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NEXT GENERATION UNMANNED AERIAL VEHICLES

Our conviction is that the next generation of UAVs absolutely has to have some form of stealth capability or survivability capability in order to be useful across a wide range of operational scenarios.

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There has been an unprecedented proliferation of Unmanned Aerial Vehicles (UAVs) in the past two decades and a commensurate increase in their employment both in conflict and non-conflict situations. While the legal and moral aspects of using these vehicles in their armed incarnation are hotly debated topics, the fact that they have become ubiquitous within the air power construct is fully accepted by all. However, UAVs continue to have their detractors and doubters although their usefulness and advantages have been clearly demonstrated in both the Afghanistan and Iraq conflicts. Since the advantages they bring are so much more than the few issues in their employment, they are unlikely to be made redundant by air forces around the world. Therefore, development of UAVs with improved capabilities is being pursued with vigour by a number of design and manufacturing units, with the tacit and often overt support of a number of military forces.

The development of UAVs has reached a critical point, not in terms of technologies that provide ever-expanding capabilities, but in terms of the resource availability to continue the process of cutting-edge development. The decision regarding the future of UAVs will hinge on two interconnected factors. First, the inclination and ability of leading military forces to financially support the research and development; and second, the willingness of the industry to keep pace with the military demands, even when only an outline capability requirement is made available. Industry by itself is unable, or more likely unwilling, to initiate bold and innovative steps to go beyond the proverbial envelope in developing UAVs with quantum improvement in capabilities. Only a well-constructed defence-industry partnership will create UAVs that will change the fundamental conduct of conflicts.

The fundamental change in thinking about UAVs within most military forces is that they are now being considered mission systems as opposed to airborne platforms. Therefore, the question being asked and debated is primarily about the mission that it can perform rather than about the performance of the UAV. This has in turn led to UAVs being loaded with more high technology sensors and systems that diversify their capabilities and provide a broader spectrum of capabilities that can, when required, be narrowed to achieve focused application of the desired capability.

J-UCAS Boeing X-45A UCAV technology demonstrator (Source: NASA/Dryden Flight Research Center/Jim Ross)

From a military perspective, UAVs have, until now, been employed in benign airspace environments where they have not faced any serious threat to their safety. Secondly, so far they have also not faced any threat from concerted electronic attack. However, Iran claimed that they were able to 'hijack' and down the clandestine, and then cutting-edge, RQ-170 Sentinel in the desert near Afghanistan in December 2011. If this was indeed the case, then a considerable amount of work needs to be done to secure UAVs from such attacks. Further, next generation UAVs will have to embed the capability to operate in contested and high-threat environments.

Any future conflict scenario will most likely be much more demanding in terms of the air environment in relation to that encountered in both Afghanistan and Iraq in recent times. In a crisis, say for example in the South China Sea, the current generation of UAVs would not have much utility and more importantly would not

survive for very long. Survivability therefore has already become a key issue in the development of UAVs. This would mean operating at faster speeds and incorporating sophisticated self-protection sensors within the platform. The downside would be that UAVs, that started life as cheap alternatives to manned platforms, would not be 'affordable throwaways' any longer. In fact, the more sophisticated UAVs in operation today cannot be considered cheap by any standards. The balance between cost effectiveness and mission competency is gradually getting skewed.

Another aspect that is engaging design engineers and operators is the need to address the ability of UAVs to self-deploy into theatre. This means that UAVs will have to transit across international airspace within the existing, or slightly modified, airspace control system. Since airspace control is intimately connected to civil and commercial air activities, this may yet prove to be a sticking point in the future development of UAVs. Purely from a military point of view, self-deployment capabilities would be a much-desired step-change in UAV operating concepts. It would provide the force with a capability that does not leave any footprint in hostile or even friendly neighbouring countries. The concept of 'global reach' would take on a different meaning.

There is no doubt that UAVs have become the preferred systems to acquire intelligence, surveillance, and reconnaissance from the air. In the near-term future UAVs will grow into the realm of electronic warfare (EW) with immense consequences for the way in which the first day of war operations are conducted. There has been a great deal of discussion regarding UAVs being highly suitable for the 'dull and dirty' missions. The dirty in this context are highly necessary (but also highly dangerous) missions like suppression of enemy air defences at the commencement of any operation. The combination of EW and strike capabilities embedded in the same platform would make it a formidable system that could achieve mission objectives with a substantially higher probability of success than even with the most sophisticated systems that are available today.

UAVs already possess highly efficient strike capabilities and the next generation vehicles will gradually incorporate the ability to interoperate with manned aircraft in combined operations. From the segregated environments in which these two operate, the next generation UAVs will be able to function in a more integrated and synergised manner with their manned counterparts.

The emphasis for UAV development so far has been endurance. However, future systems would need to be able to transit rapidly to and through an area of operation, necessitating the integration of larger and more powerful engines. This will also underpin its ability to undertake combined missions with faster manned aircraft and systems. Another aspect that is considered both a boon and a bane is the issue of autonomy. Improvements in this area are definitely in the pipeline, but at least at present there is very little appetite for handing over significantly more responsibility for mission control to the system itself.

The imperatives for the next generation UAVs are clear: they need to be stealthy with high performance engines and advanced payloads; they require a quantum change in computing and communications capabilities to ensure on-board processing; and, they need to retain the flexibility to change the payload as required in an operating environment.

Northrop Grumman X-47A Pegasus
(Source: Northrop Grumman)

Key Points

- *UAVs have become a crucial element within the capability-spectrum of most military forces.*
- *UAVs have become technologically more sophisticated and therefore more expensive to acquire, maintain and operate.*
- *The next generation UAVs will need to be stealthy, faster and more flexible for them to be effective systems in contested environments.*

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