

- the recently agreed ICAO CORSIA will also play an important role in achieving CNG from 2020.

For the ambitious long-term 2050 target, clearly Airbus and the wider industry do not have all the answers today. Such significant reductions will require disruptive approaches in technology (*i.e.* hybrid electric), significant quantities of low carbon fuels, innovative ways of operating the aircraft (eTaxi, formation flight) and sustainable ways to offset emissions.

In reaching this ambition Airbus is working on a wide range of innovative technologies that have the potential for significant environmental benefits:

- propulsion integration: from advanced turbofans to hybrid distributed propulsion (*i.e.* electrification);
- aerodynamics: from advanced wingtip devices to natural and hybrid laminar flow;
- structures: from innovative materials to bionic structures;
- systems & cabin: from paperless/wireless to more electrical systems;
- operations: from noise to climate-optimised trajectories;
- manufacturing: from direct printing to 3-D printing;
- aircraft configuration: from integrated airplanes to disruptive configurations.

Electrification and hybridisation can bring significant benefits in addressing CO<sub>2</sub>, noise and NO<sub>x</sub> emissions. Airbus is driving a step change in air vehicle performance, first through small, short-range vertical take-off and landing (VTOL) urban air mobility demonstrator projects like Vahana and CityAirbus. In the longer term Airbus will also look at larger commercial aircraft.

Airbus' engagement also extends to promoting the commercialisation of sustainable aviation fuels. For example, in order to make a step towards regular distribution of BioJet, Airbus and Total are working in cooperation to use sustainable fuels on ferry flights from Toulouse to Hong Kong. A biofuel delivery platform has been set-up and is in service in Toulouse.

Recyclability and waste management are important topics that Airbus is tackling in cooperation with other entities. With TARMAC Aerosave, a joint venture between Airbus, SNECMA and Suez, more than 90% of an aircraft weight is today recycled or re-used through a selective dismantling (reverse manufacturing) process. As airplanes manufactured with large volumes of composites start retiring in the next few decades, Airbus is working in cooperation with several specialist companies involved in carbon fibre recycling, as part of an industry goal to determine the best processes and uses for recycled and reused carbon fibre materials. Airbus is also investigating with certain operators innovative solutions to improve the in-flight cabin waste management.

#### d. Responsible Defence and Space Products

Airbus works together with states, international organisations and customers to create better defence solutions for a safer and more prosperous world. Its military aircraft, Earth observation satellites and security technologies help protect freedom and democratic values by enabling governments to guarantee their sovereignty and combat changing terrorism threats and cybercrime.

It is one of Airbus' aims to support the EU/NATO governments in their efforts to make the world a safer place. To fulfil their mission to guarantee sovereignty, security and human rights, these nations require equipment and defence systems that they themselves define. Airbus supports the EU/NATO governments – which constitute the majority of Airbus' customer base – in this task by supplying the necessary equipment.

Airbus defence technologies can also be used to solve societal challenges. More ways are being explored for observation or communication satellites to contribute to solving some global challenges such as climate change, fast and reliable internet connection or security. Recent projects include:

- Sentinel-5 Precursor, which is part of the joint European Commission–European Space Agency global monitoring programme Copernicus, aims to acquire continuous and accurate Earth observation data and provide services to improve the management of the environment, understand and mitigate the effects of climate change, and ensure civil security;
- Spationav is the coastal protection project of Signalis France, ensuring maritime security in France. Its mission is to protect human life, the coastal environment and French national interests while covering 6,000 kilometres of coastline with 5,000 ships tracked each minute. Spationav is counteracting illegal activities such as smuggling and terrorism;
- the Global Earth Observation Challenge organised by Defence and Space rewarded in October 2017, six start-ups that innovate and develop new applications primarily based on Airbus' satellite data. Among them, two projects were linked to monitor environmental impacts: Ozium (Australia) creates new landscape intelligence by fusing a variety of remote sensing data to identify where the environmental risks and opportunities occurred in the past, where they are today, and project where they will occur in the future; Kermap (France) uses satellite imagery to support the ecological transition of cities;
- TeSeR is the next EU project to clean up space, which is led by Airbus. Technology for Self-Removal of Spacecraft (TeSeR) aims to reduce the risk of spacecraft colliding with debris in space and provide a sustainable space environment for future generations;
- the OneWeb Satellites JV is building a communications network with a constellation of low Earth orbit (LEO) satellites, with a goal of enabling access to billions of people around the world. With more than 7 terabits per second of new capacity, it aims to transparently extend the networks of mobile operators and ISP's to serve new coverage areas, bringing voice and data access to consumers, businesses, schools, healthcare institutions and other end users.

Finally, the Airbus Foundation, which will be discussed later in this chapter, is multiplying partnerships in order to leverage Airbus' know-how and technologies to be applied to the humanitarian sector, with UAVs, satellite imagery and decontamination projects in particular.