

2021

Facts & Figures



Words from the President



ASD President, Alessandro Profumo,
CEO of Leonardo

Dear reader,

ASD is the voice of European companies working in aerospace, defence and security. All these segments have something in common: they are high technology and strategic domains, global drivers of innovation and technological solutions that enable the goals that the European Union is setting for itself, in terms of green and digital transition as well as geopolitics and strategic autonomy. Our more than 3,000 companies of all sizes, with more than 880,000 highly skilled employees, are at the core of European competitiveness, since their activities trigger spill-over effects on other high-tech sectors.

2020 was a challenging year, in many ways. The present edition of the ASD Facts & Figures would be incomplete if it did not illustrate the severe impact of the Covid-19 crisis on our industries, but also the resilience with which our companies mastered this unprecedented challenge and the role our technologies played in supporting civil society during the emergency.

Air traffic was particularly hard hit by the pandemic. And although recent developments have brought along a certain improvement of the situation, it is without a doubt still a long way until the

An innovative and competitive European aerospace, defence, and security industry is a key enabler of a sustainable, technologically sovereign and resilient Europe.



full recovery of the aviation sector. Notwithstanding economic hardships for the aeronautics industry, the fight against climate change remains a key priority for our sector. Together with other European aviation associations, ASD has committed itself to the sector's flagship sustainability initiative, *Destination 2050 – A Route to Net Zero European Aviation*, which sees all flights within and departing the EU, UK and EFTA realizing net zero CO₂ emissions by 2050, and we are calling for the EU to develop a policy roadmap to make the ambitious plan a reality.

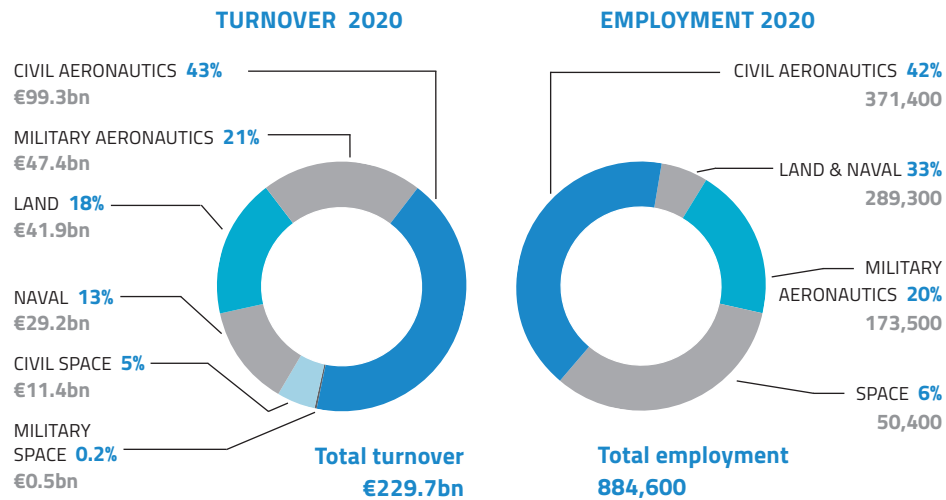
Thanks to the purely public nature of the defence market and the long cycles of defence programmes, the European defence sector suffered less from the crisis' repercussions than aeronautics. However, it still had to undergo difficulties related to Covid-19 in terms of production processes and supply chains, as well as access to international markets, which are key for the growth and sustainability of our sector, given the size of the EU domestic markets. After the financial

crisis in 2008/2009, European governments drastically decreased their defence spending which resulted in a severe loss of military capabilities. We believe that a similar reaction post Covid-19 would be highly harmful, not only for our industry. In a rapidly changing world of rising insecurities, a strong European defence industry is, in fact, strategically paramount to protect the life and way of life of our citizens. Therefore, we support the decisions of many EU countries to increase their defence spending, Covid-19 notwithstanding, as well as the more ambitious EU initiatives, starting with EDF, albeit curtailed from the €13 billion originally foreseen to the current €8 billion.

2020 has clearly shown that an innovative and competitive European aerospace, defence, and security industry is a key enabler of a sustainable, technologically sovereign and resilient Europe.

**ASD President
Alessandro Profumo**

Major trends in the European aerospace and defence industry



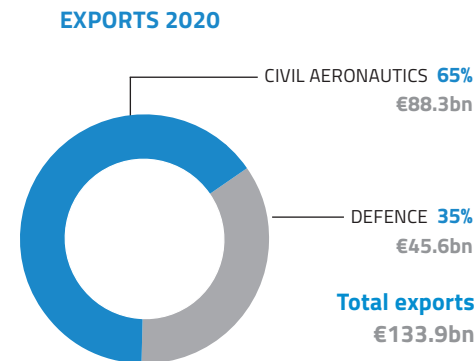
Despite the Covid-19 pandemic and the economic hardships it brought along – especially for the aviation sector – the European aerospace and defence industry managed to maintain its role as a global market leader in 2020.

The aviation sector was hit particularly hard with the breakdown of international air travel related to the outbreak of the Covid-19 pandemic. At the peak of the crisis, flights were reduced by almost 90%. Airlines grounded their fleets, with immediate knock-on effects on the entire civil aviation value chain.

As a consequence, sales in civil aeronautics decreased by almost a quarter (-24%), exports plummeted by as much as 19% in comparison to 2019. To ensure its mere

survival, European aeronautics companies were obliged to take drastic and painful decisions. At the end of 2020, the sector employed approximately 33,000 people less than before the Covid crisis (-8,3% vs end 2019).

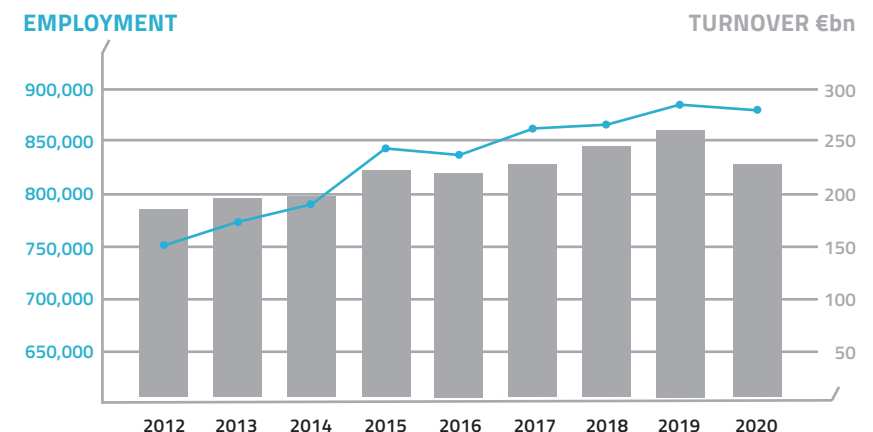
The defence sector showed economic resilience due to long-standing contracts with governments worldwide. Accordingly, sales and employment in the military aeronautics, land and naval domain remained stable or increased slightly.



Overall, the robust results in the defence sector in 2020 mitigated the severe negative impact of the Covid-19 crisis in the civil domain. Defence business benefited also from certain national governments' measures, such as accelerated acquisition schedules, financing easements and furlough schemes.

To face the challenges of the twin transition towards a greener and digitised economy, the European aerospace and

defence industries are strongly investing in research & development (R&D). Amid the enormous economic pressure caused by the Covid-19 crisis, R&D investment in the civil aeronautics sector fell by more than 5% (to €7.6bn). As order intakes dropped heavily or numerous orders were cancelled in 2020, European companies' leeway for future R&D investment has become much smaller. However, only the R&D investment of today can ensure the innovative power and competitiveness of tomorrow.



Civil aeronautics

REVENUE

€
99.3bn

EXPORTS

€
88.3bn

JOBS


371k+

European civil aeronautics sector

Supporting more than 370,000 jobs across Europe, the civil aeronautics sector remains a world leader, generating high-skilled jobs, innovation and sustainable growth in the EU despite an exceptionally challenging environment in 2020.

In 2020, the civil aeronautics sector had to go through the worst crisis in its history due to the impact of the Covid-19 pandemic. Sales decreased by as much as 24% to €99.3 bn. A sudden breakdown of global demand for air mobility starting in March 2020 resulted in a large number of order cancellations for aircraft and at the worst moment of the crisis, new orders almost came to a halt with tremendous knock-on effects on the entire value chain of European aeronautics.

With regards to civil aeronautics exports, 2020 also brought an unprecedented drop of 19% to €88.3 bn, still accounting for around two thirds of ASD members' exports. In general terms and even under the difficult circumstances in 2020, exports have provided 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 the light of the Covid-19 crisis and worldwide travel restrictions, the number of passengers who were carried by the world's airlines in 2020 slumped by more than 60% in comparison to 2019 (from 4.5 billion to 1.8 billion). 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 perishable or time-sensitive. Nearly 88 million jobs are supported worldwide in aviation and related tourism. Of this, 11.3 million people work directly in the aviation industry.*

If aviation were a country, it would rank 17th in the world in terms of gross domestic product (GDP), generating \$691.3 billion of GDP per year, larger than some members of the G20 (and around the same size as the Netherlands). By 2038, it is forecast that aviation will directly contribute \$1.7 trillion to the world GDP.*

The global aviation industry produces around 2% of all human-induced CO₂ emissions and 12% of CO₂ emissions from all transport sources.*

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 built in the 1960s. Each new generation of aircraft typically reduces CO₂ emissions by around 15-20%. Newer generation of aircraft generally burn around 3 litres



of fuel per 100 passenger kilometres.

Nevertheless, 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. With this in mind, Europe's aviation sector, with ASD as a proud member, has initiated its flagship sustainability initiative, *Destination 2050 – A Route to Net Zero European Aviation*. Building on the Paris Agreement and the European Green Deal, it sees all flights within and departing the EU, UK

* Source: ATAG

EXPORT
CIVIL AERONAUTICS
-19%
COMPARED TO 2019

and EFTA realising net zero CO₂ emissions by 2050. It is based on a 'four pillar strategy' of aircraft and engine technologies, Sustainable Aviation Fuels (SAFs), Air Traffic Management and economic measures.

Already today, 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 increase public funding as well as public co-funding rates for civil aviation research beyond what is currently available through Horizon Europe. European industry has started research on electrification and hybridisation of 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 ATM System through the deployment of SESAR solutions and the implementation of a Digital European Sky also has the potential to reduce CO₂ emissions by around 6%. In this context, it will be essential to incentivise the quicker deployment of new technologies.

Europe should also become a centre of excellence on SAFs 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 long-term environmental standards for international civil aviation. This includes the implementation of the first ever sectorial reduction scheme, CORSIA, as well as the ICAO Long Term Aviation Goals (LTAG).

Defence

REVENUE

€
119bn

EXPORTS

€
45.6bn

JOBS


462k+

European defence sector

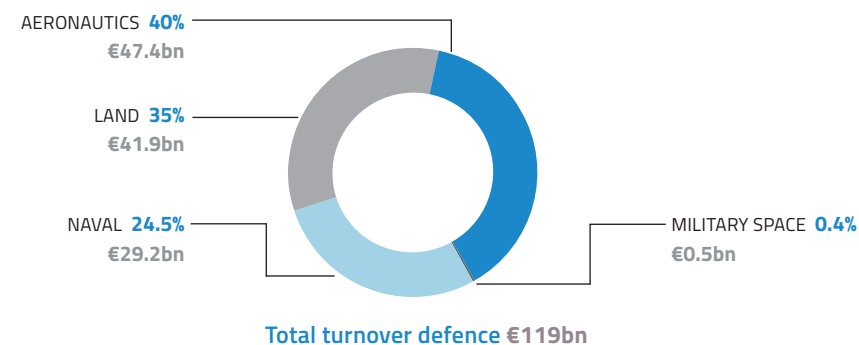
Supporting over 462,000 high-skilled jobs in Europe, the defence sector plays a vital role in helping to safeguard our security and contributes to Europe's economic prosperity.

Mirroring the differences in national defence spending, the European defence technological and industrial base is concentrated in the six "Letter of Intent (LoI) countries" - France, Germany, Italy, Spain, Sweden and the United Kingdom (UK). Smaller platform manufactures, equipment suppliers and sub-suppliers as well as niche producers exist also in other parts of Europe. 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 2020, the European defence industry generated a turnover of €119bn. Out of this total, €95.6bn came from companies located in the LoI countries.

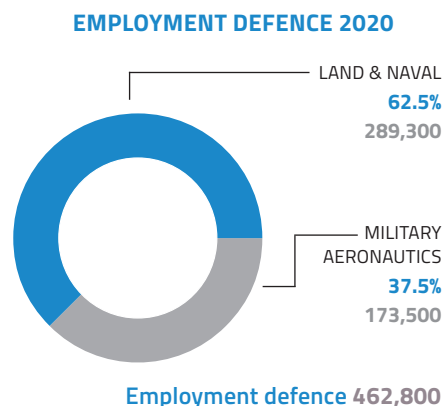
Despite all the challenges which 2020 brought along, the number of jobs in the European defence industry increased by 22,000 in comparison to 2019 to more than 462,000. Around 173,000 of them were attributable to military aeronautics, 159,000 to the land and 130,000 to the naval sectors. However, recent trends show that defence companies face a shortage of skilled labour.

TURNOVER DEFENCE 2020



The main reasons are the high pace of technological innovation and increasing competition with other sectors for younger high-skilled workers.

Military exports increased by 14% to €45.6bn in 2020. 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 a competitive economic performance.



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 2020, the European military aeronautics sector generated a turnover of €47.4bn. Employment in the military aeronautics sector stands slightly above 173,000 jobs, which accounts for more than 37% of total defence employment.

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.

The European military aeronautics sector produces a spectrum of manned and unmanned aircraft systems, from

Land and naval

The combined turnover of the European land and naval industry went up by 6.4% from €68bn in 2019 to €72.3bn in 2020. Employment was at 289,000 units in 2020, which represents 63% of the total defence employment.

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 2020, the European land defence sector generated a turnover of €41.9bn, which represents 35% 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.

The European naval industry generated in 2020 revenues of €29.2bn, which represents 24% of total European defence revenues. The sector produces the full spectrum of vessels, including aircraft carriers and nuclear submarines.

The defence sector plays a vital role in helping to safeguard our security and contributes to Europe's economic prosperity.

In Europe, there are six prime contractors which have the full responsibility to design, integrate and build military ships (BAE Systems, Naval Group, Fincantieri, Navantia, Damen and TKMS). For the design and development of combat systems and combat management systems, most of them rely on tier-1 suppliers, mainly in defence electronics. 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.

EUROPE'S TOP 10 DEFENCE COMPANIES 2020

	2020 Defence Revenue (in millions dollars)	2020 Total Revenue (in millions dollars)	Revenue from Defence	Ranking Worldwide
#1 BAE Systems	\$23,502.38	\$24,739.35	95%	#7
#2 Airbus	\$12,004.28	\$56,970.41	21%	#12
#3 Leonardo	\$11,173.33	\$15,306.40	73%	#13
#4 Thales	\$9,228.36	\$19,391.53	48%	#16
#5 Rolls Royce	\$4,863.94	\$15,092.33	32%	#25
#6 Safran	\$4,707.20	\$18,831.10	25%	#26
#7 Rheinmetall AG	\$4,249.50	\$6,705.82	63%	#29
#8 Naval Group	\$3,766.68	\$3,766.68	100%	#33
#9 Dassault	\$3,724.44	\$6,265.24	59%	#34
#10 Saab	\$3,385.41	\$3,848.42	88%	#36

Source: Defense News



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 governments 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, 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).

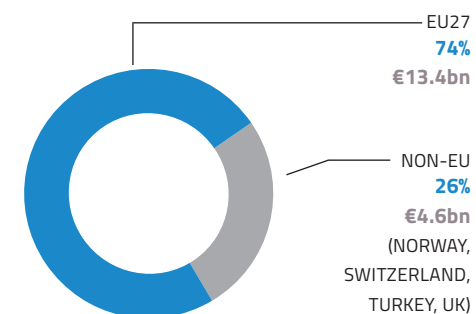
In 2020, the R&D expenditure on aeronautics and defence from both industry and governments was estimated at a level of €18bn, with an approximate 40:60 split between civil and military activities.

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 – a situation that is believed not to have changed in 2020. If this long-term investment gap persists between Europe and other regions of the world, this will add further difficulties in maintaining Europe's competitiveness and leadership.

RESEARCH & DEVELOPMENT INVESTMENTS EU27/NON-EU (UK, NORWAY, TURKEY) 2020



Total R&D Investments €18bn



R&D
CIVIL AERONAUTICS

€8bn

Invested by private and
public stakeholders

R&D in civil aeronautics

In 2020, it is estimated that an amount of €7.6bn 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.

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 *Destination 2050* initiative of the European aviation sector aims at all flights within and departing the EU, UK and EFTA realising

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

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

net zero CO₂ emissions by 2050 via a combination of four elements: enhanced aircraft and engine technologies, Sustainable Aviation Fuels (SAFs), Air Traffic Management and economic measures.



Already today, aircraft and engines are tremendously more fuel-efficient than earlier generations (current generation of jet aircraft are 80% more fuel efficient per seat kilometre than the first jets built in the 1960s). Constant research is critical to further reduce the emissions of the next generation of aircraft.

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.

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



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 €10.5bn, 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 40% 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 longterm 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, including the European Defence Fund (EDF), which was originally proposed by the European Commission and supported by Member States and the European Parliament. The budget is close to €8 billion, €2.7 billion of which to fund collaborative defence research and €5.3 billion euros to fund collaborative capability development projects complementing national contributions. It strongly encourages participation of small and medium-sized enterprises (SMEs) in collaborative projects and fosters breakthrough innovative solutions. The EDF is implemented through annual work programmes, structured along 17 thematic and horizontal categories of actions. Calls for proposals are launched on an annual basis following the adoption of the corresponding annual work programme.



R&D DEFENCE TOTAL

€10.5bn



Words from the Secretary General

In 2020, the European aeronautics sector was hit by Covid-19, the worst crisis in its history, with severe consequences also for the defence and space sector. All of our industries had to cope with enormous difficulties in their manufacturing processes and sudden supply chains ruptures.

2020 was a year to prove the resilience of the industry and its capacity to adapt even to the most challenging and unexpected scenarios. Thanks to a determined and responsive leadership, some difficult, but necessary measures, and most importantly the commitment and passion of the women and men working for our members all over Europe, our companies have dealt with the crisis in an impressive way.

Looking ahead, the economic recovery from the Covid-19 pandemic is not the only challenge of our industries. Climate change is here and we can witness almost every day its devastating impacts. It will only get worse unless we transform today's society into something much more sustainable.

The European aeronautics industry is fully committed to contribute to a carbon-neutral aviation in Europe by 2050, as laid down in the *Destination 2050* report. Some key components such as electric, hybrid and hydrogen aircraft make huge progress, also thanks to the continuous research and development efforts of our companies.



ASD Secretary General, Jan Pie

Sustainability is at the same time a dimension that has become more and more essential also for the defence industry. There is an intrinsic link between sustainability, security and defence: Defence is a crucial component of security, and security constitutes the prerequisite for peace and sustainability.

This fundamental aspect should not be neglected in the discussion on sustainable finance.

Our industries are and will remain of strategic importance for Europe and the political, strategic, environmental and technological challenges that are lying ahead. As ASD, we trust on the EU institutions and national governments to tackle these issues together with industry in a spirit of mutual confidence and partnership.

**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 2020, 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.



Rue du Trône 100
1050 Brussels
www.asd-europe.org
info@asd-europe.org
+32 2 775 81 10