Thinking about Air and Space Power in 2025

Five Guiding Principles

Lt Gen Denis Mercier, French Air Force*

The year 2025 is not far away. However, the coming years will doubtless surprise us since geostrategic or technological developments are so unpredictable. The air and space environment will certainly feature major breakthroughs that we must be ready to face. This article does not claim to treat this topic comprehensively; rather, it suggests a few principles that one can apply to support a view of the stakes for tomorrow's airpower.

Preparing for the future is difficult. One must select the time frame in order to build an innovative but realistic and reachable vision. Economist

*This article is a revised version of the author's postscript to *Envol vers 2025. Réflexions prospectives sur la puissance aérospatiale* (Takeoff for 2025: Thinking about the future of air and space power), Stratégie aérospatiale series, ed. Grégory Boutherin and Camille Grand (Paris: La Documentation Française, 2011).

Peter Drucker used to argue that "the essence of planning is to make present decisions with knowledge of their futurity."[1] Indeed, the years between now and 2025 have already been defined by a program of orders and deliveries that scales the format of military forces until 2020, within a given financial framework influenced by military forces. Consequently, any modification remains subject to the law of interconnectedness, whereby a new program must replace another one, or several, in order to avoid budgetary problems. Because such planning freezes capabilities until 2020, it takes on a budgetary character and limits strategic thinking to the time frame in question. Consequently, if we wish to go outside this framework, we must look beyond. The 2025 time frame is significant because it gives strategic thinking a renewed scope, keeping in mind the objective of shedding light on the future so we can better assess today's decisions.

Various approaches present themselves and numerous parameters require assessment as we seek to plan air and space power for the year 2025. Given the difficulty of creating a definite vision of the future that will not be misunderstood, this article offers five principles that allow us to avoid the dual pitfalls of a vision that is too futuristic and disconnected from reality, or an approach that lacks innovativeness because of constraints imposed by current projects and studies.

First Principle: Overcoming Current Thinking, Which Can Bind Future Ideas

Although we must open up our thinking in a spirit of operational and technical innovation, Air Marshal Sir John C. Slessor reminds us that the lessons of the past still represent a tremendous source of data and experiments that we can revisit in anticipation of tomorrow's stakes.[2] Neither the visions of the future nor the lessons of the past, but the tyranny of today's commitments imposes constraints on our thinking. It is very tempting to scrutinize operations in Afghanistan as a

way of imagining models of future forces, but the present is hazardous in that it has a strong legitimacy in countries where the news and coverage by the media exert much influence on public opinion. Airpower plays a significant role in Afghanistan but remains insufficiently promoted. On the one hand, its appreciation comes from successes that were as continuous as discreet; on the other hand, the visibility of its action is reflected in the land engagement. Airpower thus provides continuous surveillance, makes possible the stealthy designation of targets in a country with a number of natural or man-made vertical obstacles, offers a wide range of kinetic or nonkinetic effects, and frees itself from land constraints for the transportation of personnel and equipment, all the while minimizing losses among both allied troops and civilians.

Several incorrect lessons drawn from that engagement involved airpower. Given the very nature of the operation and fighting, we employed airpower in a wide range of missions, leveraging its variety of networked, interacting capabilities that combine their effects to benefit the tactical level. This situation reflects both the magic and perversity of networked operations. That is, integrating ever more versatile capabilities that cooperate in open operating modes, regardless of the level of use to which they belong, increases the effectiveness of tactical actions conducted in the field. However, we forget that under other circumstances, some of the capabilities offer courses of action that produce a substantial range of effects at the strategic level.

Thus, using a new-generation reconnaissance pod on a modern platform such as the Rafale or F-22 will supply the theater commander with highly significant images, but it raises the question of whether employing such platforms for this task constitutes overkill. However, these platforms equipped with that sensor, having taken off from the homeland and operating stealthily thousands of kilometers from their base, will give decision makers essential information on very short notice—a major strategic role.

The relevance of strategic platforms does not necessarily lie in high-intensity operations. The termination of the Mirage IV in 2005 after 41 years of service made France neglect, for a while, long-range missions, whether reconnaissance or stealthy strikes against highly valued targets. Recent operations, including the conflict in Afghanistan, generated tactical lessons that ignored this ability—important for any powerful nation—to take advantage of airspace fluidity to conduct strategic missions against distant targets. The lack of such capabilities may have led us to consider them useless. In such instances, past engagements can enlighten us. The pre-positioning of forces has hidden the benefits of immediate projection. However, more distant, new areas of interest—along with the need for certain stealthy missions—renew the relevance of capabilities whose ubiquity allows them to gather intelligence or strike with very short notice, including targets at great distances.

Operations in Libya offer a good illustration. Falling within the framework of Resolution 1973, passed on 17 March 2011 by the United Nations Security Council following a Franco-British initiative, the engagement of air forces (first from France as early as 19 March [Operation Harmattan] and then from the North Atlantic Treaty Organization, starting on 24 March [Operation Unified Protector]) demonstrated the strategic advantages provided by the air arm in terms of reach, adaptability, or long-distance strikes. The first bombs dropped during those air operations came from French Air Force Rafales and Mirage 2000Ds that had taken off a few hours earlier from their bases (Saint Dizier and Nancy), located more than 3,000 kilometers from the intervention area. The interdiction, reconnaissance, and ground attack operations conducted in Libya's airspace also show the diversity of missions in which air forces can participate, including those in an environment less permissive than a theater such as Afghanistan due to the existence, admittedly limited, of surface-to-air threats. Those operations over Libya, which officially ended on 31 October 2011, remind us of the importance of not focusing our thinking only on counterinsurgency operations even though the latter seem to characterize the modern era.

Using lessons from current operations is easy and free of risk because they give legitimacy to investments. As far as airpower is concerned, if the last decade involved tactical operations, everything suggests that the future will entail strategic actions or a combination of both—the first aspect influencing quantities and the second, clarity and identity. Ultimately, strategic missions—as illustrated by the operations over Libya, among others—differentiate pure airpower from an air force that operates for the sole benefit of ground forces. As a matter of fact, these missions might represent a kind of transition between this tactical decade and the future that airpower will have to confront. We might as well consider them a warning about the potential risk of reducing airpower to a tactical dimension. To think of the air arm this way would strain its capabilities and harm the know-how that shapes its engagement.

Second Principle: Distinguishing among Effectors, Systems, and Platforms

Tomorrow's airpower probably will rely less on complete platform-based systems, as is the case today. A platform is nothing in itself. Distinguishing among effectors, systems, and platforms allows greater flexibility and certainly better adaptability.

Effectors Produce Effects

The mission's effectiveness depends on the effectors (e.g., air-to-air or air-to-ground weapons, cameras, data-collection pods, cannons, or other devices). Different platforms can use the same effector. The effectors will become more varied in order to adapt to the power, lethality, use, and accuracy of the force. The credibility of airpower will rest on the most complete mix of effectors handling all types of missions. By 2025 new effectors that enable better control of force and engagement of stealthier targets will join the mix. Later on, new effectors will appear as we develop nonkinetic effects, smart weapons, and directed-

energy weapons. Furthermore, a combination of sensors able to collect information in a wide range of frequencies will enhance the accuracy of intelligence and surveillance.

Systems Provide Interoperability and Determine the Level of Network Integration

The system makes an effector more or less effective. Technology permits a sophisticated system to adapt to unsophisticated platforms—take, for instance, the Americans' use of older aircraft such as the A-10 in Afghanistan. Having proven its survivability, this aircraft carries out its air support missions perfectly, certainly better in this environment than would a new-generation platform. The A-10's system underwent complete updating to take into account the complexity of engagements, but its effectors remained very similar to those of the most modern aircraft. The system's open architecture and capacity to communicate with other systems determine integration into complex operations. The worldwide proliferation of airpower largely depends upon the integration of systems into a vast range of platforms.

The system causes effectors and platforms to cooperate. By 2025 we may begin to conduct continuous area surveillance with great accuracy and a proper refresh rate from satellites. If the accuracy of intelligence obtained through satellites becomes widespread, transmitting from space in real time over a given area would represent a true breakthrough in terms of surveillance capabilities.

Lastly, systems are associated with norms on which interoperability depends. Those norms will continue to lie at the center of major issues in the future. Given the development of networks and cooperative capabilities, systems will become the object of power struggles that weigh as much on industry as on the ability to operate within a coalition.

Platforms Determine Missions

Very long range strategic platforms offer reach and omnipresence, whether for strikes, reconnaissance, or transport missions. The United States divides its platforms, distinguishing between strategic and tactical. For a country such as France, which has chosen versatility, the lessons from recent conflicts show the need for thinking about this principle in the design as well as the use of platforms. Any such analysis necessitates drawing on all lessons learned from the operational use of the Rafale, the A400M transport aircraft, and the multirole tanker and transport aircraft. The flexibility of certain capabilities and the integration of a substantial range of equipment and effectors (so long as they have an interoperable architecture) allow us to contemplate true operational advancements. However, even if the versatility of platforms permits multiple uses at different levels, this feature may create redundancy issues at the tactical level. As such, excessive versatility may hinder the understanding and visibility of a capability's strategic character.

Recognizing that their fleets could become one of a kind and continue to operate for the next 30 to 40 years, most countries have engaged in a modernization process. Air forces must be able to react to the speed and unpredictability of strategic and technological developments that emerge in 2025 and beyond. Although current capabilities are intended to be evolutionary, one should nevertheless pursue the analysis of operational interest of new platforms, such as long-range heavy airlifters, possibly combining combat and support functions; manned, remotely piloted, or even optionally manned delivery systems; airships; and miniature systems able to operate in swarms.

In preparing airpower for its flight toward 2025, one must do more than remove concerns about preserving the necessary flexibility to migrate toward innovative capabilities while avoiding unique fleet pitfalls. More than likely, budgets and maintenance costs will not allow significant fleet enlargement, but keeping certain fleets in service beyond 2025 may create a new window of modernization different than

the midlife updates of platforms designed to last for 30 or 40 years, which hinders innovation.

This situation applies to combat as well as transport capabilities. That is, transported resources, covered distances, and deployment bases may favor the development of platforms with more or less tactical capabilities that can operate from various environments. Aircraft capable of conducting operations from makeshift airfields (e.g., heavy or light air-mobility vehicles) will complement transport fleets, and new platforms such as heavy or fast helicopters—even airships—may appear.

Wherever possible, one must emphasize simplicity through solutions that are pragmatic, affordable, and appropriate to the operational context and geographic environment. The year 2025 and beyond will feature many dual platforms whose onboard systems will differentiate their military capability.

Surveillance depends upon the sensor, which guides thinking and provides broad or narrow coverage as well as accuracy. The system creates interoperability, integration, and data transmission within the required time frame. The platform, which determines use, compromising among vulnerability, speed, and persistence, may function in different environments and may be interchangeable.

A primitive platform dedicated to a specific environment and possibly derived from existing equipment will carry out targeted tasks better than a multipurpose generic delivery system. A good-quality electro-optical turret installed on a tactical transport or light aircraft may prove quite effective in certain environments and conditions of use. A drone will offer persistence, a transport aircraft interchangeability and horizontal reach, and a satellite near invulnerability and vertical extension. Combat aircraft would prove more suitable for reconnaissance.

Surveillance and reconnaissance missions become more effective through a broad combination of platforms such as manned or remotely piloted aircraft, drones, and satellites, each complementing the others. An important differentiation lies in the ability to operate

inside or outside sovereign spaces. However, these considerations must not make us forget that platforms give airpower its identity and that they remain the most important element of missions executed in the core of the air and space power domain.

Globalization extends the area of strategic interest worldwide, making air and space power all the more relevant. The ability to reach any point in the world through the air and outer space heightens the importance of commanding the endo- and exoatmospheric spaces. This struggle for command of airspaces involves open confrontation between opponents, unlike the situation in land or ocean spaces, where asymmetric courses of action undermine the equilibrium. In the realm of air and space power, however, the strongest prevails. Confrontations on land may combine primitive and modern capabilities effectively, but air war requires force and domination since the opponent is never asymmetric. (Granted, a number of nonstate actors [e.g., the Liberation Tigers of Tamil Eelam (Tamil Tigers) and Hezbollah] operate in the third dimension either by engaging platforms, including remotely controlled ones, or by trying to challenge traditional air and space powers for use of the third dimension.) The current air arms race and the proliferation of sophisticated combat aircraft or surface-to-air systems offer the best illustration of the force and domination that air war demands. A platform is a most important and obvious component of domination.

Long-range conventional or unconventional strategic missions also rely on platforms. These missions, along with airspace control, will characterize tomorrow's airpower. However, combat support, reconnaissance, in-theater air mobility, or ground attack—all of them less strategic in nature, depending on the level of space control—can make do with primitive platforms.

Air and space capabilities often attract criticism because they are expensive. Thus, more flexible capabilities would better meet our needs while keeping costs under control. This approach must guide air and space power as it adjusts to future circumstances and resists overreliance on versatile effectors, systems, and platforms. Although they

do not determine quantities, platforms related to space control and strategic missions will give airpower its clarity and condition its identity, as they did in the past. By this logic, distinguishing among effectors, systems, and platforms will shape the development of tomorrow's industrial landscape as well as national or international cooperation.

Third Principle: Discriminating Personnel for Future Systems

A capability consists of effectors, a system, and a platform. The operator, the most important link, whether inside or outside the platform, produces the effect. With new delivery systems such as drones, the main operator controls the sensor since all or part of the flying can be automated. This arrangement closely links the operator to the effector, whereas the mission's success previously depended more on flying the platform. This new role for operators leads to a thorough rethinking of their skills and training.

Airpower will become more dependent upon the cooperation of several capabilities. Air refueling, for example, strengthens the strategic nature of a delivery system by giving it extra reach. The same tanker can act as a picture- or video-transmission relay, thus offering real-time operation. Data links increase mission effectiveness, whether by controlling spaces or cooperating with ground or naval forces. Surveillance systems feed combat capabilities, providing them with updated situations.

These examples will only multiply, allowing any air capability to fit better in more environments, to manage its data, and to create the appropriate effect with the right pacing. This cooperation among capabilities, the result of networking actors who operate in all environments, will have no bounds, as satellites explode the boundaries of visual range. Limitations will become increasingly human; for instance, airpower's handling of information will depend on the ability of men and women to do so. In 2025 and beyond, the coexistence of different platforms

and their communication capabilities both in-theater and worldwide will multiply their effectiveness tenfold. Technology makes that possible.

Although today's technology levels the playing field—unlike the situation during previous generations, when pilots' combat skills differentiated between them—the ability to integrate and fit into complex networks will likely become defining. Airmen will not have an equal understanding of complex systems. Some will have the capacity and training to devise networks and understand their place in uncertain environments in which they can determine their perimeter of responsibility; others will be destined to act only in a limited number of bounded networks. These differences will prove fundamental in planning as well as in command and control and operations, inevitably creating expansive disparities. We must prepare for this eventuality, analyze the related skills, and fit them into training. Thus, the current military reform in France may produce a beneficial side effect. That is, by understanding their place in the new complex organizations and networks involving many actors, individuals will have indirectly prepared themselves for future operational environments.

Fourth Principle: Acknowledging Joint Integration's Dependence upon Airpower

The airspace is a shared environment. All of the world's forces include airmen who contribute to airpower development. Airmen will continue their association with all types of engagement, one way or the other, through transport, strike, ground attack, support, surveillance, or intelligence missions.

The airman will become indispensable. The infantryman in Afghanistan does not see the airman, yet the latter is present everywhere—flying drones remotely; embedding with commandos; controlling close air support missions; flying combat or transport aircraft; or operating

in command and control structures, merging information and providing updated data to in-theater commanders. By having airmen operate in any environment, we guarantee freedom of movement. The networking and coordinating of all air capabilities will allow airmen to fit even better into operations in their entirety.

Even though joint work within staffs has existed for a long time, we need improvements in the field. Understanding airpower's role in all aspects of an operation's execution will facilitate true joint integration, permitting more integrated courses of action. We can do this only if all airpower components interconnect in common networks that are not partitioned into environmental segments, such as air-land or air-sea segments. The full integration of air capabilities of different environments and services will enhance joint cooperation at the tactical level.

Fifth Principle: Airpower Will Move Higher and Drive Future Industrial Challenges

The year 2025 will likely see such innovations as the more flexible use of outer space and the commonplace employment of medium- and high-altitude drones. The self-deployment of drones and their integration into air traffic will give these platforms a strategic character, putting them at the core of airpower and allowing more interdepartmental use. In the more distant future, technical advances will lead to the development of stratospheric drones (high-altitude platforms), adding the benefits of increased persistence and space observation without suffering the drawbacks of the air and space environments. When the technology becomes available, the use of the stratosphere—a space still free today—will become an important issue for civil and military traffic. The first vehicles to use it will likely be long-endurance drones. Once access to this realm becomes widespread, the nature of its first use, civilian or military, will determine the weight in the development of future regulations.

By 2025 we may witness such space missions as satellite de-orbiting as well as the interception or destruction of space vehicles. Clearly some countries are positioning themselves for these developments, having learned that investing in this field is not as costly as commonly thought. Any country that wishes to become a major actor in space must find a strategy which encourages evolution of the requisite know-how and technologies. For example, launching a supply module to the international space station and then controlling it from the ground demonstrates real skills in this field. Despite budgetary constraints, the continuation of studies such as those designed to develop reactive space interception modules will prove essential to controlling freedom of action in space during the future.

The flight toward 2025 also involves industrial stakes. With regard to progressive areas such as space or drones, the armed forces will continue to act as a driving force and partner in industrial development. These stakes will depend upon the military's accommodation of existing or future regulations and its investment in the human and financial resources necessary to guarantee the freedom of use and movement in shared environments.

Conclusion

Only the decisions made in the appropriate window of opportunity will prove correct. To be right too early is as useless as letting opportunities go by. Planning the future involves foreseeing the consequences of today's decisions, taking into consideration lessons from the past. Airpower suffers from a major constraint as it attempts to imagine the future: more than any other force, it is subject to technological developments. Although certain areas draw their inspiration from yesterday's great battles and established principles of war, technological breakthroughs modify the evolution of air strategy. This dimension overlaps the others and complicates thinking.

In 2025 and beyond, a complex reality will combine manned and remotely piloted—or even optionally manned—vehicles. The continuity of endo- and exoatmospheric spaces will become more obvious. More or less sophisticated platforms will operate side by side, overlapping civil and military applications. And the third dimension will witness all manner of confrontations. This complexity will continue to encounter criticism because that which is hard to understand tends to intimidate. A new dimension, communication, will become a priority in order to explain how actors in various environments will benefit from these developments, giving rise to challenges involving training, the integration of air and space power in the future, and, as a consequence, the identity of those who control air and space capabilities.

Air-land operations will remain tied to the land environment, as will air-sea actions to the maritime environment. The full spectrum of strategic missions and air command and control missions lies at the core of the air and space airman's identity, unbounded and encompassing all environments. By 2025 those missions will have regained all of their meaning. The flight toward 2025 will take place in the air and space environment. More than ever, we must shed light on the future in order to make the right decisions today regarding our people and capabilities. ✪

Notes

1. Peter F. Drucker, *Management: Tasks, Responsibilities, Practices* (Oxford, UK: Butterworth-Heinemann, 1974), 121.
2. J. C. Slessor, *Air Power and Armies* (1936; repr., New York: AMS Press, [1982]), x.

Lt Gen Denis Mercier, French Air Force

A graduate of the French Air Force Academy ("Capitaine Caroff de Kervezec," class of 1979), Lieutenant General Mercier received his commission as a fighter pilot in 1983. He flew Mirage F-1C and 2000C fighters as a squadron member and then leader at Orange Air Base (AB) and Dijon AB (Squadrons 1/5 "Vendée" and 3/2 "Alsace"; and 2/5 "Ile-de-France"). In 1990 he became deputy commanding officer and then commanding officer of Squadron 1/12 "Cambrésis," flying the Mirage 2000C (Cambrai AB). In 1994 General Mercier became deputy head of the manpower office at the Air Combat Command (Metz). He joined the Collège Interarmées de Défense (Joint Defense College) (Paris) in 1996 before being assigned to the North Atlantic Treaty Organization (NATO) office of the joint operational planning staff (Creil). In 1999 he was appointed deputy head of the combined joint task force department at NATO's Northern Command (Brunssum, Netherlands) before taking command of AB 112 "Commandant Marin-la-Meslée" in Reims in 2002. In 2004 the general joined the Air Force Staff as deputy chief and then chief of plans. Promoted to brigadier general on 1 December 2007, he became deputy to the assistant chief of staff "Performance-Synthèse" of the Air Force Staff. In 2008 he took command of the Air Force officer schools in Salon de Provence before becoming chief military adviser to the minister of defense and veterans affairs in 2010. He was promoted to lieutenant general on 1 February 2011. An officer of the Legion of Honor and of the National Order of Merit, General Mercier has 3,000 flying hours, including 182 in combat missions.

Let us know what you think! Leave a comment!