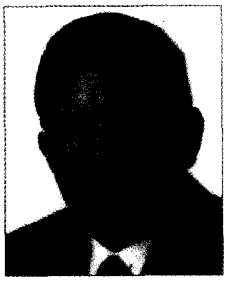
Air & SpaceEurope

Unmanned Air Vehicles are Taking Off in NATO's Priorities

Bernd KREIENBAUM

An extraordinary thrust to utilise UAVs is contained in the Defence Capability Initiative launched by the NATO Heads of State and Government at the Washington Summit on 20 April 1999. High priority requirements in this initiative are demanding future capability which may be best met with UAVs. Where are we going in the field of UAVs within NATO? Which potential roles and future requirements UAVs will have to fulfil?



Bernd Kreienbaum,
Head of Air Armaments Section, NATO.

Acronyms

AHWG	Ad Hoc Working Group
CNAD	Conference of National Armaments Directors
DCI	Defence Capability Initiative
HALE	High Altitude-Long Endurance
MALE	Medium Altitude-Long Endurance
MAS	Military Agency for Standardisation
NAAG	NATO Army Armaments Group
NAFAG	NATO Air Force Armaments Group
NATMC	NATO Air Traffic Management Committee
NC3O	NATO Consultation, Command and Control Organisation
NCS	NATO Committee for Standardisation
NNAG	NATO Navy Armaments Group
R&TO	Research and Technology Organisation
UAV	Unmanned Air Vehicles
UCAV	Unmanned Combat Air Vehicle

The status of UAV operations, beyond the current tactical UAVs, is best described as one of very high interest but few hard requirements. UAVs are the subject of numerous studies to evaluate and characterise both capabilities and costs. The ability to project specific UAV implications for NATO forces in the long term is still limited for two basic reasons. Firstly, the primary focus of military objectives is changing from a strategic, global war perspective to a range of tactical situations including humanitarian relief, peace support operations and regional conflicts. Secondly, there is increased attention to, and pressure on, military budgets.

The Defence Capability Initiative

An extraordinary thrust to utilise UAVs (an example is shown in *figure 1*) is contained in the Defence Capability Initiative (DCI) launched by the NATO Heads of State and Government at the Washington Summit on 20 April 1999. High priority requirements in this initiative are demanding future capabilities which may be best met with UAVs. For example, the DCI requirement for surveillance and reconnaissance proposes in particular an unmanned and stand-off system. All DCI requirements and especially UAVs are significant matters for armaments cooperation.

This article aims to provide a snapshot of where we are in the field of UAVs within NATO, an assumption of where we are going, and which potential roles and future requirements UAVs will have to fulfil. There is also no differentiation made between the application of UAVs to land, sea, or air requirements. Different service-orientated requirements involve more of a "tuning" of sensors rather than giving rise to basic differences in mission capabilities, namely providing the necessary battlespace information to achieve military objectives.

CNAD and NAFAG

To understand why UAVs are getting increased attention and are approaching the fast lane to success, it is necessary to take a view on how UAVs are dealt with in NATO armaments. This article is written from the point of view of the NATO Air Force Armaments Group (NAFAG), one of the three main armaments groups NATO Army Armaments Group (NAAG), NATO Air Force Armaments Group (NAFAG) and NATO Navy Armaments Group (NNAG) under the Conference of National Armaments Directors (CNAD). NAFAG participants are senior national operational and/or technical representatives (usually ** General - Colonel -

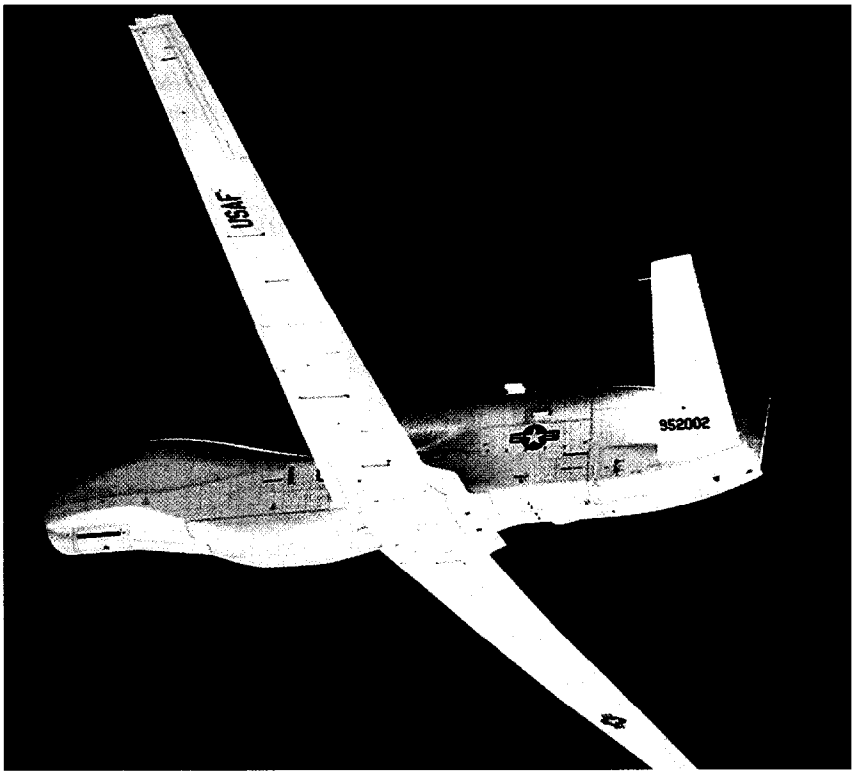


Figure 1. *Global Hawk; US HALE-UAV, Teledyne-Ryan.*

level), capable of speaking with authority on Air Force operational requirements, concepts, and related research, development and production programmes. The role of NAFAG is to support under CNAD guidance the development and establishment of NATO policies and programmes in the field of Air Armaments. In other words NAFAG is responsible for initiating and supporting all cooperative measures aimed at translating and transforming military requirements into programmes and fieldable solutions for the Air Forces of our Alliance.

UAV activities under CNAD

As long ago as 1984, NAFAG formed a UAV Working Group in recognition of the unsatisfactory situation of multiple, uncoordinated UAV programmes in several nations. The concern of NAFAG over the proliferation of UAV programmes in the Alliance was expressed to the CNAD who, in turn, formed in 1988 a Multi-Service Ad Hoc Working Group (AHWG) on UAVs, to analyse related NATO and national activities and to work out a proposal on how UAV activities should be pursued in the future. As a result, the relevant NATO Groups were directed to aim their efforts at UAV standardisation and co-operation and to liaise and coordinate closely in this field. But a look at the work of the different UAV groups shows that it was mainly project based, did not cover the whole range of UAV applications and failed to offer a coordination function with a clear focal point on generic UAV issues for NATO. This coordination gap became even more evident during a NAFAG Topical Meeting on UAVs in January 1998. The NATO Air Forces were finally and progressively accepting UAVs as an indispensable and complementary air warfare asset capable of carrying out certain specific manned aircraft missions and giving the opportunity for optimized force packages of manned and unmanned aircraft.

After intensive discussions NAFAG decided, under the former Chairman, General Gérard Saucles, the French Air Force's Deputy Chief of Staff, to request approval for the establishment of a new Air Group VII on UAVs with a responsibility for Joint Co-ordination. Together with the other Armament Groups a consolidated way ahead was proposed and approved by the CNAD in May 1999. This new Group (*figure 2*) will provide an effective forum for the exchange of information on national UAV-concepts and programmes for all services. It will monitor all UAV activities, both internally and externally, to ensure that identified gaps in NATO-related work will be dealt with and that duplication is minimised. An important advantage is that all related work on manned and unmanned air vehicles is now co-located under NAFAG thereby ensuring that all aspects of joint and combined air operations are coordinated.

Coordination challenges

The new Air Group will have to face such challenges as:

Air traffic control and deconfliction (military and civil)

This is a significant challenge for near term systems for a number of reasons. First, as seen in Bosnia and Kosovo operations, not all UAV operations will be under wartime conditions. This may require the operation of UAVs in civil airspace not under the immediate control of the military. For systems such as the Global Hawk (*figure 1*), the extended range capability, which allows for world wide deployment, also requires the ability to transit through numerous national air control systems. During operations positive control of the UAVs will have to be assured to minimise conflicts with other manned and unmanned systems. These issues are currently being addressed by the NATO Air Traffic Management Committee (NATMC) in a special Working Group on UAV.

Man in the loop

A more subtle challenge will be the level of autonomy allowed to UAV systems. Whilst pure military effectiveness may be maximised through the highest levels of autonomy, the political challen-

ge will be whether weapons release can ever be turned over to an "unmanned" system. Past history has shown that a number of military capabilities, such as beyond visual range missiles, have never met their full potential due to the limitations placed on their release. And as attention shifts from global warfare to other applications of military power, such as peace keeping/making and humanitarian relief, these restrictions can only be expected to increase.

Interoperability

In order to complement the natural political need for combined operations it is essential to ensure the necessary interoperability within UAV systems. There are two elements of this interoperability to be considered. The first is the operational integration, which includes defining standards for the various communications links used for the command and control of the vehicles. This also includes the integration of the UAV systems within the Air Command & Control System (ACCS) and development of standard operational procedures. The second element is the ability to disseminate the resulting information at the appropriate detail to the relevant levels of command.

Weaponry

Lethal applications of UAVs will be greatly dependent on the development of new small, smart weapons. Small smart weapons will allow for smaller, and therefore less expensive, air vehicles. They also will provide increased ability to employ low observable technologies on UAVs.

Robust, secure, interoperable C4I networks

This is another near term challenge which must be overcome in order to ensure the utility of UAVs, specifically with respect to the management of the air vehicle and payload. While the basic technology exists today, and is utilised with manned systems, the challenge will be to standardise and integrate the capability in an affordable package for UAV systems.

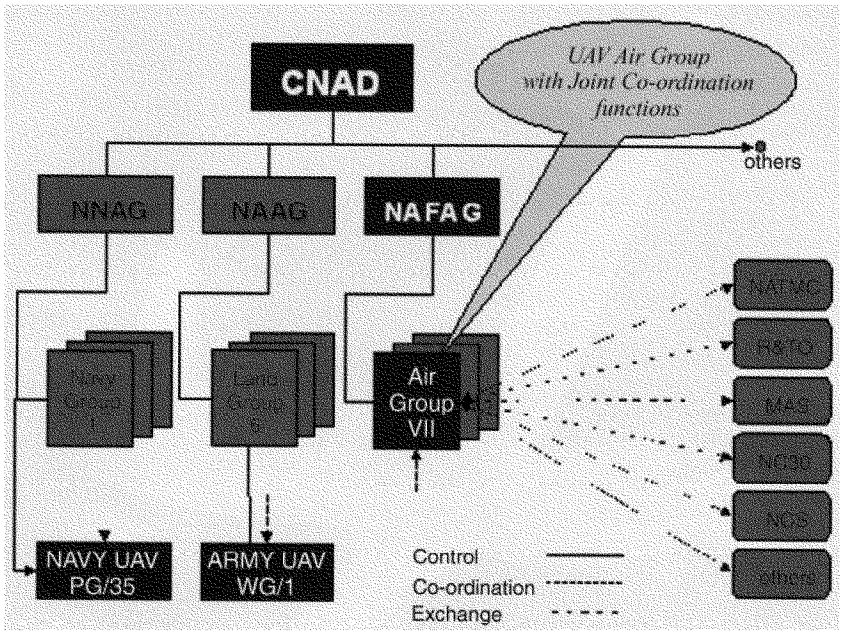


Figure 2. *New UAV-working structure under CNAD.*

Training systems

It will be essential to achieve realistic operational training. In this respect, the first step is the development of command and control stations which can double as training devices. The second step is the integration of training capabilities to allow for a mix of real assets, training devices, and simulations to facilitate realistic joint and combined training. This will be essential to verify common procedures so that UAVs can be effectively employed in combined joint operations.

Why UAVs?

Having summarised current NATO efforts and challenges in the field of UAVs, and before elaborating on future UAV requirements, let me now briefly comment on why UAVs are getting higher priority in procurement planning and acquisition.

The short answer is reduced costs and less personnel combined with higher efficiency for specific missions. For existing weapon systems, operating and logistic costs are the bulk of total life cycle cost, and the single largest portion of these costs is for personnel. Significant reduction in personnel without an equivalent loss in military capability can then achieve part of the economies being sought.

An additional reduction in life cycle costs is possible through reduced peacetime utilisation. This reduction may be achieved by increased use of modeling and simulation for training well beyond that feasible for piloted aircraft. It should also take fewer maintenance personnel to support an UAV since all crew support equipment can be eliminated. Support costs may be drastically reduced when the concept of operations allows for wartime use only, so that the UAVs remain in long-term storage during peacetime. This assumes that most training can be effectively accomplished using simulations. In some concepts, "wartime UAVs" could be operated primarily by reserve personnel who would only be called to active duty as and when required. This is another potential cost reduction for active duty personnel, though some active duty capability would most likely be retained. In addition, there is also the potential for operating UAVs with other than fully qualified pilots thereby further reducing costs. Overall, there is a significant potential for reductions in the total personnel required to accomplish the same mission, the "less manned" concept, and the training for these personnel may be less expensive in terms of both time and money. Development and production should also be less expen-

Figure 3. *"Eagle" – European MALE-UAV under development, MATRA BAe Dynamics.*

sive because of the elimination of crew stations. In any case, it has to be assumed that less manned systems would only be used if they have the same or better cost effectiveness than manned.

The other reason UAVs are becoming more attractive is the advantages provided by not having an onboard crew. By reducing the risk of loss or capture of personnel, the UAV provides a more politically acceptable military system for certain missions. UAVs also provide other capabilities not achievable with manned systems. Without onboard crew limitations, long range and/or long endurance capabilities can be significantly increased (*figure 3*).

Future requirements

Discussing, let alone determining, future requirements for UAVs is a difficult task. Many experts are working on documents describing NATO's UAV needs in the future and some are adapting their draft papers to take the lessons learned from the campaign over Kosovo into account. It is assumed that NATO will focus in the first instance on two system approaches. Firstly, in the short to medium term the focus will be on a strategic, high altitude, long endurance/range and highly survivable reconnaissance/surveillance UAV complementary to space-based systems as well as to ageing Recce-manned (see *table I*) and more tactical unmanned air vehicles. Secondly, in the longer term the focus will be on a multirole Unmanned Combat Air Vehicle (UCAV) platform (*figure 4*).

In particular, and during the early stages of a crisis, we need a means of gathering information on the ground situation deep (beyond the range of fixed wing stand-off surveillance assets) within the area of interest. However, the system should be highly survivable in order to minimise the possibility of escalation due to the engagement of an Alliance surveillance system. As the area in which these systems may be required to operate is not predictable, and as there may be up to three areas requiring surveillance simultaneously, the ability to fly from one end of the Alliance territory and area of interest to the other is necessary. This strategic range capability will also provide the range necessary for most NATO out-of-area operations. Therefore, the Alliance requires highly survivable HALE-UAVs (HALE = High Altitude-Long Endurance) in order to gather high quality imagery for identification and recognition of highly mobile time critical targets under hostile conditions during the earliest stages of developing crises.

In the long term NATO Nations are likely to pursue the development of a multirole UAV/UCAV platform capable of supporting a family of standardised packages for a wide range of conventional attack, Electronic Warfare (EW) and communications roles. General roles and missions are shown in *table II*.

The UAV should be capable of operating autonomously or by control from the ground or via a relay link from a remote site, acting as an airborne platform capable of target location, identification and illumination for guided munitions delivered by another weapon delivery system, acting as an attack platform capable of delivering conventional ordnance on fixed targets, either autonomously or by control from a ground or other control station.

Table I. Strategic recce/surveillance: future UAV requirements.

- Very High Altitude
- Long Range - Ability to reach any point in the Alliance AOR
- Sensors (multiple) for high quality imagery
- Resolution to identify and recognise all military targets
- Secure Data Link for near real time delivery
- Highly Survivable; Self Protection Sub Systems
- 24 Hour Coverage for several days
- Realisation: near term.

Conclusions

The potential impact on national and coalition air operations resulting from the addition of UAVs will fall into three basic areas. The first is with respect to the tactics available due to the unique operational capabilities offered by UAVs. These include increased mission persistence, and the ability to operate in higher risk areas without endangering life. These two attributes may be combined to provide a persistent attack within highly defended areas, a tactic to wear down and degrade defensive capabilities. Continuous surveillance may be applied to deny the opponent the ability to hide movement and placement of forces, logistics, and command centres. The "fearless wingman" concept can be exploited to identify and target threats by pushing sensors out in front of manned aircraft. The second area is relative to the additional requirements on airspace management to ensure deconfliction of all airborne assets. While automated detection and avoidance will provide significant improvements over current capabilities, it is unlikely that these systems will ever achieve the flexibility and power provided by a pilot.

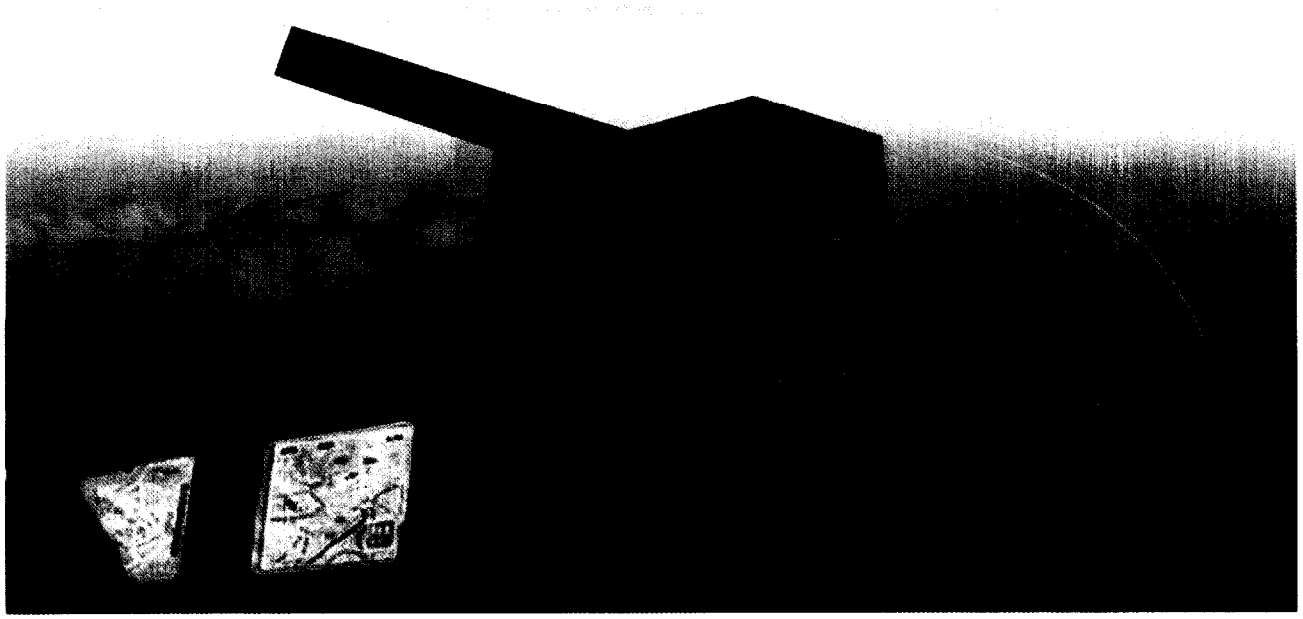


Figure 4. *UCAV impression.*

This means additional controls will be necessary, especially for the operation of manned systems in conjunction with unmanned systems (both UAVs and missiles). The third area will be in the size and structure of the personnel required to maintain air operations.

Bottom line

UAVs are currently at a major turning point in their history. After decades of limited success and some failed promises, the UAV has become a real hope for the future. The recent success of several tactical UAV systems has assured their place in future military operations. The real breakthrough, though, will be with the strategic systems to gather intelligence through surveillance and reconnaissance. In the long term UAVs will operate in joint and combined operations fully integrated with manned aircraft in a more joint-orientated force.

The bottom line is that UAVs offer significant benefits across the full spectrum of NATO operations. There are, however, numerous challenges which must be met before we can achieve effective and efficient combined operations. Under the guidance of CNAD and with the thrust of the Defence Capability Initiative the new NAFAG Group on UAVs will take advantage of the opportunities presented, and offer co-ordination for the various national and Alliance co-operative UAV efforts. ■

Table II. UCAV future roles and missions.

Support and Execution of *different* conventional Air Warfare OPS

- Recce Surveillance/Intel
- ESM/ECM & SEAD – Softkill/Hardkill
- Autonomous Target Search, Detection, Recognition, Targeting
- Attack of Ground Targets (fixed/moving)
- Weapon Delivery and Targeting/Illumination for other Players
- Search, Detection, Targeting, Attack of TBM to support
- TBMD and Counter WMD
- Secure Data Link for near real time Reporting and DATA Relay
- Realisation: < 10 years (long term)

Note

The present article has been firstly issued in: 'NATO's Nation and Partners for Peace.III.99'.

About the author:

Bernd KREIENBAUM is Head, Air Armaments Section, Defence Support Division, NATO Headquarters. After training at the German Air Force College, and studies of Radar & Communication Electronics at the Joint Forces University, Munich, he served in several German Defence Departments. From 1981 until 1986 he established the new Joint Forces Electronic Warfare Reprogramming Centre and until 1998 he was the Branch Chief for Electronic Warfare-Concepts, Plans & Policy in the MOD Air Staff, Bonn.

Bernd KREIENBAUM
Air Armaments Section, NATO
1110 Brussels, Belgium
Tel.: +32 2 707 4291/4293. Fax: +32 2 707 4103
idskre@hq.nato.int

For more information on NAFAG Air Group VII see:
http://www.nato.int/structur/AC/224/ag7/ag7.htm.