

### 1.1.8.2 Responsible Manufacturer

#### a. Product Safety

Airbus recognises and values the trust the flying public puts in its aircraft, and this is the reason the Company constantly strives to improve safety any way it can. Its investment in successive generations of aircraft which embody new and safer technologies have been very successful in achieving an ever-decreasing number of accidents despite an ever-increasing number of flights.

Today, with the rate of accidents at an all-time low, Airbus is working even harder to ensure that accidents remain rare events.

This is why it is Airbus' top priority to continually improve safety. Its commitment to safety starts at the top, is reflected in the structure of its organisation, and is most deeply embodied in the mind-set employees bring to work.

At every point in design, manufacturing and assembly, Airbus makes sure that its aircraft not only comply with but exceed the safety requirements laid down by the European Aviation Safety Authority (EASA) and the US Federal Aviation Authority (FAA). The development of the Fly-By-Wire and flight envelope protection technologies more than 25 years ago, or more recently the Runway Overrun Prevention System, are examples of significant contributions to safety introduced by Airbus and now becoming industry standards.

Whenever safety topics must be discussed, it is done at the appropriate level, including by Airbus' senior executives. By acting together, the Company ensures that the full power of coordinated cross-company action can be brought to bear on any issue where it is believed that safety can be further enhanced.

The Product Safety Process (PSP) is Airbus' primary means of responding to what is happening with the 10,000 Airbus aircraft flying today, and of maintaining continued airworthiness. It enables Airbus to analyse reports from the field and other in-service events, and frequently leads to the introduction of safety enhancements either to new products under development or to existing designs. In this way, Airbus is actively enhancing the safety level for its products and helping to advance the safety level for the whole industry.

The PSP is now evolving to be part of Airbus' Safety Management System (SMS), formalising Airbus' evolution to a risk management approach to safety. Both the PSP and the SMS rely on a network of safety representatives within each Division of the Company. All Airbus employees, including those in the safety network, are trained to recognise that the lives of passengers and airline personnel can depend on their personal commitment to safety, and to ensure that they are aware of how their personal actions can improve safety.

Airbus and its employees at all levels therefore work hard to ensure safety in:

- the design of aircraft to higher levels than those required by EASA/FAA Part 25 regulations;
- the quality of manufacturing in line with its EN 9001 certification;
- the materials/manuals supplied to customers to operate and maintain the aircraft;
- the training provided to flight crews, cabin crews and maintenance crews;
- the worldwide services delivered in support of the aircraft's operation.

Yet what makes a flight safe is a combination of a safe aircraft, safe airline operations and a safe air transport system. Therefore, even if the primary responsibility of Airbus as a manufacturer is the aircraft, the scope of safety at Airbus reaches beyond the product and also includes an active role at the air transport system level.

Airbus is in constant contact with other aircraft manufacturers, airlines and air safety organisations around the world to find new ways of improving safety standards. The Company believes that industry wide cooperation is crucial to making further safety enhancements.

Airbus has put in place a harmonised approach to product safety throughout the Company. Similar processes and tools to those described above for Airbus commercial aviation are in place at Airbus' Divisions, Defence and Space and Helicopters. These include a dedicated Product Safety function, which is empowered to take action across the business to ensure the safety of all operations, daily monitoring and management of safety topics and deployment of a SMS as well as related specific organisation approvals by competent organisations. However, the implementation of these harmonised processes was adjusted to the specificities of their activities and of the regulatory requirements. For example, there is no regulation to manage companies and official organisations' participation in safety investigation for the military world. In addition, due to the nature of military activities, investigation are often classified as confidential or restricted for officials.

#### b. Research & Technology

In 2017, CTO underwent a transformation programme to become more agile, innovative and aligned with the needs of Airbus. The new organisation applies a lean, project-based approach, will encourage collaboration with external research communities and develop partnerships, especially through open innovation with technical and scientific experts.

The CTO organisation is responsible for: guiding all R&T activities of the Company and ensuring Airbus-wide integration of technology through Technology Planning and Roadmapping, accelerating the development of selected technologies through Flight Demonstrators together with the Divisions, providing expertise in breakthrough technologies in support of the group-wide projects in Central R&T and developing technologies for the next generation aircraft in Airbus R&T.

**Technology Planning and Roadmapping** developed a set of technology roadmaps spanning the R&T portfolio, which are used to analyse technology progression using key figures of merit and is starting to provide a valuation methodology for the R&T activities.

**Flight Demonstrators** provide a maturation mechanism and maturity gates for the Group R&T portfolio. The Demonstrators employ a CTO-established development methodology, including phasing and key gates, lightweight project management and earned-value management processes, including budgeting, HR and contracting mechanisms tailored for speed of execution.

**Central R&T** is organised in five boost areas – Data Science, Materials, Communication Technologies, Electrics Expertise and Virtual Product Engineering. A research vision and new ways of working were implemented with a short cycle for testing new ideas and decision gates for the creation of larger projects. The transitioning from the former Airbus Group Innovations is ongoing through 2018.

**Airbus R&T** portfolio will be organised in three areas starting in 2018 to better adapt to Airbus product policy and business needs – Enhancing our Aircraft Programmes, Next New Aircraft, and Digital Design & Manufacturing. The organisation started a transformation programme aiming for speed, agility and high performance with a flatter hierarchy and empowered teams.

In addition to the domains described above, five technology thrusts were established to ensure coherency in the portfolio of activities and to rapidly advance strategic priorities. These thrusts are:

- Electrification;
- Digital Design and Manufacturing;
- Connectivity;
- Autonomy;
- Materials.

## Key Progress in 2017

### Flight Demonstrators

- E-Fan X Programme

The E-Fan family of technology demonstrators was a bold step towards all-electric and hybrid-electric flight aimed at establishing requirements for future certification of electrically powered airplanes and at training a new generation of designers and engineers for the challenges of electric flying. In March 2017, the Airbus Executive Technical Council decided to refocus Airbus' efforts on electric flight towards a more ambitious project, which aims to develop a hybrid-electric demonstrator baptised the "E-Fan X", a stepping stone towards a hybrid electric single aisle aircraft. In November 2017, E-Fan X was launched in conjunction with Siemens and Rolls-Royce. E-Fan X will be powered by a 2 MW motor, which is one order of magnitude greater than E-Fan 2.0's motor.

- E-Aircraft Systems House (EAS)

The EAS aims to verify hybrid- and electric propulsion systems functionality and performance for low, medium,

and high-power systems by ground testing, accelerating technology readiness in collaboration with Siemens and developing and supplying hybrid-electric propulsion systems and hardware for Flight Demonstrators.

In 2017, it continued to support electrification projects, including providing the test bench for CityAirbus.

### A<sup>3</sup>

A<sup>3</sup> (pronounced "A-cubed"), is the advanced projects and partnerships outpost of Airbus in Silicon Valley with the mission to disrupt the aerospace industry.

- **Altiscope** launched in 2017 to help integrate unmanned aircraft systems (UAS) into the airspace. Using a simulator to evaluate policy options and operational models for air traffic management systems, it aims to service all forms of airborne traffic.
- **Vahana** is an electric urban air mobility vehicle designed to carry a single passenger or cargo. A<sup>3</sup> is aiming to make it the first certified passenger aircraft without a pilot. The first Vahana full-size prototype is scheduled to fly in early 2018.
- **Transpose**, launched in December 2016, rethinks the aircraft cabin architecture and passenger experience possibilities. The project demonstrated user tests in a modular cabin in its alpha phase.
- **Voom** delivers an on-demand urban air mobility service using helicopters. It successfully completed its beta phase pilot in Sao Paulo, Brazil, and will continue as a business in 2018 within Airbus Helicopters.
- **Airbus China Innovation Centre (ACIC)**: This year, a second innovation centre was opened in Shenzhen, China. Like A<sup>3</sup>, it is focused on technologies and business models that could be disruptive to the core business. However, it will leverage the hardware ecosystem in Shenzhen, and talent pool in China to develop projects. The first ACIC project will be launched in 2018.

### BizLab

Airbus BizLab is the aerospace accelerator where startups and Airbus intrapreneurs speed up the transformation of innovative ideas into valuable businesses. BizLab offers early-stage selected projects wide-ranging support in the form of a programme with a six-month acceleration phase. Startups and internal projects benefit from free hosting in BizLab facilities, have access to a large number of Airbus coaches and experts in various domains, and participate in events such as a Demo Day with Airbus decision makers, Airbus customers and partners. The BizLab expanded its network by opening a fourth campus, in Madrid, in January 2018.

### Airbus Helicopters

CityAirbus is a three-to-four passenger optionally piloted electric vehicle for unmanned air mobility. It has transitioned into Airbus Helicopters from the ExO and expects an unmanned flight test in 2018. The urban last mile delivery solution, Skyways, plans a demonstration in February 2018, after which it will be transitioned into Airbus Defence and Space.

### Airbus Defence and Space

Airbus Aerial is an image and data analytics services company that was launched in 2017. It integrates data from a broad array of aerospace assets including satellites and unmanned aerial vehicles. At the end of 2017, it employed 22 people.

### c. Environmental Matters

The industry faces a variety of environmental challenges, including climate change, and Airbus invests and cooperates with stakeholders across the value-chain in researching and implementing innovative ways to meet them.

As aviation represents around 2% of global man-made CO<sub>2</sub> emissions, Airbus recognises its role in reducing the global environmental footprint of the sector and the importance of staying in line with the global 2°C trajectory. This is done through continually seeking to reduce the carbon intensity of Airbus' industrial operations and working together with Airbus' suppliers, industry and government stakeholders in its aim to find sustainable solutions to reduce the environmental impact of its products, deliver its ambitious sectorial emission reduction goals, as well as preparing adaptation to the effects of climate change on its operations.

One of these challenges is the elimination of substances from its products and processes that may pose a risk to human health or the environment, which will be addressed later in this section.

### 1. Environmental Management at Airbus

"Shaping our future" means that Airbus develops products and services taking into consideration current and foreseeable future environmental challenges for future generations and with long-term value creation in mind. Incorporating environmental values into its core policy not only improves the management of operational business risks and opportunities but also enhances the long-term sustainability of its business.

Alongside the Company's environmental policy in pursuit of eco-efficiency, Airbus has developed an aspirational long-term ambition for 2050 setting the direction for the Company regarding environmental matters, providing a framework to set up concrete environmental objectives for the short- and mid-term.

The Company's **2050 Ambition** covers the three following complementary directions:

- operating Airbus sites without impact on climate change by eliminating greenhouse gas emissions, with zero air and water emissions, zero waste to landfill and minimal natural resources consumption;
- delivering products which provide maximised value to customers whilst meeting expectations of society through minimised impact on climate, air emissions and noise, management of substances of concern aiming at their elimination and maximised reliability, throughout the product lifecycle;

- engaging the supply chain in the Company's ambitious objectives.

In 2015, an Environment Steering Committee was created to manage all matters related to the environment. The Steering Committee meets four times a year and is composed of the heads of Environment for Airbus Commercial Aircraft, Helicopters and Defence and Space, as well as a representative from the R&S department. Its role is to develop and define the environmental policy and associated objectives and agree on a common approach for the management of the environment throughout the Company.

Airbus has put in place a robust **Environmental Management System (EMS)** centrally and within its Divisions. One of the functions of the Airbus EMS is to track the enhancement of its environmental performance as it includes identifying, managing, monitoring and controlling an organisation's environmental issues. Airbus' EMS is guided by the latest version of the international environmental standard, ISO 14001: 2015 version. The 2015 version has a broader scope than previous standards, and Airbus was among the first aerospace companies to adopt it.

Environmental risks and opportunities are managed following the Company's ERM process. Risks and Opportunities are reported quarterly to the Executive Committee of each Division and top risks are consolidated at Company level to be brought to the attention of Airbus' top management.

On an annual basis, Airbus undertakes an extensive exercise to collect, consolidate and report the Company's environmental performance data. Quantitative data is gathered – energy and water consumption, CO<sub>2</sub> and VOC emissions and waste generation – as well as qualitative data – certification, incidents, activities on site. This enables Airbus to measure its environmental impact, follow its performance and communicate information on environmental matters to internal and external stakeholders. The Company's commitment to eco-efficiency is demonstrated through its transparent reporting.

In the future, the reporting of environmental indicators will include relevant categories of Scope 3 emissions for Airbus' operations. This will provide greater understanding of the impact on the environment of activities under Airbus' control.

#### Working in Cooperation

Airbus understands the importance of working together with other stakeholders to find solutions.

Engagement within the International Aerospace Environmental Group (IAEG). Airbus is a Founding Member of IAEG and participates in different areas of IAEG, such as greenhouse gas emissions, substances management, substitution technologies and supply chain to share practises and promote development of global standards for implementation of environmental requirements in the aerospace industry.

## Information on Airbus Activities

### 1.1 Presentation of the Company

Airbus is an active board member of the Air Transport Action Group (ATAG) which sets goals and mobilises action on strategic aviation issues such as climate change through involvement throughout the industry (*i.e.* with other manufacturers, airlines, airports, air traffic management).

Aviation is a global industry and requires global solutions. ICAO, a specialised agency of the UN, has a proven track record of delivering robust aviation environmental standards and guidance (*i.e.* air quality, noise, CO<sub>2</sub>). Airbus has shown a long-term commitment to support the need for global civil aviation governance, with ICAO as its corner-stone, working together with stakeholders across the aviation industry and with the relevant governmental agencies.

Airbus, with the rest of the aviation industry, has supported the ICAO agreements in 2016 on the CO<sub>2</sub> standard and Carbon Offsetting & Reduction Scheme for Aviation (CORSIA), the new international carbon offsetting scheme for aviation.

Airbus continues to proactively support emissions and noise reduction once its aircraft go into service. This could be through fuel efficiency services, weight saving projects, retrofits (*i.e.* sharklets) and ground operations (*i.e.* eTaxi). In 2015, Airbus launched the Sustainable Aviation Engagement Programme, establishing long-term cooperations with various Airbus operators to offer ways to reduce their environmental footprint.

Clean Sky was at the time of its launch the largest European research programme funded by the EU, developing innovative, cutting-edge technology aimed at reducing CO<sub>2</sub>, gas emissions and noise levels produced by aircraft. As part of this programme, Airbus developed the Bluecopter concept, which demonstrates a number of fuel saving and noise reduction technologies. It is already the quietest helicopter worldwide in its category, and also the first to reach the noise category A+. The demonstrator underwent a stringent flight test campaign until April 2017 in order to validate the effectiveness of the technologies developed in the frame of the CleanSky programme.

In September 2017, the Company used a modified A340 aircraft to test the laminar flow concept developed by Clean Sky. The BLADE project aims to reduce wing friction by 50% and reduce CO<sub>2</sub> emissions by up to 5%.

## 2. Environmental Concerns

### Regulated substances across its products' lifecycles

Aerospace manufacturing, operations and maintenance rely on certain regulated substances to achieve a high level of quality, safety and reliability accounting for lengthy product lifecycles. Some of these substances are or may in the future be classified as substances that may pose a risk to human health or the environment. These type of risks depend on many factors such as the category of classification, but also the operational use of these substances under applicable laws/regulations laying down occupational exposure limits, and the lifecycle stage of the products.

If a substance not yet identified is classified in the future as one that may pose a risk to human health or the environment, this may give rise to substantial costs for Airbus to manage it, including, for example, research and development (whether alone or in cooperation with other stakeholders) of suitable alternatives, testing, qualification and certification costs. Any reputational risk and potential claim against Airbus that may result will also need to be managed.

Airbus continues in its activity (also in cooperation with industry stakeholders) to identify new technologies and solutions that avoid use of substances classified as posing a risk to human health or the environment, whilst satisfying airworthiness, certification and performance requirements. Airbus also engages with suppliers to promote the adoption of a similar approach through regular communication and, more widely, by working together with the aerospace industry to promote worldwide harmonisation of regulations and ways of working, taking into account the sector's safety and lifecycle specificities.

Airbus identifies, tracks and declares regulated substances. The Company has already substituted certain substances of concern or developed replacement technology where suitable alternatives have been found, such as some ozone-depleting substances (ODS), fluorinated gases, or substances of very high concern (SVHCs) under the European regulation REACH. On top of all applicable regulatory requirements, more than 100 substances have been targeted by Airbus for substitution and the Company is always looking for new solutions. For example, Airbus Commercial Aircraft launched the Airbus chromate free project in 2006. The project has so far delivered substitution solutions for a considerable number of usages and continues efforts to substitute the remaining ones. One of the first steps was to deploy chromate-free surface protection systems, with among others, operational changes and replacement within Airbus' production lines. Over 100 suppliers are now "qualified" to use chromate-free pickling before anodisation.

Within IAEG, Airbus contributed to the creation of the IAEG "Aerospace and Defence Declarable Substances List" (AD-DSL) and the associated declaration standard (IPC-1754). The AD-DSL provides an initial common list of chemicals/substances identified and reviewed by IAEG as used within the aerospace and defence supply chain and thus will make it easier to work with regulatory agencies to appropriately manage regulated substances and chemicals used in manufacturing.

Surface modification by laser is a new technology developed by Defence and Space to replace the use of substances for some processes, notably for pre-treatment before bonding. This technology is now available for some Space Systems applications and is planned to be implemented into the serial production of flight hardware for New Generation Synthetic Aperture Radar satellites (NGSAR).