



### ***UAVs are Set to Mature***

*CC-Air-Izmir Wg Cdr J M Paige GBR AF*

Current and emerging UAV applications have the benefit of past technology; it has taken the aircraft industry over 100 years to get where it is today and whilst UAVs were used as far back as the Vietnam war and the invasion of the Lebanon by Israel, their role has remained remarkably

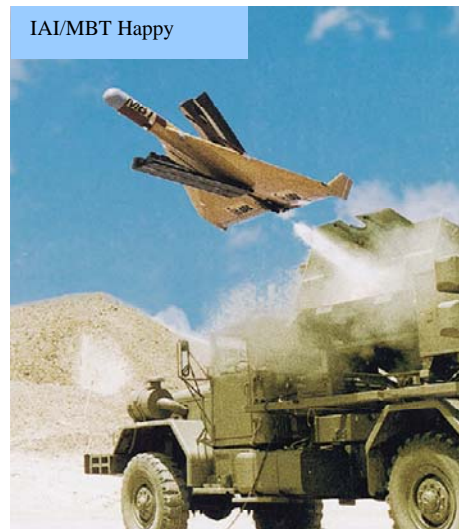


A Teledyne Ryan Aeronautical Model 147SC Special Purpose Aircraft just after launch from a DC-130 on a mission over Vietnam

unchanged. Even now UAVs are employed in only a few of the roles that manned aircraft enjoy so there is considerable potential for the future. And now their future development is certain; they provide such essential capabilities, at such low risk in terms of ‘friendly’ human life, that they have become a very potent weapon in the arsenal of any commander fortunate enough to have them available. However, whilst the increasing diversity of capabilities that they provide means the future for UAVs is certain, the way in which UAVs could be employed is not.

The issue of current and future roles for UAVs is giving military planners and tacticians around the globe a significant headache. Earlier ethos for employment of UAVs purely in the reconnaissance role was short lived. More recently, rapid progress in technology and changes in doctrine have meant that increasingly UAVs are being sent into battle.

Both UAV and weapon capabilities have improved to a point where the accurate and timely delivery of munitions can be relied upon and the role of the UAV has widened. The basic concept for most of the UAVs currently in use was to place an unmanned Intelligence Surveillance Reconnaissance (ISR) platform in the air. However, the armed UAV has recently demonstrated its potency to great effect whilst employed in Iraq,



IAI/MBT Happy

Afghanistan and Yemen. Now, the demand for platforms designed specifically to take on one or more of the multiplicity of other specialist roles is increasing. The UAV has been developed

further and mission or role specific platforms already include the IAI/MBT Harpy and Electronic Warfare (EW) decoys, such as Sampson “Towed Air Launched Decoy” (TALD), designed for the Suppression of Enemy Air Defence (SEAD) role.

It is estimated that of all the future missions identified for UAVs almost a quarter will be for weapons delivery in either theatre air and missile defence, SEAD, strike and anti-submarine warfare: the future for the Unmanned Combat Aerial Vehicle (UCAV) has just begun.

However, as advancing technology spirals, giving way to increased autonomy, better sensors and more accurate navigation and the demands of the user increase with better understanding of mission capability and CONOPS, there are far more exciting developments on the horizon.

We have seen a considerable change in the nature of the threat in our most recent major operations and the pursuit of the asymmetric terrorist and insurgent has developed an insatiable appetite for persistent ISR. In Enduring Freedom and Iraqi Freedom the need for an agile platform to provide mobile, low altitude, real-time video streaming with multiple target tracking emerged. This is a perfect niche for UAVs and were any such vehicle to be developed further, giving the vehicle the ability to deliver weapons to allow for immediate engagement of targets, the potential for close convoy support and combat support is obvious. The challenge now is to bring the support that UAVs currently offer more inline with the needs of the troops on the ground or at sea and those of the airmen in the air; this will ensure that platforms can take on a more timely and active role in combat.

Before this can happen, UAVs need to become more adept in a number of spheres. The sort of 'fire and forget' development that some of our missiles underwent in recent decades is equally appropriate for UAV development; what if we could send up a 'smart' platform that could undertake its basic mission without input from the ground? This would establish the need for UAVs to self navigate and for the process for operating UAVs to be simplified. For now at least, there may still be a need to make mission and control input from time to time, but as technology improves and software is developed there may come a time when UAVs could be relied upon to interact with other unmanned (and indeed manned) vehicles (land, sea and air), re-prioritise missions and react to their environment to enable them to complete entire sorties within a dynamic battlespace.

Work on this is well underway at the Unmanned Autonomous Collaborative Operation (UACO) programme. This US Army research and development project aims to advance UAVs in precisely the sort of areas that would bring us closer to realising this ambitious goal. The programme focuses on achieving high levels of autonomy and inter-vehicular (air as well as ground) collaboration, which it breaks down into 7 behaviours:

- See (or rather sense) and Avoid – collision and obstacle avoidance.
- Avenge kill and team protection.
- Co-operative reconnaissance/security.
- Team compensation for component failure communications links.
- Surveillance of several urban moving targets
- The establishment of multiple optimum observation points.

With this kind of development now well underway the sky, as they say, is the limit! Eventually, it is hoped, UAVs will be able to respond to the needs of the warfighter, to team-up with their manned counterparts and operate within the full spectrum of roles. UAVs will create a high resolution, three-dimensional map of the terrain as they go, which will help them to self-navigate, avoid the ground and locate targets with precision, all without human input.

Their 'sense and avoid' will ensure they do not impact other flying vehicles; they will be in data-link and satellite contact with other manned vehicles, unmanned vehicles and with troops on the ground; they will provide convoys with a multiplicity of information and react automatically to threats; monitoring systems will keep track of the teams, update progress and make adjustments as necessary to ensure the assigned tasks are completed. Thus, UAVs will be able to respond to the needs of the warfighter and to team-up with their manned counterparts and operate within the full spectrum of roles. And if you need a cup of tea .....!

## It's only just begun

The first unmanned system developed specifically for combat operations, the X-45 is an unmanned, independent, highly adaptive aircraft that combines fighter bombing, reconnaissance, surveillance and intelligence gathering into a single combat system. As an autonomous combat air vehicle it flies high-risk operational missions and delivers precision weapons on target. Controlled via either line-of-sight or satellite communications, the X-45C is highly adaptable to changing battle conditions and can provide 24/7 electronic attack, reconnaissance, surveillance and intelligence gathering as well as engage in deep strikes (4,500 lb payload) to complement manned fighter and bomber forces.

## Future Developments

Weapons delivery systems are also enjoying a period of boom as demand has ballooned but as the average UAV is small and light compared to its manned counterpart so the mass of any delivery system must be kept to a minimum. Recent trends, which have come about as a consequence of increased weapon accuracy and the desire to reduce collateral damage, have been to use smaller munitions but mixed weapon types. Today's weapons carriers must be light and developed for the unmanned release of weapons such as Hellfire, 500lb JDAM, Viper Strike and the small diameter Paveway bomb; tomorrow's weapons carrier will be developed for the sub-500 lb munition and lightweight stores.

The US Army is looking to develop 2 mid-sized UAVs for an ambitious modernization programme and 3 companies were awarded contracts and will submit proposals. The winner will compete against the US Defence Advanced Research Projects Agency.

The US Navy has taken delivery of 2 RQ-4A Global Hawk Maritime Demonstration UAVs, significantly modified from their original air force configuration, and is currently developing concepts of operation, tactics, techniques, and procedures for UAVs to begin their cultural integration into the fleet; there are currently 6 follow-on Global Hawks in various stages of production. The first US Navy Global Hawk flew in October 2004.

The KillerBee (KB) Unmanned Aerial System (UAS) is a family of scalable, long endurance, runway independent Reconnaissance Surveillance and Target Acquisition platforms designed to meet the demand for a low cost, organic UAS. Currently under development, the first KB models will be fielded for initial operational use in early 2006. The blended wing body shape offers low acoustic, visual and radar observability characteristics as well as a large bay capable of accepting modular payloads. These include EO, IR and SAR sensors with optional IR pointer, laser range finder or designator as needed to meet mission requirements. Now, as advancements have been made there is an ever-increasing support for the concept of utilizing UAVs alongside manned vehicles. (Northrop Grumman)

## Civil Use

As reliability and other safety considerations are tackled and solved, the diversity of applications across a range of civil applications becomes increasingly realistic. The need to place sensors in the air is constantly growing as the potential advantages for police forces, Customs, event organisers, and surveyors are realised. Furthermore, development for more diverse applications such as virtual reality and augmented reality development, infrastructure and natural resource management, environmental monitoring and precision agriculture are now receiving significant financial backing.

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