An artist's concept of an operational US Air force Boeing UCAV

The Legal and Moral Challenges Facing the 21st Century Air Commander

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Who will believe that your cause is just when your behaviours are so unjust?

(16th Century French Peasant)[1]

The year is 2020; a Royal Air Force Unmanned Combat Air Vehicle (UCAV) has just destroyed an armoured personnel carrier believed to contain the leader of a rebel opposition group during the latest conflict in Uzbekistan. Some 20 minutes later the UK's controller of offensive air operations is sat at his desk in Southern England when he receives a call from the head of Reuters' Central Asian Bureau. A commercial news satellite has imaged the area around the burning vehicle and early analysis suggests that up to 15 civilians may also have been killed. During the next few days the political fallout from the incident prompts the Uzbek President to demand an International Criminal Court investigation into the 'sinister use of Western air power to oppress the citizens of his country'. Under its Rome Statute obligations the UK

government agrees to carry out a full criminal investigation into the incident and the UK's Ministry of Defence (MoD) is obliged to arrest those personnel deemed responsible. But who should be charged? The operations controller in England did not task the mission; the engineers who loaded the aircraft with its weapons did not know its patrol area; and the UCAV software engineer was not even aware it was deployed on operations. Equally, what would be their defence?

At first glance this scenario appears to have more in common with a thriller novel than a critical examination of the legal and moral implications of modern airpower. Yet it encapsulates many of the issues crucial to the development and effective employment of such systems. Moreover, UK personnel already operate an armed Unmanned-Air-Vehicle (UAV) in the skies of Iraq as part of a Joint UK and United States Air Force (USAF) unit.[2] These crews operate an American military UAV; they operate the UAV remotely via satellite from the United States; the UAV is serviced by American personnel; and they receive their operational tasking from a Combined Air Operations Centre (CAOC) based in the Middle East. Clearly these issues are not futuristic or indeed fictitious.

In order to better understand the issues at play in this scenario, this essay will examine the moral and legal implications of high technology weaponry and in particular explore the issues associated with the employment of unmanned systems within a conventional air campaign. Reference will be made to the fictitious scenario, not simply as a means of answering the questions posed, but rather to expose the areas which need critical examination within the essay. Furthermore, to avoid unnecessary legal jargon and detailed examination of international law, the legal and moral perspectives will be examined using the classical just war concept of jus in bello – 'justice once war has started'.[3] It will be assumed that the fictitious campaign has the higher level authority of the United Nations Security Council. While such an endorsement does not necessarily lead to a justly fought campaign, such an assumption permits more absolute moral and legal judgements to be made on weaponry and systems used as opposed to the conduct of the campaign. The essay will also concentrate on the issues associated with their employment on operations as opposed to the airworthiness issues regarding operation within civilian airspace or potential limitations imposed by treaties such as the Intermediate-range Nuclear Forces agreement

At its most basic level this essay will support 2 simple contentions. Firstly, that the development of systems like UCAVs, increasingly discriminate weapons, smaller yield weapons and perhaps even non-lethal weapons all have the potential to improve the jus in bello legality of a future offensive air campaign. This is primarily achieved through a simple reduction in the degree of double effect associated with the use of air delivered weaponry and hence an improved degree of proportionality within the offensive phase of an air campaign. Additionally, a more sophisticated intelligence and surveillance system should enable an increase in the resolution of the battlefield available to air commanders of the future thereby increasing the degree of discrimination available within any targeting process. However, the second and perhaps conflicting contention is that the moral issues associated with the deployment of unmanned systems have the potential to present counter arguments to this

improved legality, even to the point whereby they could begin to undermine the legal basis of future air campaigns. A range of issues will be used to support this second assertion including: the principle of double intent allied with the notion of radical force protection[4]; the extensive use of automated targeting combined with unmanned prosecution of offensive operations; and the removal of the airman from the battle-space.

By way of structure this essay will briefly examine some of the more likely developments in air power doctrine and technology during the next 2 decades. The legal ramifications of such changes will then be examined to see whether any legal obstacles are likely to impede the deployment of unmanned combat systems. The moral implications of these innovations will then be examined to see if they present a different perspective on the legal position previously established. Throughout, historical analysis will be used to determine whether similar debates have occurred during the development of warfare in order to see how they were resolved and hence understand the implications for UCAV employment. Furthermore, the implications and themes brought out by this analysis will be applied to current air doctrine in order to understand whether there are any concerns for today's operations. The summary will bring together these strands to highlight the legal and moral challenges facing 21st century air commanders.

> Weapons classed as 'unfair' often make their appearance during periods of rapid technological progress.[5]

There is little doubt that we are in a period of rapid technological development but in order to understand how air campaigns of the future could be fought one must first assess the likely impacts of structural and doctrinal changes. There is also no shortage of material to examine when trying to gain an understanding of future air operations; indeed as the majority of air forces contract in size it seems the number of transformation initiatives somehow increases. Accordingly, this section will concentrate on publicised air force transformation programmes and associated research and development.

Assuming modern defence procurement processes first establish a requirement and in order to develop equipment; one must understand the emerging conceptual thinking within these air forces in order to determine their likely capabilities in the 2020 timeframe. By, 2020 the doctrine of expeditionary air operations is likely to be deeply ingrained in the psyche of most Western air forces. Therefore, the significant doctrinal changes are likely to be focused elsewhere; this certainly appears to be true of US and UK thinking. The UK's Joint Doctrine and Concepts Centre (JDCC)[6] attempted to capture the implications of the future strategic environment across 7 'dimensions' within its Strategic Trends Paper.[7] Recognising the technological innovation already underway it outlined the likely timescales for unmanned systems:

> after 2015, an important driver of change in military operations is likely to be the increasing dominance of unmanned capabilities … by 2020 the aspiration of a number of Western air forces is to be able to deploy unmanned semi-autonomous systems capable of undertaking the full gamut of air operations.[8]

Mindful of the fact that an analytical concept will never deliver actual equipment one must examine published documents that are more applied in nature to understand the progress of UCAVs towards their operational employment date. Both the USAF's

Transformation Flight Plan 2003,[9] and the UK's Future Air and Space Operational Concept (FASOC)[10] make repeated reference to the possibility of UCAV deployment within the next 10 to 15 years. Indeed, the USAF has articulated a near-term goal to deploy UCAVs which are capable of, 'lethal and non-lethal suppression of enemy air defences as well as strike missions… and to consider the longer term potential to integrate directed energy and precision all weather capabilities'.[11]

Having established the likely utility of UCAVs across a number of air forces we should aim to understand the likely capabilities of this platform. However, an exhaustive list of probable development programmes would add little to the moral or legal arguments which we seek to outline. Therefore, we shall assume our UCAV is broadly similar to the Boeing X45A which was developed as part of the now defunct US Joint Unmanned Combat Air System programme. In simple terms the X45A, along with its Northrop Grumman counterpart the X47A, demonstrated the potential of a 21st century UCAV, with the Boeing aircraft completing 2 aircraft semi-autonomous operations and successful releases of inert precision guided munitions. [12]

The air vehicle merely represents the means of delivering weapons onto targets. In order to fully capitalize the benefits of unmanned platforms a global C2 architecture that provides a secure, 2-way high capacity data-link is essential, indeed without such a system there is little operational benefit over conventional manned fast jets. A glimpse of the type of architecture required can be gained from current US methods of controlling in-service UAVs such as Predator which has proven the concept of global reach-back operations. Current US doctrine in this area typically has the UAV located at a forward operating base with a line-of-sight control cabin used to carry out take-off and recovery operations. After take-off, control of the platform, its sensors and weapons is handed to another agency who exercises control of the vehicle via a satellite capable data-link housed within the forward fuselage. This capability allows control of the UAV from virtually any position on the earth's surface although it is routinely carried out by crews based within the Continental US; on recovery a similar hand over is affected to the original ground station. The imagery provided by these aircraft is normally down-linked to an agency within the operational theatre but again it could be sent worldwide the only requirement being a suitable satellite data-link.[13] Clearly this C2 architecture provides an insight into potential future UCAV operations but does not provide the whole picture.

If UCAVs are to deliver real operational and financial advantages over conventional manned fast jets then they must possess a high degree of autonomy in order to reduce the manpower burden. These personnel savings need to be measured both in terms of the reduced numbers required to support them and those not put at risk operating them. Many routine functions which current generations of UAVs use manual input to perform will be automated in the future. The X45A carried out routine flying functions automatically whilst its in-flight routing followed a pre-programmed profile. This profile was amended via a 'drag and drop' computer screen thereby removing the skill set and cost of highly trained aircrew. Furthermore, functions such as threat reaction, formation keeping, collision avoidance and weapon delivery were demonstrated either autonomously or as directed by a ground control agency.[14] The on-board sensors and computational capacity bring about the potential for automatic

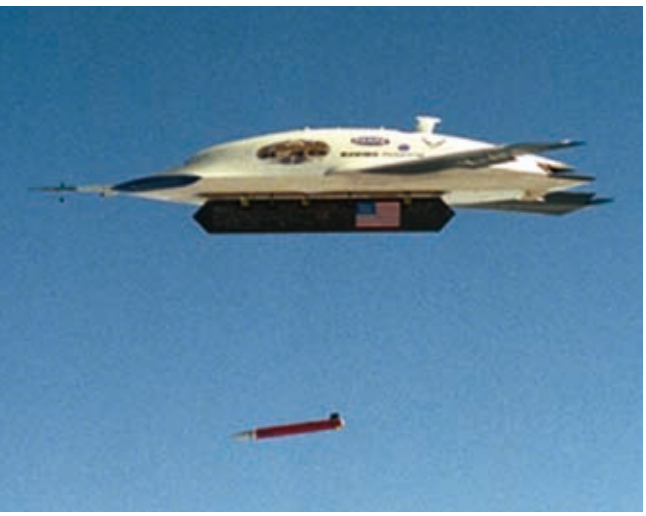
be neutered, with the Nuclear Non-proliferation and Limited Nuclear Test Ban Treaties under severe pressure. It would probably be accompanied by other, less predictable and asymmetric terrestrial actions. Secondly, global political and public opinion would harden against the United States; even traditional friends such as the United Kingdom would almost certainly find their relationship with the US permanently altered. Both outcomes pose vital questions for US grand strategy, but would be acceptable to 'pro-hegemon' strategists; recent American anger at 'Old Europe' over Iraq can only harden their position.

The third effect would be to undermine and unbalance those US conventional warfighting capabilities required now to meet current and future commitments as resources were sucked into an exceptionally expensive space weapons programme. As General Ron Keys recently noted with regard to current financial pressures within USAF: 'People always ask me, 'Well, what do you have too much of, and what do you need more of? Let me give you a newsflash. I've got too much of not enough'.[72] The extant fiscal challenges facing the current Bush Administration are severe; the need for considerably increased spending on social security and health care in coming decades, worsening the budget deficit, has already been discussed. Moreover, it is difficult to foresee circumstances in the near future where US global military dominance will be threatened; in effect, a 'tipping point' where the US must embrace space weapons to reinforce extant terrestrial conventional systems. The nuanced responses available across the spectrum of conflict for General Keys and his fellow Component Commanders would be reduced through enormous investment in a technologically impressive but strategically, operationally and tactically inflexible 'white elephant'. Ozymandias would have approved.

The Need for Debate

'Space weapons (like conventional weapons more generally) are a far more complicated and diverse subject [than nuclear weapons], and require at least as much effort and attention to debate satisfactorily, yet surprisingly little work has yet been done to describe and analyze them in satisfying detail.'[73]

It is difficult to make a credible strategic case, given current realities, for weaponizing space. Indeed, proponents of that case fail to heed the words of Hedley Bull: 'Marginal increases in security may be pursued at exorbitant economic or moral cost'.[74] 'Technology push' cannot be allowed to trump 'strategic pull' and Lambeth is right to offer the following cautionary note: 'Functions should not be migrated to space just because it is technologically possible'.[75] Unfortunately, the debate over space weapons has been consistently conducted against an ill-informed background. James Oberg has criticised both 'Gung-ho space-superiority mantras…from U.S. Air Force leaders [and] the near-hysterical ranting from American newspapers, from lobby groups posing as 'information centers' but having long-familiar agendas, and from foreign nations eager to score cheap propaganda points'.[76] Against this polarized background, and in the absence of clear policy direction to guide conceptual thinking and research effort, it has been almost impossible to engage in rational discussion over the future direction of US space strategy. The importance of continued space superiority for the US and her allies makes the debate all the more urgent. A viable national strategy, providing the United States with continued commercial and military benefits and guarantors against future uncertainty, is long overdue.



Boeing X-45 UCAV

target recognition within the platform or UCAV formation which further increases the degree of autonomy available for delegation to the platform.

The ultimate aim of all this technological innovation is of course in pursuit of one goal, namely to deliver lethal, or perhaps non-lethal, weaponry against enemy targets. The most obvious trend within the field of air guided weapons is the reduction is size of the warhead, with a gradual move away from the more traditional weapons such as the Mk80 series bombs towards lighter weapons such as the US Small Diameter Bomb (SDB). This programme is able to reduce the size of warhead by increasing the accuracy of the weapon, 2 natural spin offs from this trend are a potentially increased kill per-sortie capability and a decreased collateral damage footprint. It is this latter point which is of interest to this essay as the reduction of collateral damage is a prime consideration when targeting air-to-ground weapons.

Whilst the development of UCAVs tend to grab the headlines, perhaps the most important developments in this area of warfare are the US drive towards Network Centric Warfare and the UK move towards Network Enabled Capability. Both programmes are just as vital to the legal and moral efficacy of modern air power. Concepts such as Machine-to-Machine (M2M) interface and Network Centric Collaborative Targeting (NCCT) seek to change the way ISR assets, command networks and delivery platforms are integrated. Essentially, the cross cueing of ISR sensors is facilitated via common networks and protocols and aims to improve the resolution and discrimination on any given target. Whilst they were initially developed to decrease the sensor to shooter timescale they have much broader applications and implications.[15] The ability to cross cue an electronic intelligence asset to correlate a potential target identified by a satellite and then further refine using an air breathing platform's radar would be an impressive capability. This improved discrimination could be used to present the commander with a greater level of clarity and hopefully improve the ability of the commander to make timely and accurate decisions – assuming of course that the human remains in the loop.

Aside from the potential operational benefits of the UCAV outlined within the previous analysis, the predicted financial benefits are unlikely to be a restraining influence on the pace of development and may actually increase the pressure on air forces to field such systems. Clearly any cost predictions regarding operating costs of UCAVs are speculative at this stage. However, variable operating costs such as crew training will be much reduced through extensive use of simulation; this could reduce the operating and support costs to as little as 25% of the cost of a conventional F16 squadron.[16] Hence the very real interest being expressed by many air forces.

Bringing together the preceding analysis it is clear that by 2020 a stealthy, unmanned, and armed air vehicle may be in service with US air forces and perhaps even their European counterparts. This platform is likely to be similar in nature to the X-45A and supported by an improved C2ISR architecture which could feature elements of automation within the on-board and off-board targeting process. The difficult questions raised by the preceding analysis are not whether we can develop this technology, but whether we should and can we legally employ it? The real dilemmas in the area of unmanned combat systems stem from the legal and moral questions raised as opposed to the technological feasibility of such systems.

> The greatest kindness in war is to bring it to a speedy conclusion…it should be allowable with that view to employ all means save those that are absolutely objectionable.

The above quote paraphrases General von Moltke as he contemplated the St Petersburg Treaty of 1868 which sought to define the legalities of war and limit the military use of certain types of equipment.[17] Clearly he did not pass judgement on whether he considered the X-45A as 'objectionable' but we may infer from his tone that he would probably have approved of its use. However, despite the implicit approval of a deceased Prussian Staff Officer, we cannot assume that simply replacing a pilot with a system of electronics and data-links automatically confers some inherited right of legality upon UCAVs. Rather, the totality of the system, its weaponry, modes of operation and means of control must be examined in order to arrive at a more considered legal position.

Throughout the history of just war theory the notion of jus in bello has been governed by 2 simple principles, those of discrimination and proportionality.[18] Despite the passage of time and the movement from 'Divine Law' based on religion, through 'Natural Law' based on ethics and finally 'Common Law' based upon treaties, they still remain valid.[19] These principles were formally enshrined within the Hague Conventions of 1899 and 1907 and superseded by the Geneva Conventions of 1949 and the 1977 Additional Protocols.[20] Whilst these modern documents go into great detail as to how and when the rules therein should be applied the 2 guiding principles are still self evident. The following quote is taken from the 1977 Geneva Additional Protocols and clearly shows the continued obligation for discrimination placed upon forces engaged in an attack:

> In order to ensure respect and protection for the civilian population and civilian property obliges the Parties to the conflict to distinguish at all times between the civilian population and combatants, as well as between civilian property and military objectives and to direct their operations only against military objectives. (Additional Protocol 4 Article 57 Paragraph 2 ii).

Or put more simply there are good targets and bad targets, warring parties are permitted to strike one and forbidden from striking the other. The principle of proportionality is similarly detailed within the same document and expressed as follows:

> Parties should refrain from deciding to launch any attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated. (Additional Protocol 4

Article 57 Paragraph 2 iii).
Again this can be expressed in layman's terms as the military benefits of striking a target must outweigh the consequences – it must be noted that such calculations must also take account of expected collateral damage and potential unintended consequences such as malfunctions. However, despite the seemingly intractable constraints of first part of this quote, air operations which could result in harm to civilians or prohibited structures may still be carried out, courtesy of the 'principle of double effect' as witnessed by the latter portion of the quotation. The principle of double effect requires that attacking forces must reduce to an absolute minimum the number of civilian casualties and where possible choose the military option which limits collateral damage to the greatest degree.[21] However, it must be pointed out that despite the endorsed Geneva Conventions and Protocols there is no specific law pertaining to the conduct of aerial warfare, rather the details regarding air combat and aerial bombardment must be interpreted from the broader protocols which deal with protection of those involved in International and non-International conflicts. A situation which led to Pierre Boissier, a former head of the International Committee of the Red Cross (ICRC), to suggest that military commanders seeking to commit an atrocity would be well advised to do so from the air given the paucity of legal recourse upon aircrew and commanders.[22] Despite this situation international custom would dictate that there is still a requirement for our UCAV operators to ensure that attacks are fully justified and carried out with the aim of minimising collateral damage.

Previously we examined the potential capabilities of the UCAV in the 2020 timeframe and considered in detail the C2ISR network which supported our UCAV on its mission over Uzbekistan. At first glance this improved system appeared to solve many issues facing today's airman. The platform is likely to possess a superb sensor suite which encompasses multi-mode radar, electro-optic targeting systems, blue-force tracking means, automatic target recognition algorithms, data-linked connectivity, and is an integral part of the GIG.[23] Therefore, it is difficult to suggest that this particular platform does not meet the highest possible standards when considering the principle of discrimination. Moreover, due to the fact that weapons systems such as SDB are likely to be the weapon of choice, the principle of proportionality appears to be well covered courtesy of the reduced collateral damage implications of its armament. So in simple terms it appears that our proposed UCAV solution presents many of the answers to questions of legal application of air power in the 21st century – so why is the ICC so interested in the incident? Is there something sinister about the use of unmanned systems which promotes such interest, does the asymmetric application of air power automatically provoke such an outcry, or are they merely interested in the process used to authorise the strike?

Debates surrounding the legality of individual weapons systems have occurred throughout history and yet to the modern observer some now appear ridiculous. Perhaps the best example is the long argument which centred on the numerous variants of the bow. Within Greek mythology the bow was used as a weapon by the 'lower' Gods, whereas 'the bravest of Gods were those who used hand-to-hand weapons'.[24] Within Homer's 'Iliad' Paris is referred to as 'a woman, weakling and coward' for using the bow, and in 1139 the Second Lateran Council sought to impose a ban on the crossbow and longbow for being 'too cruel and too effective'.[25] The stated

motives for the prejudice against the bow are often cited as its effectiveness and low cost, an argument which the modern airman seldom faces. However, the true reasons are more social in nature, the fact that a body of men armed with simple and cheap weapons could annihilate a more traditional cavalry based army had the potential to threaten the established military and civil order. Clearly this historical example proves that there is little new in the concept of an 'unfair' or morally unacceptable weapon. The notion of a much cheaper weapon undermining the established military order is of particular interest when considering the potential for the UCAV to challenge manned fast jets for supremacy in offensive air power delivery.

Whilst the example of the bow has some relevance to UCAV development, the argument which perhaps has most resonance with this debate is that which surrounded the introduction of the aeroplane and more particularly the manned bomber. The deliberations at the Hague Conferences of 1899 and 1907 naturally had little inclination of the potential power of the aeroplane yet they did attempt to legislate for its future development. In 1899 the signatories agreed to, 'prohibit, for a term of five years, the launching of projectiles and explosives from balloons, or by other new methods of similar nature'.[26] This was again proposed at the 1907 conference but few continental powers supported the treaty and it was not endorsed.[27] Not surprisingly after the Great War attempts were again made to define the use of air power and limit its use, firstly at The Hague in 1922-23 and secondly at the Geneva Disarmament Conference of 1932-34. The Rules of Air Warfare drafted in The Hague sought to codify the practice of air power but were never adopted.[28] More significantly the Geneva Conference discussed a number of alternatives such as: the establishment of an international air force at the disposal of the League of Nations; the total abolition of military aircraft; and the restriction of aerial bombardment.[29] With the adoption of the Benes Resolution at Geneva in July 1932 contracting countries agreed, 'that all bombardment from the air shall be abolished…there shall be affected a limitation by number and a restriction on the characteristics of military aircraft'.[30] Difficulties in determining the definition of civil aircraft and the withdrawal of the newly established Nazi Germany brought this process to an end. Although it must be noted that the RAF bitterly opposed the banning of bomber as this was 'intimately linked to the survival of the RAF'.[31] In line with similar debates, the military establishment often wish to preserve the status quo.

As discussed previously, the air vehicle is but one aspect of the UCAV as a system, with the C2ISR architecture and associated weaponry integral parts of the whole and hence subject to the same degree of legal scrutiny. By means of our scenario it is possible to gain a simplistic understanding of these issues. Let us consider how we targeted our now deceased rebel leader. A SIGINT UAV detected an initial voice broadcast from an area known as a rebel stronghold. The voice is assessed to be that of our rebel leader and has an 80% certainty factor applied to it by a computer algorithm; the geo-location of this broadcast is used to automatically cue another sensor. Space based radar detects a convoy consisting of 2 armoured personnel carriers in the vicinity of the original plot, based on vehicle recognition techniques the lead vehicle is assessed as the likely source of the first transmission. An ELINT platform then detects transmissions from a mobile communications device known to have been used by the rebel leader within the last 2 hours, the probability

our target is using it is again assessed as 80%. If this process is automated and the results presented to a commander as a potential target what level of detail should he be presented with? In simple mathematical terms the chances that our rebel commander is in the lead vehicle is only 32%[32], yet human intuition suggests that there is a very strong possibility that our target is in the lead vehicle. This simple vignette underplays the role that network analysis plays and the wide range of other information potentially available to the commander. But it also highlights the tremendous importance of ensuring that the cross cueing and correlation envisaged by concepts such as NCCT is underpinned by thorough and legally defensible processes. After all the very brief process outlined above is being used to determine whether lethal means of force should be applied to a target – in this case a human being. The UCAV and its weaponry outlined above potentially provides an answer to many air forces equipment needs: it prevents loss of politically valuable personnel; provides access to the vast majority of the battle-space; delivers measured lethality and persistence to a degree not yet seen within the air domain; and does so at a much reduced financial cost. Yet at the same it presents very definite legal challenges, the level of autonomy permitted allied to the degree of automation within the targeting process being key areas for further legal clarification. In sum, there is nothing per se that is illegal about UCAVs, but we must understand that legal opinion and argument is often based on moral reasoning.

> The moral reality of war is not fixed by the actual atrocities of soldiers but by the opinions of mankind.[33]

Having concluded that the deployment of UCAVs may overcome some of the legal issues currently facing the air commander, we must now examine the other side of the legal and moral debate in order to understand if the moral calculus supports or counters this legal position. In broad terms the moral considerations associated with the notion of jus in bello naturally follow the same principles of discrimination and proportionality; however, they intuitively explore subtly different areas and arguments. For example when dealing with the legal side of proportionality we examined the notion of 'double effect' or in modern jargon 'collateral damage'. When examining the same principle from the moral standpoint we must consider the notion of 'double intent' a subtly different argument centring on the degree to which the combatant accepts increased risk in order to minimise risk to non-combatants.[34] Equally when considering the principle of discrimination we must understand that discriminating between friend and foe, combatant and non-combatant is not permitted as they all possess the same inalienable rights – distinction between them or in favour of one is not permitted.[35] This is self evidently a moral position yet one that is enshrined in the laws of armed conflict. So how does an unmanned platform, capable of penetrating all areas of the battle-space and attacking at will, sit within the spectrum of moral proportionality and discrimination?

The first requirement of the moral debate is to truly understand the concept of double intent and the requirements it places upon air commanders when deciding between potential courses of action. In any given military situation there are probably several methods available to achieve a given military end-state, each with different modes of attack and levels of risk to both those prosecuting the attack and innocent bystanders. Given the requirement to protect non-combatants, the commander is therefore morally bound to choose

the option which results in the lowest degree of risk to non-combatants yet still meets the military objective. In all probability this choice will result in an increased risk to those aircraft and crews assigned to the task – ergo the air commander is balancing the degree of risk to his own crews with the risk to the safety of non-combatants. Two seemingly disparate historical incidents highlight the notion of double intent in its most basic form.

Our first example concerns the Mosquitoes of Number 140 Wing and their attack on Amiens prison on 18 February 1944 – aptly named Operation JERICHO. The aim of the raid was to affect the release of over 700 French Resistance prisoners, a large number of whom had been convicted and were facing imminent execution. The degree of risk inherent within this raid was far in excess of that usually displayed within 2 Group; this extra risk can be attributed to the fact that the prisoners were essentially friendly combatants and hence worthy of such bravado. Moreover, the Air Officer Commanding 2 Group, sought permission to personally lead the raid; it is worth noting he had previously been a prisoner of war and was assisted in his escape by the French Resistance.[36] The raid required extremely accurate bombing and involved releases of weapons at staggeringly low heights, in some cases no higher than 10 feet.[37] The question that could of course be asked is should the same degree of precision have been applied to other targets across Western Europe? In contrast the bombing of a refugee convoy on 14 April 1999 in the village of Djakovica was a direct result of NATO commanders imposing a minimum height on air operations over the Balkans in order to reduce the risks to friendly air forces. In this particular incident an F-16 pilot misidentified a Kosovar Albanian refugee convoy as a Serbian military convoy and instigated a series of attacks which resulted in the deaths of approximately 70 civilians with a further 100 injured. The misidentification was as a direct result of the height the pilot was flying at, had he been lower it is likely that the original mistake would not have been made.[38] Initially it appears that the 2 incidents display either end of the spectrum of double intent, however, on closer examination things become much simpler.

In accepting a higher or lower degree of risk to friendly aircrews, the air commanders involved implicitly placed a relative value on the human lives at stake within a particular operation. In the World War 2 case the lives of the French prisoners were sufficiently 'valuable' in order to warrant increased risk to Allied aircrews. Conversely in the Kosovo incident, the lives of NATO aircrews were valued above all others. In both cases value judgements had been made which violated a fundamental principle of human rights which places all involved on an equal footing. In the 2 cases outlined above, the principle of double intent was satisfied, or could have been so, by an increase in the level of risk and sacrifice to those executing the raids – can this principle be satisfied during UCAV operations? It appears that in order to satisfy the principle of double intent one must bear an increased risk to ones own military, yet decreasing the risk to one's own forces is one of the main motives for development of technology across all 3 military environments.

Having examined the notion of double intent we must understand the drive towards the use of unmanned systems and associated technology within the air domain and examine whether any moral considerations have been included. Part of the reasoning behind development of UCAVs is to overcome the physiological limitations of the human body, and in

that sense their deployment should ultimately make economic and military sense. However, is this a prime driver for such developments, or are their more complicated reasons for such a move? The notion of 'radical force protection' is now common within Western military operations as the expectation of the Western media moves towards almost total rejection of friendly casualties during Western military interventions.[39] Allied to this is the seemingly perverse expectation that enemy casualties can also be avoided, a situation brought about in part by the 1991 Gulf War in which clinical air strikes were shown to the World's media.[40] These 2 factors combine to present the modern day air commander with a set of expectations which he must deliver, a large number of which may have little to do with the military objectives in question. On the one hand he must reduce the risk to his own crews in order to protect his government's likely centre of gravity – public will. Whilst on the other hand he must be seen to prosecute a clinical campaign which does not undermine the legal basis of the campaign. Both of these objectives no doubt contribute to the requirement to field increasingly capable weapons and platforms, perhaps the ultimate expression of which is the UCAV. Hence the legal and political imperatives can be seen to drive elements of their design and development, but the moral arguments have not yet been considered.

In many respects the lack of international law regarding aerial warfare has not stifled the legal debate surrounding the present day execution of air strikes. One only needs to visit a typical CAOC to see the pivotal role of the lawyer in the targeting process as he sits close by the Chief of Combat Operations. However, this lack of international law has in many respects allowed morality to fill the void.[41] But in the absence of law how is the moral debate guided? Usually societal norms or accepted principles are codified into formal laws over a period of time. This can clearly be seen within the Geneva Conventions with many articles directly reflecting historical military practice. However, the pace of technological development throughout the military domain is in danger of leaving the moral debate behind. The following quote from the JDCC's Strategic Trends Paper highlights the need for a moral debate but does not place a timeframe upon it:

> The development and employment of unmanned and then fully autonomous weapons systems is likely to cause significant debate about the morality of combat where only one side's personnel are at risk, and more significantly, the acceptability of machines potentially choosing to take human lives.[42]

We have briefly examined the notion of autonomous targeting and M2M cross-cueing to improve the resolution of the target area but only highlighted that the processes and algorithms behind them must be legally defensible. No discussion of whether it is morally correct for a machine to be able to take a life was considered, yet this very question may ultimately limit the development of UCAVs and similar unmanned combat systems in other military environments.

The concept of a computer based system deciding on whether a target should be struck seems somehow to go beyond what would be morally acceptable, no matter how long the debate raged or under what circumstances the battle was being fought. Yet an evolutionary approach to this same debate could very easily see that situation come to fruition. If one considers the case of a B2 Spirit bomber as it cruises across the battlefield, it is essentially invulnerable to conventional radar based surface-to-

Northrop-Grumman X-47B UCAV

air systems and can therefore be used to attack targets at will. Those personnel directly targeted by the bomber have little or no idea of its presence or their impending demise. Is this situation immoral and if not why not? Does the fact that 2 men reside in the cockpit actually make any difference to the situation on the ground – clearly not. Equally if a Predator UAV had been used to target our rebel leader, would the innocent bystanders know of the UAV's presence or capabilities – much less whether it was unmanned? So the fact that a UCAV could combine the elements of invulnerability and a degree of automation is merely a convergence of 2 well established technologies. This very simplified argument does not adequately capture the moral arguments surrounding the automation of killing but does highlight the fact it is not beyond the grasp of certain air forces. Precision represents a capability already widely fielded in many air forces. Precision weapons as we understand them today have been around since the latter stages of the Second World War. However, the real advances in precision were spurred by the Vietnam War and fully proven during the clinical execution of the Desert Storm air campaign. It is this legacy which provides many of the moral issues associated with the prosecution of tomorrow's air campaigns. As outlined previously, lack of law can allow morality to dominate the debate; this is potentially true of PGMs. Indeed, it has been suggested that 'the moral advantage of PGMs can be morally seductive… and it is easy to be seduced into believing that because they are discriminate weapons any use of them is acceptable'.[43] The fact that a weapon can be targeted in a discriminate manner, has low collateral damage implications and is used only against targets with a clear military need does not confer morality upon the campaign as a whole. Therefore there are clear precedents that the degree of proportionality and discrimination available to our UCAV operators does not automatically infer just use of these weapons systems. This should come as no surprise to those involved in the delivery of airpower but highlights the political tensions associated with clinical warfare as Dunlap points out, 'the real issue facing statesman and soldiers is ensuring that the casualty-minimising features of high-tech weaponry do not induce decision makers to inappropriately lower the threshold for the use of force'.[44]

When looking into the development of future advanced weaponry much is made of so called non-lethal weaponry such as systems designed to 'burn-out' integrated circuits within computer systems, more commonly known as directed energy weapons. Clever direction of radio-frequency energy at an electronic system can disrupt such integrated circuits. However, should one require a very high power device to increase the effective range there is the potential for directed energy systems to not only have effects on the ground but also on the host platform or crew. The logical deduction from

this is that unmanned systems provide an ideal means with which to deploy directed energy weapons. Surely the notion of an unmanned system delivering non-lethal effects onto enemy targets is approaching the nirvana of modern warfare? However, before such systems are developed we must understand whether any limitations would be placed upon their use. It seems morally counter-intuitive to limit the development of non-lethal weapons yet there are recent examples of such cases. In September 1995 the use of laser weapons specifically designed to cause permanent blindness was adopted worldwide.[45] Whilst permanent blindness is not a trivial disability one has to ask how the restriction has increased the jus in bello legality of various military operations. Presumably the desired effect sought by the inventors of such weapons was immobilisation on the battlefield, an effect which is still required and still achieved – by lethal means. So whilst non-lethal weaponry obviously has a place in future warfare we must be aware of the potential for legal restrictions to be placed upon certain means of inflicting harm. Equally, we must be certain that such weapons are correctly labelled – the intention maybe to apply force in a non-lethal manner, yet directed energy weapons designed to burn-out electronic circuits at long range could be very damaging to persons operating the target system. It appears therefore that the morality of a weapon is not necessarily linked to its lethality but rather the means employed to deliver its effect.

Much of the debate surrounding immoral weaponry has centred upon the duration of the effects caused by its employment. Notwithstanding the debate surrounding the legality of the bombing of Dresden and Tokyo, it is a widely held view that the bombing of Hiroshima and Nagasaki was somehow more sinister and truly amoral. This is despite the fact that more innocent civilians were killed in the first 2 cities than the latter 2.[46] The fact that only 2 weapons were used in the atomic attacks underlines the sinister power of the atomic weapon, but it is perhaps the long lasting nature of radiation and its effects that marks out the atomic weapon for particular moral censure. Similarly the employment of poison gas as a weapon is subject to moral outrage yet in pure military terms it is, 'relatively humane with a much lower proportion of those who became casualties actually dying'.[47] The outrage surrounding gas is again linked to the long lasting nature of effects; effects which last beyond the timescale in which a combatant should expect to be classed as such. So in common with laser blinding weapons it seems that the period of residual effects has a significant bearing upon the moral character of a weapon. Thus a morally acceptable weapon is one that affects 'only combatants and only while they are combatants'.[48] In this sense our proposed UCAV with its highly discriminate sensors and proportional weaponry could fit the bill as a morally acceptable weapon system. However, as van Creveld observed, 'the distinction between good and bad weapons exists solely in man's mind' hence by definition the morality of a weapon will always be subjective.[49] This subjectivity is perhaps dependant upon whether one possesses this weapon or is in turn threatened by it, and underlines the reason why so few weapons are outlawed when legislating through consensus.

Notwithstanding the perceived morality of UCAVs, the remaining issue to resolve for those air forces that deploy such systems is the degree of autonomy granted to the on-board and off-board computers in deciding the fate of targets they sense and observe. As outlined above, the degree of suspicion

surrounding a weapon is likely to be at its greatest as it enters service, once it becomes the established norm this debate is likely to subside. Logically therefore it would be sensible to restrict the degree of autonomy during the early service of UCAVs. Indeed, until such systems have been thoroughly tried and tested it is difficult to see how such weapons could legally be left to roam freely with authority to engage targets at will. During the early stages of their development it is highly likely that the human will remain firmly in the loop. So assuming that our UCAV over Uzbekistan was controlled by a human, we have our first contender for censure or arrest. But to paraphrase President Truman, 'the buck does not stop there'. It is entirely possible that our luckless UCAV operator followed the procedures laid down and yet still had the misfortune to permit release of a weapon which ultimately claimed the lives of 15 innocent civilians. Any of the personnel involved in ordering the mission, drafting rules of engagement and providing the information upon which the operator acted are just as liable to censure. But let us consider the case if the UCAV had been operating in fully-autonomous mode, clearly no human operator would be directly involved in the missile strike. In simple terms this merely removes one person from the chain of responsibility. The same process of planning and authorisation would take place therefore these personnel would be similarly liable. Whilst an operator was not present in the cockpit, the designer of the computer software was there in all but name. So despite the absence of a pilot the chain of responsibility remains remarkably similar with the only exception being the movement of the brain behind the execution moving further back into the defence industrial base.

When examining the concept of UCAVs the concept of invulnerability appears to bring with it significant moral baggage, yet throughout history numerous weapons have at first seemed invulnerable. The tank's first foray on the battlefield seemed at once to offer an exit from the horrors of trench warfare and the ability to roam freely. Equally the oft repeated maxim that 'the bomber would always get through' underlined the perceived invulnerability of the aircraft. Eventually the weaknesses behind such weapons were exposed and ultimately countered; hence there should be a natural time limit on the perceived immorality of any new form of weaponry. The moral outrage behind Hiroshima and Nagasaki did not stop another 7 countries from developing similar weapons or others trying to do so. Therefore, if UCAVs flourish and become part of the established norms of warfare then only those disadvantaged by their presence will be left proclaiming their sinister nature.

We have also discussed that the lack of reciprocal human threat could undermine the moral basis for a campaign, but these characteristics are to a large degree already present in many of today's asymmetric conflicts. During the first 43 days of Operation Iraqi Freedom (OIF) the 735 fighters deployed into theatre flew a total of 20228 sorties for the loss of a single A10 aircraft to enemy fire.[50] Faced with such an overwhelming air threat most adversaries have historically sought to nullify this advantage through asymmetric means, this was certainly true during OIF and equally so during Operation Allied Force. The alternative approach is of course to reduce the West's air power domination to a level whereby a more equal contest is achieved. However, air power is seldom used in isolation from other components and hence Western military domination is not solely limited to air power. The fact that UCAVs have the potential to

Boeing X45A UCAV

exacerbate this imbalance must be borne in mind when framing future air power doctrine.

As an aside to this debate, the airman has enjoyed a unique perspective of the battlefield for over 100 years. Often the airman views the land and sea in the same glimpse; the differences between their operating environments do not bother him nor affect him as he operates in another. But the prospect of conducting aerial combat through exclusively unmanned methods is by no means impossible. Indeed the UK's own Defence Industrial Strategy sees the Typhoon and Joint Strike Fighter as the last manned combat aircraft types and, 'does not envisage the UK needing to design and build a future generation of manned fast jet aircraft'.51 Whilst the loss of the 'airman's perspective' may be inevitable, it could have significant long term implications for the relationship between air forces and their land force colleagues.

Let us never forget our enemies are men'.[52] (Emanuel Vattel)

The development of the UCAV in many ways represents the next logical step in an evolutionary process which progressed from the biplane to the B2. However, the employment of UCAVs has the potential to institute a revolutionary approach to combat in the air. This revolution is perhaps most acute within the legal and moral arenas. Whilst this essay has dealt exclusively with unmanned systems within the air domain the moral and legal principles highlighted are equally applicable to the other military environments. The potential to deploy systems capable of taking human life without a corresponding risk to the attacker represents a key area of moral debate, a debate which will need to be resolved prior to their introduction into service. Moreover, a simple declaration of their morality is unlikely to satisfy bodies such as the ICRC or belligerents without access to their capabilities.

The physical employment of UCAVs should bring an extra dimension to the air commander's ability to prosecute a conventional air campaign. Moreover, the economic benefits of unmanned systems will become very attractive to many air forces as defence budgets come under increasing pressure. This economic pressure allied to a desire within most governments to avoid military casualties combine to make the future deployment of UCAVs highly likely within the next 15 years. Given that high technology weapons, and particularly airborne platforms, have a long design and development process the need to mature the legal and moral debate is already upon us. Should legal issues be identified which preclude the deployment of UCAVs or limit the degree of autonomy granted to them, then significant research and development costs may be avoided in the short term. It is highly likely that the first such systems will not be employed in fully autonomous modes

for 2 reasons. Firstly, the maturity level of autonomous control algorithms will be such that they may not be able to achieve the level of cognitive understanding or situational awareness available to similar platforms controlled by humans. Secondly, the degree to which such autonomous systems will be trusted, or more importantly legally, proven will probably not be met during their initial deployments; hence their early service will be in a human controlled mode. This should assuage the concerns of many regarding the automation of killing, which is perhaps the largest moral and legal hurdle facing unmanned combat systems. Whether the development beyond human only control is ultimately pursued will be driven not by technology but by legal opinion backed up by moral debate.

The degree to which reciprocal human threat is overcome by the employment of UCAVs is of sufficient importance to accelerate their development. Yet at the same time this lack of reciprocal danger poses a threat to the ultimate employment of UCAVs, primarily because the moral right of the attacker could be undermined. The utility of UCAVs within high intensity and high threat scenarios has been established, and their long endurance and relative cost of operation will make them attractive for the more mundane but reactive tasks associated with post conflict scenarios. But it is precisely these latter tasks which are the most complex decision making arenas as the discrimination of target from non-combatant becomes increasingly difficult.

We must also be aware that the current technological superiority of certain air forces has the potential to set the conditions of an adversary's response to coercion. Faced with an even greater capability which is unmanned, what will be the response of most belligerents? The majority will probably seek an asymmetric response which seeks to underplay the strengths of the West's air power, this is already true today and the deployment of UCAVs has the potential to further exacerbate this problem. Indeed, the West's current air power dominance already presents us with many of the legal and moral issues surrounding the deployment of unmanned combat systems, and today's air commanders must understand the relevance of the arguments outlined within this essay as they consider contemporary campaigns. Although current predictions see the UCAV able to access the majority of the battle-space unhindered, in reality their vulnerabilities will eventually be established and ultimately countered in line with the previous cycle of warfare. By the time this occurs it is likely that the debate surrounding the legality and morality of unmanned killing machines will seem as outdated as the arguments surrounding the crossbow. Nevertheless, the debate has the potential to be every bit as controversial until their utility is proven and such systems are seen as the norm within warfare.

As a final thought, van Creveld sought to understand the nature of future conflict. His basic thesis was that computers, no matter how advanced, 'could only respond to those circumstances explicitly foreseen by their programmers' and thus future conflict would remain a fundamentally human issue.[53] He went on to suggest that, 'war would not be waged by neatly uniformed men in air conditioned rooms sitting behind screens manipulating symbols and pushing buttons'.[54] Yet this is precisely the type of activity which is envisaged for the command and control of UCAVs in the early part of the 21st century.

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