Air & SpaceEurope

Unmanned Air Vehicles – Coming of Age at Last

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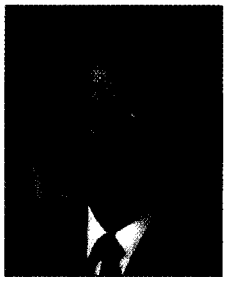
After several decades of tantalizing but unfulfilled promise, the age of UAVs has finally arrived. Unmanned vehicles will play an increasing role in future Surveillance and Reconnaissance. They may also fill a crucial gap in tactical and theater communications architecture.



Rear Admiral Robert M. Nutwell,
US Deputy Assistant Secretary of Defense.

On 10-11 June 1999, just prior to Le Bourget Air Show, 'UV'99', the seventh International Unmanned Vehicles Event, organized by Shephard took place in Paris. The present article is the text of the speech delivered by Rear Admiral Robert M. Nutwell, US Deputy Assistant Secretary of Defense (DASD) for C3ISR and Space Systems.

Good morning. I appreciate the opportunity to speak to this important conference. As the Department of Defense official responsible for overseeing the development of new capabilities for surveillance and reconnaissance (S&R) and for communications, I have a keen interest in unmanned air vehicles (UAVs) because of their great potential to contribute to these mission areas. After several decades of tantalizing but unfulfilled promise, I believe that the age of UAVs has finally arrived. Unmanned vehicles will play an increasingly important role in future S&R, eventually assuming much of the airborne mission from manned aircraft and providing an essential complement to space-based collection systems. They may also fill a crucial gap in our tactical and theater communications architecture.

A new age in reconnaissance is dawning

NATO Operation Allied Force in Yugoslavia has demonstrated that a new age in reconnaissance is in fact dawning. For the first time in warfare, commanders at all levels have had nearly continuous, real-time visibility of at least portions of the battlefield through the optical and video sensors carried on the U.S. Predator and Hunter UAVs. These sensors, employed in conjunction with synthetic aperture radar, moving target indicator, still imagery, and signals intelligence from other airborne and space-based platforms, have produced greatly enhanced battlespace awareness and enabled the near-real-time targeting necessary to destroy mobile battlefield targets. The UAVs can also provide on-the-spot battle damage assessment.

The video from Predator and Hunter is distributed throughout the theater in near-real-time via satellite communications.

Contribution to battlespace awareness

UAVs from Allied nations have also contributed to battlespace awareness in Kosovo. In short, UAVs no longer provide a niche capability. They have made themselves indispensable to the commanders in this operation, and we cannot contemplate future combat or other military operations without them.

We are generally happy with the performance of Predator in Allied Force and in previous operations in support of Bosnia peacekeeping. Performance of the sensor package has been excellent, and the vehicle itself has demonstrated improving reliability. The Predator fleet has accumulated over 13000 flight hours, including 2 000 hours of combat in the current operations. Reliability has improved to one mishap per 1 600 flight hours, approaching the goal of one per 2000 hours.

The U.S. Hunter Tactical UAV also is operating in the Balkans and has accumulated over 900 mission hours in combat operations. The Hunters flying in the Balkans are among 62 vehicles produced from a since-canceled technology demonstration program. While there are no plans to procure additional Hunters, we intend to make full use of these vehicles while a follow-on Tactical UAV is developed.

Although there have been some combat losses of the Predator, Hunter, and Allied UAVs, the loss rate so far has been tolerable. The UAV losses remind us of the benefits of performing these high-risk missions with unmanned vehicles.

Current US programs

Despite a mixed record of bringing along UAV programs in the past, I can assure you that the US Department of Defense is committed to exploiting the

great potential of unmanned vehicles for a variety of missions. Let me give you an overview of the current U.S. UAV programs. You'll hear about some of these in more detail from later speakers.
The Israeli-developed Pioneer tactical UAV has been in service with the US Navy and Marine Corps since 1986, and performed well in gunfire direction and surveillance missions during the Gulf War. The Services will retain a Pioneer capability until a follow-on system is fielded. However, we are changing the deployment strategy to a contingency posture following the current deployment onboard USS Ponce in the Mediterranean. The Navy and Marines will each maintain two systems of five aircraft for contingency deployments, and a fifth system will be available for training. In this way the assets will be preserved and funding made available for the follow-on system.

The Predator

The Predator program has transitioned from Navy to Air Force management, and we are bringing this system to full operational capability in a deliberate way. In addition to the two systems in the Balkans, there is one system at El Mirage, California for research and development, and there are two systems at Indian Springs, Nevada, for training. A sixth system is being prepared for deployed operations. We will buy one more Predator system in the year 2000, and then we will buy attrition air vehicles at the rate of seven or eight a year. The vehicles that are flying now are interim configuration versions that have been changed from the original technology demonstration configurations. This fall, Air Combat Command will take delivery of the baseline operational version of Predator, which includes Mode IV IFF, UHF/VHF voice relay, weeping wings for flight in icing conditions, and an improved engine. Older Predator vehicles will be modified to this baseline configuration. I expect that Predator will be the mainstay of our medium-altitude endurance fleet for the foreseeable future, and that we will field successive improvements and perhaps variants for other missions.

The Global Hawk

The Global Hawk advanced concept technology demonstration is proceeding ahead despite the recent mishap, which is still under investigation but appears to have been caused by a spurious flight termination command. The Global Hawk returned to flight on 18 May. It has now completed 13 airworthiness and six sensor payload flights while accumulating over 120 hours of flying time and attaining a maximum altitude of 66 000 feet. It has demonstrated search and spot imagery modes with the EO, IR, and SAR sensors. The Global Hawk system also has been successfully re-tasked in flight, and disseminated its imagery to surface-based exploitation systems.
The military user assessment of Global Hawk will commence this year under the direction of the U.S. Atlantic Command. In anticipation of a successful assessment, we are laying plans to transition Global Hawk to a formal acquisition program. Secretary Cohen has stated his desire to do this as quickly as possible. During the current budget cycle, we will be assessing how much additional development is needed to transition from a demonstration to a fully operational vehicle. Included in this assessment will be the long-term strategy for providing high altitude, long endurance S&R, including, if and when the Global Hawk will replace the U-2.

To penetrate strong air defenses

Dark Star, the companion to Global Hawk in the High Altitude Endurance technology demonstration, was cancelled earlier this year as a result of budgetary pressures and out of concerns for the operational suitability of the vehicle. However, the requirement remains for an air vehicle that can penetrate strong air defenses. A study is underway to determine how that requirement will be met.
On March 17, 1999, the Defense Acquisition Board (DAB) approved the Army's recommendation to proceed with a competitive flyoff for an operational tactical UAV. The resulting system will provide a tactical UAV to support the needs of Army tactical commanders. The vehicles will have a threshold endurance of four hours on station at a threshold radius of 50 kilometers with EO/IR (Electro Optical/Infra Red) sensors. The objective endurance is four hours at 200 kilometers. The initial operational capability is scheduled for 2001.
The other US system under development is the Navy/Marine Corps VTOL (Vertical Take-Off and Landing) UAV. When it became clear that the Outrider would not meet the needs of the maritime services, the Navy staff with Congressional help commenced a program to evaluate off-the-shelf candidates for this mission. Last spring, land-based demonstrations of the Boeing Eagle Eye tilt-rotor and the Bombardier CL-327 were successfully completed. Shipboard demonstrations of these systems will be conducted this year and next. We expect that the Navy and Marines will buy about 50 VTUA (Vertical Take-Off UAV) systems of four vehicles with an initial operational capability in 2003. The required capability includes an endurance of three hours at 110 nautical miles with EO/IR sensors and a laser designator and, of course, vertical takeoff and landing capability.

UAVs: the mainstay of airborne reconnaissance

I believe that unmanned vehicles will become the mainstays of airborne reconnaissance in the future because they offer several crucial advantages over manned aircraft for this mission:

- they reduce aircrew risk;
- they provide longer dwell over the battlefield thus enabling the continuous and overlapping coverage needed for dominant battlespace awareness;
- they are able to overfly targets that cannot be covered from standoff angles and ranges;
- they are the principal source of battlefield video increasingly demanded by commanders for real-time

situational awareness and for acquiring moving/mobile targets;
- finally, UAVs offer the potential of significantly reduced life cycle costs through the elimination of aircrew training and support costs, provided that attrition can be kept low.

Designating moving/mobile targets

The addition of a laser designator will enable the UAV to designate moving/mobile targets for attack by manned aircraft dropping laser-guided bombs. This concept of operations would facilitate target acquisition, permit the aircraft to release their weapons from safer altitudes and distances, and enable attack by aircraft not equipped with designators.

Although UAVs will assume an increasing, share of the S&R mission, manned aircraft will still be needed for the foreseeable future for their rapid response capability and operational flexibility. Also, it is probable that large, high-value airborne sensor platforms will always be manned to provide greater assurance against loss.

Airborne and spaceborne platforms are complementary

We must also consider the future role of UAVs and other aircraft with respect to spaceborne reconnaissance platforms. Spacecraft provide wide geographical coverage and access to regions denied to aircraft, can respond rapidly to missions in different regions, and are invulnerable to conventional countermeasures. Airborne S&R platforms provide under-the-weather coverage, video, dwell for imagery and video, operational flexibility, and the ability to address some regions not covered by overhead assets. In short, airborne and spaceborne reconnaissance platforms complement each other.

Several challenges

Several challenges must be overcome if unmanned vehicles are to realize their promise in the S&R mission.
- Vulnerability to air defenses must be reduced through signature reduction and provision of some self-protection capability against battlefield threats.
- Reliability must be improved, not only to reduce attrition rates and life cycle costs but also to facilitate flight in controlled airspace and over populated areas. Key factors in reliability include: redundant critical components; secure, reliable communication links; and enhanced ability for autonomous operations and recovery in the event of the loss of communications.
- All weather capability, including ability to fly in icing conditions, must be provided.
- Agreements, procedures, and capabilities for operating UAVs routinely in controlled airspace must be developed.
- Assured global, wide-band data links that are accessible to multiple echelons of command.

UAVs: a great priority

UAVs must receive greater priority in Service budgets. Investments in UAV programs are still modest compared with investments in manned aircraft. To some degree this reflects a continuing cultural bias toward manned platforms in the Services. This bias will eventually be overcome by the demonstrated operational worth of unmanned vehicles, but it will retard the rapid exploitation of their potential.

The capabilities of UAVs will undoubtedly grow and expand to other mission areas in the future. Mini- and micro-UAVs have good potential to provide urgently-needed capabilities for close-range surveillance, including in urban missions. Airborne vehicles, probably unmanned, will almost certainly provide key nodes in the "Last Tactical Mile" communications architecture. It will probably make sense to combine this mission with S&R missions in many cases.

Uninhabited Combat Air Vehicles (UCAVs) will assume some of the highest threat strike missions, including Suppression of Enemy Air Defenses (SEAD).

Technologies needed to enable these new missions include power generating, propulsion, and lift concepts for micro-UAVs, artificial intelligence, robust secure communications, and affordable stealth/self protection for the larger vehicles.

Conclusion

In conclusion, the age of unmanned air vehicles has arrived. The confluence of technology and tactical considerations, especially the thirst for "dominant battlespace awareness" and the desire to avoid aircrew losses, has resulted in increased reliance on unmanned vehicles for S&R and for other missions. Together with other sensor and communications platforms, UAVs are now crucial to achieving the information superiority necessary for victory in Information Age warfare. ■

About the author:

Rear Admiral Robert NUTWELL is Deputy Assistant Secretary of Defense (DASD) for C3ISR and Space Systems.
Since graduating from the U.S. Naval Academy in 1966 he has pursued a varied and well-decorated career. Admiral Nutwell was Deputy Director for Plans and Policy (J-5), US European Command, Stuttgart, Germany, from May 1993 to June 1995. His most recent assignment was Deputy Director, Space, Information Warfare, Command and Control (N6B).

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