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FUTURE VERTICAL LIFT: HOW THE NEXT AMERICAN MILITARY HELICOPTERS WILL LOOK LIKE

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In recent years, the United States Department of Defense carried out a deep doctrinal reflection on the future role and the emerging operational needs of its helicopter fleet. This reflection arises from the analysis of several factors, now geostrategic in nature, now purely technological. As far as the latter side is concerned, the Defense is inevitably experiencing the progressive obsolescence of the current fleet of helicopters, extensively employed in all the operating theaters (numerous and heterogeneous) that see its Armed Forces as protagonists. Some aircraft, including legendary models such as the CH-47 Chinook or the UH-60 Black Hawk, despite multiple updates, maintain a conceptual design dating back to the Sixties. In addition to this, at the state of the art, the American Defense cannot fail to recognize the urgency of this update, since the recent developments of the Russian and Chinese helicopter industry are likely to gradually erode the technological superiority of the United States in this specific sector. The risk becomes increasingly significant in light of the progressive repositioning of US strategic interests, in the face not only of the 2014 Crimean events, but also of the growing tensions in the South China Sea.

More generally, the recent evolution of the international geostrategic framework will require in the coming years to meet heterogeneous and hitherto unusual operational requirements. Among the directions of this change, the proliferation of increasingly sophisticated military technologies stands out, previously almost exclusive prerogative of the major military powers, among a growing number of emerging countries and informal actors. In addition to this, on a capacitive level, the impressive evolution and the global diffusion of the new hybrid war doctrines that we have witnessed in recent years shows increasingly heterogeneous and widespread security risk profiles, no longer necessarily limited to certain geographical areas. The U.S. Armed Forces, as well as their allies, will experience a wide proliferation of missile systems (cruise, ballistic and MANPADS in particular), interdiction capabilities on multiple domains (Anti Access/Denial Area - A2/AD), as well as the intensification of electronic warfare activities in contexts hitherto considered generally permissive, not least the Mediterranean basin.

As regards the geography and the characteristics of the environments in which the American military will operate,

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densely urbanized terrains (DUT) such as megacities and concatenations of slums are becoming increasingly relevant, thinking above all of Equatorial Africa and South East Asia. The specific configuration of these environments poses technical challenges that could undermine the effectiveness of the aircraft currently in use.

Precisely for this reason, in 2004, the Department of Defense launched the Future Vertical Lift (FVL) program, an ambitious project to replace, in the medium term, the whole fleet of helicopters of the United States Armed Forces, from troops transportation (CH-47 Chinook) to utility and fire support (OH-58 Kiowa). The FVL program currently sees all the major giants of the American aerospace industry compete around two major projects: The Future Attack Reconnaissance Aircraft (FARA), for a new light utility and scout helicopter, and the Future Long-Range Assault Aircraft (FLRAA), for a new 'medium-heavy' utility helicopter.

The first project, launched in 2018, will go to designate the successor of the US Army's OH-58 Kiowa Warrior. The latter, in fact, used for the first time during the final frames of the Vietnam War and extensively employed during the Iraqi Freedom and Enduring Freedom (Afghanistan) operations, was decommissioned in 2017. At the moment, its role is temporarily taken over by the most famous and "muscular" AH-64 Apache, which works along with the reconnaissance drone AAI RQ-Z Shadow.

What the US Army essentially asks for is maximum performance in a small package, namely a compact, stealth helicopter, capable of penetrating into narrow, congested and non-permissive spaces. It will also have to guarantee the possibility of transforming itself into a real UAV (unmanned aerial vehicle), and launching small drones, called ALE (Air Launch Effects), directly from the cabin. The future scout helicopter should be able to fly at a cruise speed of 220 knots (about 407km/h), while demonstrating great maneuverability, resistance and flexibility, for deployment in multiple and heterogeneous scenarios.

Considering that, to date, the AH-64 Apache or the Italian AW-129 'Mangusta' in favorable conditions fly at an average speed of 140 knots (260 km/h), those required by the Army are revolutionary performances.

On March 26, starting from a plethora of five proposals, the Department of Defense selected Bell and Sikorsky for the final phase of the program.

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With the 360 Invictus, Bell offers a 'classic' and compact design (obviously inspired by the RAH-66 Comanche), equipped with a single main four-blade rotor and propeller in the tail beam. According to the company, the Invictus will be able to significantly increase the cruise speed during the most critical phases. However, this ability is still to be verified, since it is just a prototype, not yet tested in flight.

The concept proposed by Sikorsky (Lockheed Martin) is completely different. His Raider X, in fact, is a version derived from the well-known S-97 Raider demonstrator. It is an utterly new technology, with two counter-rotating coaxial rotors in the upper part and an anti-torque propeller in the rear, capable of guaranteeing exceptional performance in terms of speed (average speed above 220 knots) and maneuverability. In addition, the design, the concealed weapon container and the reduced infrared signature guarantee low observability and greater protection against the seekers of the new generation surface-to-air missiles. A significant advantage that Sikorsky could enjoy in the tender lies precisely in the fact that its demonstrator has not only already been developed, but also tested extensively during flight with excellent technical performance. The whole selection process will end in 2022 and will see the first aircraft probably flying by 2025.

Parallel to the FARA tender, the screening phase of the FLRAA (Future Attack Reconnaissance Aircraft) program, started in 2019, is proceeding. It will select the future 'medium' utility aircraft that will replace in 2030 the UH-60 Black Hawk, developed in the early Seventies and entered into service in 1979. The winner of the FLRAA, which will be produced in approximately 1,000 machines, will enter into service with the US Army and the Marine Corps, and will also be modulated according to the specific needs of the Special Forces, as it was for the Black Hawk.

In general, the tactical scenario from which the operational requirements for this new aircraft have been derived sees first the FARA perform reconnaissance activities and take control of a specific area or air corridor, also thanks to the support of the ALE. Later, the FLRAA enters quickly into the theater, transporting and deploying the troops. To ensure the effectiveness of this type of operation, in multiple and complex contexts such as those described above, the US Army and the Marine Corps have expressed a

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maximum speed requirement of 250 knots (about 460 km/h). As for the payload, the Marines ask the FLRAA to carry 8 passengers (excluding crew), while the American Army 12-14, as it was for the standard version of the Black Hawk.

On March 5 the US Army announced the two companies admitted to the final phase of the program: Bell and the Sikorsky/Boeing team. Bell offers a completely new concept with its V-280 Valor tiltrotor aircraft. The machine was officially unveiled during the 2013 Army Aviation Association of America (AAAA) Professional Forum & Exposition in Fort Worth, Texas, and was first tested in flight in December 2017. The V-280 is a high-powered twin-engine tiltrotor, not dissimilar conceptually from the V-22 Osprey, developed by Bell in partnership with Boeing and currently employed by the US Air Force, Marines and Navy. What fundamentally distinguishes the V-280 from the Osprey are the fixed engines, arranged at the end of the wings, that in the V-22 are integrated within a tilting structure, which also includes the wings. Net of originality, however, a critical issue that could afflict Bell's proposal might be the substantial lack of interest of the US Army for a tiltrotor intended to carry out troop transportation tasks. The SB-1 Defiant, born from the Sikorsky/Boeing partnership, is instead a compound helicopter, with classic but stealth design, equipped with rigid coaxial rotors and anti-torque propeller placed perpendicularly in the tail. The Defiant, which carried out the first flight tests in 2018 and recently passed the 100 knots (185 km/h) cruise speed threshold, promises to reach a maximum speed of 250 knots (about 460 km/h) and to guarantee incredible performance in terms of maneuverability. According to the official schedule of the FLRAA program, the production contract will be awarded by the Department of Defense in the summer of 2021, while the first flight is scheduled for 2024.

Whatever the solutions selected for both projects, the United States will be able to set a new standard for the helicopter sector, with huge impact not only on the military, but also on the whole world of civil aviation. These products will offer revolutionary performance and capabilities, which distance themselves considerably from the current standards, in terms of employment, safety and force projection.

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Washington has always played a pioneering role in the defense industry, operating a constant and unparalleled effort of forecasting and doctrinal reflection. Today, within NATO, and in particular among the European partners, many countries express the need to equip themselves with new aircraft that meet the same operational needs as the FARA and FLRAA programs. However, to date in Europe there are currently few programs for the development of next generation fast rotorcraft. Leonardo is going to certify the first civil tiltrotor in the world, the AW-609, capable of reaching a speed of 270 knots (500 km/h). In addition, within the European 'Clean Sky 2' program, the same company (with a new prototype of tiltrotor) and Airbus (with the RACER compound helicopter) compete for the construction of new a high-performance and low-emission aircraft. However, these remain civil programs.

It is therefore fundamental to start a deep reflection to try to understand, within NATO, what is the way to go. On the one hand, pursuing the development of less performing and less ambitious military technologies at national level could generate gaps in military capabilities and delays, especially in the face of a growing integration and interoperability with the modern IFVs, 5th generation fighters and UAVs. On the other hand, if some states decide to participate in the development of American technology, they should try to encourage synergies with their national industries in all ways, in order to develop new industrial capabilities and boost employment and innovation.