How are Drones Changing Warfare?
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'Drone' is a word with so many connotations. It conjures to mind something dull, repetitive, but also unthinking and robotic. Used in relation to modern technology, unhelpfully it is applied in popular commentary to capabilities ranging from a palm-sized helicopter to the apocryphal Amazon delivery bot, from an insect-like imitator to a massive missile-laden airborne platform.[1] The term is used for both civilian and military platforms. Here I want to talk specifically about the military 'drone'.

To those opposed to the use of military remotely piloted vehicles, 'drone' encapsulates the deadly, insidious, pervasive, unnerving but faceless nature of this technology. To those engaged in the development and operation of these machines, the term drone seems to deny the most human aspects of its use. Hence the Royal Air Force (RAF) preference for the term 'Remotely Piloted' over 'Unmanned' and certainly over the word 'drone'.[2]

This lecture will analyse the impact of this specific technology – remotely operated military machines – on the way that the UK, in particular, engages in warfare, now and in the future. I will use the RAF and their employment of remotely piloted aircraft since the early 2000s to frame these thoughts and arguments.

In thinking about the impact of these systems, the way that I approach this, appropriately for a capability that grew out of a requirement for surveillance, is to zoom out and then zoom in, from the Bird's Eye View to Point Blank Range. The Bird's Eye View, here, is the national level, and questions that unmanned aircraft pose about the nature of combat and about ethics and the enemy.

Zooming in further, at the institutional level it is important to understand the impact that this technology has and will have on the institution of the RAF, as an object lesson, in terms of its culture and identity. I believe this is more profound than perhaps those deeply embedded in these activities recognise. Zooming in further still, those working at Point Blank Range have their own challenges with which to wrestle. The identity of pilots and operators of aircraft like Reaper, the risks they don't take (with their lives) and those they do (including their mental health), are important issues that impact on day-to-day lives, but also reflect back up to the institutional level with implications for the long-term identity of the RAF.

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[1] Michael Dempsey, 'The stealthy little drones that fly like insects', *BBC News*, 20 April 2020 https://www.bbc.co.uk/news/business-51840027>, (accessed 20 October 2020).
[2] The RAF originally used the term 'unmanned aerial vehicle', or UAV, but now refers to 'remotely piloted air systems' (RPAS).

Remotely piloted aircraft have a number of distinctive features and attributes that differentiate them from manned platforms. The most striking of these is their relationship with distance. History tells us that emerging technologies in warfare have understandably sought to increase the distance between combatants, progressing from pistols to snipers, and from cannons to intercontinental ballistic missiles. However, the argument that this technology is just a further extension of this trend misses the fundamental point that distance, in the case of unmanned aircraft, has been thoroughly distorted. Where is the fighting taking place? Simultaneously in a cabin in Lincolnshire and in the borderlands of Iraq. Where is the cockpit? Is it in the battlespace or separate from it? Are the crews psychologically distanced (and potentially therefore dehumanized) from the battlefield or intimately close to it, loitering as they do for hours, days and weeks over places until they become familiar with their targets in a way that those prosecuted by a manned Harrier aircraft in Afghanistan did not? Physical distance and perceptual distance have been divorced by this remote technology and aircrew, while thousands of miles from the battlefield, find themselves in intimate ocular proximity to the people they kill.[3]

The Present – The UK Reaper Programme

A Reaper is about the length and height of a Hawk Red Arrow aircraft but with double the wingspan.[4] It is flown remotely from a Ground Control Station by a pilot, who works alongside a crew consisting of a Sensor Operator and a Mission Intelligence Coordinator, although many more personnel have input into their missions. It can carry four 100lb Hellfire missiles and two 500lb Laser Guided Bombs. It takes off and lands under the control of what is known as an LRE – Launch Recovery Element – in or close to the theatre of operation, who then hand over to the remote Mission Control Element. The Reaper then can stay airborne for over twenty hours operating at an altitude of around 20,000 feet. Now that the RAF has personnel in both the USA (Creech, Nevada) and the UK at RAF Waddington, when crews hand over during those long missions, they can be handing over control of a single aircraft flying over Iraq between a pilot in Nevada and their counterpart in Lincolnshire.

Remotely piloted aircraft like the Reaper are generally accredited by those procuring and operating them with certain characteristics. First, the fact that it can stay airborne for so long gives it persistence that a manned aircraft (which would much sooner run out of fuel and need to return to base to change crew) does not possess. This not only means that the aircraft can loiter to survey a potential target over long periods, but it can loiter to protect, perhaps watching over forward-based friendly forces at risk from ground attack.

As well as the characteristic of persistence, remotely piloted aircraft lack a manned cockpit in the aircraft which, as their promoters would argue, saves on payload, maintenance, costs and training. That said, the irony remains that an 'unmanned' platform is highly manpower intensive. Crews rotate every eight hours and the missions generate huge volumes of data which require (at the moment) human intelligence experts to interpret and process.[5]

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[3] Grégoire Chamayou and Janet Lloyd, *A Theory of the Drone* (New York: The New Press, 2015), p. 117.
[4] Reaper – Length: 10.97m Height: 3.66m Wingspan: 21.12m. Hawk T1 – Length: 11.85m Height: 4.00m Wingspan: 9.39m.
[5] Justin Bronk, *Combat Air Choices for the UK Government*, RUSI Occasional Paper (RUSI, July 2020), pp. 1–38 (p. 10).

Clearly there is no physical risk of being shot down (or captured) for remotely based personnel. Though the cost of platforms like Reaper does not make them truly disposable, the cost of catastrophic destruction of the aircraft does not include the loss of human life. However, although the crews may face no risk to losing their lives if their aircraft crash, there has been an increasing focus on the potential for psychological harm from working with this particular technology.

Remotely piloted aircraft have their limitations in comparison with manned combat aircraft. In defence terms, remotely piloted aircraft like Reaper are less resilient in adverse weather conditions and their manned equivalents currently enjoy better self-protection in hostile environments against physical and cyber threats. Manned combat aircraft are faster and can carry a wider array of weaponry. They also afford, arguably (and opinions are divided), better situational awareness for the pilot since he or she can look around outside their aircraft rather than their perspective being limited to the camera's view.[6]

The National Level (Bird's Eye View)

So those are some of the key technical characteristics which differentiate the Reaper, for example, from a manned fast jet. However, this paper is interested in how the technology changes culture. What do these features change in the way nations fight, institutions develop and individual warfighters experience combat?

Starting at the national level, it is not a novel contention to state that the UK has been engaged in warfighting of some kind continuously since soon after the end of the Cold War, starting with the 'Gulf War' in 1991, followed by continuous UK operations policing the no-fly zones over Iraq, which only ended at the time of the invasion of Iraq in 2003, while operations in Afghanistan started in 2001. The UK, in the early 2000s, then introduced remotely piloted aircraft. Over the last fifteen years or so, not only has our nation been constantly in conflict somewhere (and often in multiple locations) around the world, but these aircraft are themselves constantly in the battlespace. Persistence is a very special quality in an era of persistent conflict.[7]

Here, perhaps, the most modern technology actually heralds a return to our imperial past. As Rogers and Hill propose:

> "If the warship in the age of empire allowed the European powers to cheaply exert their will around the globe against the pre-industrial world by sending a near invulnerable gunboat, then the revolution of the UAV is to restore the capacity to intervene overseas with impunity to today's powers, at least with regard to the global south, through the sending of a drone."[8]

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[6] Julia Macdonald and Jacquelyn Schneider, 'Battlefield Responses to New Technologies: Views from the Ground on Unmanned Aircraft', *Security Studies*, 28.2 (2019), 216–49 (pp. 232, 243) <https://doi.org/10.1080/09636412.2019.1551565>; David Whetham, 'Killer Drones: The Moral Ups and Downs', *The RUSI Journal*, 158.3 (2013), 22–32 (p. 25) <https://doi.org/10.1080/03071847.2013.807582>.
[7] Ann Rogers and John Hill, *Unmanned: Drone Warfare and Global Security* (Toronto, Ontario: Between the Lines, 2014), p. 58.
[8] Rogers and Hill, p. 148.

Of course, the rest of the globe didn't remain pre-industrial and no doubt in time we will face adversaries with similar remotely piloted capabilities of their own. But for now, we enjoy the advantage of asymmetry. Asymmetry is nothing new as Olsthoorn pithily commented, 'Western militaries have long since been successful at killing non-western opponents without getting themselves killed in the process'.[9] But the fact that it is 'nothing new' should not stand as a justification for this twenty-first century manifestation of the phenomenon. Massacring colonial subjects in the last two centuries does not a legitimate precedent set.

Another conundrum presented by remote warfare is that, without a significant presence on the ground in terms of British soldiers, wars can, and do, prove inconclusive. Wars from the air without physical risk where violence is inflicted with no 'blood' cost do not seem to provide the certain outcomes that war has traditionally been expected to provide. Our intervention in Libya (in 2011) is a case in point where a fight from the air and from Tomahawk missiles launched from submarines reached a far from decisive outcome as subsequent events have shown. The UK Parliament website contains a piece on British deaths in war and in its final paragraph states: 'The sensitivity of public opinion to military casualties incurred in wars perceived to have no clear purpose or definition of victory, together with constraints on public spending, mean the threshold for future interventions will be high.'[10] This is the Catch-22: if the public won't tolerate risk, they may not get decisive outcomes and perhaps Chamayou is right: 'The partisans of the drone as a privileged weapon of "antiterrorism" promise a war without losses or defeats. What they fail to mention is that it will also be a war without victory.'[11]

The persistent nature of remotely piloted aircraft, and the perception of their persistence amongst the populations under surveillance and attack, seems to add a different – and important – psychological dimension to this form of warfare. This affects the behaviour not just of the combatants but of the civilian population around them. Research carried out in Pakistan, where the US has been carrying out kinetic strikes for over a decade, provides disturbing evidence of the effects of this form of air power. The threat of a strike from loitering drones created anxiety and stress, as testified by interviewees. Decisions about attending family events or meeting in groups outside were governed by the fear of an attack which could come at any time.[12] Other researchers interviewed a Pakistani psychiatrist who reported mental disorders caused by 'unmanageable fright and anger'.[13]

Militants' behaviour has also changed as a result of this constant surveillance, this persistence. Air power has traditionally been found wanting where insurgents have used natural protection, such as caves, to avoid detection and targeting. Now, the cover of crowds and civilians offers better protection than rocks and caves which can be watched from above for days on end. In the case of Pakistan, senior insurgents have relocated to towns and cities, and taken to using public transport rather than easily identifiable all-terrain vehicles; challenging the ability of those operating remotely piloted aircraft to distinguish between combatant and civilian.[14]

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[9] Peter Olsthoorn, *Military Ethics and Virtues: An Interdisciplinary Approach for the 21st Century* (London; New York: Routledge, 2010), p. 74.

[10] https://www.parliament.uk/business/publications/research/olympic-britain/crime-and-defence/the-fallen/ (accessed 22 October 2020).

[11] Chamayou and Lloyd, pp. 71–72.

[12] Rogers and Hill, p. 97.

[13] Andrew Roe, '"Bugsplat" and Fallible Humans: The Hi-Tech U.S. Drone Campaign over North-West Pakistan', *Air Power Review*, 15.2 (2012), 65–82 (p. 73).

[14] Roe, pp. 74–76.

I argue that it is the persistence of remotely piloted aircraft (and the perception of it, since those on the ground cannot know when the air above them is free from drones, as they sometimes may be) that changes behaviours in a way that other remotely deployed weaponry does not. A Tomahawk missile and a manned fast jet with stand-off weaponry can both deliver violence from afar with no warning. But neither can be characterised as 'flying watchtowers', able to loiter indefinitely and deliver lethal force when required.[15] The Reaper's constant presence high above changes the relationship between the warring sides.

If the enemy has no enemy on the ground, if ultimately we fight wars using remote weapons alone, then who do *they* fight? Here the ethics of remote warfare jar with Just War tradition. If only one side is willing to sacrifice lives, how just is the cause of the other? And, perhaps, the inevitable consequence of having no enemy to fight is to take the fight elsewhere, away from the enemy's battlefield. Instead the enemy looks to other means, such as terrorism, to take its fight to our population on home soil. Though reprisals may be aimed at military targets, such as RAF bases, how much easier is it to target randomly? In this roundabout way, is this then the only route by which the British population come to understand their country is at war?

The mistrust created by the UK's participation in the 2003 invasion of Iraq has proved a salutary tale for twenty-first century politicians, endowing them with a public both sceptical of military intervention and mindful of the cost in blood and treasure of waging war. In this context, drones present a particular challenge to the relationship between society and the Armed Forces. On the one hand, they are viewed with suspicion (recent research suggests less than a third of the British population feel positive towards even civilian drone technology) but on the other they offer, in a warfighting context, the political nirvana of zero bodybags and no captured aircrew or emotional images of coffins paraded ceremonially through Wiltshire and Oxfordshire villages.[16]

The inability of the government to communicate effectively with the media and the public about remotely piloted aircraft has resulted in a perception – in my opinion firmly grounded in reality – that this British capability is being uniquely shielded from view. Manned fast jets are celebrated in the form of the Red Arrows, sent around the country to promote the RAF and around the globe as part of the government's defence engagement programme. Yet the Reaper remains obscured from sight. Partly this is caused by sensitivities around the close US-UK nature of the programme, but from its introduction there was little governmental interest in communicating effectively about the new capability. And thus, organisations like Drone Wars UK claim that there is deliberate and suspicious secrecy around the use of remotely piloted aircraft. Some efforts have been made to improve MOD communications but, without real commitment from the top and an understanding of the insidious implications of accepting the status quo, distrust will fester to the detriment not only of the government but of the institution most closely associated with remotely piloted flight – the RAF.[17]

The Institutional Level

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[15] Chamayou and Lloyd, p. 45.

[16] 'Building Trust in Drones', PWC report from opinion polls carried out in April 2019, <https://www.pwc.co.uk/issues/intelligent-digital/drones-and-trust.html> (accessed 20 October 2020).

[17] One effort of note was that Air Marshal Bagwell was interviewed by Drone Wars UK, <https://dronewars.net/interview-of-air-marshall-greg-bagwell-drone-wars-uk/#GB_specific> (accessed 15 October 2020).

So, where do these conundrums leave the armed force commanding lethal unmanned weapons in the British inventory, the RAF? The RAF has, I would argue, wedded itself to the reputational acclaim it gained from the Battle of Britain. What defines the Force more than the iconic memories of lone pilots in their Spitfires and Hurricanes saving Britain from invasion because they risked their airborne lives? The RAF has chosen to celebrate and elevate the Battle of Britain as a defining moment in its history. But history limits and as a result the public image of RAF pilots is conflated with the bravery of those extraordinary men who fought, risking their lives in the skies above their civilian counterparts. How does that narrative marry with aircrew taking no risk to their lives while those on the ground absorb all the danger?

An RAF predicated on the exulted pilot warrior is now faced with the remotely based pilot: a challenge to its essential culture. How does it change the narrative of the pilot from one about danger and self-sacrifice to one about self-preservation and remoteness from the battlespace?[18] Actually, Reaper aircrew, visually intensely *in* the battlespace might argue they do not feel remote from it, but that is the carefully curated description that the RAF champions: 'remotely' piloted aircraft.

When the RAF acquired Predator and then Reaper, aircrew were posted into the role from other aircraft types.[19] The demise of the Nimrod maritime patrol aircraft, Harrier ground attack aircraft and the drawdown of the Tornado fast jet fleet provided a steady stream of experienced aircrew flowing into the Ground Control cabins of the British squadrons in Nevada and Lincolnshire. They became a melting pot of crew from different aircraft types. For example, they had to adapt to varying styles of communication, from the chatter on a large multi-crew aircraft to the discipline of minimal conversation in a two-seat Tornado, let alone the lived experience of a single seat Harrier pilot. As they are joined by entrants coming directly into the force, no doubt a new culture will develop, unique to that force.

More recently the RAF has created an RPAS(P) – Remotely Piloted Aircraft System (Pilot) – career stream. These women and men will undergo some elementary flying training in the air and then move straight to the Reaper. Unsurprisingly, this raises questions in some minds about the level of airmanship that these young aircrew can attain with such limited time in the physical medium of the air. As one former RPAS operator put it 'although not physically sitting in an aircraft, in every other way [RPAS(P)'s] are operating an aircraft so there is a need for air awareness'.[20] Concerns over developing airmanship in these aircrew are overlaid with a question mark over how much a force without the hinterland of manned flight in the air environment will detach the human from the aircraft even further, as they have little practical airborne experience from which to contextualise their sensory experiences: another type of distance challenging the status quo.[21]

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[18] Chamayou and Lloyd, p. 101.

[19] The Predator was the forerunner to Reaper, a similar sized aircraft equipped solely for intelligence, surveillance and reconnaissance (ISR).

[20] Interview with author, 22 September 2020.

[21] Alison J. Williams, 'Enabling Persistent Presence? Performing the Embodied Geopolitics of the Unmanned Aerial Vehicle Assemblage', *Political Geography*, 30.7 (2011), 381–90 (p. 387) <https://doi.org/10.1016/j.polgeo.2011.08.002>.

Death has long been part of air force culture because, from the first military crash in 1912, flying military aircraft, particularly combat aircraft, has been a dangerous business.[22] The 'most culturally powerful silo', that of the pilot, is delineated by a variety of traditions, rituals and ceremonies.[23] The most striking of them surround aircrew fatalities and what happens when a comrade is lost. They include drinking on the victim's bar bill, piano burning and the 'missing man' formation. Although the rituals and cultures around fatalities in conflict and in training remain firmly embedded in RAF psyche, in reality risk levels have fallen significantly in the last thirty years. For example, in the last ten years, there has been only one accident (a mid-air collision with three fatalities) involving RAF combat jets. Nevertheless, the fact remains that manned combat flight can end in death while remotely piloted flight avoids that risk completely. In the eyes of the public, as well, the physical risks associated with flying fast jets remain central to the identity of the warrior pilot. The inversion of this paradigm with the advent of remotely piloted aircraft challenges the identity not just of the pilot but of the institution which continues to place him or her at the pinnacle of its reputation (not least as all Chiefs of the Air Staff to date, bar one, have been fast jet pilots).

The Individual Level (Point Blank Range)

Pilots answer the question of why they love flying in myriad ways – concepts like freedom and independence, a unique view of the world from the air, the medium itself and a love of aircraft are oft cited – although they can be reticent to articulate the attraction of the societal status their chosen career bestows upon them.[24] The contrast with the realities of the crews of remotely piloted aircraft could not be more stark. In a research paper written by the now squadron commander of a British Reaper squadron, the author references Peter Singer's comments saying that 'RPAS crews are not viewed as warriors by their immediate honour group' meaning their acceptance within the air force fold will be as airwomen and men with a different status and identity to their fast-jet forebears.[25] Is this why the easier comparisons to make are not between the pilots of manned aircraft and their Reaper equivalents, but between video gaming and remote pilots? It has been argued that the latter comparison offers a way 'to explain the complex cultural/ethical negotiation that is occurring as a new kind of soldier struggles to reconcile the complex flows of the twenty-first century's heavily mediated culture'.[26]

And the nature of the cockpit they occupy presents another fundamental difference to the manned experience. For the crews of a Reaper are never alone, always observed not just by their squadron chain of command but by others stationed thousands of miles away in an air operations centre. Lee, who embedded with British Reaper crews, described the role of the safety observer ('as far as I can glean – unique to the RAF Reaper Force') who enters the cabin ahead of an expected weapon release to provide additional supervision.[27] This scrutiny appears to be broadly welcome, adding to

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[22] The deaths of Captain Eustace Loraine and Staff Sergeant Richard Wilson in 1912 are marked by The Airmen's Cross now located by Stonehenge.
[23] Fin Monahan, 'The Origins of the Organisational Culture of the Royal Air Force' (unpublished Ph.D., University of Birmingham, 2018), p. 291 <http://etheses.bham.ac.uk/8306/> [accessed 11 January 2019].
[24] Houston R Cantwell, 'Operators of Unmanned Systems', *Air and Space Power Journal*, 23.2 (2009), 67–76 (p. 74).
[25] Colin Welsh, '"Drone Warfare" Profoundly Changes Traditional Concepts of the Warrior Ethos.' (unpublished Defence Research Paper, Defence Academy, 2017), p. 41.
[26] Rogers and Hill, p. 82.
[27] Peter Lee, *Reaper Force: Inside Britain's Drone Wars* (London: John Blake, 2019), p. 56.

the situational awareness of the crews and, potentially, improving their decision-making and accountability.[28]

As I mentioned in my introduction, there has been an increasing focus on the potential for psychological harm, or risk to mental health, from working with this particular technology. The intimate perceptual distance between targeter and target, created by the sensor and loiter capability of platforms like Reaper, is unique and uniquely challenging. Lee likens the 'visual, emotional and psychological distance […] to that experienced by First World War aircrew' and, in fact, the persistent nature of the capability is something completely different to any aerial combatant experience then or since. Reaper aircraft can loiter high above while their crew observe a compound, and a group of people, families, over days of operations. They come to know their daily routines, their children, scenes of marital coupling, acts of defecation. This is an intimate experience that can then be followed by prosecuting a target and watching the aftermath as family rush to the scene. Aircrew report watching hasty burials and funerals. The contrast between the tedium of lengthy periods of surveillance and the adrenaline-filled moments of weapon firing surely add an additional test of resilience for these crews.[29]

On the flip side to these concerns about the mental health of Reaper aircrew there are those who argue that these women and men are not suffering from an over-sensitisation to the horrors of war and the peculiar challenge of lingering over those horrors in their 'flying watchtowers'. Instead, they conclude that the nature of this remote world is that crews become dehumanised and that their dislocation from events leads to a 'moral buffering' effect.[30] In fact, those on either side of the argument concede that it is most likely that responses to operating remotely piloted aircraft will range across a spectrum, from those who can detach themselves from the intimacy of their visual engagement with the battlefield and their enemies to those who over-empathise to the point of risking their own sanity. Does the RAF need to search out recruits with a specific ability to compartmentalise, one wonders?

I asked earlier: if the enemy has no enemy to fight on the battlefield, because British Reapers are operating remotely giving them no human to fight, who do they target? One answer is, of course, the operator or those close to them at their home base. The murder of Lee Rigby has been mentioned to me several times in the course of researching for this paper; it has clearly had a profound impact on contemporary psyche. That said, perhaps memories are short, as those military or ex-military over the age of fifty will remember joining the military at a time when we were well aware we were targets of the IRA. So perhaps the potentially most ghastly threat to the Reaper crew themselves is also one that is enduring and not simply a product of this novel technology.

The Future – Protector and Autonomy

For the RAF, the immediate future holds the prospect of replacement of Reaper with sixteen MQ-9B Protector aircraft. These aircraft, similar in design and appearance to the Reaper, can stay

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[28] Whetham, p. 27; Cantwell, p. 70.
[29] Lee, p. 301.
[30] Chamayou and Lloyd, pp. 45, 119.

airborne longer (up to forty hours), deal better with adverse weather conditions, and will meet the standards required to fly in civilian airspace.[31]

What of the future for these remote operators of Protector? The melting pot of backgrounds that characterised the early years of Predator and Reaper is morphing into a more settled culture amongst these aircrew, which will be further solidified by direct entry RPAS pilots progressing from initial officer and elementary flying training, directly to cabins in New Mexico for their conversion onto Reaper and, in time, Protector. The RAF will need to shape its policies and doctrine to accommodate a hybrid force of manned, unmanned and increasingly autonomous machines well into the middle of this century, including the development of the Tempest programme, with proposed 'swarming drone' technology. There is opportunity here for a redefinition of what it means to 'fly' in the air force. Instead of being a force led by pilots who fly aircraft, it could become a force led by air professionals who *conduct* operations in air, space and cyberspace.[32]

And looming in front of us, unavoidably, is the march of artificial intelligence, autonomy and machine learning. Automated military systems already in existence have given us a taste of their complexity where humans and highly automated machines work together. The shootdown of a British Tornado fast jet by a US Patriot surface-to-air missile in the 2003 Iraq War (as well as a US Navy F-18) were caused by a complex combination of human and machine failures.[33] Yet the prize of automation, to the military at least, is the ability to outthink one's opponent. Removing aircrew from the cockpits of aircraft is not, I would argue, revolutionary in warfare, while non-human decision-making through artificial intelligence (AI) probably is. However, the use of remotely piloted aircraft is causing a cultural revolution in the Air Force and increased autonomy – with the human increasingly further from the action – will further accelerate cultural change. The heroic figure of the pilot will vanish even further into the distance.

Human-automation integration will be challenging. As humans are moved from 'in-the-loop' to 'on-the-loop' they move 'upward and away from the action' to higher-level supervisory tasks.[34] Monitoring tasks require different skill sets – in a sense the experience of remotely piloted aircrew is a stepping stone in that direction. The long periods of tedium that they experience during routine surveillance are occasionally interrupted by episodes of high drama during kinetic operations. In human-on-the-loop systems, system operators may be monitoring for long periods of time, yet expected to maintain a high level of vigilance over an extremely complex system. There may well be lessons to be learned from the current crop of Reaper operators that could inform this future.

In Summary

Drones are changing warfare, and this can be better understood using the lens of the challenges faced in Britain from state level, to that of the RAF, and to its remotely piloted aircraft and crew. The

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[31] 'UK's First Protector Aircraft Undertakes Maiden Flight', RAF Website, 28 September 2020, https://www.raf.mod.uk/news/articles/uks-first-protector-aircraft-undertakes-maiden-flight/, (accessed 27 October 2020).

[32] Cantwell, p. 76.

[33] John K Hawley, 'Patriot Wars', 25 January 2017, Center for New American Security, https://www.cnas.org/publications/reports/patriot-wars, accessed 28 October 2020.

[34] Kenneth Payne, *Strategy, Evolution, and War: From Apes to Artificial Intelligence* (Washington, DC: Georgetown University Press, 2018), p. 184.

manned challenges of the twentieth century are being replaced by a capability that is significantly changing the RAF's cultural relationship with warfare in the twenty-first. At Point Blank Range, the issues for the crews include psychological risk, bravery, scrutiny from the chain of command, and living amongst a civilian population largely ignorant of their existence. At the Bird's Eye View, the relationship between the state, the Armed Forces and society are faced with myriad ethical, moral and legal hurdles that fighting remotely presents.

In between, and where I argue the remotely piloted aircraft is having the most fundamental cultural effect, is on the nature of the RAF itself: what it stands for, who it reveres, how it trains and selects personnel, and critically how it adapts conceptually to these issues. The tactical issues of the daily lives and working regimes of operators, and recognition of their distinct and novel way of operating, are surmountable with effort. The new collegiate body of remote warriors will form its own culture, but they form the hinge between the past and the future of the RAF as an institution: between manned flight and the warrior ideal of the pilot, and a future increasingly automated world where operators and controllers oversee the delivery of lethal violence from afar.

Technological change is easier to analyse and debate than conceptual advancement is to enact. The Reaper is 'just another platform' and many have argued that if the effect is the same on the ground then the mode of delivery is irrelevant. However, the particular characteristics of distance (physical distance and ocular proximity) and persistence (the impact of the 'flying watchtowers' on civilians and combatants) are peculiar to this new form of warfare and are changing, I argue, the nature of warfare. The challenge at governmental level is to understand that these characteristics are not just 'attributes' to be exploited but have a cultural resonance. The fixation on the word 'remote' can also spark distrust. Lessons could and should be learned from the Reaper experience about barriers to the implementation of future, potentially revolutionary, technologies in institutional and societal terms.

The remotely piloted 'drone' serves as a stepping-stone at every level, the national, institutional and individual, between traditional manned warfare and a machine-dominated battlespace. Each different issue can be extrapolated forwards towards a future era in which AI and autonomy become increasingly dominant. Without wishing to belittle in any way the capability of an aircraft like Reaper and its remote crews, they offer a petri dish in which we can experiment conceptually with the challenges of the future and their effect on the culture of warfare. This, to me, is a more interesting (and potentially fruitful) avenue for debate and conceptual thinking, than the currently prevailing public discourse over whether drones are evil, sinister robots or ethical, effective platforms. That debate tells us plenty about recent and current warfare, and not least about the increasing distrust between society and government about military intervention. But I suggest that it is more important to envisage and conceptualise what we face ahead and what lies beyond this fascinating stepping-stone on that journey.