



## Australian Defence Magazine Congress

### *UAS Address*

- Deputy Chief of Air Force: Air Vice-Marshal Leo Davies, CSC -

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Good afternoon ladies and gentlemen.

It is a pleasure to be able to speak to you today about a subject that is confronting military aviation around the globe, but which also has expanding implications for civil aviation, governments and regulatory bodies. Broadly speaking that subject is the use of Unmanned Air Systems (UAS), and specific to our attention today is the use of armed UAS in a military context.

### **Terminology**

You will note that I do not use the term 'drone' as it is inaccurate, inappropriate and an incorrect term that does not describe what we are talking about. Words matter.

### **Advantages**

So why are air forces around the world so attracted to the idea of operating UAS? The answer is simple and is governed by engineering principles and the laws of physics that apply to the aircraft component of a UAS. For a similar sized platform, a Remotely Piloted Aircraft (RPA) (as part of the Unmanned Air System) has advantages over a manned aircraft. It has increased endurance, emits a reduced signature in almost all spectra, is not constrained by human limitations to the manoeuvres it can perform, and it preserves the lives of our men and women.

With the RPA crew located on the ground, or in a supporting aircraft, we can provide specialist advisors suited to the task at hand. Legal officers, intelligence officers, imagery analysts and other specialists can be assigned to provide real-time support to the operation. Rotating RPA aircrew also reduces fatigue and inattention. The combination of these physical and human advantages appears to indicate a promising future for UAS, but they must also be weighed against the vulnerabilities and cost.

### **Vulnerabilities**

One area of concern in the operation of UAS is the communications links required to monitor and direct their actions. In the media there have been a number of claims concerning the interception of UAS video feeds and the manipulation of GPS data used to navigate the RPA. This is a potential vulnerability, as without a secure communications link to the RPA, we will not be able to ensure the safety of their operations, or the security of the data they collect.

Methods for ensuring the security of communications and navigation are available and include frequency agility, encryption and directional transmissions for communications, and combining inertial navigation systems with GPS data to counter GPS jamming or deception. Security of communications and navigation will be a priority for any future Australian UAS, armed or not.

### **Costs**

The operation of the RPA by itself is generally less expensive and less complex than for a manned aircraft as there are fewer onboard systems to maintain and repair. But this situation is complicated by the need for other essential components of a UAS. A UAS is typically comprised of the aircraft, payloads, ground control elements, communications, a command network, and launch and recovery teams.

We have developed some understanding of the costs associated with a whole UAS through our experience of Heron operations in Afghanistan and through AIR 7000 Phase One. Much of the detail is commercially sensitive, but I can describe in broad terms what our expectations are in some of the more significant areas. Analysis has indicated that the through-life costs for UAS are significantly less than for a manned platform. This includes items such as logistics support, spares holdings, upgrade programs, obsolescence management and engineering support.

Additionally, crew training and ongoing maintenance costs for UAS are expected to be less than for a manned platform. We do expect a UAS could be on-task for a greater percentage of its life than for a manned platform. As a consequence, our expectation is that the UAS will increase our manpower requirement per platform compared with a manned aircraft, especially in the intelligence analyst areas. Ironically, unmanned systems appear to be manpower intensive. Costs associated with satellite communications at the bandwidth required for both flight and sensor data, and their associated controls are significantly greater than for a manned platform.

On balance, we anticipate areas of cost savings and areas of increased costs. While I am talking about UAS costs, let me also touch on the 'expendability' issue. While they may eventually be less expensive than a manned platform, they will not be cheap. They will still cost millions per platform and cannot be thought of as a throw away item any more than our current or planned inventory. Attrition aircraft will not be able to be replaced overnight.

## **Autonomy**

An issue that is often raised when talking about UAS is the assumed fully autonomous nature of such systems. Automation exists as a continuum from complete human control, to where many functions are delegated to the onboard computer systems. The degree of human interaction is dependent on the platform and the nature of the operation of course. The UAS we use today, and those we will use in the immediate future, will operate in the central band of this continuum.

While the technology currently exists to substantially automate the aviation component of the UAS capability, i.e. the flying, I want to make it clear that the same cannot be said for any targeting or weapon employment. For the foreseeable future, these activities will continue to require the direct involvement of human operators. Even when automated systems become available for these functions the experience of our allies indicates that targeting and weapon employment will still require human authorisation in nearly all situations. The true value of automated systems is not to provide a direct human replacement but to extend and complement human capability.

## **Ethics**

I would like to now turn to the ethical question of using UAS and suggest that there is no question at all. At the highest level the ethical parameters for all ADF operations are mandated by the Laws of Armed Conflict (LOAC) that Australia has adopted and is a signatory to. From these laws are derived a set of Rules of Engagement (ROE) that is approved by government and within which the use of armed force is constrained. The Chief of the Air Force has no authority to contravene these ROE or LOAC. Any weapon system—including UAS—must comply with these same laws and rules.

If, as part of the detailed examination of all equipment that we acquire, we determine that a weapon system would contravene the laws of war, or not allow us to operate within them, then the system will not be acquired. I believe Australia has proven our determination in this matter by our withdrawal from service of weapons that have been so classified, such as cluster munitions and mines.

The employment of a UAS provides no new ethical problem that has not already been addressed in the operations of manned aircraft such as the F/A-18 fleet or stand-off weapons such as JASSM and JSOW. The intelligence preparation and evaluation will be the same. The civilian, cultural and collateral damage assessment will be the same. Considerations of necessity, distinction and proportionality will be the same. The targeting and weapon-application planning will be the same. The specific identification of the target will

be the same. The checks required to be performed by the pilot before weapon release will be the same. The post strike assessment of damage will be the same. The one difference will be that the crew will be seated on the ground, or in another aircraft, instead of the releasing platform. I can discover no new ethical issue in this.

An argument that is sometimes made is that by using UAS we will reduce the barriers to initiating conflict as we will not be putting our own people's lives at risk. The inference is also made that the resulting war will not be a 'fair fight'. There are two issues that I wish to raise at this point. Firstly, all wars, unfortunately, cost lives. The taking of all life has consequences, both for those who order it and those who carry it out. From personal experience, I can assure you that the loss of Australian life and the taking of an enemy's life weigh heavily on the minds of Government and ADF leadership. Additionally, UAS operators and analysts monitor strike operations and are exposed to weapon effects often in more close-up detail than conventional strike aircrew might experience. Although they are removed from physical danger, the emotional and psychological effects can be profound.

The second point I would make is that the current use of UAS has largely been in counterinsurgency or counter terrorism operations. In these circumstances any nation's major weapons systems—such as tanks, artillery, and strike aircraft—can appear 'unfair'. The Chief of Air Force has a moral obligation to the people of Australia to safeguard, as best he can, the men and women he commits to conflict. If that means obtaining a capability that increases the protection of our soldiers, sailors and airmen then the Chief of Air Force would be short sighted not to consider such a system. War is not a sporting contest where the fairness of a level playing field is sought.

Advances in military technology have always sought to maximise operational and tactical advantages. Mankind has historically sought to distance, or remote, himself from activities that are dull, dangerous or dirty. You could look as far back as the invention of the spear. Either thrown or held, the spear provides separation from your adversary. As time progressed, there followed the bow and arrow, rifles/cannons and finally rockets and missiles, each progressively able to deliver an effect further, and with greater accuracy; and, each providing further separation of the shooter from the target. This is why we have acquired precision weapons such as JDAM and JASSM.

It is why we are looking to acquire a long endurance UAS and it is why we have acquired the Super Hornet, and in the future, the Growler and JSF. We will always strive to maximise the desired effect while minimising the risk to our forces. This is the nature of military operations.

## **Armed UAS Operations**

Let us now consider how an armed UAS might affect the four major roles of air power that Air Force currently delivers.

### ***ISR***

Perhaps the air power role most influenced by the use of UAS is Intelligence, Surveillance and Reconnaissance (ISR). This is where Air Force has started to exploit the benefits of unmanned operations and is a future growth area. The introduction of the Heron was a huge step forward. It heralded a transformation in the delivery of Australian air power and has been a catalyst for a cultural shift in our approach to the delivery of ISR. Heron allowed us to provide persistent ISR. As a consequence, persistent pattern of life surveillance is now available and has been essential in identifying and tracking the activities of our enemy, while also reducing collateral damage.

In other words, persistence allows a greater ability to ensure distinction, and therefore lower the chances of civilian casualties. Persistence has contributed to the counter-IED mission by enabling us to detect changes over time, reducing the exposure of our ground forces to IED threats. UAS permit the persistent overwatch of patrols and convoys, providing earlier warning of potential threats as well as reducing response times.

These factors have resulted in requests for UAS support from ground forces increasing almost exponentially. Increased persistence also allows more time to monitor communication and electronic transmissions. This

increased ability to monitor transmissions over time improves the fidelity of our intelligence. However, perhaps one of the most prolific changes we will see in Air Force ISR will be in the maritime environment. The introduction of the Triton maritime UAS, or an equivalent, will change the way we do maritime surveillance.

With an endurance of up to 40 hours, we will be able to surveil more ocean more often. We will be able to provide surveillance overwatch of maritime task forces for periods far longer than previously able. In concert with the P-8 it will provide a maritime response capability exceeding what we are capable of today. A further advantage grown out of UAS ISR operations has been the development of armed “hunter-killer” such as the General Atomics MQ-9 Reaper. The arming of an ISR platform has done more to realise the potential of time sensitive targeting than any other development.

The sensor, weapons and human command element are combined in the same system and a rapid kinetic response to the detection of an authorised target is available immediately. The normal chain of events required to authorise and execute the engagement of the target in compliance with LOAC and ROE is still followed, but in a highly compressed timeframe.

### ***Strike***

Ladies and Gents, the 2013 White Paper made it very clear that Defence would further expand the roles played by unmanned aircraft to possibly include interdiction and close air support, subject to policy development and Government consideration. At the end of World War I Sir John Monash wrote: ‘the true role of infantry was not to expend itself upon heroic physical effort, not to wither away under merciless machine-gun fire, not to impale itself on hostile bayonets, but on the contrary, to advance under the maximum possible protection of the maximum possible array of mechanical resources, in the form of guns, machine-guns, tanks, mortars and aeroplanes; to advance with as little impediment as possible; to be relieved as far as possible of the obligation to fight their way forward.’

I agree with the sentiments within this statement and believe our ground forces deserve the best support we can provide. Our troops on the ground in Afghanistan have benefitted immensely from the presence of armed UAS provided by other nations. The persistent overwatch, combined with the ability to prosecute a clearly identified target with precision, has saved many lives. The introduction of an armed UAS into Australian service will allow us to deliver the whole package of UAS close air support effects to Army and add to our capabilities in the wider strike role. In my opinion I believe the argument for Australia to acquire an armed UAS for the strike role will be a convincing one.

### ***Control of the Air***

A prime reason for air forces to exist is to control the air in support of national security. UAS advances in this role are aimed at delivering a specialised RPA platform; the unmanned combat air vehicle orUCAV. Progress in this area is still at the technology demonstrator stage, but rapid change has been the trend. The American X-47B flew off, and landed on an underway aircraft carrier last year and is designed to be a subsonic, stealthy strike aircraft designed to survive in a contested environment. While the indicators are there, achieving the dual goal of being both affordable and capable will take some time.

### ***Mobility***

The final air power role is air mobility. New capabilities are being developed and while most are at the technology demonstrator stage; the Kaman K-Max helicopter has been used in Afghanistan to deliver cargo to forward bases avoiding the threat from IEDs. Israel is testing a UAS ambulance, the AirMule that is aiming to have battlefield casualties delivered to a medical facility within the ‘golden hour’. Whilst these are in development, I see the C-17A, C-130J and C-27J as continuing to provide our air mobility solution well into the future as the UAS options evolve. For the movement of personnel I think a major cultural evolution or revolution will be required by passengers before they accept a crewless aircraft. This may occur in the future but is unlikely in the timeframe we are looking at.

## **Conclusion**

In closing, I want to reiterate a couple of important points. The potential introduction into Australian service of an armed UAS will not change in any way Australia's compliance with LOAC or the ROE that flow from them and are approved by government. As with all weapons systems we consider, we will closely examine the advantages, vulnerabilities, and costs before we make the decision to field them. However, the potential for armed UAS to preserve Australian lives, enhance precision and reduce collateral damage, are significant benefits that must be considered.

Thank you for the opportunity.