



# PARE Article

## Aircraft Markets

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### Based on

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Yearly Report of the  
PARE project

### Prepared by



PERSPECTIVES FOR AERONAUTICAL  
RESEARCH IN EUROPE



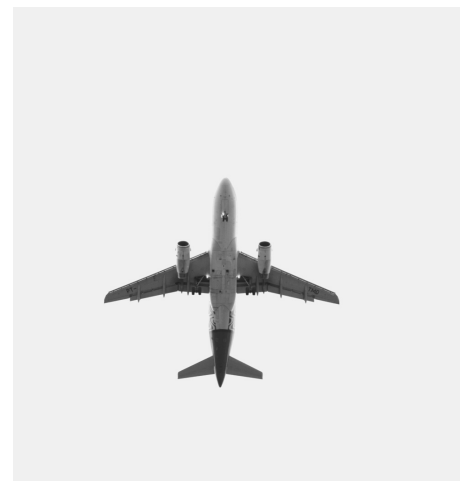
## INTRODUCTION



To support the 23 Flightpath 2050 goals established by the Advisory Council for Aeronautics Research and Innovation in Europe (ACARE), the PARE project defined 35 additional PARE Objectives. The Objectives 24 to 28 are addressed in the 7th chapter of PARE's 2nd-year report, entitled "Aircraft Markets", which focuses on the following markets: large or long-range aircraft, regional jet, business jet, convertibles and civil and military unmanned aerial vehicles (UAVs).

## THE GROWING AIRBUS CHALLENGE TO BOEING

The long-range airliner market is dominated by the Airbus-Boeing duopoly (since the 1990s) that arose at the end of a long competitive period in which Airbus steadily gained ground starting from a newcomer status. The airlines that want a competitive choice of aircraft are least interested in the Airbus-Boeing duopoly becoming a monopoly. However, this has not deterred the long-running dispute at the World Trade Organisation (WTO), which may become a permanent nuisance if not properly contained. Considering this, by 2050, a level playing field in the large aircraft market should be promoted.



### KEY FINDINGS

- The middle of the market (MoM) segment is defined as a mid-size market, located between the narrow-body and the wide-body market, and which encompasses aircraft carrying 200 to 270 passengers and a range that can vary from 3 meters (m) to 5 m, respectively;

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- The market shares in the single-aisle narrow-body and twin-aisle wide-body market are different, showing an appropriate balance: Airbus is leading the former and Boeing the latter. The third and fourth largest airliner manufacturers in the world, Embraer (Brazilian) and Bombardier (Canadian), are about one-tenth of the size of the two world leaders;
- The reasons for the duopoly are multiple:
  - a. Airbus and Boeing both absorb a greater share of the industry, being that in 2018 Airbus acquired Bombardier's C-Series (renamed A220) and Boeing is currently creating a joint venture with Embraer on the E-Series;
  - b. Extremely high entry barriers: to ensure the entrance in the aerospace industry, there are three required ingredients: i) strong financials; ii) powerful science and engineering resources; and iii) an efficient industrial organisation;
  - c. Extreme concentration at the top of the market in terms of major revenue-producers;
- Currently, both Airbus and Boeing are in the healthy situation of having the largest order books in history and face challenges in achieving higher production rates. Nevertheless, this market duopoly means that Boeing and Airbus are constantly fighting to gain an advantage over the other in terms of aircraft sales. And the fight extends in non-technical fields like legal actions;
- In 1992, a bilateral European Union (EU) - United States (US) agreement was made regarding the trade-in large civil aircraft (TLCA), which banned support from governments in production financing and allowed up to 33% of the development programme costs to be met through government loans which are to be fully repaid within 17 years with interest and royalties. In 2005, each party (Airbus and Boeing) filed complaints against the other at WTO, claiming that each other's airline manufacturer was unfairly subsidized (e.g. was receiving unfair state aid from their respective governments). By doing this, the EU and US withdrew from the TLCA agreement;
- It is possible that other competitors emerge in the long-range air transport market, such as the new CRAIC CR929, formerly known as Comac C929, a wide-body twin-aisle airliner family to be developed by CRAIC, a joint-venture between Chinese Comac and Russian United Aircraft Corporation.



### KEY ACTIONS

To achieve PARE Objective 24, it is recommended that a strong legal, commercial and technical basis is developed to (a) in any case, if necessary, deal with litigation at the WTO, and (b) preferably, if possible, renew the large aircraft agreement between the EU and the US.

## THE REGIONAL JET AND TURBOPROP MARKET

The regional jet and turboprop market, which seating capacity ranges from 20 to 130, cannot be separated from the long-distance air travel since it acts as its feeder at major hubs and as a direct link between smaller communities in shorter routes. It is also an important market for Europe, much more accessible to other entrants than the Airbus-Boeing duopoly of giants and thus attracts increased competition. Taking this into account, by 2050, the position of the EU in the regional aircraft market must be strengthened.





## KEY FINDINGS

- The main market for regional aircraft is represented by regional carriers, which are carriers with an average stage range around 500 kilometres (km) or fleet without narrow-body and wide-body aircraft (turboprops and/or regional only);
- The link Airbus-Bombardier on C-Series (renamed A220) and the possible counter Boeing-Embraer on the E-Series imply a tie-up between regional and long-range jet airliners since the majority stake of Airbus in the Bombardier C-Series has extended the market reach to all jet airliners above 100 seats, with Boeing-Embraer as the only major competitor. This reduction of the number of competing suppliers, from 4 to 2, could extend the Airbus-Boeing duopoly from long-range to regional jets;
- In the regional market below 100 seats, the leading position of ATR (Franco-Italian aircraft manufacturer) faces fierce competition from traditional rivals from Canada and Brazil, as well as from newcomers from Japan, Russia and China;
- In the small turbofan aircraft with 50-120 seats, Embraer is the market leader with its E170 / E190 family, its position being at this moment threatened seriously only by A220 (ex-Bombardier C-Series) family. However, other potential competitors, like Comac ARJ21 (Chinese), Sukhoi Superjet 100 (Russian) and, probably, Mitsubishi MRJ 90 (Japanese) will certainly create a regional turbofan market distortion for Embraer and Airbus.

## KEY ACTIONS

To accomplish PARE Objective 25, it is recommended that the development of European regional aircraft in a world with an increasing number of competitors is supported and that synergistic tie-ups between large and regional aircraft suppliers are also considered.



## THE BUSINESS JET MARKET AND SUPERSONIC PROSPECTS

Europe is strongly competitive not only on long-range and regional airliners but also in other categories like business aircraft, which market extends from the largest airliners customized for heads of state to private aircraft flown by their owners. Dassault Aviation (French), together with Gulfstream Aerospace (American) and Bombardier (Canadian), is a world leader in large business jets, and European share of the rest of the market could increase. Moreover, the next civil supersonic transport following Concorde (the first and only effective supersonic commercial airliner co-developed by the British Aircraft Corporation (BAC) and Aerospatiale (French), now a part of Airbus) could be a supersonic business jet. Taking this into account, by 2050, the position of the EU in the business jet market must be strengthened.



### KEY FINDINGS

- According to the General Aviation Manufacturers Association (GAMA), three classes of business jets are identified by specific performances and price levels: i) light jets (e.g. Cirrus SF50, Cessna Citation series lower end or Pilatus PC-24); ii) midsized jets (e.g. Bombardier Challenger, Cessna Latitude or Embraer Legacy); and iii) large business jets (e.g. Gulfstream Aerospace, Bombardier and Dassault Aviation' Falcon families);
- Europe is far from leading in this market. Of the total number of business jets delivered worldwide in 2018 (703 units), only 60 were manufactured in Europe, of those 41 being Falcons shipped by Dassault Aviation;
- Concorde was designed in the 1950s, first flew in the 1960s and ceased airline operations in 2003 due to high operating costs and difficulties in maintaining an old aircraft for lack of spares;

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- The prospects for a commercial supersonic aircraft look dim because i) the sonic boom would prevent flight overland, leading only overwater routes, with the transatlantic market small and the transpacific market requiring more range; and ii) the overall number of aircraft, perhaps a few hundred, could hardly cover the high development cost of a supersonic airliner and a dedicated engine;
- Of all aircraft manufacturers, Dassault Aviation would be best placed to design and produce a supersonic business jet, since it has: a) decades of experience with supersonic jet fighters; b) a complete range of high-end efficient business jets; and c) researched the critical aspects of a supersonic business jet;
- The miniaturization of electronics allows business jets to be adapted to other missions like sensor platforms, patrol and surveillance, that are high-value extensions of the baseline business jet market.

### KEY ACTIONS

To achieve PARE Objective 26, it is recommended that the development of European business jets and their expanded use as sensor/surveillance/control platforms are supported.

## MARKETS FOR HELICOPTERS AND CONVERTIBLES

Within the convertibles aircraft (those capable of vertical take-off and landing (VTOL)), the helicopter market is one of Europe's major successes: Airbus Helicopters is the world leader and Leonardo (Italian manufacturer that currently owns the former British aircraft manufacturer named AgustaWestland) also holds a strong position in the market. The main competitors are Boeing-Vertol, Bell and Sikorsky from the US and Mil and Kamov from Russia. The strong US investment in greater hot-and-high and high-speed capabilities must be matched if the EU wants to maintain long-term market share. Taking this into account, by 2050, the EU leadership in the world helicopter market must be maintained.





## KEY FINDINGS

- The helicopter market has some stable elements like search-and-rescue (SAR), emergency medical services (EMS) and law and order protection. Other elements are more volatile and vulnerable to large fluctuations, such as off-shore oil exploration and wars in inhospitable places lacking safe ground infrastructure or alternative means of transport (e.g. hot and dusty Iraq and high, hot and dusty Afghanistan), but are the main cause of helicopter's expansion;
- The decline in military operations in the countries named before and the reduction in oil exploration caused a reduction of both military and civil helicopter markets that are slowly recovering. Consequently, faced with reducing order books, the American helicopter industry is pressing the US government to end decades of stagnation in helicopter technology;
- The US has started a major programme Future Vertical Lift (FVL) to design helicopters or tiltrotors with (i) twice the range, (ii) 50% higher speed, (iii) over twice the hover payload in demanding hot and high conditions, using engines with double power but similar fuel consumption, size and weight. Although it is a military programme, it could have civil spinoffs: (i) double-range for off-shore oil exploration; (ii) higher speed for medical emergencies and executive transport; (iii) greater payload for rescue and transport missions. All this could challenge the position of Europe with over 50% of the world helicopter market;
- Russia is also funding the development of an advanced high-speed helicopter. The Central Aerohydrodynamic Institute (TsAGI) has confirmed on 2018 that Kamov Design Bureau started working to create a flying laboratory on the basis of the Ka-52 helicopter. It is expected that new technologies will provide more speed (probably about 400 Kilometres per hour (km/hr)) and range and better fuel efficiency;
- To compete with US and Russia, Airbus Helicopters has recently unveiled the aerodynamic configuration of the high-speed demonstrator it is developing as part of the Clean Sky 2 Joint Undertaking (CSJU) European research programme. The demonstrator Codenamed Racer, for Rapid and Cost-Effective Rotorcraft, will incorporate a host of innovative features and will be optimised for a cruise speed of more than 400 km/hr. It will aim at achieving the best trade-off between speed, cost-efficiency, sustainability and mission performance.

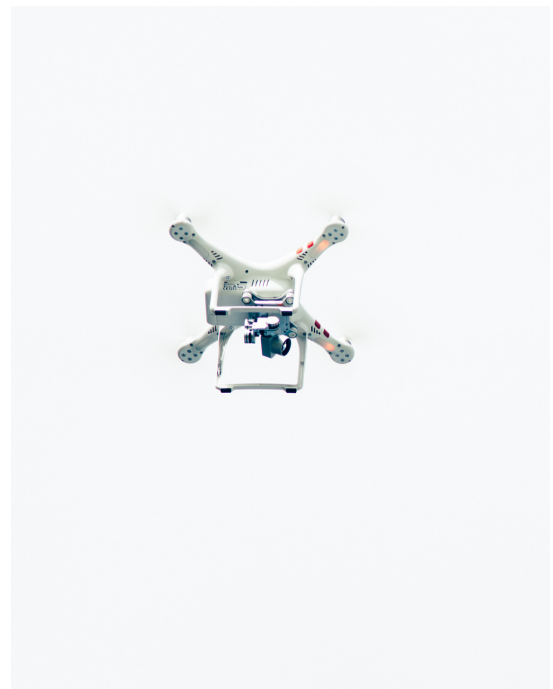


## KEY ACTIONS

To accomplish PARE Objective 27, it is recommended that Europe keeps at least abreast of developments in high-power high-speed helicopters and tiltrotor aircraft with enhanced hot-and-high lift capabilities.

## CURRENT UAVS MARKETS DEMAND

Europe has the technology to develop all classes of UAVs that are increasingly relevant to a wide range of defence and civil missions. Nevertheless, Europe is far from being competitive in the particular large Unmanned Combat Aerial Vehicles (UCAVs), commonly known as combat drones, market due to a lack of coordination in the allocation of resources at EU level. There must be an end to the European dependence on foreign UAVs, and a move to enter the international market since there is the technology to achieve both targets. To be concrete, by 2050, a European alternative to the drones used in Europe with the potential to also enter the world market must be provided.



## KEY FINDINGS

- There are currently several prototype programmes across EU countries, such as i) Taranis in the UK; ii) Talarion in Germany; iii) HammerHead in Italy; and iv) multi-national nEUROn implemented by Dassault Aviation in France. However, none of these programmes has reached production;

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- In the meantime, Europe is buying the following drones from non-EU countries: Global Hawks, Reapers and Predators from the US and Herons and Hermes from Israel. Moreover, the in-development US programmes using Artificial Intelligence (AI) like Loyal Wingman and Skyborg have no EU equivalent at present;
- Other countries had progressed in this field, ahead of Europe. The reluctance of the US to export armed drones has allowed China to take a leading position as the supplier of such systems in Asia and the Middle East. While during the decade 2009 to 2018 the US exported just 15 Reapers, China exported 163 UCAVs of 5 models to 13 countries;
- Moreover, the efforts made by the Chinese to develop a wide range of almost state-of-the-art drones and the willingness to export them at unbeatable prices creates a market advantage that will be difficult to challenge. One unit of Wing Loong II Chinese UCAV is offered at a list price between \$1-2 million, compared with \$16 million for the Reaper, only slightly superior in performance.

### KEY ACTIONS

To achieve PARE Objective 28, it is recommended that the technological capabilities demonstrated in several prototype drones are leveraged into a coherent European Programme covering all levels, to satisfy internal needs and compete in the world market.

For more information about these topics, you can access the full chapter [here](#).

