

# The Aerospace and Defence Industries Association of Europe



**2020**  
Facts & Figures

# Words from the President



ASD President, Alessandro Profumo,  
CEO of Leonardo

*The issue at stake is not only our industries' short-term economic success, but Europe's long-term technological sovereignty and competitiveness.*

Dear reader,

ASD represents the interests of the European aerospace, defence and security industries. Our membership consists of more than 3,000 companies of all sizes with more than 890,000 highly skilled employees across Europe. These companies are at the core of European competitiveness, since their high-tech activities trigger spill over effects on several supply chains and economic sectors.

The present edition of the ASD Facts & Figures, including all supporting texts, illustrate the success of our industries

in 2019 and the outlook we had at the time. In the aftermath of the COVID-19 crisis, those figures have become the very benchmark we should target and, if possible, exceed for a full recovery.

The pandemic represents an unprecedented crisis and has led to a sharp downturn of the world economy. Air traffic was one of the first and hardest hit sectors. By mid-April 2020, at the peak of the crisis, flights were reduced by almost 90% in Europe and worldwide if compared to the same period in



2019. Despite a mild recovery in summer 2020, air traffic in Europe remains poised to drop by at least 60% by comparison to last year. Airlines grounded (almost) their entire fleets and still suffer dramatic losses of revenue, with immediate knock on effects on the entire civil aviation value chain.

The impact on aeronautics has consequences also on the other ASD sectors, as supply chains and technologies are intertwined between aeronautics, space, defence and security. The issue at stake is not only our industries' short-term economic success, but Europe's long-term technological sovereignty and competitiveness. What we need now is unfaltering support by national and European institutions, and a general recognition of our industries as an indispensable asset for European economy.

Aeronautics, defence, space and security can play a key role for Europe's

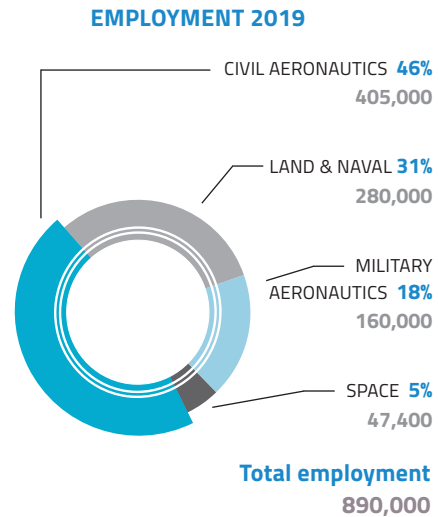
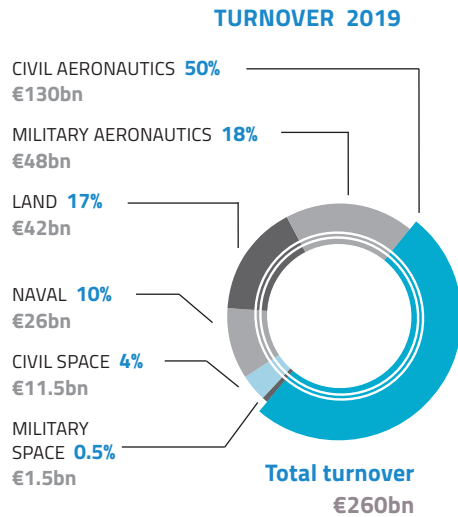
recovery and is indispensable in achieving Europe's post COVID-19 priorities, leading us back to industrial leadership and strong international competitiveness through a full involvement in essential processes such as the digital transformation, the implementation of the Green Deal and the future of global trade.

A strong and sustainable European aerospace, defence, and security industry is at the heart of a strong, united, technologically independent and resilient Europe. This is also to the benefit of EU citizens and future generations. To continue its success story in a fast-changing world and to fully exploit its strength for the benefit of our economies and citizens, it needs, more than ever, a strong partnership with the EU and its Member States.

**ASD President  
Alessandro Profumo**

# Major trends in the European aerospace and defence industry

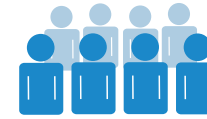
As a major pillar of the European economy, the European aerospace and defence industry reinforced its position as global leader in the market in 2019.



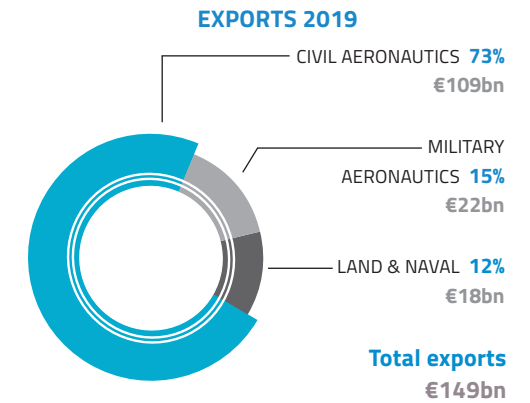
Despite continued economic and political uncertainties, the aerospace and defence industries continue to expand, following the growth trend of recent years. Year to year sales growth for the industry as a whole amounted to 5.2%, with total revenue reaching €260bn. The number of employees also increased to 890,000 workers marking new records for the companies represented by ASD.

The European aerospace and defence industries plays a crucial role in leading global innovation and generating high-skilled jobs. Our industry is amongst top leaders on the global markets which is

crucial for growth within the EU. In 2019, the sector sustained its leading role in exports, amounting to €149bn. In this context, our industry generated a positive net trade balance to the European economy. As our members are Hi-Tech manufacturers, our industry is deeply involved in the current technological transformation such as digitalisation, artificial intelligence (AI) and green technologies. Therefore, its know-how and capabilities gain a broader scope than in the past, with new neutral technologies and dual-use applications (i.e. R&D, platforms, services and support) fertilise transversally also in other



**890,000 highly-skilled employees in Europe**

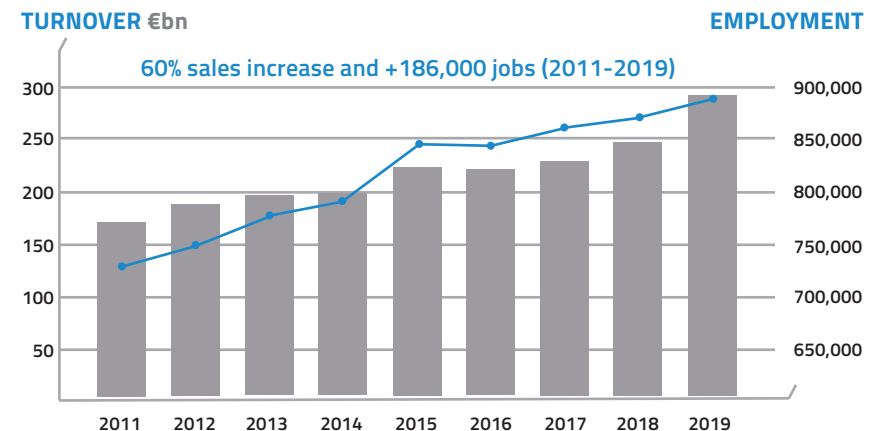


sectors, blurring traditional civil and military boundaries along its ecosystem. These flexibility and developments are considered within Facts & Figures traditional methodology, as such the new baseline shall not be directly comparable with previous editions.

Overall, the sector delivered strong economic performances with increased deliveries, export orders and backlog in most segments, in a global context marked by the growth of civil and mili-

tary demand, as well as a stronger competition, economic uncertainties and complex security challenges.

This is the result of sustained competitiveness driven by significant efforts in Research and Development (R&D) and efficiency improvements of industrial processes through digitalisation and cutting-edge technologies. Fostering innovation and technologies is essential in order to deliver sustainable and competitive products and services that are sold worldwide.





## Civil aeronautics

REVENUE

€  
130bn

EXPORTS

€  
109bn

JOBS

  
405k


## European civil aeronautics sector

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In 2019, the civil aeronautics sector continued its growth with revenue increasing by 3% to €130bn. This sector remains by far the leading sector in aerospace and defence and accounts for 50% of total industry revenue. The increasing global demand for mobility and the replacement of older aircraft, which use more kerosene, with the latest low-noise, fuel-saving generation of aircraft continue to be the major drivers of growth.

In 2019, civil aeronautics exports increased to €109bn, accounting for 83% of aeronautics exports. In general terms, exports provide an important net trade balance to the European economy.

The activities of the civil aeronautics sector, including large companies as well as a great variety of small and medium-sized enterprises (SMEs), are spread across Europe and are concentrating a full spectrum of technologies and integrated capabilities. The civil aeronautics sector includes all certified

flying objects, manned and unmanned, along the life-cycle, i.e. the complete range of categories of commercial aircraft, business jets, regional jets, general aviation, combat aircraft and trainers, as well as a broad range of transport aircraft and rotor-wings, training and simulation services, Maintenance Repair & Overhaul (MRO) and air traffic management ground systems.



## Future challenges

In 2019, nearly 4.5 billion passengers were carried by the world's airlines. While air transport carries around 0.5% of the volume of world trade shipments, it is over 35% by value – meaning that goods shipped by air are very high value commodities, often times perishable or time-sensitive. Over 66 million jobs are supported worldwide in aviation and related tourism. Of this, 10.2 million people work directly in the aviation industry (\*source ATAG).

If aviation were a country, it would rank 20th in the world in terms of gross domestic product (GDP), generating \$704.4 billion of GDP per year, considerably larger than some members of the G20 (and around the same size as Switzerland). By 2036, it is forecast that aviation will directly contribute \$1.5 trillion (compared to \$1.5 trillion in 2018) to the world GDP (\*source ATAG).

Worldwide, flights produced 915 million tons of carbon dioxide (CO<sub>2</sub>) in 2019. Globally, humans produced over 43 billion tons of CO<sub>2</sub>. The global aviation industry therefore produces around 2% of all human-induced CO<sub>2</sub> emissions (\*source ATAG).

Civil aviation has shown a track record of reducing its environmental footprint. The current generation of jet aircraft are 80% more fuel efficient per seat kilometre than the first jets build in the 1960s. Each new generation of aircraft typically reduces CO<sub>2</sub> emissions by around 15-20%. Newer generation of aircraft generally burn around 3 litres



of fuel per 100 passenger kilometres.

The civil aviation industry is very much aware that more needs to be done to decarbonise, in particular since aviation continues to grow as result of economic growth and global trade (aviation is expected to double in the next 20 years). The civil aviation industry became the first in the world to agree a comprehensive approach for reducing its emissions. It is based on the 'four pillar strategy' of technology, operations, infrastructure and a global market-based measure (CORSIA) setting a goal to half net aviation CO<sub>2</sub> emissions by 2050 (compared to 2005).

EXPORT  
CIVIL AERONAUTICS  
**+12%**  
COMPARED TO 2018



European industry is playing a leading role to develop the future green technologies for civil aviation. The support from the EU institutions through EU funded research programmes such as Clean Sky and SESAR are essential in this context. If Europe wants to meet its climate targets, it will be essential to safeguard funding for civil aviation research in the future Horizon Europe Programme through providing at least €5 bn of public funding. European industry has started research on electrification and hybridisation of civil aircraft along other potential options to reduce civil aviation emissions in the longer term (including research on hydrogen-based aircraft).

Moreover, improving the efficiency of the European Air Traffic Management (ATM) System through the deployment of SESAR solutions and the implementation of a Digital European Sky also has the potential to reduce CO<sub>2</sub> emissions by around 10%. In this context, it will be essential to incentive the quicker deployment of new technology in line with the recent report from the EU Wise Person Group on ATM and the



SESAR Airspace Architecture Study. Solutions to make aircraft movements emission-free when taxiing could also be deployed faster based on economic incentives for equipped aircraft such as for example modulation of airport charges.

Europe should also become a centre of excellence on sustainable alternative fuels for aviation based on a strong European energy policy which should incentivise the development and deployment of those alternative fuels which have the potential to drastically reduce civil aviation emissions.

Finally, the EU should continue to work through the International Civil Aviation Organization (ICAO) to develop ambitious global environmental standards for international civil aviation. This includes the implementation of the first ever sectorial reduction scheme, CORSIA, as well as a global CO<sub>2</sub> aircraft certification standard.



## Defence

REVENUE

€  
116bn

EXPORTS

€  
40bn

JOBS

  
440k


## European defence sector

The defence sector remains essential as a contributor to our security and economic prosperity. In 2019, it supported roughly 440,000 high-skilled jobs in Europe.

Mirroring the differences in national defence spending, the European defence technological and industrial base is concentrated in the six so-called "Letter of Intent (LoI) countries" - France, Germany, Italy, Spain, Sweden and the United Kingdom (UK). Smaller platform manufacturers, equipment suppliers and sub-suppliers as well as niche producers exist also in other parts of the EU. The total number of SMEs doing business in defence is estimated at 2,000 to 2,500 (of which

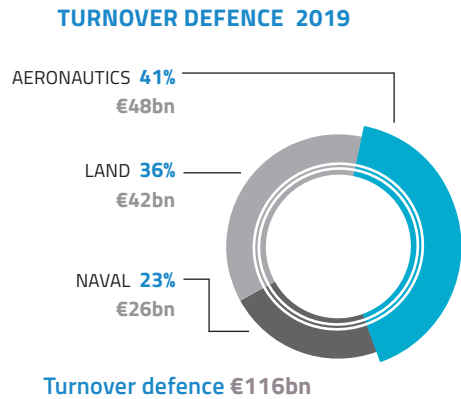
39.6% operate in the land domain, 30.5% in air, 18.7% in naval, 7.8% in cyber, 3.4% in space).

In 2019, the European defence industry generated a turnover of €116bn. Out of this total, €93.2bn came from companies located in the LoI countries. Overall, the European defence industry accounts for more than 20% of the global defence turnover, which is far behind the United States (US) global market share (almost 60%).

## EUROPE'S TOP 10 DEFENCE COMPANIES 2019

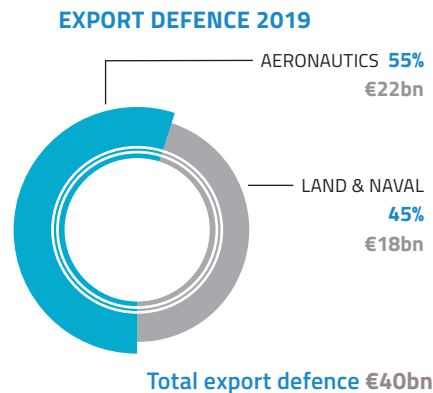
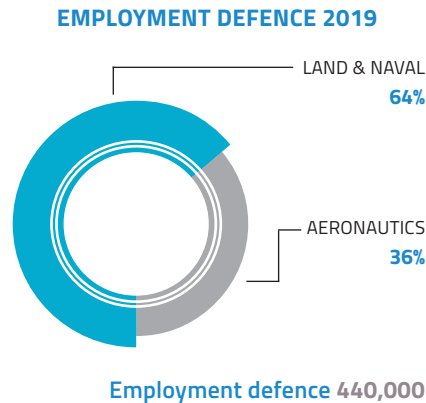
	2019 Defence Revenue (in millions dollars)	2019 Total Revenue (in millions dollars)	Revenue from Defence	Ranking Worldwide
#1 BAE Systems	\$21,033.27	\$23,370.3	90%	#7
#2 Airbus	\$11,266.57	\$78,916.36	14%	#12
#3 Leonardo	\$11,109.27	\$15,429.55	72%	#13
#4 Thales	\$9,251.68	\$20,596.61	45%	#16
#5 Dassault	\$5,708.84	\$8,171.48	70%	#22
#6 Rolls Royce	\$4,260.53	\$4,260.53	24%	#27
#7 Safran	\$4,413.05	\$27,581.55	16%	#28
#8 Naval Group	\$4,155.14	\$4,155.14	100%	#30
#9 Rheinmetall AG	\$3,942.46	\$7,001.73	56%	#33
#10 Babcock International	\$3,233.92	\$6,220.17	52%	#39

Source: Defense News



In 2019, defence industry supported more than 440,000 jobs in Europe. Around 160,000 of them were attributable to military aeronautics, the remaining 280,000 to the land and naval sectors. Recent trends show that defence companies face a shortage of skilled labour. The main reasons for this are the high pace of technological innovation and increasing competition with other sectors for younger high-skilled workers.

Military exports have reached €40bn in 2019. Out of this total, €22bn come from military aeronautics and €18bn from the land and naval sectors. Given the high development costs of most defence systems and the relatively small size of European home markets, these exports are crucial for European industry to reach the production volumes which are necessary to maintain competitive per-unit prices.



## The European defence industry – an indispensable element of Europe’s strategic autonomy

### Military aeronautics

European air power must be able to support all missions and to operate in a joint and collaborative environment. Air power superiority requires a strong industrial base that must be constantly sustained to remain at the technological edge.

Employment in the military aeronautics sector stands slightly above 160,000 jobs, which accounts for 36% of total defence employment.

### Land and naval

The combined turnover of the European land and naval industry went up by 11% from €61bn in 2018 to €68bn in 2019. Both sectors increased their export volumes from €13bn in 2018 to €18bn in 2019. Employment was at 280,000 units in 2019, which represents 63% of the total defence employment.



The European military aeronautics sector produces a broad range of manned and unmanned aircraft systems, from combat aircraft and drones to transport aircraft and helicopters. It consists of companies of all size, from prime contractors to tier-3 sub-suppliers which provide components and raw material.

In 2019, the European military aeronautics sector generated a turnover of €48bn. Out of this, €22 bn derive from exports, which accounts for more than half of total European defence exports.

The land defence sector is of strategic importance for future military capabilities. Land forces represent a vital contributor to operational supremacy, and both the EU and the North Atlantic Treaty Organization (NATO) consider ground combat capabilities as one of their main priorities. In 2019, the European land defence sector generated a turnover of €42bn, which represents 36% of total European defence revenues. The sector has a diverse product portfolio, spanning from main battle tanks to families of armoured vehicles, artillery, guided ammo, integrated systems and components for the battlefield, protection of soldiers and infrastructures, etc. The largest



European land prime contractors are located in France, Germany, Italy and UK, although important industrial capabilities are present also in other Member States.



The European naval industry generated in 2019 revenues of €26bn, which represents 23% of total European defence revenues. The sector produces the full spectrum of vessels, including aircraft carriers and nuclear submarines. In Europe, there are six prime contractors which have the full responsibility to design, integrate and build military ships. For the design and development of combat systems and combat management systems, most of them

rely on tier-1 suppliers. The lower tiers of suppliers consist of a broad range of companies of different size and activities but many of them generate only a small part of their revenues on the defence market.

### Future challenges

Defence systems have always relied on the most advanced technologies, which for decades were mainly designed and developed in the military sphere (e.g. advanced sensors, secure communications, stealth technology). However, future warfare will be characterised more and more by a system architecture approach, which takes advantage of new emerging and disruptive technologies (e.g. AI, quantum computing, 5G, biotechnology, human augmentation, novel materials) that are mainly driven by huge investments in the commercial sector. Although the defence industry will not be at the forefront of developments in such technologies, it is indispensable to adapt and translate them into military systems that meet the requirements of armed forces.

The increasing importance of commercially driven technologies is likely to have an impact also on the structure of the defence industrial and technological base. It will bring new entrants into the military sector and cause defence companies to adapt their strategies to meet the need to incorporate these new technologies into the products they develop.





## Research & Development

TOTAL R&D  
INVESTMENT

**€18bn+**

## Research & Development (R&D)

Research, technology and innovation are instrumental for a sustainable and competitive future.

The European aeronautics and defence industries is driven by significant activities and investments in R&D. R&D refers to the activities companies or public stakeholders undertake to improve or develop new products and services. While R&D encompasses the whole research and development process, from upstream research to the final product or service, whereas Research and Technology (R&T) focuses on the first phases (study of mature technology components (up to TRL 6) that will allow the project to be launched and developed with a lower level of risk).

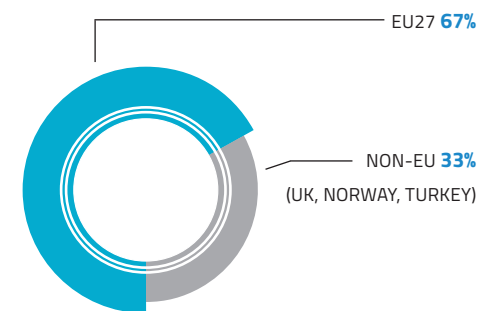
In 2019, the R&D expenditure on aeronautics and defence from both industry and governments is estimated at a level of €18bn, with a possible 40:60 split between civil and military activities.

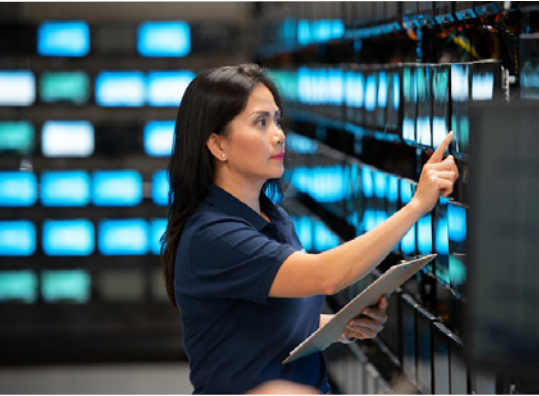
For European industry to stay ahead in a fast-changing and global innovation race, the support of national governments and the EU is essential.

The investment gap between the EU and the US is massive when it comes to aerospace and defence-related R&D.

In 2019, the R&D investments in the US (from industry and government) were more than four times higher than in Europe. If this long-term investment gap persists between Europe and other regions of the world, this will add further difficulties in maintaining Europe's leadership.

### RESEARCH & DEVELOPMENT INVESTMENTS EU27/NON-EU (UK, NORWAY, TURKEY) 2019





R&D  
CIVIL AERONAUTICS

€8bn

Invested by private and  
public stakeholders

### R&D in civil aeronautics

In 2019, it is estimated that an amount of €8bn were invested in civil aeronautics R&D activities by private and public stakeholders. Most of the investment comes from an increasing value as well as number of private investors (suppliers and customers) while government support is increasingly marginal, confirming a descent trend.

According to the European Commission, every Euro invested in aeronautics R&D creates an equivalent additional value in the economy annually thereafter. Indeed, it enables the development of sustainable and competitive products and services, while maintaining and creating high-skilled jobs in Europe.

R&D is the main driver to achieve the ambitious sustainability targets the sector is committed to. The Flightpath 2050 roadmap aims are that by 2050,

the technologies and procedures that will be available will allow a 75% reduction in CO<sub>2</sub> emissions per passenger kilometre, and a 90% reduction in NO<sub>x</sub> emissions, with the perceived noise from aircraft operations being reduced by 65%. These are relative to the capabilities of typical new aircraft in 2000. Today's aircraft and engines are more fuel-efficient than earlier generations: it is estimated that fuel consumption per passenger/km has been reduced by 70% since the 1970s.

The societal demand for air travel is booming (with an average increase of 5% each year), and constant research is critical to further reduce the emissions of the next generation of aircraft. Competitiveness is the key driver for taking the lead on green technology at international level and ensuring solutions and pathways are affordable and can be integrated by the whole sector. The aeronautics sector is marked by

the high complexity of its products and systems and is subject to significantly long R&D cycles (of up to 20 years) all of which require long term and large investments.

The long development cycles and the high technological risks that characterise the aeronautics industry require cooperation between all the key actors along the supply chain (private and public organisations) to reinforce and streamline research.

European public-private partnerships (PPPs) such as Clean Sky and SESAR are delivering substantial socio-economic impacts.

Clean Sky develops innovative, cutting-edge technology aimed at reducing CO<sub>2</sub> emissions and noise levels produced by aeroplanes and helicopters. To this end, more than 30 main demonstrators of different

sizes are being developed at a very high technological maturity level. So far, Clean Sky results confirm an overall potential to reduce CO<sub>2</sub> emissions by 32%, and noise by 50% to 86%. These are being achieved as the technologies are applied to commercial products, while, at the same time, the programme's partners are innovating further to increase the performance of aircraft.

SESAR is delivering a catalogue of solutions to modernise the management of air traffic in Europe, ensuring the safety and sustainability of European air travel and aviation. When deployed, the 60 solutions already delivered should increase airspace capacity by 34% and decrease flight time by an average of 30%, resulting in reduced delays on all EU flights (95% of flights staying within their time plan), and lead to a 2.3% decrease of fuel burn and CO<sub>2</sub> emissions per flight.

*R&D is the main driver  
to achieve the ambitious  
sustainability targets the  
sector is committed to*





## R&D in defence

Investments in defence R&D and (its subset) R&T are key factors for the success of industry and its capacity to design and develop the next-generation capabilities of Europe's armed forces. Combined European investment in defence R&D amounts to roughly €10bn, mainly from national governments as key customers. Private investments are very limited and concern only lower complexity or lower value research. Defence R&D spending in Europe remains highly concentrated, with France and the UK alone accounting for more than half of the total (followed by Germany, Italy, Spain and Sweden).

Despite a general increase in defence spending, investments in defence R&T remains low in percentage of the overall defence budget. According to the European Defence Agency (EDA), only four Member States spent more than

1% of the total defence budget on R&T and account together for 85% of the total defence R&T spending in Europe.

The concentration of R&T activity in a few countries and the fact that the collective benchmark for R&T funding (2% of defence budget, as defined by EDA and as part of the Permanent Structured Cooperation (PESCO) commitments) has never been reached, raise concerns about Europe's long-term capacity to cope with emerging security challenges and to gain strategic technological advantages.

To reverse this trend and foster European collaboration, the EU has put forward several initiatives to support the European defence industrial base. Via the Preparatory Action on Defence Research (PADR) and European Defence Industrial Development Programme (EDIDP), EU resources have been allocated, for the first time ever, to boost collaborative defence R&D. In 2019, the first nine EDIDP calls for proposals were launched, addressing various capabilities needs such as multipurpose unmanned ground systems, air combat capabilities, future naval platforms, and Command and Control (C2). In addition, a specific call was launched to encourage the participation of SME. EDIDP and PADR prepare the ground for the fully-fledged European Defence Fund (EDF) under the next Multi-Annual Financial Framework (MFF) 2021-2027.



R&D DEFENCE TOTAL  
Invested by governments

€10bn

€6bn

AERONAUTICS

€4bn

LAND AND NAVAL



## Words from the Secretary General

In 2019, the European aerospace and defence sector reached a new record: sales grew by 5.2% to total revenues of €260bn, making our industry a key contributor to European wealth. I would like to thank the 890,000 employees of our companies for their commitment and passion that are behind this success story.

Looking at these figures today is dramatic. Shortly after our companies closed their books for 2019, they were overwhelmed by COVID-19. Civil aeronautics was particularly hard hit. The demand for new civil aircraft slowed down drastically, and it is totally unclear if and when air traffic will reach pre-COVID levels again.

This has dramatic consequences for all our sectors. Civil aeronautics, defence, security and space have multiple strong links and form in many ways a common ecosystem. Most companies of this ecosystem have activities in more than one of these sectors and are part of complex supply chains that span across all EU Member States and beyond.

The links between our sectors offer both risks and opportunities: given its economic weight, a complete breakdown of civil aeronautics would undermine the basis of the ecosystem as a whole and, thereby, drag down defence, space and security as well. This would also damage the industrial basis of Europe's aspired technological sovereignty.



ASD Secretary General, Jan Pie

At the same time, the links between our sectors can be turned into an advantage. Defence and security markets are not big enough to compensate for the implosion of the commercial business. However, since they are (mainly) public markets, the EU and its Member States can use their procurement and research budgets to support these two strategic sectors directly. This would also contribute to stabilising the civil aviation sector until the global commercial market recovers.

This industry is and will remain of strategic importance for Europe. There will be a time after the pandemic, and our companies will contribute to making Europe emerge from this crisis more resilient and more sovereign, more digital and greener.

**ASD Secretary General  
Jan Pie**

## About ASD

**ASD is the voice of European Aeronautics, Space, Defence and Security Industries, representing over 3,000 companies and actively supporting the competitive development of the sector in Europe and worldwide.**

## Methodology

The ASD Facts & Figures result from the contribution of the National Associations that are members of ASD, with ASD as a coordinator. In 2019, ASD National Associations members were spread across 18 European countries.

The data published in this industrial overview takes into account the following factors: exchange rate fluctuations, different statistical accounting in the UK, unconsolidated data for aeronautics and defence and consolidated data for space. The analysis was conducted using a consolidated process based on crosschecks. The perimeter of this analysis is different from that of the EU, the EDA or the NATO. Due to membership changes in ASD and its members, any year to year comparison should be considered in terms of trends and order of magnitude. A few non-ASD associations' data are included in order to complete the full picture.

The definition of aeronautics includes civil and military aeronautics. The definition of defence combines all sectors, i.e. military aeronautics, space, land and naval. Each sector combines

systems, platforms and components, while electronics and missiles are embedded transversally.

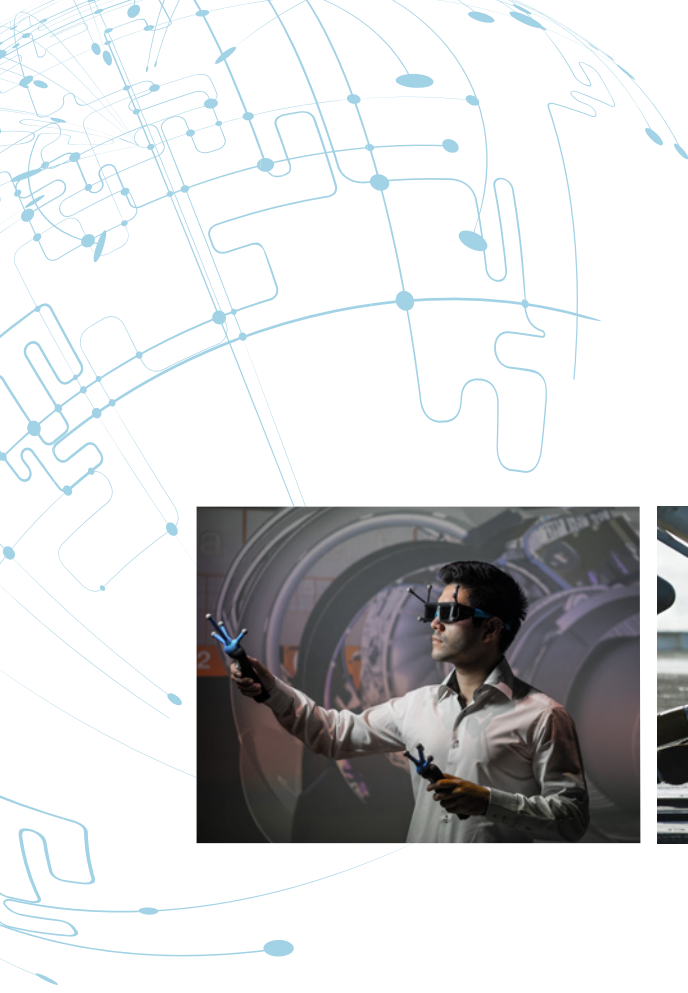
Process coordination and data analysis were performed by Fabrizio Braghini, Chairman of the ASD Data Analysis Committee. Pierre Lionnet, ASD-Eurospace Research Director provided space data and advice.

All photos used in this brochure belong to ASD members.



\* Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Norway, Poland, Portugal, Spain, Sweden, The Netherlands, Turkey, and the United Kingdom.





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