



**THE AIRMOBILITY REQUIREMENTS OF THE ITALIAN ARMY:
GUIDELINES FOR THE FUTURE**

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SUMMARY

Title explanation. The Italian contribution to international activities, airmobility requirements definition, and operational requirements of aircraft designed to meet these requirements.

The Italian Army Light Aviation, its origin and evolution through new forms of operations related to available means:

- Initial requirements: light fixed-wing aircraft
- New requirements: airmobility, the helicopter

Evolution of the requirement in relation to the increased capabilities offered by the helicopter, namely the tendency to acquire specialized aircraft for specific missions.

The first helicopter programme entirely Italian in operational conception and in technical development: the anti-tank A-129 helicopter.

Future trends:

- Extention of the utilization cycle for the existing aircraft by modernization and "rejuvenation".
- Aircraft of the 90's:
 - . the scout helicopter
 - . the tactical transport helicopter
 - . the observation and liaison helicopter

1. INTRODUCTION

The Italian Army has accumulated an experience in the past several years enabling it to now offer a reasonable response to the ever increasing airmobility requirements.

The scope of this presentation is to describe the experience which has led to requirements for the future. This makes it possible for us to state guidelines now for future developments.

The need for a continuous relation between operators and manufacturers is essential and this relation is not exhausted in meetings like this, but is constantly upheld whenever a requirement progressively becomes: operational, design, development and production of units.

However, a confrontation of opinions may prove very useful to determine possible common lines to basic solutions, even considering the required tailoring of each specific national programme to particular national requirements.

The Italian Army has not the pretention to indicate reference lines for future technical developments in the rotary wing sector, which may be absolutely suitable to all ground military operators, but has the intent to describe the solutions deemed necessary for its own operational requirements.

Since Italy is placed into a well defined political and military context, the Armed Forces, in a drive of sincere and loyal cooperation, are attempting to promote, to the greatest possible extent, rationalization, standardization and interoperability of their equipment.

Therefore the Italian Army contributes in several fields, in conjunction with other Allies, to the definition of the basic common operational requirements as well as to the definition of the features for the materiel to be used to meet these requirements, while favouring all forms of technical and industrial cooperation among the various countries.

Along this line I wish to mention the valuable actions performed by an international working group, called the FINABEL K Group, covering the airmobility of ground forces and airlift of Army materiel.

The FINABEL Coordination Committee was established in 1953 and comprises the Army Chiefs of Staff of FRANCE, ITALY, NETHERLANDS, BELGIUM, FED. REPUBLIC OF GERMANY, GREAT BRITAIN and LUXEMBURG, with the authorization of the respective Ministers of Defence.

This Committee which consists of several working groups, among which the aforesaid Group K, pursues the aim of promoting military cooperation among NATO member countries, in a mutual effort to establish common guidelines for the coordination of the armament sector.

Group K has defined the basic data for the study of the operational characteristics for future helicopters:

- . Light Anti-Tank Helicopter
- . Medium Transport Helicopter
- . Light or Tactical Transport Helicopter

and is presently working at a study covering the future liaison and observation helicopter.

The validity of this work, is proved by the fact that the technical-operational guidelines originating from the Group and approved by the Chiefs of Staff, enjoy the greatest consideration in view of the future European programmes which will evolve into either military or industrial joint ventures.

Therefore within an international cooperation, the Italian Army may influence the definition of common guidelines for meeting common requirements.

The purpose of my address, is to explain in particular the criteria followed by the Italian Army in the transition from initial and general orientations to specific programmes, through requirement finalization and updating of the operational features, considering the peculiar and particular aspects of the Italian operational and natural environment, and the size of the Army, in order to develop a balanced and harmonious structure in which, a new system, like a new helicopter for example, may find its proper application.

In this connection the particular requirements of the Italian Army become guidelines for the home industry, either if this industry operates autonomously or within the sphere of an international cooperation.

The specific subjects that I will discuss now are:

- a) Italian Army Light Aviation, its origin and evolution through forms of operation related to available aircraft. In particular:
 - . initial requirements and means to implement these requirements: fixed-wing light aircraft;
 - . acquisition of the airmobility concept connected to the advent and development of the helicopter.
- b) Evolvement of the requirement in relation to the increased capabilities offered by the helicopter, namely the trend to acquire specialized aircraft for specific missions.
- c) The first military helicopter programme entirely Italian in the operational concept as well as in technical design: the A-129 anti-tank helicopter.
- d) Future trends:
 - extention of the utilization cycle for existing aircraft through modernization and modernization programmes
 - aircraft of the 90's:
 - . the scout helicopter
 - . the tactical transport helicopter
 - . the liaison and observation helicopter

2. THE ITALIAN ARMY LIGHT AVIATION

Our Army can boast an undisputed record in the use of aircraft, dating back from the very first years of this century when during the Great Maneouvers of 1911 and immediately afterward during the Campaign of Lybia, we have proved to have understood very well the role that aircraft were capable of performing on the battlefield in close cooperation with ground units. In those historical circumstances, both operationally and experimentally, the aircraft were requested to perform their first missions: intelligence, liaison and fire support.

Aircraft however did not remain a long time in service with the Army. Maybe it was just the rapid technical progress during and after World War One, that determined the separation of aviation from the Army and the establishment of an autonomous Airforce, capable of performing essential tactical and strategic tasks vital for the outcome of the conflict.

Nonetheless, after World War II despite the most extensive forms of cooperation between ground and air forces, it proved necessary to offer to the Army units a more continuous and adherent support eliminating procedural bounds. The solution was to integrate organic aircraft into the ground forces.

Following the example of the UNITED STATES, that made available the first aircraft and trained the first pilots, the Army Light Aviation was established in Italy, and initially operated the glorious Piper Cub, to perform artillery aerial observation, surveillance, and liaison.

The light airplane has performed excellently and is currently on the flight line of the Italian Army Aviation with tasks complementary to the helicopter. In the meantime new forms of operations are being studied and particular equipment is being researched in order to optimize the airplane operational capability, which we believe is still eligible for valuable use in our environment.

Since the objective of this conference is to demonstrate how the Army particular requirements constitute a guideline in the development of new aircraft, I think it is worth mentioning the development of the new SM-1019 light airplane, AL-2 according to our military designation, which has recently entered service.

The first Piper Cub L-18 and L-21 had been subsequently integrated with the more powerful and capable CESSNA L-19s which was also in service with the Italian Army and have fully confirmed their technical-operational capability.

When it became necessary to have these aircraft replaced as they were approaching the end of their technical life, the Army General Staff, through evaluating the alternative offered by same-category helicopters, determined through the application of operational research methods, that it was still convenient in the particular national operational and

natural environment, to retain in service a fleet of light airplanes to complement the observation helicopters.

A special study group was directed to define the operational requirements for the new airplane that may be synthesized as follows:

- . basic features similar to the L-19's
- . increased STOL performance, higher speed with same range
- . logistics commonality to the greatest possible extent, with AB 206 "Jet Ranger" observation helicopters, which in the meantime had entered service.

On this basis, the national industry found the simplest and most logical conclusion in the "rejuvenation" of the glorious and old "Bird Dog" which was fitted with the same powerplant, in turboprop version, as the AB-206, with the same avionic equipment as well as being additionally modified in order to make it more suitable to perform the expected roles, namely observation, surveillance, liaison, ground illumination, fire support in particular situations. The feasibility of performing the anti-helicopter mission is under evaluation:

Despite its usefulness, the light airplane alone would have been insufficient to acquire the essential role that the Army Aviation performs for the ground forces.

As a matter of fact only the helicopter was eligible for the development of a tridimensional mentality and for the application of the operational concepts, condensed under the term "airmobility", which offer once unthought-of new tactical possibilities.

In this field the UNITED STATES Army has been decidedly in the vanguard. However, also the European Armies promptly appreciated the importance of this new vehicle and readily accepted it as part of their armament. The Italian Army as far back as 1950 purchased AB-47 series helicopters which were initially put beside the light airplane with similar tasks, while conducting some experiments in the "fire" role configuration by the installation of anti-tank missiles, free rockets and machine guns.

But the actual jump in quality with the first significant possibility of application of the airmobility concept in its three essential components: intelligence, tactical-logistical mobility, fire support, was the introduction in service of the AB-204 helicopters, the glorious "Hueys", which also with our Army fully proved to be actually "multirole" aircraft, namely to be capable of coping with various requirements in our peculiar operational and natural environment. AB-204, AB-205 and soon to be added AB-212 helicopters are the backbone of our mobility, as regards tactical mobility and fire support. The fire support consists of rockets and machine guns which have proved effective against area targets.

The subsequent stages of the evolutionary process, initiated with the advent of the helicopter, are featured by the acquisition of two vehicles, which in a lower and higher class with respect to the HUEYS, have completed the helicopter flight line: the AB-206 "Jet Ranger" and the CH-47 "Chinook."

Presently the Italian Army Aviation has completed its second life cycle by becoming an harmonious and balanced structure in service with the ground forces. Its organization and tasks are basically similar to those of western Army Light Aviations, but with some particularities for specific adaptation to our situation, our requirements, our capabilities.

To the present time in peacetime we have not demonstrated our effectiveness in actual combat. However we have already received the gratitude and acknowledgement from our nation for our prompt and effective intervention in many crisis situations, originating from natural disasters such as earthquakes and flooding. In addition, our helicopters fly daily rescue missions in the mountains.

In this connection the Italian Army Aviation, though prepared to cope with its purely military commitments in the defence of our Country, constitutes one of the most effective organizations for the enactment of a principle recently ratified by a State bill, directing that among the fundamental tasks of the Armed Forces, it shall be their responsibility to participate in rescue operations.

I wish to end this first part of my address that had the purpose of describing the "helicopter situation" of the Italian Army, from its origins up to the present, by saying that I believe that the Italian Army Light Aviation constitutes a valuable example for an European application of airmobility. This airmobility of ours, though similar to its sisters in organizational and operational principles, has one peculiar feature of its own which fits our situation and our capabilities. The Army Aviation is an effective organization confirming the saying:

"lumine igni mobilitate adiuvat"

namely to offer a valuable and essential support in three fundamental sectors of airmobility:

- . intelligence support
- . tactical-logistical contribution
- . fire support

3. EVOLVEMENT OF THE REQUIREMENT: TREND TOWARD SPECIALIZED AIRCRAFT

One of the reasons that has made the helicopter readily eligible for military operations, especially by the Army, has been its extreme versatility and flexibility of operation.

After the renowned "Jeep" I think that very few vehicles have really deserved the title "general purpose vehicle" or "multirole" better than the helicopter.

It is not unusual for the same helicopter to be utilized to perform various tasks such as highly humanitarian roles, search and rescue and casualty evacuation, as well as offensive missions such as fire support.

Since the outset, helicopters have been used as "Christmas Trees" to which everything can be attached, from litters to machine guns, from fire fighting equipment to anti-tank missiles, from aerial spray systems to rockets.

This multi-role, multi-system aspect of helicopter utilization is still the current concept. However, the helicopter is being integrated more and more into the ground forces because of its substantial contribution to every phase of combat. But, for successful operations in the environment of a sophisticated threat, each operational situation must be carefully analyzed in order to increase the probability of survival.

Today this analysis must be accomplished through an examination of the elements contributing to define a medium or high-density operational environment. This means essentially locating the threat to the rotary wing aircraft, in order to avoid making over-optimistic estimates where the helicopter operation could not be safely performed.

While performing its basic tasks of transport, fire support or observation, because of its unique capability to maneuver in every direction, and fly low and slow in order to take advantage of protection offered by the ground, the helicopter truly is operated as a highly maneuverable ground vehicle.

As various threats have evolved since the time of the sword and shield, other offensive devices have called for new defensive ones. And now there is a new factor in helicopter operation threat analysis--an anti-helicopter. We are involved in a multitude of studies and technical developments to counter this new threat. Anti-helicopter operations have become as common a discussion subject as anti-tank operations.

What is the result of our threat analysis? As our helicopters maneuver forward, performing those assigned tasks, the enemy is maintaining surveillance and will attempt to acquire them as targets to be neutralized or destroyed. The closer that our helicopters approach hostile formations, the higher the probability of being detected and engaged. Therefore, not only does the helicopter require specialized mission equipment just to successfully perform those various tasks, but also requires complementary equipment and design features that will enhance its survivability - not only for the sake of the helicopter itself, but also for that most precious and dear component: the crew.

The conclusion is a concept which is simple to describe but difficult to implement because of required new technology and the attendant high related costs. The concept is this: our helicopters are divided into two basic categories, those that will operate in the rear areas where it is relatively safe, and those which must advance very close to the enemy, and indeed in some cases even be inter-mixed with or behind some enemy elements. The latter we define as "first line helicopters". These are the ones that must be provided with a sufficient survivability capability to achieve a realistic and economically feasible operational life.

From the distinction between "first-line helicopters" destined to perform particular and specific tasks under the worst conditions, and other helicopters, originates the concept of specialization, namely the requirement to design ad hoc aircraft for these specific tasks. The cost of these aircraft, although particularly high, will be fully justified by cost/effectiveness considerations, in the face of requirements that could not be otherwise met.

Let's consider a multirole helicopter operated for example in the transport/observation and anti-tank roles. If configured with an anti-tank missile system, it would be excessively penalized for the two other roles, because of the reduced useful load.

This does not mean that the intrinsic multirole capability of the helicopter does not exist, the contrary is true. However, when a helicopter is designed for specific missions, it is perhaps implied acceptance of some limitations from the outset.

Undoubtedly the "multirole" capability is a solution when the resources available are limited, but specialization is more desirable and is feasible when the financial resources are available.

Acceptable compromise solutions are also possible with the establishment of a balanced and harmonic flight line, which comprises aircraft designed to counter the primary threat, purchased in a number strictly necessary to support the major conflict, while for other less critical sectors, aircraft capable to cope with different requirements may be deployed.

This is in fact the medium-term orientation of the Italian Army and an example of this trend is offered by the launching of the design, development and procurement programme covering the light anti-tank helicopter which I will now address.

4. THE FIRST MILITARY HELICOPTER PROGRAMME
ENTIRELY ITALIAN IN OPERATIONAL CONCEPTION
AND TECHNICAL DESIGN: THE A-129 LIGHT
ANTI-TANK HELICOPTER (LAH)

For many years the Army Staff has monitored with interest the evolution of the anti-tank helicopters, either as aircraft designed for other requirements and subsequently armed with wireguided missile systems, as well as aircraft designed primarily for the anti-tank role.

In order to validate the requirement for a "dedicated" anti-tank helicopter, and establish programme priority it was necessary to investigate other alternatives, adaptation of existing aircraft and procurement of an ad hoc aircraft.

Taking into consideration the operational environment and the threat, great perplexities existed in fully acknowledging the effectiveness of a system, that could be termed "suitable" and for which the operational capability was difficult to assess a priori.

In reviewing helicopters already purchased in sufficient quantity to satisfy tactical/logistical fundamental requirements, the AB-205 was considered as a potential anti-tank helicopter. However, our conclusion was that one of the operational requirements would have been adequately met by this solution.

The remaining solution was to procure additional helicopters. But of what type? Again multirole or specialized aircraft?

The latter solution was undoubtedly attractive but mainly financial considerations stood in the way, since the trend worldwide was tending toward sophisticated helicopters in a class and weight of assumed costs not compatible with our budgetary resources.

Meanwhile the requirement to strengthen the national anti-tank defense was becoming more and more urgent. The existing primary defense consisted of the long-range wire-guided missiles, which in our environment were severely limited in fields of fire and mobility.

This situation substantiated the need for an appropriate aerial missile platform, primarily based upon the greatly enhanced mobility capability.

A relatively light-helicopter formula was studied -in any case lighter than those in service or under development at that time- specialized in a single specific mission, optimized in the application of a specific weapon system, and capable to opposing any hostile battlefield threat with excellent survivability.

In view of the above the formula for our helicopter may be summarized in two words: "light and anti-tank".

Why light and why anti-tank and not attack in general?

In considering weight the answer is simple: in aviation it is possible to calculate the cost of an aircraft by the kilo, and the more sophisticated the aircraft, the higher the cost per kilo. Since the beginning of the process, efforts have been made to establish a weight ceiling to make it possible to develop a compact aircraft, of reduced dimensions, essential, designed specifically for its primary operational mission. This weight has been set at approximately 3500 Kg.

By emphasizing the primary mission, anti-tank, other potential missions were restricted. The purpose of this was to restrain the costs of developing a suitable aircraft to within our financial capabilities.

I am well aware that this limitation might give rise to a certain skepticism regarding the possibility of achieving the planned objective. Calculations made from other qualified sources have suggested the necessity for an additional 700 or 1000 Kg to achieve the desired results.

The Italian Army nonetheless is confident that the technicians of our national industry will arrive at a positive and successful conclusion of this project through:

- . Application of advanced technology; and
- . Selection of only essential characteristics, based upon investigations to eliminate non-essential solutions.

For validating the operational/technical concept of the A129 the Army Chief of Staff was offered the use of an existing adequate-sized, modern helicopter which had previously been qualified by our industry and purchased by the Army in small numbers for VIP liaison and specialized training requirements.

I am referring to the A-109, a typical and valuable example of a multirole light helicopter, for commercial and military operation, which we have used and shall continue to use in the frame of the A-129 programme, to develop engineering and operational experience in parallel with the development of the anti-tank helicopter. The results shall flow into the main programme thus saving time and costs.

The first of such experience was the one relating to evaluation of the TOW wire-guided anti-tank missile system that has since been selected to arm the future A-129. This selection is based upon:

- . its proven operational dependability;
- . equipment and missile commonality with ground units;
- . its prospects of technical and operational growth, which makes it still effective for many years to come.

Incidentally we can say that the A-109 has proven so satisfactory as a test platform for the TOW (100% of hits) that because of its operational flexibility, it is currently being utilized as a valuable transitional anti-tank system and may be considered complementary or even possibly a replacement for a pure anti-tank helicopter.

Other experimental test programmes will follow in the night vision, communication and navigation fields.

The A-129 will be flying in two years' time and two years later an initial production will enter service with the flight line of the Italian Army Aviation. That introduction will give our Aviation a new physiognomy and a more modern and advanced configuration.

Speaking of a helicopter still under development I will mention in parallel the operational requirements (namely the guideline of the Italian Army) along with the principal design features.

In summary, the requirement of the Italian Army is for a helicopter that is:

- . light
- . effective
- . technically reliable
- . capable of operating night and day, and under adverse weather conditions
- . difficult to detect, not vulnerable, highly survivable
- . capable of a 2h. 30 min anti-tank mission under the severe conditions imposed by tactical flight and under the extreme environmental conditions of the Italian territory, featuring high temperatures, flat and mountaneous terrains.
- . capable of alternate attack missions with alternate weapon systems without penalization of its lightweight and relative simplicity features.

The slides that follow will offer a detailed description of the general features and flight performance of the aircraft.

Certain of our requirements and the resulting proposed technical solutions deserve elaboration.

Engines - The twin engine configuration has been chosen. Not for technical reasons considering the high reliability level of modern power plants. The decision was tactical to enhance the aircraft to continue the mission, to return to base or to make a power-assisted descent in the event one engine is hit.

Weapon System - We have already explained why we have chosen the TOW. The helicopter may alternatively or in combination be armed also with rockets, but the installation of a 25 or 30 mm machine gun has not been considered for two reasons: one technical the other operational. With the rockets it is not necessary to increase the structural weight for installation of a heavy, high recoil, weapon, nor is it necessary to increase the size to stow internal ammunition and in any case the helicopter is provided with two effective, flexible and sufficiently accurate weapon systems for air-to-air engagements.

Of course when I speak of rockets I am referring to advanced systems (including ammunition and on-board equipment) which will provide significant improvement over the present system.

Communications - We have taken into consideration all the requirements for air-to-ground-units short-range communication, long-range communication, with the headquarters, air control and tactical flight. Particularly interesting will be the concentration of all these functions in a single control panel with the double advantage of reducing crew operational stress and to save space and weight.

Protection - Three fundamental factors shall be investigated: detectability - vulnerability- survivability - in the tactical environment, in order to make the helicopter:

- . Firstly: less detectable visually, aurally and by radar search and tracking, laser aiming, and infrared (IR) homing missiles.
- . Secondly: less vulnerable as far as feasible, from small caliber projectiles and from fragments.

We are well aware that it would have been impossible to develop a flying tank (assuming that tanks are invulnerable!). The passive armor protection was restricted to the crew and some vital systems. Some essential systems have been duplicated and the main transmission and tail rotor gear boxes will operate in flight for 30 minutes after loss of lubrication.

- . Thirdly - Higher survivability if hit, enabling the helicopter to perform a controlled landing (twin-engine) and crashworthiness features, to reduce the effects (energy absorption structures; fire-proof fuel system).

I wish however to point out that the highest survivability factor for the helicopter is its capability to operate very close to the ground, taking advantage of any obstacle for protection against visual detection and direct fire. The low silhouette and high performance features enhance maneuverability. Also essential are crew observation and stand-off long-range weapon systems.

Of course I can release at present only general description information since the design data are covered by military and industrial restrictions.

However, the following are particularly interesting solutions:

- . a large-diameter main rotor mast, internally housing the blade pitch controls; this solution offers a higher ballistic protection, and prevents cut wires from winding around the pitch controls, a great threat to low-altitude flying;
- . the adoption of fiberglass blades with the well known advantages of increased performance, safety and maintenance.

5. FUTURE TRENDS OF THE ARMY LIGHT AVIATION

I will end my address with a summary of the expected future developments in flying materiel.

In a short/medium term perspective only the A-129 helicopter will constitute a priority programme for a totally new aircraft. This does not however mean that we will let the rest of the line grow obsolete without fully exploiting the residual technical/operational life.

This would not be convenient for two reasons:

- . the first is an economical reason. The longer we keep aircraft in service that would be too burdensome to replace now, the better we can devote our efforts to other armament sectors enjoying a higher priority;
- . The second reason is operational. We cannot permit a decline in our general operational capability to satisfy increasing airmobility requirements by operating obsolete aircraft. On the other hand an advanced generation aircraft like A-129 will operate at its best if in conjunction with other adequate performance units.

On the basis of these concepts the Italian Army in the 80' s, will initiate various programmes covering three currently existing basic aircraft:

- . modernization and revitalization of the AB-206 "Jet Ranger" reconnaissance helicopter, in order to actually develop two versions:
 - .. a scout version capable of operating with the A-129s;
 - .. an observation and liaison version, to satisfy the general operational and territorial requirements of Large Units' Commands;
- . modernization of the AB-204 and AB-205 multirole helicopter line, either by replacing the AB-204 with the twin engine AB-212, and by providing the AB-205s with the essential improvements to enhance the operational capability and safety of operation;

- . modernization of the CH-47C medium transport helicopters, in order to extend their operational life beyond the year 2000, meanwhile introducing improvements in performance, safety, and logistics.

Looking at a more distant future, it is obvious that during the 80's the necessary actions must be taken to completely renew the flight line, and new aircraft will be acquired.

Currently only trends exist featuring long-term studies, that are conducted at a national level and within the frame work of our alliances.

Among these some have precise objectives and appear to have the highest probability of success.

A typical example is the initiation of a programme for an advanced scout helicopter, a derivative of the A-129 anti-tank helicopter, in order to enhance the operational effectiveness of this latter, especially when it will be equipped with more sophisticated weapon systems. For this helicopter the Army General Staff has defined, for study, the basic operational requirements.

Another impending programme will cover the light or tactical transport helicopter, which will replace the current multirole helicopters, and will constitute the fundamental element of the tactical/logistical mobility of our Army. Since this aircraft is based upon studies conducted within FINABEL and by cooperative efforts of European industries, it has the potential of being utilized by a large base of countries.

Eventually, in the 90's, a liaison and observation helicopter will be developed. Its features are being studied and defined by the above mentioned FINABEL K Group.

The most interesting aspects of the Italian Army trends are that these trends are common to most European Countries and therefore they are viable candidates for joint European programmes with enormous advantages for the European economy and for the efficiency of our Armies. These trends will promote standardization and interoperability of our armament systems.

When I talk of European programmes I do not intend to refer to European materiel only, since within the Atlantic Alliance, European solutions could develop into NATO programmes, and become transatlantic solutions.

Gentlemen this concludes my presentation.

As an "operational-type", I have presented to you, past history, with an eye to future prospects of Italian Army Aviation. I now remind you that military requirements constitute the guidelines for new equipment developments, but also the technological indications coming from the industry could be of great help in defining our requirements and prevent us from asking for too much or too little.

You are all dedicated to the vertical flight environment from which the helicopter has originated, an aircraft that has offered increased freedom in the third dimension. On behalf of the Italian Army I thank you for your attention and wish to see your efforts crowned by success so that you can make available increasingly improved, dependable, economical aircraft valuable not only in a war but also in peacetime.