

# THE ROLE OF THE HELICOPTER IN THE NEW DEFENCE MODEL

EDITED BY

MICHELE NONES AND STEFANO SILVESTRI

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IN THE NEW DEFENCE MODEL**

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*This research is sponsored by AgustaWestland*

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## **Introduction**

The new international military scenario highlights the need for mobility and flexibility of forces, operational integration, control of the territory and other elements which seem to suggest a more intense and qualified use of helicopters in various configurations (combat, surveillance, SAR, EW, tactical transport, etc.). At the same time, however, this aircraft has had a extremely limited use in some recent military operations, particularly in Kosovo.

An important debate is thus opened, concerning not only the overall strategic approach to crisis-management and peace-enforcing operations but also the future of airmobility and what priority to assign to the development of the rotary-wing component in the European armed forces. Very advanced concepts of this use, such as those developed by the U.S. Army, exist alongside other, much more restrictive concepts. This debate has traditionally remained within the circle of the few people concerned, mostly in the armed forces, and has been strongly influenced by the evolution of the individual services' operating concepts. A clear debate in a joint framework is lacking, as well a broader debate covering the general, political and strategic aspects of the missions to be performed and the most suitable means for achieving the desired goals. These deficiencies render the long-term prospects of helicopter technology and production even more uncertain. This problem has to be addressed in a global perspective that goes beyond the analysis of individual choices.

Since there is no dedicated service that considers the helicopter as its reference platform, this aircraft has had an ambiguous development. On one hand, it seems to be suitable for all the forces, since it is used mainly - albeit not exclusively - as a means of transport by all the military services. On the other, it has been to some extent "split up" and shaped on the basis of the "residual" requirements of the various forces, without tackling the problem of its optimal deployment. In particular, the great range of machines and specialised versions available creates the problem of finding a correct balance for the present fleet, in line with its deployment hypotheses.

We have thus decided to examine recent military experiences and the debate on strategic operating concepts to reflect on the effective potential of the helicopter in the new international military scenario with particular reference to the Italian case. We have surveyed the Italian experiences and the lessons learnt from the most recent ones. We have also enlarged our horizon to the experiences and debate underway in the U.S., where this aircraft has always been more widely used. The intention is to offer a useful contribution to the debate on the future of the helicopter and its role in the Italian and European defence model.

*M.N. and S.S*

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# 1. Airmobility, Concept, Use and Prospects of the Helicopter in the Italian Armed Forces\*

*Andrea Nativi*

## *1.1 General Considerations*

The rotary-wing aircraft has always occupied a significant place within each of the three national armed forces, and especially the Army and the Navy; the Air Force, albeit possessing a respectable helicopter fleet, has only recently reassessed their role and capabilities. This is to some extent the merit of the vitality and considerable capacity of the national industry in the sector. This latter, besides producing on American licence, has also demonstrated ability in redesigning and modifying U.S. projects, at the same time developing its own original projects which have created state-of-the-art products. The initial market for these aircraft was naturally the domestic one.

The growth of a national helicopter industry has mostly been stimulated by the demand of institutional clients who would have anyway turned to foreign procurements if the national industry was uninterested or unable to supply them with what they needed. The core business of these industries has for many years been represented by licensed productions.

The armed forces have relied greatly on the potential of the rotary-wing aircraft since the immediate post-war period, sometimes working out innovative and singular doctrines and operating requirements for them. Just think how important helicopters embarked on naval platforms of all tonnages have become, without naturally forgetting their use from shore bases. For a certain period our Navy was an authentic pioneer in the use of the embarked helicopter, mainly for antisubmarine operations and starting with small- medium-sized machines. Since the Navy could not rely on task forces or aircraft-carriers escorts like the main allied navies it realised that the helicopter could be important for exploiting the great possibilities offered by an airborne component. This is confirmed by the construction of medium tonnage units able to transport and deploy a large number of these machines: the innovative Doria and afterwards Vittorio Veneto class cruisers. The Italian philosophy enjoyed widespread success and the main navies, including the American one, started to design naval units equipped with flight decks, hangars and the necessary devices for using and supporting naval helicopters.

In turn, the Army has always been fascinated by the airmobility concepts successfully tested by various western countries, by France, in Algiers and Asia, but especially by the United States in South-East Asia and before that in Korea. The first pilot training courses were held in 1955, while the first multi-role AB.204 helicopter was introduced into service in 1963. However, for decades helicopters have been considered as little more than a useful means of support, liaison, surveillance and reconnaissance, assigned to the big units in a more or less systematic manner. In particular, the armed and combat helicopters have long been neglected, in Italy as in many other European armies. Nevertheless, with the experience of Vietnam, already in the early sixties weapon systems were being tested, including rockets and machine-guns installed on machines in service, which anyway could not perform more demanding firing support roles. The Italian

\* Translation by Sarah Nodes.

Army has tried to remedy this deficiency with the A-129 programme, the first in Europe to introduce a dedicated combat/anti-tank machine.

In the Air Force, the helicopter was immediately seen to be an ideal instrument for difficult search and rescue needs, especially in a country like Italy with its long coastlines, islands and vast mountain areas.

Furthermore, and this applies to all three armed forces, helicopters have been widely used in "collateral" civil-defence and public utility tasks, especially during natural disasters. For a long time these roles were fostered by a defence unable to obtain the support of the media and public opinion for its own primary mission and which thus fell back on paramilitary/civil defence. It is thus not surprising that, at least in terms of numbers, Italy has always been able to boast of one of the leading helicopter forces worldwide. Only last year AVES, Army Aviation, could alone count on almost 370 helicopters; the Navy had around 90 and the Air Force 130. These are entirely respectable figures.

In the new strategic context, with the accent on the ability to project and support forces abroad and with the constant commitments in national and international operations - definable, in an atechanical sense, as peace-keeping - the helicopter has been "rediscovered" by all three "services". The capabilities and limits of helicopters have been directly tested in a whole series of real operations ranging from Somalia, to the Middle and Far East, to Asia and to the Balkans, just to cite the main and most recent ones. This has triggered a fervour of initiatives and proposals, accompanied in many cases by new doctrines for using existing machines. All this has occurred at a time when the armed forces are being faced with the choice of how, when, to what extent and in what way to renew their rotary-wing aircraft, most of which have reached the end of their working life and almost simultaneously.

These are extremely delicate choices, because not only is there a chronic lack of financial resources to cope with the extremely high development, production, life-cycle and support costs of new helicopters, but there is also a drastic cut in quantities to be faced in the near future. This latter is accompanied by the abolition of conscription and the need to find a strong doctrinal and operating integration, accompanied by standardising means to those of our principal allies. This must be done by tapping to the full the developments offered by technological progress, thanks to which a new generation of "conventional" helicopters could be flanked, at least in the medium term, by new machines such as tiltrotors and UAVs (either rotary-wing or not).

Shrewd choices must be made, trying to maximise the return on investments and generating synergies in a "joint" (interforce) and "combined" (multinational) environment, because no one is seriously thinking of replacing the old aircraft on a 1:1 base. Given that the tasks planned for the rotary-wing aircraft are in continuous expansion/evolution it will be indispensable to intensify the forms of cooperation. In the meantime, who does what and where must be better defined, because the once tolerable duplications have become simply unsustainable.

### *1.2 The Italian Navy: Current Situation*

As said before, the helicopter component is considered one of the most valuable "jewels" of the armed force, which has dedicated and continues to dedicate considerable resources to it. All the naval squadron front-line units are now able to operate one or more helicopters, and at least some of the second-line units. Sacrifices are willingly made in other sectors as well as increases in hull dimensions to have at least one flight deck and possibly even a hangar - even only an expandable one - to house and permanently support a rotary-wing machine. An emblematic case is that of the new light frigate-corvettes, currently called NUMC (New Minor

Combat Unit), the first of which will be launched this year and will enter service in 2001. After lengthy debate and heated internal dialectic, the Navy has approved a design with a flight deck and adequate equipment for using an intermediate helicopter. These aeronautical installations are lacking on eight Minerva-class corvettes that entered service between 1987 and 1991. For the larger units, the majority of the Navy considers the choice of "flat decks", pure or amphibious aircraft-carriers, to be mandatory. However all the future squadron units, anti-aircraft destroyers/frigates and multi-role frigates, will be able to operate one or more rotary-wing aircraft. The new flagship of the Navy squadron has finally been called an "aircraft-carrier" since it is capable of accommodating 360 of the San Marco's seamen and will probably also be equipped with an expandable basin to give it a "dual" use as an amphibious aircraft-carrier. Thus the helicopter will become one of the key means also in the medium and long-term.

In its present structure, the Navy has over 80 light and medium aircraft (twin-engine AB-212s and intermediate twin-engine SH-3Ds) distributed between five helicopter groups. It has acquired 59 AB-212s since 1974, of which a little over 50 remain in service as the older machines started to be pensioned off in the mid-nineties. Thirty-six SH-3Ds were delivered between 1968 and 1980, divided into four production batches (A,B,C,D) and despite efforts to ration their use and keep them fit, the number of serviceable vehicles has now fallen to under 30.

There are three main bases in Italy, located to support the naval units stationed at La Spezia, Taranto-Brindisi and Augusta:

- Grupelicot 1 with SH-3Ds and Grupelicot 5 with AB-212s are based at Luni. The SH-3Ds are mainly used for the Garibaldi flight line and to support the COMSUBIN special forces in special operations. The AB-212s are instead mostly embarked on board the naval units.

- Grupelicot 4, with AB-212s is at Grottaglie as well as the NLA, Amphibious Combat Nucleus, which uses AB-212s and modified SH-3Ds with most of the "naval" devices removed so they can transport troops and materiel and with launching armament installed for self-defence/firing support. The NLA vehicles transport the San Marco seamen and special forces. This division does not have the status of an autonomous unit, but is a "rib" of Grupelicot 4 and the "NLA" is only an additional qualification that pilots add to the "normal" ones. The NLA uses the AB-212s in scout/firing support/escort roles and SH-3Ds for heliassault/helilanding.

- Finally, Grupelicot 3 with SH-3Ds and Grupelicot 2 with AB-212s are based in Catania. The SH-3Ds are mainly used for coastal patrols and naval short-range blockades with anti-ship missiles, as well as for supplementing the Garibaldi/LPD flight line and for the SARs; besides standard roles, the AB-212s are also used for machine promotion and training.

The Navy's deployment philosophy has the ground support/preparation divisions aimed at the "production" of troops and materiel who, when necessary, are embarked on naval units of which they constitute the "long arm". Thus the various Grupelicots have a quite robust technical and specialised support component with considerable capabilities (a limited number of technical personnel able to carry out limited interventions can be embarked on ships) and a relatively reduced flight component - pilots - mainly consisting of instructors and pilots in advanced training. The combat-ready machines and personnel are generally on board the ships. This ship-serving structure offers a very high operating efficiency for the machines embarked, entrusted to well-trained personnel. If an embarked machine breaks down, there is an extremely rapid system for supplying the necessary parts and assistance or, if repairs on board are impossible, the replacement of the aircraft. The groups on shore thus have a limited direct operating capability. To some extent the SH-3D groups are an exception to this rule because



these machines are profitably deployable along the coasts in a multitude of roles, from surveillance to anti-ship attack, as well as ASW operations supplementing naval aircraft and/or units. The SH-3Ds are also used for infiltration/extrication/transport of special detachments and for transporting troops and materiel.

For logistical support, each of the three helicopter stations is able to carry out maintenance up to second technical level and even third technical level for some mission equipment and avionics, because the Navy does not want to depend too much on industry in these areas.

Since it only has limited resources in terms of helicopters, personnel and money, the Navy has always aimed at the maximum flexibility and versatility for personnel and especially for pilots and specialists. Thus helicopters can rapidly switch roles simply by fitting a specific mission kit, the ASW or electronic war suite, or perhaps removing them all to make room for personnel and materiel. This approach is mainly used for the AB-212 helicopters which have a necessarily limited payload, while the SH-3Ds are more suitable for maintaining a "rich" basic configuration to which specific elements can be added. However, the majority of helicopters are already specialised; there are EW, ASW/ASUW and NLA machines, although it is always possible to modify them. There are three basic configurations for both the AB-212s and SH-3Ds. The most recent SH-3Ds (C/D) are in ASW configuration while the older ones are destined for anti-ship attack (MARTE) or assault transport in NLA configuration.

Aircraft have to be versatile and modular when used on board. When a ship can only count on one, or at the most two, helicopters it becomes indispensable to deploy them for every kind of role: from liaison to VERTREP (vertical sea replenishment), from MEDEVAC (evacuation of sick/wounded) to SAR and even CSAR, from ASW to anti-ship ASUW, from the designation of targets to electronic war and so on, without forgetting the customary civil "collateral" duties, including fire-fighting.

Equally, only very few pilots and specialists can be embarked and thus each must be able to perform any type of mission. This belief in "can do" derives from the extreme professionalism and capability requested of the basic mission, ASW. If a pilot is capable of flying at night, at low altitude, with adverse weather conditions and thus with instruments (IFR), of reaching the established area, descending to a few metres above the waves, hovering to drop the sonar with windscreen wipers fighting to remove the sea spray and then, after having carried out a series of deeps and perhaps one or two attacks, to return to the ship and land on a tiny, rolling and pitching flight deck... then he or she can do anything.

Undoubtedly those with all the necessary qualifications can really perform a variety of roles, but there is a limit to versatility. Even by greatly increasing the number of flying hours to maintain an all-round capability (something anyway very costly) there is no pilot who can be said to be really omniscient: the more the things one has to do, the lower the level of excellence achievable in the specific role. This applies to everyone, whether pilots of "multi-role" fixed-wing aircraft, which are actually only top class in some of the missions (swing-role concept), or helicopter pilots. The Navy has had to provide specific training courses (in Italy and abroad) for NLA helicopter pilots, who are asked to carry out a tactical flight over land, albeit for a very limited depth of coast. All this cannot be simply "added to" the traditional preparation.

For training its crews, the Navy generally uses a U.S. pipeline, with the acquisition of a military pilot's licence in the U.S. Navy schools. There is also a national path, with courses in the Air Force's flying schools. All pilots acquire the different operating qualifications directly in the flight group they have been assigned to. This group thus performs a double operational and OCU/advanced training/qualification maintenance course role, whereas the central organisation, Maricentreadd, is responsible for standardisation and monitoring.

### *1.3 The Italian Air Force: Current Situation*

The helicopter component of the Air Force is required to play an essential role of Search and Rescue (SAR), mainly in favour of military aircrews. There are precise duties and responsibilities in this field, defined on a NATO level (the Air Force has to provide at least four helicopters continuously). Similar duties are involved for search and rescue to support civil aviation and naval means by agreements signed under ICAO/OACI, as well as bilateral and multilateral agreements (for example MEDOC with France, Spain and Malta) and by national legislation that entrusts the Air Force with the main SAR responsibility and coordination.

The deployment of divisions and materiel over the territory is conditioned by the possibility of being able to intervene within the time fixed for emergencies (1.5 flying hours). In practice the Air Force has to keep a certain number of helicopters and crew in constant readiness to guarantee take-off on alarm and intervention in the assigned areas in reasonable time. The promptness of troops and materiel can be increased according to the situation, up to having crews already sitting in the cockpit, able to take off in a matter of minutes and to receive a mission update directly in flight. Under normal conditions, one helicopter is kept ready to take off in 30 minutes in six different national airports.

Helicopters are also used quite extensively in liaison and support tasks and some have been assigned directly to operating divisions' liaison squadrons, partly to substitute fixed-wing aircraft that have been pensioned off and not replaced.

As we shall see, at the time of the first missions in Somalia the Air Force had already started to achieve experience with its own helicopters in Combat SAR (CSAR, aircrew rescue in enemy territory) and special operations support. On the basis of the lessons learned from these operations, significant initiatives have been launched for improving machines, personnel preparation and operational capabilities.

Traditionally, the Air Force's helicopters perform a whole series of "minor" tasks, from VIP carriers to emergency health/organ transport and interventions in natural disasters and fires. Its helicopters are currently distributed over a large training division dedicated to SAR/CSAR and broken down into different groups and squadrons, a VIP transport division and a series of minor divisions that often only have one aircraft for liaison. NH-500E light helicopters are used, of which around 50 have been purchased since 1990, with at least 48 still in service. There are also the twin-engine light AB-212s, of which 35 have been acquired, three in 1979 and the others after 1984 (33 are still available), and the medium twin-engine HH-3F, of which 35 have been purchased since 1977 (33 still in service). Then there are two SH-3 helicopters in VIP transport configuration that entered service in 1975.

The NH-500s are mainly used for training and recently also for liaison, because the old light aircraft used by the liaison squadrons of various flight formations have been withdrawn. However, the NH-500s also have operating roles, albeit not advertised: they can be armed with rotating barrel miniguns and rockets and in this configuration are suitable for providing, albeit with great limitations, escorts to SAR/CSAR helicopters as well as carrying out installation defence tasks.

The AB-212s are used for SAR and some for supporting the Perdasdefogu shooting-range. The avionics and cockpits of these machines have been upgraded and they are particularly suitable for mountainous areas and high altitudes. The HH-3Fs are the key craft of the SAR groups-centres as well as for combat SAR tasks and occasional support to special operations divisions. The first 20 machines acquired have been delivered in the Alpha initial standard, while the last 15 have been fitted to Bravo standard which can be considered as a basic CSAR. The machines of the first series have also been retrofitted according to the new standard, but they

have different fittings/configuration, so that only a few aircraft can be used for CSAR purposes. The HH-3Fs are most suited for low altitudes and have some problems in the mountains and hot and high conditions.

The main Air Force divisions equipped with rotary-wing aircraft have recently been incorporated in a large unit, the 9th Transport, Special and Combat SAR Brigade stationed at Pratica di Mare, but helicopters are also present in a training wing and in other operating divisions. In particular:

- 72nd Stormo of Frosinone, with NH-500s and the division dedicated to basic crew training, not only for the Air Force but also the Army, Police and in some cases even the Navy. Moreover, in the Air Force, pilots obtain only a military pilot's licence and to pass to rotary-wing aircraft they need a qualification and thus machine promotion. The training path of Air Force pilots is identical for all pre-operational courses, at which point the diversification according to the service assigned occurs. Thus Air Force helicopter pilots also have a certain familiarity with fixed-wing aircraft. The "external" students instead acquire a specific military helicopter pilot's license, but there are differentiations also in this case.
- 15th SAR Stormo of Pratica di Mare, which has both a training division, the 81st Crew Training Centre, also at Pratica, and four operating divisions, the 85th SAR Group (Pratica di Mare), the 82nd SAR Centre (Trapani), the 83rd SAR Centre (Rimini) and the 84th SAR Centre (Brindisi). The SAR Centres have a structure and consistency very like that of a normal flight group. The 15th Stormo has mainly HH-3F helicopters with a few AB-212s assigned to the Training Centre. The 15th is the main Air Force division for both SAR and CSAR.
- Liaison/rescue squadrons: based in Ciampino (under 15th Stormo), Decimomannu, Grazzanise, Grosseto, Istrana and Linate and performing both SAR and liaison roles.
- Additional AB-212 helicopters are to be found at Perdasdefogu, in special configuration for support of operations carried out in the shooting range, while two aircrafts are permanently stationed in Malta under a cooperation programme with the local armed forces and one machine is assigned to the experimental division.
- There are three to four NH-500Es assigned to operating units' liaison divisions.
- Two SH-3D/TS helicopters are fitted out for VIP transport.

For teaching/training, after having passed the course at the 72nd Stormo (around 70 flying hours) the pilots pass to the 81st Training Centre where they are promoted to the AB-212/HH-3F. The division also provides qualification maintenance courses and various qualifications, but the main operating divisions also perform a certain amount of advanced training activity.

Given the natural conformation of the Italian territory, various SAR divisions have good practice in long-range search operations over the sea. In addition, the need to operate in extreme weather conditions (ideally SAR and CSAR require full all-weather capability) requires considerable preparation of personnel. The AB-212s often "rummage" among the peaks of the Alps and Apennines.

The Air Force is tackling the specific CSAR problem with enthusiasm and decision, but is constrained not only by the limited means at its disposal but also by the impossibility of having groups of specialised operators of a real international standard. There is a certain tendency to create air-rescuers and para-jumpers out of personnel already in service, retrained with in-house specialisation courses, but the results are necessarily modest. Certainly with the advent of out-of-area operations it becomes increasingly important to possess a real CSAR capability, albeit numerically limited. Evidently it is not only a problem of machines, since some HH-3Fs have already been extensively transformed with the addition of armouring, enhanced navigation

systems, FLIR and NVG, self-defence system, armament, etc. It is currently being attempted to create a CSAR component that can be inserted in an international context.

For special operations' support, despite the working experience gained since Somalia, not much has yet been done beyond training events carried out with detachments of the Army's special units. Apparently the Air Force does not want to go further and this applies not only to the rotary-wing component but also to that of tactical transport. And yet there are many significant examples in Europe (just think of the RAF). On an operating level the will seems to exist but a strategic-conceptual interest is lacking.

#### *1.4 The Italian Army: Current Situation*

The Army has always been able to count on a strong helicopter component, which has been enhanced in recent years. Among other things, in 1993 it became AVES (Army Aviation) instead of Army Light Aviation (ALE) and an Army Aviation Headquarters replaced the previous Inspectorate. And it is not only a question of terminology. The air component has been qualitatively strengthened with the entry into line of combat helicopters (A-129) and a small number of fixed-wing aircraft (Do-228 and P-180). Thus the withdrawal from service of the old surveillance/liaison SM-1019s did not mean giving up fixed-wing aircraft. However, the "ceiling" fixed for this component of only eight machines reduces its effective role to not much more than a symbolic one. Future restructuring will have to decide the future of such a small fixed-wing component: whether to increase it or eliminate it, assigning its running and all the relevant roles to the Air Force.

A further transformation occurred in January this year, which for many will involve a reshaping of roles and functions as well as a structural and numerical downsizing. The fact that AVES has ceased to exist and the Air Cavalry has been created in its place does not seem world-shaking, but things have actually changed considerably. The decision was whether to promote the air component to the rank of independent arm with extensive autonomy or to keep it in its traditional role of support to the other arms. The latter route has been chosen. The AVES divisions have thus been incorporated in the cavalry arm with which they effectively have the greatest affinity. A cavalry arm that had already absorbed the tank units, once the specialty of the infantry. Thus on one hand the close link between armoured/line cavalry and air cavalry (in particular with the RSTA concept) is endorsed and on the other the aircraft will be seen as another operating unit "support". In fact things are not nearly so tragic and the marriage between helicopters and "base" detachments will finally lead to the creation of that airmobile unit which has been discussed for years. A further advantage will consist of feeding select, dedicated personnel into the air cavalry which will no longer have to rely on personnel with a variegated training and experience and perhaps only in "transit", albeit for a long period, in air units.

The new deployment concept for rotary-wing aircraft and the consequent reorganisation of divisions, redistributed over the territory, is certainly the most significant development for the air cavalry. Basically, it means abandoning the old "spread-out" pattern for a "concentrated/mission oriented" one, as well as multiple line divisions with different types of helicopters. The main operating divisions are the regiments, made up of different squadron groups in turn formed of various squadrons. There is no standardisation with regards to quantity and type of helicopters assigned and the organisation is anyway in transition.

As we shall see, various operating divisions directly assigned to the different commands or operating divisions are added to a central unit under Supports Command (COMSUP), but all coming under COMFOTER, Land Operating Forces Command. The technical-logistical

support beyond the first technical level, carried out directly in the operating divisions, is supplied by four special support regiments dealing with second-level activities. Third-level maintenance is done directly by industry. The four regiments come under the Logistics Inspectorate and in particular the 1st and 4th Regiments, stationed at Bracciano and Viterbo, are inserted in the Southern Logistics Area Command while the 2nd and 3rd, stationed at Bologna and Orio al Serio, are under the Northern Logistics Area Command. The Bergamo regiment, the Aquila, is being transformed to operate and support the particular needs of divisions sent abroad as part of national contingents inserted in a multinational context.

The Army has decided to perform a drastic pruning of its different flight lines to eliminate both the machines officially in service but actually unusable because not working, out of configuration, worn out or cannibalised, and those surplus to real requirements, and especially logistic technical support. So as the older helicopters reach the limit fixed for the more demanding servicing they are grounded. However, many of these machines are still usable and it is being assessed if, suitably reconditioned, they could be handed over to some friendly country instead of being scrapped. The number of divisions and the consistency of the lines will be commensurate with the actual "flying hours production" capability and their actual use and even this goal will not be simple to achieve.

This is currently the situation/planned evolution for the following machines:

- The AB-206 light single-engine helicopters are mainly used for training and/or achieving/maintaining qualifications. In theory they should also be deployed for reconnoitre/scout/surveillance, but they are totally unsuited for this role and are the outcome of the initial idea of "militarising" a civilian machine. Around 130 were still officially in service (out of 150 acquired in two series) a year ago, but by 2001 the number will be reduced by around sixty. Obviously the first to be withdrawn will be the aircraft of the initial series, which anyway entered service at the beginning of the seventies.
- The AB-205 multi-role, single-engine helicopters constitute the pivot of the helicopter divisions, performing an infinity of roles from assault transport to firing support. They have undergone targeted improvements entailing various configurations, the most advanced of which is destined for use in peace-supporting missions abroad and is armoured with a NVG-compatible cockpit. Eighty-five will remain in service, of which 36 are or soon will be of "international" standard. The older aircraft, dating back to the second half of the sixties, are being eliminated.
- The AB-212 multi-role helicopters basically perform the same tasks as the AB-205s; they are all Combat Support Helicopters (CSH) but thanks to the twin-engine power pack offer greater performance and safety. Around 20 are in service, whereas another five of these type of machines, the famous "ex-Iraqi" helicopters, are still being converted to Italian Army standard.
- The AB-412 multi-role helicopters are the most modern of the CSH class and are assigned to the most demanding missions. There are only two dozen in service since 1986 and insufficient to meet all needs, which also include their use as a platform for the battlefield surveillance radar system CRESO.
- The CH-47C+ medium transport helicopters are excellent for heavy cargoes since fast and with a high load capacity. They entered service in 1973, but have already undergone an extensive upgrading involving replacement of rotor blades, more powerful engines and transmission, etc. These are machines with high running costs which require complex and exacting maintenance. There should be 36 of them - modestly called ETM (medium transport helicopters) although they are actually heavy

helicopters - but also here it is impossible to support and deploy such a numerous service, so it is planned to cut them down to 30, still a significant force.

- There are 45 A-129 attack helicopters in service, in addition to 15 machines in combat CBT version, which besides the anti-tank role will also be able to perform firing, escort and scout support. The machines already in service will also be brought to the new standard. This transformation is indispensable, given that the A-129, conceived as an ambush helicopter in the context of a high-intensity armoured war, is and will be deployed for entirely different tasks. This means passing from the anti-tank helicopter to the combat helicopter. To be able to obtain this result with a relatively light machine is certainly not easy and has required a radical and very complex redesign and integration of systems.
- The A-109 helicopters are fast twin-turbines that feel the weight of their "commercial" derivation. There are about two dozen of them, in service since 1976, including the machines used for testing the helilaunched TOW system, now out of configuration. Besides liaison, they are also used for reconnoitre, surveillance and scout roles for A-129s, tasks for which they are not entirely suitable.

All these aircraft have been assigned in a varying numbers to the different operating divisions that do not come under, at least for deployment, a unified structure, but are incorporated in various operational commands. In particular the Air Cavalry Command, stationed at Viterbo, comes under the Ground Operating Forces Support Command (COMSUP, stationed in Treviso). On a divisional level, the command covers:

- The Air Cavalry Centre for training personnel and with headquarters in Viterbo, in what can be considered as the "cradle" of the speciality. The division can naturally count on almost every type of machine in service and therefore AB-206s (as many as forty), A-109s, AB-205s, AB-212s, AB-412s and A-129s;
- The 1st Antares Regiment, equipped with CH-47 helicopters and a small number of AB-412s;
- The 21st Orsa Maggiore squadron group, with AB-205 and AB-206 helicopters;
- the 28th Tucano squadron group, assigned all the fixed-wing aircraft;
- the SOATCC group, with helicopters equipped with surveillance equipment, including CRESO radar, constituting the key sensors of the CATRIN command and control system. The helicopters are AB-205s, A-109s and AB-206s. This division is about to be re-equipped with AB-412s and placed under C4IEW Command which will be stationed at Anzio and will obviously be its natural user.

The Air Cavalry Command has also inspection and specialist technical coordination functions over all the other helicopter divisions, distributed as follows:

The Projection Forces Headquarters of Milan incorporates:

- 7th Vega Regiment, inserted in the Friuli Airmobile Brigade and equipped with AB-206, AB-412, AB-205, A-109 and A-129 helicopters;
- 5th Rigel Regiment, inserted in the Friuli Airmobile Brigade and equipped with A-129 combat helicopters, AB-205 multi-role and A-109 (EOA);
- 26th Giove Squadron Group, stationed to support the Folgore Parachute Brigade and equipped with AB-205 helicopters;

whereas:

- the 4th Altair Regiment comes under the Alpine Troops Command and has AB-205 and AB-206 helicopters, based in Bolzano and Venaria Reale for supporting the Alpine Brigades;

- the 2nd Sirio Regiment comes under the 2nd Defence Forces Command in Naples and has AB-205 and AB-212 helicopters.
- Finally, there is a last division, the 39th Drago squadron group of Alghero, with its AB-412s devoted to special tasks.

As can be seen, this organisational unit is extremely well-coordinated, with many intersecting command lines. The transformation process is still not entirely completed, and the Air Cavalry Command might not manage to keep its central role for elaborating doctrines and procedures and for guaranteeing the indispensable standardisation in all divisions. These latter have a dangerous, albeit natural, tendency to "do their own thing" which will have to be eradicated to prevent each unit constituting an anarchical and independent entity unable to be "plugged in" with other units.

With regards to roles, the Army has divided up its units into two big classes:

- manoeuvre regiments, made up of combat and multi-role helicopters enabling complex aircraft to conduct "air-mechanised" airmobile or independent actions;
- manoeuvre-support regiments, practically all the remaining operating units.

The two manoeuvre regiments are the main element of the Airmobile Brigade that - after infinite debate - is finally being created and enhanced, although full operability will not be achieved for another five years. The Army initially wanted a single airmobile regiment, but it finally decided to transform gradually the Friuli Brigade, which at the moment is a hybrid with an airmobile light infantry regiment and two helicopter regiments as well as an armoured cavalry regiment and a mechanised regiment with supports.

The Friuli currently has a dual nature, although it is planned to "lighten" it of all its traditional components, starting with artillery, and hopefully transform the mechanised regiment (which already operates as an airborne unit as well as in its traditional role) into authentic airmobile units. The Friuli is already fully utilising the helicopters assigned to it, reinforced with the CH-47s when necessary, but if the entire brigade is to become airmobile it has to step up the helicopter component.

Certainly the airmobile units, albeit very expensive, offer extraordinary capabilities and a considerable flexibility, in particular in all those contexts where a range of peace-keeping to peace-enforcing operations have to be conducted.

The other helicopter regiments continue to play "traditional" roles in support of land forces such as transport, assault, liaison, reconnaissance, observation, firing support, combat and MEDEVAC. Not to mention special operations and SAR/CSAR support since the Air Force lacks specialised means. As we shall see, there are specific plans for setting up a Special Operations Command, at least on an armed forces level. Then there are the usual "collateral" tasks, ranging from rescue to interventions in natural disasters and fire-fighting.

The Air Cavalry units are regularly deployed in real out-of-area operations ranging from the helicopters present for years in Lebanon with UNIFIL to those deployed in the Balkans in Kosovo, Albania and Bosnia. These are difficult operations that put to the test men and materiel, but which provide great feedback for all specialities in terms of knowledge, comparison with similar NATO forces and the possibility of enhancing doctrines, procedures and structures for better meeting actual requirements.

Finally, a word about crew training. As said before, the Army mainly sends its crews to the 72nd Air Force Wing, but a certain number of personnel directly attend U.S. Army schools in the United States. Courses and qualifications, as well as promotion to operating machines, are carried out in the Air Cavalry Centre in Viterbo. Refresher and upgrading courses are held in the relative units.

### *1.5 Programmes and Requisites: Medium-long term*

The three armed forces have already launched major programmes for replacing most of the aircraft currently in service. A good choice was to participate in international programmes and pursue a certain standardisation among forces, at least with regards to the platforms. And this standardisation is already a reality today: just think of the family of HH-3F (Air Force) and SH-3D (Navy) helicopters or of the AB-212 series in service with all three armed forces. It was therefore illogical to renounce the advantages of having modern (to a greater or lesser extent) variants of the same basic design. In international cooperation, this is now considered mandatory for keeping down/sharing research and development costs in any significant project. The multinational programmes are more expensive than similar projects conducted on a national level, and each additional member involves a further increase. Nonetheless, each participant's individual share is anyway less than the cost of a domestic programme. Concrete efforts are finally being made to reduce the "extras". This is achieved by competitive procurement, at least on a system and sub-system level, and by avoiding "national fits" (albeit not with great results), as well as by streamlining management structures and bureaucracy. Some steps in this direction should be taken after the launch of OCCAR, antechamber of a real European agency for armaments.

The costs of the new generation of machines are rising steeply and the number of machines that can be reasonably purchased and run continues to drop, so there are no alternatives to joint/combined cooperation. The armed forces are willing to pay more (within certain limits) for the new helicopters, but in exchange they claim not only considerably greater performances, but also and above all a drastic reduction in the cost and complexity of the logistic support chain for the entire life of the machine (life-cycle cost). Moreover, the platform has to offer a considerable growth potential in terms of performance, easy replacement of systems and reconfigurability, guaranteeing a much greater utilisation than the machines being replaced. In practice, the new helicopters must give more, last longer and be adaptable and upgradeable, especially in their systems and avionics. They must also be easy to maintain (there will be increasingly less people for support and they will have to operate from advance bases, with limited technical units and possibly with limited equipment to aid rapid deployment) and offer a high availability/reliability (the few machines in service will have a decidedly higher mission-capable rate than the present ones).

As said before, all three armed forces have programmes (EH-101, NH-90 and A-129) underway for completely or partially re-equipping their units. Further projects are being studied, but they are less urgent, while additional requirements are appearing linked to the advent of new types of machines and the techno-operative choices that some countries are already making or are preparing to make.

The Navy is looking at the large EH-101 bi-national tri-turbine to replace, although not on an equal stance, the SH-3Ds. Sixteen machines are on order and there is an option on a further eight, since the new machines will be entrusted with multiple tasks, starting with surveillance/AEW. These helicopters will become the "eyes" of the naval task force, especially for operations in areas where it is impossible to rely on the support of a fixed-wing AWACS/AEW. At least six EH-101 AEWs are needed for two airmobile/aircraft-carrier naval platforms. There will be at least six amphibious assault helicopters for NLA (TTH configuration with ramp) which leaves just 12 machines for the key ASW/ASUW role. Money permitting, it is reasonable to think of at least one additional order, also considering training/conversion needs and the Navy's desire to develop a further version of the machine, primarily dedicated to CSAR and special operations support. At the moment the Navy is reasonably satisfied with its development and fitting-out programme.



To replace the AB-212s, hopefully by 2005, the Navy intends to acquire 56 NH-90 quadrinational twin turbines, of which 46 should be in the ASW/ASUW standard naval configuration and 10 in the attack/CSAR transport version. The problem for the NH-90 is that of the weight increase, partly compensated by the "slimming" programmes underway as well as by the parallel decrease in the weight and volume of the NFH avionics suite thanks to progress in the miniaturisation of electronic components. The programme is also affected by the delays in choosing crews and the first production order was signed this year. There is the risk of a reduction in the helicopter line because the withdrawal of AB-212s is not compensated by the prompt entrance of the new NH-90s. There will only be around 70 machines in service for at least a decade between 2005 and 2015. With these two programmes (and the Harrier, JSF and MPA in fixed-wing) it is practically impossible for the Navy to launch new initiatives, except for the tactical/medium range UAVs. Both the tiltrotor and a combat/firing support rotary-wing machine to escort and accompany assault helicopters remain dreams.

In turn, the Air Force has to tackle the problem of the replacement of its two main machines, the HH-3F and AB-212. The initial idea was to merge flight lines, with immense benefits from a logistical, training, economic and operating angle, and to have only one type of aircraft, the NH-90 in TTH version. A better organisation and the performances of the new helicopters would also have thinned out the flight lines and reduced the number of divisions. The intention is to have an adequate basic configuration for all helicopters, completed by a certain number of mission kits for CSAR machines (in a ratio of 1:2 with regards to the total number of helicopters planned, around 40). The Air Force is also rather worried about the weight increases in the NH-90, especially in the CSAR role. The mission requirements are very strict and include armouring, special navigation and communication devices, a very sophisticated and complete self-defence kit, a probe for refuelling in flight, extra fuel, crews reinforced with equipment and arms and naturally the capacity to embark a good number of "passengers". All this is not very compatible with the payload, motive power and dimensions of the dynamic components of the machine.

Although no final decisions have been taken, the possibility of maintaining a double flight line is being assessed, choosing a heavier machine (EH-101?) for the CSAR mission and a lighter and cheaper twin-engine helicopter for SAR roles and other secondary tasks (possibly the NH-90). The Air Force still has time before making its choices, but not too much, because for a variety of reasons the operating efficiency of many machines is falling to unsustainable levels. Further requirements regard the VIP transport line, but these could probably be met by a pair of specially fitted out EH-101s.

For training, NH-500Es are still young enough and can easily continue to be profitably deployed for at least another 20 years, so it is early to speak of their replacement. At the most, a cockpit and systems upgrading for some of the aircraft will be needed. In any case, the identikit of the future helicopter is a light, mono/twin engine machine (depending on safety standards and norms for flying over built-up area), easy to use, but also powerful and agile. The ability to play a secondary combat role is appreciated but not essential, since the deployment of the NH-500 in these tasks is already disputable given its lack of protection, limited range and small payload.

The Army's priority is to thin out drastically the range of helicopters in service: with seven types of helicopter and two types of airplane the present situation is problematic in terms of cost/efficiency and the "pruning" of the lines only aggravates the problem. Almost all the divisions are finding they have to operate several different types of machine, with the obvious consequences. There will be rapid standardisation, with a combat/scout helicopter, a combat/assault transport support helicopter, a less sophisticated transport helicopter and a heavy

transport machine. The A-129 CBT has already solved the problem of the first role. The Army has long hoped to replace the various AB-205/212/412s with a single aircraft, the NH-90 TTH, but the costs of this machine will probably induce a rethinking. It will most likely end up with a "fleet" of 150 machines equally divided up among the NH-90s (on which there is some anxiety about the weight increase) and a 5-6 ton model, decidedly less costly both as regards buying and running. The first to be withdrawn from service to make room for the new helicopters will naturally be the venerable AB-205s.

For the "heavy" transport there is no urgency to pension off the very popular CH-47s which have a good 10-15 years of service ahead of them. There are multiple solutions for the future: a new version of the CH-47, the lighter and less roomy EH-101 or even a tiltrotor. A replacement for the AB-206 has still to be found, but for now there is no specific requirement for a light machine; the market anyway offers various solutions, and it should be remembered that the new UAVs could take many of the roles originally planned for these helicopters. However, a machine for advanced training and qualification-maintenance courses, currently carried out by the 206, will probably be needed, unless some of the much more expensive first-line machines are used for these tasks.

As said earlier, the Army is planning to set up a division dedicated to special operations/CSAR support. Some of the already available machines will be assigned to this unit, and in particular suitably modified AB-412s and CH-47s. These latter will already constitute the first nucleus in 2001, with the long-term goal of being able to put more suitable or "customised" aircraft into service, as some NATO armies are doing.

### 1.5.1 Tiltrotors and UAVs

The tiltrotor, object of desire. The armed forces are observing with extreme interest the introduction into service, after a very long, costly and difficult development, of the first tiltrotor by the U.S. Armed Forces and in particular the Marines. The performance offered by the new machine is extraordinary. It combines all the traditional advantages of the helicopter (hovering, able to land/take off practically anywhere a semi-prepared area is available, etc.) with some of those typical of the fixed-wing (in particular the high cruising speed, at least 100-130 knots above that offered by the fastest helicopters, and a considerably greater range). The tiltrotor carries its load further and faster and exposes itself less to enemy fire (speed is life!), something vital in all assault operations, special-operations support, CSAR, MEDEVAC and the like, without forgetting the at least theoretical possibility of making specialised escort/firing support tiltrotors.

No one denies that the traditional formula of the helicopter is now "mature" and offers relatively small improvement margins, at least for performance. However, the new alternative is still unknown; it will probably be extremely expensive and is certainly destined to have a complex and difficult maturation. There is undoubtedly a lot of truth in these fears, as confirmed by the U.S. experience, but there is also the habitual national conservatism which is suspicious of the new and needs a very long time to evaluate, choose, acquire and introduce a "new" system into service. This "prudence", combined with the chronic lack of funds, has often meant that the "new" machines were distributed to divisions when they were already obsolete or anyway philosophically out-of-date and in other countries would already have been replaced. To date there is only one type of tiltrotor that is close to operating, the American V-22, while the smaller commercial BA-609 seems more suitable for paramilitary than purely military tasks, although it is early to judge an aircraft that still has to make its maiden flight. Industry, including the European sector, is definitely not resting on its laurels (there are at least two programmes, which

will be combined, for studying a second-generation tiltrotor) and the formula has good possibilities of success. But this does not mean that we should remain as onlookers: Great Britain, for example, is already seriously studying the adoption of the V-22, alone or in combination with EH-101 helicopters, for FASH (Future Amphibious Support Helicopter) to replace, initially, the amphibious assault Sea King Mk.4 from 2008.

In Italy at the moment there do not seem to be either the financial conditions or the willingness on the part of operatives and Chiefs of Staff to launch an important programme in the tiltrotor field. This moves the "time window" in which the entry of a machine of this type can be envisaged, perhaps when having to replace machines which will remain on line for at least another decade. In this perspective one could think of replacing the CH-47s with a machine such as the one the Americans are studying with the JTR, Joint Transport Rotorcraft, programme. But it is difficult to make long-term forecasts with so many variables at stake. The only exception could be the CSAR/special-operations support role. The possible requirements would in any case involve a small number of machines, which could however provide considerable operating/technical/running experience. At the same time, there is no lack of possibilities of working with U.S. and international armed forces who choose to aim immediately at the tiltrotor.

The UAVs are, at least partly, another matter. The Italian armed forces have already gained a certain experience in this field (just think of the small DASH helicopters tested by the Navy or the Army's CL-89 drones), but it is only now that the unmanned machine is receiving the attention it deserves after years of oblivion (to the extent that Italy was the only major NATO country not to have used some type of UAV during military operations against Yugoslavia last year).

The Army in particular is finally putting into service a complete range of short- and medium-range systems, and a certain number of U.S. pre-strategic Predator UAVs will be acquired, to be run by the Air Force. The Navy, on its part, continues to pay great attention to the programmes and studies carried out abroad and on a NATO level (PG-35) on vertical take-off UAVs; these can be embarked and deployed by small and medium-size units equipped with limited aeronautical equipment and a small flight deck. As soon as the technologies have proved to be sufficiently reliable, the Navy will probably acquire a significant number of these type of UAVs, very useful in a myriad of operating roles and scenarios. This choice will to some extent also be imposed by the lack of helicopters of the new generation and relative crews.

The Navy, like the Air Force, is naturally interested in the deployment of medium-long range UAVs in CTOL configuration. It is natural to ask to what extent the tactical UAVs are and will be in competition with the manned and rotary-wing machines. The UAVs today and the UCAVs of tomorrow are destined to take on at least part of the missions traditionally entrusted to manned airplanes and helicopters. The same will occur for the vertical take-off UAVs with regards to helicopters embarked. This is entirely natural since there is an increasing tendency to avoid exposing one's troops if possible. Today it would be simply suicidal and politically unacceptable to jeopardise men and materiel, even in apparently low-risk missions. This particularly applies to high-risk tasks of reconnaissance, surveillance, patrolling, observation and shooting direction. However, it has to be borne in mind that the request for information and surveillance requirements continue to grow and both manned and unmanned machines are needed to meet them. This was seen during the Allied Forces' operation in Kosovo and Serbia and is confirmed by the U.S. programmes for both types of aircraft. UAVs and UCAVs have and continue to have limitations, but it is mainly a matter of a better division of roles and missions.

Finally, it is significant that the U.S. Navy has recently decided to replace its first-generation, assisted-CTOL-launch UAV Pioneers with a vertical-takeoff UAV which is nothing else but a hybrid combining the dynamic components, basic airframe and propeller of

a light Schweizer 330 helicopter with a new control/autopilot system and mission load. The other machines proposed, including a mini-tiltrotor, have been discarded, mostly because of costs and risks.

### *1.6 Reorganisation, Roles and Functions*

The passage from a military instrument based on conscription to a completely voluntary-professional one, coupled with a reduction of staff and divisions, could soon become a reality and the relative bill has already been examined by Parliament. For now, however, the armed forces are still completing the transition from the old "all-conscription" scheme to that hybrid structure in which a greater number of volunteers is flanked by a still consistent number of those carrying out national service. Nonetheless, the effects of the reorganisation have been considerable and have involved a concentration and, in some cases, a redistribution of troops and materiel over the territory. This development has already had considerable effects on the Army's helicopter units and to a lesser extent also on the other two armed forces. The Air Force has planned a reduction in the number of SAR groups/centres (one of the current four units will be disbanded) and an optimal deployment of troops and materiel over the territory. The Navy could also be involved in similar, at least partial "relocations" according to the distribution of the main fleet units and the maintenance of the current levels of the dockyard poles.

Instead the second stage of cuts, which will be an inevitable consequence of switching to a professional Army, have not been spelt out. This is also because it is still not known what personnel levels it will be able to sustain, the weight and role of civil-defence staff and what functions will have to be transferred to the national industry in terms of technical and logistical support. This means that the figures, programmes and hopes detailed in the previous paragraphs will have to be critically revised. And this time, besides the purchase/running costs factor, the number of machines will also depend to a substantial extent on the ability to manage/use them with the personnel assigned. It is anyway unlikely that the famous 190,000 personnel indicated in the government project will become a reality. Any estimate on the future consistency of the military instrument and the space allotted within it to units equipped with rotary-wing aircraft would be futile at this moment.

But beyond money and permanent staff, a series of recent military experiences have aroused doubts about the role of the helicopter, sparking off a lively debate in Italy and elsewhere. In particular, the debacle of the U.S. Army in Albania is still a sore point. The transfer of troops and materiel from central Europe to the theatre of operations was a logistical nightmare and their long period of training/amalgamation was a disaster. But this was nothing compared to the "great refusal" (the ban imposed by the U.S. President on the use of these machines in combat) to the Air Forces' activities.

These considerations could apply in principle to all the ground/naval forces, which were certainly not protagonists but only (important) second leads during the Allied Force operation. But it would be risky to draw conclusions on the basis of the lessons learned, just as the role of the helicopter should not have been overestimated after Desert Storm (albeit only by those involved).

After the Apaches were unable to prove their worth, a high-ranking officer in the rotary-wing forces in Italy commented that "we have discovered that even the U.S. Army still has to solve many of our problems"! These are firstly problems of training, of the projectability/sustainability of units which are everything but "expeditionary" and emergency, albeit helicopters have a self-deployment capability.

Above all, everything that flies must be integrated in the strategic air-battle plan and its daily updatings (the famous ATO). This also means the long-range artillery systems, heavy rockets and ballistic missiles in primis. Moreover, in a concept of joint operations and when force relationships permit it, one chooses the machine, the weaponry and the unit that guarantees the best result in the specific theatre of operations with the least losses and the lowest risk of collateral damage. Today this could be a plane, in different circumstances it could be a team of special units, a missile or a helicopter. Don't forget that the Gulf War was inaugurated by an attack against the Iraqi early-warning radar by Apache combat helicopters accompanied and guided by the special forces' long-range helicopters.

In Europe, as in the U.S., the doctrine developed at the end of the cold war on the use of special airmobile units to stop the penetration of the formidable Soviet OMGs was soon discarded. Some forces, such as the British Army and the Armee de Terre, even disbanded their big rotary-wing based units established for this purpose. But this was a transformation and not an epilogue. All the major European armies have already set up or are setting up new airmobile/air-mechanised units underpinned by a consistent number of helicopters. This has happened in France, Great Britain, Germany, the Netherlands and Australia, just to quote the most evident examples. And of course in the U.S. no one is thinking of pensioning off the 101st Air Assault or the 82nd Airborne or the Army Aviation Brigades which support all the big combat units. The Russian Army, with all its financial problems, is trying to keep in service numerous combat, assault and transport helicopters, regularly in the front line in the Chechen conflict.

Helicopter contingents are called "air cavalry units" because they have many of the typical features of this traditional arm: mobility, speed, ability for deep penetration, to extricate themselves, to concentrate rapidly efforts, etc. But the cavalry is unsuitable for frontal attacks or for a war of attrition against well-placed heavy forces, even though the combat helicopter, in addition to these talents, has a formidable firing power and the ability to carry out precision stand-off attacks. Moreover, to function as advertised, the airmobile/air-mechanised units require considerable investments, both for initial equipping and during maintaining/support and deployment. They are expensive "toys", but invaluable in any type of operation. The feats of the U.S. 18th Airborne Corps and in particular of the 101st Air Assault in the Gulf demonstrate that, in certain context and theatres, heliborne "light" forces can play an essential role even during a traditional high-intensity conflict.

The U.S. Army is now studying how to re-equip its "line" divisions so that they can rapidly marshal credible combat forces in crises without necessarily having to make use of advance positioning in the area concerned or of sea transport, given that air transport is impossible for the traditional contingents. We are talking about armoured machines, light tanks, self-propelled guns, rocket launchers on trucks or wheeled vehicles to replace the traditional armoured machines, monsters that can weigh up to 70 tons. But these light units will need the support provided by combat/scout/assault helicopters to be able to tackle enemy formations of a certain consistency.

The heliborne divisions are particularly important in the vast range of peace-supporting operations (PSO). The PSO "umbrella" is very wide and almost everything can fit under it, from the relatively simple peace-keeping operations to the peace-enforcing ones, very similar to the old-style wars. It is perfectly possible that an entirely peaceful mission on paper can suddenly change into a dangerous one, such as in Somalia or in the disaster-prone history of UNIFIL. In these missions helicopters are irreplaceable. They permit a very large territory to be reconnoitred and patrolled rapidly, something impossible even for the fastest wheeled armoured means, especially when the terrain is mountainous and there are few roads. In addition, when there are few troops and equipment, an aircraft is a credible surrogate for an otherwise impossible continual

and wide-ranging presence. The helicopter also has a considerable deterrent effect thanks to its "visibility", something that a UAV certainly does not possess. The helicopter permits a rapid concentration of firing and troops where they are needed, to reinforce a small unit in difficulty and to ease the pressure. And a prompt demonstration of power can often stop a crisis situation from degenerating into an open clash. It is thus natural to entrust the emergency/rapid reaction role during peace operations to the air-mechanised units.

The combat helicopter also offers the vital advantage of precision firing. The undesirability of "carpet bombing" means that firing-support indirect weapons are not recommended, and especially "generic" artillery unequipped with precision munitions. A combat helicopter armed with air-surface missiles can act against dot-shaped targets, even moving ones, and can eliminate a nest of sharpshooters or a bunker without need of over exposing itself to enemy fire and without wiping out a district.

Cost problems prevent the massive use of airmobile divisions in peace missions that could drag on for years, but a significant helicopter component is a must and in the hotter stages of these operations these units could be decisive.

The rotary-wing aircraft is particularly vulnerable to anti-air weapons, such as the shoulder, fire-and-forget, heat-seeking missiles or the ever popular AAA, either optical or radar guided. However, with suitable intelligence and training, the appropriate tactics and mutual support among the different weaponry with an increasing use of self-defence systems, it is possible to reduce these threats to tolerable levels.

At least a mention should be made of the big, helicopter-equipped divisions used in civilian evacuation operations (NEO) and humanitarian rescue. The combination of tactical transport planes, helicopters, highly-trained light infantry divisions and light wheeled vehicles has no parallel when it is necessary to intervene with the maximum speed, spread the necessary protective cordon, reach, recover and "extract" personnel who perhaps cannot be concentrated beforehand and then get out of the way, reducing exposure times to the minimum. All this has been confirmed by the recent experiences of the Italian armed forces in Albania. And for carrying out humanitarian interventions, distributing aid, evacuating the sick and wounded in rough terrain or areas difficult to reach the helicopter can be the only solution - just think of its use during the terrible floods in Mozambique.

Then there is what the helicopter-equipped divisions have always done extremely well: transport, liaison, scout/attack, MEDEVAC, electronic war, surveillance, assault, anti-tank fighting, etc. Sensors, systems and requirements can be changed and some roles can be partly transferred to other means, but the core business remains intact.

No one denies that military helicopters are extremely expensive machines. They are delicate, they need continual care (a heliborne division cannot be seen as just another pawn of the basic arm, as if it were a "flying" mechanised division) and to be best deployed they need suitable doctrines and skilled personnel. But if properly used, the helicopter remains a formidable and irreplaceable military instrument. However, precisely because they are prize assets (and especially the "first line" aircraft) they cannot go on being used, especially in Italy, as a green/grey liveried factotum. The armed forces all agree that certain collateral tasks that have gradually taken on a leading role (and been advertised as such) must be cut back. We are talking about the transport of the sick and organs, various civil-defence tasks, general rescue, fire-fighting and so on. Naturally, all available resources must be mobilised in disasters, but the military should no longer routinely intervene with their equipment in normal events to fill gaps. Luckily, national or local bodies/agencies are now starting to set up their own helicopter units/divisions to take over these duties. These might be expensive and rather inefficient structures, but at least the problem concerns the general tax-payer rather than the armed forces. Thus the Prefects will

have to resign themselves to losing the free workforce provided by conscription and will no longer be able to request the intervention of military helicopters for two drops of water or to rescue trippers lost in the mountains. The military will have to concentrate their efforts on guaranteeing the community a fundamental product: security.

### *1.7 Prospects and Opportunities*

There is a lively debate in the armed forces on the impact of the switch to a professional army, of the effect joint and combined cooperation will have on the respective helicopter divisions. The immediate instinct, in any civilian or military organisation, is to close ranks and fiercely try to defend the existing structure, habits and procedures, well-proven and perfected over years of experience. However, we cannot just go on watching what is happening in the rest of Europe as the old apparatus is stripped a piece at a time, losing personnel, resources, materiel and bases. The courageous and revolutionary British decision to create a unified helicopter command, spelt out in that Strategic Defence Review, was launched as one of the first acts of the Blair government and is currently being implemented. Unfortunately however, the British initiative, which is being gradually refined and amended while work is in progress, has been greeted as an anathema. Everyone - or at least the middle echelons and many of the "operatives" - is convinced that it is best to keep existing rules and responsibilities and seek resources in the individual armed force to carry out old and new tasks.

Rapid integration, division of roles or functional specialisation are not even envisaged. Interoperability can be conceived but not a fast-track standardisation. Luckily there is no lack of courageous souls who are starting to reason in joint terms and who realise that international standards will not be achieved by trying to do everything in-house with increasingly limited means; the "critical mass" will not be reached and there will be a negative cost/effectiveness.

The need to economise on every resource, starting with personnel, should thus urge even the most recalcitrant to look at these topics from a different perspective. It is even acknowledged that certain demanding roles are not only outside the capabilities of a single armed force, but are even outside those of the national military instrument as a whole. This is why the integration of forces on a European level - protecting interoperability with the trans-Atlantic ally - or even functional specialisation on a European level, is transforming itself from a mere academic exercise to working projects, albeit in the medium term. Time is needed, but ESDP/DCI will inevitably overturn the organisational and operational structure of the European armed forces, at the same time bringing the much needed rationalisation of procurement and the aerospace and defence industry closer.

This is why joint & combined will become more than just a slogan or politically correct profession of faith. Let us take CSAR and special operations. CSAR is decidedly in vogue today, with everyone to a greater or lesser extent trying to equip themselves for these missions. An authentic CSAR deep-penetration operation in a territory controlled by an enemy with decent air surveillance and defence systems is no joke. It requires the mobilisation of colossal resources, from intelligence, command and control to an extremely complex and articulated "package" of specialist and non-specialist forces. Only the Americans can really do it alone, all the others are forced to make do. This is why even leading European countries can only permit themselves the minimum specialised structures, very expensive toys requiring the highest quality personnel and materiel.

In Italy one tends to believe that these special pawns can be produced and managed on an armed-force level. But CSAR naturally belongs to the Air Force, which has finally realised it can at the most boast a couple of small "dedicated" divisions, with a dozen helicopters each. Not only the machines, but also their pilots have to be suitably prepared: specialists and "real" air-rescuers, whom it is Utopian to train in a purely autarchic manner. A unit with 50,000 troops is certainly able to vaunt a sufficient number of candidates with the right characteristics to specialise through a special training pathway that is at least European. Yes, because real CSAR is something that belongs to special forces and is managed as such on a NATO level, in rigorously multinational units, as during recent real operations.

These invaluable rotary-wing units should naturally be made available whenever any "forces package" is sent abroad and they have to have a real capability in this field. Troops and machines must know how to operate on the ground, in the mountains and on the sea, leaving from naval platforms or from shore bases. When these "special units" are not available or requested, given the limited threat or particular conditions, they can be "surrogated" but without claiming they are an authentic CSAR.

The special operations - and to some extent contiguous - sector is even more delicate, a real Pandora's box. Whereas in all of Europe and in the U.S. joint commands have been created for special operations, responsible for all the different armed forces, in Italy no one is prepared to give up its own "crown jewels". The attempts to create a joint unit have failed, basically because of the head-on collision between the Army and the Navy, while curiously the Air Force has remained indifferent. However, the Navy does not possess the aircraft for placing/recovering its personnel in anything else than littoral situations and this is why it wants to set up an EH-101 CSAR/Special Operation unit to support COMSUBIN. As said earlier, the Army is about to create a unit, initially equipped with helicopters (CH-47/AB-412), hopefully some fixed-wing aircraft (Do-228) and later on new *ad hoc* machines. This detachment will have to support the new Special Forces Group Headquarters being established around Col Moschin-Monte Cervino.

Thus the forces are moving in three different directions to respond to more or less similar needs. It would be logical to avoid the impasse and wasting energy and money by creating a special joint unit, naturally also including an air component, with helicopters and fixed-wing aircraft. The CSAR helicopters at least partly meet the techno-operating requisites for supporting special forces and could constitute a good starting point, naturally assisted by other types of machines with different features. But at the moment it is useless to delude ourselves, also because the newborn joint high commands are not yet in full possession of their powers and are unable to pass over to the *manu militari* initiatives not shared by the individual armed forces. Moreover, unlike what happens elsewhere, there is no input in this sense from the political leaders. However, it is only a question of time before Italy has to fall into line with the rest of the world, because nowadays either you do things properly or you stay at home. And we are no longer content with hyper-specialist and niche activities as the range of possible uses continues to expand.

Something must and can be done towards a greater integration also outside these particular areas. The standardisation of machines will certainly be important here (NH-90 and others), but there is no reason why the extreme solution should not be adopted, the "merger" of the armed forces' components, at least for battlefield support helicopters (transport, reconnoitre/scout, combat, assault), with the exclusion therefore of CSAR, special forces and ASW/ASUW naval helicopters. Among other things the Navy will find it increasingly difficult to maintain a force of assault/ transport helicopters consistent enough to support a San Marco Regiment that wants to become a brigade and that is increasingly



being deployed in the mountains (even in Sarajevo!) in roles that have little to do with littoral and amphibious warfare.

In addition, the Navy has a "hole" in terms of strike/scout support as it does not have combat helicopters (something the U.S. Marines or British Navy has or will soon have). Either a helicopter like the AB-212 today and the NH-90 tomorrow is enough or one has to rely on the Harriers, with nothing in between, given that providing a direct escort to helicopters with a jet is not simple. But the Army has its Mangustas.... which have already flown from ships. So it is not absurd to think of a joint helicopter force operating according to need from land or from ships, with aircraft-carriers that can also be used as floating airports supporting big joint helicopter formations. If the U.S. Navy did it in Haiti with its nuclear-powered attack aircraft-carriers then it can also be done in Europe with decidedly smaller ships. And it is evident that an integrated and flexible solution of this type would mean substantial savings in resources.

A further advantage can be achieved in the logistical support field, as well as in that of procurement-development. Today, despite the coordination meetings and actions, an armed force often discovers a need for a certain system and starts the long drawn-out evaluation/selection/acquisition procedure to find that the same kind of thing is also being sought by the "cousins". For example, armament or self-protection systems or the entire vast range of support GSE equipment. With increasingly less machines in service and moreover of the same type or at least the same family, this will no longer be admissible. Despite the sometimes negative experiences in the techno-maintenance sector, the structures of the single armed forces have to be rationalised and integrated. It has to be decided how much and what can be entrusted to an outsourcing system for elastic and just-in-time management of spare parts and bigger interventions. Again, it would be natural to imagine that the technical specifications and requisites for the future machines would be defined by joint bodies or at least take into account ab initio elementary joint needs in terms of cross servicing/support and interoperability.

And alongside this something of the same can be sought on a European level, since some aircraft (NH-90s or EH-101s) will be spread among the armed forces of various allied countries. Again, one can think of tackling the problems of training in a European framework, starting with areas suitable for carrying out "delicate" activities, such as low-altitude flying (immediately after Cermis there was the risk of saying goodbye to tactical flying and thus of the possibility of using helicopter divisions in operations) or that of complex and large formations. And perhaps in addition to (and not instead of!) the U.S. and national pipelines an intermediate formula could be found in a European key, rather like what is happening for the air forces and fixed-wing aircraft with programmes such as the TLP NATO (a multinational initiative for the advanced training of pilots who acquire a common standard).

There are many opportunities and they must be fully tapped: unless absolutely necessary, the era of the independent "reigns" and impassable borders will soon be a thing of the past. This must not be seen as a disaster but as a chance to do better and as a spur to become part of the new operating units/formulas which will be defined on a supranational level, just as has partly occurred for the air forces. Today it's the turn of the helicopters, tomorrow perhaps the tiltrotors.

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## 2. Experience and Lessons from Recent Military Operations: A U.S. Perspective

*Charles M. Burke*

### 2.1 Preface

The purpose of this treatise is to capture the essence of what a modern aviation force brings to the army in today's new international setting and those principles upon which it is employed across the range of military operations; additionally, what are the implications for the Italian Army as it examines the expanded use of the helicopter in the new military scenarios; and finally, what lessons can be learned from the United States Army's recent employment of aviation.

Current events have underscored the uncertainty of these times. The post-Cold War period has placed unprecedented operational demands on the armies of the NATO Alliance. Civil disturbances, disaster relief, humanitarian and peace-enforcing operations, and the threat of regional contingencies, punctuate the need for a trained and ready contingency-oriented force capable of deploying on short notice in response to an emerging crisis. Amidst these regional and global demands, national domestic change and fiscal constraints broaden the challenge.

This era also confirms the application of high technology in future contingencies. Weapons with the "effects of massed forces" are available to any nation possessing hard currency. Precision munitions, digital communications, position location equipment, advanced visionics and robotics promise to change the face of future conflicts.

The physical and intellectual dimension of new international military scenarios in which these forces are compelled to operate urgently demand intuitive, versatile leaders supported by agile staffs and well-trained professional soldiers. Mobility, agility, simultaneity of effort, credible deterrence, lethality when required, increased operational tempo, and space age logistics dominate most ongoing restructuring initiatives and investment decisions while, at the same time, NATO Armies are downsizing.

The Italian Army is responding positively to this new strategic environment with new emphasis on crisis management and planned changes in its force structure. Other NATO countries are increasingly using Italian territory and airspace to support contingencies in the Balkans. Italian soldiers today are patrolling the streets of Pristina and other areas in and around Kosovo and Albania. The Italian government is decisively engaged in projecting its influence in the region, and the future portends increased involvement in regional contingencies by the Italian Army.

The helicopter plays a critical role for the ground commander in this regime. The helicopter today is more than mere transport. It is reconnaissance and surveillance, attack, assault, and special operations aircraft. It performs electronic missions, search and rescue, medical evacuation, and command and control missions in support of ground forces. It operates day and night and in same-weather conditions with which the ground commander must contend. It comprises the third-dimensional contribution to a modern army. While the new operational scenarios demand readiness for a wide range of employment, relevancy for the effectiveness of the ground commander's mission is the obligation for which an aviation force must be focused.

The future use of the helicopter in this updated and very capable role will essentially serve as the third dimension centerpiece of the Italian Army.

## 2.2 Strategic Realities

The centerpiece of US and NATO military strategy continues to be deterrence, coupled with a military capability to inflict overwhelming destruction upon an enemy should deterrence fail. New military scenarios have added responsibilities to respond quickly to regional contingencies ranging from humanitarian relief to peacemaking operations with competent, credible forces.

The end of the Cold War and the dramatic upheaval in Eastern Europe and the former Soviet Union have reduced the immediate threat of a superpower confrontation. The United States and its allies still retain global strategic interests, including obligations to other allies who face significant regional threats across the spectrum of military conflict. Events in Southwest Asia and the Balkans in the period immediately following the end of the Cold War to the present continue to demonstrate how rapidly threats can emerge and how volatile the world situation is.

The range of possible military operations spans the spectrum from absolute peace to Thermal Nuclear War. Mankind has never been at absolute peace and, hopefully, the threat of nuclear war will remain low for the foreseeable future. Nevertheless, we live in uncertain times. The U.S. Army, for example, has nearly 120,000 soldiers deployed to more than 70 countries, performing missions that range from humanitarian relief to peacekeeping. In the war-torn region of the Balkans, armies from more than 25 nations are patrolling roads and villages. During a time when 94% of the world's governments are democratic, the only certainty seems to be that soldiers around the world will continually find themselves deployed from their home bases performing missions between these two extremes.

Prudence dictates the presence of an effective military capability to deter conflict, or to move quickly to resolve challenges and threats. The differences in responding to actual conflict and lesser operations are often measured in moments. Therefore, a military force is only relevant if it is capable of moving quickly and competently to any challenge, at anytime, regardless of its current mission. Today in Bosnia, a powerful force capable of conflict is maintaining peace without conflict.

This has resulted in the development of new national military strategies for the United States and most NATO countries. Smaller standing "professional" armed forces, with less reliance on conscripts, has become the norm. Confronting threats with smaller armed forces requires evolutionary adjustments to operational doctrine as well as modernized equipment.

Missions involving rapid deployment and crisis management will continue to be highly important to the NATO Allies. Peacekeeping, peace enforcement, and humanitarian assistance operations demand attention and participation. Peacemaking, counter-narcotics and support of civil authority will certainly demand innovative application of armed forces well into this century. Aviation forces must be sufficiently versatile to contribute effectively through the range of military operations.

Although the Army must always be prepared for war, operations short of war are the most likely. In recent years, activities in Somalia, the Balkans, and in Central Africa demonstrate that while the range of military operations may have narrowed, regional threats are less well defined than in former times.

What is clear is that major regional contingencies will be the basis for force development planning in the future. Conflict can occur quickly anywhere in the world. Sudden outbreaks may involve powerful armies with modern weapon systems, including nuclear and chemical capabilities. Because of the robust international armaments markets, these armies may possess the latest technologies.

There is a high probability of numerous operations – other than full-scale war – in many parts of the world. Although the likelihood of encountering sophisticated weaponry in these

scenarios may be small, the threat to allied forces can be formidable.

The implications for military forces encountering these threats involve both geography and technology:

- A lengthy out-of-country deployment on short notice will be the standard.
- Joint operations with allied airpower and naval presence will quickly dominate the area of operations.
- Friendly command, control, communication and intelligence (C4ISR) assets will significantly overmatch the opponent.
- Threat forces will probably outnumber early deploying allied forces and may have technological parity in some weapons systems.
- Early deploying forces must be mobile, lethal, and sustainable upon arrival.

Seldom, if ever, will military operations be conducted by a single military branch. The army will act as part of a combined force in future operations. The contributions of every component add to the effectiveness of the overall force.

The Italian Army's aviation component possesses inherent characteristics that guarantee a significant – if not unique – role throughout the range of military operations. Aviation doctrine must adjust to ensure its maximum contribution to the operational effectiveness of the army. Particularly important and potentially decisive will be the role aviation forces play in the early days of a strategic deployment of contingency forces to a hostile or threatening situation such as the United States found in the Gulf War and NATO discovered in Bosnia, and most recently, Kosovo.

Properly planned and executed, operations by aviation elements can be decisive at the tactical level and may make highly important, or even decisive, contributions to operational level success.

### *2.3 The Role of the Helicopter from Vertical Envelopment to Air Maneuver*

#### *2.3.1 The Us Army Experience*

The Vietnam era saw the beginning of today's modern army aviation forces. The concept of aviation as an enhancement to maneuver was developed and demonstrated, and later proven in battle, by the United States Army during the Viet Nam conflict. The concept of vertical envelopment became a viable tactic and an important operational element.

The escalation of helicopter operations in the 1960s and 70's was made possible by the enhancements in the gas turbine engine, which provide reliable power, speed and range. Missions such as airmobile operations, medical evacuation and artillery adjustment quickly became standard. US Army aviation developed a close association with fire support that extended well beyond the traditional role of artillery adjustment. Attack aircraft took on various roles, including aerial rocket artillery and attack of close and deep targets. Aviation operations during this time frame, however, were still characterized by being “in support of ground operations.”

In the post-Vietnam era, U.S. Army aviation became firmly rooted within the organizational structure of the division and the corps. Each division had an aviation battalion that comprised the spectrum of aviation-- attack, assault, and general support units. The command and control of the subordinate aviation units were carried out under operational control (OPCON) of ground maneuver units for either a specific operation or for an extended period of time. Aviation units seldom performed “aviation only” operations, and operations at night were limited.

Beginning in the early 80's, improvements in night vision, navigation, and stand off weapons enabled aviation to become a full partner in combat operations in the "ground environment". The army established aviation brigades in every division and corps. Planning for aviation operations as part of ground operations became routine.

The divisional aviation brigade began to be assigned missions for execution under its own command and control. This was the beginning of "air maneuver," or combat, as the third dimension of the ground commander's battlespace. Air maneuver, as an operational concept, took on definition as divisions and corps experimented with this new organizational structure and with the profound capabilities introduced by new aircraft.

New technologies introduced in the late 1980s and early 90's significantly bolstered the enhancement of air maneuver. Night vision goggles and night vision systems of the attack and utility aircraft gave aviation a quantum advantage in conducting successful sustained night operations. Precision munitions and the ability to fire from extended ranges added to the effectiveness and survivability of air maneuver operations. Additional hardware improvements in navigational (Doppler/GPS) and communications equipment enabled the commander to win the information war, protect the force, and conduct precision fires throughout his area of operations.

Operations in Panama and the Arabian Gulf saw this evolutionary doctrine of Army aviation as an air maneuver combat force come of age. The technological advances brought to the battlefield through Army aviation have not changed any of the principles of war. Rather, they have enabled the ground force commander to apply these principles in an expanded battlespace with far greater depth, speed, and precision than ever before possible in the history of warfare. He is now able to conduct coordinated and synchronized maneuver operations in all three dimensions of the battlefield.

### 2.3.2 Air Maneuver - The Third Tier of Mobility

To appreciate fully the potential offered by the concept of air maneuver, consider that superior mobility alone often determines the outcome of operations. At the outbreak of World War II, warfare was primarily a static affair, with "rapid" maneuver restricted to small movements of truck-infantry forces or horse-mounted cavalry. Large-scale maneuver was on foot. During World War II, the German Army took advantage of a much improved weapons system: the tank. The Germans employed composite tank divisions at blitzkrieg speeds to outmaneuver a less mobile foe.

Using large, highly mobile tank units to thrust deep into enemy territory and to set maneuver pace, the Germans added a new dimension to warfare. This new dimension was referred to as the "second tier of mobility." Indeed it proved to be decisive for the Germans until the allies learned the art.

Mobility of forces on the battlefield has continued to increase since World War II. However, it is unlikely that technology will produce any significant increase in ground force mobility. Restrictions imposed by terrain and man-made obstacles will not allow modern tanks and fighting vehicles to achieve their maximum speeds.

For any notable increase in mobility, ground forces must move into the third dimension, the air. At the same time, they must stay close enough to the earth to take part in ground combat. Such is the operating domain of the helicopter. Unencumbered by terrain and fixed obstacles on the earth's surface, the speed of the helicopter elevates the commander to another level in warfare. This advantage in speed and agility is what General von Senger und Etterlin and other respected military strategists in the late 1980's declared as the point in history in which warfare

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is moving into a "third tier of mobility" -- that of the helicopter or air maneuver.

Our strategic task is to discover how best to optimize on the battlefield the superior mobility that the helicopter offers. In this regard it is instructive to consider the advantages afforded by rapid combat maneuver in the third dimension.

Of particular significance is the ability of combat aviation units to mass quickly for concentrating fire or respond to an emergency. The speed and range of modern rotary wing platforms enable commanders to keep their units dispersed for security. At a given time and place, they can mass quickly to achieve synchronization and surprise. The process can be repeated in rapid succession, keeping an adversary off balance and in a reactive posture. Using aviation forces in this manner can enable the ground commander to seize and maintain the initiative, to set maneuver tempo, and ultimately to dictate the terms of the operation. To achieve this end, it is important to think of aviation as a combat maneuvering arm and to capitalize on the unique capabilities it offers by integrating aviation fully into the scheme of maneuver.

In most instances, the helicopter should be integrated into the operation based on its own capability to maneuver -- independently of the ground system, when necessary.

If the most mobile ground system -- usually the tank or infantry fighting vehicle -- determines maneuver tempo and the helicopter is integrated into the fight based upon this ground-paced tempo, then the two greatest attributes of the helicopter, its speed and agility, will be negated. The ground commander will lose an important asset. This is not to say that the dominant tempo of an operation, especially in the close operations, should always be air-paced, or that army aviation should not operate in support of ground-paced maneuver. It certainly can. But, used properly, the tremendous mobility of the helicopter will enable the commander to mass combat power quickly, strike enemy weaknesses, and to increase maneuver tempo when it is advantageous to do so.

Currently the most potential adversaries enjoy essential parity in quality and quantity of ground maneuver systems. Given this, it is unlikely that one of these ground systems could "outmaneuver" the other, at least not consistently. The ground maneuver equation, then, yields strength against strength. The idea that we can apply the superior mobility of the helicopter (strength) against a less mobile ground system (weakness) is fundamental to the competitive strategy proposed in this paper.

So far, superior mobility of the helicopter to gain a maneuver advantage appears germane mostly to tactical operations. Significantly, the concept of air maneuver may be equally suited for the operational level.

The quantum technological leap and attendant increases in firepower, speed, range, and survivability of the modern helicopter gives it the requisite capabilities to function in an operational role. The modern helicopter's ability to maneuver deep into enemy territory, to do it quickly, repeatedly, and at unexpected times and places, provides the operational level commander with a highly credible weapon. The fact that this represents a relatively new capability presents the enemy with a broader, more complex threat. This may cause him to alter the way he operates. The competitive strategy of deep air maneuver is to make him do precisely that.

In summary, the Germans used innovation, initiative, and the superior mobility of the tank to introduce a new concept to modern warfare. Similarly, the helicopter offers a significant new capability in advanced technology rotary wing systems. The manner in which the army uses this capability may well be the key to success on the modern battlefield.

In the middle 80's, Richard Simpkin asserted in his book *Race to the Swift* the "operational use of the helicopter can have a far more revolutionary impact on maneuver warfare than ever the tank did." In the early 90's, then Major General Hugh Shelton (currently serving as the

Chairman of the U.S. Joint Chiefs of Staff) reported... 20 or 30 years from now... Aviation will be... Perhaps the dominant battlefield operating system." Accordingly, we should continue to explore innovative ways to use the speed, agility, firepower, and rapid massing and dispersing capabilities of the helicopter.

#### 2.4 *A Vision for Army Aviation*

Modern army aviation is not a substitute for any other member of the combined arms team; rather, it brings unique capabilities to the operational environment, capabilities that complement those of the other combined arms. Aviation maneuvers rapidly in the third dimension of the ground commander's battlespace to bring decisive combat power to bear at the critical point and time on the battlefield. This capability expands the battlefield and reduces the time needed to move decisively against enemy forces. A specific aviation unit could be found performing in deep, close, and rear operations on the same day on the modern non-linear battlefield. Thus, aviation's ability to operate in all dimensions of the battlespace is recognized and provides a degree of flexibility and agility that is not only unique, but brings maneuver warfare to a pinnacle of battle dominance.

While aviation forces break friction with the ground, they operate in the ground regime. They are manned systems, operating as units, employed as combined arms, and utilizing the terrain in the same fashion as ground units. Although they offer some unique advantages to the commander -- the ability to fight from the swamps, the tops of the forests and the sides of mountains -- they are subjected to the same dynamics of the battlefield and the same physics of land warfare as ground units.

*Army Air Maneuver* -- to place the enemy in a position of disadvantage through the flexible application of combat power in the third dimension.

*Army Air Maneuver* leverages these unique advantages to the benefit of the ground commander. Synchronizing air maneuver with ground maneuver by enhancing reconnaissance, providing security, and conducting attacks and counterattacks allows the friendly force commander to increase the tempo of his ground operations, and to achieve a positional advantage in both time and space over his enemy. Linked with deep fires, air maneuver offers the ground commander the capability to influence events throughout his entire area of operations.

##### 2.4.1 Aviation Operational Principles

Aviation provides the essence of a versatile force whose primary focus is combat operations. Mission planning and execution are driven by general principles that apply or derive from the principles of war and the tenets of army operations.

Suggested principles for aviation operations are as follows<sup>1</sup>:

*Aviation operates in the ground regime, not in the aerospace environment*

This cardinal principle defines aviation's role as an element of land power. Aviation is a component of the combined arms team, not the air component of the army. Aviation's primary

<sup>1</sup> U.S. Department of the Army. FM 1-100. *Army Aviation Operations*. Washington, D.C. 21 Feb. 1997, Chapter 1.



mission is to fight in the land battle, secondarily to support ground operations. Aviation is comprised of soldiers, not airmen and its battlefield leverage is achieved through a combination of observation, mobility and firepower that is unique to land warfare. Aviation greatly multiplies the commander's ability to apply four fundamental Principles of War: Maneuver, Mass, Surprise, and Economy of Force.

*Aviation expands the battlefield in space, time and echelon*

Expansion of the battlefield is necessary to enable the commander to seize the initiative at a critical point in the operation. Aviation expands the scope of the ground commander's battlefield in three dimensions. Principally, in space and time by extending the range at which direct fires and observed fires can be concentrated on the enemy and by expanding his reconnaissance and surveillance envelope beyond the effective range of other systems. Aviation expands battle space at each echelon to which it is assigned or attached, providing a capability where none exists or adding to existing capabilities.

*Planning times for air and ground maneuver elements will be the same*

Aviation units conduct deliberate planning within the same time parameters as the other maneuver elements. Airspace coordination, route clearances and weather updates complicate the task for aviation staffs, but for effective combat operations the standard is the same. Planning for Aviation must be accomplished by ground staffs as well, and like ground operations, planning is continuous.

*Combat aviation is concentrated at the tactical level*

Combined arms battles and engagements are fought by brigades and regiments. In the Italian Army, the brigade is the lowest level at which all of the combined arms are normally integrated. The combination of combat aviation, armor and infantry is generally a habitual association at this level. All three arms are required for deep, close, and rear operations throughout the course of a contingency. Army aviation fights as units and, in like manner, aviation units conducting air maneuver operations are given maneuver objectives rather than individual targets. Therefore, combat aviation is primarily assigned to and employed at the tactical level. This differs from air forces, which are generally employed at the strategic level.

*Aviation performs combat, combat support, and combat service support battlefield functions*

Aviation's greatest contribution to battlefield success is the ability it gives the commander to apply decisive combat power at critical times, anywhere on the battlefield. This may be direct fire from aviation maneuver units or the insertion of overwhelming infantry fires, which are delivered into combat by air assault. Aviation can also provide missions directed toward the support of ground combat operations. This includes air movement and aeromedical evacuation whose primary function is support of combat elements in contact with the enemy. Aviation logistics elements support maintenance and supply of aviation combat and combat support units.

*Aviation units are integrated into the combined arms down to the level at which they will be employed*

Aviation must be fully integrated at whatever level it is to be employed. Aviation operations are decentralized. The Aviation Regimental Commander is responsible for planning and employing aviation at whatever level it is integrated. This is normally accomplished on a "mission basis" and liaison is detached to the ground commander to advise on aviation employment.

#### 2.4.2 Tactical Operations

The primary focus of Army aviation is to support the ground commander, but planning for the employment of aviation is both a ground brigade and aviation regimental commander's responsibility. Although the planning focus for the brigade differs from that of the regiment, the planning guidelines for aviation maneuver forces are similar. Whether a ground brigade commander is deciding on how to shape tomorrow's battlefield, or the aviation regimental commander is planning on how to support tonight's counterattack, the planning principles for the employment of aviation remain constant. With such detailed planning, operations throughout the contingency area can be planned and conducted by the aviation units, quickly, from the same mission orders that ground forces utilize.

During a strategic deployment to an actual or potential regional conflict, self-deployment or early strategic air and/or sealift of aviation forces could be decisive. Placing attack helicopters in the early entry phase offers the ground commander a force which can deploy rapidly, provide reconnaissance over great ranges, in depth and at night, and increase his security capability during the critical phase of force build up. The presence of attack helicopters in the initial force package may deter the threat or interrupt the aggressor's decision cycle long enough for friendly forces to arrive.

If the entry force must fight to obtain a lodgment, or to secure the force against an aggressive threat, attack helicopters once again place an overwhelming direct-fire capability in the hands of the ground commander. Assault helicopters can rapidly move personnel, equipment, and supplies across great distances that expand the lines of communication. Utility helicopters can aid in command and control, aeromedical evacuation, sustainment operations, and situational knowledge of the forces.

The realm of the aviation regiment is the third dimension of the ground commander's battlespace -- his warfighting airspace. This airspace is nominally defined by the operational and/or political boundaries of the ground force and the coordinating altitude. The coordinating altitude is a permissive control measure common to U.S. and NATO doctrine. Airspace below the coordinating altitude is controlled by the ground commander using procedural control measures in the forward combat zone and air traffic services in the rear combat zone. The ability to control this airspace gives the ground commander greater flexibility and freedom of maneuver than previously possible. And today, modern communications and digitization are increasingly giving the ground commander the ability to dynamically control this airspace instantaneously.

Army aviation forces, ready to fight early, provide the commander one of his most lethal, flexible, and versatile means of influencing events. Depending on the mission of the force and the environment, with regard to the range of military operations, aviation forces offer the ground commander a rapidly deployable force that can perform a multitude of operations.

## 2.5 Lessons

*“You may fly over a land forever; you may bomb it, atomize it, pulverize it, and wipe it clean of life – but if you desire to defend it, protect it, and keep it for civilization, you must do this on the ground, the way the Roman legions did, by putting your young men into the mud.”*

The Gulf War lasted 46 days from the start of the air campaign to the signing of the cease-fire. It was a classic Joint and Combined operation. Each of the Services did what they do best. The combined air forces destroyed the Iraqi air force and air defenses in a matter of hours and then, for the next forty days, air power systematically destroyed command and control facilities, supply depots, ammunition storage sites, airfields, and the transportation network. The Iraqi Army was frozen in place unable to reposition, resupply, or to refit. They had no choice but to suffer constant bombardment from Allied Air Forces.

The Combined Naval Forces controlled the Gulf and all movement on, above, and below the sea. 10,000 Marines feigning an amphibious landing kept one third of the Iraqi forces in place defending against a possible beach assault.

In short, the air and naval forces of the Allied Powers set the condition for a successful ground campaign. As we have learned throughout history, the only way to culminate a conflict is to defeat the enemy on the ground and the ground assault of the Gulf War lasted less than four days.

MG Barry McCaffrey, Commanding General of the 24th Infantry Division (Mech), was asked by the Senate Armed Services Committee shortly after the Gulf War, why he thought the war only took 100 hours. MG McCaffrey responded, “It didn’t take 100 hours, it took 15 years.” The Army undertook a Herculean effort following the Viet Nam War to rebuild and reshape itself into competent fighting force. In the fifteen years preceding the Gulf War, the Army made three major changes in the force that were instrumental in setting the conditions for the successful prosecution of the war against Sadaam Hussein’s Army. The US Army invested in “quality people, quality training, and quality equipment”. The quality of the soldier was by far the most important of these initiatives and enabled the Service to attract sufficiently educated soldiers capable of being trained to operate and maintain sophisticated equipment under very challenging conditions. But the foundations of these changes were born out of the lethargy, decay, and intolerance the Army suffered coming out of the debacle of Viet Nam.

After Viet Nam, the major threat posed by the Soviet Union and the Warsaw Pact was clearly the most dangerous. The Warsaw Pact had undergone an unprecedented modernization during the years the US was occupied with the conflict in Southwest Asia. The 1973 Arab-Israeli Conflict provided a timely and propitious window on the future of conflict the Service would likely face. This war was the first large-scale confrontation between two forces equipped with modern weapons representative of those found in NATO and the Warsaw Pact. Secondly, the battle was so bloody, intense, and close-run that policy makers outside the Army began to seriously question the ability of a seemingly moribund American Army to fight a war of similar intensity. The war and the state of affairs of the post Viet Nam Army prompted a compelling argument for sweeping modernization and reform.

<sup>2</sup> Fehrenbach, T. R., *This Kind of War: A Study in Unpreparedness*. New York: Macmillan, 1963. This was a study in the conduct of the Korean War.

### *Quality People*

In the early 1970's, Congress mandated an end to the draft and directed the Army to form an all-volunteer force (called VOLAR) of highly trained, professional soldiers to meet the ever-growing threat of the Warsaw Pact nations in Central Europe. The VOLAR experiment was slow in starting and didn't become successful until the early 80's when Congress finally raised soldier pay and benefits to near civilian counterpart levels. Educational incentives like matching college funds helped raise the quality of the enlistee.<sup>3</sup> In 1991, 98% of the soldiers in the Service had at least a high school education. This was quite a contrast to just 10 years earlier when only 50% were high school graduates. Indicators of indiscipline also dropped considerably as the quality of the Army increased<sup>4</sup>.

### *Quality Training*

Simultaneously with the improvements of the quality of the enlistee, were dynamic the changes and improvements to the standard of the training of the force. The Army's Training and Doctrine Command (TRADOC) established high standards for individual training of soldiers and officers, and high standards of training for units as well. The "train-to-the-standard" philosophy enabled soldiers and units to meet known, universally accepted standards. This further enabled units and personnel to be exchanged or "chopped" between commands to meet the mission at hand without requiring considerable retraining. This enabled commanders preparing for contingencies to start at higher levels of unit proficiency.

The birth of the Combat Training Centers (CTC's) during this same period of time carried training to a new standard. The National Training Center (NTC) at Fort Irwin, California, provided a realistic force-on-force training venue for the Army's mechanized and armored forces. Light and airmobile forces were trained primarily at the Joint Readiness Training Center (JRTC) at Fort Polk, Louisiana and the Combat Maneuver Training Center (CMTC) at Hohenfels, Germany enabled forward deployed units in Europe to achieve certification in force-on-force combat maneuver training. All of the Combat Training Centers provided as near realistic combat conditions as could be achieved in a training environment.

As testimony to the effectiveness of the CTC's, immediately following the cessation of hostilities in Desert Storm, a young Armored Cavalry officer commented, "Sir, the National Training Center was worse than this". A typical unit rotation to the CTC's included nearly two weeks of stressful combat like conditions. Hostilities in the Gulf War lasted only 100 hours and the swift victory in this conflict is evidence the Army had certainly gotten its money's worth out of its investment in the CTC's.

Training soldiers and young officers was not enough. The Army also developed the Battle Command Training Program (BCTP) for placing its General Officers and senior staffs under the stress of combat conditions. Although primarily a computer driven command post exercise, BCTP nevertheless challenged senior officers and staffs to plan, execute, and supervise contingency operations under very stressful conditions using their own deployed command posts and standard operating procedures.

<sup>3</sup> In 1991, fully 41% of the force chose to enroll in the Army College Fund.

<sup>4</sup> Soldiers who tested in the upper half of the mental categories rose from 26% in 1980 to 75% in 1991. Positive indications of drug abuse dropped from 25% in 1979 to less than 1% in 1989.

By 1991, nearly every soldier, officer, general officer, and combat unit had experienced the CTC's or the BCTP on a schedule of about every eighteen months. Even the Reserve Components were trained in the combat training centers.

### *Quality Equipment*

When GEN Creighton Abrams, the Chief of Staff of the Army in 1972-1974, and the architect of the rebirth of the Army, committed to developing world-class soldiers, he also sought first class equipment. With the help of Congress, this led to the development and acquisition of the "Big Five" – the Abrams main battle tank, the Bradley infantry and cavalry fighting vehicle, the Apache attack helicopter, the Blackhawk assault helicopter, and the Patriot air defense missile system.

Fielding of these weapons systems occurred in the 1980's. The Army trained extensively with this equipment at the CTC's and at their home stations. So by the time Saddam Hussein's Army marched on the tiny Kingdom of Kuwait, the United States Army was quite arguably at its highest state of readiness in its 214-year history.

The country's investment in quality people, quality training, and quality equipment paid off with quick victory and minimum casualties. The ground war lasted 100 hours and saw a force equal to half of the eighth largest army in the world utterly defeat 100% of the fourth largest Army in the world – with minimum casualties – on the enemy's ground.

#### 2.5.1 Operations in the Gulf War

For the Army Aviation Branch, these fifteen years were formative. The Branch was formed in 1983, the Blackhawk and the Apache were fielded by 1985, every Corps and Division was outfitted with an Aviation Brigade by 1990, and all of these units had the opportunity to perform at one of the CTC's. The notion of maneuver by air had become routine through constant practice at the CTC's.

Operation DESERT STORM provided the first combat experience of this third tier of mobility. The experience of the Gulf War validated the helicopter's ability to maneuver in the third dimension of the battlefield and demonstrate the overwhelming value of this combined arms approach to conflict.

Nearly 1,800 U.S. Army helicopters of all types operated in the Gulf conflict. A little over half were attack and scout helicopters (AH-64, AH-1 and OH-58) and the 360 attack helicopters that were deployed accounted for 17 percent of the destruction of Iraqi armored forces – a ratio of better than 2.5 to 1. That, incidentally, is higher than any other weapons system involved in the ground conflict.<sup>5</sup>

Thirty-eight percent of the aircraft were utility and medium lift helicopters and another 8 percent were light utility. Helicopters during Operation Desert Storm flew more than twice their peacetime operational tempo and sustained a readiness rate that exceeded peacetime requirements despite the austere conditions of the open desert.

The experience of helicopter operations was essentially the same for all seven U.S. Army divisions deployed in the conflict. Helicopter forces expanded the ground commander's battlefield

<sup>5</sup> Smith, M. K., *United States Army Aviation in the Gulf War*. Fort Rucker, AL: Office of the Aviation Branch Historian, 20 June 1993, p. 504.

in both time and space. Each division commander was able to influence operations in the full depth and breadth of his battlefield in all types of weather, day and night, with his organic aviation force.

The 101st Airborne Division conducted the longest and largest airmobile operation in history. In just 24 hours after the start of the ground war, the Screaming Eagles occupied blocking positions along Highway 8, effectively severing the main line of communication between Baghdad and Basra. The tactical formations of the 101st clearly achieved strategic impact by cutting off any opportunity for withdrawal of the Republican Guards from Kuwait, as well as posing a threat to the Iraqi capital.<sup>6</sup>

Time and time again, ground commanders intuitively employed aviation and ground forces to achieve overwhelming maneuver capability. In each case, the ground commander was able to put all or most of his ground combat forces in the battle, rather than holding back a sizeable reserve, because the flexibility of aviation enabled him to react to any unforeseen contingency quickly. With aviation reconnaissance forces, he secured his flanks and screened his advance at greater distances than with ground forces alone. With their flanks secure and knowledge of the enemy to their front, the ground division commanders were able to nearly double the tempo of their advance. Aviation forces, synchronized closely with ground forces, enabled commanders to maneuver in all three dimensions of the battlefield with security and speed -- a combination indefensible by the best of the Iraqi Army.

### 2.5.2 Operations in Bosnia

Operations in Bosnia are continuing to this day and the lessons are still being learned and written. Aviation operations in Bosnia have so far paralleled many of the experiences in the Gulf War in manner of employment, effect on the field of operation, degree of flexibility, and record of sustainment.

Full integration with ground commander's plan at each level is routinely executed. Missions such as force protection, reconnaissance, and surveillance; command and control; the ability to respond quickly to any contingency; and the ability to perform the full range of military missions define the characteristics with which aviation operations are being conducted in the Balkans.

Helicopter forces demonstrated their strategic self-deployability from their bases in Central Germany in the first deployments into Bosnia. Attack and reconnaissance helicopters gave senior commanders the ability to recon "beyond the horizon" while ground forces were hampered by the Saava River crossing during the initial stages of that operation. Medium lift helicopters delivered bridge spans and other critical supplies in direct support of the river crossing, which, incidentally took place in the worst weather the region had experience in more than 30 years.

During the first winter, helicopters were able to verify with complete certainty the status of the zones of separation (ZOS), which was especially valuable since snow covered most land mine locations. Attack helicopters added to the value of deterrence, as many of the various factions complained of the menacing appearance of the ever-present Apache. They claim that the Apache "...is very ugly." There is little doubt of the deterrent value of the attack helicopter during these peace-type operations, nor is there any doubt of the capability to be decisive should it be required.

<sup>6</sup> Houlahan, T. *Gulf War: The Complete History*. New London: Schrenker Military Publishing, 1999, pp. 241-250.

Helicopter forces in Bosnia have enjoyed similar success in sustainment as the forces of the Gulf War. The Aviation Support Battalion provides on-site maintenance and supply support. Helicopter forces routinely fly twice as much as they do at home station. Fully mission capable rates are comparable to the Gulf War and better than rates at home station.

The use of the command and control helicopter has proved especially useful in Bosnia. U.S. forces are spread over large areas with the requirements to be able to react quickly anywhere within the area of operation. Commanders are required to know their the terrain, know the status and location of friendly forces, and be able to move to critical locations at critical times, quickly. Commanders and their battle staffs are able to use the helicopter to move to these critical areas unencumbered by the difficulties of moving over the congested road network and undeterred by the weather. UH-60 Blackhawk helicopters specifically outfitted with command and control consoles are vital in keeping the commander informed and aware of the on-going situation while moving about his area of responsibility.

Much the same was experienced during the Gulf War, as well, except the U.S. Army employed a light utility helicopter, the UH-1, as a dedicated command and control helicopter. The UH-1 accounted for only 8 percent of the fleet but flew 16 percent of the total flight. As a percentage, light utility helicopters flew more than any other category of helicopter and were just as busy before and after the ground war as during. The missions these aircraft flew ranged from command and control, to liaison, to medical evacuation, and limited logistical resupply.

Today, the Army has no dedicated light utility helicopter and is relegated to using the Blackhawk for this mission. Most aviation commanders feel this is overkill. The U.S. Army Aviation Modernization Plan recognizes a need for a light utility helicopter, but the requirement is currently unfunded.<sup>7</sup>

Aviation units deploy to Bosnia on the average of every six to twelve months. Since 1996, every aviation task force has had the opportunity to train its officers and aircrews at the U.S. Army Aviation Center at Fort Rucker, Alabama in a simulation that replicates the environment and conditions in Bosnia. They receive extensive training in the rules of engagement, the planning scenarios, the terrain data base, and on a standard set of missions they would likely encounter during their deployment. Each training session is updated with the latest conditions and lessons learned from the previous deployment. The use of simulation in these mission rehearsals has proven extremely valuable and cost effective.

### 2.5.3 Operations in Kosovo

The initial deployment of helicopters to Kosovo was not as successful as previous US Army experiences. Criticism of Task Force Hawk (as the aviation element was referred to) exclaimed the operation took too long to react and required too much logistics and too much support for their movement. Planners were concerned about the security of the forces once in Albania and the possible anti-aircraft missile threat against the Apaches in Kosovo. Additionally, Apache crews required too much training time once they arrived in country.

The mission of TF Hawk was to conduct deep operations against Serbian forces in Kosovo;

<sup>7</sup> The objective requirements for the light utility helicopter for the U.S. Army are to carry a crew of two with 6-8 passengers; capable of single pilot operations in bad weather; dual engine preferable; heated and cooled cabin; carry 2,000 pounds (U.S.) internally and 3,000 pounds (U.S.) externally; carry 2 litter patients in a side-by-side configuration. The LUH should have a 4-hour endurance with over 700 kilometers in range. The aircraft should be Night Vision Goggle (NVG) capable with a heads up display as a threshold requirement and a lightweight electro-optic sighting system (Forward Looking Infra-red Radar) as an objective requirement.

to”...On order, attack armored vehicles, artillery, ADA systems, C2 nodes and troop concentrations to defeat [Military and Paramilitary Police] forces in and around [Kosovo].<sup>8</sup>” These were forces that were very difficult to engage with air power only, especially at night and in adverse weather. GEN Wesley K. Clark, the SACEUR, requested this capability early in the campaign in order to counter Milosevic’s armed forces inside Kosovo.

TF Hawk consisted of more than just Apaches, however. It included long-range rocket artillery, intelligence assets, target acquisition capability, force protection forces, and combat service support. The Task Force was more than 5000 men strong.

The use of Apaches in the air campaign had little support from either NATO or from the United States National Command Authority, even with the SACEUR’s insistence. Pentagon officials believed sending in Apaches would be the first step towards using ground forces, and NATO political leaders believed their people would not support the use of ground troops. Although Apaches were eventually ordered to Albania, approval for their employment in combat operations in Kosovo was withheld by the American president until Pentagon leaders were convinced the missions made sense. The air campaign ended before the Apaches could be employed, but their deployment to the region had a positive effect on Milosevic’s withdrawal from Kosovo.<sup>9</sup>

Task Force Hawk suffered basically from two major problems: The lack of sufficient and timely planning on the part of senior staffs to deploy a ground-oriented force into a major theater of operations; and the absence of training proficiency of the helicopter crews in Night Vision Goggles (NVG’s).

In declaring the Kosovo operation to be an “air” only campaign, NATO leaders and the United States limited and discouraged comprehensive planning for the use of Apaches in the “ground” environment in which they were to operate.

The major lesson to be learned from this experience is if the use of helicopters is anticipated in any facet of a major operation, their participation must be planned early and planned as a ground operation. The failure to treat this as a major ground operation relegates the planning for helicopters to a minor effort. This type of an operation must be given the time and the priority one would require of any other critical aspect of a major campaign.

On the issue of training of the aircrews, the Apache units deployed to Albania were primarily from Europe. These units had been involved for a long time with operations in the Balkans and several other out-of-sector contingencies. Many aircrews had served several rotations to Bosnia. They generally met readiness standards (in accordance with Army regulations) but they were not proficient in NVG’s, with unit-level operations, or the operational environment in the Kosovo region.

The level of training proficiency of all NATO Army forces has degraded somewhat since the Gulf War. Since the end of the Cold War, there has been a reduction in large-scale maneuver training exercises. Aviation training has suffered because of increasing sensitivity to noise and low-level flying. To be relevant in today’s strategic scenarios, military forces need to be trained and ready for the full range of military operations in order to facilitate short-notice employment.

The Apache’s Forward Looking Infrared Radar (FLIR) is reliable and has proved extremely valuable in the reconnaissance and surveillance role. However, the Apache’s FLIR is over sixteen years old and is now undergoing an upgrade to “Second Generation FLIR.” Had Task

<sup>8</sup> Center for Army Lessons Learned. TF Hawk Combined Arms Assessment Team (CAAT) Initial Impressions Report: Operation Allied Force. Fort Leavenworth, KS: U.S. Army Training and Doctrine Command (TRADOC), January 2000, p. 73.

<sup>9</sup> In an address at the Association of the United States Army (AUSA) Winter Symposium, in Ft Lauderdale, FL., 16 Feb 2000, GEN Clark commented he believed the Serbian leader’s decision to withdraw his forces from Kosovo was heavily influenced by the arrival of the Apaches into Albania.



Force Hawk been equipped with the advanced FLIR, they would not have had to undergo extensive training in the use of NVG's and would have been ready for employment much sooner.

TF Hawk met and overcame significant obstacles in deployment and preparation to position itself for successful execution of deep strike operations. Initial operational capability existed after 38 days from initial notification and the entire deployment was completed within 49 days. As NATO and Serbia reached agreement on peace in Kosovo, TF Hawk was alerted to provide initial forces for the peacekeeping mission. Aviation forces are still operating in Kosovo today.

#### 2.5.4 Key Lessons Learned

*“Warriors win wars, and smart weapons require smart people and sound doctrine to maximize their effectiveness. The highly trained, highly motivated all-volunteer force we fielded in Operations Desert Shield and Desert Storm is the highest quality fighting force the United States has ever fielded”<sup>10</sup>.*

All major operations since the Gulf War have continued to validate the major lessons learned from that conflict – the high water mark for the United States Army. In the decade following, the US Army has downsized by more than 40% and defense-funding levels in relation to the Gross National Product have been reduced to less than they were before World War II. By the time of the Kosovo deployment, the soldier was still a volunteer and still of high quality, but the force was smaller, training standards were eroded, and the equipment was older. The fixes are clear and the lessons are much the same.

- A smart, professional force is required to meet the training demands to operate and maintain modern sophisticated equipment. Continued investments in quality soldiers are required.
- The training, education, and leader development regimen, and the universally accepted standards of performance for soldiers and units, were essential in giving the Army the flexibility in adapting from a Cold War posture in Central Europe to pressures of a hot peace worldwide.
- The use of simulators and simulation are increasingly valuable and cost effective in maintaining the standards of training in the absence of large-scale maneuver exercises. Continued improvements in fidelity of simulation will help keep the force trained at a fraction of the cost.
- The dominant overmatch and quality of the weapons systems used by the US Army achieved quick victory with minimum casualties. A disciplined program of continued modernization is required.
- The aerial firepower of the attack helicopter have lessened greatly the traditional Army reliance on tactical air power and give the ground commander the ability to maneuver in all three dimensions of the battlefield.

<sup>10</sup> Department of Defense. Conduct of the Persian Gulf War: Final Report to Congress Pursuant to Title V of the Persian Gulf Conflict Supplemental Authorization and Personnel Benefits Act of 1991 (Public Law 102-25). Washington, D.C., Apr 1992, p. xvii.

## 2.6 Conclusion

Army aviation brings an extra dimension of excellence to warfighting - the third dimension! Breaking friction with the ground, air maneuver forces vastly expand the commander's ability to conduct simultaneous operations in depth and to do so undetected at night. The dynamics of combat power are magnified as aviation units integrate maneuver and firepower in combined arms operations under the capable leadership of aviation warriors. Force protection is significantly enhanced through technological advances that allow cavalry and attack helicopter units to detect, engage and destroy the enemy at extreme standoff distances, day and night, and to digitally report, transmit, and receive real-time operational information among ground and air users throughout the battlespace. Utility aircraft can deliver overwhelming dismounted firepower and artillery anywhere in the battlespace quickly. And the light utility helicopter can provide the ground commander invaluable service in command and control.

The potential for aviation to be employed through the range of military operations means that aviation units must be versatile and ready to meet any challenge, any time. What aviation does across our mission area is captured in the "spirit of the cavalry" -- a mind set of agile-minded and intuitive leaders and soldiers with a sense for battle. These are leaders who are bold in applying force and who possess tactical and operational savvy. There is virtually no point throughout this spectrum at which Army Aviation will not play an active, and sometimes dominant, role. Whether in humanitarian assistance, disaster relief, or combat operations, air maneuver forces must be prepared to conduct and sustain operations in environments ranging from sub-zero weather of northern regions to the tropical heat of the jungle, from the heights of the mountain tops to the barren wastelands of the desert.

In preparing to move the Army into the new international scenarios, aviation will play an ever-bigger role in projecting decisive combat power to defend national interests. New designs in organizational structure and aircraft technologies will focus on deployability demands while maintaining the edge on lethality and mobility. They will be integrated with other Army weapon systems as well as being interoperable with those of other military services.

Aviation leaders will continue to conduct tough, realistic training to maintain that competitive edge over potential adversaries. They will accept nothing short of the highest standards of safety through assessing and managing risk to ensure aviation resources are preserved, trained and ready for battle.

Aviation is vested in the future of a modern army through modernization, technological advancement, leader development and a warrior ethic that permeates everything it does.

Army aviation is key in the combined arms team whether in combat or supporting combat. So while there are challenges, in them there is incredible opportunity as aviation forces shape the force for the future and give NATO armies the ability to break friction with the ground and achieve dominance or accomplish a variety of humanitarian or disaster relief operations when and wherever we are called to serve.

Aviation's primary mission is warfighting! A trained and ready TOTAL air and ground force will assure decisive victory!

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## **3. Operational Strategic Concepts of the U.S. Armed Forces - Rotorcraft**

*Richard L. Ballard*

### *3.1 Introduction*

It is an accepted fact that in military world conflicts of the last several decades success would not have been achieved without the involvement of military rotorcraft capabilities. The rotorcraft provided weapons delivery, troop carrier/movement, equipment transport, and reconnaissance missions. In assessing future military strategic environments and without substantiation, it is evidential that in future military conflicts, rotorcraft will be a major factor in the continued achievement of success of military missions. This factor of the involvement of military rotorcraft must be recognized. The U.S. Armed Forces current inventory fleet of Apache, Chinook, Black Hawk, Kiowa Warrior, Cobra, Huey, Sea Knight, Sea Stallion and other platforms are proven weapon systems which have provided the needed capabilities to achieve success, such as the Apache AH-64 weapon systems in the first mission in the Gulf War and the follow-on missions. The rotorcraft will continue to be a major contributing factor in future military missions and operations. However, it is essential that this factor be recognized. The future will require significant platform performance improvements in range, speed, endurance and payload, inasmuch that platform performance is a major element in mission accomplishment. Future military operational strategies will require platform performance improvements. The evolution of rotorcraft technology advances, which have been providing performance improvements, must continue. The bottom line is that the current inventory of proven rotorcraft will continue to be a critical element in contributing to future military operations and mission accomplishments. However, to contribute to the fulfillment of future strategic operations success there is an obvious need to exploit rotorcraft advanced platform technology which will provide the product for the required platform performance improvements.

### *3.2 The Military Strategic Environment*

In establishing future rotorcraft operational strategic concepts it must be recognized that potential world adversaries are establishing capabilities that are a major threat to rotorcraft, and that these adversaries are making technology progress or advancements that support these capabilities.

In addressing the operational strategy concept from a U.S. global security position, it is recognized that the United States Forces are a dominate military player. However, it is equally recognized that the world continues to be in a transitional state which evolves with advancing societies, technology development, developed states and failed states. It is essential that rotorcraft performance continues to evolve to accommodate the world transient environment. Critical elements in such an accommodation include not only benefits from rotorcraft technology advances, but military organizations, combined forces-seamless operations, timelessness, and continuous operational capabilities. These are essential elements to assure a successful military mission. For such a conflict environment, it is essential that to fulfil future operational needs, rotorcraft systems need to be a total weapons

system that includes advanced lethal weapons, reconnaissance target identification, capabilities to manage target information which includes communication with other military elements shared situational awareness (real time data), and survivability.

In addressing the specifics of future operational strategies, it must be recognized that the world, to some degree is in a state of transition (as stated) and, therefore, a future operational strategy must incorporate a high degree of flexibility. Essential and fundamental elements of a future operational strategy, that must respond to a transient world circumstance, must include: deep and close attack capability; reconnaissance capability; air assault and movement; electronic warfare; a fundamental support-logistical-maintainability system; medical evacuation; search and rescue, special operation, training; command and control, drug enforcement; and cargo transport of equipment personnel. All of these specifics for a future operational strategy must benefit from platform improvements, such as, speed, range, endurance, payload, and hover capability. A major element in the fulfillment of these specifics is the fundamental factor of affordability, which can benefit from jointness, both domestically and internationally, and efficient and effective acquisition strategy, operations and support and the exploitation of evolving technologies.

A major factor in an effective acquisition strategy is the including the appropriate level of flexibility in the preparing the requirement. This is necessary to assure the capability of adapting to transient strategy concept circumstances and the evolving technology. Establishing a detailed weapon system requirement and implementing an acquisition process that forces total adherence to the requirement details drastically restricts implementing the process of adhering to technological advances and to potential changing military scenario. In general terms, the requirement for a weapon system, oriented to fulfil the planned operational strategy, must be: full spectrum capability and doctrinally balanced; modernized via improved performance; logistically supportable; adaptable and having multi-functional and modular flexibility; and a training system and process that is supportive and oriented to fulfilling the weapon system mission requirement. As stated, system requirement details must be limited. The specifics of a weapon system requirement must be stated at the macro level to assure the requirement is not only responsive to an operational strategy, that accommodates the changing world environment, but permits flexibility in the acquisition process.

Any operational strategy for the future must be capable of having a twenty four hour operational responsiveness and adverse weather capability as well as owning the night capability. The strategy must be responsive and adaptable or tailorable to the mission operational concept. The strategy must include a joint force capability and simultaneous and distributed operations options. Also, critical is the capability to fulfil an expanded battle space. The fundamental organization aspects of a sound operational strategy must incorporate the essential elements of a responsive strategic deployability to assure timing on site, operational agility and precision lethality. The organizational cohesiveness and the capability to accommodate an expanded operation is important. Survivability is considered critical to any strategy. Equally as important to a successful operational mission strategy is the sustainability of the military equipment and the support of the personnel.

### *3.3 The Rule of Helicopters*

To execute an operational strategy successfully, the rotorcraft weapon system must be capable of rapid maneuverability, such that the rotorcraft weapon system combat provided can bring a decisive impact with full capability on a timely basis at the essential

location. Based on military activities subsequent to World War II, it is accurate to draw the conclusion that future military rotorcraft weapon systems will be organic and essential to future military operational missions. Regardless of the military or hostile situation the rotorcraft will be a critical element of the mission. The missions may include: direct fire support immediately in front of friendly troops; air defense of friendly forces; attack of enemy rear targets; support of airborne forces and troop and cargo resupply; and reconnaissance and observation. Depending on the situation the missions may include deep interdiction actions, as well. Regardless of the mission, it is concluded that future missions will continue to consider the rotorcraft capabilities organic to the conflict situation.

A major element in any operational strategy concept is the recognition that the operational world circumstance is changing. This transient world/global environment introduces evolving threats to military rotorcraft. For the future this factor must be given serious consideration and it must be recognized that world rotorcraft air defense menaces have dramatically increased in the context of anti-rotorcraft mines, man portable air defense systems, air defense artillery, and rotorcraft air-to-air threats. The major concern is air defense/man portable systems that include thirty plus systems in over twenty countries. Most every major world power, except the United States, has air defense artillery, not only including advances in rotorcraft target sensing, but major gun systems. The future in air-to-air threat capability includes the Hokum, Apache and Tiger, whereas, the Hind and Gazelle fall in the first generation of rotorcraft air-to-air capabilities. Integration of advanced air-to-air weapons systems and rotorcraft remains a challenge. Anti-rotorcraft mines, that adapt acoustics or IR. sensors, are available. The manportable air defense system is the established primary rotorcraft threat, with air defense artillery and air-to-air weapon systems capabilities evolving.

The basic missions that must be achieved by military rotorcraft to assure future operational strategies military rotorcraft weapon systems employment success, include the basic capabilities of attack, armed escort reconnaissance, lift (light, medium and heavy), search and rescue, command and control, and electronic warfare. Connected with the mission requirement is the need for continued evolution/revolution of platform performance capabilities (speed, range, endurance, and payload). These basic capabilities, in the context of operational needs, can be considered in terms of broader/common capabilities, such as: attack-armed-reconnaissance weapon system; utility; Medevac; ASW; transport-troop assault; search and rescue; and special operations platforms and heavy lift-special operational platforms. The current U.S. inventory of military rotorcraft include in the order of ten basic rotorcraft platforms with something in excess of two dozen systems derivatives, such as, the various configurations of the Apache, Black Hawk, Huey, Cobra, Sea Stallion, Chinook, Kiowa Warrior and the Sea Knight.

For future missions and operational strategies, it is concluded that the concept of reduced weapon systems will include common lift, common attack, common armed reconnaissance, and assault/multi-role platforms that will perform the numerous required missions. Such an acquisition or development strategy will require the term jointness to be implemented and an establishment of a high level of commonality in platform design and performance. It will also, as stated, require the increase in platform performance capabilities, such as, speed, range, endurance, payload, maneuverability, signature, and reduced support and maintenance.

### *3.4 The U.S. Armed Forces Fleet*

The U.S. Armed Forces rotorcraft fleet include an age spread or a range of platforms that extend from the AH-1 Cobra, UH-1 Huey, CH-47 Chinook, and OH-58 Kiowa Warrior through more advanced and modern rotorcraft platforms, such as the AH-64 Apache, UH-60 Black Hawk, and the CH-47D Chinook. The immediate future systems are the V-22 Osprey tilt rotor system and the RAH-66 Comanche program, both scheduled for introduction in the early 2000 period. Other future rotorcraft programs being considered are the small tactical tilt rotor and a transport rotorcraft.

In spite of the AH-1 Cobra, UH-1 Huey, CH-47 Chinook and the OH-58 Kiowa Warrior being designated the senior rotorcraft group, programs are in place for service life extensions and upgrades for these rotorcraft. The AH-1 Cobra and UH-1 Huey are involved in a major upgrade program and low-rate production, projected for the 2003 time period. Involved in this upgrade program for these two helicopters are all-composite four bladed rotor system, fully integrated advanced technology cockpit, an advanced technology transmission, a four bladed tail rotor and tail-rotor drive system, and a new landing gear. The bottom line for the AH-1 Cobra and UH-1 Huey upgrade programs is that in essence these two bladed helicopters are basically new helicopters. The OH-58D Kiowa Warrior upgrade program is covered under a safety enhancement improvement program that includes an increase in the engine power availability and an avionics upgrade that will provide survivability and performance improvement via increased lift capability.

The CH-47D Chinook system is considered to be the fundamental cargo rotorcraft and must fulfil the heavy-lift cargo mission. A major upgrade program, the Improved Cargo Helicopter (ICH) program, is planned for the Chinook. The Chinook upgrade program includes a modified T-53 engine for increased horsepower output and lower operational cost. The Chinook cockpit improvement includes a color-liquid crystal display with one large multiple function display. The avionics improvement includes an integrated instruments-two flight data computer, radar altimeter, FLIR, colored digital map, and a data loader that permits the adaptation of a Health and Usage Monitoring system. The structural redesign of the airframe results in decreased fuselage vibrations, a new rotor head, and additional fuel tanks in the fuselage. The product of the Chinook improvements is increased payload, lower operational costs and increased system range.

The AH-64 Apache system conversion to the AH-64D Apache Longbow system, which provides the U.S. Forces with the premier attack aircraft, is proceeding and has been fielded. The major modification involves the adaptation of the basic AH-64 Apache to an AH-64D configuration that incorporates a fire control radar acquisition system with comparable Hellfire radar anti-armor missiles. Also planned for the AH-64D Apaches are other upgrades that include readiness and maintenance improvements and the incorporation of a 2nd Generation FLIR in the Apache TADS/PNVIS system. The AH-64D Apache Longbow system is the prototype for the Rotorcraft Pilot's Associate (RPA) program integration and test. The RPA advanced technology includes the next generation controls and displays, to provide the pilots with CDAS-real time cognitive decision aiding system, data fusion, artificial intelligence and virtual reality symbology and advanced technology computing system. The RPA advanced technology AH-64D Apache Longbow program will provide the Apache system with increased capability permitting sustainment projection and protection of the force, deep-decisive operations, adaptability to shape the battlespace and permit gaining information dominance.



The UH-60 Black Hawk upgrade program is oriented toward an Army UH-60X and a Navy SH-60R. Both programs will address performance improvements, i.e. range and speed, reduced maintenance, increased payload capability, structural improvements, digital cockpit with advanced technology improvements in data bus, HUMS, GIPS/DOPPLER, engine upgrade, and advanced surveillance and reconnaissance equipment. The Navy SH-60R sensor suite includes a nose-mounted forward-looking infrared and Telephonic APS-143 radar. The Navy SH-60R Seahawk will use the external stores support system permitting the carrying of fuel tanks and weapons - including the hellfire missile for which the platform has a laser guidance capability. The upgrade program product is performance improvements, payload capability, and mission performance capability. The UH-60 Black Hawk upgrade program that produces the UH-60X may result in basically a new rotorcraft.

The RAH-66 Comanche program remains in a demonstration phase and is planned for the engineering and manufacture development (EMD) phase in the FY00 third-quarter time period. The RAH-66 Comanche program faces major challenges in the: validation of the stealth capability; achievement of weight goals, integration of the sensor or mission equipment package; the validation and demonstration of a new rotor system and a T-801 engine; validation of the system software; establishing acceptable unit costs; and meeting the major claims of RAH-66 Comanche system supportability and maintainability reduction goals. The RAH-66 Comanche reflects major technology advances, such as the adaptation of composite structures. However, the other advanced capabilities publicized for the program face major challenges in validation and meeting a fielding date of FY07. The RAH-66 Comanche program flight test program has endured limitations, and when compared to flight test programs of other development aircraft flight test programs, the program appears behind schedule. The RAH-66 Comanche flight test goals of a total system has not been achieved. The product of not being capable of executing a progressive flight test program of a total system program may require another program restructuring. The RAH-66 Comanche platform characteristics provide performance comparable to an existing or a conventional helicopter, and the major attribute of the program is the claimed advanced avionics/sensor/Mission Equipment Package suite. This suite may have the capability to be adaptable to any rotorcraft.

The V-22 Osprey tilt-rotor program represents a major rotorcraft technology advance in the rotorcraft arena. It provides the uniqueness of not only having the vertical/hovering flight capabilities of a conventional helicopter, but it provides a major advance in forward flight performance. The V-22 Osprey tilt-rotor technology introduction into the rotorcraft world is revolutionary. It is comparable to the adaptation or the introduction of the gas turbine into the helicopter world. The V-22 Osprey tilt rotor configuration is not only considered advanced technology rotorcraft, but it incorporates composite structures and provides performance capabilities, such as flying twice the speed of a conventional helicopter, has designed-in-survivability features, and is world-wide self-deployable. The system provides mission versatility such that one configuration aircraft can perform both the conventional helicopter and fixed-wing aircraft types of mission. Other progressive features that the V-22 Osprey provides are increased productivity per flight hour, reduced vibration compared to a conventional helicopter, and better reliability. Incorporated into the V-22 Osprey design are electronic warfare suites, as well as, consideration of system detectability and ballistic tolerance and protection. The V-22 Osprey is a revolutionary, advanced technology, vertical and short take-off and landing multipurpose rotorcraft with high-speed cruise performance. It has the capability of performing a wide range of VTOL missions effectively as a conventional helicopter with capability of achieving long range mission as a turbo-prop

aircraft. The U.S. Armed Forces - USMC, Navy and Special Operations Command will adapt the V-22 Osprey tilt rotor rotorcraft in a process that will permit mission accomplishment more efficiently and effectively. The V-22 Osprey may fall into the category of a U.S. Armed Forces joint program.

### *3.5 The Future of Helicopters in U.S. Armed Forces*

A potential future mission capability that would fully exploit the tilt-rotor technology is a small tactical/attack configured tilt-rotor of the size comparable to the successfully XV-15 tilt-rotor demonstrator. This rotorcraft concept was started and validated in the early 1950s via XV-3 and XV-15 tilt-rotor demonstrator programs. Such a rotorcraft would have a multitude of mission application with the US Armed Forces - Army, USMC and Special Operations Command. As with the V-22 Osprey, a tactical/attack tilt-rotor weapon system rotorcraft would be responsive to the joint concept identified by the United States Department of Defense Joint Staff - J-8 and identified by both the Army and USMC as "Generation After Next" rotorcraft requirement. It would provide or offer the military a mission capability in desired vertical flight "leap ahead" technical performance of range, speed, payload and endurance, that far exceeds the mission capabilities of a conventional helicopter and even enhancements in current conventional helicopters. Such a tactical/attack tilt-rotor program does not imply that there is no need for a conventional helicopter. The conventional helicopter will continue to be an essential military rotorcraft platform for the performance of numerous military missions. However, the Laws of Physics prevail and a conventional helicopter performance increases required by the military are not physically possible or are minute. Such a program, tactical/attack tilt-rotor program, should be established as a joint program to assure that development of advanced VTOL/rotorcraft platforms will be available for the U.S. Armed Forces/Services to fulfil their performance requirements in future military or operational missions.

Vertical take-off and landing and hovering flight capabilities are significant characteristics of a conventional helicopter. The U.S. Department of Defense/Department of Army has exploited these capabilities over the last four decades and has achieved major U.S. military mission successes. The evolution of the helicopter performance has basically maximized its performance and has reached the point where significant future development and enhancements are limited. Future military operations simply demand more performance than is available in conventional helicopters. As is being demonstrated via the V-22 Osprey, vertical flight platforms are entirely feasible which can offer the military the desired vertical-flight "leap ahead" technical capabilities of speed, range, payload and endurance, that far exceed the capabilities of conventional helicopters, even with enhanced helicopter technology. Future military missions can benefit from the exploitation of these advanced concept configurations.

The basis or rationale for joint vertical flight system programs is sound, both in the domestic and international arenas. The major benefits are obvious in that there is a favorable impact on required program investment or acquisition costs or the end product contribution in joint operations and support. However, establishing or implementing a joint vertical flight system development program faces major challenges. For example, there is the impact on acquiring agencies maintaining uniqueness, the challenge of the achievement of a standard or common requirement and reaching an agreement of an acceptable acquisition process to include who is in charge, the division or proportional funding from each agency, and who receives the

first delivery of the system. It is also recognized from a joint program international perspective that the governments' process for providing funding differs not only from amount of funding but the timing availability. From the perspective of initially successful joint domestic program, the United States V-22 tilt rotor program, i.e., J VX program, established an acceptable process that resulted in the J VX phase of the program being successful. A joint requirement and acceptable acquisition plan was the product of this initial phase. The J VX joint program process was accomplished on schedule and established the basis for the USMC to proceed with a successful V-22 aircraft system program (The United States Army withdrew from the program in the J VX final phases).

In considering the future for United States joint programs the following programs have been identified as having the potential for joint program consideration: Joint Common Attack/Armed Reconnaissance system (JCAAR); Joint Common Assault/Multi-Role system (JCAM); and Joint Common Lift (JCL). The JCAAR would be a replacement for current aircraft and would encompass the future attack reconnaissance mission. The JCAM would encompass the utility, Special Operations, Medevac, Anti-Submarine Warfare, transport, assault, vertical replenishment, and Search and Rescue. The JCL would provide heavy lift, mine countermeasures, and special operation missions. In the first tier below the joint program concept there are benefits to be realized in system commonality in the context of performance (hover, flight profile, range, payload speed, maneuverability, etc.) and design (crew size, shipboard compatibility, cabin size, armament, mission equipment package, noise reduction and NBC protection.) As stated, the benefits from jointness are positive, but as well, there are major benefits to be realized from commonalty, such as acquisition cost and operating and support costs.

The U.S. Department of Defense Joint Staff (J-8) has identified the potential for a joint tactical/attack tilt-rotor rotorcraft. The future of rotorcraft endorses this potential, as well as the consideration of other rotorcraft configurations. There are evolving global conditions, as well as adjustments to the air and land strategies by the U.S. Department of Defense to permit responding to the changing world situation. Other VTOL rotorcraft configurations have potential to provide the needed capability to adapt to the world developing threats. Basic performance requirements, such as payload, range, speed, maneuverability, survivability, and mission accomplishments will continue to be supported and required. The demonstrated and proven rotorcraft configurations will permit responding to these various requirements. However, it must be recognized that some compromises may be necessary.

It is an obvious recognition that to fulfil the requirement of hovering, the conventional helicopter provides the most efficient hovering platform Whereas at the other end of the spectrum, the direct lift VTOL platform will provide the best speed and range capability. As stated, compromises are part of the process and the numerous VTOL rotorcraft configurations adapt to the unique requirements. These unique requirements can drive the VTOL rotorcraft platform configuration.

The numerous VTOL rotorcraft configurations include the conventional helicopter, compound helicopter, canard rotor wing, tilt rotor, tilt wing, tilt ducted fan, fan-in-wing and direct lift. There are pros and cons in performance capabilities for each of the configurations. Past demonstration programs by the U.S. Army and other U.S. government agencies have evaluated these configurations capabilities via demonstration programs. The conventional helicopter has hover efficiency and low downwash characteristics, but has limited speed and range capabilities. The helicopter is mechanically complex as well as is a platform with high vibration. The compound helicopter exhibits hover performance efficiency, low downwash and has a delta speed increase compared to a conventional helicopter. But a compound

helicopter has range limitations, increased weight, added complexity and a vibration similar to a conventional helicopter. A canard rotor-wing configuration benefits from no tail rotor and has good hover performance, low downwash characteristics and the potential for subsonic cruise. However, the canard wing concept has complexity in stopping the main rotor to a fixed wing configuration as well as the conversion of the engine to provide thrust. The tilt-rotor has good hover efficiency, low downwash, speed and range performance, and maneuverability. The drawbacks are the increase space requirement for operation, the need for a conversion, and the potential for increased empty weight. A tilt-wing configuration has reduced hover efficiency, increased speed and range capability, increased downwash, increased empty weight and limited conversion space. The tilt-ducted fan provides thrust efficiency, which also has the element of safety, but hover efficiency, conversion corridor, increased empty weight, high drag after conversion and complexity are the major downsides of this configuration. The fan-in-wing suffers from inefficient hover performance, but fixed wing performance characteristics of speed and range are pluses. This concept has high downwash, high empty weight and a limited conversion corridor. The direct-lift jet has excellent fixed wing performance, good speed, range, and maneuverability performance, but suffers from high downwash, limited hover performance, and low speed maneuverability. The bottom line is that the various VTOL rotorcraft configurations are more complex than fixed wing aircraft and do not have the hover efficiency of a conventional helicopter. However, both of these factors must be addressed in the context of what the specific military mission system requirement is. As stated, it is an accepted fact that the conventional helicopter responds to the most efficiency hover rotorcraft requirements. The direct lift configuration provides fixed wing similar performance from a speed and range perspective. It must be recognized there is the necessity to accept the performance compromise to accomplish the US Armed Forces mission.

### *3.6 Conclusions*

It is a proven fact that military rotorcraft weapon systems have executed a vital role in significant military operations involving the U.S. Armed Forces for the past fifty years. Rotorcraft involvements have included combat, peace keeping, and humanitarian missions. With the world in a continuous transient state, and the recognition that there continues to be a global advance in technology, the world situation approaches a plateau oriented status. It is essential that in any strategic concept that there be a recognition that military rotorcraft weapon systems are organic to the successful military operations and should be a priority element of any military strategic concept operation.

Combat threats to rotorcraft are being accomplish by world advancing societies and development states. These threats encompasses anti-rotorcraft mines, man portable air defense systems, air defense artillery and rotorcraft air-to-air missiles. The current inventory of U.S. Armed Forces military rotorcraft systems - AH-64D Apache, UH-60 Black Hawk, CH-47D Chinook, OH-58D Kiowa Warrior, CH-53 Sea Stallion, CH-46 Sea Knight, UH-1 Huey and AH-1 Cobra are proven rotorcraft weapon systems, and these systems have fulfilled the U.S. Armed Forces mission needs and will continue to do so for the foreseeable future. Many of these systems are undergoing upgrades and improvements that will provide each system with increased capabilities. An excellent example is the improvement of converting of the AH-64A Apache system to the inproved AH-64D Apache Longbow Weapon System with the integration of an advanced fire control radar acquisition system and the Hellfire

radar missile system. The Army's RAH-66 Comanche program is in a technology demonstration phase and has experienced numerous program restructuring that has not only resulted in major delays in the program, but has established numerous challenging phases that the program must pass in the future, such as a more aggressive flight test program (including full scale stealth flight test) that involves a total RAH-66 Comanche system including total mission equipment package and weapons. The V-22 Osprey has successfully validated the tilt-rotor concept/technology as a viable, productive, and contributing system and will go into service with the USMC, Navy and the Special Operations Command in the immediate future. The V-22 Osprey will provide performance gains over the conventional helicopter in the context of speed, range, endurance, self deployment, and other performance capabilities that is needed for the future of U.S. Armed Forces operational strategic concepts.

To provide assurance that rotorcraft continues to fulfil the successful organic role with the U. S. Armed Forces in accomplishing a multitude of various military missions, such as, direct combat, peace keeping, surveillance and reconnaissance, resupply of troops and equipment and deep penetration missions it is fundamental that rotorcraft technology continues to evolve. Not only must this evolutionary technology continue in the context of adapting the advanced technology to legacy rotorcraft systems, but advanced technology configurations, such as tilt-rotor, tilt-wing, fan-in-wing, canard rotor, compound helicopter, ducted fan and direct lift. The near term pay off via exploiting advanced rotorcraft platform technology is a joint attack/tactical tilt rotor program. The U.S. Armed Forces Strategic Operations Concept - Rotorcraft will continue to be organic to the successful military operations that have benefited from the proven legacy rotorcraft systems and through exploitation of advanced technology rotorcraft systems and platforms.

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## 4. The Role of the Helicopter in the Possible Evolution of the Italian Defence Model\*

*Michele Nones and Giovanni Gasparini*

### 4.1 *The Rotary-wing in the Italian Defence Model: The Missions*

#### 4.1.1 Strategic Framework and Institutional Missions

The changes in the international scenario have started to remodel the Italian military instrument. The probable developments of the armed forces' deployment scenarios obviously also concern rotary-wing aircraft. On a general plane the military instrument, albeit having to guarantee a certain degree of "classic" territorial defence and deterrence, also under collective NATO/WEU defence commitments, will have to serve a vaster concept of security, in which territorial defence plays a much smaller role than during the Cold War period.

The future scenarios mainly involve missions outside the national territory and Atlantic area; combined international operations, carried out within the framework of the security organisations to which Italy belongs, will be engaging an increasing number of forces in varied risk contexts, always susceptible to escalation. The most recent defence model has three main missions: presence in and surveillance of the national territory (including civil defence operations), deterrence and defence of the national territory and intervention to foster international stability. The third mission involves out-of-area interventions and covers a vast range of operations from simple monitoring and interposition to peace-keeping and peace-enforcing or peace-making, with a risk level varying from very low to medium-high.

This new type of operation requires means that can guarantee projectability, interoperability and promptness, at the same time limiting losses and providing target discrimination capability. Many different means will have to be used to carry out these activities, designed to tackle completely different deployment scenarios. In the new context, helicopters will not only perform the more traditional territorial defence missions, but will also act as support for the new operations. The helicopter is an intrinsically mobile and powerful means, albeit with some limitations regarding its complexity and vulnerability.

#### 4.1.2 Operational Missions

Within the strategic framework outlined above, the helicopter can be used for the following missions:

##### *Antitank - Scout - CAS (Close Air Support)*

The Italian Army currently has a good capability of combat helicopters specifically studied for anti-tank functions; it possesses 45 A-129 Mangustas, built to Cold War specifications to

\* Translation by Sarah Nones.

stop the tanks of the Warsaw Pact in case of invasion, and of quite recent manufacture. It is planned to purchase another 15 A-129s, but in the more up-to-date "international" multi-role model. However there is less need for a dedicated machine for this mission, whereas there are more requests for gunships with distinct multi-role features, and in particular with the ability to perform CAS (Close Air Support) and scout missions, guaranteeing high protection for crews. The recent experiences of the Gulf War and the Kosovo conflict have proved that the attack capability of rotary-wing aircraft must also be maintained against armoured means. But they have also shown that this mission can no longer be seen as a simple support for ground operations. Helicopters will be used less in traditional battlefield scenarios, but the deterrent capability of a fast, strongly armed means, fully able to exploit the surprise element, is still high.

Strike helicopters should be used jointly if they are to best exploit their capabilities and contribute to the success of complex operations. Their action should be planned in a coordinated manner, not only for ground troops but, above all, for air operations. In the Gulf, the American Apaches demonstrated they were capable of very different missions from that of the simple destruction of enemy tanks, whereas in Kosovo their deployment was impeded by political issues, risks to pilots and the difficult integration of air forces in ATO (Air Tasking Order). In future, the antitank attack mission should be performed by a select number of multi-role strike helicopters and not by dedicated aircraft designed only for land forces' needs. The Army's decision to update its existing machines without changing their overall number falls within this framework.

It is very unlikely that helicopters will have to perform close support missions in open-war scenarios, and therefore against equally matched, strongly armed and defended enemy forces. However, the use of detachments from abroad in potentially serious crisis situations has increased requests for armed multi-role aircraft. The control of the battlefield by armed helicopters and air-attack actions are still urgent needs and can be met by adopting a mix of attack helicopters, like the two-seater A-129 in multi-role version, and assault helicopters, thanks to less demanding aircraft (currently the A-109-K) that are suitably armed.

### *Ground Surveillance (GS)*

The technological supremacy of land forces entails a knowledge of the battlefield situation; the increasingly urgent need to avoid casualties means that those most exposed must act by fully exploiting information resources. Within this framework GS systems are combined with battlefield digitalisation projects. Battlefield surveillance is an essential assumption for a joint integration of ground and helicopter forces with the airborne arm. GS devices are powerful force multipliers both for CAS missions and for land combat forces; their use should also limit one of the most regrettable phenomena of wars, the losses (often consistent) owing to friendly fire (blue on blue).

The need to intervene in unknown territories with a high target-discrimination capability requires an extensive use of helicopter-mounted GS systems; current capability is rather limited when faced with a growing demand for the information resources on which modern weaponry relies.

### *Electronic Warfare (EW)*

The urgent need to avoid losses among friendly forces, combined with the rapid evolution and dissemination of high-tech weaponry, calls for an appropriate response in terms of electronic protection/attack operations. Electronic war by fixed-wing aviation forces is waged by dedicated aircraft. Appropriately modified utility helicopters can perform the same function at lower

altitudes and to the benefit of other helicopters destined for missions in environments in which the presence of precision anti-air systems (shoulder missiles and mobile batteries) is destined to increase.

#### *Transport – Support - Liaison*

The need to operate in distance places, at the same time guaranteeing a high mobility of forces, makes the helicopter one of the key machines for the Italian armed forces' future missions. But the Army is also undergoing substantial personnel cuts and it is not expected that all the existing machines will be replaced, also because new helicopters are very expensive. The future transport helicopters will benefit from a vast production and logistical support experience - also thanks to the civilian market - and should ensure much greater reliability and availability. This could mean less machines can guarantee an equally good transport capacity. There is a prevalence of light models in the current aircraft fleet, the majority of which are obsolete and at the limit of their active life. The quantity available today on paper is thus more theoretical than effective. In this scenario it is evident that maintenance times for a fleet of old machines are much longer and this further reduces their availability.

Finally, the utility helicopters not only transport troops and logistical material but also perform a series of vital tasks, ranging from evacuation to SAR and command, control and communications. Given the versatility of the tool, it is particularly important to find the right equipment mix to assign to missions, also because of budget restrictions. In the near future, the flight line should concentrate on three types of machines (light, medium and heavy) with the possibility of studying the adoption of tiltrotors.

#### *SAR (Search And Rescue) and CSAR (Combat Search And Rescue)*

To conduct actions without suffering casualties or losses (that could also affect domestic consensus for military operations) requires an effective rescue capability, both in non-conflict situations and in risky actions in hostile territory. In Europe this is becoming an increasingly urgent need - also in virtue of the shortages described earlier - meaning that the assets (machines and troops) that perform this task are becoming equally vital.

No particular means are requested for SAR but simply a certain number of utility aircraft kept at a high degree of readiness. However, for authentic CSAR operations, besides specially trained troops, helicopters specifically dedicated to this purpose are also needed. The current availability of the Air Force (responsible for these operations) is suitable in numerical terms but the machines are rather old. When the new helicopters enter service their number can probably be reduced, also thanks to the greater operating capacity of the new aircraft. The CSAR mission could also become one of the main deployment fields of the new tiltrotor aircraft as soon as it is properly tested.

#### *Medevac (Medical Evacuation)*

The armed forces have to guarantee to rescue their units, frequently employed in scenarios far from relief centres and potentially more at risk. They are also required to offer support to civil defence in natural disasters. Military requirements have not modified in intensity and thus some utility helicopters will still be needed to perform these functions. This need is perhaps felt even more now, since the "pain threshold" has lowered (that is, losses are much less acceptable) while the risk of a possible intervention in hostile and remote areas has grown. Aircraft have to



be modified for this option, also exploiting the greater capacity of the new machines and, in future, of the interesting possibilities offered by the tiltrotor.

#### *Aew (Airborne Early Warning)*

The intervention of armed forces and, in particular, of naval units in areas distant from the national territory, combined with the widespread use of powerful delivery means, such as stand-off cruise missiles, have increased exposure to potential aero-naval threats. In this scenario, it is increasingly vital to have platforms capable of identifying the threat in time and adopting suitable counter measures.

Surveillance on a strategic and theatre level is entrusted to complex and expensive devices such as AWACS or fixed-radar networks, whereas air surveillance requires a greater presence of highly mobile machines, possibly not very vulnerable. The rotary-wing aircraft respond well to these needs and are therefore the most popular for surveillance, in particular in their naval version. At the moment the Italian armed forces are rather lacking in this area, but the recent acquisition of EH-101s for the Navy should reduce the gap, also because a relatively small number of machines is needed.

#### *Littoral Surveillance*

One of the most recent problems faced by the Italian armed forces, together with the other State services, is the control of the over 8,000 kilometres of Italy's coastline to prevent indiscriminate immigration and criminal infiltration. The mission is linked to the surveillance of national areas and, secondly, to civil-defence services. The helicopter is eminently suited for this task and it is planned to use it extensively in the immediate future. However, there are still serious problems in coordinating the actions of the different police and military forces responsible for this mission. In the short term, the division of tasks between the Navy and the other bodies and between the Coastguards and the Navy must be better defined. In the medium term, a national coastguard service should be established with complete responsibility for interventions in territorial waters with all the equipment currently distributed among the various bodies (Carabinieri, Police, Inland Revenue Offices, Navy). The Navy would be entrusted with strictly military tasks and only intervene elsewhere in emergencies.

There must be a large helicopter component in this unified responsibility, because the rotary-wing is the most suitable machine for this mission. Besides light aircraft, the new tiltrotors should be used especially for littoral surveillance.

#### *ASW and ASuW (Anti Submarine Warfare and Anti Surface Warfare)*

The end of the confrontation with the Warsaw Pact has considerably reduced the risk of the Italian fleet, mainly deployed in the Mediterranean, coming up against submarines or large surface naval units, albeit the dissemination of stand-off missiles increases its vulnerability. It is also possible to use it in blue water outside the Mediterranean and in particularly hostile environments, as occurred during the war in Iraq; moreover, it still has to defend itself from naval mines, a real threat for the freedom of routes.

The Italian Navy must guarantee not only the self-defence of its units, but also the freedom of the SLOC (Sea Lines Of Communication), and offer support to the frequent international embargoes or naval blockades. Rotary-wing aircraft can be used in all these missions and can effectively extend the operating capability and range of action of the naval units to which they belong.

The machines currently available are more than sufficient for the existing ships, but the entire line needs to upgrade its systems and elements, also because of the evolution of the war units the Navy will possess in the near future.

#### *4.2 Models and Number of Machines*

Some future needs can be forecast on the basis of the probable commitments of the armed forces and the role the helicopter is required to play in them. The timescale is about 15 years, a medium-long period coinciding with the end of the useful life of the majority of the helicopters available today and with the final adjustment of the military instrument to the new force targets. The reference to current contracts and models available is obviously necessary, but the analysis is not limited to these.

To date, the helicopter has played a residual role within the classic scheme of the three forces, since it does not represent the chosen weapon for any of them. This has penalised it in the past but it could now constitute the key of its success in a joint management perspective. Moreover, rotary-wing aircraft, since they are basically the result of international projects, represent an excellent field of application for the future development of European joint bodies on both an operational (for example with regards to CSAR) and machine-management level.

Efficiency and effectiveness requirements mean that purchases are concentrated on a limited number of basic models, essentially the AB-139, NH-90, EH-101 and, in future, the tiltrotor. Aircraft maintenance could then be centralised in a single, joint unit, stationed according to the location of the helicopters. The machines currently available are quite old, and especially the AB-205, AB-206 and AB-212 models. It will thus be necessary to acquire not only aircraft for missions not envisaged in the previous strategic framework (or which will have less resources dedicated to them) but also to replace obsolete or worn-out helicopters.

The overall reduction of the military instrument means there will be less helicopters available, estimable as around a hundred. The main downsizing will probably occur in the light transport helicopter sector. The optimal request for new helicopters is expected to be around 300 machines over 15 years, and it will be necessary to upgrade the others. The necessary aircraft are calculated on an estimate of 190,000 personnel in all the armed forces, according to the most recent reform project. The hypothesis is to use simultaneously a mixture of forces in two different theatres in medium-high intensity "Petersberg type" operations supporting two standard brigades of around 15,000 troops each. The coefficient of operating readiness of aircraft is 50% for the more complex systems and 66% for the utility versions.

Around 130-150 utility aircraft will be needed to transport and generally support land forces, of which 40% medium-light, 25% medium and 35% medium-heavy and heavy, with a total troop capacity of around 2,000 and the possibility of using relatively large ground equipment (wheeled machines and artillery in particular). The reduction in numbers is a result of the downsizing of the Army and is mainly compensated by the greater availability and capability of the new machines. Particular attention must be devoted to deploying rotary-wing aircraft in difficult and dangerous scenarios and thus to their navigation, protection and self-defence systems; the survivability factor will be determinant for helicopters.

When choosing the mix of helicopters, it is important to have a suitable number of light, modern aircraft; this is also necessary for supporting command and control activities. The combat version of the light A-109 helicopter should guarantee, with the more powerful and armed A-129s, the necessary land combat capability. The scout and attack missions will require 80-100 helicopters, of which two-thirds are A-129 gunships in the international version, with

a multi-role capacity and advanced avionics. These armed aircraft will also be responsible for heliborne assault and battlefield infiltration missions, thanks to their - albeit limited - troop transport capacity.

The naval means are calculated separately, since they meet the specific needs of naval platforms. The hypothesis is the ability to arm two, 15-20,000-ton aircraft carriers, four type D ships with ASW capability, four San Giorgio type LPDs with aero-naval disembarking capacity, ten frigates and four high-seas patrol ships. In detail, there will be one medium helicopter for each patrol ship; two medium helicopters for each type D ship (future Orizzonte frigate), for a total of eight helicopters dedicated to naval war; one medium helicopter for each frigate; four medium-heavy helicopters for naval transport and disembarking for each LPD ship (thus permitting a real capability for aeronaval disembarking operations) and finally two medium-heavy ones in AEW version and four ASW/ASuWs for each of the two major units. Besides, obviously, the reserve and land-based means.

The littoral surveillance missions are another consideration. The machines indicated (20-30 light and medium aircraft and possibly also medium-light tiltrotors) are sufficient for military requirements. The innovation represented by tiltrotors has a certain interest for this application since patrol and rescue missions benefit from their greater operating range.

More in general, the self-deployment capability of the tiltrotor and its hybrid features make it interesting for a series of operational missions, in particular if one wants an aircraft of medium-heavy dimensions. The uncertainty about the developments of the technology, however, counsel a certain cautiousness. Initially, one could use a limited number of tiltrotors, sufficient to evaluate their features and not uneconomic with regards to running costs. Besides the utility version, of which a few should be acquired to gain operational experience, the missions in which the new aircraft could provide an added value are CSAR and special operations. Since there is a general lack of machines dedicated to these operations in Europe, if the Italians were to acquire a specific capability in this sense (a dozen machines) it could be particularly useful from a point of view of integration and comparison with its partner countries.

In the meantime, for SAR alone, twenty or so intermediate machines are needed - more than sufficient considering the ample capability of each utility machine to perform these operations if suitably equipped - with the addition of an equal number of medium-heavy, CSAR-dedicated helicopters. To perform this last mission, a certain surplus capacity of space and weight is needed because of the complex electronic and self-defence systems to embark, which also involve a relative overcapacity on a propulsion level. It is not therefore an application in which reduced margins of growth can be accepted for the machine.

The electronic war devices deserve a separate mention; a dozen, suitably modified and integrated, medium helicopters should guarantee the constant operation of two machines for each of the operational theatres described above. The medium helicopters should also be sufficiently robust to carry the necessary instrumentation for battlefield surveillance. The surveillance system to install could be the CRESO already available on the existing AB-412s.

No additional machines are needed for training and State service, although the existing ones should be updated in the first case and the two SH-3D/TS operating today replaced with two, suitably equipped medium-heavy machines.

Overall, the armed forces should operate 60 specialised scout/attack helicopters, 100-120 light helicopters in the different versions (of which one fifth naval), 50 or so training helicopters, 130-140 medium helicopters (of which a third naval), 60 medium-heavy helicopters (of which a little less than half naval), 20-30 heavy helicopters and 20 or so medium-light tiltrotors.

The above scenario could be significantly changed by the start-up of deliveries, in 2002, of the new, 6-ton medium helicopter, the AB-139\*. This is an innovative machine, a result of the vast experience acquired thanks to the two major programmes (EH-101 and NH-90) as well as the commercial one. The fact that the machine is industry launched and destined for the civilian and military market, with particular attention paid to development/production and running/maintenance costs, should make it particularly interesting for the armed forces. It will involve the first real, transatlantic cooperation based on an agreement signed in 1998 for setting up BAAC - Bell Agusta Aerospace Corporation, with Agusta Prime Contractor and responsible for the final assembly in Europe and Bell responsible for final assembly in North America. Other important subcontractors for all the main components have been chosen since the launch of the programme: Pratt & Whitney and LHTECH for the two possible engines, Honeywell for the avionics and PZL for the airframe. On the military level, the fact that the AB-139 is smaller than the NH-90 and tailored to the actual requirement of transporting a squadron (without useless waste of space and weight as well as consumption) suggests it could be integrated with or replace other more expensive machines in the sectors of transport, ground and naval support, special operations and coastal surveillance.

Another change, even if more improbable in the timescale described, could be given by the availability of a medium-heavy tiltrotor (again if the machine is interesting in terms of costs and maturation). In this case it could act as a substitute for a certain number of heavy helicopters.

It also has to be evaluated whether to keep a heavy transport capability with a perhaps insufficient number of Chinooks. The poor commonality of the equipment could lead to uneconomic running; the helicopters already acquired would be rather young and could be used until the end of their working life, while waiting for the new technological solutions currently being studied in the tiltrotor sector.

#### *4.3 The Economic Aspect*

The renewal and integration of the Italian armed forces' rotary-wing aircraft will involve a considerable investment of around 800 billion lire over 15 years. Of the total 12,000 billion lire available in current values, about 6% should go to scout/attack helicopters, a little under 30% to ground transport and support, a third to naval means (ASW/ASuW, AEW; naval transport and disembarking), 15% to CSAR/SAR and the remainder to the other functions (Ground Surveillance, Electronic Warfare, Special Operations, Training, Littoral Surveillance). The acquisition of these helicopters would absorb around 15% of current investments.

The calculations carried out to date on the basis of the main contracts underway are to be considered as purely indicative. It is difficult to estimate the costs of machines, since there are various models and versions and the armed forces have different ad hoc contracts. The running costs are also difficult to calculate, but it can be assumed they will be less than current ones, thanks to the use of new technologies and new materials; moreover, the new airframes will need much less maintenance.

It has already been seen how important it is to concentrate on a limited range of aircraft, guaranteeing cost-effective running and the absorption of fixed model design and study costs. The acquisition of models derived from successful commercial helicopters should help to reduce costs. Commitments in costly projects such as the tiltrotor should be progressive and anyway appear more

\* This machine will have a 2.5-ton payload and will be able to transport underslung loads of up to 2.7 tons.

than justified by the operating advantages and technological know-how that the programme seems to guarantee.

Specifications are satisfied in most of the international programmes in which the Italian industry participates and sometimes in purely national productions; in the helicopter sector it is fortunately possible both to buy the most suitable product and to protect national technological and productive capacity. In terms of technological and industrial returns and income cycle, the rotary-wing aircraft seem one of the most advantageous investments, thanks to the strong presence of Italian industries in the sector. Despite this, the investment is considerable and will probably rise in the wake of the rapid and intense technological developments in on-board systems.

The purchasing plan should favour sectors in which deficiencies could make it impossible to operate in certain situations, starting with the support component. The new naval units should be acquired when the respective ships enter service. Apart from acquisitions, it is to be hoped that adequate funds will be allocated to research and development in the sector, especially with regards to tiltrotor hybrids and unmanned devices.

**Table 1- Relative importance of different missions in future scenarios and present situation compared to future needs**

MISSION	IMPORTANCE	PRESENT SITUATION
Anti-tank	--	To be converted
Scout / Attack	+	Lacking
GS / AEW	+	Lacking
ASW / ASuW	-	To be updated
Littoral Surveillance	++	Lacking *
EW	+	Lacking
Special Operations	+	Lacking
CSAR	+	To be updated
SAR (includes MEDEVAC)	=	To be updated
Transport (includes VERTREP)	++	Lacking – obsolete
Training	=	Fair

**Note:**

--	highly reduced
-	reduced
=	unchanged
+	increased
++	highly increased

AEW	Airborne Early Warning
ASW	Anti Submarine Warfare
ASuW	Anti Surface Warfare
CSAR	Combat Search and Rescue
EW	Electronic Warfare
GS	Ground Surveillance
MEDEVAC	Medical Evacuation
SAR	Search and Rescue
VERTREP	Vertical Replenishment

\* Mission shared with other Public Security Services.

**Table 2 - Present stock of helicopters in Italian armed forces**

MISSION	QUANTITY	TYPE
<i>Army</i>		
Anti -- tank	45 *	A-129 ongoing conversion from anti-tank to scout version
Attack / Assault	89	27 A-109 62 AB-206
Transport / Utility / GS	226	86 AB-205 68 AB-206 13 AB-212 23 AB-412 36 CH-47C
<i>Navy</i>		
ASW / ASuW / AEW	76 **	28 SH-3D 48 AB-212ASW
Transport (includes VERTREP)	14	8 SH-3D 6 AB-212
<i>Air Force</i>		
CSAR	33	HH-3F
SAR	36	AB-212
Transport (VIP)	2	2 SH-3D
Training	51	51 NH-500

**Source:** author's evaluation based on data from IISS "The Military Balance 1999 - 2000", London, 1999.

**Note:** \* 15 A-129 International has been ordered.

\*\* 16 EH-101 has been ordered.

AEW	Airborne Early Warning
ASW	Anti Submarine Warfare
AsuW	Anti Surface Warfare
CSAR	Combat Search and Rescue
GS	Ground Surveillance
SAR	Search and Rescue
VERTREP	Vertical Replenishment

**Table 3 - Forecast of future needs**

(medium-term needs; the type is indicative)

MISSION	QUANTITY	TYPE
<i>Ground forces and utility</i>		
Scout / Attack / CAS	80-100	A-129 International A-109K
GS	6-10	NH-90TTH
Transport / Utility / Liaison (includes SAR and MEDEVAC)	130-150	A-109K AB-139 NH-90TTH EH-101Utility CH-47C medium-heavy tilt-rotor
<i>Navy</i>		
ASW / ASuW/AEW	45-55	NH-90NFH EH-101ASW/AEW
Transport and Assault (includes SAR and VERTREP)	30-40	AB-139 NH-90NFH EH-101Naval
<i>Joint</i>		
CSAR / SAR	30-40	NH-90TTH EH-101 (CSAR) medium-heavy tilt-rotor
Transport (VIP)	2	EH-101Utility
Training	45-55	NH-500
EW	6-10	NH-90TTH
Special Operations	8-12	EH 101 BA 609
Littoral Surveillance	20-30	AB-139 BA-609

AEW	Airborne Early Warning
ASW	Anti Submarine Warfare
AsuW	Anti Surface Warfare
CSAR	Combat Search and Rescue
GS	Ground Surveillance
SAR	Search and Rescue
VERTREP	Vertical Replenishment



## 5. Conclusions\*

Stefano Silvestri

The use of the helicopter largely depends on the future conflicts in which the military forces will be engaged.

### 5.1 Global War and Small Wars

These exercises should be regarded with a certain degree of flexibility as they are inevitably only hypotheses. However, it seems clear that, at least for the next decade, no high-intensity general conflict scenarios are expected in Europe such as those envisaged in a NATO framework during the Cold War. This does not completely exclude the chance of similar conflicts in other parts of the world, and especially in Asia. Countries such as China, India, Pakistan, the two Koreas and Japan have the military capabilities, the theoretical political possibility and, in some cases, also the potential will for waging a continental war at very high intensity with the use of mass-destruction weapons.

However, even this scenario would not presumably achieve the intensity and extent of a war for achieving hegemony over the international system (as the last two world conflicts were). Despite their relative strength and their great economic and military growth, none of the Asian powers can presently challenge the United States on the military level with any expectation of success, and perhaps not even Russia. So we are speaking about a regional conflict of large scope and gravity which would anyway be circumscribed and conditioned by the general international balance. Europe and its armed forces would probably not play an independent role in such a large conflict, but would regulate their participation on the basis of the requests and needs of their American ally and Russian counterpart. Although this European attitude could vary according to the choices of individual European countries and their different interests in the area, these variables should never change the overall approach. In other words, *it is difficult to imagine a scenario of generalised and very high intensity war that would directly involve European countries and that would thus require maintaining military units and weapons adequate for this end.*

However this does not exclude other, much more probable types of conflict scenarios, with wars of medium-high intensity, in particular in the Caucasus and the Middle and Near East. Finally, the most probable scenarios are those concentrated on crisis-management operations in many parts of the world. These latter can vary greatly in intensity and extent, ranging from the "Allied Forces" type of peace-enforcing (Serbia-Kosovo) to public order and State reconstruction, "Alba" (Albania) type intervention, surveillance and UNIFIL (Lebanon) type peace-keeping, or the pure and simple delivery of humanitarian aid, such as the East Timor protection mission.

Other military force deployment scenarios can be classified more as "security" operations than real crisis management. For example, the use of armed forces for surveillance and repression of clandestine immigration or organised crime, both inside the national territory (Vespri Siciliani) and outside it (Cambodia, Albania, Bosnia, etc.).

\* Translation by Sarah Nodes.

All these examples are below the "global" war threshold and involve various types of military force deployment already considered both by NATO and the European Union. This latter groups them under the generic name of "Petersberg tasks" now included in the Treaty of Amsterdam. These tasks are generally characterised by:

- a wide margin of freedom of decision (for intervention times and methods)
- a clear subordination of military operations to political preconditions and objectives.

## *5.2 Limits and Characteristics of Crisis Management*

A great variety of operations have been carried out in recent years. However it is possible to pinpoint some common features from the politico-military angle. For example, the clear political nature of these missions means that military operations are conceived:

- to prevent as far as possible any human loss among the forces deployed (zero deaths), even at the cost of complicating the same mission or not entirely achieving the strategic goal (for example during the Gulf War, with the decision not to occupy Baghdad, or during the Kosovo campaign with the decision not to use land forces);
- to prevent as much collateral damage as possible and in particular the killing of civilians, not seen as "enemies" in the strict sense;
- to attempt to complete the most intense stage of the conflict within a relatively short time to prevent serious problems of domestic or international political consensus.

There is also a series of operating limits conditioning the options of the armed forces engaged in crisis-management operations outside the national boundaries. Some of these limits seem particularly significant:

- It is very improbable that intervention forces will manage to achieve numerical superiority over enemy forces. This never happens at the start of operations, and generally not even at the end (exceptions are some "anomalous" operations such as the Russian interventions in Chechnya). The intervention forces must therefore compensate their numerical inferiority by acquiring a decisive advantage in terms of manoeuvring, firing power, self-protection, ability to inhibit enemy reaction, etc.
- The most delicate and dangerous stage of any operation is probably still the initial one, in which the intervention forces are most vulnerable and the reaction ability of the adversary's forces is still intact and able to block the intervention or raise its price in a politically unacceptable way. This concept of "acceptable price" is particularly important because it has to be set beside the "zero deaths" of the previous point. The adversary does not have to achieve a victory in military terms, since it could be enough for it to inflict highly visible and politically divisive losses on the intervention forces. To counter this risk effectively, the intervention forces must be able to ensure from the outset an evident strategic superiority (the certainty of being able to control any escalation of the conflict), besides naturally a good level of self-protection.
- The greater the distance from the permanent bases of the intervention forces the greater the importance of logistics, which encounters greater difficulties if the area of intervention is far from the sea and/or does not have an internal communications system utilisable for military ends. In other words, the intervention forces have great problems of weight and bulk of materiel to transport to the site, besides refuelling, support and maintenance.

- Finally, once the territory is controlled the intervention forces, when remaining in place, not only have to guarantee their self-defence, but must also rapidly transform themselves into security forces in close contact with the local population, with all the attendant problems (defusing mines, disarming factions, separating opposing factions, surveillance, functioning of communications and energy infrastructures, etc.). This stage can also be politically delicate: the experience of the four-party mission to Beirut, hastily concluded after two particularly serious terrorist attacks against the United States and French forces is a precedent that should not be forgotten.

### 5.3 *Conflicting Needs, Possible Solutions*

These and other needs pose conflicting problems. Because self-protection, manoeuvrability and firing power could be ensured by armoured divisions, but these pose logistic and transport problems (weight, bulk, etc.) and could appear politically too "offensive" for many types of "peace" operations. Moreover, these "heavy" forces might be suitable for the battlefield scenario but are certainly insufficient for "security" tasks. When it impossible to find an acceptable solution to the initial vulnerability of the intervention forces, the crisis-management operation itself risks being delayed or anyway becoming more difficult because the intervention of land forces cannot be promptly organised.

Such fears and hesitations end up by making the immediate conquest of air superiority strategically more important, increasing the propensity to multiply and lengthen the duration of precision bombing exercises (airplanes and missiles). This has the politically negative consequence of emphasising the offensive aspect of the operation in the eyes of the country attacked, its political and economic system and its population. In other words, an element of total war is inserted in crisis-management operations. On the other hand, the alternative to a greater use of manoeuvres or stealth by the intervention forces could be insufficient to guarantee the desired level of self-protection, including the certainty of reducing losses to the minimum, and could reduce the military effectiveness of the intervention.

It is always difficult to find a balance among all these different needs, which is anyway linked to the specific features of each individual mission. The operations carried out to date have triggered an extremely varied range of solutions and still open problems. *Armed forces conceived to fight and, if possible, win a global war find it very difficult to adapt to the needs of "small" (but still demanding) local conflicts.* Already during the war between Iran and Iraq, when the two opposing nations started to use mines to block the traffic of oil-tankers, the all-powerful U.S. Navy found it had seriously underestimated its mine-sweeping requirements. More recently, it was the U.S. Army to be hauled over the coals by the Armed Forces Committee of the American Senate, accused of having badly mismanaged its role in the Kosovo operation. The fact is that we are in the throes of a strategic revolution that still has to be fully grasped, which will certainly require profound changes in both doctrine, orders and armaments, and which will affect the choices of the next 20-30 years in the military field.

In the meantime, these changes impose a cautious approach for the military world, but without reaching the point of ignoring the need for a transformation. This is particularly true *in Europe, where changes have to reckon with a military structure linked to the past* in a closer and more restrictive manner than the American structure. This latter has always been organised to project its force far from its borders and has always maintained the aim of fighting one or more regional wars, over and above its strategic task of fighting a global conflict. The European Armed Forces are basically structured for territorial defence inside their boundaries or

immediately outside the front line. They are also having to tackle these changes in a period of serious financial restrictions, with budgets already heavily curtailed by the "*peace dividend*" and within strict parameters of public expenditure containment fixed by the common monetary policy. These restrictions are not negligible and are further increased in many countries by changes in the basic structure of military personnel recruitment and training with the passage from conscription to voluntary service.

All these factors, taken together, have perhaps over emphasised the importance of some technological and operational choices. In particular, the operations carried out in recent years by the western forces have continuously sought:

- sufficient *firing superiority* over their adversaries to give the certainty of always being able to dominate any escalation and to force the adversary to accept its obvious strategic inferiority (even if sometimes this superiority cannot be fully exercised at a tactical level);
- complete *technological superiority*, in particular with regards to electronic war and the C4ISR (what the United States has called "revolution in military affairs" - RMA);
- *complete dominion of the air*, at every level (tactical and strategic);
- availability of abundant precision *guided* ("intelligent") and *specialised munitions* (area interdiction bombs, for the destruction of airport and communication infrastructures, radar, anti-bunker, etc.);
- capacity to *conduct complex, joint and combined operations* on a theatre level, denying the adversary any possibility of doing the same.

Not all operations are equal, and there have been numerous cases in which the forces sent to the theatre of operations, despite their evident strategic superiority, have encountered numerous difficulties on the tactical level. This occurred in Somalia and also during the Kosovo operation (the case of the Task Force Hawk, examined in earlier chapters). This is generally due to uncertainties or weaknesses in the strategic approach, such as using forces and materiel that are not perfectly integrated or nor trained for the mission in which they are deployed, or even (and this is the most frequent case) a combination of both these factors. This can make it particularly difficult to learn lessons from the experience. For example, it is currently thought that the Task Force Hawk's failure in Kosovo was due to the desire to avoid the errors committed in Somalia on the military level (insufficient training, insufficient forces for protecting and supporting the helicopter forces, insufficient independent tactical intelligence capability) and the strategic-political errors committed were thus underestimated. Consequently, the forces sent to Kosovo (almost 7000 personnel) were too numerous for rapid deployment; their training took too long and above all they were not integrated beforehand on the operational and strategic plane. This meant they only managed to arrive at the scene of operations a long time after the identification of the need, surrounded by controversy and perhaps excessive expectations, but without a clear deployment strategy. It is not surprising they were never used.

#### 5.4 Towards "Medium" Forces and a Joint Approach?

It is undeniable that the potential offered by technological developments must be fully tapped. It is probable that only a decisive technological growth will enable European armed forces to keep that strategic superiority over every theatre of operations necessary for managing crises in a secure situation. On the other hand, it is as well not to delude ourselves that technological advantage alone (and in particular dominion only of the air) is sufficient to

guarantee the success of these operations. *That is, what is necessary must not be confused with what is sufficient.*

In the current situation, for example, the problem of land forces is anything but solved. The heavy forces seem too heavy, but the light forces risk being too light. To remain with the American example, the difficult experiences in Somalia, Bosnia and Kosovo have accelerated the transformation, for an Army organised around heavy, armoured divisions (and combat tanks), towards a new model that will be based on medium-weight units, equally lethal but much faster and easier to deploy. Even the armoured vehicles are destined for a radical transformation. The present M1A2 tank weighs 39 tons (of which 76% is the armouring, suspension and driving system). A Future Combat System is being studied in the initial concept defined by the U.S. Army. It should weigh around 20 tons, imposing very complex choices in terms of self-protection, design and weaponry. Its greater vulnerability will have to be compensated by its manoeuvrability, very low radar, acoustic and infrared signatures, a new stealth ability, a more intense use of countermeasures aimed at degrading the enemy attack and by active rather than passive defence systems. All choices that will oblige the Army to *profoundly modify its traditional concept of armoured vehicles and their deployment.*

A new approach must go beyond equipment to embrace the entire strategic and operating concept. It is possible to use lighter forces, given that the necessary equipment and technologies exist. Some features of crisis-management missions actually require them and the new operating concepts, such as those linked with RMA, enable a much more effective use of these light forces, combined with their greater protection, power and firing precision, etc.

In particular, there is the concept of a three-dimensional battlefield (the "battle space") for land forces, in which there are not only air forces to support the ground ones, as they have done in the past, but in which the same land forces directly take over the air dimension, for both manoeuvres and combat.

This discourse directly concerns the role and thus the future of the helicopter. This weapon system has the necessary features of great mobility and great flexibility, acceptable as long as they can ensure *less logistics* and *ease of use* in changing contexts (and thus also a certain aircraft "expendability"). The future helicopter will be used in all possible stages of operations, both offensive and defensive, when delaying or in transition, and also in actions other than war. These are deep-penetration, close-support or rearguard missions involving varied tasks. Although, as far as the Army is concerned, it is expected that the "combat" function will become increasingly important.

However it is necessary to maintain a realistic approach: like the armoured means, too heavy and/or too costly aircraft could render the helicopter less useful. The American Apaches have been best used in high-intensity combat (Gulf War) while they have encountered immediate political and operational limits in a different situation such as Kosovo. On the other hand, their use in Somalia and in Bosnia in basically surveillance and "security" tasks was perhaps disproportionate to their effective capacity. It follows, that to be useful (i.e. usable) helicopters must maintain *a high level of effectiveness* while *cutting back costs* (both of the machine and the support, whether it be logistic or operational). This can be partly done by working directly on the machine but its logistic line must also be updated.

Crisis-management operations, even more than global war ones, have a *strong cooperative aspect*. That is, they are generally "combined" operations as well as "joint" ones (i.e. conducted by different countries as well as by different forces). Like the rest of the military instrument, *the helicopter must also be integrated in the joint operations plan*, whatever components are most used. Current doctrine is attempting to optimise the helicopter for the needs of the individual armed force, and this could greatly limit its development, besides creating deployment problems

(from the “friendly fire” effects experienced in the Gulf, to not using them in combat during the Kosovo campaign, except for CSAR missions - perfectly integrated in the Air Force’s operational doctrine).

The armed forces are faced with a problem. It is evident that helicopters are required to cover important roles for each service. Some roles can be specific to an individual force (for example ASW and ASUW missions for the Navy) but other roles apply to all three armed forces, even if they have different priorities according to the operation. A rather general survey indicates that:

- SAR and CSAR missions interest everyone but are particularly valuable for the Air Force
- combat and firing support missions interest everyone but particularly the Army
- special operations mostly interest everyone
- support missions for amphibious operations mainly interest the Navy, although as disembarking operations they also concern the Army
- electronic war, reconnaissance, surveillance, etc. operations mainly interest the Army and Navy
- possible use of the helicopter for command and control missions mainly interests the Army
- tactical transport interests everyone
- MEDEVAC missions interest everyone

This list is further complicated by the fact that some missions are in great demand (such as tactical transport, assault, combat support) whilst others are more specialist (CSAR) whilst others gain importance with crisis-management operations (surveillance, reconnaissance, dissuasion). Still other missions could be questioned by the evolution of less costly and more expendable alternative systems (for example, the use of *drones* for certain targets and some reconnaissance roles), whilst others have yet to be fully tested and evaluated (command and control, anti-air protection).

*It is not feasible for each armed force to develop a complete set of these capabilities within a European national framework.* The only country that continues to sustain such a complete operational autonomy for its services is the United States, which has also strongly influenced the thinking of its European allies. However, this is an evident case of duplication, only possible with an entirely unrealistic availability of resources in our countries. With the current shortage of investments this could lead to serious deficiencies in the specialisation of both machines and divisions and their crews, jeopardising the effective ability to carry out the mission, especially in difficult circumstances.

*This kind of vertical specialisation could only be feasible in Europe if it were to go beyond the individual national sphere to a higher and more complex, integrated and multinational level.* In other words, it could be achieved within the framework of an entirely integrated European Army, Navy or Air Force: something that still seems remote, as does the alternative hypothesis of a complete “specialisation” of missions, attributed exclusively to the level of one or the other nation. The individual service can only aim at the vertical integration of all its components and affirm its operating autonomy, at least up to a certain point, within the framework of a strong transnational integration (in the past partly achieved thanks to NATO and the Americans’ determinant contribution, but insufficient today); otherwise a much stricter joint doctrine will have to be adopted.

However, even if financially sustainable, the idea of vertical integration within the individual service might not be the best proposition from an operational angle. *The advantages*

of the vertical integration of the helicopter within the individual service are described in this research (for example by Charles M. Burke). These imply the complete strategic-operational integration of this armament system in a new and more advanced concept of land operations (for the Army, but the same also applies to the other armed forces). *The disadvantages* could derive from the difficulty of inserting this system in unpredictable situations and in joint operations, with the risk of not fully exploiting its potentiality.

There could be a horizontal integration instead of a vertical one, in which the *entire range of these functions would be ensured by all the armed forces*, eliminating duplications (at least on the national plane). It would mean entrusting the optimal development of every individual function to the capability of one of the services, which would also exercise it for the others. This proposition obviously presumes a strong joint spirit and a *real unity of command*, able to decide on the attribution of forces and the scope of priorities in real time. On the basis of the overall needs of the operation (and not of the services) it could anyway offer Europeans a better cost-effective ratio, besides fostering the development of joint operational plans.

### 5.5 The Future of the Helicopter

Whatever the solution chosen the helicopter, like the other armament systems, will have to adapt itself better to the new needs of the international scenario (to crisis management). One of these needs is the *mobility and projectability of forces*. Helicopters are naturally "mobile" but the principal problem is to make them fully "projectable" in Petersberg scenarios. The first aspect to consider is the logistical one; it is not enough to project the helicopter, the "system" has also to be projected in real operating conditions, with the necessary supports and with the other forces and capabilities linked to it. Secondly, its deployment has to be effectively *integrated in air, land and sea operating plans* at all levels of engagement and in every stage of the operation. These forces must therefore fully dialogue in real time with the other operating segments - air, land or sea - and their use must be planned from the beginning on the basis of *the operation as a whole* and no longer on the needs and priorities of each individual service. Today the problem is solved in a sectoral manner: it is decided to use the Army, and the latter chooses up to what point and to what extent the helicopters can serve. Its decisions will be influenced by its specific order and doctrinal structures, as well as its availability of machines. The same applies to the other forces. But *helicopters must have their own operational scope* (air and surface at low and intermediate altitudes), providing a support space for the operation as a whole. This scope has to be studied independently and then integrated in the general operating plan in a global and not sectoral perspective. In other terms, the helicopter has to lose its "optional" aspect and become a "normal" element of deployment scenarios.

An explicitly joint approach can also help to *reduce, if not the number, then at least the classes of aircraft* to acquire. Also for this sector there is a choice to be made between specialisation and standardisation. Ideally, every mission should have its dedicated machine. However, reducing the number of helicopter classes constitutes an objective saving, for the structure, in terms of training, interoperability, maintenance, logistic chain, etc. The greatest risk in choosing standardisation is that, to keep an effective multi-role profile, the machines will become increasingly complex, large and costly, and the cost-effective ratio goes overboard. A certain degree of specialisation is advisable from this point of view. Thus "*families*" of aircraft should be aimed at, starting with a joint definition of missions. This would enable defining the optimal military requisites of the machine for the specific mission and not for the arm in which it will serve.

These machines must anyway meet the needs defined during the military operations of the last ten years and also those envisaged for the future. The most clearly definable features are the following:

- Projectability and deployment rapidity. The machines must be able to rapidly reach the theatre of operations (both under their own steam or, more usually, taken there by air or naval means) as must the logistics and support they need.
- Active and passive defence. The survival of a helicopter can only be partially entrusted to its armouring. Even land machines are affected by this philosophy. More than ever the new attack systems confirm the saying that a sighted armoured element is a dead armoured element. This applies even more to the helicopter, so it has to develop greater stealth capability, as well as more sophisticated countermeasures and a greater active defence ability.
- The choice of the medium weight. Recent experience has demonstrated that the armed forces have exaggerated the distance between "heavy" forces and "light" forces, giving the former the role of combatants for high-intensity conflicts and the latter that of combatants for low-intensity conflicts. But it is impossible to divide up conflicts on this basis. Each military operation has points of high intensity and situations of low intensity which are equally essential for achieving success in crisis-management operations. Therefore the helicopter has to insert itself into this new, poly-functional balance, with its new "medium" forces, without duplicating tasks that could be performed by other, more cost-effective means. For example, a gunship plane such as the A10 has a better performance for massive area interdiction operations, whereas the combat helicopter can work better in precision operations or in support of combat forces on the ground.
- Multiple configurations. The machine must be easily adaptable to a number of different missions, with few, non-structural modifications to increase its deployment flexibility and the options available to the operations planner. For example, a combat helicopter has to be able to pass easily (and cost-effectively) from the scout role to that of surveillance, from its traditional, anti-tank function to the more modern one of combat and attack, from air saturation missions those of air defence, etc. Equally, troop transporters must be also conceived for special operations, for MEDEVAC functions or even for the more complex command and control missions.
- Stealth and EW, self-defence capability. The "medium" helicopter must also be evaluated, with an eye to lower radar, acoustic and infrared signatures, its manoeuvrability/stealth aspects and the need to embark a suitable set of defensive countermeasures, including electronic devices (active and passive) and self-defence systems.
- Great reliability, reduced logistics tail. The trend is already to make these machines more functional, with longer intervals between servicing and simplifying their normal maintenance. Their all-weather use in every climate (sand, salinity, etc.) should also be enhanced.
- Interoperability (joint and combined). Machines must be able to operate in close cooperation with all the forces present in the theatre, whether they be land, naval or air, and at the same time it must be possible to use them without greater impediments in combined, multinational operations. All this requires particular attention to communications, identification, data transmission, etc. systems.



The need to simplify machines and to favour the *medium weight* suggests a greater operating integration among forces. For example, in certain operating scenarios most of the helicopter EW cover could also be guaranteed from sea or shore bases, strengthened by close cooperation with real aircraft. The revolution in military affairs highlights the autonomy of the individual combatant or machine, but is dependent on the possibility of ensuring a better integration among individual elements, although scattered around the battlefield. *It isn't necessary for everyone to do everything (anyway physically impossible) as long as everyone performs his or her role in an optimal manner and in full coordination with the others.*

The *helicopter/tiltrotor combination* is another possibility. As said before, an optimal balance between the weight and cost of the helicopter and its operational effectiveness has to be found. Certainly, the trend towards gigantism must be countered (except for some extremely specific, heavy tactical transport missions). The increase in weight and complexity increases the vulnerability of the helicopter and makes it more expensive. Equally, the increasingly wide mission range require the machine to be heavier and larger. This has to be set against the fact that the deployment of a helicopter force requires a logistical and operating support that has to be projected with other machines. Some of these problems can be better tackled by developing a mix of machines with different, albeit similar technical features, such as the helicopter and tiltrotor (or, for some combat missions, for example at sea, short take-off and vertical landing - STO-VL - aircraft).

As Richard L. Ballard has exhaustively explained in this research, the tiltrotor constitutes an authentic quantum leap in terms of mission range and cruising speed, although with some limits in other helicopter functions such as manoeuvrability and hovering. An analysis of missions can help to decide which machine is preferable for a specific use. This means that the individual machine is no longer asked to carry out an entire range of often contradictory roles and a combination of different machines can provide an optimal result as regards cost-effectiveness.

### 5.6 Summing up

In conclusion, the helicopter has to accompany (and in some cases anticipate) the necessary transformation of our military instrument, announced both in a NATO and European framework, but still far from being concluded. The needs have been clearly defined:

- the new armed forces have to be much more mobile, on both the strategic and tactical level, and be flexible enough to adapt to very variable conflict scenarios that can easily oscillate between operations of high and low intensity;
- the intervention forces have to improve their operating rapidity and promptness and be able to operate immediately in acceptable safety conditions, even when they are inferior in number and in conditions of environmental vulnerability;
- these forces have to be sustainable over time and must be able to adapt rapidly when management needs change (from combat missions to surveillance and peace-keeping including those of a humanitarian nature).

All this requires a substantial change in the structure of our armed forces, conceived to fight World War III, enabling them to regulate operating capability and doctrines with greater precision. Europe in particular has to move away from its current position of "immobile giant", with a surplus military capability linked to territorial defence and serious deficiencies in the projection of its forces. This means that our heavy forces have to slim down and our light forces have to fatten up.

The experience in the crises in which we have been engaged in recent years is not wholly positive. Although in some cases considerable military successes have been achieved, we have also had serious failures (Somalia). However, we have realised that the greatest problems and fiascos occur when moving from hostility to an authentic peace-building. Our military victories have not always been translated into political victories; this is least partly due to the difficulties encountered in passing from war to the management of security. These difficulties have also had repercussions in the structure of the military forces and the means at their disposal.

Just as difficult is the passage to a fully integrated and joint operating system. This is a much debated and much desired step, but all the most recent operations have been a succession of individual actions managed in a more or less exclusive manner by a single armed force. The division between land, sea and sky still stands and the helicopter, situated in an intermediate group, risks not being entirely understood and exploited.

Over and above the necessary technological choices, therefore, the future of helicopters depends on the effective will and capability of the armed forces to reform and adapt ability, organization, means and doctrines to the new needs. The helicopter has a great potential in almost all the crucial crisis-management areas from mobility to surveillance, from firing support to air defence, from command and control to special operations, and so on. It can contribute in a determinant way to that "medium" force model of which so much is spoken.

This is true in theory, but as Andrea Nativi illustrates so well in his paper, it still has to find its practical application, starting with a concept of air-mobility (also highlighted here by Burke) that must be fully tapped on a joint level. The future of the helicopter is certainly not in question, since these machines have widely proved their usefulness in the most varied tasks, but it has to make a quantum leap in pace with the evolution of the entire military instrument.

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