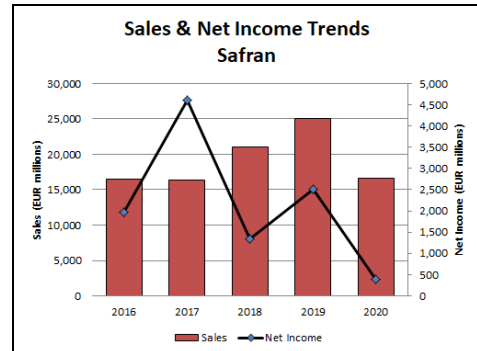


# Safran

## Outlook

- Safran's consolidated sales for 2020 were EUR16.6 billion, down 34 percent from EUR25.1 billion in 2019
- The company reported net income of EUR386 million, compared to EUR2.5 billion for 2019
- Company cut its workforce by 17 percent in response to pandemic, from 95,400 to 78,900 by the end of 2020
- French stimulus helped to preserve operations and invested in emerging technologies in electric and hydrogen power



## Headquarters

Safran  
2 Boulevard du Général Martial Valin  
75724 Paris, France  
Telephone: + 33 1 40 60 80 80  
Website: <https://www.safran-group.com/>

Safran was created in May 2005 through the merger of Snecma and Sagem. The combined company now operates in two core businesses: Aerospace and Defense.

Snecma (Société National d'Étude et de Construction de Moteurs d'Aviation) was formed on August 29, 1945, from the merger of Gnome et Rhone, Société Anonyme des Moteurs RENAULT pour l'Aviation, Société Général de Mécanique et d'Aviation, and Groupe d'Étude des Moteurs à Huile Lourde. Snecma is France's largest and most important manufacturer of gas

turbine engines for fixed-wing applications and is one of the largest aero-engine manufacturers in the Western world.

Aside from the production of gas turbine engines and machines, Snecma is involved in space systems, landing gears/brakes, thrust reversers/nacelles, components for aircraft and space propulsion systems, precision mechanics and machining of aircraft engine parts, and aircraft engine repair and maintenance.

Sagem was founded in 1924 in Paris as a manufacturer of electrical components, power distribution equipment, cameras, projectors, and military equipment. Up until the merger, Sagem was focused primarily on telephony, consumer electronics, and defense electronics.

In 2016, the firm grouped its various operations under a single brand and logo – Safran.

## Structure and Personnel

Olivier Andriès  
Chief Executive Officer  
Bernard Delpit  
Group Deputy CEO and Chief Financial Officer  
Stéphane Cueille  
Executive Vice President, R&T, Innovation  
Stéphane Dubois  
Executive Vice President, Human Resources  
Bruno Durand  
Executive Vice President, Industrial, Purchasing and Performance

Kate Philipps  
Executive Vice President, Communications  
Céleste Thomasson  
Corporate Secretary  
Frédéric Verger  
Executive Vice President, Chief Digital Officer and Chief Information Officer  
Alexandre Ziegler  
Executive Vice President, International and Public Affairs  
Jean-Paul Alary  
CEO, Safran Aircraft Engines

## Safran

Vincent Caro  
CEO, Safran Nacelles  
Cédric Goubet  
CEO, Safran Landing Systems  
Norman Jordan  
CEO, Safran Cabin  
Vincent Mascré  
CEO, Safran Seats

Franck Saudo  
CEO, Safran Helicopter Engines  
Alain Sauret  
CEO, Safran Electrical & Power  
Martin Sion  
CEO, Safran Electronics & Defense  
Sébastien Weber  
CEO, Safran Aerosystems

## Product Area

In aerospace and defense, Safran companies are major Tier 1 and Tier 2 suppliers of aircraft equipment and systems, including aircraft and rocket engines, engine components, thrust reversers and nacelles, landing and braking systems, unmanned air vehicles (UAVs), security systems, and defense electronics. The organization is currently structured as follows (percent ownership indicated):

1. Aerospace Propulsion
  - 1.1 Safran Aircraft Engines
    - 1.1.1 Commercial Engines Division
    - 1.1.2 Military Engines Division
    - 1.1.3 Space Engines
    - 1.1.4 Services
  - 1.2 Safran Helicopter Engines
    - 1.2.1 Safran Power Units
  - 1.3 Safran Aero Boosters (67 percent)
  - 1.4 Safran Transmission Systems
  - 1.5 ArianeGroup (50 percent)
  - 1.6 Safran Ceramics
2. Aircraft Equipment, Defense, and Aerosystems
  - 2.1 Safran Landing Systems
  - 2.2 Safran Electrical & Power
    - 2.2.1 Safran Engineering Services
  - 2.3 Safran Nacelles
  - 2.4 Safran Electronics & Defense
    - 2.4.1 Avionics
    - 2.4.2 Defense
  - 2.5 Safran Aerosystems
3. Aircraft Interiors
  - 3.1 Safran Cabin
  - 3.2 Safran Seats
  - 3.3 Safran Passenger Solutions

### Aerospace Propulsion

Safran Aircraft Engines (formerly Snecma) is one of the world's leading manufacturers of aircraft engines. This operation designs, develops, manufactures, and markets both commercial and military jet engines. Commercial engine orders account for 70 percent of total orders.

**Commercial Engines Division.** Products include the CFM56, GE90, and CF6 engines.

**Military Engines Division.** Produces turbojets and turboprops for combat, training, and transport aircraft.

**Space Engines.** Produces a range of plasma thrusters and propulsion systems for satellites.

**Services.** Snecma Services provides repair and maintenance services for a wide range of commercial and military aircraft engines, using state-of-the-art technologies.

Safran Helicopter Engines (formerly Turbomeca) produces gas turbines for helicopters for both land and marine applications. Safran Power Units (Microturbo) supplies jet engines for missiles, target drones, and UAVs.

Safran Aero Boosters (formerly Techspace Aero) teams with aerospace manufacturers to design, develop, produce, test, and maintain components for both aircraft and space propulsion systems. The company is jointly owned by Safran (67 percent), the Federal Investment Company (2 percent), and the Walloon region of Belgium (31 percent). This company is active throughout the three core units of the Snecma Group.

Safran Transmission Systems (Hispano-Suiza) is one of the world's leading suppliers of power transmission systems for gas turbine engines and is a major producer of thrust reversers for commercial transport aircraft. In the latter field, it developed the innovative pivoting door reversers for the CFM International CFM56-powered Airbus A320, working with Rohr of the United States. Safran Transmission Systems' skill base covers a wide range of products, including nacelles, the propeller gearbox for the Dassault Atlantique ATL2's Tyne engines, and ejection seats under license from Martin-Baker. The business entity is expanding its non-aerospace activities to include robotics for the French electricity utility EdF, turrets for light-armored vehicles, and high-speed diesel engine turbochargers for rail and naval applications.

Ariane Group. Formerly called Airbus Safran Launchers, this is a 50-50 joint venture between Airbus

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Group and Safran that focuses on supporting the Ariane 5 and developing the new Ariane 6.

Safran Ceramics. This is Safran's center of excellence for high-temperature ceramic technologies and materials.

### Aircraft Equipment, Defense, and Aerosystems

Safran Landing Systems (Messier-Bugatti-Dowty) designs and produces complete landing systems for both commercial and military aircraft, including landing gears, braking systems, wheels, and brakes. Messier-Bugatti has established three specialized subsidiaries to repair medium-duty landing gears and hydraulic equipment: A-Pro in the U.S., S-Pro in Asia, and Hydrep for Europe and Africa. Messier-Bugatti-Dowty is also a participant in the Boeing 777, IPTN N-250, Franco-German Tiger, and Airbus A330 and A340 programs.

Safran Electrical & Power (Labinal Power Systems) produces small and medium-size gas turbines, electrical connectors, and equipment for the aerospace, defense, and electronics industries.

Safran Nacelles (Aircelle) develops, designs, and produces nacelle/thrust reverser systems and aerostructures and jet engine composite parts.

Safran Electronics & Defense (formerly Sagem Défense Sécurité) operates in the civil and military avionics and defense electronics markets:

**Avionics.** Avionics provides products and services for avionics, navigation, mission planning systems,

helicopter flight control, and aircraft modernization programs. These are provided through four product lines: inertial navigation, flight control systems, guidance and seeker systems, and onboard information systems.

**Defense.** This unit designs, develops, and produces optronics and sights, soldier modernization equipment, navigation and sensor systems, seekers and guidance systems, and drone systems.

Safran Aerosystems. This division develops and manufactures aircraft electrical distribution and power generation systems, lighting solutions, interconnection solutions, safety systems, oxygen systems, fluid, water and waste management systems, in-flight entertainment systems, remote measurement and communication systems, and fuel systems.

### Aircraft Interiors

Safran Cabin. Produces cabin interiors for regional, medium-haul, long-haul, business, and military aircraft. Integrated cabins, overhead bins, galleys, on-board service equipment, lavatories, crew rest areas, and freight containers.

Safran Seats. Manufactures passenger seats for economy, premium economy, business, and first class; technical seats for flight-deck and cabin crew; and helicopter seats.

Safran Passenger Solutions. This unit handles complex cabin equipment such as water and waste management systems and in-flight entertainment systems.

## Facilities

Some of Safran's major subsidiaries are located at the following addresses. For full listing please visit <https://www.safran-cabin.com/implantation>

### Propulsion

Safran Aircraft Engines, Route Henri Auguste Desbrières, BP 81, 91003 Evry, France. Telephone: + 33 01 69 87 92 60. Formerly Snecma, this division has production facilities at Villaroche, Vernon, Gennevilliers, Bordeaux, Le Creusot, and Istres.

Website: <https://www.safran-aircraft-engines.com>

Safran Aero Boosters, Route de Liers 121, B-4041 Herstal (Milmort), Belgium. Telephone: + 32 0 4 278 81 11.

Website: <https://www.safran-aero-boosters.com>

Safran Helicopter Engines, Avenue Szydlowski, 64511 Bordes Cedex, France. Telephone: + 33 0 5 59 12 50 00.

Website: <https://www.safran-helicopter-engines.com>

Safran Ceramics, Rue de Touban BP 90053, 33185 Le Haillan Cedex, France. Telephone: + 33 0 5 56 55 30 00.

### Aircraft Equipment, Defense, and Aerosystems

Safran Transmission Systems, 18, Blvd Louis Seguin, 92707 Colombes 15, France. Telephone: + 33 1 41 30 50 10.

Website: <https://www.safran-transmission-systems.com>

Safran Landing Systems, 7, rue Général Valérie André, 78140 Vélizy-Villacoublay, France. Messier-Bugatti-Dowty and its subsidiaries also have facilities in Bidos and Molsheim. Additional facilities are in the U.K., France, and Canada.

Website: <https://www.safran-landing-systems.com>

## Safran

Safran Electrical & Power, Parc d'activité d'Andromède 1, rue Louis Blériot, 31702 Blagnac, France.

Website: <https://www.safran-electrical-power.com>

Safran USA Inc, 700 South Washington St, Suite 320, Alexandria, VA 22314, USA. Telephone: + 1 (703) 351-9898.

Website: <https://www.safran-usa.com>

Safran Nacelles, Route du Pont VIII, BP 91, 76700 Gonfreville l'Orcher, France. This operation has additional locations throughout France and in the U.K.

Website: <https://www.safran-nacelles.com>

Safran Ventilation Systems Blagnac, 10, place Marcel Dassault ZAC du Grand Noble BP53 31702 Blagnac Cedex.

Website: <https://www.safran-ventilation-systems.com>

Safran Electronics & Defense, 72-76 rue Henry Farman, Paris, France. Telephone: + 33 01 40 70 63 63.

Website: <https://www.safran-electronics-defense.com>

Safran Electronics & Defense, Avionics USA, 2802 Safran Dr, Grand Prairie, TX 75052, USA. Telephone: + 1 (972) 314-3600. Produces helicopter autopilot systems, airplane and helicopter flight control components, and aircraft condition and monitoring systems.

Safran Vectronix AG, Max-Schmidheiny-Strasse 202, 9435 Heerbrugg, Switzerland. Telephone: + 41 71 726 72 00. Produces optical rangefinders.

Website: <https://www.safran-vectronix.ch>

Safran Electronics & Defense Canada, 2000 Fisher Dr, Box 4525, K9J 7B1 Peterborough, Ontario, Canada. Telephone: + 1 (705) 743-6903. Products include electronic engine controllers, propeller de-icers, landing gear controllers, electronic control modules, and data collection units.

Safran Aerosystems – Plaisir, 61 rue Pierre Curie CS20001 78373 France. + 33 1 61 34 23 23

Website: <https://www.safran-aerosystems.com/>

### Aircraft Interiors

Safran Cabin - Huntington Beach, 17311 Nichols Ln, Huntington Beach, CA 92647 USA. Telephone: + 1 (714) 861-7300. This is the headquarters for the division.

Website: <https://www.safran-cabin.com>

Safran Seats, 61 Rue Pierre Curie, 78373 Plaisir, France. Headquarters.

Website: <https://www.safran-seats.com/>

Safran Seats USA, 2000 Zodiac Dr, Gainesville, TX 76240 USA. Telephone: + 1 (940) 668-4100

## Corporate Overview

Safran is a Tier I supplier of systems and equipment in the aerospace and defense markets. Comprising a number of subsidiaries, Safran produces aerospace components, aviation gas turbine engines, avionics, rocket and missile propulsion, and defense electronics.

### New Products and Services

**ENGINEUS.** In November 2020, Bye Aerospace selected Safran Electrical & Power to provide its announced ENGINEUS electric smart motors for the eFlyer 2 & eFlyer 4 aircraft. Bye Aerospace is FAA-certifying the two-seat, all-electric eFlyer 2 for the professional flight training mission and the four-seat eFlyer 4 for air-taxi and advanced training uses.

Earlier, in October 2018, Safran Electrical & Power presented the first electric motor from its ENGINEUS range designed for future hybrid and electric aircraft. The ENGINEUS 45 motor has a continuous power of 45kW. It has built-in, dedicated control electronics with an energy efficiency of over 94 percent. It also has an excellent power-to-weight ratio of 2.5kW/kilogram at

2,500rpm. The ENGINEUS product line will eventually include a range of electric motors with a power output of up to 500kW. In October 2019, two ENGINEUS 45 motor versions were installed on the VoltAero Cassio 1 hybrid-electric testbed aircraft.

**Euroflir 410.** In October 2020, Safran Electronics & Defense won a contract from Airbus Helicopters to supply new-generation Euroflir 410 observation systems for ten NH90-TTH Caiman helicopters deployed by French special forces. Ten NH90 TTH Standard 2 helicopters will be delivered to the 4th Special Forces Helicopter Regiment starting in 2025 and will gradually replace the French Army's Puma helicopters.

In September 2020, the Euroflir 410 was selected to equip four H160 helicopters for the French Navy. The first H160 helicopters outfitted with the Euroflir 410 will be delivered in 2022.

In May 2020, Héli-Union selected the Euroflir 410 to refit a dozen Dauphin N3 helicopters. These aircraft, modified to meet the operational needs of the French

**Safran**

Navy, will replace currently used Alouette III. The first Dauphin N3 fitted with a Euroflir 410 will be delivered in the summer of 2021.

**AS2 Components.** In December 2019, Aerion Supersonic selected two Safran companies to provide systems for the AS2 supersonic business jet. Safran Landing Systems will design the complete braking and landing gear system, from main and nose landing gears to wheels and brakes, including extension/retraction, monitoring, and steering systems, at their engineering centers in Canada and France. Safran Nacelles will design the AS2 nacelles – including the engines' inlets, fan cowl doors, and thrust reverser – in France. The 12-passenger business jet is scheduled to begin flight testing in 2024.

**WZ16 Certified.** In October 2019, Safran Helicopter Engines and Aero Engine Corporation of China (AECC) announced the certification of WZ16 turboshaft with the Civil Aviation Administration of China (CAAC). Installed in the AVIC AC352 helicopter, the WZ16 is the first jointly developed aero engine to be entirely certified by Chinese authorities, the company said. Also known as the Ardiden 3C, the WZ16 has been jointly developed and built by Safran Helicopter Engines with Harbin Dongan Engine and Hunan Aerospace Propulsion Research Institute (HAPRI) – both parts of the AECC consortium. The Ardiden 3C was certified by EASA in April 2018.

**Australian Submarine Components.** In October 2019, Lockheed Martin Australia awarded Safran Electronics & Defense Australasia Pty Ltd a \$36.8 million contract to design three combat system components for Australia's Future Submarine Program. Under the contract, Safran will deliver the preliminary and detailed designs for the combat system's optronics search and attack mast, navigation radar, and navigation data distribution components. The effort will run through mid-2023.

**SpaceJet Interiors.** In June 2019, Safran Cabin announced it is providing full scale integrated interiors for the Mitsubishi SpaceJet family of regional jets. These integrated interiors include galleys, lavatories, overhead bins, passenger service units, sidewalls, ceiling panels, and other components.

**T-7A APU.** In June 2019, Safran Electrical & Power and Saab signed an agreement to supply the Auxiliary Power System for the Boeing/Saab T-7A Red Hawk (formerly T-X) military training aircraft for the U.S. Air Force. This system will be manufactured at Safran's factory in Pitstone, U.K., and then delivered to Saab.

**Plant Expansion/Organization Update**

**Washington Cabin Facility Closed.** In October 2020, Safran Cabin announced it would close its Bellingham, Washington, facility by the end of 2021 due to the pandemic-related decline in demand. The facility produced overhead storage compartments, ceiling panels, sidewalls, and class dividers. Prior to the pandemic, the operation employed 600.

**Tarnos Campus Opened.** In February 2020, Safran Helicopter Engines opened a EUR50 million, 355,000-square-foot industrial campus in Tarnos, southwest France. Tarnos is mainly dedicated to the support of in-service helicopter engines and MRO activities. The CAP 2020 campus will act as the hub for the company's global support network. The location employs 1,550 employees and is the manufacturer's second largest facility. Construction of the new facility began in 2015.

**French R&D Centers.** In October 2019, Safran Electronics & Defense broke ground on a new EUR20 million research and development center in Valence, France. The center will concentrate its research and development work on developing more electric aircraft and new technologies for highly integrated electronics. The new 4,500 square meters (48,450 sq ft) facility should be completed by 2021.

In September 2019, Safran Landing Systems broke ground on a new, EUR4 million research lab near Paris. The new 2,000 square meters (21,600 sq ft) test laboratory, dubbed ExceLAB, will develop landing and braking systems for future aircraft. The lab should be operational in 2021.

**Segments Reorganized.** In July 2019, Safran announced it would adopt a new organizational structure as part of its assimilation of the Zodiac Aerospace acquisition. The Group's activities are now organized into three operating segments: Aerospace Propulsion; Aircraft Equipment, Defense, and Aerosystems; and Aircraft Interiors. See **Product Area** for the current hierarchy.

**Carbon Brake Plant.** In July 2019, Safran began construction of a new aircraft carbon brake plant in Feyzin, near Lyon, France. This new plant will strengthen the production capacity of Safran Landing Systems.

**Turbine Blades Research Center.** In February 2019, Safran opened its new research center for advanced turbine blades at its plant in Gennevilliers, near Paris. The 3,000 square meters (32,400 sq ft) advanced turbine blades research facility is part of the corporate Research & Technology center, Safran Tech.

## Safran

**Indian LEAP Engine Component Plant.** In February 2019, Safran Aircraft Engines announced it would build a new plant in Hyderabad, India, to make parts for the LEAP turbofan engine from CFM International. Safran will invest EUR36 million in this new facility, which will cover 13,000 square meters (140,400 sq ft), including 8,000 square meters (86,400 sq ft) of workshops. The facility was expected to be producing components in early 2020, with full production anticipated by 2023.

**Hamburg Expansion.** In October 2018, Safran Nacelles opened a new plant in Hamburg, Germany, dedicated to the integration of the engine nacelle on the Airbus A320neo. Safran invested nearly EUR10 million in the 8,000-square-meter plant, which will ultimately employ about 100 people. By 2020, plans were for the plant to assemble and integrate some 400 nacelles per year on CFM International's LEAP-1A engines powering the Airbus A320neo.

**Polish Expansion.** In July 2018, a new Safran Aircraft Engines Poland plant was inaugurated. This new facility will make low-pressure turbine blades for the LEAP turbofan engine from CFM International. Safran invested some EUR48 million in this new 8,000-square-meter facility. The new plant delivered its first parts in July 2017. The operation employs over 200.

**Mexico Expansion.** In February 2018, Safran and Albany opened their third joint manufacturing plant to make composite parts for the LEAP aircraft engine in Mexico. This joint plant is similar to and complements the two existing plants in Rochester, New Hampshire (United States) and Commercy (eastern France), inaugurated in 2014. The new plant involved a total investment of about \$100 million and delivered its first parts in October 2017, primarily making 3D woven composite fan blades for the LEAP engine from CFM International. new plant in Mexico currently has nearly 230 employees, operating in a facility with 31,000 square meters (334,800 sq ft) of floor space.

**Sarasota Expansion.** In October 2017, Safran Electrical & Power completed the expansion of its facility in Sarasota, Florida. The development of Safran's Sarasota facility began in 2014 with the purchase of the Eaton business in Sarasota. The 125,000-square-foot facility focuses on the manufacturing of switches and circuit breakers as well as contactor and maintenance, repair, and overhaul (MRO) activities for aircraft electrical equipment, particularly backup systems such as ram air turbines (RATs) and air-driven generators (ADGs).

**Open Rotor Test Program.** In October 2017, Safran celebrated the successful first ground tests of the Open Rotor demonstrator engine in Istres, southern

France. The engine, which was developed through Europe's Clean Sky research program, is a strategic focus in Safran's research and technology efforts as well as a key part of Safran's plans to develop a propulsion system meeting aircraft manufacturers' future needs toward 2030.

**Safran Groups Companies Under a Single Brand.** In May 2016, Safran changed its companies' names and its visual identity to bolster the group's position as a global industrial leader and accelerate its international growth. All company names now include the Safran brand name, along with a description of their business:

Aircelle - Safran Nacelles

Herakles - Safran Ceramics

Hispano-Suiza - Safran Transmission Systems

Labinal Power Systems - Safran Electrical & Power

Messier-Bugatti-Dowty - Safran Landing Systems

Morpho - Safran Identity & Security

Sagem - Safran Electronics & Defense

Snecma - Safran Aircraft Engines

Techspace Aero - Safran Aero Boosters

Turbomeca - Safran Helicopter Engines

Space Launchers operations have been folded into the ArianeGroup joint venture.

## Mergers/Acquisitions/Divestitures

**Rockwell Collins Unit Acquired.** In February 2019, Safran completed its acquisition of Rockwell Collins' actuators, pilot controls, and special products business. These operations generated sales of \$159 million in 2018, with 575 employees at four facilities in North America, mainly in Irvine, California, in the U.S. and in Mexicali, Mexico. The operations will be integrated with the electrical actuation and flight control business lines of Safran Electronic & Defense and the recently acquired Zodiac Aerospace. The sale of the unit was part of United Technologies' effort to clear anti-trust concerns over its Rockwell Collins acquisition. The deal was first announced in September 2018.

**OXIS Energy Stake.** In January 2019, Safran Corporate Ventures acquired a stake in OXIS Energy, a developer of lithium sulfur cell technology for high energy density battery systems. Safran Corporate Ventures is participating in a GBP7 million round of fresh funding for the firm. OXIS intends to focus on the

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aviation, defense, and heavy electric vehicles (such as buses and trucks) markets.

Website: <https://oxisenergy.com/>

**Neelogy Acquired.** In July 2018, Safran Electrical & Power acquired Neelogy, a French start-up that has developed technology for electrical current sensors that are designed to the needs of the more electric aircraft as well as hybrid and totally electric propulsion.

**Safran Acquires Zodiac, Finally.** In February 2018, Safran took control of Zodiac Aerospace, significantly expanding its aircraft equipment activities. The merger followed almost a year of changes related to the deal. In May 2017, Safran withdrew its earlier acquisition agreement for Zodiac and issued a new one, reducing its offer to \$7.7 billion. The change occurred after weeks of Zodiac's share price weakening amid further problems at its seating and cabin operations. Originally, in January 2016, Safran agreed to acquire Zodiac Aerospace in a deal valued at \$9.1 billion. The revised deal was approved by the EU in December 2017. Zodiac Aerospace has 32,500 employees and generated sales of EUR5.1 billion for its fiscal year ended August 31, 2017.

The combined entity merges Safran's capabilities in landing gear, wheels and brakes, nacelles, power systems, actuation systems, and avionics with Zodiac Aerospace's leading positions in seats; cabin interiors; power distribution; lighting; fuel, oxygen, and fluid systems; and safety equipment. The group is the third-largest aerospace supplier after GE Aviation and Raytheon Technologies with its Pratt & Whitney and Collins Aerospace Systems divisions.

**Hexel Acquires Structil.** In October 2017, Safran Ceramics, along with co-shareholder Mitsubishi Chemical Corporation, sold their jointly owned company, Structil SA, to Hexcel for an undisclosed amount. Structil become part of Safran when the latter acquired SNPE's energetic materials business in 2011. Structil designs, produces, and sells structural adhesives and high-performance carbon-fiber composite materials for aerospace and other high-tech industries. The company has annual sales of about EUR21 million. The deal was originally announced in June 2017.

**Security Unit Sold.** In May 2017, Advent International acquired Safran Identity & Security (Morpho) in a deal valued at EUR2.4 billion. The operation has been merged with Advent's Oberthur Technologies into a new firm, IDEMIA. The new entity has annual revenues of nearly EUR3 billion and employs over 14,000 workers.

**Morpho Detection Sold.** In April 2016, Safran agreed to sell the U.S.-based Morpho Detection

subsidiary and other detection-related activities to Smiths Group plc for \$710 million. Headquartered in Newark, California, Morpho Detection provides solutions for detecting and identifying chemical, biological, radiological, nuclear, and explosive (CBRNE) threats as well as other illicit items to improve security at airports, borders, and sensitive sites and events. Morpho Detection will become part of Smiths Group's Detection segment. The deal was completed in April 2017.

**Hydrep Acquisition.** In July 2014, Messier-Bugatti-Dowty signed an agreement to acquire Sabena technics' 50 percent stake in their 50-50 joint company, Hydrep. Based in Dinard, France, Hydrep employs 100 people and provides repair services for landing gear on regional and business airplanes and helicopters. The joint venture was originally formed in 1991. Terms were not announced.

**Aerospace Propulsion Products Acquired.** In May 2014, Safran Ceramics acquired 70 percent of Aerospace Propulsion Products (APP), a company held by the TNO Group. APP produces igniters for space engines. The operation is based in Klundert, Netherlands, and has 38 employees. Terms were not announced.

**Eaton Units Acquired.** In May 2014, Safran acquired Eaton's Aerospace Power Distribution Management Solutions and Integrated Cockpit Solutions businesses for \$270 million. The businesses employ approximately 350 people at manufacturing facilities in Costa Mesa, California, and Sarasota, Florida. The businesses produce illuminated switches, cockpit panel assemblies, pilot controls, and passenger safety unit latches as well as circuit protection, power distribution and switch components, and subsystems for aerospace and industrial applications. The Aerospace Power Distribution Management Solutions activities will be consolidated within the Aircraft Equipment business. The Integrated Cockpit Solutions activities will be consolidated within the Defense business. Sales were approximately \$102 million in 2013. The deal was first announced in January 2014.

**Globe Motors Sold.** In October 2013, Safran completed the sale of Globe Motors Inc, a U.S.-based subsidiary, to Allied Motion Inc for \$90 million. The agreement was originally announced in August 2013. Headquartered in Dayton, Ohio, Globe Motors designs, manufactures, and distributes standard and bespoke precision, subfractional horsepower motors, and motorized devices internationally, with applications in aeronautical, automotive, and industrial markets. Globe Motors was part of Safran's Aircraft Equipment activities and had sales of \$106 million in 2012.

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**Rolls-Royce RTM322 Bought Out.** In September 2013, Safran acquired Rolls-Royce's 50 percent share in the two companies' joint RTM322 helicopter engine program for EUR293 million. Safran Helicopter Engines is now responsible for design and production of the RTM322 engine and for product support and services (spares and MRO services).

**Goodrich Electric Power Systems Acquired.** In March 2013, Safran completed its acquisition of Goodrich Electrical Power Systems (GEPS) for EUR300 million. This former United Technologies operation is a supplier of onboard aerospace electrical power systems. GEPS's 60 percent equity interest in Aerolec, a joint venture with Thales, was included in the scope of the transaction. Aerolec is a supplier to Airbus for the main electrical power generation of the A380 and A400M programs. These activities, which will be consolidated within Safran's Aircraft Equipment business, generated revenues of over \$200 million in 2012, of which the aftermarket business (spares and MRO services) contributed half. GEPS employs approximately 560 people, primarily at its headquarters and facility in Pitstone Green, U.K. (460 people), and at a facility in Twinsburg, Ohio, USA (100 people). The deal was first announced in October 2012.

**Colibrys Acquired.** In January 2013, Safran Electronics & Defense acquired the Swiss company Colibrys SA, which specializes in high-performance microensors (acceleration and vibration) based on silicon microelectromechanical system (MEMS) technology. Colibrys is a supplier to the energy, robotics, defense, automotive, rail, instrumentation, and infrastructure sectors. It is also a long-standing partner to Safran Electronics & Defense, which uses Colibrys' precision accelerometers in a wide range of systems. Colibrys has about 70 employees and annual sales of EUR12 million. Terms were not disclosed.

**Optovac Acquired.** In June 2012, Safran Electronics & Defense signed an agreement to acquire Optovac Mecânica e Optoeletrônica Ltda, a Brazilian company specializing in optronics and night vision equipment. The acquisition is part of Safran Electronics & Defense's strategy to develop local partnerships with the Brazilian defense industry.

**SNPE Matériaux Energétiques Acquired.** In April 2011, Safran completed the acquisition of SNPE Matériaux Energétiques (SME) and its subsidiaries, including a 50 percent stake in Roxel (manufacturer of solid rocket motors for tactical missiles) and a 40 percent stake in Regulus (manufacturer of launcher propellants, based in Kourou, French Guiana). (The stake in Regulus would not include Eurenco.) The sale was first announced in October 2010. Safran now plans

to bring together SME's operations with those of Snecma Propulsion Solide, based near Bordeaux, creating a "world leader in solid rocket propulsion."

## Teaming/Competition/Joint Ventures

**3M.** In November 2020, 3M and Safran Cabin announced a partnership to design cleaner aircraft interiors. For "Travel Safe" – a joint initiative of Safran Interior companies to verifiably elevate the hygiene of aircraft interiors – 3M will leverage expertise to help design cleaner aircraft cabin interiors. "Safran will certify 3M technology that enhances cleaning and protection features of aircraft cabin equipment and provides the capability to mitigate or improve the removal of bacteria and viruses, including SARS-CoV-2. These solutions can be permanently embedded into aircraft interior surfaces during the manufacturing process, or they can be applied to upgrade existing interiors. It is expected that these new aerospace materials will be available beginning in 2021.

**Aero Engine Corporation of China.** Safran and Aero Engine Corporation of China (AECC) have jointly developed the WZ16 French-Chinese helicopter engine. The engine, also known as the Ardidien 3C, is installed in the AVIC AC352 helicopter.

**Aero Gearbox International.** In August 2015, Rolls-Royce and Safran named their joint venture Aero Gearbox International and announced plans to construct a new production plant in Poland. The news followed the signing of a final agreement, in October 2014, to create a jointly owned company to design, develop, produce, and support accessory drive trains for all of Rolls-Royce's future civil aircraft engines. In April 2017, AGI opened a new facility in Ropczyce, Poland. The site will produce accessory drive trains (ADTs) for all of Rolls-Royce's future civil aircraft engines.

Website: <http://www.aerogearboxinternational.com/>

**AES Aerospace Embedded Solutions.** In July 2012, Safran Electronics & Defense and MTU Aero Engines formed a 50-50 joint venture, AES Aerospace Embedded Solutions GmbH, to provide safety-critical software and hardware for military and civil aviation applications. Main products will include control systems for engines such as the TP400-D6 turboprop powering the Airbus A400M military transport as well as controls for landing gear, braking, monitoring, and information systems. As part of the venture, the Safran Electronics division of Safran Electronics & Defense will provide support and access to its portfolio of onboard electronics.

Website: <https://www.aes.gmbh/>



**Safran**

**Airbus.** At the 2019 Paris Air Show, Airbus Helicopters and Safran Helicopter Engines signed a Letter of Intent to jointly demonstrate future technologies that will reduce CO2 emissions and sound levels for future vertical takeoff and landing (VTOL) platforms.

**Airfoils Advanced Solutions.** In June 2017, the Safran Aircraft Engines and Air France Industries KLM Engineering & Maintenance joint venture was named Airfoils Advanced Solutions. The venture was formed in May 2016 to specialize in the repair of aircraft engine compressor blades. Located at the Sars-et-Rosières business park in northern France, near Valenciennes, the new company's plant will repair high-pressure compressor blades and variable stator vanes, focusing on CFM56 engines from CFM International (Airbus A320 and Boeing 737 families), the GE90 from General Electric (powering the Boeing 777), and the Engine Alliance GP7200 (for the Airbus A380). Airfoils Advanced Solutions is jointly owned by Safran Aircraft Engines (51 percent and Air France KLM (49 percent), who will together invest over EUR20 million in the new firm.

**Alstom.** In June 2017, Safran and Alstom signed a technological cooperation agreement to collaborate on electric propulsion. Initially, the agreement will focus on two areas: components and technologies for electric propulsion equipment and electric and hybrid propulsion systems for aircraft and public transport vehicles.

**AMES.** This is a joint venture between Air France Industries, KLM Engineering & Maintenance, and Aircelle. AMES combines the expertise of Air France Industries as a provider of maintenance, repair, and overhaul services with Aircelle's capabilities as an original equipment manufacturer of small, medium, and large engine nacelles.

Website: <https://www.ames-fzco.ac/>

**AOI-Aircraft Factory.** In September 2015, Safran Electronics & Defense and Egyptian manufacturer AOI-Aircraft Factory signed an exclusive commercial and industrial collaboration agreement on the Patroller surveillance drone system that addresses the requirements of the Egyptian Ministry of Defense. According to the agreement, AOI-Aircraft Factory will handle final assembly of Patroller drones in its Egyptian plants. The agreement also covers system support. AOI-Aircraft Factory will develop a dedicated training center in Egypt to train staff for the operation and maintenance of Safran Electronics & Defense's drone systems.

**ArianeGroup.** In June 2017, Airbus Safran Launchers renamed itself the ArianeGroup. The name change is intended to provide greater brand coherence with its main subsidiary, Arianespace. In December 2014, Airbus and Safran created the 50-50 Airbus Safran Launchers to support the Ariane 5 and develop the new Ariane 6. The venture is the lead company in a group comprising numerous subsidiaries and affiliates: APP, Arianespace, Cilas, Eurockot, Eurocryospace, Europropulsion, Nucleitudes, Pyroalliance, Regulus, Sodern, and Starsem. (For more details, see full report on ArianeGroup included with this service.)

Website: <https://www.ariane.group/en>

**AVIC.** In October 2010, Safran and AVIC signed a Memorandum of Understanding on training. The MoU sets the foundation for collaboration between the two corporate universities on a number of programs and initiatives.

In September 2009, Safran and AVIC extended their long-standing partnership in airplane and helicopter engines to encompass aircraft equipment. This latest effort is focused on landing systems and engine nacelles. The two partners will collaborate on all aspects of these two product lines, including design, production, assembly, and support. The agreement includes the planned establishment of new facilities in China, based on the partners' existing assets. The partners will be able to submit competitive proposals for new Chinese aircraft, such as the COMAC C919, as well as other applications.

The partnership between Safran and AVIC was initiated when AVIC Aircraft subsidiaries Landing Gear Advanced Manufacturing Corp Ltd, Xi'an Aviation Brake Technology Co Ltd, and the First Aircraft Institute came together with Safran group subsidiaries Messier-Dowty and Messier-Bugatti to submit a joint proposal to COMAC for landing and braking systems on the C919. The partnership took another step forward when Nexcelle and AVIC Aircraft signed an MoU to create a joint venture for engine nacelles.

In 2008, Safran Helicopter Engines and AVIC Dong'an launched a joint project to develop, produce, and support a new-generation turboshaft engine, the WZ16/Ardiden 3C, to power the AC352 helicopter. An initial order for 120 engines was placed in March 2014. Certification by Chinese aviation authorities was expected at the end of 2015. The two companies have since signed an MoU expanding the partnership into turboprop engines.

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**Avio Aero.** In July 2006, Safran Aircraft Engines and Avio Aero signed a Letter of Agreement for Avio Aero (part of GE Aviation) to join Safran Aircraft Engines in the design and construction of a core demonstrator. This core was to pave the way for the new Silvercrest (formerly called SM-X) business jet engine under consideration by Safran Aircraft Engines. Avio Aero's contribution would focus on the combustor and combustor case for the HP core. Avio Aero would also participate in the design and manufacture of parts. The demonstrator was to lay the foundation for a new generation of engines designed to meet the requirements of long-range business jets. The Silvercrest engine began testing in late 2007.

In July 2006, Safran Aircraft Engines and Avio Aero finalized their collaboration agreement on the SaM146 engine program, in which Avio Aero holds a 10 percent stake as a risk-sharing partner within the Safran Aircraft Engines share. Avio Aero is responsible for the design, development, and production of the combustor and the mechanical power transmission. The SaM146 propulsion system is manufactured by PowerJet, a joint company of Safran Aircraft Engines and NPO Saturn, Russia. Sukhoi selected the SaM146 propulsion system to power the new Russian Regional Jet aircraft family in April 2003.

**Barzan.** In June 2018, Barzan Holdings and Safran Electronics & Defense signed an MoU to jointly develop the foundations of a partnership in the defense and other high-tech sectors, focused on electro-optical and navigation solutions. The agreement between Barzan and Safran provides for joint R&D and production operations to benefit the Qatar defense industry. In particular, it will support the armored forces for the Qatari Ministry of Defense.

**Beijing Turbomeca Changkong.** In November 2006, Safran Helicopter Engines signed a joint venture agreement with Beijing Changkong Machinery (an AVIC company), creating the first joint venture company between Safran Helicopter Engines and an AVIC company: Beijing Turbomeca Changkong Aero-Engine Control Equipment Co Ltd. This joint venture assembles and tests hydromechanical units of turboshaft engines for both Safran Helicopter Engines and Beijing Changkong for their respective markets. It is located 50 kilometers north of Beijing in Beijing Changkong Machinery's new plant.

**Boeing.** In September 2019, Boeing and Safran announced a joint investment in Electric Power Systems (EPS), a company offering a suite of safe, certifiable, and lightweight energy storage products that provide high-quality power for aerospace and other markets. The joint investment will help EPS develop a highly automated industrial base capable of producing

aviation-grade energy storage systems and support the advancement of technologies to further reduce the costs of battery systems for electric airplanes, the companies said.

Website: <https://ep-sys.net/>

**Initium Aerospace.** In June 2018, Boeing and Safran agreed to jointly design, build, and service Auxiliary Power Units. Both companies will have a 50 percent stake in the partnership, which will be based in the United States.

In February 2019, Boeing and Safran announced their new joint venture would be named Initium Aerospace. *Initium* is Latin for "beginning" or "start." Initial work is being done in San Diego, where the focus is on the next-generation APU design as well as collaboration with teams across Boeing and Safran on engineering and production.

However, in February 2021, the partners decided to freeze the joint venture due to the COVID-19 pandemic and its impact on the aerospace industry.

Website: <https://initiumaerospace.com/>

**MATIS Aerospace.** The two firms are also 50-50 partners in MATIS Aerospace. MATIS Aerospace (Morocco Aero-Technical Interconnect Systems) was founded in 2001 by Boeing, Safran Electrical & Power, and Royal Air Morocco (which has since withdrawn from the venture). MATIS produces interconnection systems and electrical harnesses for several airframe and engine companies.

**Ceramic Coating Center.** In June 1999, MTU Aero Engines and Safran Aircraft Engines created this equally owned joint venture specializing in the application of ceramic coatings on gas turbine and aircraft engine parts. The Ceramic Coating Center is based in Châtellerault, France. MTU and Safran Aircraft Engines are each responsible for half of the investment, totaling EUR12 million. The company handles parts for the CFM56, the M88-2 that powers the Rafale fighter, and turbines on the TP400 turboprop that powers the A400 military transport as well as parts made by MTU for the General Electric CF6, LM6000, and GP7200.

**CFM International.** Formed in 1974, this is one of the most significant teaming efforts ever undertaken by Safran Aircraft Engines. CFM International SA is a joint venture company formed with General Electric Aircraft Engines (Evendale, Ohio) for production of the ICFM56 series of medium-thrust turbofan engines. More recently, the company unveiled a new engine, the LEAP-X.

Website: <https://www.cfmaeroengines.com/>

**Safran**

**CFM Materials.** In May 2010, CFM International's parent companies, GE and Safran Aircraft Engines, became partners in a 50-50 joint venture named CFM Materials. The company supplies used serviceable CFM56 material to CFM's aviation customers around the globe.

Website: <https://cfmmaterials.com/>

**China Eastern Airlines.** In November 2016, China Eastern Airlines and Safran Landing Systems created a maintenance, repair, and overhaul (MRO) joint venture focused on landing gear for Airbus A320 and Boeing 737 commercial airplanes. The new company, Xi'an Eastern Safran Landing Systems Services, Ltd, will be based in Xi'an, already the main maintenance hub for China Eastern's fleet. It will primarily provide services for the Chinese domestic market.

**Clean Sky.** Launched in 2008, Clean Sky is a European public-private research program focused on developing technology aimed at reducing CO<sub>2</sub>, gas emissions, and noise levels produced by aircraft. The Clean Sky 1 effort has six focus areas, Green Regional Aircraft (led by Leonardo and Airbus), Smart Fixed Wing Aircraft (Airbus and Saab), Green Rotorcraft (Leonardo and Airbus), Sustainable and Green Engines (Rolls-Royce and Safran), Systems for Green Operations (Liebherr and Thales), and Eco-Design (Dassault Aviation and Fraunhofer Gesellschaft). A larger Clean Sky 2 program was launched in 2014 and will run through 2024. This phase is studying improvements to Large Passenger Aircraft, Regional Aircraft, Fast Rotorcraft, Airframes, Engines, Systems, Small Air Transport, and Eco-Design.

Website: <https://www.cleansky.eu/>

**Collins Aerospace.** In June 2011, Collins Aerospace (now part of Raytheon Technologies) and Microturbo signed an agreement to form a partnership for the development of new-generation electrical and bleed APUs and APU installation systems, targeting the business jet market. The first application for the new partnership will be the Bombardier Global 7000 and Global 8000 aircraft, for which Collins Aerospace was selected as the APU supplier. Under the partnership agreement, Microturbo will design, certify, and supply major modules and components for the APU and the installation system in support of Collins Aerospace's design and development of the overall APU system.

**COMAC.** In February 2011, Safran Electrical & Power and Shanghai Aircraft Manufacturing Co Ltd (SAMC), a subsidiary of Commercial Aircraft Corporation of China (COMAC), established a joint venture company in China called Shanghai SAIFEI Aviation EWIS Manufacturing Co, Ltd – or simply SAIFEI, which is a

combination of SAIFENG ("Safran" in Chinese) and SHANGFEI (the simplified name of COMAC in Chinese).

Based in Shanghai, the joint venture is focused on the design, development, production, and support of Electrical Wiring Interconnection Systems (EWIS) for the Asia-Pacific aerospace market.

The joint venture has been tasked with execution of the C919 EWIS program.

SAMC owns 51 percent of SAIFEI, while Safran Electrical & Power owns 49 percent.

**Dassault Sagem Tactical UAV.** In April 2002, Dassault Aviation and Safran Electronics & Defense reached a cooperation agreement on the development of future tactical unmanned aerial vehicles. The two companies have since formed an equally owned joint venture, dubbed Dassault Sagem Tactical UAV. The venture is tasked with developing and marketing next-generation tactical drone systems. Its initial UAV concept was dubbed SlowFast.

**Diota.** In June 2017, Safran Electrical & Power signed a technological and commercial cooperation agreement with Diota that focuses on R&D work on the development of systems using augmented and optimized reality for Safran Electrical & Power products, equipment, and services. Development of such tools is expected to speed maintenance times.

**DSNA.** In June 2015, the French air navigation service provider DSNA (Direction des Services de la Navigation Aérienne) and Safran signed an agreement to work together on the integration of drones in civil airspace. The agreement mainly covers research and development projects concerning anti-collision technologies ("detect & avoid") and associated procedures.

**EcoPulse.** At the 2019 Paris Air Show, Daher, Airbus, and Safran teamed up to develop EcoPulse, a distributed hybrid propulsion aircraft demonstrator. Based on Daher's TBM platform, the system will use a distributed hybrid propulsion system provided by Safran. Airbus will have responsibility for the aerodynamic optimization of the distributed propulsion system, the installation of high energy density batteries, and the use of those batteries to power the aircraft. First flight is scheduled for 2022.

**Europrop International.** In May 2003, Europrop International was selected to power the new Airbus Military A400M military transport with the Western world's largest-ever turboprop engine. EPI comprises Industria de Turbo Propulsores, or ITP (16 percent), MTU Aero Engines (28 percent), Rolls-Royce

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(28 percent), and Safran Aircraft Engines (28 percent). Initially, more than 750 TP400-D6 engines will be required for the 180 four-engine A400M aircraft participating nations committed to.

ITP is responsible for the low-pressure turbine, including the turbine exit casing, the dressing, and the front frame. MTU is responsible for the intermediate-pressure spool, comprising the intermediate-pressure compressor and turbine. It also cooperates with Safran Aircraft Engines in producing the engine control system and has final assembly responsibility for all of the engines produced. Rolls-Royce is responsible for engine integration, the high-pressure compressor, the low-pressure shaft, the intermediate casing, and the structural parts for the bearing supports. In addition to its engine control system role, Safran Aircraft Engines is responsible for the combustor and the high-pressure turbine as well as the powerplant installation on aircraft.

Website: <http://www.europrop-int.com>

**FADEC International.** In January 2003, BAE Systems Controls and Safran Transmission Systems formed FADEC International, a limited-liability company that focused both companies' capabilities on the design, production, and support of Full Authority Digital Engine Control systems for large commercial engines. The two companies have produced the FADEC systems for CFM56, CF6-80, and GE90 engines. In June 2011, GE signed an agreement with FADEC International to form a 50-50 joint venture to develop and produce the FADEC for CFM International's next-generation engine, the LEAP.

Website: <http://fadecinternational.net>

**Future Combat Air System.** In February 2020, France and Germany awarded Dassault Aviation and Airbus, together with their partners MTU Aero Engines, Safran, MBDA, and Thales, the initial framework contract (Phase 1A) that launches the demonstrator phase for the Future Combat Air System (FCAS). This EUR155 million framework contract covers a first period of 18 months and initiates work on developing the demonstrators and maturing cutting-edge technologies, with the ambition to begin flight tests as soon as 2026.

This phase will, in a first step, focus on the main technological challenges per domain:

- Next Generation Fighter (NGF), with Dassault Aviation as prime contractor and Airbus as main partner, to be the core element of the Future Combat Air System.

- Unmanned Systems Remote Carrier (RC), with Airbus as prime contractor and MBDA as main partner.
- Combat Cloud (CC), with Airbus as prime contractor and Thales as main partner.
- Engine, with Safran and MTU as main partners.

The program formally began in February 2019, when France and Germany awarded a two-year, EUR65 million (\$74 million) Joint Concept Study (JCS) contract to Dassault Aviation and Airbus for FCAS, which is known in France as the Systeme de Combat Aerien Futur, or SCAF). Spain joined the program later in the month. The three partners aim to develop the sixth-generation fighter as a long-term replacement for the lead combat aircraft in the French, German, and Spanish air forces between 2035 and 2040. This aircraft will replace the Dassault Rafale and Eurofighter Typhoon fighters currently in service.

The Next Generation Fighter (NGF) is to operate in conjunction with a swarm of drones that will serve as both weapons platforms and advanced sensors. These two systems are collectively referred to as the Next-Generation Weapon System (NGWS). The FCAS program envisions UCAVs operating together with next-generation combat aircraft as "loyal wingmen."

**General Electric.** In July 2014, Safran Aircraft Engines and Safran Aero Boosters partnered with GE on the GE9X engine Boeing selected as the exclusive powerplant on its new 777X long-range, twin-engine widebody jetliner. Safran will have a total stake in this new engine program of slightly more than 11 percent. Safran Aircraft Engines will produce the composite fan blades via CFAN, its 50-50 joint company with GE, as well as design and produce the turbine rear frame and the forward fan case. Safran Aero Boosters will be in charge of the low-pressure compressor global integration and the fan disk manufacturing.

In July 2008, GE Aviation and Safran agreed to form a new joint venture company to cooperatively develop, produce, and support engine nacelles for the next-generation single-aisle commercial airliners. The agreement covers complete nacelles and nacelle subsystems – based on the expertise and resources of Safran Nacelles and GE's Middle River Aircraft Systems subsidiary (see Nexcelle entry).

**Famat.** In 1981, Safran Aircraft Engines and General Electric created the jointly owned Famat (Fabrications Mécaniques de l'Atlantique), which produces turbofan engine housings for the CF6, CFM56, GE90, GP7200, and CF34 jet engine families.

Website: <https://www.famat.fr/>

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**CFAN.** The two firms are also partners in CFAN, which was formed in 1991. The company, located in San Marcos, Texas, produces jet engine fan blades made from carbon-fiber-based composite materials.

Website: <https://c-fan.com/>

**Propulsion Technologies International.** PTI is an equally owned subsidiary of Safran Aircraft Engines and GE that focuses on repair services for CFM56 engine parts. Based in Florida, it offers specific expertise and capabilities in the repair of rotating parts (shafts and disks), low-pressure compressor (booster) guide vanes, and cases.

Safran Aircraft Engines is a participant in GE Aircraft Engines' current generation of high-thrust commercial turbofan engines, the CF6 series. Safran Aircraft Engines has a 10 percent stake in the CF6-80C2 program and a 20 percent stake in the CF6-80E1 program. Safran Aircraft Engines is also involved in the GE90 high-thrust commercial turbofan engine (see CFM International entry).

**Hanwha.** In June 2017, Safran and Hanwha signed a Strategic Cooperation MoU to expand cooperation to new significant programs; to establish long-term cooperation in the fields of propulsion, aeronautical, and defense equipment; and to identify other potential opportunities. Most recently, the two firms partnered to develop and supply the engine of the new Korean helicopter Light Armed Helicopter (LAH) for the Korean Army.

**Hindustan Aeronautics (HAL).** In February 2021, Safran Aircraft Engines and HAL signed an MoU on bringing niche engine technology to India. Under the terms of the MoU, HAL and Safran Aircraft Engines intend to explore opportunities to assemble the Safran's M88 engine and manufacture components for the engine for an additional batch of Rafale fighters for India and for any aircraft manufactured in India by HAL fitted with M88.

In July 2016, Safran Helicopter Engines and Hindustan Aeronautics agreed to establish an Indian support center for national and international rotorcraft customers. This new joint venture will provide maintenance, repair, and overhaul (MRO) services for Safran TM333 and HAL Shakti engines installed on HAL-built helicopters.

**Irkut.** In June 2017, Irkut and Safran signed agreement to participate in the development of Russia's MC-21 single-aisle aircraft. Safran Ventilation Systems will provide a complete ventilation system package for the plane.

**Korea Aerospace Industries.** At the 2019 Paris Air Show, KAI and Safran signed an MoU that will explore

potential collaborative opportunities across activities on the various areas in space, commercial, and military sectors. The two firms' past collaboration includes providing equipment for KAI programs such as the KUH Surion and its derivatives.

**Lisi Aerospace Creuzet Polska.** In February 2003, Creuzet Aéronautique and Safran Aircraft Engines created a joint venture in Poland to manufacture aircraft engine parts. Called Creuzet Polska, the new company is located in Sedziszow, southeast Poland, and shares the premises of Snecma Polska, a Safran Aircraft Engines group plant. Creuzet Polska handles the machining and finishing of compressor blades using semifinished products supplied by Creuzet Aéronautique's plant in Marmande. The company is jointly owned by Creuzet Aéronautique and Safran Aircraft Engines, with ownership split 70 percent and 30 percent, respectively.

**Lynred.** In June 2019, Sofradir was merged with Thales' Ulis subsidiary to form a new company, Lynred. Sofradir, formed in December 2012, had been a joint venture between Safran and Thales, which are equal (50-50) shareholders. According to the company, Lynred was created to respond to a need for an all-inclusive infrared (IR) product offering to the global aerospace, defense, industrial, and consumer markets. Lynred is a supplier of IR detectors to the optronics industry. Its technologies are used for a wide range of commercial and military applications, particularly night vision equipment.

Website: <https://www.lynred.com>

**Maritime Airborne Warfare System (MAWS).** This is development program set to be undertaken jointly by France and Germany post-2025, with an eye on achieving a new maritime patrol capability by 2030. The two countries signed a letter of intent (LOI) to develop this capability at the ILA exhibition in Berlin in April 2018, and they have already agreed to award manufacturers with a two-year common requirements study determining the technical and financial elements involved.

The partner nations plan to select a European platform for MAWS in 2023. Airbus is planning to offer the A320neo as the platform. The effort will also likely include participation from Dassault, Hensoldt, Safran, and Thales.

In November 2020, the French Defense Procurement Agency (DGA) confirmed that the feasibility studies for the mission system will be launched shortly.

**MARS.** In November 2010, France selected a consortium formed by Thales, Nexter, and Safran Electronics & Defense to lead the architecture phase of

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the Scorpion program on behalf of the French Army. This two-year contract (four years with optional tranches) is worth EUR21 million. The consortium has created a dedicated company called MARS (Maitrise de l'ARchitecture Scorpion) to oversee the architecture phase.

The Scorpion effort will provide the Army's 1,500-person joint tactical force – the groupement tactique interarmés (GTIA) – with two new medium-weight armored vehicles, an upgraded Leclerc tank, and a high level of connectivity between land and air assets.

In 2016, the French government pledged \$6.7 billion over 11 years to fund the Scorpion modernization effort.

**Max Aero Engines.** In October 2014, Safran Aircraft Engines and Max Aerospace signed an agreement to create a joint venture called Max Aero Engines Private Ltd (MAEPL), which will offer military aircraft engine maintenance, repair, and overhaul (MRO) services in India. MAEPL will provide complete engine support solutions, in particular shop-level maintenance and flight line services. More specifically, its main role will be providing maintenance services for the Safran Aircraft Engines M53 engines powering the Mirage 2000H Vajra fighters on behalf of the Indian Air Force (IAF).

**MBDA.** In May 2008, MBDA France and Safran Electronics & Defense signed a cooperation agreement concerning the modular air-to-ground weapon (AASM) and infrared guidance for tactical missiles. Under the terms of the agreement, MBDA France will be responsible for all sales and marketing of the AASM family developed by Safran Electronics & Defense. The two companies will also combine their respective areas of expertise to form a close partnership for the joint development of future versions of the AASM family.

**MTU Aero Engines.** In February 2019, Safran and MTU Aero Engines teamed to develop and produce the next-generation European fighter engine. The two firms will jointly lead the development, the production, and after-sales support activities of the new engine that will power the next generation combat aircraft, as part of the Franco-German Future Combat Air System (FCAS). Under the partnership, Safran Aircraft Engines will take the lead in engine design and integration, and MTU Aero Engines will take the lead in engine services. The existing joint venture Aerospace Embedded Solutions (AES) will be in charge of the engine control hardware and software.

In April 2021, the two partners founded of a 50-50 joint venture to manage the development, production, and after-sales support activities of the new engine that will

power the Next Generation Fighter (NGF). The new entity, called EUMET GmbH (derived from European Military Engine Team), will be based in Munich and will be headed by a Safran-nominated CEO. The joint venture will be the sole contract partner for the participating nations in the engine program. On this basis, Safran Aircraft Engines and MTU Aero Engines are looking to involve the Spanish company ITP Aero in this effort. ITP will be contracted as a main partner to EUMET.

**MTU Turbomeca Rolls-Royce.** Formed in 1989, this consortium, also called MTR GmbH, consists of Safran Helicopter Engines (41 percent), MTU Aero Engines (41 percent), and Rolls-Royce (18 percent). It oversees program management for the MTR390 engine, which powers the French-German Tiger attack helicopter.

Website: <https://www.mtr390.com/>

**Nexcelle.** In September 2009, GE's Middle River Aircraft Systems (MRAS) and Safran Nacelles chose the name Nexcelle for their joint venture company. Nexcelle's responsibility covers complete nacelles and nacelle subsystems for CFM International engines in applications on both new and existing aircraft.

Website: <https://www.nexcelle.com/>

**OCEAN2020.** This is a European Commission project to develop a technology demonstrator that will validate the concept of deploying a complete array of drone systems (air, surface, and submarine) for surveillance in a maritime environment. Safran is part of the Leonardo-led OCEAN2020 consortium that won the contract in January 2018. The first demo, coordinated by the Italian Navy, took place in the Mediterranean Sea in 2019. The second demonstration will take place in 2021 in the Baltic Sea and will be coordinated by the Swedish Navy.

Website: <https://ocean2020.eu/>

**OEM Defence Services.** In June 2009, Diehl Aerospace, Liebherr-Aerospace, Safran, and Thales, officially opened OEM Defence Services. OEM, which was formally registered in France in October 2008, represents an alliance of major European equipment manufacturers that provides integrated industrial support solutions to meet the specific needs of national armed forces. According to the partners, OEM was initially designed to provide innovative support contracts for a wide range of equipment and systems on board the NH90 and Tiger helicopters and the A400M military transport aircraft.

Website: <https://www.oemds.com/>

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**Optrolead.** In July 2012, Safran Electronics & Defense and Thales created Optrolead, an equally owned optronics joint venture. The new company focuses on several major programs, including the optronic payload for the planned upgrade of the French Navy's Atlantique 2 (ATL2) maritime patrol aircraft; the imaging system for the future French-British medium-altitude, long-endurance (MALE) drone; and modular optronic systems for army combat vehicles. The formation follows the signing of an MoU between the two firms in December 2011 to combine operations in optronics.

**PowerJet.** This joint venture, equally owned by NPO Saturn and Safran Aircraft Engines, is tasked with the design and production of the SaM146 aircraft engine. In April 2003, Russian aircraft manufacturer Sukhoi selected the PowerJet SaM146 to power the Russian Regional Jet (RRJ) family.

Website: <https://www.powerjet.aero/>

**Propulsion Technologies International.** In May 2007, Safran Aircraft Engines Services and Airfoil Technologies International (ATI) formed a joint venture named Propulsion Technologies International. PTI will provide aero-engine component repair services specializing in major rotating assemblies, booster vanes, cases, and frame repairs. Since 2011, PTI has been a 50-50 joint venture between Safran Aircraft Engines and GE Aviation. The facility, previously known as Propulsion Technology LLC, is located in Miramar, Florida.

Website: <http://www.ptechi.com>

**Raytheon.** In June 2018, Raytheon, Safran Electronics & Defense, and Safran Optics 1 signed an MoU to collaborate on the next generation of combat vehicle sighting systems.

**Rolls-Royce Snecma Ltd.** In July 2012, Snecma and Rolls-Royce signed a contract with the U.K. Ministry of Defence to undertake studies into the next generation of U.K. and French combat aircraft engines through their 50-50 Rolls-Royce Snecma Ltd joint venture established in 2001. Safran Aircraft Engines and Rolls-Royce have also signed a collaboration agreement with BAE Systems and Dassault Aviation to explore concepts and technologies as part of the Anglo French Future Combat Air Systems Demonstration Program Preparation Phase contract.

**Rolls-Royce Turbomeca Ltd.** This joint venture was originally formed in 1966 to manufacture the RTM322 turboshaft engine as well as the Adour turbofan engine. Safran Helicopter Engines bought out Rolls' share in the RTM322 program in September 2013. Cooperation between the two

companies on the Adour engine, which powers the BAE Systems Hawk and Sepecat Jaguar aircraft, "is unaffected by this agreement," Rolls-Royce officials said.

**Rosoboronexport.** In December 2010, Safran Electronics & Defense and Rosoboronexport agreed to create a joint venture, RS Alliance, for inertial navigation systems. The company is based in the Russian Federation, with the Russian partner holding 51 percent and the French partner 49 percent of the capital.

**Roxel.** In March 2003, MBDA and Safran Ceramics (then SNPE) founded a new 50-50 venture called Roxel to build rocket motors for missile systems. Roxel consists of two affiliates: Roxel France SA and Roxel (UK Rocket Motors) Ltd, U.K.

Website: <https://www.roxelgroup.com>

**Safran Aero Boosters.** This jointly held operation, formerly called Techspace Aero, is a member of the Safran group, which holds 67 percent of the capital. The other shareholders are the Walloon Region of Belgium (31 percent) and the Federal Investment and Participation Company (2 percent). Safran Aero Boosters designs, develops, and supplies modules, equipment, and test cells for aircraft and space engines.

Website: <https://www.safran-aero-boosters.com/>

**Sagembat Defense.** This is a joint venture between Baynuna Aviation Technology of the United Arab Emirates (Dubai) and Safran Electronics & Defense. It focuses on the development of advanced technologies and solutions for defense applications.

**Seguritech.** In June 2015, Safran Electronics & Defense and Mexican partner Seguritech agreed to collaborate in the development in Mexico of technology solutions for defense and homeland security applications, including drone systems, airborne surveillance, and command and control. As a first stage in this agreement, Safran Electronics & Defense will contribute its skills and expertise in aerial surveillance, based on its Patroller drone system.

**SEM MB.** Created in 1959, ejection seat specialist SEM MB (Société d'Exploitation des Matériels Martin-Baker) is an equally owned subsidiary of Safran and Martin-Baker.

Website: <https://www.safran-martin-baker.com/>

**SIA Engineering.** In February 2018, SIA Engineering Company Limited (SIAEC) signed an MoU with Safran to collaborate in the field of data analytics. Under the MOU, SIAEC and Safran will explore collaborating in the areas of research and development

## Safran

of software for predictive maintenance, to be used in the aviation industry.

In June 2009, SIAEC and Safran Electronics & Defense signed an agreement to form an avionics MRO joint venture in Singapore. Under the agreement, SIAEC will hold a 49 percent equity shareholding in the joint venture, with the remaining 51 percent owned by Safran Electronics & Defense.

**Sichuan Services.** Sichuan Services AeroEngine Maintenance Co (SSAMC) is a 60-40 joint venture between Air China and CFM. It offers a wide range of services for CFM56-3, CFM56-5B, and CFM56-7 engines.

**Smartec.** In February 2002, Safran Aircraft Engines (70 percent) and NPO Saturn (30 percent) established the Smartec joint venture for the SM146 turbofan engine development program. Based in Russia, Smartec initially focused on the design of aircraft engine components, followed by work on various joint programs, particularly the SaM146 engine intended for the RRJ project.

**Snecma Morocco Engine Services.** This joint venture is 51 percent owned by Safran Aircraft Engines Services, with the remainder held by Moroccan airline Royal Air Maroc. Located in Casablanca, the operation provides MRO services for CFM56-3, CFM56-7, and PW2037 engines as well as for various components and APUs.

**Thales.** In June 2005, Thales and Safran Electronics & Defense signed a preliminary agreement to create an equally owned joint venture for Dassault combat aircraft, excluding the Mirage 2000 and Rafale. Thales agreed to provide expertise in onboard radars, electronic warfare, communications, and laser designation pods. Safran Electronics & Defense would add its expertise in navigation and mission planning systems, mission computers, mission software and integration, and new-generation weapon deployment. Opportunities exist for upgrading several dozen earlier-generation Mirage aircraft from various nations' air forces. The partnership is known as the ASTRAC (Association Sagem Thales pour la Rénovation d'Avions de Combat) consortium. ASTRAC's first contract was the Moroccan Mirage F1 upgrade, begun in 2009.

**UAV Engine Team.** In September 2019, Safran Helicopter Engines, ZF Luftfahrttechnik GmbH (ZFL), and MT-Propeller agreed to cooperate on a new turboprop engine intended for European unmanned

applications. This turboprop will be derived from Safran's Ardiden 3 and will use technologies matured through its Tech TP technological demonstrator. Within this partnership, MT-Propeller will be responsible for the propeller and ZFL for the PAGB (propeller and accessory gearbox). Tech TP is part of the Clean Sky 2 research program (see entry above).

**VolgAero.** In October 2005, NPO Saturn and Safran Aircraft Engines created a new jointly owned company called VolgAero to produce aircraft engine parts. VolgAero will produce components for aircraft engines, beginning with the SaM146 engine. The SaM146, developed by Safran Aircraft Engines and NPO Saturn within their joint company PowerJet, is designed for new-generation regional jets.

**Xi'an Aircraft.** In September 2011, Xi'an Aircraft International and Safran Nacelles opened their new nacelle components production facility in China. The joint venture, called Xi'an Saiwei Nacelle Co Ltd, will produce the nacelle components supplied by Nexcelle (itself a joint venture between Safran Nacelles and GE Aviation's Middle River Aircraft Systems) for COMAC's C919 narrowbody aircraft. Xi'an Aircraft International and Safran Nacelles first announced the joint venture in November 2010. According to reports, the joint venture will produce thrust reversers and door subassemblies, and possibly other components – including air inlets and fan cowlings – for other aircraft.

**XIESA.** In July 2017, the XIESA joint venture between Safran Landing Systems and China Eastern Airlines began construction of its first landing gear maintenance, repair, and overhaul (MRO) center. The venture was originally formed in November 2016 to provide support for the Chinese market.

**ZF Aviation Technology.** In July 2020, Safran Helicopter Engines and ZF Aviation Technology signed a Memorandum of Agreement (MoA) strengthening their collaboration to offer a turboprop engine suitable for European military applications – specifically the unmanned, training, and transport sectors. ZF Aviation Technology is also confirmed as a strategic partner for the propeller reduction and accessory gearbox of the Ardiden 3TP engine.

**Zhejiang XiZi.** At the 2019 Paris Air Show, Safran Cabin and Zhejiang XiZi Aircraft Component Company signed a collaboration agreement to create value for the companies' OEM and airline customers in China through a combined complimentary portfolio of assets and skills.



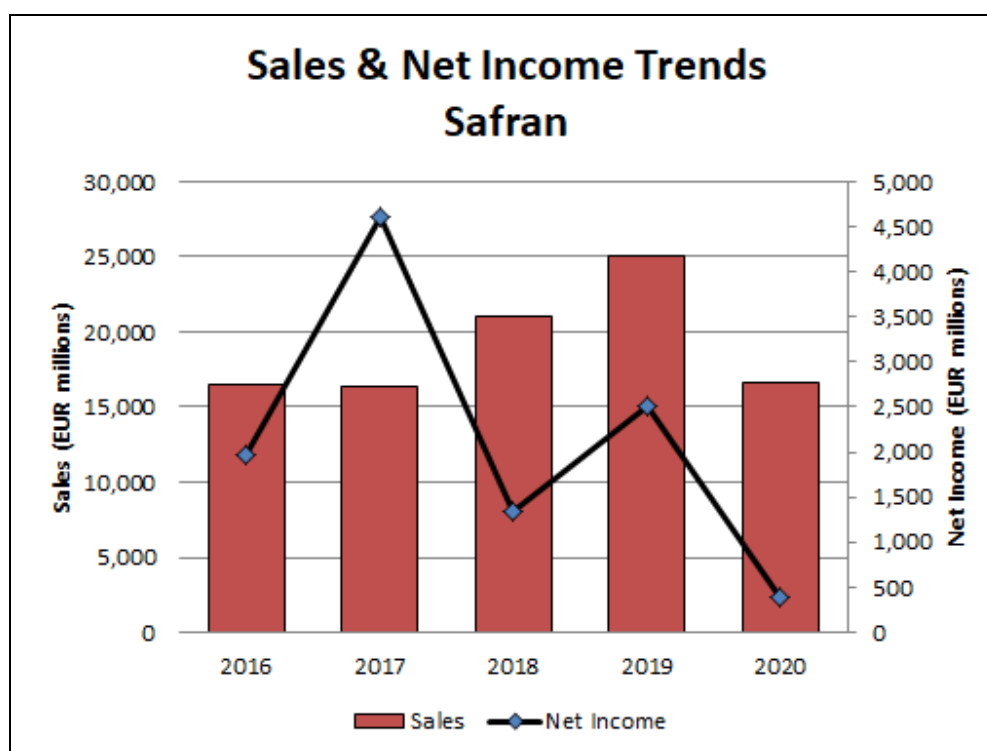
## Financial Results/Corporate Statistics

Safran's consolidated sales for 2020 were EUR16.6 billion, down 34 percent from EUR25.1 billion in 2019. The company reported net income of EUR386 million, compared to EUR2.5 billion for 2019. The jump in income for 2017 was attributed to a "change in fair value of the portfolio of currency derivatives used to hedge future cash flows," which resulted in a non-cash gain of EUR3.48 billion. Results have been restated to the company's current presentation. U.S. dollar figures were translated as of December 31, 2020, at the rate of EUR1 = USD1.22824.

### Safran (FR: SAF)

(EUR millions)	2016	2017	2018	2019	2020	(USD) 2020
Net Sales	16,482	16,376	21,025	25,098	16,631	20,427
Net Income	1,963	4,611	1,341	2,512	386	474
R&D Expenditures	1,708	1,367	1,472	1,725	1,213	1,490
Long-Term Debt*	3,091	3,815	3,969	3,744	4,508	5,537
Total Equity*	6,809	9,648	12,301	12,748	12,750	15,660
Debt-to-Equity Ratio	.45	.39	.32	.29	.35	-
Employees	66,490	58,324	92,639	95,443	78,892	-

\* Source: <https://www.wsj.com/market-data/quotes/FR/XPAR/SAF>



## Safran

### Industry Segments

Safran's sales by business segment for the past five years were reported as follows (totals may have been rounded):

<b>SALES</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
(EUR millions)					
Aerospace Propulsion	9,391	9,357	10,579	12,045	7,663
Aerospace Equipment, Defense & Aerosystems	-	-	7,942	9,256	6,893
Aircraft Interiors	-	-	2,511	3,321	1,922
Aerospace Equipment	5,145	5,260	-	-	-
Defense	1,238	1,316	-	-	-
<b>OPERATING INCOME</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
(EUR millions)					
Aerospace Propulsion	1,789	1,476	1,999	2,478	1,035
Aerospace Equipment, Defense & Aerosystems	562	605	983	1,188	454
Aircraft Interiors	-	-	42	182	-246
Defense	69	79	-	-	-

### Segment Details

Below is a breakdown of key financial data for the company's major business segments.

<b>AEROSPACE PROPULSION</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
(EUR millions)					
Net Sales	9,391	9,357	10,452	12,045	7,663
<i>Civil Aviation</i>	73%	77%	80%	77%	66%
<i>Military Aviation</i>	11%	11%	9%	13%	18%
<i>Helicopter Turbine Engines</i>	12%	12%	11%	10%	16%
<i>Ballistics and Space</i>	4%	-	-	-	-
OEM	-	-	4,473	5,081	2,859
Services	-	-	5,999	6,848	4,668
Sales of Studies	-	-	67	65	85
Other	-	-	40	51	51
Operating Income	1,789	1,476	1,898	2,478	1,035
R&D Expenditures	775	754	546	573	334
CFM56 Engines Delivered	1,693	1,444	1,044	391	
LEAP Engines Delivered	77	459	1,118	1,736	815*
LEAP Backlog	-	-	15,614	15,620	9,614*
LEAP Orders	-	-	3,211	1,968	351*
LEAP Cancellations	-	-	201	238	1,511*
Employees	23,210	23,969	24,536	26,741	24,204

\* In 2020, Safran changed the definition of how it based purchase orders: up to the end of 2020, Safran published the volume of LEAP engines for which there were orders and purchase commitments along with the order backlog (in the same definition). In 2020, following the Boeing 737MAX flight ban and the COVID-19 health crisis, Safran decided to exclude purchase commitments and to only include orders from airlines that had been confirmed by airframers' purchase orders.

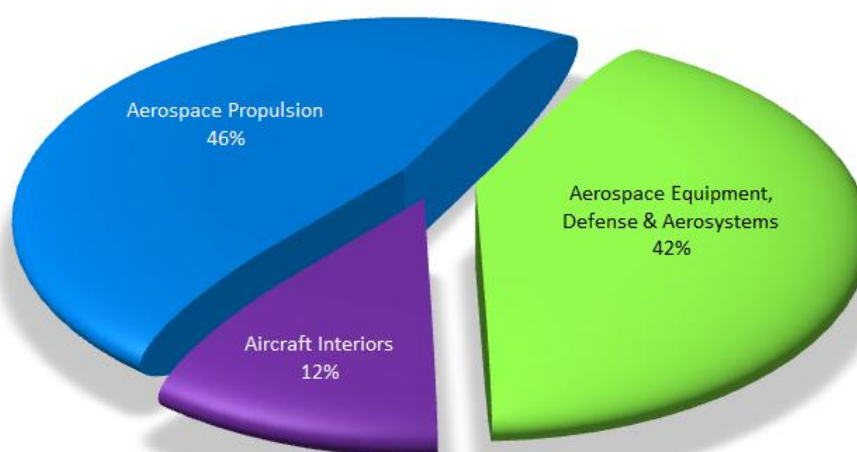
**Safran**

<b>AIRCRAFT EQUIPMENT, DEFENSE AND AEROSYSTEMS</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
(EUR millions)					
Net Sales	-	-	7,942	9,256	6,893
<i>OEM</i>	-	-	5,070	5,857	4,456
<i>Services</i>	-	-	2,582	3,002	2,114
<i>Sales of Studies</i>	-	-	167	262	237
<i>Other</i>	-	-	123	135	86
Operating Income	-	-	983	1,188	454
R&D Expenditures	-	-	502	527	357
<i>Employees</i>	-	-	44,534	44,231	38,471

<b>AIRCRAFT INTERIORS</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
(EUR millions)					
Net Sales	-	-	2,511	3,321	1,922
<i>OEM</i>	-	-	1,813	2,352	1,409
<i>Services</i>	-	-	656	895	478
<i>Sales of Studies</i>	-	-	3	63	22
<i>Other</i>	-	-	39	11	13
Operating Income	-	-	42	182	-246
R&D Expenditures	-	-	178	231	166
<i>Employees</i>	-	-	2,226	22,118	13,928

**2020 Sales by Segment  
Safran**



## Safran

GEOGRAPHIC SALES	2016	2017	2018	2019	2020
(EUR millions)					
France	3,262	2,744	3,314	4,870	3,823
Europe	3,439	4,374	5,018	5,236	3,450
Americas	5,345	5,220	7,729	8,617	5,434
Asia and Oceania	2,368	2,463	3,472	3,728	2,669
Africa and Middle East	1,367	1,152	1,517	2,189	1,122
Currency Hedge	701	423	-25	458	133
<b>TOTAL</b>	<b>16,482</b>	<b>16,376</b>	<b>21,025</b>	<b>25,098</b>	<b>16,631</b>

### Major Competitors

Safran operates in a variety of highly competitive markets. Some of its major competitors by sector as follows:

**Aerospace Propulsion.** *Aviation Gas Turbines* competitors include Pratt & Whitney, Rolls-Royce, GE Aviation, and the IAE Consortium (Pratt & Whitney, MTU Aero Engines, and Japanese Aero Engines Corp). *Helicopter Engines* competitors include GE Aviation, Pratt & Whitney Canada, Rolls-Royce, and Honeywell. *Space Systems* competitors include NPO Energomash, Space X, International Launch Services, and Mitsubishi Heavy Industries. *Tactical missile* competitors include Nammo, Bayern Chemie, Avio, Aerojet Rocketdyne, Northrop Grumman, Rocketsan, and Denel.

**Aircraft Equipment.** Competitors include Collins Aerospace, Honeywell, Liebherr, Spirit Aerosystems, Moog, Thales, GKN, Meggitt, Avio Aero, LATElec, KHI, GE Aviation, Triumph, and Fokker.

**Defense.** In *Avionics*, Safran's main competitors include Thales, BAE Systems, Leonardo, Collins Aerospace Systems, Honeywell, and Teledyne. In the *Defense* sector, Safran's main competitors in these businesses include Thales, BAE Systems, Leonardo, Elbit, L-3 Wescam, FLIR Systems, and Northrop Grumman.

**Aerosystems.** Safran's main competitors in this sector includes Collins Aerospace, EAM, DART Aerospace, Honeywell, Cobham, Parker Hannifin Corporation, Eaton Corporation, GE Aviation, Diehl, Panasonic, and Thales.

**Aircraft Interiors.** Competitors include units or divisions of Airbus, Boeing, AVIC Cabin Systems, Diehl, Collins Aerospace, JAMCO, Recaro, and Bucher.

## Strategic Outlook

After facing perhaps the greatest crisis in aviation manufacturing, Safran emerged a bit worse for the wear as it positioned itself for recovery from the COVID-19 pandemic.

As Safran focuses primarily of the commercial sector, it was particularly hard-hit by the collapse in air traffic due to lockdowns and travel restrictions all around the world. The company has a limited amount of defense-related contracting, which has helped some aviation firms maintain revenue throughout the period.

As a result, the firm moved quickly to adjust its operations, cutting its workforce by 17 percent to 78,900 from a high of 95,400 in 2019. The company also rationalized its industrial footprint within its Aircraft Interiors, Electrical & Power, and Nacelles activities with four site closures, three transfers of production, and about 10 restructuring plans.

Helping the company in these difficult transitions was strong support from the government. Early in the crisis, the French government responded with a EUR15 billion

plan to save jobs and the industrial base primarily within the aviation sector. The rescue package will also ramp up investment in emerging technologies such as electric and hydrogen power.

The program aims to shore up major companies that are considered national assets, such as Airbus, Dassault, Safran, and Thales, while helping hundreds of smaller subcontractors throughout the country. The country wants to preserve aviation skills in order to prevent decline and better compete with Boeing and a new potential rival in China's COMAC.

While a period of recovery is budding in 2021, the situation will remain difficult for the near term. Cargo has proven robust during the pandemic and is expected remain so. Passenger air travel is slowly improving, with domestic flights recovering faster than international routes. However, despite the improvements, recovery will take some time, as air travel is not forecast to reach its prepandemic levels until 2023 at the earliest.

## Safran

One bright spot for Safran is the possible acceleration of advanced technology programs. Part of the French government's stimulus package is a goal to ramp up research and development of hydrogen and electric power for future aircraft designs.

Here, Safran stands to benefit the most from its earlier acquisition efforts. One area of focus in the company's strategy has been to expand its operations in the "electrification" of aircraft, which is poised to be the next growth market in aerospace, as it promises even more aircraft efficiency.

The keystone to this focus was the acquisition of Zodiac Aerospace. In 2018, Safran completed its long-stored acquisition of Zodiac, effectively taking control of the company. The combined entity unites Safran activities – which span turbines, landing gear, brakes, and avionics – with Zodiac's cabin interiors and fuel, lighting, safety, and power-distribution gear. As a result, Safran is now a one-stop shop for OEMs. Further, the deal expands Safran's interests in North America, where Zodiac has a large industrial presence. This should help decrease the combined firms' currency exposure in the aerospace industry's dollar-denominated market.

Zodiac Aerospace is one of two major suppliers of aircraft seats, the other being B/E Aerospace. B/E Aerospace was acquired by Collins Aerospace, which was recently acquired by Raytheon Systems. The goal of these consolidations among Tier 1 suppliers is to gain a stronger position from which to negotiate with OEMs.

Thanks to increased government stimulus, the company is likely to increase research into hydrogen fuel cells as a power source for aircraft electrical systems. Electrical systems are one of the key technologies that make modern aircraft more efficient. They are now one of the guideposts the French government is following as part of its pandemic recovery effort.

Another key technology in new aircraft designs are fuel-efficient engines. Safran Aircraft Engines, through its joint venture with CFM International, has developed the new LEAP engine to meet this demand. There is a backlog for well over 9,600 LEAP engines, representing years of work. While COVID-19 and the 737 MAX grounding slowed production in 2020, this will rebound in tandem with the airliner recovery over the next few years.

## Program Activity

Some important aerospace and government programs underway at Safran are listed below, along with the company's business interests:

- Avionics
- Defense Electronics
- Optronics
- Civil Aircraft Engines
- Military Aircraft Engines
- Helicopter Turbine Engines
- Auxiliary Power Units
- Engine Maintenance, Repair, and Overhaul
- Landing and Braking Systems
- Nacelles and Thrust Reversers
- Mechanical Power Transmission Systems
- Aircraft Electrical Power Generation and Distribution Systems
- Electrical Connection Systems
- Ventilation Systems and Electric Motors
- Engine Components and Parts
- Launch Vehicle and Missile Propulsion

### Aircraft Programs

As a Tier 1 and Tier 2 supplier, Safran's Aircraft Equipment division and its subsidiaries support a variety of commercial aircraft programs by Boeing

(787, 777X, and 737 MAX), Airbus (A350 XWB, A330neo, A330ceo, and A320neo) and COMAC (C919). The company also provides components for regional aircraft manufacturers, including ATR, Bombardier, Cessna, Dassault Aviation, Embraer, Gulfstream, Sukhoi, Fokker, and Piaggio.

In addition, the firm supplies various systems for a number of major military aircraft programs such as the A400M, Rafale, Eurofighter Typhoon, KC-135, KC-390, F/A-18, and V-22.

### Aviation Gas Turbine Programs

#### Turbofan Engines

#### **CFM International CFM56**

The CFM56 series, developed and manufactured in conjunction with GE Aircraft Engines, are commercial high-bypass turbofan engines. The military designation of the CFM56 is the F108. Safran Aircraft Engines manufactures the CFM56 fan, the low-pressure system, the thrust reversers, the core and engine frame, the gearbox, and the accessory drives. Applications for the CFM56 series include the Airbus A319, A320, A321, and A340; Boeing 737; and C-135 military variant aircraft. More than 32,000 CFM56 series engines, including F108 military variants, have been built.

## Safran

### CFM International LEAP

This is a new twin-spool, high-bypass-ratio advanced-technology turbofan engine being developed for narrowbody aircraft from Airbus and China's COMAC. CFM's LEAP-X began as the LEAP56 technology development program in conjunction with parent companies Safran Aircraft Engines and General Electric.

The company used the existing CFM56-5B and -7B engines as a baseline, targeting improvements of a 10-15 percent lower specific fuel consumption, a 15-25 percent reduction in maintenance costs, a 25 percent increase in on-wing time, and a 50 percent decrease in NOx emissions. The key to these goals has been leveraging technologies from GE's GE90 and GEnx engines as well as composite fan technology Safran Aircraft Engines is developing.

The LEAP-1A is an option on the Airbus A320neo. The LEAP-1B is the exclusive powerplant for the Boeing 737 MAX. Finally, the LEAP-1C is the sole Western powerplant for the COMAC C919. The LEAP-1A engine test ran in September 2013; the LEAP-1B began testing in June 2014.

Approximately 4,183 engines were produced through 2020.

### Engine Alliance GP7000

The GP7000 engine family is being marketed to power very large widebody, high-capacity aircraft, such as the Airbus A380 and the proposed Boeing 747 Advanced (now the 747-8). The engine was designed and built by the GE-P&W Engine Alliance, which is owned equally by Pratt & Whitney and General Electric.

While GE and Pratt are equal partners in the alliance, they have reduced their exposure by bringing in other firms as revenue-sharing partners. MTU Aero Engines of Germany holds about 22 percent of the program, 10 percent through GE, and 12 percent through Pratt. Safran Aircraft Engines has a 10 percent share of the project (through GE), while Safran Aero Boosters has 7.5 percent of the program (through Pratt).

By the end of 2018, Airbus no longer had any orders for an A380 powered by the GP7200 in its backlog. All A380s currently scheduled for future delivery feature the Trent 900.

### General Electric CF34

This is a two-shaft, high-bypass-ratio aviation turbofan engine designed for 50-, 70-, 90-, and 110-seat regional jets as well as super midsize business/corporate jets. Safran Nacelles produces nacelles for this engine.

### General Electric CF6-80C2/E1

This is a two-spool, axial-flow, high-bypass-ratio turbofan engine designed for heavy commercial and military transport aircraft. The military designation of the CF6-80C2 is the F103-GE-102. Safran Aircraft Engines produces this engine under license and holds a 10 to 20 percent risk-sharing role in the CF6-80C2 and CF6-80E1. For the CF6-80C2, it manufactures some assemblies and major parts, such as the fan blade and combustion chamber. Safran Aircraft Engines became part of the CF6-80E1 effort by taking charge of the aerodynamic, aeromechanical, and mechanical design of the derivative booster, with the exception of the inlet guide vane's aerodynamic design and the spool mechanical design.

### General Electric GE90

The GE90, an ultra-high-thrust turbofan designed to power future large commercial airliners, is currently in production under the direction of General Electric Aircraft Engines of Evendale, Ohio. Safran Aircraft Engines has a 24 percent share in the development and manufacture of this turbofan. Safran Aircraft Engines' responsibilities for the GE90 include the LP and HP compressors and booster, lubrication system, FADEC subassemblies (through the subsidiary Safran Aero Boosters), and starter (equal partner with GE on composite fan blades through C-Fan, Austin, Texas). Safran Aircraft Engines also performs development work on the backup titanium fan and 10-stage compressor.

On the new GE9X variant, Safran Aircraft Engines is responsible for the design and manufacture of the 3D-woven composite forward fan case, the turbine rear frame and, in conjunction with GE, the composite fan blades through its 50-50 joint venture company CFAN. Safran Aero Boosters will be responsible for design and manufacture of the low-pressure compressor and the fan disk. Certification for the GE9X engine began in 2018. An estimated 2,787 GE90 engines have been produced for the Boeing 777 program, including development engines.

### PowerJet SaM146

The PowerJet SaM146 is an axial-flow aviation turbofan engine developed using European and Russian technology. The engine is also referred to as the SM146. The PowerJet SaM146 is being developed by PowerJet, a 50-50 joint company formed by Safran Aircraft Engines and NPO Saturn. The engine has been selected to power the Superjet 100 Russian Regional Jet family. An estimated 428 SaM146 engines were assembled through 2020.

**Safran****Rolls-Royce AE 3007**

This is a high-bypass, two-spool, axial-flow turbofan engine series that powers midsize business jets and the Global Hawk unmanned aerial vehicle (UAV). Safran units provide the nacelles and fan ducts for the engine.

**Rolls-Royce BR700/Pearl**

The BR700 family is used primarily on large, long-range business jets. The new Pearl 15 engine is the latest iteration of the BR700 family and offers higher fuel efficiency. Safran Nacelles provides nacelle components.

**Rolls-Royce Trent**

RB211/Trents are three-spool, high-bypass-ratio turbofan engines used on large commercial transport aircraft. The Trent 900 is in production for the Airbus A380, and the Trent 1000 is in production for the Boeing 787. The Trent XWB is in development for the Airbus A350 XWB. Safran Transmission Systems, which supplies the gearbox for the Trent models, is a manufacturing participant in this program (accessory drive gearbox and power transmission system) and holds a 3 percent share. Safran Nacelles provides nacelle components.

**Rolls-Royce Turbomeca Adour**

Rolls-Royce Turbomeca (Safran Helicopter Engines) Ltd produces the Adour turbofan in both augmented and non-augmented versions. Rolls-Royce is responsible for the combustor system, the LP and HP turbines, the LP shaft, the exhaust cone, the mixer, and the oil tank. The Adour powers a number of military trainer, fighter, and attack aircraft and is currently in production for the BAE two-seat Hawk trainer and its single-seat Hawk 200 attack variant as well as the T-45 Hawk variant chosen for the U.S. Navy's undergraduate jet trainer requirement. The U.S. designation for the Adour engine used in the T-45 (the Adour Mk 871) is F405-RR-401. Engine production is expected to end in 2022.

**Safran M88**

The M88 is a two-shaft, low-bypass-ratio, advanced-technology turbofan engine designed for fighter aircraft. The Safran M88-2 is one of the new wave of European fighter engines designed to fit the exacting requirements of the new generation of combat aircraft. Safran Aircraft Engines' efforts in the military propulsion market for the next two decades are focused squarely on the M88's sole application to date, the Rafale. An estimated 554 M88s have been produced, including engines for development and testing. Production is to remain stable in near term as Dassault delivers aircraft to export customers, including Egypt, India, and Qatar.

**Safran Silvercrest**

Announced in late 2006, this is a new-generation business jet engine under development at Safran Aircraft Engines. The Silvercrest (formerly called the SM-X) is being developed for large and long-range business jets that will soon enter service. According to Safran Aircraft Engines, the powerplant will develop from 9,500 to 12,000 lbf, making it ideal for upcoming large and long-range business jets. In late 2017, Dassault canceled the Falcon 5X program and scrapped its contract with Safran over the troubled Silvercrest turbofan. In September 2018, Safran and Dassault reached a settlement under which Dassault would be paid \$280 million. The engine had also been selected for the Cessna Citation Hemisphere. However, in July 2019, Cessna canceled its supply contract for Safran's Silvercrest after freezing its Hemisphere aircraft program in 2018. Safran said the program will continue as an R&T platform.

Aviation Auxiliary Power Units**Safran Power Units APS 500 and SPU150[DA]**

This is a small, single-shaft, centrifugal-flow gas turbine machine/airborne auxiliary power unit. Applications are currently limited to the Embraer Legacy 650 business jet. Safran rebranded the APS 500 as the SPU150[DA] for future applications in 2016. The final application for the APS 500 auxiliary power unit, the Embraer Legacy 650E business jet, exited production in 2020 amid the fallout from the COVID-19 pandemic, leaving the APS 500 without an application. An estimated 2,967 APS 500 APUs were produced through 2020.

**Safran Power Units Rubis**

This is a small, single-shaft, centrifugal-flow gas turbine APU/GPU in the 50 to 200 shp class. The Rubis' sole application is the Dassault Rafale fighter. Through 2020, an estimated 243 Rubis APUs had been built for the Dassault Rafale program. Another 687 were built for other applications, including ground power units (GPUs).

**Safran Power Units Saphir**

This is a small, single-shaft, centrifugal-flow APU/GPU gas turbine used on both helicopters and military trainer aircraft. APU is in production in France for the Airbus Helicopters Super Puma family, BAE Systems Hawk, and NH Industries NH90 helicopter. An estimated 5,632 Saphir APUs were produced through 2020.

## Safran

### Turboprop Engines

#### **Europrop International TP400-D6**

The Europrop International TP400-D6 is the first production-viable aviation turboprop engine in what could become an engine family. The engine will power the Airbus A400M military transport. For the TP400-D6, Rolls-Royce, MTU Aero, and Safran Aircraft Engines hold equal shares in the Europrop partnership (28 percent each), with ITP holding 16 percent. However, those totals do not relate to the work shares allocated to each partner (percentages that reflect the number of aircraft purchased by each country). For the latter, Safran Aircraft Engines has a 32.2 percent share of the program, Rolls-Royce has 25 percent, MTU 22.2 percent, and ITP 20.6 percent.

An estimated 465 TP400-D6 engines were delivered through 2020. Production was cut to eight aircraft annually in 2020 as Airbus responded to the ongoing lack of new export orders.

### Turboshaft Engines

#### **MTR GmbH MTR390**

The MTR390 is a modular, two-shaft, centrifugal-flow, free-turbine turboshaft engine designed for medium-weight helicopters, such as the Airbus Helicopters Tiger. The prime contractor for the MTR390 is MTU Turbomeca Rolls-Royce GmbH (MTR GmbH). Partner manufacturing firms in the consortium include MTU Aero Engines, Safran Helicopter Engines, and Rolls-Royce. Each partner has a one-third share in the joint venture. The work share is MTU, 40 percent; Safran Helicopter Engines, 40 percent; and Rolls-Royce, 20 percent. Production of new Tigers, the engine's sole application, was suspended in 2020 pending new orders.

#### **Safran Arbizon**

This is a single-shaft, axial-centrifugal-flow turbojet engine series used on missiles and remotely piloted vehicles. The Arbizon engine powers the OTOMAT Mk 4 missile.

#### **Safran Arrano**

Announced in 2013, the Arrano, formerly named the TM800, replaced the Arriel series in the 1,100 shp class of helicopter engines. This is a new engine, which will initially power the Airbus Helicopters H160 medium-twin. The Arrano-powered Airbus Helicopters H160 made its first flight on January 27, 2016.

#### **Safran Arriel**

This is a twin-spool, axial-centrifugal, flow-free turbine turboshaft engine. The Arriel is in production for Airbus Helicopters/Harbin and Sikorsky medium, civil, and military helicopters. More than 15,300 Arriel

turboshaft engines have been manufactured in France and China.

#### **Safran Arrius**

This is a twin-spool, centrifugal-flow, free-turbine turboshaft engine designed for light/medium-class, single- and twin-engine helicopters, such as the Bell 505 and Airbus H135. An estimated 4,685 engines have been produced.

#### **Safran Helicopter Engines TM333/Ardiden**

This is a twin-spool, axial-centrifugal-flow, free-turbine turboshaft designed for light- and intermediate-weight commercial and military helicopters. An estimated 286 TM333 and 380 Ardiden engines have been produced.

#### **Safran High-Power Engines (HPE)**

This program is developing a new family of engines with power in the 2,500-3,000+ shp range. Safran Helicopter Engines is currently working on a technological demonstrator engine, designated the TECH3000 demonstrator, to validate new compressor and hot-section technologies and test the use of new materials. Safran has said little about the program since 2017.

#### **Safran Makila**

This is a two-shaft, axial-centrifugal, flow-free turbine turboshaft designed for medium- and heavy-weight commercial and military helicopters. The Makila's fortunes remain tied to the Airbus Helicopters H215/H225 Super Puma/Cougar family of heavy helicopters.

#### **Safran Makila TI**

The Safran Helicopter Engines Makila TI is a two-shaft, axial-centrifugal-flow, aeroderivative industrial, and marine gas turbine machine in the 1.0 to 1.5 MW class. The Makila TI is used in electrical generation, mechanical load drive, and marine propulsion applications.

#### **Safran RTM322**

The RTM322 is a 2,100 shp turboshaft engine developed by Rolls-Royce and Safran Helicopter Engines. In September 2013, Safran acquired Rolls-Royce's 50 percent share in the two companies' joint RTM322 helicopter engine program for EUR293 million. Safran Helicopter Engines is now the sole prime for the RTM322 engine, which was selected for the British-built versions of the three-engine EH101 multirole helicopter and will equip the Kamov Ka-62 commercial rotary-wing aircraft. The RTM322 has been selected as a powerplant for the WAH-64D Apache and NH90 helicopters in U.K. service. More than 1,300 RTM322 engines have been built.



## Safran

### Turbojet Engines

#### **Safran Arbizon**

The Arbizon is a single-shaft, axial-centrifugal-flow turbojet engine series used on missiles and remotely piloted vehicles (RPVs). Safran currently produces the Arbizon turbojet for two missile programs: the OTOMAT and the Hsiung Feng II/III.

#### **Safran Power Units TR Turbojet Family**

The TR family of small turbojet engines provides power to a number of missile and target drone programs. Missile programs include the SCALP-EG, RBS15, Exocet, Naval Strike Missile, and the Missile de Croisière Naval (MdCN). TR engines are also used on the BQM-167A and BQM-177 target drones.

#### **Safran Power Units TRS 18**

The Safran Power Units (formerly known as Microturbo) TRS 18 series of engines is a family of lightweight turbojet powerplants designed for propulsion applications on light aircraft, remotely piloted vehicles (RPVs), drones, and missiles. It is currently produced solely for Italy's Mirach target drone.

### Electronics Programs

#### **FELIN**

Fantassin à Equipements et Liaisons Intégrés (FELIN) is the French Army's individual soldier system. The aim of the system is to improve the operational functions of the French infantryman. With FELIN, each infantryman will be equipped with a complete combat system that features electronic and optical-electronic equipment. Safran Electronics & Defense is the prime for FELIN systems.

#### **Safran Periscopes**

These are advanced search-and-attack periscopes of the PIVAIR family, incorporating a variety of sensors on a single mast. The PIVAIR integrated periscope system is deployed on all French nuclear-powered attack submarines of the Rubis and Améthyste classes. The non-penetrating optronic developments of these systems are being applied to French SSBNs and France's future Barracuda class nuclear attack submarines. The mast and periscopes are produced by Safran Electronics & Defense.

#### **Sagem EOMS**

The Electro-Optical Multifunction System provides an infrared search-and-track capability for surface combatants. Featuring an infrared camera, an eye-safe laser rangefinder, and a black-and-white TV monitor, the EOMS provides search-and-track,

surveillance, and intelligence-gathering capabilities. Safran Electronics & Defense introduced a new version, the EOMS NG, which reportedly takes advantage of the latest advances in infrared technology.

#### **'SPECTRA**

Self-Protection Equipment Countering Threats to Rafale Aircraft (SPECTRA) is an electronic warfare system designed for Rafale combat aircraft. Thales is the prime, with Safran Electronics & Defense providing the SAMIR missile warning system.

### Space System Programs

#### **Ariane 5**

The Ariane 5 is a European heavy-lift expendable launch vehicle. Safran Aircraft Engines is prime contractor for the Vulcain 2, developing and producing this new main-stage cryogenic engine for Europe's Ariane 5 ECA heavy launcher. In December 2014, Airbus and Safran created a new joint venture, ArianeGroup, to provide support for the Ariane 5 and develop the new Ariane 6.

#### **Ariane 6**

In August 2015, the European Space Agency (ESA) and ArianeGroup signed a EUR2.4 billion contract covering the development of the Ariane 6 launcher. Also known as the Next-Generation Launcher (NGL), the Ariane 6 will be a European heavy-lift expendable launch vehicle designed to replace the Ariane 5. ESA and ArianeGroup expect the first launch to occur in 2020. Due to the COVID-19 pandemic and accompanying production and testing delays, the first launch has been pushed back to sometime in 2022. Safran is developing the Vulcain 2.1 main engine.

### Unmanned Vehicles Programs

#### **Furious**

In January 2018, Safran was selected for the DGA (Direction Générale de l'Armement) Science & Technology project Furious. This five-year effort is designed to lay the groundwork for the integration of land robots in French armed forces as part of the Scorpion modernization program. The DGA's Furious project will involve the development of three robot demonstrators of different sizes and with different mission profiles for a variety of environments, such as exploring buildings and carrying loads for infantry soldiers. These demonstrators will be deployed by an infantry platoon and tested in different configurations. The largest of the three robots will be the eRider autonomous vehicle developed by Safran Electronics & Defense in partnership with Valeo and PSA.

**Safran****Sperwer/Patroller**

Safran Electronics & Defense is also offering the Patroller family of UAVs. These are long-endurance UAVs that can perform over-land or maritime patrol missions. The members of this family include Patroller-R – air force reconnaissance; Patroller-M –

maritime surveillance; and Patroller-S – homeland security operations. The Patroller is based on the S-15, a manned aircraft built by the German firm Stemme. The first flight of the Patroller took place in 2009. Safran Electronics & Defense has produced over 25 complete tactical drone systems to date.

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