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The operational role of the Heron remotely-piloted aircraft in the Royal Australian Air Force

an address to the Institute on 27 August 2013 by

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Remotely-piloted aircraft (RPAs), also referred to as unmanned aerial vehicles (UAVs) and more unacceptably in the media realm as 'drones', have revolutionised aerial warfare in the 21st century. John Jenkins describes one such system, the Heron RPA system, which is used by the Royal Australian Air Force in Afghanistan for intelligence gathering, reconnaissance, and surveillance. It does not carry weapons.

Key words: unmanned aerial systems; unmanned aerial vehicles; remotely-piloted aircraft; Heron; Australia; Afghanistan; Project Nankeen.

On 11 September 2001, civilian airliners flown by terrorists destroyed the World Trade Centre in New York and part of a wing of the Pentagon in Washington. It was the worst single terrorist attack in history and nearly 3000 innocent victims lost their lives resulting in the United States responding by declaring a 'war on terror'. Australian forces have participated in these operations, and will remain operating in Afghanistan until 2014. Unmanned aerial systems have played a major part in those operations and continue to do so.

In this paper, I shall expand on the nature of unmanned aerial systems and then outline the operational roles and tasking of the Heron RPA, the unmanned aerial system with which my flight, No. 5 Flight, Royal Australian Air Force, is equipped and have been flying in Afghanistan since 2009.

Unmanned Aerial Systems

Unmanned aerial reconnaissance is not a new idea. Pigeons, for example, were used with cameras strapped to their chests in the early 20th century. Hopefully, though, we have made a few improvements since then. There are a number of components or subsystems within an unmanned aerial system (UAS), each of which is inevitably referred to usually by way of a three-letter acronym:

- remotely-piloted aircraft (RPA);
- ground datalink terminal (GDT);
- ground control station (GCS) – in effect, the aircraft's cockpit; and
- ground mission station (GMS) – the intelligence centre which controls the mission.

Other terms frequently used to describe a remotely-piloted aircraft include: unmanned aerial vehicle (UAV); and unmanned air combat vehicle (UACV). The remote pilot is usually referred to as the air vehicle operator (AVO); and his counterpart, the navigator/weapons system operator, as the payload operator (PO).

Tier classification

Remotely-piloted aircraft are classified on the basis of weight, endurance and altitude:

- Tier 0 – micro;
- Tier I – low altitude and long endurance;
- Tier II – medium altitude and long endurance (MALE), such as the Heron, Predator and Reaper;
- Tier II+/III – high altitude and long endurance (HALE), such as the Global Hawk.

As an example, the MQ9 Reaper (or Predator B) has a wingspan of 66 feet (20 metres), a length of 36 feet (11 metres) and a gross weight of 10,000 pounds (4.54 tonnes). Its maximum speed is 250 knots; and its endurance is 24 hours without weapons and 17 hours combat loaded. It currently flies for about 14 hours on operations at an altitude of 20,000 to 25,000 feet (6100 – 7600 metres) with weapons, or 50,000 feet (15,250 metres) without weapons. It can be armed with two GBU-12 Laser-Guided Bombs and four Hellfire missiles.

A Reaper medium altitude, long range, remotely-piloted aircraft [Photo: Department of Defence]

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Heron Remotely-Piloted Aircraft

The Australian Defence Force operates three unmanned aerial systems, the Heron (Air Force), the Shadow (Army), and the Scan Eagle (Navy), none of which carries weapons.

To meet an urgent operational requirement for a high-resolution intelligence, surveillance and reconnaissance capability in Afghanistan, Project Nankeen was undertaken by the Australian Defence Force beginning in 2009 to rapidly acquire a medium altitude, long endurance, unmanned aerial system. The Heron unmanned aerial system as already used by the Canadians in Afghanistan was selected. The Defence Materiel Organisation signed a contract with Canadian company MacDonald, Dettwiler and Associates Ltd. to lease Heron services built by Israeli Aircraft Industries.

Australian Air Force and Army personnel undertook training in both Canada and Afghanistan thereby enabling Australia to rapidly establish its own stand-alone Heron capability at Kandahar airfield in Afghanistan adjacent to the Canadian Heron detachment. France and Germany also operate Herons in Afghanistan in the same intelligence-surveillance-reconnaissance role. Other nations that operate Herons include Israel, India, Turkey, Brazil and Ecuador, as well as the United States Navy.

The Heron system, as Australia has it configured, is designed to undertake intelligence, surveillance and reconnaissance operations. It has full-motion video, electro-optics (TV) and infra-red optics viewing systems.

A Heron detachment consists of some 35 air force, army and navy personnel consisting of: the RPA mission crew; intelligence officers; imagery analysts; intelligence analysts; and operations, maintenance, administration and logistics personnel.

It is important to understand that a Heron is an aircraft – not an oversized radio-controlled toy. It weighs one tonne, has a wing span of 16.6 meters; a length of 8.5 meters; its engine is a Rotax 914F3 (piston) of 115 horsepower; its operational ceiling is 30,000 feet (10,000metres); its endurance time is 20 – 30 hours; its range of operation is in excess of 200 km; and its maximum airspeed is 110 knots (200 km/h ground speed).

A Heron medium altitude, long range, remotely-piloted aircraft
[Photo: Department of Defence]

The Heron system has four main components:

- the remotely-piloted aircraft itself, which normally comes with a long-range electro-optic payload, but various optional payloads are also available, and includes an auto-land system;
- a ground control station;
- a ground mission station; and
- a ground data terminal.

The Heron system is designed for line-of-sight operations, with the aircraft in direct communication via datalink with the ground data terminal and with any rover real-time video equipment deployed with 'force elements' (*e.g.* troops) in the field. The rover element and the ground control station also have direct links to navigation satellites; and there is direct intercommunication between the two ground stations and between them and the ground data terminal.

The main Heron payload is described as a multi-mission optronic stabilised payload (MOSP) – an electro-optic long-range system. This has three components: an electro-optical sensor for daytime surveillance; an infra-red night-time sensor; and an infra-red laser pointer.

The ground control station is staffed by the air vehicle operator (pilot) and the payload operator (navigator) each of whom sits at an operator's console. The ground mission station has a core crew of three consisting of an intelligence-surveillance-reconnaissance officer, and a couple of geospatial imagery analysts. There may also be several other intelligence analysts in the mission station.

A Heron ground control station, which is staffed by an air vehicle operator (pilot) and a payload operator (navigator)
[Photo: Department of Defence]

Operational roles

Most Heron operations in Afghanistan have involved intelligence gathering, which falls into four main types of operation: assessment of so-called 'pattern-of-life' surveillance to establish the normal pattern of life in the area under surveillance and to look for any departures from the usual pattern; overwatch of friendly forces during operations; direct support of

forces on operations; and tasks specifically requested by a commander.

There are several factors which impact on the planning and conduct of such tasks, especially the weather at the time and the availability of airspace in what can be a crowded sky during operations. Deconfliction, which is the process of avoiding mutual interference, or outright hazards, among systems under the control of one's own side, is always an issue requiring careful management. Another is the possible loss of the datalink to the aircraft or the satellite, but in 16,000 flying hours in Afghanistan to date, No. 5 Flight has not experienced such a loss, as is the case across many other Heron operators. The design of the human-machine interface is another factor; and the experience of the ground operators also has to be considered. No. 5 Flight tends to use fixed-wing pilots from the Royal Australian Air Force, Australian Army or Royal Australian Navy as air vehicle operators; although the Canadians tend to use a mix of navigators and pilots. As payload operators (sensor operators), we tend to select people on the basis of experience and airmanship.

A Heron ground mission station, which is staffed by an intelligence-surveillance-reconnaissance officer, and two geospatial imagery analysts
[Photo: Department of Defence]

The two ground control station crew members drive the remotely-piloted aircraft and its sensors, optimising their output. They also manage the datalink and communications with 'force elements' (*e.g.* troops) in the field. The ground mission station crew members undertake: full-motion video imagery analysis; intelligence, surveillance and reconnaissance effect analysis; post-mission reporting; and intelligence mapping.

Tasking of the remotely-piloted aircraft can be reactive to events as they unfold, with intelligence gathering tasks queued and prioritised, although the aircraft's relocation can be subject to airspace availability. It is imperative that the Heron crews are well versed in rapidly re-tasking in order to move the remotely-piloted aircraft and get 'Eyes on ASAP' in a dynamic environment – for instance when responding to a critical incident.

Conclusion

The Heron unmanned aerial system is leading edge technology that is operationally proven and provides Australia with an essential capability on the modern battlefield. It allows the Australian Defence Force to develop its skills and knowledge of a nascent war-fighting capability that will inevitably become a significant part of future operations as demonstrated by the tremendous proliferation of unmanned aerial systems over the last few years.

Air power of the future will involve a balance of manned and unmanned platforms. In particular, long endurance, unmanned aerial vehicles can enhance force protection by providing ground commanders with real-time intelligence. The experience that the Royal Australian Air Force is gaining in operating long-endurance Heron remotely-piloted aircraft in Afghanistan will help shape the development of unmanned Defence capabilities for Australia through the next decade.

The Author: Squadron Leader John Jenkins joined the Royal Air Force as a navigator in 1989 and completed officer training at RAF College Cranwell. On graduation from the School of Air Navigation, he was posted to fast jet streaming. In 1991 he undertook Tornado GR1 Fighter operational conversion training before undertaking three operational tours in Germany on No. 17 (Fighter) Squadron, No. 31 (Bomber) Squadron and No. IX (Bomber) Squadron. During this period he became a qualified weapons instructor and saw the introduction into service of the Tornado GR4 and completed seven operational deployments to Iraq, including Operation Desert Fox, and flew on Kosovo War operations into Serbia from Germany. In 2000, he completed two exchange tours to the Royal Saudi Air Force developing their inaugural Fighter Weapons Top-Gun School and also serving as a Tornado operational conversion unit flying instructor.

In 2009 he transferred to the Royal Australian Air Force. He was initially posted as an air combat officer instructor at the School of Air Warfare and then was selected for Heron unmanned aerial system training. In 2010, he deployed to Afghanistan on operations and was awarded an Air Component Commander's Commendation for leadership and tactics development. On return, he was posted to No. 5 Flight (Heron), and deployed to Afghanistan again in 2012 as Executive Officer of the Heron detachment. His unit was awarded an Air Component Commander's Commendation and he was awarded an Air Commander Australia Silver Commendation for the development of the Heron operational training system and for project managing the Heron capability in Afghanistan. [Photo of Squadron Leader Jenkins: Department of Defence]