy air defence system.

Unrealistic expectations?

Some commentators have cautioned that the successful use of RPAS in permissive environments may have created unrealistic expectations of what RPAS might be able to do in the future.

International Defence Review found a growing sense of among air operators that "the unusually permissive air environments in Afghanistan and Iraq fostered a potentially unrealistically high level of reliance on unmanned aerial vehicles (UAVs)."[118]

RAF Squadron Leader Joe Doyle analysed RPAS operations in Iraq and Afghanistan between 2001 and 2010. He concluded that RPAS did not show themselves to be genuine competitors to conventional manned aircraft, because the aircraft operated in an environment which presented little or no threat to it:

> Success in mission areas where UAV utility was most evidence was enabled by a counterinsurgency-dominated strategic context combined with a permissive air environment. Significant technical and conceptual limitations endured throughout this period. The limited and context-specific extent of this UAV "revolution" should warn against the premature replacement of manned capabilities in Western force structures and doctrine.[119]

Doyle notes the US military refused to deploy Global Hawk into the Libyan theatre in early 2011 until integrated air defence systems had been sufficiently degraded.[120]

The author of the NATO study warns that future adversaries should be assumed to have the "will have the capability and intent to oppose or disrupt NATO air operations and will represent a serious threat to Allied RPAS assets."[121]

The joint UK/France study into a future unmanned combat air system (UCAS) is specifically working on a capability that would be able to carry out strikes in hostile territories.

Restrictions on operational use: satellites and data links

[117] C Heyman, *The Armed Forces of the United Kingdom 2014-2015,* 2013, p154
[118] "Fragile invaders: can UAVs survive in contested airspace?", *International Defence Review,* 6 July 2012
[119] Joe Doyle, "Rise of the Robots? Western unmanned air operations in Iraq and Afghanistan, 2001 to 2010", Air Power Review summer 2013, vol 16 no 2, p12
[120] Joe Doyle, "Rise of the Robots? Western unmanned air operations in Iraq and Afghanistan, 2001 to 2010", Air Power Review summer 2013, vol 16 no 2, p15
[121] A. Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014

The use of Remotely Piloted Air Systems are entirely dependent upon data feeds.[122] They also require access to frequencies and spectrum to operate.[123] Failure of these datalinks, and failure to restore control, can lead to the loss of the aircraft.

Major Haider notes in his NATO study that current beyond line of sight RPAS operations are entirely dependent on a reliable satellite data link network. Haider assesses the threat to RPAS from anti-satellite weapons to be low because of the low availability of such weapons. However he assesses the threat from electronic warfare to RPAS to be high. He notes that electronic warfare attack equipment has historically required less sophisticated technology than is needed to defend against that attack – simple jammers can be bought for less than a $100.[124]

The threat of cyber-attack is also rated high by Major Haider because although RPAS are part of secured military networks there have been instances of RPAS being 'hacked'. In 2011 a computer virus was discovered at Creech Air Force base in Nevada following the key strokes of Predator and Reaper pilots flying missions over Afghanistan.[125] In his study of RPAS operations in Afghanistan and Iraq, Joe Doyle cites examples of US Predators lost because of the failure of datalinks during operations in Afghanistan. In one instance, a Predator had to be shot down by a USAF F-15. In 2009 the US discovered insurgents in Iraq had hacked into the real-time video feeds transmitted by Predator aircraft.[126]

The Ministry of Defence has explained what happens in the event of the loss of control of an RPAS in UK airspace:

> Should a flight be aborted, standard operating procedures applicable to each UAV type allow a safe recovery, either to an established airfield or to a pre-selected emergency recovery site. In the event of a loss of the control link between the ground station and the aircraft, a UAV will revert to a pre-programmed emergency flight plan and fly to an established airfield where operators will attempt to regain the control link or, failing that, continue to a pre-selected emergency recovery site where it will automatically land. The flight-paths of UAVs operating in UK segregated airspace and danger areas are designed to minimise or eliminate the overflight of populated areas, thus mitigating risk to third parties to the absolute minimum.[127]

Restrictions on operational use: weather

One of the greatest constraints to operational use of RPAS is the effects of weather, the Ministry of Defence told the Defence Committee. The

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122 A. Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014

123 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

124 A. Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014 p34

125 "computer virus hits US drone fleet", *Wired,* 10 July 2011

126 Joe Doyle, "Rise of the Robots? Western unmanned air operations in Iraq and Afghanistan, 2001 to 2010", Air Power Review summer 2013, vol 16 no 2, p20; Further analysis of RPAS crashes and causes can be found in the Drone crash database maintained by Drone Wars UK

127 HC Deb 28 February 2011 c83-84W

Ministry said this is the case for all aircraft but can be particularly difficult for lighter airframes to manage in certain environments, such as areas that suffer from high cross winds, icing or lightning strikes.[128] Drone Wars UK database of crashes identifies the loss of a two Predators in June 2011 because of bad weather and lightning strikes.[129]

Afghanistan's harsh environment posed difficulties for the Royal Artillery operating the Hermes 450. Major Claire Button of 32 Regiment, Royal Artillery, has written about how high crosswinds often exceeded the Hermes maximum for take-off. Carburettor icing was a serious problem that led to engine failure and the near loss of aircraft. Major Button said to mitigate the weather conditions the army developed comprehensive meteorological training for operators to assist them in minimising the risk of placing an aircraft in conditions outside its performance envelope.[130]

[128] Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1
[129] Drone crash database, *Drone Wars UK,* accessed 15 May 2015
[130] Major Claire Button, "Unmanned Aerial Vehicles on operations: overcoming the challenges", *RUSI Defence Systems,* June 2009, p78

6. Deploying weapons from RPAS

Summary

Reaper is the only UK RPA that can conduct air strikes and the Government says operators abide by the same rules of engagement as manned combat aircraft and comply with International Humanitarian Law. However the use of armed RPA by the United States combined with a perceived lack of transparency about their operational has prompted questions about the UK's policy on using Reaper to conduct air strikes.

The Ministry of Defence states the rules of engagement for the use of weapons from remotely piloted aircraft are the same as those that apply to manned combat aircraft.

The rules of engagement for the use of weapons from remotely piloted aircraft are the same as those that apply to manned aircraft.

However public perception of the rules of engagement has arguably been driven by the policy of the United States to use its remotely piloted aircraft to conduct air strikes in Pakistan, Yemen and elsewhere. US policy is beyond the scope of this note.[131] But the US policy has raised public awareness of 'drone strikes' and prompted questions about their use by the UK Armed Forces. These questions came to the fore again in light of the killing of a British national in Syria by an RAF Reaper aircraft on 21 August 2015 which, the Prime Minister acknowledged, was a "new departure."

Specific areas of concern, which are explored in the following two sections, include:

- The rules of engagement and accordance with international law
- How civilian casualties are minimised and investigated if they occur
- The applicable rules of engagement for UK personnel embedded with the US Air Force
- The applicable rules of engagement for US or other allies when operating UK-owned Reaper aircraft
- The use of intelligence gathered by UK RPAS by allies

The Defence Committee, the Birmingham Policy Commission, the APPG on drones and Drone Wars UK are calling on the Government to be more transparent about RPAS operations. The Committee and the Commission have also called on the Government to engage more with the public in explaining the rules of engagement to assist in improving wider public understanding and acceptance of the use of armed RPAS.

[131] For more about US policy on targeted killings, see Council on Foreign Relations backgrounder, 23 May 2013; "Legal Issues Related to the Lethal Targeting of U.S. Citizens Suspected of Terrorist Activities" Congressional Research Service memorandum, 4 May 2012

6.1 Armed RPAS used by the Armed Forces

The only remotely piloted aircraft in the UK inventory that can carry weapons is Reaper. The Government said in 2011 it has no plans to arm Watchkeeper.[132] Reaper has conducted air strikes during:

- Operation Herrick in Afghanistan: 2008-2014
- Operation Shader in Iraq: 2014 to present

Regarding future capabilities, the MOD is currently looking to replace Reaper with an RPAS that can provide an offensive capability from 2018 to 2030. This is known as the Protector programme (it was known as Scavenger until it was renamed in October 2015). Further ahead, it is considering whether an unmanned combat aircraft could be part of a future fast-jet fleet from 2030.

6.2 The Law of Armed Conflict

International Humanitarian Law, also known as the Law of Armed Conflict, forms part of public international law. It seeks to limit the effects of armed conflict. The International Committee of the Red Cross states: "it protects people who are not or are no longer participating in hostilities and restricts the means and methods of warfare."[133]

The Government has consistently stated that RPAS strikes are carried out in accordance with the Law of Armed Conflict.[134] Defence Minister Lord Astor of Hever explained in November 2014:

> Armed Remotely Piloted Aircraft Systems (RPAS) are operated by the UK's Armed Forces in accordance with the same domestic and international legal framework and Departmental policy that regulates conventional manned aircraft. The Doctrine and Rules of Engagement that govern and underpin the use of armed RPAS are aligned to both current UK policy and International Humanitarian Law (IHL). The UK constantly reviews and updates both its policy and doctrine to ensure it remains both operationally effective and fully compliant with IHL.[135]

The Defence Committee concluded at the end of its inquiry into RPAS that it was "satisfied that UK remotely piloted air system operations comply fully with international law."[136]

Others take a different view. Public Interest Lawyers has argued that it is "highly likely" the UK's use of drones in Afghanistan is unlawful. PIL argues:

> there is a strong probability that the UK has misdirected itself as to the requirements of the IHL principles of proportionality, distinction and humanity and as to its human rights obligation to

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132 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1

133 International Committee of the Red Cross (ICRC), 'War and International Humanitarian Law', accessed 13 May 2015

134 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1;

135 See for example HL3118, 2 December 2014; HC213743, 6 November 2014; HC Deb 30 June 2014 c355W; HL Deb 5 February 2014 GC93

136 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 163

> protect human life and to investigate all deaths (civilians and combatants alike) arguably caused in breach of that obligation.[137]

The Defence Committee noted this in its report. The Government's response to the Committee explained the "well-established command, control, supervisory, training and qualification frameworks the RAF has in place for conducting air operations." The Ministry said Reaper crew receive regular training on domestic and international law regarding the use of force, which includes the understanding of, and compliance with, UK Rules of Engagement and International Humanitarian Law. Reaper crew have access to legal advice and support during operations 24 hours a day, 365 days of the year. The Government went on to say:

> The UK complies fully with its obligations under international law, including as set out in Article 36 of Additional Protocol 1 to the Geneva Conventions, to review all new weapons, means and methods of warfare. This process applies equally to manned and unmanned systems. UK forces operate in accordance with International Humanitarian Law, following the principles of humanity, proportionality, military necessity and ensuring that only appropriate military targets are selected. The UK's clearly defined Rules of Engagement are formulated on this basis. The same strict Rules of Engagement that govern the use of conventional military aircraft also apply to RPAS and targets are always positively identified as legitimate military objectives.
>
> UK Reaper aircrew carry out a high level of consistent training and have continuous access to legal representation. As a result, the public can be confident that they always strictly adhere to these Rules of Engagement.[138]

There is a significant legal debate about the United States policy on using its armed RPAS fleet for counter-terrorism operations.[139] The UN Special Rapporteur on Human Rights, Ben Emmerson, released a report in March 2014 examining the use of remotely piloted aircraft extraterritorial lethal counter-terrorism operations. He raised a number of legal questions and urged all States to ensure that the use of remotely piloted aircraft complies with international humanitarian law and international humanitarian rights law. [140]

The UN Human Rights Council subsequently adopted a resolution in April 2014 calling on states to ensure that "any measures employed to counter terrorism, including the use of remotely piloted aircraft or armed drones, comply with their obligations under international law, including the Charter of the United Nations, international human rights law and international humanitarian law, in particular the principles of precaution, distinction and proportionality." The UK voted against the resolution.[141]

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137 "The legality of the UK's use of Armed Unmanned Aerial Vehicles (drones)", *Public Interest Lawyers,* 8 June 2013

138 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 67

139 For more about US policy on targeted killings, see Council on Foreign Relations backgrounder, 23 May 2013; "Legal Issues Related to the Lethal Targeting of U.S. Citizens Suspected of Terrorist Activities" Congressional Research Service memorandum, 4 May 2012

140 UN Human Rights Council, A/HRC/25/59, 11 March 2014, para 73

141 UN Human Rights Council A/HRC/RES/25/22, 15 April 2014

Library Standard Note *Drone attacks and the killing of Anwar al-Awlaqi: legal issues* examines some of the legal issues raised by the killing of Anwar al-Awlaqi, a dual US-Yemeni citizen described as the "leader of external operations for Al-Qaeda in the Arabian Peninsula", in a drone strike in Yemen in September 2011.[142]

6.3 Self-defence

The Prime Minister said the UK was exercising its inherent right to self-defence when the Defence Secretary authorised the killing of Reyaad Khan in Syria on 21 August 2015 by an RAF Reaper aircraft. This is a reference to Article 51 of the United Nations Charter.

Self-defence, codified in Article 51 of the UN Charter, is one of the few accepted exceptions to international law's general prohibition on the use of force. Force used in self-defence must comply with the rules of International Humanitarian Law, and is also subject to the principles of necessity and proportionality. Article 51 states:

> Nothing in the present Charter shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security. Measures taken by Members in the exercise of this right of self-defence shall be immediately reported to the Security Council and shall not in any way affect the authority and responsibility of the Security Council under the present Charter to take at any time such action as it deems necessary in order to maintain or restore international peace and security.[143]

Joint Doctrine Publication UK Defence Doctrine include a section on UK defence and the law. This is contained in Annex 2C and states:

> The UN Charter requires that all member states refrain from the threat or use of force against the territorial integrity or political independence of any other state. However, this does not restrict the inherent right of a state to take action in self-defence in response to an armed attack. Further, it may also be lawful to use offensive force in another state's territory (without its consent) in certain circumstances – under a Chapter VII UN Security Council Resolution – or to prevent an overwhelming humanitarian catastrophe.[144]

Harriet Harman, Leader of the Opposition, questioned the legal justification and called for independent scrutiny of the Government's actions via the Intelligence and Security Committee. Lord McDonald, a former Director of Public Prosecutions, spoke of the need for more details of the timing of the decision-making process in order to understand whether the Reyaad Khan presented an imminent threat to the UK.[145] The media discussed at length the legality of the action. Joshua Rozenberg, writing in the Guardian, concluded that on the facts

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142 A. Thorp, Drone attacks and the killing of Anwar al-Awlaqi: legal issues, House of Commons Library Standard Note SN06165, 20 December 2011

143 Charter of the United Nations, Article 51

144 *UK Defence Doctrine,* JDP 0-01 (5th edition) para 2C.1.

145 "Syria drone strike: former DPP questions legal justification", *The Guardian,* 9 September 2015

available, it would be within the law.[146] On the other hand Philippe Sands QC called for more evidence on how the attack met the legal requirement of self-defence. Roy Greenslade summarised press reaction to the news in an article in the Guardian: drone strikes, right or wrong? What the national newspapers say. The attack prompted a wider debate about a possible vote on UK military action in Syria but that is beyond the scope of this particular note.

Further discussion about the UN Charter and self-defence can be found in section 3.3 of a 2011 House of Commons Library briefing paper: *Drone attacks and the killing of Anwar al-Awlaqi*.

Further legal justification for the action was provided in a letter by the UK Government to the UN Security Council. The UK Permanent Representative said:

> In accordance with Article 51 of the Charter of the United Nations, and further to our letter of 25 November 2014 (S/2014/851), I am writing to report to the Security Council that the United Kingdom of Great Britain and Northern Ireland has undertaken military action in Syria against the so-called Islamic State in Iraq and the Levant (ISIL) in exercise of the inherent right of individual and collective self-defence.
>
> On 21 August 2015 armed forces of the United Kingdom of Great Britain and Northern Ireland carried out a precision airstrike against an ISIL vehicle in which a target known to be actively engaged in planning and directing imminent armed attacks against the United Kingdom was travelling. This airstrike was a necessary and proportionate exercise of the individual right of self-defence of the United Kingdom.
>
> As reported in our letter of 25 November 2014, ISIL is engaged in an ongoing armed attack against Iraq, and therefore action against ISIL in Syria is lawful in the collective self-defence of Iraq.[147]

6.4 UK Rules of Engagement

The rules of engagement for the use of weapons from Reaper are the same as those that apply to manned combat aircraft. The MOD does not publish the Rules of Engagement as "disclosure would, or would be likely to prejudice the capability, effectiveness or security of our Armed Forces."[148]

Then Armed Forces Minister Nick Harvey detailed the legal use of Reaper in Afghanistan in July 2012:

> In Afghanistan, the policy governing the use of Reaper is identical to that for conventionally piloted combat aircraft. UK forces in Afghanistan come under the command of the NATO International Security and Assistance Forces (ISAF) and operate in accordance with international humanitarian law (also known as the law of armed conflict) and UK rules of engagement. Military lawyers based in Afghanistan advise on all aspects of operations including

146 "Was it lawful for UK forces to kill British ISIS fighters in Syria?" *Comment is Free*, 7 September 2015

147 Letter from the Permanent Representative of the UK to the UN Security Council, 7 September 2015, S/2015/688, provided by the Reprieve

148 HC Deb 13 September 2011 c1153W

> the selection and prosecution of all ISAF targets, which is the subject of a rigorous process that is compliant with international humanitarian law. Every effort is made to minimise the risk of collateral damage, particularly civilian casualties, which includes in some circumstances deciding not to engage the target.[149]

Defence Minister Lord Astor discussed the MOD's policy on armed RPAS during the Committee stage of the Defence Reform Bill in early 2014:

> The UK policy relating to use of and targeting by remotely piloted aircraft systems is exactly the same as that for manned aircraft. It is entirely compliant with international humanitarian law and the law of armed conflict. The rules of engagement used by Reaper pilots are no different from those used by manned aircraft pilots. Targets are always positively identified as legitimate military objectives following the principles of distinction, humanity, proportionality and military necessity.[150]

The RAF and Ministry of Defence also explained in detail the chains of command for tasking RPAS in Afghanistan in written evidence to the Defence Committee.[151] The RAF states:

> The majority of the weapons employed from Reaper have been Hellfire missiles. Hellfire has a relatively small warhead which helps minimise any risk of collateral damage. Regardless of the type of weapon system employed, a full collateral damage assessment is conducted before any weapon release; this is irrespective of whether that weapon is released by a manned or remotely piloted aircraft. On current operations, many UK Reaper weapons engagements have been authorised by a Forward Air Controller (FAC) or Joint Terminal Attack Controller (JTAC) who will be observing the target on the ground or from Land Forces HQs.[152]

6.5 Civilian casualties

The Ministry of Defence has stated that it seeks to avoid civilian casualties while undertaking airstrikes. It says it knows of only one incident involving an armed UK RPAS which resulted in the deaths of civilians. This was in Afghanistan on 25 March 2011. Six people, including four civilians - two women and two children - were killed during an attack on two pick-up trucks. Two of the six were believed to be enemy combatants and were the target of the air strike.[153]

Defence Minister Mark Francois explained the Government's position in regard to current operations in Iraq:

> The UK seeks to avoid civilian casualties while undertaking airstrikes against ISIL targets. All airstrikes are conducted in accordance with International Humanitarian Law, following the principles of distinction, humanity, proportionality and military necessity. The UK's clearly defined Rules of Engagement are formulated on this basis. The same strict Rules of Engagement that govern the use of manned military aircraft also apply to remotely piloted aircraft systems. Careful selection and approval of targets before a strike, together with the use of precision

149 HC Deb 12 July 2012 c381W
150 HL 5 February 2014 cGC92
151 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1
152 Reaper MQ9A RPAS, RAF website, accessed 7 April 2015
153 UN Human Rights Council, A/HRC/25/59, 11 March 2014, para 39

> guided weapons, minimises collateral damage and the potential for civilian casualties. This contrasts sharply with ISIL's brutal disregard for human life.[154]

Investigating civilian deaths

The Ministry of Defence says that after an incident in which a civilian has been or appears to have been killed by UK forces a full investigation is undertaken. If required, a special investigations team is deployed to conduct a quick and thorough assessment of the situation. It said these reports are not routinely published for reasons of operational security.[155]

The Government admits the operating environment limits investigations. Defence Minister Mark Francois said of operations in Iraq: "an accurate count of ISIL casualties cannot always be made in this type of environment."[156] Mr Francois said of operations in Libya in 2011:

> All allegations of civilian casualties involving UK forces are thoroughly investigated. However, verification is often hindered by the complexity and risk that would be involved in collecting robust data. This was particularly the case for operations in Libya, where an absence of UK ground forces meant contemporaneous verification from within the country was practically impossible.[157]

An investigation into the 25 April 2011 in Afghanistan was conducted by ISAF in line with ISAF procedures the Government has said. [158] The incident was cited in the report by Ben Emmerson, the UN Special Rapporteur, who called on the United Kingdom to declassify and publish the results of the investigation report.[159] The MOD has resisted calls to publish the report saying as it was an ISAF investigation, any decision on the report's disclosure sits within the ISAF chain of command.[160]

Demands for greater transparency about civilian investigations

Commentators have called for greater transparency about investigations into civilian deaths.

The Defence Committee said it was satisfied that RAF rules of engagement provided a high level of assurance that, as far as possible, civilian casualties will be avoided. However it added the MOD needs to be more open and transparent to debunk myths and counter misinformation.[161]

The Birmingham Policy Commission observed that a perceived lack of transparency over RPA use "heightened concerns, whether justified or not, around the legitimacy of its operations."[162] It called on the

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154 PQ213743, 6 November 2014
155 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 163
156 PQ 15 October 2014 c210712
157 HC Deb 31 October 2013 c546W
158 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future UK use,* 25 March 2014, HC 772 2013-14, Ev 1
159 UN Human Rights Council, A/HRC/25/59, 11 March 2014, para 39
160 HC Deb 20 March 2014 c700W
161 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 66-67
162 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p47

Government to routinely make public the outcome of such investigations except where operational considerations preclude this.[163] It argued a lack of information makes it difficult for Parliament to hold the executive to account.[164]

The UN Special Rapporteur, Ben Emmerson, has called on the United Kingdom to declassify and publish the results of the investigation report into the incident of 25 March 2011, as cited above, and any other report relating to the infliction of civilian casualties through the use of remotely piloted aircraft by the UK in Afghanistan.[165]

6.6 British personnel operating American RPAS

UK personnel embedded with the US Air Force have operated US Reaper aircraft in Afghanistan, Libya and Iraq. This has led to questions about the applicable rules of engagement – whether they operate under UK or US rules of engagement.

- UK aircrew operated a US Air Force Reaper on 512 UK sorties in Afghanistan between 2008 and August 2014.[166]
- UK aircrew had flown approximately 2,150 operational missions using US Reaper and Predator RPAS in operations in Afghanistan and Libya between October 2006 and 31 December 2012.[167]
- Of the 2,150 missions flown by UK personnel, there were 271 missions in Afghanistan when UK personnel utilised a US Reaper as a UK Reaper was unavailable. During these missions, UK personnel released 39 weapons.[168]
- UK Reaper was not deployed in Libya.[169] Three RAF officers of flight lieutenant rank were embedded with the USAF and piloted USAF RPAS during operations in Libya.[170] UK personnel contributed to around 200 armed RPAS missions.[171] All missions involving a Predator required a US sensor operator.[172]
- No RAF-operated RPA flew in Iraq during Operation Telic in Iraq. RAF personnel embedded with the US Air Force flew armed and unarmed US RPAS in Iraq between 2004 and 2007.[173]

UK aircraft operated US Air Force Reaper aircraft in Afghanistan predominantly because of: the unavailability of UK Reaper aircraft; short term unserviceability or routine maintenance; an increase in ISAF tasking in 2014 and the availability of UK aircrews being ready before the

163 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p51
164 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p48
165 UN Human Rights Council, A/HRC/25/59, 11 March 2014, para 39
166 PQ 207734, 25 November 2014
167 HC Deb 24 April 2013 c906W
168 Ministry of Defence FOI, 4 February 2014
169 HC Deb 6 November 2012 c204WH
170 HC Deb 15 October 2013 c637W
171 HC Deb 21 November 2012 c494W. Note the MOD did not clarify or expand upon the use of the word 'contributed'.
172 HC Deb 31 January 2013 c882W
173 HC Deb 13 May 2013 c101W and 3 June 2013 c994W

additional Reaper aircraft procured were available for operations. These aircrew were therefore used to fly US Air Force aircraft.[174]

The Defence Committee asked the Government to clarify the operational use of RPAS in Afghanistan. In response, The Government explained ISAF Reaper missions were issued to a combined pool of available aircraft from both the UK and US Reaper RPAS squadrons. The Government said the UK had, on occasions, used a USAF Reaper for UK-tasked missions when "UK Reaper RPAS were not available to them due to serviceability issues. UK aircrew are subject to UK Rules of Engagement for all weapons releases."[175]

The Birmingham Policy Commission report on drones examined the legal implications of UK personnel using armed RPA with the US Air Force. It welcomed the above confirmation from the MOD that UK aircrew are subject to UK rules of engagement when releasing a weapon. The Commission's overarching message to the Government is for greater transparency in its operational use of RPAS. The Commission recommended that 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."[176]

6.7 US operational use of UK Reaper

US personnel operated UK Reaper aircraft in Afghanistan during the Launch and Recovery phase. The Ministry of Defence says that only UK personnel operated UK Reaper aircraft in Afghanistan during flight. [177] During Operation Herrick, RPA were piloted by UK personnel located in the United States and the United Kingdom but required ground crew in Afghanistan to take-off and land. The MOD has said: "in all cases, UK Reaper RPAS are operated in line with UK procedures and rules of engagement."[178]

The US Air Force has never requested the use of a UK Reaper in Afghanistan, the MOD said in July 2014.[179]

The Birmingham Policy Commission recommended "if allied forces use UK RPA, assurances should be obtained that their use is in accordance with UK legal guidelines."[180]

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174 PQ 207734, 25 November 2014
175 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 5.
176 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p51
177 PQ 216916, 9 December 2014
178 HC 15 January 2014 c578W
179 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 5.
180 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p51

6.8 Intelligence-sharing with allies

UK remotely piloted air systems are predominantly used for Intelligence, Reconnaissance and Surveillance (ISR). The Defence Committee noted in its report on RPAS that there has been growing concern about the sharing of intelligence with allies and the uses to which such data may contribute.[181]

Operations in Iraq and Syria in 2014 provide an example of this.

The UK Government has only authorised air strikes in Iraq but not Syria. RAF aircraft, both manned and unmanned aircraft (Sentinel, Rivet Joint and Reaper) are conducting surveillance flights over Syria.[182]

Foreign Office Minister Tobias Ellwood has said the UK is "providing intelligence and surveillance to support coalition partners, who are carrying out air strikes in Syria against ISIL."[183] Chris Cole of Drone Wars UK suggests "it is likely that information from UK Reapers operating in Syria is being used to carry out strikes there."[184]

The Defence Committee acknowledge the "growing concern in relation to the sharing of intelligence with allies and the uses to which such data might contribute" but said that such issues stray beyond the remit of the Committee.[185] It invited the Intelligence and Security Committee to consider this issue in the future.

Members of the House of Lords questioned the Government on this issue during a debate on the Defence Reform Bill. Lord Hodgson of Astley Abbotts said "what we need to find out is whether information is being passed on which others take action. If we are doing that, we are assisting an illegal act."[186] Lord Hodgson expressed his dissatisfaction with the Minister's response that "systems for supervision and scrutiny exist, but he was not prepared to confirm that they are being used because he could not say that."[187]

The Government, when pressed on this matter by Tom Watson, said:

> It is a long standing policy not to comment on intelligence matters. I would reiterate to the Hon. Member that all of the UK's intelligence sharing with Foreign States is undertaken within a robust legal framework, and is subject to rigorous ministerial, parliamentary and judicial oversight, including through the Consolidated Guidance.[188]

The Birmingham Policy Commission called on the Government to confirm that guidance has been issued to staff and safeguards put in place to ensure that in sharing intelligence with the US government and

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181 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 161
182 HC Deb 21 October 2014 cWS73 and HLWS477
183 PQ224326, 11 February 2015
184 "New figures for British air and drone strikes in Iraq", *Drone Wars UK,* 15 May 2015
185 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 161
186 HL Deb 5 February 2014 cGC115
187 HL Deb 5 February 2014 cGC119
188 PQ 209539 26 September 2014

military, the does not inadvertently collude in RPA or other counter-terrorist actions 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.[189]

The chair of the Commission, the chair and vice-chairs of the APPG on Drones and the Director General of RUSI[190] have written to the Foreign Secretary requesting he "consider disclosing the Guidance to Intelligence Officers and Service Personnel applicable to the passing of intelligence relating to individuals who are at risk of targeted lethal strikes outside traditional battlefields." The letter went on:

> In our view, disclosure of the Guidance, setting out the principles which govern intelligence sharing consistent with UK domestic and international law, in the context of the US covert drone programme, would serve to safeguard the important work of UK intelligence officers pursuing their statutory functions. Disclosure would reassure an anxious public that the UK government will protect personnel from inadvertent collusion in counter-terrorism operations contrary to our understanding of the law. It would also underline the distinction between Reaper strikes by our Armed Forces in Afghanistan, and now Iraq, and those of other states elsewhere.[191]

6.9 An international code of conduct governing RPAS usage?

Lord Judd tabled a question for short debate in the House of Lords to ask the Government: "what progress they have made in preparing a code of conduct for the civilian and military use of drones operating from the United Kingdom; and what negotiations they advocate for an international code." Lord Tunnicliffe spoke in favour of codes for the use of drones and the use of lethal force.[192] Earl Atlee responded for the Government: "RPAS are aircraft under human control. The very clear regulations and guidance that apply to aircraft also apply to RPAS. I am confident that no further code of conduct is required.[193]

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189 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p50-51

190 Tom Watson MP, David Davis MP, Baroness Stern, Professor Sir David Ormand and Professor Michael Clarke.

191 Letter to the Foreign Secretary, 19 November 2014, available on APPG on drones website

192 HL Deb 25 June 2013 c722

193 HL Deb 25 June 2013 c728

7. Why are RPAS so controversial?

The Birmingham Policy Commission identified Remotely Piloted Aircraft as the most controversial convention weapons platform in the UK Armed Forces' portfolio.[194]

This section explores some of the many concerns raised about RPAS, although questions about the legality of air strikes conducted by remotely piloted aircraft and the rules of engagement under which they are operate are explored in the previous section.

7.1 Do RPAS lower the threshold for the use of force?

Does state intervention become easier because they have access to remotely piloted aircraft?

Chris Cole of Drone Wars UK argues they do. He argues drones lowers the threshold for the use of force because of their persistence and ability to be operated remotely from thousands of miles away. Cole argues that as no pilots or troops on the ground are at risk, the political cost of intervention is much lower. Cole cites the use of RPAS to carry out air strikes in Pakistan, Yemen and elsewhere by the United States government. Cole suggests the UK may find it hard to "resist the siren call to deploy these armed systems each time a crisis develops as there is no perceived cost to doing so."[195]

The Government rejected this assertion in its response to the Defence Committee's RPAS report:

> The Government is aware of the perception that the operation of RPAS may lead to a reduced threshold for military intervention. The Government does not believe this is the case. Military intervention remains an option of last resort and is only considered when other means have failed. The laws governing the recourse to the use of force are the same for RPAS as for other military systems. The Ministry of Defence would only ever contemplate military intervention where there was a proper legal basis to do so, for example where a UN Security Council Resolution permits or when justified under Article 51 of the UN Charter, which confirms the inherent right of states to collective or individual self-defence. The same strict Rules of Engagement that govern the use of conventional military aircraft also apply to RPAS.[196]

The Ministry of Defence addressed this issue directly in the *UK Air and Space Doctrine*:

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194 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p56; This excludes Trident, the UK's strategic nuclear deterrent, as this is a strategic, not conventional, weapon.

195 C Cole "What's wrong with drones?" *Drone Wars UK website,* 20 January 2014; "think drone technology is not really the problem? Think again", *Drone Wars UK website,* 31 March 2015

196 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 17

> Some argue that without the risk to the crew, it encourages the early use of force. However, any UK operations (manned or unmanned) using armed force in an international context require political authorisation. This is subject to parliamentary scrutiny and its associated checks and balances.[197]

The Birmingham Policy Commission said it had 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. The Commission pointed to Parliament's role in reining in any alleged propensity to resort to easily to force, naming the Defence and Parliamentary Intelligence and Security Committees in particular, and cited the 2013 vote on Syria as example of where Parliament refused to endorse military action.

7.2 Do RPAS encourage a video-game mentality?

Some commentators suggest the physical distance between those operating an armed RPA and the target of the strike makes the act of killing much easier.[198] Philip Alston, then UN Special Rapporteur on extra-judicial, summary or arbitrary executions, raised the concept of a video-game mentality in a 2010 report to the UN Human Rights Council:

> because operators are based thousands of miles away from the battlefield, and undertake operations entirely through computer screens and remote audiofeed, there is a risk of developing a "Playstation" mentality to killing. States must ensure that training programs for drone operators who have never been subjected to the risks and rigors of battle instill respect for IHL and adequate safeguards for compliance with it.[199]

The UK Government addresses this issue in Air and Space Doctrine:

> Remote crews are always subject to stringent rules of engagement that ensure we lawfully use armed force. The persistence of remotely piloted air systems also means crews usually observe the target area for a significant period prior to, and following, an engagement. This allows them to assess target validity, the likelihood of collateral damage and observe the consequences of an attack in detail. This is a sobering reality rarely afforded to other pilots or anyone delivering indirect fire.[200]

A United States Air Force RPAS operator counters the 'play station' view:

> You are 18 inches away from 32-inch, high-definition combat, where you are in contact [by headset with] the guys on the ground... You are there. You are there. You fly with them, you support them and a person you are tasked with supporting gets engaged, hurt, possibly killed, it's a deeply, deeply emotional

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197 JDP0-30 UK Air and Space Doctrine, July 2013, para 215

198 C Cole "What's wrong with drones?" *Drone Wars UK website,* 20 January 2014; "think drone technology is not really the problem? Think again", *Drone Wars UK website,* 31 March 2015

199 "Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions, Philip Alston", *UN General Assembly Human Right s Council*, 28 May 2010, GE-10 13753, Para 84

200 JDP0-30 UK Air and Space Doctrine, July 2013, para 215

> event. It's not detached. It's not a video game. And it's certainly not 8,000 miles away.[201]

The Defence Committee spoke to Reaper operators at RAF Waddington and as a result rejected suggestions of a video game mentality:

> It was very clear from the visit to XIII Squadron and discussions with Reaper aircrew that all were experienced professional personnel with a clear purpose and keen understanding of the Rules of Engagement which govern their operations. Despite being remote from the battle space they exhibited a strong sense of connection to the life and death decisions they are sometimes required to take. This was in stark contrast to the image portrayed by some commentators of "drone" pilots as video gaming "warrior geeks".[202]

Lord Stirrup, former Chief of the Air Staff (and former Chief of the Defence Staff) suggests an RPA operator will make better decisions than the pilot in an aircraft at 20,000 feet "because he is looking at a bigger screen, with greater definition, he will be able to see more detail of the target area, and he will be in a better position to avoid collateral damage."[203]

The US-based Stimson Centre's task force on US drone policy similarly rejected suggestions that RPAS creates a 'playstation mentality' among operators. Ironically, it says, the men and women who remotely operate lethal UAVs have a far more up close and personal" view of the damage they inflict than the pilots of manned aircraft, who speed past their targets in seconds from far above.[204]

7.3 Impact on mental health of operators

Does the nature of operating an RPA put operators at risk of mental health issues?

Unlike combat aircraft pilots, RPAS operators may witness the full aftermath of an air strike by continuing to observe the target area. They may watch in real-time an attack on fellow service personnel. This experience may be harder to process because of the physical separation between themselves and the area of operations. Because they are not deployed as a unit to a combat area, they may not benefit from the social cohesiveness and support networks gained from units that deploy on operations together.[205]

RPAS crew may experience difficulty in separating work from home. The NATO study says "the impact of fighting a war on-base and going home to family at night obliterates the clear demarcation between

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201 "Demand grows for UAV pilots, sensor operators", *Air Force Times,* 21 April 2012; see also "Meet the pilots who fly America's drones", *Global Post,* 16 December 2011

202 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 57

203 HL Deb 5 February 2014 cGC89

204 Stimson Centre, "*Recommendations and Report of the Stimson Task Force on US Drone Policy*", 30 June 2014, p24

205 Major A Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014

combat and personal life."[206] An article in the US *Stars and Stripes* magazine noted the dangers of exhaustion and burnout among UAV operators.[207]

Members of the Defence Committee raised this with RPAS operators for its inquiry into RPAS. Crew members told them of the importance of decompression and keeping the two parts of their lives discreet. Some individuals suggested the one hour commute from home to work, when working at Creech Air Force base in Nevada, was helpful, though this type of commute is not a feature when operating from RAF Waddington.[208]

A US Air Force study into mental health diagnoses among pilots of RPAS in 2013 found:

> Remote combat does not increase the risk of Mental Health outcomes beyond that seen in traditional combat. Military policymakers and clinicians should recognize that RPA pilots have a similar MH risk profile as Manned Aircraft pilots. Although unadjusted rates of MH outcomes among both cohorts of pilots were much lower than rates among those in other USAF occupations, further research is needed to evaluate the impact of aeromedical policy on these rates, as well as the effect of remote combat on other RPA crew members.[209]

The Ministry of Defence was asked what psychological and physical assessments have been undertaken on pilots of RPAS in February 2013. Defence Minister Andrew Robathan replied:

> The Ministry of Defence takes seriously the psychological and physical health of all Armed Forces personnel. The RAF Reaper remotely piloted air systems (RPAS) force, alongside other frontline forces, has robust Trauma Risk Management strategies in place to ensure this is continually monitored. The RAF Medical Services have not detected any adverse psychological and physical trends for RAF pilots of RPAS.[210]

7.4 Impact on civilians and danger of 'blowback'

A report by Stanford University examining US drone attacks in Pakistan, Living Under Drones, argued drone strikes are damaging and counterproductive. Based on figures collated by the Bureau of Investigative Journalism, it estimated between 2,562 and 3,325 people were killed in drone strikes in Pakistan between June 2004 and mid-September 2012, of whom 474 to 881 were civilians. It argued US drone strike policies "cause considerable and under-accounted for harm

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206 Major A Haider, "Remotely Piloted Aircraft Systemsin Contested Environments: A Vulnerability Analysis", *NATO Joint Air Power Competence Centre*, September 2014, para 7.3.2.2

207 "The war room: Daily transition between battle, home takes a toll on drone operators", *Stars and Stripes,* 27 October 2009

208 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 53

209 J Otto, B Webber "Mental Health Diagnoses and Counseling Among Pilots of Remotely Piloted Aircraft in the United States Air Force", *Medical Surveillance Monthly Report,* March 2013, vol 20 no 3

210 HC Deb 25 February 2013 c38W

to the daily lives of ordinary civilians, beyond death and physical injury."[211]

The Birmingham Policy Commission wrote of the need to consider the potential 'blowback' of RPA use. It cited the work of the Stimson Centre's task force on drone policy which notes that "civilian casualties, even if relatively few, can anger whole communities, increase anti-US sentiment and become a potent recruiting tool for terrorist organizations." It also acknowledges widespread unease about US use of RPAS worldwide and in particular by America's allies. For the US, the task force recommends that "the risk of international backlash against US strikes needs to be factored in as we evaluate the strategic value of targeted strikes."[212]

7.5 Demands for greater transparency

The Defence Committee, the All Party Parliamentary Group on Drones and the Birmingham Policy Commission have all called on the Ministry of Defence to be more transparent and open about RPAS operations.

The Birmingham Policy Commission said that the recurring theme of its report is the need for "clearer, more forthcoming public communication and transparency on the part of the UK government, and the MoD in particular."[213]

The Defence Committee said it is of "vital importance" that a clear distinction is drawn between the actions of UK Armed Forces RPAS operations and those of other states. Implicit in this recommendation was a call to clearly differentiate itself from the United States.

In response, the Government said it was already taking steps to raise public awareness. It gave as examples evidence to the committee for its inquiry, media events at RAF Waddington (Reaper) and Boscombe Down (Watchkeeper) and briefings to MPs and Peers. The Department also said it intends to continue communication with the public, media and Parliamentarians to "promote a better understanding of what we do and why we do it" when operational secure to do so.[214]

The Ministry of Defence acknowledged the need to do more in JDP 0-30 Air and Space Doctrine.[215] The Doctrine warns adversaries may encourage the misperception that "air power is a disproportionately violent, detached and indiscriminate form a force." As such "we must engage with the legal process proactively to make sure we are operating legally" and establish, manage and archive a "comprehensive

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211 "Living Under Drones", *Stanford Law School and NYU School of Law,* September 2012 , introduction

212 Stimson Centre, "*Recommendations and Report of the Stimson Task Force on US Drone Policy*", 30 June 2014, p24p30

213 Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014, p82

214 Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response,* 22 July 2014, HC 611 2013-14, para 163

215 This is the highest level statement of the UK's air and space doctrine.

audit trail to record our actions and decisions so that we can prove our activities are legal."[216]

Members of both Houses have pressed the Government on this.

The All Party Parliamentary Group on Drones was founded in October 2012. It is chaired by Tom Watson and the vice-chairs are Baroness Stern and David Davis MP. Baroness Stern has explained that "the APPG is concerned not with opposing drones but with transparency: ensuring that Parliament is well informed and that information about the development and use of drones is put in the public domain so that we may debate the many issues that arise."[217]

Peers tabled amendments to the Defence Reform Bill in February 2014 to probe Government policy on RPAS operations, prompting a wide-ranging discussion on terminology and oversight of RPAS operations.[218] Lord West of Spithead, a member of the APPG on drones, tabled probing amendments to the Counter-Terrorism Bill.[219] Subject-specific debates were held as follows:

- Drones: code of conduct, House of Lords, 25 June 2013, c719-728
- Lethal Autonomous Robotics, adjournment debate, 17 June 2013, c727-737
- Unmanned Aerial Vehicles, Westminster Hall adjournment debate, 11 December 2012, c27-48WH
- Unmanned Aerial Vehicles, Westminster Hall adjournment debate, 6 November 2012 c196-204WH

Tom Watson, among others, has tabled many parliamentary questions pressing the Government for information on RPAS operations. The APPG on drones and Drone Wars UK have made freedom of information requests also about RPAS. Information on these can be found on the following websites:

- RPAS-related Parliamentary Questions: collated by the APPG on drones
- Parliamentary proceedings (debates): collated by the APPG on drones
- Committees: collated by the APPG on drones
- Early Day Motions: collated by the APPG on drones
- Freedom of Information Requests: collated by the Ministry of Defence

216 JDP 0-30 para 213
217 HL Deb 5 February 2014 cGC84
218 HL Deb 5 February 2014 cGC81-126
219 HL Deb 26 January 2015 c95-100

8. Autonomous versus autonomy

Summary

There is a global campaign to pre-emptively ban fully autonomous weapon systems. The UN Special Rapporteur has recommended a moratoria on the testing, production and deployment of Lethal Autonomous Robots. The UK Government says it has unilaterally put in place a policy to not develop lethal autonomous robots but does not intend to formalise that in a national moratorium. Fully autonomous weapons systems do not yet exist.

One of the major concerns with future plans for remotely piloted aircraft systems is the move towards ever greater autonomy.

Autonomy and autonomous should not be conflated. As the Defence Committee noted:

> The concepts of automation and autonomy are often applied to unmanned aircraft interchangeably, but, as the MoD has noted, the distinction is important "as there are moral, ethical and legal implications regarding the use of autonomous unmanned aircraft".[220]

The issues surrounding fully autonomous weapons systems are detailed enough to merit a separate briefing note. However the subject is relevant to a discussion about RPAS because technology is proceeding at such a pace that such an autonomous weapons system may be developed. Debates have been held in Parliament and there is a global campaign for a pre-emptive ban on fully autonomous weapons. Terminology used to describe this includes: lethal autonomous weapons systems (LAWS), lethal autonomous robotics (LARs) and, more colloquially, "killer robots".

Fully autonomous weapons systems

Fully autonomous weapons systems are not yet in existence and the UK Government says it has no plans to develop such a system.

Fully autonomous weapons systems are not yet in existence.

However a debate about the repercussions of such a technology and how States should respond is underway.

A significant contribution to this debate was the report by the UN Special Rapporteur on extrajudicial, summary or arbitrary executions, Professor Christof Heyns, to the UN Human Rights Council on lethal autonomous robotics (LAR) in April 2013.

Professor Heyns defined lethal autonomous robotics as "weapon systems that, once activated, can select and engage targets without further human intervention."

Professor Heyns said LARs raise far-reaching concerns about the protection of life during war and peace. He questioned the extent to which they can be programmed to comply with the requirements of

[220] Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use,* 25 March 2014, HC 772 2013-14, para 21

international humanitarian law and the standards protecting life under international human rights law. He questioned whether an adequate system of legal accountability could be devised. He argued robots "should not have the power of life and death over human beings."

The Government says it has no plans to replace military pilots with fully autonomous systems.

He concluded by recommending States establish national moratoria on the testing, production, assembly, transfer, acquisition, deployment and use of LARs. He recommended establishing a high level panel on LARs to articulate a policy for the international community on the issue.[221]

Professor Heyns warned:

> Coming on the heels of the problematic use and contested justifications for drones and targeted killing, LARs may seriously undermine the ability of the international legal system to preserve a minimum world order.

Debate in Parliament on lethal autonomous robotics

Nia Griffith led a debate on lethal autonomous robotics in the Commons on 17 June 2013, prompted in part by Professor Heyns' report.[222] Ms Griffith argued that because a robot would be able to make the decision to kill a human being "LARs would constitute not an upgrade of the weapons that are currently in our arsenals, but a fundamental change in the nature of war.[223] She added:

> Our current understanding of the nature of war cannot support them; that our existing legislation cannot regulate them; and that we cannot predict the effects that they may have on our future world.

Ms Griffith concluded by endorsing the call for a global moratorium on LARs and called on the UK to be at the forefront of the debate on LARs.[224]

Government position

The UK Government does not possess fully autonomous weapons systems. Nor does it have any intention at present of developing them.

Foreign Office Minister Alistair Burt outlined the Government's position in the debate led by Nia Griffith:

> As a matter of policy, Her Majesty's Government are clear that the operation of our weapons will always be under human control as an absolute guarantee of human oversight and authority and of accountability for weapons usage.

Mr Burt said the Government shared her concerns about possible technological developments. Mr Burt said the UK believes that the basis of international law governing weapons systems would prevent the development of such weapons.

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221 Report of the Special Rapporteur on extrajudicial, summary or arbitrary executions, Christof Heyns, *UN Human Rights Council*, 9 April 2013, A/HRC/23/47
222 HC Deb 17 June 2013 c729-738
223 HC Deb 17 June 2013 c729
224 HC Deb 17 June 2013 c729-731

Mr Burt explained the Government's opposition to a formal national moratorium:

> The UK has unilaterally decided to put in place a restrictive policy whereby we have no plans at present to develop lethal autonomous robotics, but we do not intend to formalise that in a national moratorium. We believe that any system, regardless of its level of autonomy, should only ever be developed or used in accordance with international humanitarian law. We think the Geneva conventions and additional protocols provide a sufficiently robust framework to regulate the development and use of these weapon systems.

He added international humanitarian law would prevent the UK developing such systems because such systems would breach that law.[225]

The House of Lords discussed this in a similar debate in the same month entitled *drones: code of conduct.* Government minister Earl Atlee sought to reassure peers that: "there are no future plans to replace military pilots with fully autonomous systems."[226]

Automated versus autonomous: an example

In both debates the question of the difference between automated and autonomous systems was raised, with the example of Phalanx given. Phalanx is a ship-borne air defence system consisting of a radar-controlled gun that fires at incoming enemy aircraft and missiles if they penetrate a ship or task group's outer ring of defences. Earl Atlee noted that while Phalanx can be used in an automatic mode a human operator oversees the entire engagement.[227] Alistair Burt explained that while the system does fire of missiles automatically, the parameters for that system are set by a human operator. He said lethal autonomous robotics is a "step beyond" current systems because once activated they could select and engage targets without any further human intervention.[228]

The campaign for a pre-emptive ban on fully autonomous weapons

The *Campaign to stop killer robots* is a global coalition that is working for a pre-emptive ban on fully autonomous weapons. The global coordinator is Mary Wareham at Human Rights Watch and the campaign includes Amnesty International, Drone Wars UK and the Campaign Against the Arms Trade.[229] Nobel peace prize winner Jody Williams, who led the campaign to ban landmines, is a prominent member of the campaign.

The campaign says it seeks to raise awareness of the numerous ethical, legal, moral, policy, technical, and other concerns of fully autonomous weapons. It advocates a comprehensive, pre-emptive prohibition on fully autonomous weapons. The campaign suggests this could be

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225 HC Deb 17 June 2013 c734-738
226 HL Deb 25 June 2013 c726
227 HL Deb 25 June 2013 c726
228 HC Deb 17 June 2013 c735
229 A full listing is available on the coalition's website: Stopkillerrobots.org

achieved through an international treaty, as well as through national laws and other measures.

The campaign is calling on all countries to implement the recommendations of the 2013 report by UN Special Rapporteur Professor Christof Heyns, mentioned above.

The Convention on Conventional Weapons

The Convention on Certain Conventional Weapons (CCW) aims to ban or restrict the use of specific types of weapons that are considered to cause unnecessary or unjustifiable suffering to combatants or to affect civilians indiscriminately. The CCW has a total of 119 States parties, including the UK, and five signatories.

The Government has said it believes the CCW is the right place to discuss this issue.[230]

A five day meeting of experts at the CCW was held in April 2015 to discuss the questions related to emerging technologies in the area of lethal autonomous weapons systems.[231]

[230] HC Deb 17 June 2013 c736

[231] A full list of statements from contributing countries, including the UK, and copies of presentations and discussion papers is available on the CCW website: 2015 Meeting of Experts on LAWS

9. Further reading

There is a wealth of information discussing the issues raised by remotely piloted aircraft. This list is weighted towards material that focuses on UK military usage but does include commentary on US and global use.

- Defence Committee, *Towards the next Strategic Defence and Security Review: Part three*, 25 March 2015 HC 1127 2014-15
- House of Lords European Union Committee, *Civilian use of drones in the EU*, 5 March 2015, HL 122 2014-15
- Parliamentary Office of Science and Environment, *Civilian drones*, 2 October 2014
- Defence Committee, *Remote Control: Remotely Piloted Air Systems – current and future use: Government response*, 29 July 2014, HC 611 2014-15
- Stimson Centre, "*Recommendations and Report of the Stimson Task Force on US Drone Policy*", 30 June 2014,
- Defence Committee, Remote Control: Remotely Piloted Air Systems – current and future use, 25 March 2014, HC 772 2013-14
- Birmingham Policy Commission, *The security impact of drones: challenges and opportunities for the UK*, October 2014[232]
- Major André Haider, *Remotely Piloted Aircraft Systems in Contested Environments: a vulnerability analysis,* NATO Joint Air Power Competence Centre, September 2014
- *Current and Future Maritime Air Power for the United Kingdom*, Royal Aeronautical Society, July 2014
- M Aaronson and A Johnson, *Hitting the target? How new capabilities are shaping international intervention,* RUSI Whitehall Report 2-13, March 2013
- RAF Air Power Review, various editions
- "Integrating remotely piloted air systems", *RAF Air Power 2013,* p91

Drone Wars UK maintains a library of documents and articles on the use of drones which can be accessed at dronewars.net

[232] Commissioned by the University of Birmingham and chaired by Professor Sir David Omand, formerly the first UK Security and Intelligence Coordinator; Director of GCHQ; Deputy Under Secretary of State for Policy in the Ministry of Defence.

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