ISSUES, OPPORTUNITIES AND CHALLENGES

FOR GENERAL AND BUSINESS AVIATION

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SUMMARY

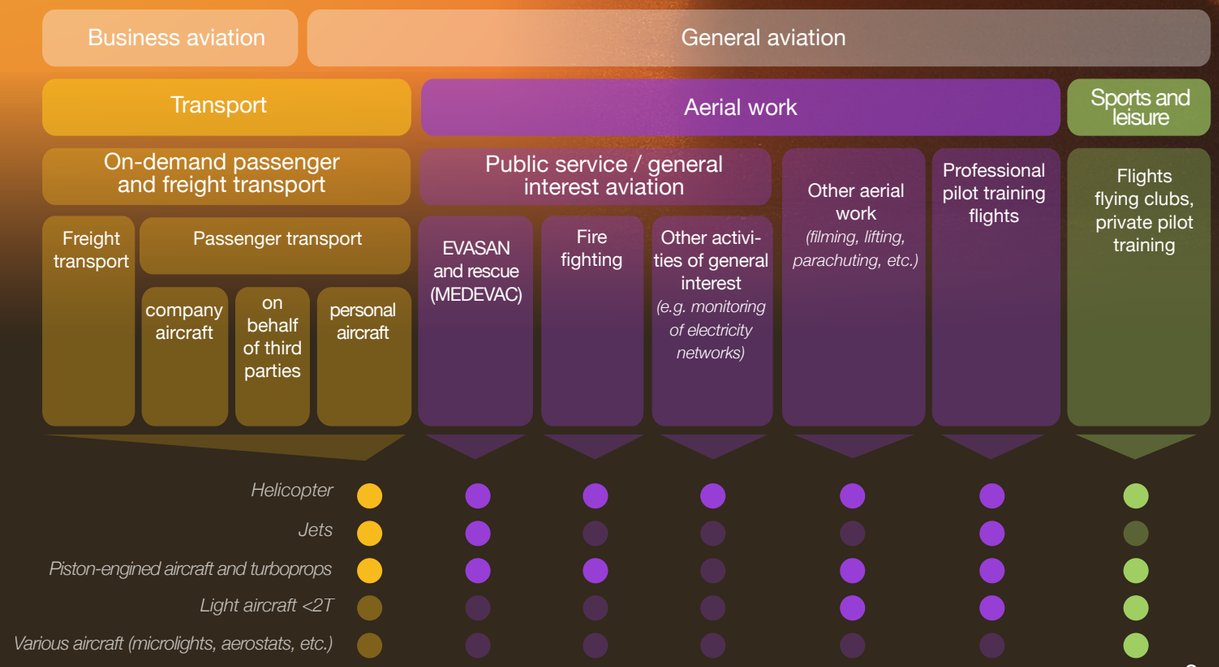
This study offers an overview of the general and business aviation ecosystem in France, its specific characteristics, the opportunities the sector can seize and the challenges it must meet to perform its three key functions of

→ Being the crucible for training and innovation to invent the aviation of tomorrow.
→ Acting as a catalyst for economic and social development and regional connectivity.
→ Serving the citizens of our country.

1. GENERAL AND BUSINESS AVIATION: WHAT TASKS AND WHAT AIRCRAFT?

Before looking at the tasks and aircraft that constitute general and business aviation, it is important to provide a definition of this type of aviation. In regulatory and operational terms, general and business aviation comprises aeroplanes with fewer than 19 seats, helicopters and other aircraft (gliders, aerostats, microlights). In terms of its uses, general and business aviation corresponds to many different types of aviation. It includes sport and private aviation, on-demand passenger and freight transport, as well as public interest and aerial surveillance aviation. In terms of its nature and tasks, it is therefore very different from regular commercial civil aviation and military aviation.

General and business aviation is a unique and specific form of aviation, distinctive for its value proposition. That proposition is defined by a combination of {possible operational modes} x {time savings} x {agility} that is completely unique and not matched by other means of transport. Mainly used for business purposes, this type of aviation is also characterised by a carbon footprint that has remained stable over the last fifteen years. It is positioned to play a pioneering role in decarbonisation over the next 10 years. At the heart of aeronautical innovation and training in its services, general and business aviation also acts as a catalyst for regular commercial aviation and for the development of the many regions it serves.



Source : Arthur D. Little

2. A UNIQUE AND PARTICULAR FORM OF AVIATION, CLEAN BUT ALSO INNOVATIVE

General and business aviation: an unbeatable combination of [operational mode] x [time savings] x [agility]

Within the spectrum of transport solutions, general and business aviation offers a unique value proposition:

- It is positioned over a very wide «relevant distance» range (from 0 to more than 10,000 kilometres).
- It offers major time savings, thanks to a very wide operational speed window, from hovering to high subsonic flight.

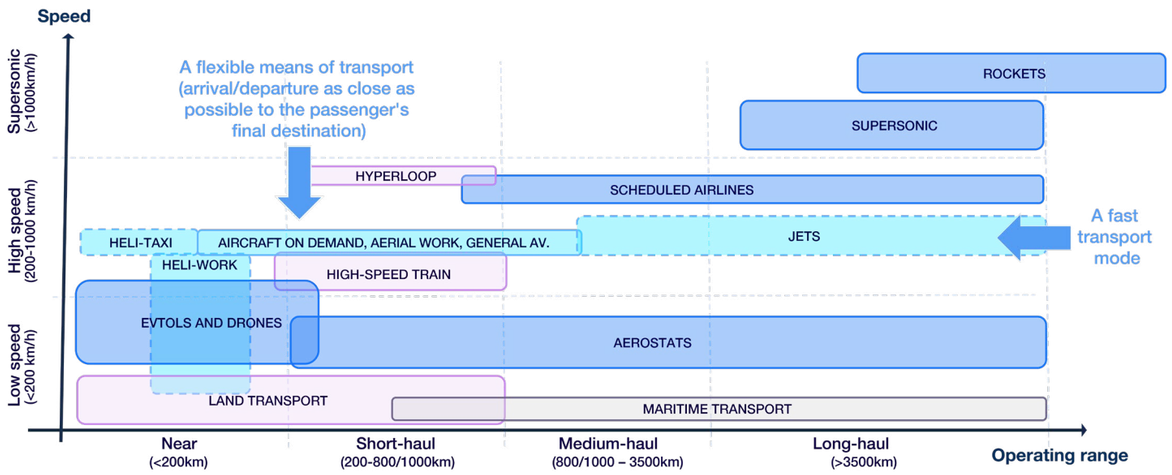
Obviously, helicopters, sport and private aviation, aerial work and transport on-demand (depending on whether the aeroplanes is piston-, turboprop- or jet-powered) are used for a different range of tasks. But, overall, the various components of general and business aviation are positioned in unique and complementary segments relative to other air or ground transport solutions.
In addition to its speed, adaptability and wide range of «operational mode», general and business aviation is also the most flexible and agile form of aviation, ensuring that passengers are picked up and dropped off as close as possible to their destination, thereby increasing the total time saved on a journey. For example, a flight from Annecy to Nice will take between 45 minutes (in a Citation Mustang light jet) and 1 hour 10 minutes (in a Diamond DA62), compared with 5 hours 30 minutes by car or more than 7 hours by train (with at least one connection).

Utility Aviation, Serving Professionals, Citizens And Regions

Transport on-demand that primarily serves the needs of professionals

The industry estimates that 80% of passenger transport flights are for business purposes. These business trips exist because they save time by offering a fast point-to-point journey as close as possible to business meetings compared with other modes of transport (road, rail or scheduled commercial flights). In an increasingly competitive environment, this time saving is a key performance driver for French industry. Without it, the agility needed to sign contracts, negotiate strategic agreements or manage remote activities effectively would be reduced. For example, scheduled flights in France carry around 28% of passengers for business reasons, 22% for «Visiting Friends and Relatives» («VFR») and 50% for personal leisure (tourism)1. By way of comparison, 34% of high-speed rail journeys in France are for business purposes (2% daily commuters, 5% weekly commuters and 25% occasional commuters) and 66% are for personal or leisure reasons2

Segmentation of means of transport according to their «operational» characteristics



Source : Arthur D. Little

Aerial work, essential to public service and the public interest

Most of the hours flown for aerial «work» are for reasons relating to public service and the public interest. General and business aviation are deployed above all for medical evacuation, health and rescue (38,000 flying hours, or 47.5% of total air work), followed by surveillance of critical infrastructure networks (22,000 flying hours, or 27.5% of total air work) and firefighting (20,000 flying hours, or 25% of total air work). All these activities are centred on critical tasks with no possible alternative to airborne operations.

Airports as catalysts for regional development

General and business aviation represents a reservoir of jobs and skills that cannot be relocated directly or indirectly linked to aviation for the regions that host it, for activities centred on:

- Construction (at Rochefort, Le Bourget, Francazal and Tarbes, for example).
- Maintenance and repair (Avignon is the base for helicopters belonging to Airtelis, a subsidiary of Réseau de Transport d'Électricité (RTE); Nîmes is the base for Civil Safety aeroplanes; Épinal, Troyes, Châteauroux, Uzein, Toussus-le-Noble and Dinard are home to major aircraft maintenance centres),
- Training (Perpignan, Bron, Merville, Le Bourget, etc.).
- Or around multi-activity players such as AviAlpes in Annecy, which is emblematic of this model, with its professional transport on-demand business, tourist flights around Mont Blanc, maintenance and private and professional pilot training.

But general and business aviation do, of course, have an impact on economic and social development as a whole, as well as on regional networking:

- It enables key economic decision-making centres to be located in the region, such as the head offices of major companies like Legrand in Limoges and Michelin in Clermont-Ferrand, or small and medium-sized businesses with an international reputation.
- Above all, airports are becoming multi-activity zones. The case of Le Bourget is emblematic, with an airport that combines an energy hub with a geothermal power station that benefits the town of Dugny (cf. the solar power station at Auch, for example), a hub of commercial and conference activities (cf. EurExpo, also near Bron), a cultural hub (Musée de l'Air et de l'Espace, Fondation Gagosian), a catalyst for structuring transport projects (cf. dedicated electric shuttles from Le Bourget airport to the RER

station, pending the opening of metro line 16), a telecoms hub (e.g. data centres hosted at Le Bourget), a general training centre with an aeronautical training centre and neighbouring vocational colleges that are developing in symbiosis to serve the hub (e.g. catering trades to serve conferences).

- At the same time, they constitute important reserves of biodiversity in the heart of certain urbanised areas (such as Bron, Le Bourget and Cannes airports) thanks to the extent of their green spaces.

Clean aviation

General and business aviation account for 12% of air travel worldwide, but given the distances involved and the weight of the aircraft, the sector only accounts for around 1.6% of aviation greenhouse gas emissions overall, or around 0.04% of global emissions.

In France, general and business aviation account for around 4.5% of total aviation emissions. Roughly 50% of these emissions are linked to transport on-demand (and very largely to jets) and helicopters and aerial work aeroplanes account for between 15% and 20% of general and business aviation emissions.

Greenhouse gas emissions from general and business aviation are not increasing:

- A long-term perspective shows that the number of demand-responsive transport flights has in fact been stable over the last 15 years and even declining slightly. The same applies to flying clubs. Only public service activity has increased (with an increase of around 20% in the Civil Safety fleet of helicopters and firefighting aeroplane).
- The number of general and business flights and especially transport on-demand flights, saw a strong rebound in activity in 2021 and 2022 compared with 2019. However, activity at the beginning of 2023 is very close to 2019 levels, with a significant slowdown in activity from August 2022. So the rapid increase in emissions during the COVID period does not seem to be continuing, contrary to fears at the time.

4,5%
of total aviation emissions in France

0,04%
of global emissions

A crucible of innovation and training at the service of scheduled aviation

General and business aviation will be the first low-carbon aviation sector:

- It is the crucible for the design, certification and operation of the first electric aeroplanes such as the Pipistrel Velis Electro or (ii) those under development by aeroplane manufacturers focused on this market (Diamond, Aura Aero, VoltAero...).
- It is ahead of the game in the adoption of sustainable aviation fuels (SAF) - Dassault Falcon Services and Michelin Air Service already use 30% SAF in their flights, compared with less than 0.5% in commercial aviation.

General and business aviation are testing and adopting the operational and air traffic control practices of the future: free routing, continuous descent and ascent operations, single-pilot commercial flights on turboprops and remote control towers. The latter, also known as remote tower centres, are in effect remote workstation for aerodrome control services, in a location other than the aerodrome itself, or several hundred kilometres away. These «remote tower centres» use sensors to remotely recreate a local environment in real time, with more usable information making it possible to manage several low-traffic aerodromes remotely, to provide an emergency control tower function, or to create a new control tower with lower maintenance costs than a conventional control tower.

3. KEY FACTS AND FIGURES

General and business aviation is testing and adopting noise-reduction solutions for the greater benefit of local residents: new aeroplanes propellers, helicopter blade shapes, electric aeroplanes engines, noise reducers and so on.

Finally, general and business aviation is the crucible for training the talent that will constitute tomorrow's aviation. Over 1,200 pilots and more than 400 technicians are trained from scratch each year by its schools and are often employed there on completion of their training, before moving on to regular aviation for the most part.

General and business aviation is a complete ecosystem that combines aircraft manufacturers, engine manufacturers, maintenance centres, training schools (for pilots, technicians and ground staff), aircraft operators, air traffic control, airports and Fixed Base Operators (or 5), which may be wholly or partly focused on this segment. **The sector generated sales of around €7,600 million in 2019.**

This ecosystem is made up of more than 500 companies and organisations providing 36,000 direct jobs:

- 25,000 in aircraft manufacturing, including around 7,500 in the helicopter industry.
- 5,500 in operations (transport on-demand, aerial work, etc.), including around 1,500 for helicopters.
- 3,000 in maintenance, including around 1,000 for helicopters.
- 400 in vocational training (flight school instructors, teachers of aircraft and helicopter mechanics and techniques).
- 1,100 at airports «focused» on general and business aviation and FBOs.
- Approximately 250 within the Civil Aviation Authority (DGAC) (central services, staff of the Air Navigation Services Directorate at sites where general and business aviation predominate, civil aviation safety organisation).

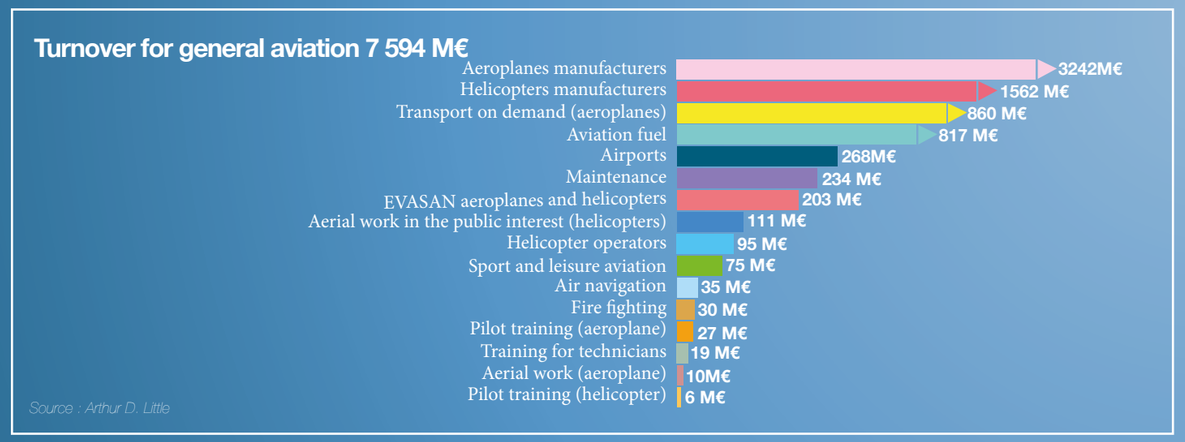
France is home to some of **the world's current and future leaders** in this segment:

- Mid-size to Xtra-large business jets: Dassault Aviation, Airbus Corporate Jets.
- Turboprop aeroplane: Daher
- 4 to 19-seater hybrid or electric aeroplanes: Robin, Aura Aero, Ascendance Flight Technologies, VoltAero.
- Helicopters: Airbus Helicopters (designer-assembler-maintainer) or Turbomeca (turbines).

This ecosystem builds around 400 civil aircraft (helicopters, aeroplanes) a year, operates and maintains a fleet of almost 11,700 aircraft, which performs 1.5 million flights and around 1 million flying hours a year. General and business aviation thus represents as many flights as scheduled aviation in France, which carries out around 1.4 million flights but only less than 20% of the total number of flying hours performed in France (considering that scheduled aviation carries out around 5 million flying hours per year).

Turnover by business line within general and business aviation

2019, en millions d'euros, France



Source : Arthur D. Little

Economic figures

2019, France

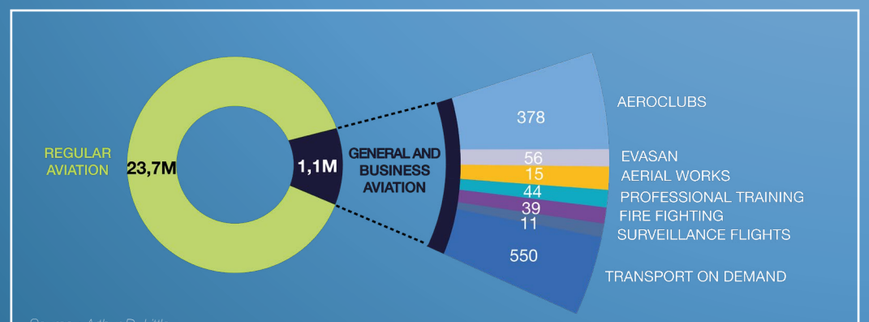
7,6 BILLION
Generated by the sector

500
Companies and organisations

36 000
Employeesdirectly of the sector

CO2 emissions generated by flights

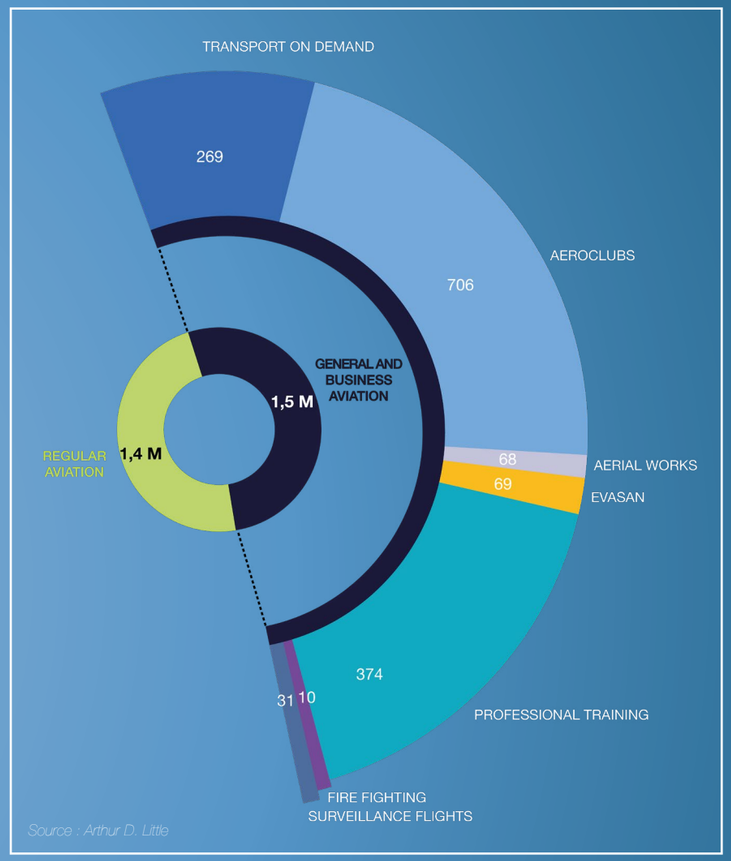
2019, France, thousands of tonnes of CO^2



Source : Arthur D. Little

General and business aviation movements

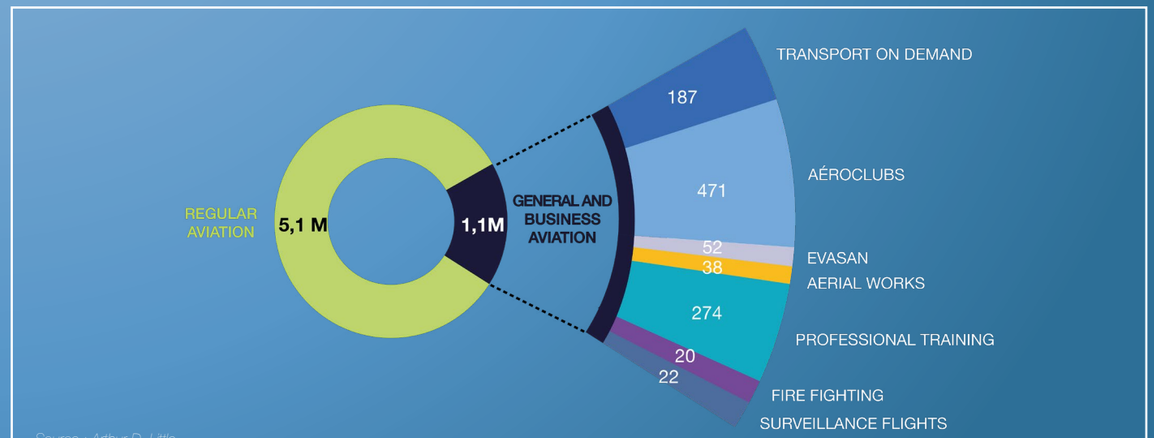
2019, France, in thousands of movements



Source : Arthur D. Little

General and business aviation flight hours

2019, France, in thousands of flight hours



Source : Arthur D. Little

4. OPPORTUNITIES AND CHALLENGES

In the **transport on-demand** segment, general and business aviation has not undergone any major changes to its offering, infrastructure or business model that would have enabled it to develop more rapidly. As a result, its activity has remained more or less stable over the last decade (2010-2019), unlike that of other forms of transport (scheduled commercial aviation, high-speed rail, road), which have benefited from major «breakthroughs» that have enabled them to capture a larger customer base (for example, with (i) the development of low-cost airlines or high-speed rail services, or (ii) the expansion of the high-speed rail and motorway networks, etc.). In the medium term, however, the reduction in operating costs made possible by recent aircraft or aircraft currently under development could give a boost to the transport on-demand business.

In the aerial work and public interest services segment, the need for general aviation is likely to remain sustained. On the one hand, in order to deal more effectively and agilely with the climatic risks that are affecting all regions more randomly and with ever greater frequency. Secondly, to meet the needs of an ever-increasing number of isolated populations, such as those living in the French overseas territories.

Maintenance centres and training schools are the players for whom demand will present the most challenges. First of all, it is still heavily impacted by the cyclical needs of scheduled aviation, which are significant over the next 10 to 15 years but could diminish beyond that. Secondly, the staff trained by and required for general and business aviation are quickly absorbed by the scheduled airlines, even though the needs are crying out.

More generally, the economic and operational performance of general and business aviation could be greatly improved by adapting the safety and certification regulations (for aircraft and talent) that apply to it, by returning to an approach that is more relevant to the fundamentals and structure of this type of aviation: flexibility, agility, small structures. This process has been initiated by the public authorities, but needs to be 6.

Technological innovations are also leading to even more **fuel-efficient, quieter, safer and less costly operations** for general and business aviation, with new electric and hybrid engines on the many aircraft that will be certified between 2025 and 2030 (more than 200 aircraft manufacturers worldwide are pushing ahead with low-carbon aircraft projects) (i),engine noise reducers and quieter helicopter blades (ii) or digital operating resources (iii) (simulators, remote tower centres, fully automatic search, approach and landing on a field using a «safe button»).

Public support may seem to have waned with:

- The erosion of resources for general and business aviation, with, for example, a reduction in the number of border crossing points (BCPs)or controlled airfields.
- An increase in direct taxation on aviation fuels consumed for own-account flights.

However, public authorities continue to make significant initiatives to support general and business aviation:

- It appears that the vast majority of «controlled» airfields in France and a very significant number of border crossing points (BCP) are operated mainly for the benefit of general and business aviation. France has 119 BCPs, including 78 at airports (and 14 «controlled crossing points» in overseas territories) and 86 control towers operated by the Aerial Navigation Services Directorate (including 12 in overseas territories). Yet France has only 46 airports with more than 200,000 scheduled passengers a year (in 2019) and only 27 airports with more than 500,000 passengers a year.
- Finally, from an economic perspective, the public service charges (air navigation service, air safety) borne by general and business aviation are moderate. Aircraft with a maximum take-off weight of less than 2 tonnes are exempt from all air navigation charges and for general and business aircraft subject to charges, these remain minimal in relation to the operating cost per flying hour (less than 2% to 3%).

However, the general aviation **sector is economically fragile** because it is fragmented and made up overwhelmingly of VSEs and SMEs. Behind the «locomotives» in the aircraft manufacturer sector, the rest of the players are much smaller:

- Dassault Aviation and Airbus Helicopters each generate sales of over €2 billion in the general and business aviation segment, Daher around €350 million and the other players are of modest size (Issoire Aviation, Hélicoptères Guimbal, etc.)
- The largest operators have sales of **between €10 million and €80 million** (for example: AstonJet, Airlec, Oyonnair for aeroplanes; Babcock, SAF, Airtelis, Groupe HBG, Monacair, Civil Safety Agency and National Gendarmerie for helicopters).
- In addition, there are more than 70 independent aeroplanes operators and more than 30 independent helicopter operators, the vast majority with sales of less than €10 million.

- The biggest players among maintainers (Troyes Aviation, Rectimo Aviation, etc.) and training schools (AFMAE, AeroPyrénées, AeroFormation, AstonFly, etc.) have sales of just €5-10 million.
- For aerial work, the largest players generate sales of €3 to 5 million (e.g. APEI).
- Most airports «specialising» in general and business aviation and FBOs have a turnover of less than €10 million. The existence and formation of networks (the ADP Group in Ile-de-France, Vinci Airports in Auvergne-Rhône Alpes and in the west of France, the EDEIS group throughout France, for example) enables them to «increase their skills», in particular to diversify a business model that remains very fragile in the core business (although these airports remain economically independent of the Group structure, except for ADP).

Furthermore, the French players are all **being challenged by extremely competitive international players.**

- Aircraft manufacturers are competing on a global scale, mainly with American players, but increasingly with European manufacturers of smaller aircraft (Austria, UK, Sweden...).
- Commercial pilot training schools are in fierce competition with Eastern Europe (aircraft) and Canada (helicopter).
- Transport on-demand operators are also in competition with European players who can take advantage of a more favourable environment by operating under an Austrian or Maltese flag, for example.
- Ultimately, only maintenance workshops and aerial work companies (in particular for tasks of public interest) are relatively protected because their activity is «local» (because of the frequent need for maintenance and the very high relative cost for maintainers of «flying empty» to have their aircraft serviced; because of the necessarily local nature of tasks to rescue people, monitor networks or fight fires)

The limited profitability and economic fragility of most of the players in the ecosystem are major handicaps in the face of **the very high level of investment required over the next 10-25 years (2035-2050):**

- A fleet to be converted to electric or hybrid power, with priority given to the 2,500 piston and turboprop aeroplanes.
- Electric recharging infrastructure to be deployed at the region's airports and airfields
- A sustainable aviation fuel production chain (CAD) to be «guaranteed» to serve general and business aviation (i.e. from the production of biomass, renewable electricity, CO2 and hydrogen to refining into CAD or the storage or liquefaction of H2), essentially for the benefit of jets and helicopters
- The deployment of several dozen remote tower centres to guarantee the continuity and extension of air navigation service hours.
- The widespread use of simulators and digital technologies for pilot, mechanic and technician training

The small size of the players, strong competition and, finally, pressure on human resources (absorbed by scheduled aviation, which is also facing (i) an economic upturn and (ii) a structurally unfavourable age pyramid), all lead to problems of critical size and a growth «ceiling» for general and business aviation.

Finally, the vast majority of general and business aviation is **«entrepreneurial aviation».** This entrepreneurial dimension is fundamental to success and survival in a sector that is so fragmented and economically fragile and in which there is strong competition from international players in certain sectors. It is all the more key as the sector's vocation is to train and innovate to lay the foundations for tomorrow's aviation. However, this entrepreneurial dimension will naturally and automatically be accompanied by succession and shareholding issues. Behind «new entrants» such as AstonJet, AviAlpes and Revolution'Air on the operator and maintenance side, or Aura Aero, Ascendance Flight Technologies and VoltAero on the aircraft manufacturer side, many of these companies will have to face the challenge of renewing their management or shareholders.

5. WHAT FLIGHT PLAN FOR GENERAL AND BUSINESS AVIATION?

In this context, **seven points of attention and support on the part of public and private decision-makers will enable general and business aviation to continue (i) to serve and accelerate the socio-economic development of territories and (ii) to be the crucible for the talents and technologies of tomorrow in regular aviation.**

The major challenge for general and business aviation in the short term (2030) is, of course, to accelerate its decarbonisation and reduce its environmental impact as much as possible:

- The transition to clean energy sources must be given greater support:
  - → In addition to financing (i) aircraft technologies and aircraft manufacturers, which is a tangible priority for France (see the initiatives of 8, 9 support for aircraft manufacturers, etc.).
  - → The decarbonisation of general and business aviation should be sequenced as follows
    - guaranteed access to and availability of the required sustainable aviation fuels or green electrons,
    - setting up ad hoc recharging infrastructures in the area
    - and support for aircraft conversion to accelerate the relatively slow natural rate of renewal (cf. 30-40 year operational life of aircraft))
  - → Classification must contribute to this objective by providing a strong incentive for environmental performance, but must avoid the pitfall of drying up funding for an ecosystem that needs to invest significantly (in line with its economic scale) to decarbonise (see above).
- The transition to silent aviation through the adoption of noise-reduction solutions and electric aeroplanes where use permits must also be supported by the public authorities.

In the medium and long term, the aim is also to ensure that general and business aviation is supported through the following actions:

- **General aviation infrastructure must be preserved: airfields, BCPs (border crossing points), control towers (on site or remote).**
- The flexibility and agility of the players in the ecosystem must not be hampered and above all the international, European and national regulations that apply to them must be reviewed, adjusted and simplified as far as possible.
- **All stakeholders must make an effort to facilitate the recruitment of apprentices and students undergoing initial training, leaving the secondary education system or undergoing vocational retraining (validation of prior learning and skills, military aeronautical technicians or automotive technicians, for example).**
- **The economic «equalisation» between (i) scheduled aviation and (ii) general and business aviation must be maintained.**
- **Finally, the economic performance of the players in the ecosystem needs to be strengthened, with support for the transfer of businesses and cooperation between players, to be promoted by and for the players in the sector.**

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