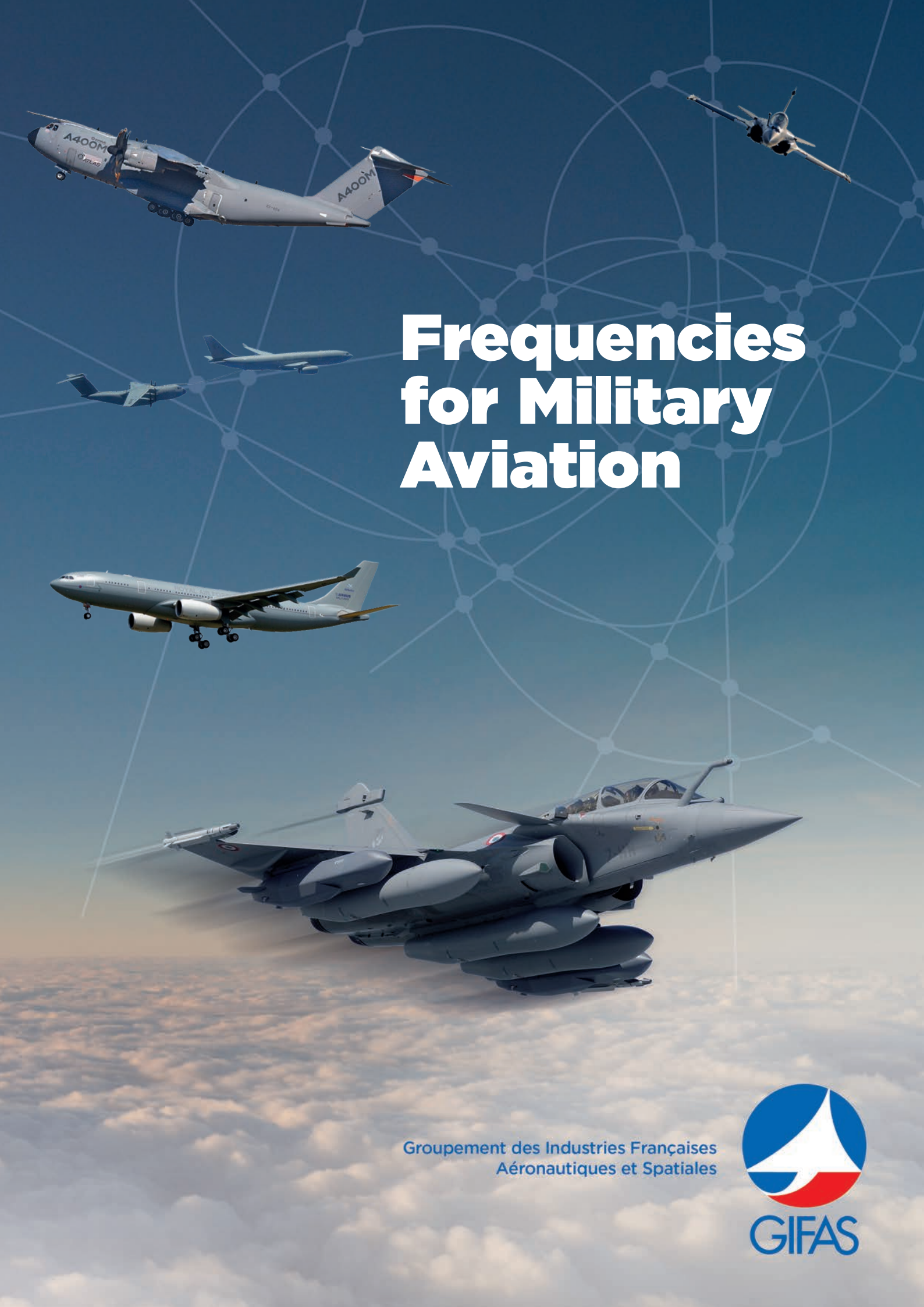


Frequencies for Military Aviation

Groupement des Industries Françaises
Aéronautiques et Spatiales

GIFAS

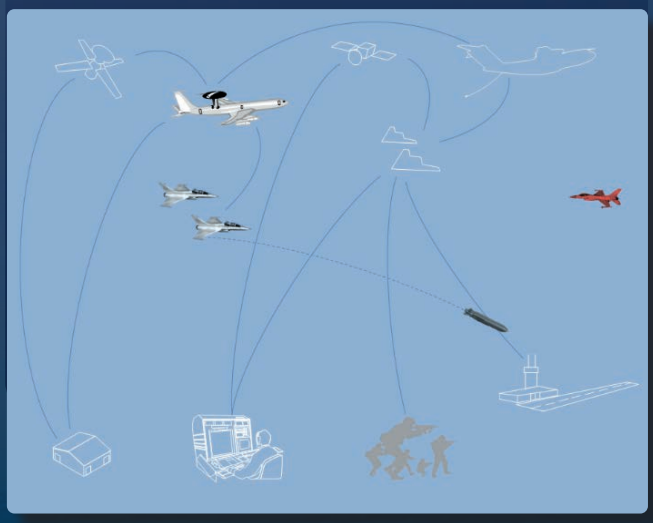
Sector Situation

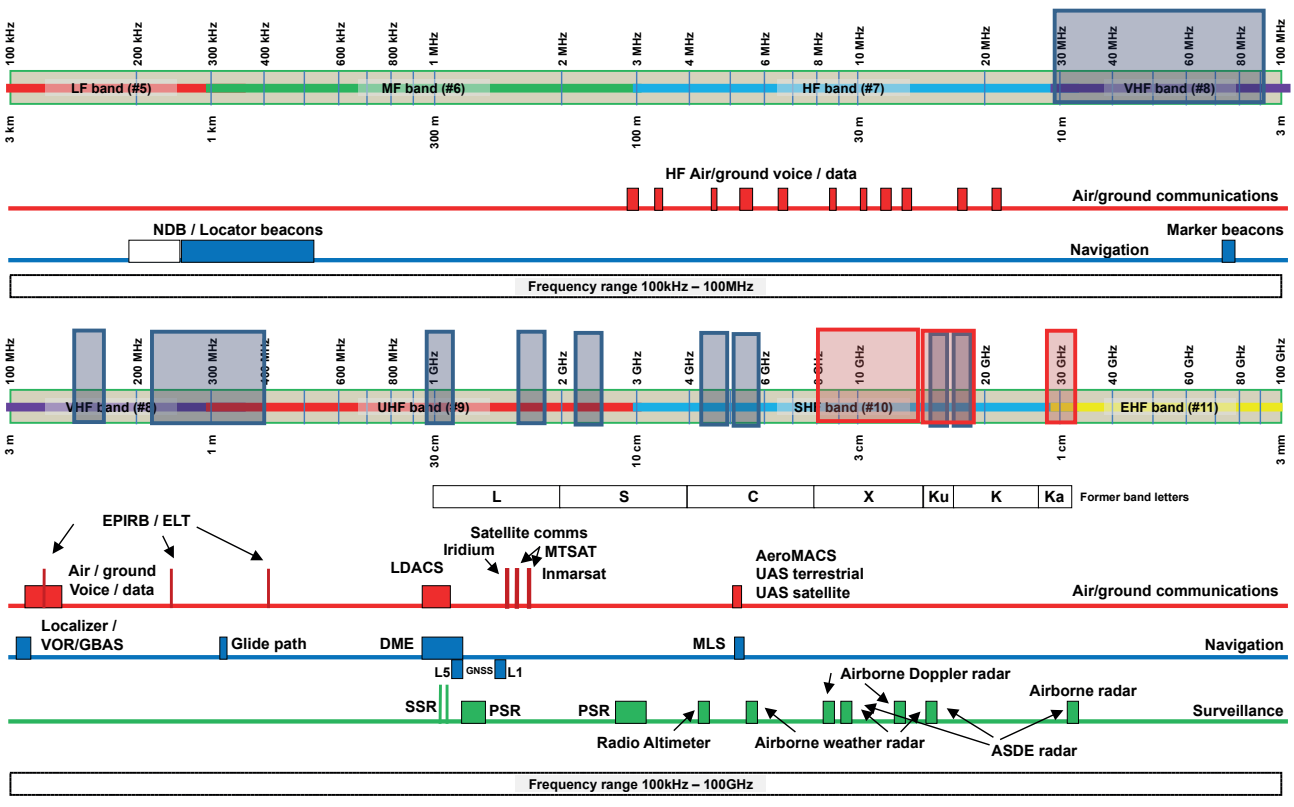
Stakes

Military aircraft are equipped with multiple systems. The most important of these, the Communications, Navigation and Surveillance systems (CNS), provide the same essential and critical safety functions as equivalent systems on commercial aircraft (see civil aviation booklet) and are related to airworthiness. In addition, military aircraft are required to undertake missions such as maritime surveillance, air and border police, Air-to-Air Refuelling (AAR) and, of course, combat missions which use other systems including:

- **Radar systems** for tracking aircraft in civilian (sky police) or military (air combat) contexts and for detecting ground air defence systems (Synthetic Aperture Radar - SAR);
- **Self-protection systems involved in electronic warfare;**
- **Identification Friend or Foe (IFF);**
- **Target designation;**
- **Their own communication systems** (including satellite systems in development);
- **Detect & Avoid sensors** as well as command/control links for Unmanned Airborne Vehicles;

In addition, resources used by armed forces for operations and maintenance purposes require bandwidth-intensive ground-air communications. These are often integrated with the systems deployed by NATO which also manages systems using frequency resources.





Military usage

Social and economic importance

The military aviation sector is a major contributor to the French economy and economic prosperity.
Moreover, a significant part of research and development conducted in this sector has an effect on the civil sector.
It is obviously very difficult to have an idea of the sector globally but we can cite figures in the more limited context of France. The figures published by GIFAS for 2022 reveal that:

- The defence sector accounted for 25% of aerospace revenues, generating €20 billion. The order book for the defence sector amounted to €39,6 billion, increasing to +44% of the industry total between 2021 and 2022, a clear indicator of defence sector growth. The upward trend is set to continue thanks to orders from markets associated with military aircraft (Rafale, Eurofighter, MRTT...).
- The defence sector is strongly export-oriented and therefore contributes directly to France's wealth.

Half of the entire sector's revenues is derived from exports. Finally, direct employment increased to 195,000 direct jobs in France (18,000 new hires in 2022) in the French aerospace and defence industry.

In conclusion, the military aviation sector is still and will continue to grow, being a significant force in the French aerospace landscape.

Specificities

In the same way as for civil aviation, frequencies allocated to defence operations for CNS require special protection against unwanted interference phenomena from other services. This remains true even in segregated airspace. Exclusive or primary allocations must be made to ensure the safety and regularity of flights. Similarly, specific systems may be imposed by the defence authorities of those countries operating the aircraft and can lead to additional restrictions on the use of frequencies with spectrum redundancy or spreading, related to platform cyber security.

Military and/or government aircraft are subject to specific qualifications and regulations and can operate other specific means which use frequencies allocated to both the Ministries of Defence and the Interior. To ensure the interoperability of NATO countries' defence systems, standards such as STANAG 7085 or STANAG 4660 are issued, specifying frequencies that the various systems must use. Note that the introduction of unmanned systems creates a specific requirement for an aircraft control link falling within civil sector allocations (in the 5030-5091 MHz band) which must be standardised with NATO allocations.

The spectrum allocated to the military aviation sector includes that allocated to civil aviation but also specific links. It is spread across the entire frequency spectrum envelope (from 100 kHz to 100 GHz) and covers vital functions: CNS and functions associated with defence and electronic warfare as shown in the figure opposite. Consider the rapid development of military systems which have to conform to operational constraints and can involve the use of specific solutions such as an instrument landing system for helicopters in case of brownout (reduced flight visibility due to dust clouds whipped up by the rotors).

In addition to the wavelength characteristics, this spectrum is highly varied because it is used for air-to-ground, ground-to-ground and air-to-air links and satellites. Both analogue and digital technologies are employed for voice and/or data applications.

The life of defence systems varies widely:

- CNS systems have a very long life span (offsetting the high cost of systems such as satellites and ground networks, equipment interoperability, etc.);
- air/ground radar systems also have a very long life span due to the technologies and equipment employed;
- other systems such as obstacle detection systems are often replaced within a few years to keep pace with technological development.

Military aviation is an international industry which has the specific characteristic of being managed by national authorities that have to take into account not just national but also supranational regulations. Nonetheless, it shares the same air space as civil aviation. While the number of manned military aircraft remains stable, the increase in civilian air traffic (approximately 5% per annum) is putting increasingly significant restrictions on the use of these aircraft. Civilian systems must not interfere with the functioning of military systems because the latter are essential to the defence of national territory as well as the country's power projection capability. Any increase in the spectrum range exclusive to civil aviation must therefore be consistent with this development.

Evolution: an industry viewpoint

The development of military systems towards network-centric operations (such as Link-16) automatically increases the sector's frequency requirements whether for command, data communications or new requirements such as Non-Cooperative Target Recognition (NCTR). Unmanned aviation is a prime example in this respect because it introduces specific channels that did not exist previously. As a result, defence systems most often use frequencies reserved exclusively for military purposes. Nonetheless, the trend towards dual-use spectrum sharing means that the requirements mentioned above will, over time, have an impact on civilian frequency requirements and sharing studies.

In addition, mission systems increasingly use active sensors that require a wide spectrum in order to obtain high-quality image resolutions. The systems producing the highest resolution images operate at higher frequencies. Specific communication channels will be required to transmit information directly to command centres because the data size is increasing exponentially over time and spectrum limitations are the only thing limiting useful data rates.

Finally, it is important to remember that military aircraft must also be able to integrate into civilian air traffic and therefore the growing spectrum requirements mentioned in connection with civil aviation also apply to military aviation.

Spectrum requirements

The following points that could potentially have an impact on military aviation are on the agenda for the next World Radiocommunication Conference in 2027:

- **Agenda item 1.2:** to consider possible revisions of sharing conditions in the frequency band 13.75-14 GHz to allow the use of uplink fixed-satellite service earth stations with smaller antenna sizes.
- **Agenda item 1.7:** to consider studies on sharing and compatibility and develop technical conditions for the use of International Mobile Telecommunications (IMT) in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands.
- **Agenda item 1.13:** to consider studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage.
- **Agenda item 1.19:** to consider possible primary allocations in all Regions to the Earth exploration-satellite service (passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz, in accordance with Resolution.

In all these areas, care must be taken to avoid restricting the use of military systems (data links, Defence Radar, Radio altimeters) by inappropriate spectrum allocation and to conduct meticulous sharing studies in the case of secondary allocations.

About GIFAS

GIFAS is a Trade Association with 517 members, from major prime contractors and system suppliers to small specialist companies. They cover the full spectrum of skills from the design, development and production of aerospace systems to marketing, maintenance and operation. GIFAS members are active in all sectors of the aerospace industry including civil and military aircraft, helicopters, engines, missiles and weapons, satellites and launch systems, UAV, large aerospace, defence and security systems, equipment, subassemblies and associated software applications. Managed through dedicated entities, GIFAS structures its recommendations in the spectrum domain through the Frequencies Commission.

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