



FUTURE CHALLENGES FOR REMOTELY PILOTED AIRCRAFT

Given their special capabilities, UAV sensors can identify an object, when sensors on a satellite can only spot it. However, UAVs have great disadvantages. Because they violate airspace, they can create political problems when flown in other than wartime circumstances. UAVs are manpower intensive to operate...Unlike stealth aircraft, UAVs are useless if not communicating.

Martin C. Libicki

Senior management Scientist, RAND Corporation, 1996

Over the past few decades remotely piloted aircraft (RPAs)—also referred to as uninhabited aerial vehicles (UAVs) or remotely piloted vehicles (RPVs)—have become an indispensable and often critical element in the employment of air power. As a result, most modern air forces now consider RPAs a priority capability for further development and integration into broader concepts of operations. The advantages that RPAs bring to operations have been articulated a number of times and are not in question. However, as the character of air operations continues to evolve, issues on the optimal employment of RPAs are coming to the fore. These challenges have to be carefully analysed if the full capabilities of these versatile vehicles are to be realised.

A major challenge that faces RPAs is an existentialist threat brought about by the proliferation of surface-to-air weapon systems. In the contemporary operational environment most forces, including non-state entities, are able to acquire air defence missiles of varying sophistication, all of which have the potential to be extremely effective. The non-traditional adversary also perceives RPAs as the primary threat to their uninhibited operations because of the intelligence, surveillance and reconnaissance (ISR) capabilities that the RPAs possess. It is only natural that insurgents and other non-state entities consider the RPAs as priority targets. The outcome is that even though conventional forces obtain and maintain control of the air in the traditional mode, an RPA's freedom of operations will become more contested and their survivability less assured. While RPAs will continue to be treasured for their surveillance capability, as well as a strike capability in irregular warfare, their

ability to function freely in high-intensity operations and in contested airspace is less certain.

The future of RPAs will be significantly influenced by the assessment of its survivability in contested air spaces and the technological and conceptual developments that will improve its effectiveness. This challenge is further complicated by the extraordinary budget constraints

being faced by all the major military forces of the world. There are two questions that emerge from this challenge. First, whether or not RPAs will be able to penetrate and survive a hostile environment without diluting their primary characteristic of being uninhabited, which made them attractive in the first place. Second, if they have to be made survivable, would the technologies required to ensure survivability make them far too expensive to be



MALAT Heron RPV - ACS Maritime Trials off Weipa.

allowed to operate in contested air spaces where there is a significantly higher probability of loss? In both cases, if the answer is not in favour of the RPAs, the inherent advantages of employing them become greatly diluted.

In little more than a decade, RPAs have become ubiquitous and have been exploited across all levels of conflict—strategic, operational and tactical. To an extent they have become synonymous with the operations of the Western forces in all contexts. This increased usage was the result of a greater focus on irregular warfare, as well as the technological developments that made RPAs much more effective. But perhaps most importantly, RPA operations have been able to operate almost uninhibited in the permissive airspace of the Iraq and Afghanistan theatres of operations, where the bulk of Western operations have taken place within the past decade.

There has, however, been another conceptual development because of these operations—an unrealistically high expectation in the Western forces that control of the air will never have to be contested. In turn this has allowed operations to become highly reliant on the exploitation of effects available from even basic RPAs. Any challenge to friendly control of the air will have far greater impact on one's own operational efficacy than is currently being accepted or even considered in the planning stage.

The status of RPAs after operations wind down in Afghanistan will depend on the threat scenarios the joint force will face in the future. RPAs will be operated by all arms of the military, with the type of RPA determined by the operational or tactical effect desired by the user. RPAs will form part of the Air Force order of battle and operated to create effects across all roles of air power. But requirements for RPA employment in contested airspace will drive the joint concept of operations along a significantly different path than witnessed during the Iraq/Afghanistan conflicts.

Another important aspect that will have significant impact on the future of RPAs is the question, and associated debate, regarding the employment of armed RPAs like the MQ-1 Predator and MQ-9 Reaper. It should be remembered that while the platform is unmanned, the decision-making and execution commands are all human based. The use of armed RPAs has increased in the Afghanistan theatre but their autonomy in actual operations is greatly restricted. The question commonly raised is the amount of autonomy that can be given to these systems. Autonomous weapon release is technically feasible on both RPA and manned platforms. However, to ensure decision-making continues with a human-in-the-loop, it is unlikely that complete autonomy will be granted.

The actual control of the RPA rests solely with a human being, albeit operating from a remote location on the ground. Advances in technology can permit automation to a very high degree, allowing the controller of the RPA to monitor the progress of the aircraft during a pre-programmed flight—just like a pilot would do in a manned aircraft on autopilot. Equally, the controller can 'fly' the RPA with the use of controls located in a remotely positioned mission station.

Irrespective of the method of control adopted, the cultural issues of physically flying versus remotely flying RPAs must be addressed. A number of air forces report a cultural disconnect between the established 'pilot culture' of traditional air forces and those of the RPA operators. Part of this issue abates as an air force matures in its RPA

operation, but this dichotomy needs to be addressed if the RPAs are to develop further.

The challenges facing the continued evolution of RPA operations in contested airspaces brings into focus the primary role of air forces—to obtain and maintain the necessary level of control of the air. Air superiority missions, necessary to achieve this, will continue to have to be given priority and are even more critical than before for two reasons. First, potential adversaries have closed the technology gap, especially in air defences, and are now capable of contesting control of the air even if in a limited manner and delineated in time and space. Second, the reliance on RPAs for the efficient conduct of the ISR role will require their survivability in a contested environment; therefore air superiority will be critical to the success of joint campaigns.



RQ-4 Global Hawk

Alongside their persistence, RPAs provide an acceptable means to carry out missions where the risk to a manned platform would be high. However, adopting this concept of employment is predicated on a cost-effective and readily replaceable capability. This can be achieved either by ensuring that losses are kept to a minimum, or by reducing the technological sophistication of the RPAs to minimise their per-unit cost. This is a fragile balance between cost-effectiveness and capability requirement. Any imbalance in this delicate equilibrium will be detrimental to the efficacy of RPAs in future conflicts.

Key Points

- *RPAs provide critical capabilities to a modern military force*
- *Their efficiency is likely to reduce if employed in contested airspaces*
- *A delicate balance has to be maintained between cost-effectiveness and capability if RPAs have to continue to be a crucial element in conflicts*



Air Power Development Centre

TCC-3, PO Box 7935, Department of Defence
CANBERRA BC ACT 2610

Ph: 02 6266 1355 Fax: 02 6266 1041

Email: airpower@defence.gov.au

Web: www.airforce.gov.au/airpower

