

## 1.1 Overview

### 1.1.1 History

Safran is a leading international high-technology group in the Aerospace, Defense and Security industries, where it enjoys prime global or European market positions, either alone or in partnership with other companies. Safran is constantly seeking to adapt and reinvent itself to meet the critical technological and economic challenges of tomorrow.

Safran's roots and its technological and industrial hub are in France and Europe. From this base, it has extended its footprint to the American continent, Africa, the Middle East, Asia and Oceania. This presence enables the Group to develop and nurture industrial and commercial relations with the leading prime contractors and operators at national level, and to promptly deliver first-class local service to customers around the world.

#### Key dates in the Group's history

Safran was created on May 11, 2005 from the merger of Snecma and Sagem, and is the world's oldest aircraft engine manufacturer. It has been at the forefront of Aerospace and Defense for more than a century and is now also a leading name in Security.

**1905** Louis and Laurent Seguin found the Société des Moteurs Gnome in the Paris suburb of Gennevilliers. In just a few short years, their Gnome rotary engines become the standard for planes around the world.

**1912** Louis Verdet founds the engines company Le Rhône. Within two years, Le Rhône becomes Gnome's main competitor and is taken over by its rival to form Société des Moteurs Gnome & Rhône. After the First World War, Gnome & Rhône becomes one of the world's leading manufacturers of aircraft engines.

**1924** Marcel Môme creates Société d'Applications Générales d'Électricité et de Mécanique (Sagem), whose main business is to supply power to telephone exchanges. A few years later, Sagem diversifies its business to include the manufacture of cameras, projectors and artillery equipment. It also sets up the first ever analog telephone network. Sagem creates Société d'Application Téléphonique, which in 1960 becomes Société Anonyme de Télécommunications (SAT). This company goes on to design the world's first infrared guidance system for air-to-air missiles.

**1945** After the Second World War, Gnome & Rhône is nationalized and renamed Snecma (for Société Nationale d'Étude et de Construction de Moteurs d'Aviation). It groups together the majority of French aircraft engine manufacturers launched since the beginning of the century (Renault, Lorraine, Régnier, etc.).

**1968** Hispano-Suiza, specializing in power transmission for the engines of civil and military aircraft and helicopters, joins Snecma. A few years later, it teams up with Messier to create Messier-Hispano-Bugatti (MHB) and consolidate all products relating to landing systems. Messier-Bugatti-Dowty is today the world's leading player on this market<sup>(1)</sup>.

**1974** Snecma becomes a civil aircraft engine manufacturer through a cooperation agreement with General Electric Aircraft Engines for the manufacture of the CFM56\* ("CF" for General Electric's commercial engine line and "M56" for Snecma's fifty-sixth project). This engine currently represents the world's largest civil aircraft engine fleet<sup>(2)</sup>; an aircraft powered by the CFM56 takes off every two seconds<sup>(2)</sup>.

**1993** Sagem purchases Morpho, a specialist in fingerprint-based biometric recognition systems. Today, the business is the world leader in this sector.

**1997** Snecma takes full control of Société Européenne de Propulsion (SEP) and enters the space propulsion market (Ariane launcher).

**2000** Aircraft wiring specialist Labinal joins Snecma and becomes a leading world player in this market. Labinal helicopter engine manufacturer subsidiary Turbomeca also joins Snecma, to continue a technology success story that started in 1938 with company founder Joseph Szydlowski. Today, Turbomeca is the world's premier manufacturer of turbine engines for helicopters<sup>(2)</sup>.

**2002** Hurel-Dubois merges with the aircraft engine nacelle business of Hispano-Suiza to become Hurel-Hispano. Three years later the company is renamed Aircelle. It is currently one of the key players on the aircraft engine nacelle market.

**2005** Safran is formed from the merger of Snecma and Sagem. Safran strengthens its positions in the Security business with the acquisition of smartcard specialist Orga Kartensysteme GmbH.

**2008** Safran extends its partnership with General Electric (GE) in the fields of aerospace propulsion and nacelles through to 2040. Safran's Security business acquires Sdu-I in the Netherlands, renamed Morpho BV.

**2009** Safran acquires 81% of GE's Homeland Protection business, and Motorola's biometrics business (under the Printak brand, now MorphoTrak). Then in 2012, Safran acquires the remaining 19% of GE Homeland Protection, renamed Morpho Detection Inc.

**2010** Labinal completes its acquisition of Harvard Custom Manufacturing - renamed Labinal Salisbury - an American company based in Salisbury (Maryland).

(1) Source: Safran.

(2) Source: Ascend, [www.ascendworldwide.com](http://www.ascendworldwide.com)

**2011** Safran acquires L-1 Identity Solutions, now MorphoTrust USA, a leading identity management provider in the US market, to become a front-line world player in identity solutions and electronic documents. It also acquires SME (formerly SNPE Matériaux Énergétiques), to be merged with Snecma Propulsion Solide in 2012 to form Herakles, world number two in solid propellants for rockets<sup>(1)</sup>.

**2012** In optronics, Safran and Thales form the 50-50 joint venture Optrolead. The two companies also buy out the Areva stake to obtain 50% each of Sofradir and transfer their infrared businesses to this company.

**2013** Safran acquires the electrical systems business of Goodrich (Goodrich Electrical Power Systems – GEPS).

Safran also acquires the 50% interest of Rolls-Royce (UK) in their joint RTM322 helicopter engine program, to strengthen its position on the strategic heavy-lift helicopters segment.

**2014** Safran brings all the Group's electrical systems operations together into a single unit to form a leading world player in aircraft electrical systems: Labinal Power Systems. Safran also acquires the aerospace power distribution management solutions and integrated cockpit solutions businesses of Eaton Aerospace.

Morpho acquires Dictao, a prominent developer of software solutions for security and digital trust.

**2015** Safran and Airbus Group found a new 50-50 joint venture, Airbus Safran Launchers (ASL), to support the onset of the Ariane 6 project that will be providing Europe with a new family of competitive, versatile, high-performance space launch vehicles.

Hispano-Suiza and Rolls-Royce found Aero Gearbox International, a joint venture specializing in design, development, production and after-sales for accessory drive trains (ADTs).

## 1.1.2 Organization and position of the issuer in the Group

### Organization

Safran is an industrial group within which each subsidiary directly manages the operational side of its business activity and takes responsibility for the internal control system to be implemented in accordance with Group procedures and internal rules.

The organizational structure is based on:

- ◆ a parent company, Safran, the issuer, responsible for the Group's strategic management, organization and development;
- ◆ companies handling specific business lines, under strategies determined by the parent company's Board of Directors. Executive Management of the parent company ensures that the strategic orientations defined for each business line are implemented and complied with at the operational level.

First-tier entities (shown in section 1.1.3) are responsible for overseeing the second-tier entities with which they have operational ties.

### Role of the issuer within the Group

Safran is listed in compartment A of the Euronext Paris Eurolist and is eligible for deferred settlement (see Euronext notice 2005-1865 of May 11, 2005).

As the Group's parent company, Safran performs the following functions for the Group companies:

- ◆ it holds and manages shares in the Group subsidiaries;
- ◆ it steers and develops the Group, determining: Group strategy; research and technology (R&T) policy; sales policy;

legal and financial policy; human resources policy; personnel training, retraining and skills matching by Safran University; communications; and oversight of operations;

◆ it provides:

- support services on legal, taxation and financial matters, and in particular:
  - centralized cash pooling to govern the terms and conditions of advances and investments between Safran and each Group company,
  - foreign currency management policy to reduce uncertainty factors and protect the economic performance of operating subsidiaries from random foreign currency fluctuations (mainly USD),
  - commodity risk management policy to reduce uncertainty factors and protect the economic performance of operating subsidiaries from commodity price volatility,
  - tax consolidation, in jurisdictions such as France where Safran is liable for the entire income tax charge, additional income tax contributions and the minimal tax charge due by the tax group comprising itself and its tax-consolidated subsidiaries;
- services through Shared Services Centers (SSCs) in the following areas: payroll administration and management, recruitment, non-production purchases, materials purchases, IT, and some transaction accounting (customers, suppliers and fixed assets).

The list of consolidated companies is presented in section 3.1, Note 33.

<sup>(1)</sup> Source: Safran.

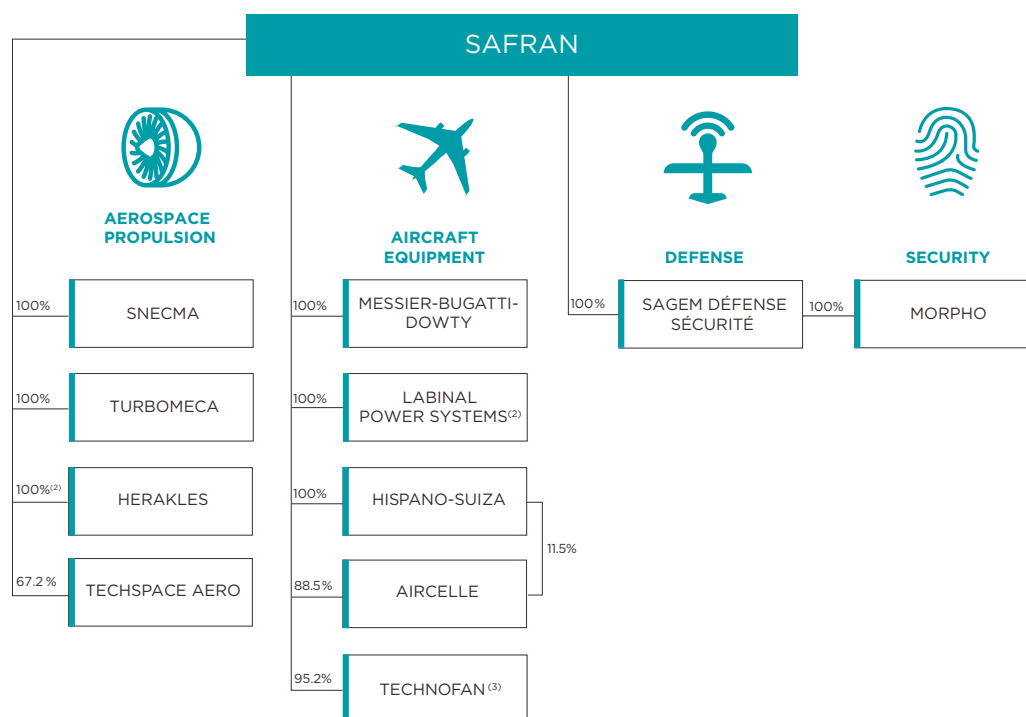
## Financial flows between the issuer and Group companies

Safran receives dividends paid by its subsidiaries compliant with applicable regulations.

It receives payment for services provided to Group companies, and invoices them for services provided through the Shared Services Centers.

### 1.1.3 Simplified organization chart<sup>(1)</sup>

Safran, the issuer, is the parent company of the Group. The simplified organization chart as of December 31, 2015 is as follows:



The list of consolidated companies is presented in section 3.1, Note 33.

With a view to capitalizing on Safran's strong brand recognition in France and worldwide, the Group is rationalizing and simplifying its brand portfolio, making it clearer and easier to understand.

In 2016, Safran's first-tier companies will be renamed as follows:

- ◆ Snecma: Safran Aircraft Engines;
- ◆ Turbomeca: Safran Helicopter Engines;
- ◆ Herakles: Safran Ceramics<sup>(4)</sup>;
- ◆ Techspace Aero: Safran Aero Boosters;
- ◆ Messier-Bugatti-Dowty: Safran Landing Systems;
- ◆ Labinal Power Systems: Safran Electrical & Power;
- ◆ Hispano-Suiza: Safran Transmission Systems;
- ◆ Aircelle: Safran Nacelles;
- ◆ Sagem: Safran Electronics & Defense;
- ◆ Morpho: Safran Identity & Security.

The simplification provides Safran with an opportunity to raise brand value outside the Group and to advance in the development of a strong Group-wide culture.

<sup>(1)</sup> First-tier operating companies and listed company.

<sup>(2)</sup> Less one share held by the French state.

<sup>(3)</sup> Company listed in compartment C of the Euronext Paris Eurolist.

<sup>(4)</sup> On completion of operations bringing together Airbus Group and Safran activities in space launch vehicles.

## 1.1.4 Main Group companies by business sector

Safran currently operates in three main markets: Aerospace, Defense and Security. Safran's Aerospace business breaks down into Aerospace Propulsion and Aircraft Equipment.

### Aerospace Propulsion

Safran's Aerospace Propulsion business covers all activities (design, production, marketing, testing, maintenance and repair) relating to propulsion systems for planes, helicopters, missiles and launch vehicles, in the civil, military and space markets.

#### SNECMA

Engines for commercial and military aircraft, maintenance, repair and overhaul (MRO) services. Liquid-propellant rocket propulsion systems for launch vehicles and plasma propulsion systems for satellites and space vehicles.

#### TURBOMECA

Turboshaft engines for civil and military helicopters, auxiliary power units (APU), starting and propulsion systems for missiles, target drones and unmanned aerial vehicles (UAV). Maintenance, repair and overhaul (MRO) and associated services.

#### HERAKLES

Solid rocket motors for launchers and missiles, as well as energetic materials, pyrotechnic equipment, thermostructural and organic composite materials for the aerospace, defense, automobile and manufacturing industries.

#### TECHSPACE AERO

Low-pressure compressors for aircraft engines. Equipment for aircraft and spacecraft. Test cells and equipment for engine testing.

### Aircraft Equipment

Safran's Aircraft Equipment business covers equipment, subsystems and services for civil and military aircraft and helicopters.

#### MESSIER-BUGATTI-DOWTY

Aircraft landing and braking systems. Control and monitoring systems. Capabilities covering the entire product cycle, from design and production to maintenance, repair and overhaul (MRO).

#### LABINAL POWER SYSTEMS

Electrical power systems for the aerospace market, covering all onboard electrical functions (power generation, distribution and conversion, wiring, load management, ventilation). Engineering solutions for the aerospace, automobile and rail industries.

#### HISPANO-SUIZA

Mechanical power transmission systems for commercial and military airplane engines and helicopters. Maintenance, repair, overhaul (MRO) and associated services. Mechanical components for airplane and helicopter propulsion systems.

#### AIRCELLE

Complete nacelle systems for aircraft engines, associated support services, composite materials for aerostructures.

#### TECHNOFAN

Ventilation equipment for civil and military aircraft. Support and related services. Company listed in compartment C of the Euronext Paris Eurolist.

### Defense

#### SAGEM<sup>(1)</sup>

Optronics, avionics and navigation systems and equipment, electronics and critical software for both civil and defense markets, covering land, sea, air and space applications. A full range of product support services.

### Security

#### MORPHO

Multi-biometric identification technologies (fingerprint, iris and face recognition). Identity solutions and digital security. Smart cards, documents and secure elements. Explosives and narcotics detection systems. Solutions for road safety. Gaming and betting terminals.

(1) Sagem is the trade name of Sagem Défense Sécurité.

## ◆ 1.2 Group strategy

Safran builds front-line positions on the Aerospace, Defense and Security markets. In all its business areas, it enjoys wide recognition for technological excellence serving customers' critical applications.

In Aerospace Propulsion, Safran is a leading manufacturer of aircraft engines, helicopter turbine engines and space engines. Safran's extensive portfolio and installed base of products in service (the CFM56 engine in particular) offer significant new vistas for value creation, as do the related service and maintenance activities. To maintain its positioning, the Group also places a strong emphasis on development of innovative engine solutions, as shown from its investments in the following programs:

- ◆ in short- and medium-haul commercial aviation, CFM International, a 50-50 joint venture between Safran and GE, is developing the LEAP engine (successor to the best-selling CFM56) that will power the Airbus A320neo (-1A version), the Boeing 737 MAX (-1B version, exclusive source) and the COMAC C919 (-1C version, sole Western source);
- ◆ in long-haul commercial aviation, Safran partners GE on development of the GE9X engine, chosen as the sole source for the forthcoming Boeing 777X;
- ◆ in business aviation, Safran is developing the Silvercrest® engine selected by Dassault Aviation for its Falcon 5X;
- ◆ in helicopters, Safran is developing a range of high-power engines (3,000 shp) for medium-to-heavy-lift helicopters, following the 2013 acquisition of Rolls-Royce's share in the RTM322 program;
- ◆ in space vehicles, Airbus Safran Launchers is working on the Ariane 6 launch vehicle engine (P120C powder booster, Vulcain 2.1 and Vinci cryotechnic engines), under an agreement signed with the European Space Agency in August 2015 on the initial development phase for Ariane 6.

Safran is also a front-line player in Aircraft Equipment (landing systems, wheels and brakes, nacelles, power transmission systems, electrical systems and wiring systems), and in "more electric" aircraft architectures for aircraft manufacturers and airline companies. It is preparing technological differentiation in equipment for the future generation (around 2030) of short- and medium-haul aircraft. In all its Aerospace business lines, Safran has developed a very strong customer and operator service capability, notably through rate-per-flight-hour service contracts that offer customers guaranteed aircraft availability while improving the visibility and the recurrence of aftermarket revenues for Safran.

In Defense, Safran harnesses its strong innovative capacity to assert its leadership in optonics, navigation and avionics, and to develop full onboard solutions with a view to seizing growth opportunities in emerging countries.

On the Security market, Safran harnesses world-renowned experience to meet growing demand for multi-biometric identification systems, secure document systems (for passports,

identity cards, etc.), public safety (as with the passenger name record system, or PNR) and tomographic systems for the detection of explosives and illicit substances. The Group pursues development in digital identity systems (bank applications, strong-authentication secure internet transactions, and cloud computing) using know-how and technologies derived from physical identity solutions.

Safran's development is guided by four main focuses:

- ◆ technological innovation, driving long-term growth;
- ◆ front-line positions in its various businesses;
- ◆ strong positions on high-growth markets;
- ◆ consistently sound financial position.

To back its strategy, Safran continues to forge alliances and long-term partnerships, as with GE on engines for short- and medium-haul aircraft (partnership dating back to 1974, then renewed in 2008 through to 2040). The joint venture Airbus Safran Launchers is a further illustration of this long-term alliance strategy.

Safran also executes targeted external growth operations, chiefly to round out its coverage of key technologies and to access new markets. Following the consolidation of Goodrich Electrical Power Systems in 2013, the 2014 acquisition of two Eaton Aerospace businesses broadened the scope of Lalab Power Systems to cover aircraft electrical distribution and complemented Sagem's cockpit solution positioning. The acquisition of Dictao brings know-how in strong authentication solutions for improved security of bank transactions. These levers strengthen and accelerate Safran's growth.

Safran is pushing ahead with its competitive performance improvement plan, through development of its industrial facilities and preparatory work on the Factory of the Future program, which involves additive manufacturing, digitization/automation of production processes, industrial Internet of Things, and maximization of plant running times.

Safran takes up positions on long-term markets on which sustained demand ensures growth and profitability. Growth opportunities are found in the strong development potential of emerging countries, and in mature US and European markets, where aircraft fleets are under renewal. Safran expects the worldwide fleet to double in size over the next 20 years. This is the global aerospace market on which Safran asserts its sustainable growth and profitability strategy.

Safran's financial fundamentals are very sound. Robust cash flow from operations underpins a strong long-term position at the technological frontline, sustained R&D investments, and an acquisitions policy geared to short- and medium-term growth.

Safran implements its development strategy in accordance with strong ethical principles, as set out in its guidelines on Group values and ethical conduct (see section 5.2.1).

## ◆ 1.3 Group businesses

### 1.3.1 Aerospace Propulsion

The Aerospace Propulsion business operates in three fields:

AIRCRAFT AND LIQUID-PROPELLANT ENGINES	
<b>Civil aircraft engines</b>	Business jets Regional jets Short- and long-haul aircraft Long-haul aircraft
<b>Military aircraft engines</b>	Fighters Training and support aircraft Patrol, tanker and transport aircraft
<b>Liquid-propellant and plasma-propulsion engines</b>	Launch vehicles and satellites

HELICOPTER TURBINE ENGINES	
<b>Turbine engines for helicopters</b>	Light helicopters Medium-weight helicopters Heavy-lift helicopters

SOLID-PROPELLANT ENGINES	
<b>Civil space industry</b>	Launch vehicles
<b>Military industry</b>	Ballistic missiles Tactical missiles and targets

#### 1.3.1.1 Aircraft and liquid-propellant engines

##### CIVIL AIRCRAFT ENGINES

##### Key characteristics of the business sector

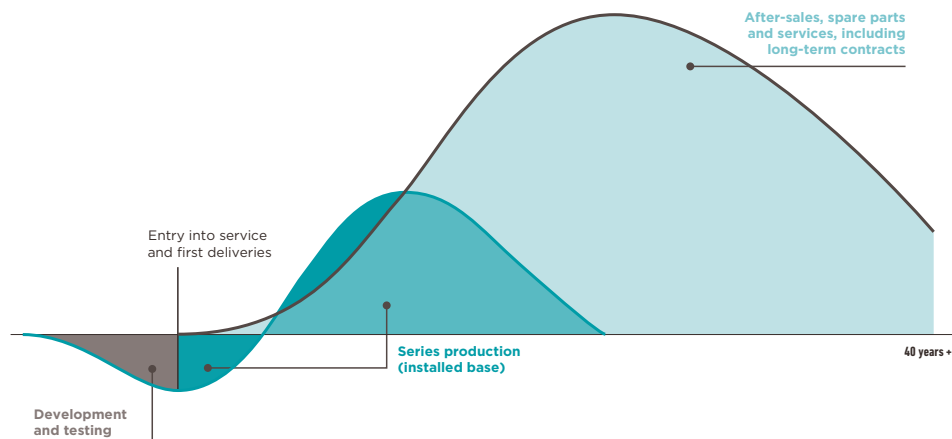
The civil aviation sector comprises four main segments:

- ◆ business jets powered with engines delivering between 5,000 and 18,000 pounds of thrust;
- ◆ regional jets (30 to 100 seats) powered by engines delivering between 8,000 and 18,000 pounds of thrust;
- ◆ short- and medium-haul aircraft with 100 to 200 seats, powered by engines delivering between 18,500 and 50,000 pounds of thrust;
- ◆ high capacity long-haul aircraft with a twin-aisle fuselage, powered by engines delivering over 50,000 pounds of thrust (currently up to 115,000 pounds).

In response to aircraft manufacturer requirements for specific engines for each of these business sectors, engine manufacturers invest in civil engine programs comprising two types of activity:

- ◆ original equipment activity, involving the sale of engines installed on new aircraft;
- ◆ service activity, comprising the sale of spare parts and service contracts entered into on a case-by-case or long-term basis with operators and approved maintenance centers.

##### ECONOMIC LIFECYCLE OF AN AIRCRAFT ENGINE<sup>(1)</sup>



(1) For illustrative purposes only.

These programs may span more than 40 years and have several phases. A significant portion of revenue generated by these programs comes from support services.

Addressing operators' expectations on this market, there is a growing tendency to offer long-term rate-per-flight-hour service contracts. This improves visibility for customers and offers engine manufacturers a better guarantee of revenues and a smoother cash profile throughout the engine lifecycle.

There are four major engine manufacturers in the sector that can act as prime contractors: GE (US), Rolls-Royce (UK), Pratt & Whitney (US) and Safran.

In the industry, the US dollar is used almost exclusively as the transaction currency.

### Alliances and partnerships

Because of the very substantial investment involved in new engine programs, Safran often works in partnership with other engine manufacturers.

Partnerships may take the form of joint ventures, as with GE and NPO Saturn (Russia).

They can also be based on contractual risk-and-revenue-sharing agreements, under which Safran receives a share of sales revenue for the final delivered product, corresponding to its share in the program. The GE90 program is an example of this kind of arrangement.

### Group products and programs

Safran's operations in the civil aircraft engines segment mainly involve Snecma and Techspace Aero.

#### Low-thrust engines for civil aircraft

This engine family powers regional transport jets and business jets.

Safran is the prime contractor for the SaM146 program, in partnership with the Russian engine manufacturer, NPO Saturn. The SaM146 is the sole engine for the Superjet 100, the 70- to 95-seater aircraft made by Russian manufacturer Sukhoi.

Safran also invests in engines for business jets through its Silvercrest program, in the category of engines delivering 10,000 pounds of thrust. This engine has been selected by Dassault Aviation for its Falcon 5X.

The Group also operates in this engine range through the participation of Techspace Aero in the following GE programs:

- ◆ CF34-10 (Embraer 190 and COMAC ARJ 21 regional jets);
- ◆ Passport (Bombardier Global 7000 business jet).

#### Medium-thrust engines for civil aircraft

The CFM56 engine program (including spare parts, maintenance and repair sales) generates around 50% of Safran's Aerospace Propulsion revenue. This engine is developed under equitable joint cooperation agreements by CFM International, a 50-50 joint venture between Safran and GE.

The majority of short- and medium-haul aircraft with more than 100 seats delivered over the last 20 years are powered by CFM56 engines. These engines power 57% of the Airbus A320ceo (current engine option) range<sup>(1)</sup>. Competition to power the Airbus range comes from the V2500 engine made by the IAE consortium (Pratt & Whitney, MTU Aero Engines and Japanese Aero Engines Corp).

The current generation of the Boeing 737 NG, like the previous version (Classic), is powered solely by CFM56 engines.

The success of this program with airlines has led to a steady rise in the fleet of CFM56 engines delivered over the past 30 years. This engine currently represents the world's largest engine fleet; just under 29,000 units have been delivered and some 27,700 are in operation.

CFM International is in the final stages of developing a new generation of engine called LEAP, which should achieve a significant reduction in fuel consumption and CO<sub>2</sub> emissions in comparison with the best CFM56 engines currently in service. The new engine will also significantly reduce nitrogen oxide emissions and noise levels, with no compromise on the reliability or competitive cost of ownership of CFM56 engines.

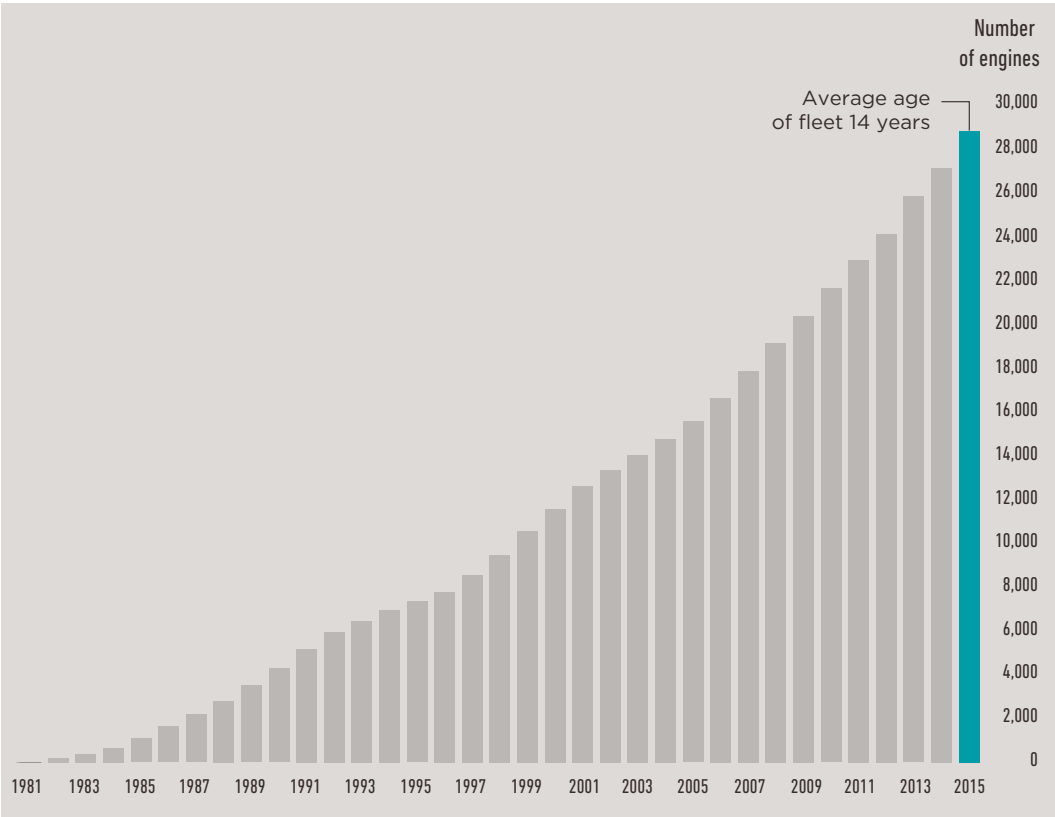
The LEAP® engine has so far been selected for use on three aircraft:

- ◆ the LEAP®-1A version is one of the two engine options for the new Airbus A320neo (new engine option), the other being the PurePower PW1000G developed by Pratt & Whitney;
- ◆ the LEAP®-1B version is the sole source for the new Boeing 737 MAX;
- ◆ the LEAP®-1C version is the sole Western source for the propulsion system (engine plus nacelle) on China-based COMAC's C919 aircraft.

The highly innovative LEAP engine is also a resounding market success, with more than 10,000 purchase intention and firm order agreements signed by January 2016. The release of the new engine has been staggered across three phases in line with aircraft manufacturers' schedules: 2016 for the LEAP-1A (on the Airbus A320neo), 2017 for the LEAP-1B (on the Boeing 737 MAX) and 2018 for the LEAP-1C (on the COMAC C919).

<sup>(1)</sup> Source: Safran.

TOTAL DELIVERIES OF CFM56 ENGINES



High-thrust engines for civil aircraft

The Group operates in this engine range as a risk and revenue sharing partner, primarily with GE. Participation rates vary between 7% and 24% across several engine programs in series production, including the CF6 powering the A330 (19.4%) and the Boeing 767 (10%), and the GE90 powering the Boeing 777 (23.7%). Safran is a partner on the GENx engine program: 7.7% for the 1B version powering the Boeing 787 Dreamliner long-haul aircraft and 7.3% for the 2B version powering the Boeing 747-8. Safran also partners GE, at just over 11%, on the program for the forthcoming GE9X engine, the sole source for Boeing's new 777X long-haul aircraft. Finally, as part of its cooperative arrangements with the Engine Alliance consortium partners (GE, Pratt & Whitney, MTU Aero Engines), Safran has a 17.5% stake in the GP7200 engine which powers the A380.

Spare parts and services for civil aircraft engines

After-sales operations primarily involve the sale of spare parts and the provision of maintenance, repair and overhaul (MRO) services. They hold significant growth potential for the Group, owing to the size and lifespan of the aircraft fleets concerned.

For several years the Group has been developing long-term service contracts for CFM56 engines with airlines and major maintenance workshops to assert its position on this highly competitive market. Each CFM56 engine is removed for inspection and servicing in a maintenance workshop three to five times during its service life. Sales of spare parts for the fleet of CFM56 engines in service will continue to increase even after production of this engine has been discontinued.



For the new-generation LEAP engines, scheduled to come into service from 2016, long-term revenue may be generated by spare parts provision or service contracts signed at the same time as the OEM purchase intention and firm order agreements.

On other civil aircraft engine programs, including those for high-thrust engines in which Safran holds a minority stake alongside GE, the Group also benefits from revenue from spare parts and service contract sales.

## MILITARY AIRCRAFT ENGINES

### Key characteristics of the business sector

The military aviation sector comprises three main segments:

- ◆ fighters;
- ◆ training and support aircraft;
- ◆ patrol, tanker and transport aircraft.

The military aircraft engine and related services market is dependent on the budgets of customer air forces. The military market is also influenced by national independence and diplomatic considerations.

The nature and performance of engines vary considerably depending on the segment: jet engines with a high thrust-to-weight ratio for fighters, and jet engines or turboprops closer to those found in civil aircraft for training and patrol aircraft.

As in the civil aviation sector, military engine programs generally involve two types of activities, namely original equipment and after-sales service, the latter comprising the sale of spare parts, maintenance and repair activities, as well as other customer services.

Alliances and partnerships between engine manufacturers have been forged to bring together the best technological and commercial assets, pool risks, and meet the needs of pan-European programs.

The majority of civil engine manufacturers are active in military aircraft engines and benefit from the technical synergies that exist between the two activities.

The key Western players in the fighter jet engine sector, apart from Safran, are North American and British: Pratt & Whitney, GE and Rolls-Royce.

The main European players are: Safran, whose M53 engine powers the Mirage 2000 and whose M88 engine equips the Rafale; Rolls-Royce, whose Pegasus engine powers the Harrier; and the European Turbo-Union consortium comprising Rolls-Royce (UK), MTU Aero Engines (Germany) and Avio (Italy), for the RB199 engine powering the Tornado fighter. In addition, the European Eurojet consortium, comprising Rolls-Royce, MTU Aero Engines (Germany), Avio (Italy) and Industria de Turbo Propulsores - ITP (Spain), develops the EJ200 engine that powers the Eurofighter Typhoon.

The choice of engines in the training and support aircraft sector consists mainly of those made by Safran (the Larzac, which powers the Alpha Jet, and the Adour in cooperation with Rolls-Royce), Pratt & Whitney (PW500 and PW300) and Honeywell (TFE731 and F124 engine families).

In the engine segment for military tanker, transport and patrol aircraft, the fleet is primarily made up of the T56 and AE2100 turboprops developed by Rolls-Royce North America

(formerly Allison) and the Tyne engines developed by Rolls-Royce and made under license by Tyne Consortium (Snecma 52%, MTU Aero Engines 28% and Rolls-Royce 20%). Safran is also involved in the program for the TP400 engine powering the A400M European military transport aircraft, with a 32% stake in the Europrop International GmbH (EPI) consortium, which also includes Rolls-Royce, Industria de Turbo Propulsores - ITP and MTU Aero Engines.

### Group products and programs

Safran's operations in the military aircraft engines segment mainly involve Snecma, Turbomeca and Techspace Aero.

#### Fighter engines

Historically tied to Dassault Aviation, activity in this segment is based mainly around the following programs:

- ◆ the Atar engine (4.5 to 7.1 metric tons of thrust), which powers the Super-Étendard Marine jets and the Mirage III, IV, 5, F1 and 50 family. A total of 410 engines remain in service with 6 customers;
- ◆ the M53 engine (9.5 metric tons of thrust), which powers the Mirage 2000. There are 578 of these engines in service with 8 customers;
- ◆ the M88 engine (7.5 metric tons of thrust), which powers the Rafale. There are 350 of these engines in service with 2 customers.

#### Training and support aircraft engines

Activity in this segment is based on the following programs:

- ◆ the Larzac engine (1.4 metric tons of thrust), which powers Dassault Aviation's Alpha Jet training aircraft. At the end of 2015, there were 484 engines in service with 7 customers;
- ◆ the Adour engine, which delivers thrust of 3.7 metric tons (with afterburner) or 2.9 metric tons (without afterburner). Made in cooperation with Rolls-Royce, it powers support and attack aircraft such as the Jaguar aircraft produced by Dassault Aviation and BAe Systems, and training aircraft such as the Hawk produced by BAe Systems and the Goshawk T-45A produced by Boeing. There are currently 1,100 Adour engines in service.

#### Patrol, tanker and transport aircraft engines

Activity in this segment is based on the following programs:

- ◆ the CFM56 engine powering military versions of the Boeing 707 (CFM56-2), the KC135 tanker aircraft and the Boeing 737 (CFM56-7), the C-40 transport aircraft, the P-8 Poseidon MMA (Multimission Maritime Aircraft), and the AEW&C (Airborne Early Warning & Control) aircraft;
- ◆ the 4,550 kW Tyne turboprop engine, developed by Rolls-Royce and manufactured under license by Tyne Consortium. This engine powers C-160 Transall transport aircraft and Breguet Atlantic and Atlantique 2 maritime patrol aircraft. Series production of this program has ceased but it continues to generate revenue through spare parts and repairs;
- ◆ the 8,203 kW TP400 turboprop engine powering the Airbus A400M European military transport aircraft, with 90 engines in service.

### Spare parts and services for military aircraft engines

After-sales operations for military aircraft primarily involve the sale of spare parts and repair services. These activities are directly linked to the aircraft availability needs of governments using military aircraft. Two programs account for the bulk of these military aircraft service operations today: Mirage 2000 (M53 engine); and Rafale (M88 engine). The Group also continues to provide services for older aircraft fleets, to meet the needs expressed by customers.

Because of the extreme operating conditions involved, military aircraft engines are usually serviced before they reach 1,000 hours in flight. One of Safran's constant development objectives is to lengthen the interval between servicing visits. The Group has developed a new version of the engine that powers the Rafale, the M88 Pack CGP, helping to maintain the aircraft in optimal operating condition. Hot parts and rotating parts have a longer service life, lengthening inspection intervals for the main engine modules and considerably reducing the M88 cost of ownership. Most governments currently delegate the management of their spare parts to the engine manufacturer.

### LIQUID-PROPELLANT AND PLASMA-PROPULSION ENGINES

#### Key characteristics of the business sector

This business sector comprises launch vehicle propulsion systems and satellite engines.

Two types of technology are involved: liquid-propellant rocket engines and electric thrusters (known as plasma thrusters).

To boost competitive performance and safeguard the future of the European space sector, faced with increasing international competition, Safran and Airbus Group joined forces in the space launch vehicle sector in 2015 through the Airbus Safran Launchers (ASL) joint venture. Airbus Safran Launchers now handles the management of Safran and Airbus Group civil space programs, and brings together some of the partners' shares in commercial launch vehicle operations. In the long term, there are plans to provide Airbus Safran Launchers with the assets and resources needed to run civil launch vehicle and military launcher (strategic missile) projects as an autonomous unit.

The main players on the liquid-propellant engine market are Safran, Aerojet Rocketdyne (US), NPO Energomash (Russia), Space X (US) and Mitsubishi Heavy Industries (Japan).

The main players on the electric (plasma) thruster market, besides Safran, are OKB Fakel (Russia) and Aerojet Rocketdyne (US).

#### Group products and programs

Safran's operations in the liquid-propellant engine segment mainly involve Snecma:

- ♦ **series production**, with manufacture of the Vulcain 2 cryogenic engine delivering 135 metric tons of thrust to power the main stage of the ES and ECA versions of Ariane 5, and manufacture of the HM7 cryogenic engine delivering 7 metric tons of thrust to power the upper stage of the Ariane 5 ECA rocket;

- ♦ **development activities**, with the Vulcain 2.1 upgrade for the Ariane 6 main stage and the new Vinci restartable cryogenic engine, delivering 18 metric tons of thrust, selected for the upper stage of the new-generation Ariane 6 launch vehicle.

Safran has been developing, integrating, testing and marketing plasma thrusters and plasma propulsion systems with power ratings from 300 W to 20 kW for satellites and space exploration probes for more than 30 years.

Plasma propulsion systems have a considerable advantage over traditional chemical propulsion systems as regards take-off mass. They can be found on the telecommunication platforms Eurostar 3000 EOR (Airbus Defence and Space), Alphabus (Thales Alenia Space and Airbus Defence and Space), Spacebus (Thales Alenia Space) and Small Geo (OHB - Orbitale Hochtechnologie Bremen, Germany). In 2015, Safran plasma thrusters were selected for the telecommunication platforms of Space Systems/Loral (US).

### 1.3.1.2 Helicopter turbine engines and auxiliary power units

#### Key characteristics of the business sector

The helicopter turbine engine market is characterized by significant diversity in applications and end-users. With the exception of armed forces and certain specific civil applications, current helicopter fleets are small in size.

Helicopter engine size is determined mainly by airframe weight and mission type. Helicopters may have one, two or sometimes three engines.

The Group serves:

- ♦ government and parapublic applications: police, border control, medical and emergency services;
- ♦ civil applications: off-shore oil industry, transportation, tourism and private ownership, and airborne work such as spraying and construction;
- ♦ military applications: transport, attack and ground support, maritime patrol.

This diversity, coupled with the fact that engines are tightly integrated into the helicopter airframe, gives rise to a wide variety of engines and associated versions.

The helicopter engine market, like the civil aviation market, comprises two activities:

- ♦ sale of turbine engines to helicopter manufacturers for installation in new airframes (original equipment);
- ♦ after-sales activities based on spare part, maintenance and repair contracts with operators, requiring a major global customer support network with local reach, given the large number of users and the helicopter's limited radius of action.

The profile of a helicopter turbine engine program is extremely similar to that of a civil aircraft engine program as presented earlier in the section.

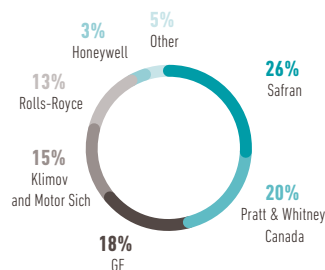
The airframe/engine pairing is often unique and at the origin of a new model. However, there is a trend toward multiple engine sizes among some helicopter manufacturers (offering a choice between two engines). This can also be seen where a helicopter is adapted for a specific purpose, thereby reintroducing competition to a given program.

There are fewer partnerships between engine manufacturers than in the civil aviation engine sector. The main partnership is MTR1 (MTU Aero Engines, Turbomeca, Rolls-Royce and Industria de Turbo Propulsores – ITP), on the 1,450 shp<sup>(1)</sup> MTR390-E engine powering the Tiger. The growth of the helicopter market in emerging markets has also led Safran to develop other types of partnerships with consortiums of helicopter manufacturers looking to enter the propulsion sector. This is the case with HAL (Hindustan Aeronautics Ltd.) in India and AVIC in China, which are becoming both customers and partners.

The majority of major Western aircraft manufacturer groups are also present in the helicopter turbine engine market: Safran, GE, Pratt & Whitney Canada, Rolls-Royce and Honeywell.

Safran has also developed a range of auxiliary power units, based on turbine technology and featuring innovations developed through substantial technological investment and strategic partnerships.

#### MARKET SHARE: SALES OF HELICOPTER ENGINES, 2011-2015<sup>(2)</sup>



#### Group products and programs

Most of Safran's helicopter engines are modular turbine units adaptable to civil and military helicopters. Modularity makes for more efficient maintenance programs. Safran helicopter engines are designed with a large additional power potential (up to 15%), which means they address a broad application spectrum. Through Turbomeca, Safran is active in all of the helicopter engine categories described below.

Auxiliary power units are non-propulsive systems that generate energy on an aircraft for powering on-board systems. Safran fields a range of auxiliary power units through Microturbo.

#### Turbine engines for light helicopters

For single- and twin-engine light helicopters, Safran offers two types of engine: Arrius and Arriel.

These engines and their derivatives power many civil helicopters, from Airbus Helicopters (EC120, EC135, Écureuil, EC145, Dauphin, etc.), Sikorsky (S76) and Kamov (Ka-226T), along with the military versions of helicopters from Airbus Helicopters (Fennec, Lakota and Panther), AgustaWestland (A109 Power) and AVIC (Z9).

In December 2015, the latest variant of the Arrius engine – Arrius 2R – obtained certification from the European Aviation Safety Agency (EASA). This engine, set to come into service in 2016, was selected by Bell Helicopter (US) to power its new Bell 505 Jet Ranger X helicopter. It marks the successful outcome of the first long-term partnership between Safran and Bell Helicopter.

#### Turbine engines for medium-weight helicopters

For single-engine helicopters from 2 to 3 metric tons and twin-engine helicopters from 4 to 6 metric tons, Safran designed the Arrano, a new engine delivering 1,100 to 1,300 shp. It will consume 10% to 15% less fuel than other engines in service today, meaning enhanced performance (range, payload) and a smaller environmental footprint. Airbus Helicopters selected the Arrano as the sole source for its new twin-engine H160 helicopter (5.5 to 6 metric tons).

For helicopters from 5 to 7 metric tons, Safran is present on the military market for combat helicopters, with the MTR390 (developed jointly with Rolls-Royce and MTU) that powers the Airbus Helicopters Tiger, and the TM333 engine that powers HAL's Dhruv. A special development contract has been signed with Spain (including ITP as an additional engine partner) for a more powerful version of the MTR390 for the Tiger.

For helicopters from 5 to 8 metric tons, Safran's Ardiden range of engines covers power ratings from 1,400 to 2,000 shp. The Ardiden 1H1/Shakti powers the Dhruv and twin-engine light combat helicopters (LCHs) from Indian helicopter manufacturer HAL. HAL selected the Ardiden 1U variant to power its forthcoming light utility helicopters (LUHs). The Ardiden 3 currently under development is designed for helicopters of up to 8 metric tons, and has already won orders from AVIC in China (for the AC352/Z-15) and Kamov in Russia (for the Ka-62).

#### Turbine engines for heavy-lift helicopters

On the heavy-lift helicopters market, Makila turbine engines from 1,800 to 2,100 shp are used on helicopters including the H 225/225M and Super Puma from Airbus Helicopters.

The RTM322 turbine engine powers the NHIndustries NH90 helicopter and the AgustaWestland AW101 Merlin helicopter and Apache UK fighter helicopter.

In line with its investment and development policy on new engines in the high-power helicopter turbine engines segment (3,000 shp and above), Safran acquired Rolls-Royce's 50% share in the joint RTM322 engine program in 2013. Safran thus assumes global responsibility for design, production, product support and services for the RTM322 engine.

(1) shp: shaft horsepower.

(2) Source: Safran.

### Spare parts and services for helicopter turbine engines

Following the example of its civil aviation activities, Safran has developed an international structure able to provide customers with local access to technical and sales support for their turbine engines, along with spare parts and services. Local coverage is provided through a worldwide network of repair centers (performing in-depth maintenance) and service centers.

### Auxiliary power units

The auxiliary power units developed by Safran meet the demanding requirements of the world's leading aircraft and helicopter manufacturers. Safran supplies a large fleet of civil and military aircraft and helicopters, including Alenia Aermacchi's M-346, Dassault Aviation's Rafale, BAe Systems' Hawk, NHIndustries' NH90 and Airbus Helicopters' EC725. Safran auxiliary power units will also power future business jets from Dassault Aviation (the Falcon 5X) and Bombardier (the Global 7000).

Safran has developed a new auxiliary power unit, the e-APU, specially designed and optimized to meet the needs of new-generation business jets and "more electric" helicopters. This system is used on AgustaWestland's new-generation AW189 helicopter.

Safran also provides after-sales support for these high-technology systems.

## 1.3.1.3 Solid-propellant engines

### Key characteristics of the business sector

This business sector comprises two main segments:

- ◆ the civil space industry, comprising launch vehicle propulsion to place satellites in orbit as well as satellite engines;
- ◆ the military industry, comprising propulsion for all types of ballistic and tactical missiles.

In the military sector, ballistic missiles are an essential component of national nuclear deterrent forces for countries possessing this capability. With the exception of the United Kingdom, production is entrusted to national manufacturers. In Western Europe, France is the only country to develop its own ballistic missiles.

In both the civil and military segments, engine manufacturers work closely with the launch vehicle or missile prime contractor. Development and engineering programs tend to be long and financed by institutional budgets, such as the European Space Agency (ESA) for civil space activities in Europe or national defense budgets for strategic operations. Tactical missile

development is also financed by customer governments. Series production activities generally involve limited quantities and fixed costs are high.

It is planned for all these activities to come under the responsibility of the new joint venture, Airbus Safran Launchers (ASL).

The main players on this market, besides Safran, are Aerojet Rocketdyne (US) and Orbital ATK (US).

### Group products and programs

Safran addresses the civil and military space segments through Herakles.

### Civil space propulsion

This segment features the following activities:

- ◆ **series production**, with the manufacture of powder boosters (solid-propellant engines) for Ariane 5 boosters. Europropulsion, which assembles the engines, and Regulux, which produces the propellants, were joint ventures between Safran and Avio (Italy). Safran also contributes to the European Vega program, in which it is notably responsible for the nozzle on the P80 solid-propellant engine. Safran's shares in Europropulsion and Regulux were brought under the new joint venture ASL in January 2015;
- ◆ **development activities**, with the development and production of nozzles in advanced composite materials for US space engines. Safran is also responsible for preliminary design studies on the P120C solid propulsion engines common to the future Ariane 6 and Vega-C launch vehicles.

### Ballistic missile propulsion

Safran provides rocket engines for the missiles of France's ocean-going strategic nuclear force, in particular for the fourth-generation program (M51).

### Tactical missile and target propulsion

Safran provides engines for MBDA very-short-range ground-to-air Mistral missiles, and Apache and Scalp long-range air-to-ground missiles, as well as their Storm Shadow derivatives. It also supplies components for the production of SM-3 interceptor missiles, developed by the American company Raytheon for US missile defense programs.

Through Roxel, a 50-50 joint venture with MBDA, Safran has developed and assembled a substantial range of engines for tactical missiles of international renown (including Milan, MICA<sup>(1)</sup>, AASM<sup>(2)</sup>, Exocet, Aster and Meteor).

(1) MICA: interception, combat and self-defense missile.

(2) AASM: Modular Air-to-Ground Weapon.

## 1.3.2 Aircraft Equipment

Safran's Aircraft Equipment business operates in three sectors:

### LANDING AND BRAKING SYSTEMS

**Landing gear**

**Wheels and brakes**

**Landing and braking systems**

**Support services for landing gear, wheels and brakes and related systems**

### ENGINE SYSTEMS AND EQUIPMENT

**Nacelles and thrust reversers**

**Power transmissions**

### ELECTRICAL SYSTEMS AND ENGINEERING

**Wiring and electrical connection systems**

**Electricity distribution and generation**

**Engineering**

This business covers design, manufacture and sale of various products, plus maintenance, repair, related services and sale of spare parts.

The Group enjoys leading positions in each of its sectors in recent and prospective major short-, medium- and long-haul commercial aircraft programs by Boeing (787, 777X and 737 MAX), Airbus (A350, A330neo and A320neo) and COMAC (C919).

Thanks to its technological expertise in a large number of aircraft equipment sectors, the Group is a preferred partner of aircraft manufacturers and is able to offer a comprehensive range of products and services. Safran is notably the sole comprehensive "ATA 32" supplier (landing gear + brakes + systems).

Safran's substantial capacity for innovation has enabled it to carve out either leading or major positions in its markets. Competitors such as UTC Aerospace Systems (US) and Honeywell are present in several sectors of the aircraft equipment market, whereas Liebherr (Germany), Spirit (US), Moog (US), Zodiac (France), Thales (France), Meggitt (UK), Avio Aero (Italy), LATElec (France) and Fokker (Netherlands) specialize in only one or two specific sectors.

Adopting a less systematic approach than in the Aerospace Propulsion business, Safran has formed a number of alliances and partnerships in the Aircraft Equipment sector, on an individual product and program basis.

Market characteristics are outlined individually below, for each business area.

### 1.3.2.1 Landing and braking systems

This business comprises three main product lines: landing gear, wheels and brakes, and landing/braking systems.

Safran merged its wheels and brakes, landing and braking systems, landing gear, and maintenance and repair businesses within Messier-Bugatti-Dowty. This organization is in response to market shifts toward more tightly integrated offerings addressing both aircraft manufacturers and airlines.

#### LANDING GEAR

##### Key characteristics of the business sector

The market for commercial aircraft landing gear is shared by Safran, UTC Aerospace Systems, Liebherr, Héroux-Devtek (Canada) and a handful of niche players positioned in specific market segments (business jets, helicopters, drones, etc.). Technology requirements are high, as landing gear must bear extreme loads during maneuvers on the ground: it must be light, compact and robust, while being fully adapted to and optimized for the aircraft's profile. The business model includes a long development period - which starts with the initial aircraft development phase - limited production volumes and regular service flows. Technological challenges include the use of new materials to improve the resistance and mass of parts, new, more eco-friendly production processes (including the elimination of chrome), and enhanced acoustics.

##### Group products and programs

Safran addresses the landing gear segment through Messier-Bugatti-Dowty, which holds around half the market<sup>(1)</sup> for commercial aircraft landing gear.

Safran designs, manufactures and provides after-sales services for landing gear for civil and military planes and helicopters of all sizes. It also handles integrated systems if requested by the customer, and provides the technical assistance, spare parts and repair services needed for its equipment.

Safran is number one worldwide<sup>(1)</sup> for landing gear structural units, having equipped a fleet of some 26,000 aircraft. The Group supplies the world's major aircraft manufacturers (including Airbus, Boeing, Bombardier and Dassault Aviation) and military and civil operators. Among the main commercial aircraft programs are the entire Airbus range, including the A350, and Boeing's 787 Dreamliner.

The Group also has a strong presence in military applications, where it equips the A400M, Rafale, Eurofighter Typhoon, F18 and V22 planes and helicopters from Airbus Helicopters, as well as in the business jet and regional jet markets (ATR, Bombardier, Dassault Aviation - Falcon, SuperJet 100, Fokker, Piaggio, etc.).

(1) Source: Safran.

## WHEELS AND BRAKES

**Key characteristics of the business sector**

The present-day wheels and brakes market for commercial aircraft with 100 or more seats splits into two segments: aircraft with steel brakes (first-generation brakes), which account for 24%<sup>(1)</sup> of commercial aircraft of 100 or more seats, and aircraft with carbon brakes, invented by Safran, which account for 76%<sup>(1)</sup>. The market for carbon brakes has developed rapidly since the 1980s, with the increase in air traffic and the gradual phase-out of steel brakes, replaced by carbon units. The wheels and brakes market is currently shared among four major global players: Safran, UTC Aerospace Systems, Honeywell and Meggitt.

**Group products and programs**

Safran designs and manufactures wheels and carbon brakes for aircraft, and provides related after-sales services. It also provides electronic and electrohydraulic systems for aircraft braking, tire/brake/landing gear monitoring and landing gear steering systems.

The Group's wheels and brakes offering covers civil applications (on the A320ceo, A330/A340, Boeing 767 and Boeing 777) and the military sector (for the A400M, Rafale, KC135 refueler and C-17 and KC-390 transport aircraft). Recent contract wins for the A350, the A320neo range, the Boeing 737 NG, the Boeing 737 MAX and the Boeing 787 have bolstered its position as leader in this sector.

With almost 7,500 aircraft fitted with Safran wheels and carbon brakes, the Group holds more than half of the market<sup>(1)</sup> for aircraft having over 100 seats and fitted with carbon brakes. Given the size of the fleet equipped by Safran, 41% of which is less than five years old, the business model underpinning this activity offers the promise of strong revenue streams, since Safran is basically remunerated each time a plane equipped with its systems lands.

To address strong market growth in the Asia-Pacific region, Safran has set up a new facility in Malaysia, making and reconditioning carbon brakes.

**EGTS™**

In 2012, Safran and Honeywell formed the EGTS International joint venture to develop and offer airline companies an electric taxiing system (EGTS) enabling the aircraft to taxi without airport towing services and without using the aircraft engines.

Activities to promote the new system proceeded throughout the year.

## LANDING AND BRAKING SYSTEMS

**Key characteristics of the business sector**

This market includes braking systems, orientation systems, landing gear and door extension/retraction systems, and monitoring systems. The main players are Safran and the US companies, UTC Aerospace Systems, GE Aviation Systems and Crane Aerospace & Electronics.

**Group products and programs**

Safran's operations in the landing and braking system segment mainly involve Messier-Bugatti-Dowty. Customers include Airbus, for all its programs, Boeing for the 747-8, Embraer for its KC-390 military program, Gulfstream for its G650 program and Dassault Aviation for its Falcon (7X, 2000 and 900) and Rafale programs.

In the landing and braking electronic control systems segment, Safran's position is buoyed by its technological advance in electric braking and its ability to propose a comprehensive offering to customers, which encompasses landing gear, wheels and brakes, and associated control systems.

**Services for landing gear, wheels and brakes and related systems**

Safran provides maintenance services for its own products and for competitor products on commercial aircraft with more than 100 seats. Through its partnerships in Asia, the US and France, the Group offers solutions tailored to regional and business jets.

To provide maintenance services for landing gear and landing and braking systems, Safran has developed regional repair centers in Mexico, the UK, France, Singapore and the US. Some of these repair centers are managed as joint ventures with partners such as ST Aero and Dassault Aviation Falcon Jet.

**1.3.2.2 Engine systems and equipment**

## NACELLES AND THRUST REVERSERS

**Key characteristics of the business sector**

The nacelle is a complex piece of equipment which optimizes internal and external engine airflows, helps reduce noise and incorporates safety components. It is made up of an air inlet, a fairing, a thrust reverser and a nozzle. The thrust reverser, which reverses the engine's thrust to help brake the aircraft, represents more than half the value of the nacelle.

Nacelle research requires specific technical expertise in areas such as achieving acoustic, aerodynamic, thermal and mechanical performance through the intensive use of composite material and titanium technologies. Specifications vary with engine power and location (under the wings for airliners and regional jets, or at the rear of the fuselage for business jets). Along with its nacelle subassembly design and technical expertise, Safran has also developed know-how in nacelle-engine integration and interfacing with the aircraft manufacturer's engine pylon. Safran's main competitor on this market is UTC Aerospace Systems, the world number one.

**Group products and programs**

Safran is present in the nacelle and thrust reversers sector through the activities of Aircelle.

Safran ranks number two worldwide with a market share of more than 20%<sup>(1)</sup>. One characteristic of the world nacelles market is the large number of second-line players.

(1) Source: Safran.

Safran designs and manufactures nacelles, and provides related after-sales services. In the segment of nacelles for commercial aircraft with more than 100 seats, Safran enjoys strong, long-standing recognition for the manufacture of complete nacelle systems and large thrust reversers for the Airbus A320ceo, A320neo, A330, A330neo and A380 platforms. Boeing selected Safran to supply titanium exhaust systems for the 777X. Safran also supplies nacelles for regional jets (Sukhoi Superjet 100, Embraer 170) and is a leading supplier of nacelles for top-end business jets (Dassault Aviation, Gulfstream, Bombardier, Cessna, Embraer), with a market share of more than 30%<sup>(1)</sup>.

Aircelle is working in partnership with a GE subsidiary, Middle River Aircraft Systems (MRAS), on the development of the nacelle for the Airbus A320neo version powered by the CFM LEAP-1A. Furthermore, Nexcella, an alliance entered into with GE in 2009 through its subsidiary MRAS, is completing the development of the COMAC C919 nacelle as part of the CFM LEAP-1C "integrated propulsion system" package. This contract comes with an industrial cooperation agreement between Safran and the Chinese group AVIC. Nexcella has also been selected by GE to supply the nacelle for its Passport engine on Bombardier Global 7000 business jets.

#### Services for nacelles and thrust reversers

Safran offers operators service solutions through its Customer Support and Service Development Division (CSSD), generating revenue in spare parts, services, repair and maintenance.

### MECHANICAL POWER TRANSMISSION SYSTEMS

#### Key characteristics of the business sector

The mechanical power transmission market covers a range of applications, the main ones being accessory gearboxes (which deliver mechanical energy to engine accessories), reduction drives (which transfer power to the propeller blades on turboprop aircraft and are also used in turbofan engines with very high bypass ratios), and main transmission gearboxes (which transfer power to the blades on helicopters). The main players on this market are the engine and helicopter manufacturers themselves, along with equipment suppliers such as the UTC Aerospace Systems group, GE, KHI (Japan), Triumph (US) and Northstar (US).

#### Group products and programs

Safran's operations in the mechanical power transmission sector involve Hispano-Suiza.

Safran designs, manufactures, markets and maintains a wide range of mechanical power transmission systems for civil and military aircraft engines. Recognized technical expertise in mechanical power transmission systems is harnessed to develop applications for the world's leading aircraft manufacturers and for Airbus Helicopters.

In 2015, Safran and Rolls-Royce formed Aero Gearbox International, a 50-50 joint venture specializing in power transmission systems. This new company strengthens Safran's position among the leaders in this sector.

### 1.3.2.3 Electrical systems and engineering

The gradual shift toward more electric aircraft systems is a priority for aircraft manufacturers. As electrical systems begin to phase out most of the hydraulic and pneumatic systems on today's planes, this will bring a significant rise in the power required of electricity generation and distribution systems. The advantages of electrically powered systems include improved safety, lighter weight, smaller volume, and reductions in fuel consumption and greenhouse gas emissions. The introduction of new electrical systems will also reduce aircraft assembly and maintenance costs, and improve availability.

Step by step over the past few years, Safran has built a leading world position in electrical power systems, chiefly through a series of acquisitions. In 2013, Safran acquired Goodrich Electrical Power Systems (GEPS), a leading supplier of onboard aircraft electrical power generation and conversion systems. In 2014, Safran finalized the acquisition of Eaton Aerospace's power distribution businesses.

These external growth operations, coupled with a substantial internal research and technology effort, enable Safran to assert a strong legitimacy in aircraft electrical systems. Labinal Power Systems brings together all of Safran's electrical systems operations under a single dedicated unit, covering the following main specialties:

- ◆ electrical interconnection systems;
- ◆ onboard electrical energy (generation and distribution);
- ◆ power electronics;
- ◆ maintenance and repair of electrical equipment;
- ◆ ventilation systems and electric motors;
- ◆ engineering, design and production services, especially for electrical systems.

### ELECTRICAL POWER GENERATION AND DISTRIBUTION SYSTEMS

#### Key characteristics of the business sector

The electrical systems market mostly covers power generation and distribution functions. This market is currently commanded by major players such as UTC Aerospace Systems, Esterline and Zodiac, which cover all or some system components. Only UTC Aerospace Systems and Safran field a comprehensive offering covering main and backup power generation, conversion, and primary and secondary distribution.

The power electronics market is more recent, arising directly from developments in electrically powered aircraft functions (electric thrust reversers, electric brakes, electric load control, etc.). UTC Aerospace Systems, Honeywell and Safran hold skills in this field.

(1) Source: Safran.



## Group products and programs

Safran's operations in these segments involve part of the Labinal Power Systems electrical systems businesses brought in from Hispano-Suiza in 2014. Since the acquisition of GEPS, Safran has held critical experience and know-how in electrical power generation central to aircraft electrical systems. Safran filled out its portfolio of products in these areas with its acquisition of Eaton Aerospace's primary power distribution businesses.

Examples of Safran's capacity for innovation in power electronics include ETRAS (Electrical Thrust Reverser Actuation System), the world's first electric control system for nacelles, developed on the A380, and EBAC (Electrical Braking Actuation Controller), on the Boeing 787. These major technological advances, along with Safran's engine and electrical wiring expertise, enable the Group to offer aircraft manufacturers innovative electrical aircraft systems for their forthcoming programs.

For example, Safran provides all emergency backup power and primary and secondary distribution systems for the Embraer KC-390 military transport aircraft program, currently at the test-flight stage.

## ELECTRICAL CONNECTION SYSTEMS

### Key characteristics of the business sector

The Group is the leading worldwide supplier<sup>(1)</sup> on this market. Wiring and electrical connection systems mainly comprise electrical harnesses as well as main and secondary transformer stations and other electrical cabinets.

Much of the aircraft wiring market is still in the hands of aircraft manufacturers' internal departments. Safran's main rivals on the aircraft wiring market are GKN (UK), which bought the wiring businesses of Dutch company Fokker Elmo in 2015, LAtelec and Ducommun LaBarge (US).

## Group products and programs

Safran's operations in the wiring and electrical connection system segment involve the activities of Labinal Power Systems.

Safran provides electrical and layout design work in addition to harness production and installation support services at the aircraft manufacturer's site, for customers including Airbus and Boeing. If requested, as on upgrade programs, Safran can take on the planning and onboard installation stages. This can – as with major programs such as the A380 and A350 – extend to an "end-to-end" service covering engineering, manufacture and installation support.

## VENTILATION SYSTEMS AND ELECTRIC MOTORS

### Key characteristics of the business sector

Ventilation systems comprise various electrical, electronic, mechanical and pneumatic subsystems.

High-performance ventilation systems perform the following functions:

- ♦ management of air circulation in the cabin and cockpit;

- ♦ cooling of aircraft brakes on landing;
- ♦ cooling of avionics bays, which house systems including the main aircraft controllers (flight control systems, digital cockpit screens, etc.).

Safran, UTC Aerospace Systems and Honeywell are the main players with skills in this field.

## Group products and programs

Safran designs, manufactures and markets ventilation systems for aircraft cabins and avionics, and brake cooling systems for commercial and military aircraft and helicopters, through its subsidiary, Technofan.

Safran supplies all ventilation circuit equipment (valves, air filters, nozzles, heat exchangers, flowrate sensors, pressure sensors, etc.) along with the ventilation regulation and control system. The Group has also developed expertise in electric motors fully integrated in the aircraft electrical chain.

## ENGINEERING SERVICES

### Key characteristics of the business sector

The engineering market is dependent on major development programs. As these approach completion (Airbus A350 and Boeing 787), aircraft manufacturers and equipment vendors have less need of specialist engineering skills.

At the same time, Safran's major aerospace customers are trimming back their supplier panels, and this gives rise to consolidations and opportunities for those suppliers that are selected.

Selection depends on the ability of suppliers to provide consistent support on their customers' international markets, and to sustain and develop their skills bases.

The Group's main competitors are leading full-service engineering groups such as Alten (France) and Altran (France) as well as niche aviation suppliers such as Assystem (France) and Aeroconseil (France).

## Group products and programs

Safran is present in the engineering market through Safran Engineering Services. In Europe, North America, South America and Asia, Safran provides engineering services on the aviation market and on related markets. Its expertise, focused on five broad areas (electrical systems architecture, aerostructures, mechanical systems, embedded systems and certification support), is used by various Group companies, chief among which ranks Labinal Power Systems. Services are also provided to major aviation customers (Airbus Group, Boeing, Dassault Aviation and Embraer) and land transport companies (Bombardier Transport, Renault, Peugeot and Jaguar Land Rover).

For support in the design of new electrical system architectures, Safran's aircraft manufacturer customers see the expertise of Safran Engineering Services, backed by Labinal Power Systems, as a determining factor.

(1) Source: Safran.



### 1.3.3 Defense

The Defense business can be broken down into three key sectors:

#### OPTRONICS

**Soldier modernization**

**Optronics and sights**

**Drones**

**High-performance optics**

#### AVIONICS

**Navigation and sensors**

**Seekers and guidance systems**

**Flight control systems**

**Onboard information systems and data management**

#### ELECTRONICS AND CRITICAL SOFTWARE

**Onboard electronic equipment**

**Onboard critical software**

Through the French and international facilities of its subsidiary Sagem, Safran develops and manufactures electronic equipment, inertial navigation systems, and high-added-value optical and optronic products. It develops, produces or purchases, and maintains computers and printed circuit boards used in all types of platforms for the civil and military aviation and defense sectors. Safran develops onboard electronics and critical software for the systems it manufactures.

Safran's main partners and customers in the Defense sector are governments (ministries or armed forces) and European groups such as Thales, Airbus Group, Nexter, BAe Systems (UK), MBDA, Finmeccanica (Italy), Saab AB (Sweden), Dassault Aviation, DCNS and CMI (Belgium).

Other well-known integrators and equipment and system suppliers in the international aviation and defense sectors are also set to become partners or customers of the Group.

#### 1.3.3.1 Optronics

##### Key characteristics of the business sector

The high-tech industry of optronics combines optics and electronics for use in detection, image processing and stabilization.

The optronics sector covers a wide range of equipment and systems, including the soldier modernization system, night vision goggles, thermal cameras, combat vehicle digitization (vectronics), gyro-stabilized optronic surveillance platforms ("pods") for aircraft and drone systems, periscopes and optronic masts for submarines, and high-performance optics.

Safran's main competitors in these businesses in France and abroad include: Thales, Airbus Defence and Space, BAe Systems, Finmeccanica, Elbit (Israel), L-3 Wescam (Canada) and FLIR Systems (US).

##### Group products and programs

Safran's expertise and ability to innovate have enabled it to develop a comprehensive product portfolio and to become a global reference in several platforms: surface ships, submarines, combat vehicles, aircraft and drones and dismounted combatants. Safran is active in the optronics industry through Sagem and its subsidiaries Vectronix in Switzerland and the US (portable optronic products), Optics 1 Inc. in the US (integrated optical systems and subsystems), Optovac in Brazil and REOSC (high-performance optics), and through its stake, along with Thales, in Optrolead and Sofradir (world number one<sup>(1)</sup> in infrared detectors).

##### Soldier modernization

Safran harnesses experience from the *FELIN*<sup>(2)</sup> program on soldier modernization in the French armed forces to offer innovative solutions addressing the needs of various armed and security forces (army as well as police, civil security and firefighters) in France and further afield. The modular approach developed to give infantrymen optimal ease of movement provides enhanced climatic, NBC and ballistic protection, night and day target identification and engagement optronic systems and a network-based communication system particularly adapted to modern network-centric warfare.

##### Optronics and sights

###### Portable optronic equipment

In terms of portable optronics, Safran is both a trailblazer and the leading European producer<sup>(1)</sup>. It offers a full range of hardware and systems for observation under any weather conditions, day or night. Its multi-purpose night-vision imagers, such as the JIM LR long-range multifunction imager, are widely used in overseas operations by French and allied forces and are considered a global market reference.

###### Onboard systems

Safran equipment provides protection for land combat vehicles (tanks and lighter vehicles). Stabilized sighting is a key part of the performance of target identification and fire direction, under day or night conditions, including ambulant firing capability. Safran equips several French and export land vehicles (Leclerc, VBCI, BMP3, United Arab Emirates, Saudi Arabia, etc.) and artillery systems in around 20 countries with its range of terrestrial sighting systems, including the latest model in the range, the PASEO panoramic surveillance and fire direction sight.

(1) Source: Safran.

(2) FELIN: fantassin à équipements et liaisons intégrés (*infantrymen with integrated equipment and links*).

In the field of gyrostabilized sights, Safran participates in major combat helicopter programs: Tiger, NH90, Cougar, Panther and Caracal. The STRIX and OSIRIS infrared sighting systems fitted on Tiger helicopters meet exceptionally demanding operational conditions and guarantee the performance of the weapons systems.

Safran has applied its experience in the specialized field of conventional and nuclear submarine optronic masts and periscopes to equip several programs such as Scorpène and Agosta. The new generation of combat nuclear submarines, the Barracuda class, will be equipped with Safran's periscope system using non-penetrative optronic masts.

### Drones

Safran is active in drone systems through its expertise in critical function chains: navigation and flight control, image chain, and data transmission. Safran's tactical drone systems are used in daily operations in both night- and day-time conditions.

For its experience in high-integrity drone flight control, Sagem sits on the Civil Drone Commission set up by the French Directorate General for Civil Aviation (DGAC), along with other aerospace companies, SMEs in the sector and major contractors. The purpose of this commission is to organize and promote the civil drones industry in France by drawing up technological roadmaps for the development of safe civil usages.

In early 2016, Safran's Patroller system was selected by the French army for its SDT tactical drone system.

### High-performance optics

With its REOSC optic range, Safran is a leading world player in the design, manufacture and integration of high-performance optical systems for space, astronomy, large-scale lasers and the semiconductor industry.

### Customer support

Safran's customer support includes high value-added services, including repairs, equipment delivery and technical support. All strive toward the same goal: ensuring that equipment is in full working order at all times.

## 1.3.3.2 Avionics

### Key characteristics of the business sector

Safran's avionics segment covers onboard electronics technologies in four product lines: inertial navigation, flight control systems, guidance and seeker systems, and onboard information systems.

In addressing several different markets and platforms with common-core technology, Safran enhances competitive performance and optimizes its product portfolio, covering

applications such as guided weapons, military and commercial planes and helicopters, and combat vehicles and ships.

Safran's main competitors in these businesses in France and abroad include: Thales, BAe Systems (UK), Finmeccanica, Rockwell Collins (US), Northrop Grumman (US), Honeywell, and Liebherr.

### Group products and programs

Safran is present in the avionics sector through Sagem and its US subsidiary Sagem Avionics Inc. (automatic pilot systems for aircraft, actuators and onboard data acquisition and processing modules).

Safran is European number one<sup>(1)</sup> in inertial navigation, with a full technological portfolio comprising inertial sensors, gyrometers (mechanical, gyrolaser, fiber optic and vibrational), accelerometers (pendular and vibrational) and MEMS<sup>(2)</sup> sensors. Through its subsidiary Colibrys, which specializes in high-performance micro-movement (acceleration and vibration) sensors, Safran is a front-line player in MEMS technology. With its Montluçon facility in France, Safran has world-class industrial capabilities for making inertial sensors and systems.

In 2015, Safran continued its program of investments in France, extending operations at the Fougères site to cover production of controllers for LEAP engines, and developing a new R&D center at its Eragny site.

Full consolidation of the integrated cockpit solutions business of Eaton Aerospace during the year bolstered Safran's offering in avionics and flight controls.

### Navigation and sensors

Safran offers a wide range of inertial and stabilization systems for all land, sea, air and space platforms and all performance classes. At the highest performance level, Safran's recognized expertise lies behind its involvement in programs such as Rafale, A400M and nuclear-powered ballistic missile submarines.

### Seekers and guidance systems

Safran has combined expertise in optronics and inertial systems to provide infrared seekers for France's main missile systems, particularly Mistral and MICA IR. MICA IR missiles are carried by Rafale fighters and Mirage 2000-5 interceptor aircraft.

The AASM is a high-precision modular air-to-ground weapon that can be used in all conditions, day or night, and is in service on Rafale fighters belonging to the French air force and navy. It comes in several versions and harnesses Safran know-how in many areas – infrared and image processing technology, inertial components with hemispherical resonant gyro (HRG) and laser guidance. It has proved highly effective in recent operations.

Finally, Safran has been selected to supply infrared seekers for the French army's MMP medium range missiles<sup>(3)</sup> and for the future French-British light anti-ship missile, the FASGW<sup>(4)</sup>.

(1) Source: Safran.

(2) MEMS: micro electro mechanical systems.

(3) MMP: missile moyenne portée (medium range missile).

(4) FASGW: Future Anti-Surface Guided Weapon.

### Flight control systems

As a worldwide leader<sup>(1)</sup> in civil and military helicopter flight control, Safran offers systems, including autopilots, onboard computers, flight control actuators and navigation systems, designed to aid the pilot while maintaining a maximum level of security. Safran contributes to several ongoing programs in this segment, including Airbus Helicopters' next-generation helicopter, Embraer's KC390 and the MA700 aircraft made by Chinese manufacturer AVIC.

### Onboard information systems and data management

Safran has developed flight-data recording systems (Aircraft Condition Monitoring System - ACMS) equipping ATR, Embraer, Boeing and Airbus civil aircraft. Under Airbus prime contractorship, Safran also provides the secure gateway between the cockpit and the cabin information system for the A380 and A350.

Given the extensive fleet it equips among many airline companies, Safran is ideally placed for developing its Cassiopée data management service, which inputs recorded flight data to yield results in areas such as flight analysis (Flight Data Management - FDM) and optimization of fuel consumption (SFCO2).

### Customer support

Safran's customer support in avionics extends to high value-added services, including repairs, equipment delivery and technical support. Customer satisfaction is sustained through constant improvements in TAT (Turn Around Time), up to industry benchmark level, to ensure the best competitive performance in equipment availability. Given its highly varied worldwide avionics customer base, Safran may localize support services for closer contact with the customer. Customer support performance is a key issue: customer support is a long-term revenue source throughout the lifecycle of an avionics product, and it develops customer loyalty, thereby influencing customer choices on new programs.

## 1.3.3.3 Electronics and critical software

Given the strategic importance of onboard electronics and critical software today, Safran vertically integrates these technologies through Sagem's Safran Electronics Division. Subsidiaries in Canada, Asia and Europe offer good geographical reach to customers, for development projects and for repair and maintenance services.

Sagem's Safran Electronics Division provides all Group companies with world-leading electronic equipment and critical software. It develops, produces, and maintains electronic circuit boards and certified onboard computers for numerous systems, particularly in aviation (FADEC engines, thrust reversers, nacelles, landing gear, braking systems and flight control systems). With its partners it has woven strong, balanced links through FADEC International (joint venture with BAe Systems) and FADEC Alliance (joint venture between GE and FADEC International).

### ELECTRONIC EQUIPMENT

Safran specializes in increasingly integrated electronic systems for harsh environments (temperature, vibration, etc.). It designs and produces onboard computers used in engine, flight, braking and landing gear control systems. Safran designs and installs electronic control systems for electromechanical actuators and for Labinal Power Systems' power converters<sup>(2)</sup>. In the space segment, Safran is conducting work on the electronic propellant flow-rate regulation demonstrator for the future Ariane 6 engines, and on electronic control systems for plasma thrusters. Safran's expertise in the production of electronic circuit boards and complex computers is maintained through a strong core of industrial excellence particularly at its Fougères plant.

### ONBOARD CRITICAL SOFTWARE

Safran develops the complex critical software used in Group onboard systems. This software is said to be "critical" because it must comply with extremely demanding certification standards as regards dependability in harsh environments.

Safran teams handle software specification, architecture, coding, verification, quality assurance, configuration management and certification, using modern software platforms that yield ever-higher efficiency.

### Computer maintenance and repair

At its Massy and Singapore repair centers, Safran performs maintenance of its own onboard computers along with systems from other Group and third-party manufacturers. It also maintains and repairs computers and electronic boards for many airlines and air forces worldwide.

(1) Source: Safran.

(2) See section 1.3.2.3, *Electrical systems and engineering*.

## 1.3.4 Security

Security activities can be split into two key areas:

### IDENTITY AND SECURITY

**Governmental solutions**

**Commercial solutions**

**Public safety**

### DETECTION

**Detection by X-ray tomography and X-ray diffraction of explosives and dangerous and illicit substances**

**Spectrometry-based detection and analysis of traces of explosives and dangerous and illicit substances**

Through its Morpho subsidiary, Safran is a world front-runner in biometric identity and security solutions. Safran's business here is driven by the emergence of new security and authentication needs in an increasingly digital and connected world. Safran addresses these needs by constant progress in technologies, backed by a targeted partnership and acquisitions policy.

Safran expertise covers all security-chain technologies, in the fields of biometrics, embedded security, cryptography, strong authentication, secure printing techniques, data analysis and detection of explosives and illicit substances. These technologies are needed to access key target markets.

Safran is present in the Security sector through Morpho, whose operations are mainly located outside France. Morpho's main subsidiaries are:

- ◆ Morpho Detection, LLC, specializing in the detection of explosives and illicit substances;
- ◆ Morpho Cards GmbH, specializing in smart cards and related trusted service management;
- ◆ Morpho BV, specializing in the printing of secure documents such as passports;
- ◆ MorphoTrust USA, LLC, which manages, under an agreement with the US government, the US activities of L-1 Identity Solutions regarding the issuance of identity documents such as driver's licenses in the US, biometric enrollment services for authorization control, and sensitive projects run by the US government;
- ◆ MorphoTrak, LLC, which supports Morpho's biometrics business development in the US, addressing local police services and government contracts in particular.

production of identity documents, terminals, automatic biometric identification systems and enrollment services.

### Identity

Civil identification management for governments includes biometric enrollment services, issuance of identity documents, automatic biometric data processing systems, verification solutions and digital identity service platforms. The civil identification sector is experiencing strong demand as a result of:

- ◆ developments in issuance and verification solutions for biometric passports and other electronic identity documents (identity cards, health insurance cards, etc.), worldwide;
- ◆ the emergence of new uses for these documents, such as the creation of a digital identity for secure access to public and private services via the internet.

The highly competitive civil identification market is served by Safran along with other industrial players including Gemalto (Netherlands), Giesecke & Devrient (Germany) and HID Global/Assa Abloy (Sweden).

Commercial identity solutions cover transaction and digital identity security, in areas such as telecom applications, bank applications, transportation and access to enterprise networks and the internet.

Safran is a major player on the digital identity market, along with Gemalto (Netherlands), Oberthur Technologies (France), Giesecke & Devrient, ATOS and HID Global/Assa Abloy (Sweden).

### Security

Public security operations mainly involve biometric identification and automated analysis of video footage and passenger name record (PNR) data for air passengers.

Safran, NEC (Japan), 3M (US) and CrossMatch (US) are the main players on the market for automated fingerprint identification systems (AFIS), multi-modal platforms (fingerprint, iris and face recognition) and biometric enrollment stations addressing forensic applications. This market is governed very largely by technical performance considerations (rate and rapidity of crime solving, interoperability and ease of use).

Mounting risk levels raise new security needs, most pronounced in border control (as in the US and European entrance and exit control programs), and in surveillance and protection for sensitive sites.

In the airport sector, the continuing trend toward tighter security has brought about a considerable joint effort by numerous players, including airport and civil aviation authorities, airline companies, border police and customs authorities. On this market, Safran cooperates with all national and international organizations having an influence on the development of new technologies in the air travel sector, in order to offer solutions capable of ensuring air transportation safety and passenger convenience. The market for airport security and PNR data analysis systems is covered by many players, including SITA (Belgium) and ARINC (US).

### 1.3.4.1 Identity and Security

#### Key characteristics of the business sector

Safran is one of the world's leading players in the biometrics market, which covers solutions in civil and criminal identification,

## Group products and programs

Safran's operations in the identity sector cover civil solutions for governments and commercial solutions for financial institutions, telecom operators and businesses.

### Governmental solutions

Safran provides governments with civil identification services including population enrollment, electoral list compilation, production and personalization of identity documents (ID cards, voter cards, passports, health insurance cards, driver's licenses, etc.), and document lifecycle management. Safran has developed a comprehensive range of solutions and services in response to the new opportunities in electronic documents opened by the widespread growth of digital technologies in general and the intensifying shift toward electronic management of government services.

To help governments and administrations provide secure online services (tax declarations, monitoring of welfare services, etc.), Safran provides digital identity service platforms for: secure citizen data input to guard against identity theft; strong authentication; digital signatures; and online archiving to ensure data integrity and probative value over time.

### Commercial solutions

In the banking sector, Safran offers a full range of innovative secure payment solutions, using smartcard technologies, mobile-phone security components, host card emulation (HCE) mobile payment and strong multi-factor authentication.

Via an extensive network of production and personalization centers, Safran's customers include the main banks in Europe, Latin America and Asia. This sector is currently benefiting from two major trends: magnetic stripe cards are giving way worldwide, including in the United States, to smart cards meeting the Europay MasterCard Visa (EMV) standard; and contactless technologies are gaining ground. Both technologies heighten the security of transactions, reduce the incidence of fraud and improve customer convenience.

Safran also provides banks with support on the ongoing transition toward digital practices; this typically concerns security in applications such as online banking, e-commerce, online contract signing, etc. The Group's digital identity management solutions help prevent the fraudulent use of personal information online. Specifically, customers can tighten authentication and security settings at all the stages in the mobile payment process: identification, electronic signature and multi-factor authentication, including biometric authentication, which is increasingly in demand due to its high level of security and ease of use.

On the telecommunications security market, Safran offers a variety of secure elements and services, including a wide range of SIM cards, subscription management, solutions for near-field communication (NFC), which enables users to identify themselves via their mobile phone, machine-to-machine (M2M) technology

capable of tracking fleets of GSM-equipped vehicles, and digital identification, where a smart card becomes a means of internet user authentication. Safran supplies the world's biggest mobile phone operators (including Orange, AT&T, Deutsche Telekom, Telefonica, Vodafone and T-Mobile) via a worldwide logistics chain.

With its expertise in digital identity and trusted services management (online strong authentication and electronic signature systems, etc.), Safran can also meet industry-sector needs in areas such as physical and logical access control, data protection and confidentiality, document traceability, transaction proofs and probative-value archiving.

### Public safety

Safran's public safety operations cover solutions for identifying persons, detecting threats, ensuring border control security and facilitation (in air travel especially), and protecting sensitive and high-traffic sites.

The biometric identification solutions developed by Safran are based on biometric enrollment stations, which are used to capture fingerprint, vein pattern, face or iris data, or a combination of the four. In crime investigation applications, Safran provides police forces and judicial authorities with systems for automated fingerprint identification (AFIS), face recognition and fast DNA identification. To meet growing needs for mobility, interoperability and rapid analysis, Safran is introducing new terminals for in-the-field identification and rolling out its identification systems on the cloud.

Safran provides a range of border control and airport security solutions, including automatic verification of passenger identity by biometric authentication with electronic passport data, a common European system for Schengen visas and visas for asylum-seekers, and verification of air passenger name record (PNR) data.

Safran's image analysis expertise finds applications in systems and services for transportation safety. This is particularly the case for road safety, where Safran products cover all safety rule control requirements (current and average speed, signaling, etc.) and include manual solutions and fully automated digital systems. In response to growing demand for processing large video volumes, Safran develops solutions, such as face recognition software and advanced video analysis functions, that substantially reduce the time investigators have to spend at the screen.

## 1.3.4.2 Detection

### Key characteristics of the business sector

This sector covers all solutions for detecting CBRNE (chemical, biological, radiological, nuclear and explosive) threats and other illicit items. These systems improve security at airports, in air transportation (passenger and freight), at borders (land and maritime), and at sensitive sites and major events.

Safran holds a share of close to 50%<sup>(1)</sup> of the market for X-ray tomography hold-luggage control systems. Safran's main competitors are L3 Communications (US), Leidos/Reveal (US), Smiths Detection (UK), OSI/Rapiscan (US) and Nuctech (China). Safran is a front-runner on the market for analysis of traces of explosives, holding a market share approaching 40% in 2015<sup>(1)</sup>. With the new European Commission regulation requiring inspection of at least 10% of air passengers at checkpoints, the market for trace detection equipment was especially active across the European Union in 2015. Safran fields one of the fullest and highest-performance offerings in this sector, where its main competitors are Smiths Detection, Thermo Fisher Scientific (US), Bruker (US) and Implant Sciences (US).

### Group products and programs

Safran's operations in the detection market primarily concern air transportation security. It also supplies explosive detection systems (EDS) for automated hold-luggage inspection, and explosive trace (vapor or particle) analysis systems for vetting luggage, passengers and air freight. Safran holds prime expertise in several key technologies, such as computerized 3D X-ray tomography, X-ray diffraction spectroscopy and ion mobility spectrometry. Safran has also extended its portfolio of technologies to include mass spectrometry, addressing applications that require very high sensitivity and precision.

### Detection by X-ray tomography and X-ray diffraction of explosives and dangerous and illicit substances

This technology is used in automatic detection systems such as large-diameter luggage tunnels for airports. Safran's CTX 5800 and 9800 tomography systems meet European Standard 3. Safran also provides unique automatic detection solutions combining tomography and X-ray diffraction, allowing better detection capacity and considerably reducing the number of false alarms.

### Spectrometry-based detection and analysis of traces of explosives and dangerous and illicit substances

Stationary and mobile systems detect and identify vapor traces of explosives or illicit substances using ion mobility spectrometry or mass spectrometry. Safran's wide product range addresses a broad spectrum of users' needs and operational environments. The systems are used by all types of security services worldwide (airport passenger control, civil security, prisons, police, customs, etc.), in border control applications (air freight, hold luggage, passengers and cabin luggage), and for protection of sensitive sites and major events. Advanced detection and screening capabilities are provided by the Itemiser 4DX (ETD) solution, which uses a non-radioactive ITMS™ (ion trap mobility spectrometer) to detect traces of explosives. Optimized for ease-of-use and mobility, Itemiser 4DX eliminates the administrative, regulatory, storage and shipping requirements associated with a radiation-emitting trace detection source.

## 1.4 Competitive position

Safran covers international high-technology markets in Aerospace, Defense and Security.

In all these fields, Safran faces competition from both global rivals and niche players on some markets.

The Group operates in the strictest observance of all applicable rules on competitive business practice in all of its host countries, complying with the specific measures governing competitive business practice on each market.

To mobilize sufficient resources and share the industrial risks involved in innovative and costly programs, players in the aviation industry can form partnerships capable of developing new technologies, products and services. Accordingly, it is not unusual to find otherwise rival companies joining forces on certain aviation programs.

## 1.5 Research and development

Safran operates in a high-technology and high value-added arena. In aircraft engines and equipment, as in defense and security systems, technology and reliability requirements are high, consistent with the highly critical nature of the applications concerned. To meet these requirements, Safran calls on the best capabilities available in mechanical engineering, aerodynamics, combustion, thermodynamics, metals, composite materials, fuel materials, electronic and electrical engineering, spectrometry, imaging, and information and communication technologies. Research and technology (R&T) comprises all studies, research and technological demonstrations needed to develop expertise

for a given product at the lowest possible risk and cost and within the shortest possible timeframe.

Further downstream, research and development (R&D) corresponds to product design, prototype manufacture, development tests and certification tests showing that the product meets customer specifications and applicable regulations.

Spanning the R&T and R&D stages, the Innovation Department nurtures the emergence of new developments using innovative concepts, helping Group companies identify, produce and validate

(1) Source: Safran.

proof-of-concept demonstrators, thereby shortening development lead times to meet time-to-market targets.

Group R&T and innovation projects are guided by forward-looking considerations, and the substantial budgets they draw are in line with Safran's current or targeted positions on its markets. Research, technology, innovation and development are fundamental to the implementation of the Group's strategy. This commitment reflects the importance given to preparing for the future and developing new products and programs.

Under Safran's R&T policy, each company in the Group determines its own research program, and thus concentrates on its own objectives. In tandem, the Group is constantly working to develop technology synergies.

R&T operations are guided by roadmaps charting the strategic challenges faced by Group companies (competitive positioning sought at different time-frames, along with the corresponding technological demonstrations and fulfillment levers in terms of external partnerships and internal synergies). The roadmaps are analyzed by Group experts covering seven broad cross-functional areas, who issue recommendations accordingly.

In 2015, the Group opened the Safran Tech research and technology center at the Saclay high-tech cluster, France's biggest science and technology campus, near Paris. Initial teams have been formed for the new center, which is to employ a research workforce of around 300 in six units, covering energy & propulsion, materials & processes, sensors, electronics, information & communication technologies, and digital simulation for engineering. Safran Tech also runs platforms specially equipped for developing next-generation materials and processes. The specific areas covered here are composite materials, monocrystalline casting and additive manufacturing.

The Safran Tech center underlines the Group's resolve to intensify and mutualize research and technology endeavors on major technological disruptions. Safran Tech opens a new dimension to the Group's research and technology operations, with an emphasis on open innovation. Universities, public organizations, industrial partners and innovative startups work with Safran Tech teams in joint laboratories or on shared platforms, forming a creative, connected, top-level scientific campus open to the outside world.

## 1.5.1 Major technological focuses

### 1.5.1.1 Propulsion performance

Propulsion performance objectives and acceptability requirements for future aircraft engines derive from work carried out through ACARE<sup>(1)</sup>. Objectives are set for two dates: 2020 and 2050. For 2020, aircraft propulsion systems are to cut fuel consumption by 20%, pollutant emissions by 60% and noise levels by 50%. The Flightpath 2050 publication specifies reductions of 75% in greenhouse-gas emissions, 90% in NOx and 65% in noise levels by 2050.

The Group's roadmap for the aircraft propulsion systems of the future, though its subsidiary Snecma, incorporates two technology stages:

- ◆ the LEAP turbofan engine, with a very high bypass ratio. For those modules under Snecma's responsibility in CFM, this integrates advanced technologies such as a highly innovative lightweight fan made from composite materials and a high-efficiency low-pressure turbine. This engine will be available in 2016 and will bring about major improvements in line with the ACARE 2020 objective, particularly in terms of fuel consumption. It has been selected by Airbus for its A320neo, by Boeing for its 737 MAX and by COMAC for its C919, and obtained its first certification in 2015. R&T work is in progress on long-term continuous improvement in engine performance;
- ◆ the second phase is more ambitiously innovative, in line with Flightpath 2050, whose objectives call for breakthroughs in engine architecture through the exploration of developments such as the open rotor concept and faired architectures

with very high bypass ratios. These have been addressed by advanced research under national and European programs outlined in the seventh FPRTD<sup>(2)</sup>, and are to continue under the eighth FPRTD – Horizon 2020 (H2020). Specific initiatives here include the Clean Sky Joint Technology Initiative.

Helicopter turbine engines are subject to similar imperatives requiring reductions in fuel consumption and environmental impacts. Through its subsidiary Turbomeca, Safran has undertaken ambitious technology programs to address future market needs. A number of technologies developed under the TECH800 program have been adopted on the Arrano engine, selected by Airbus Helicopters as the sole source for its new H160. Then in 2016, tests will begin on the TECH3000 demonstrator to validate new concepts and technologies specific to the range of 3,000 shp engines for helicopters from 11 to 14 metric tons. Safran's technological progress strategy is backed by work in close liaison with customers to come up with innovative new engine integration developments such as hybrid power architecture concepts in drive systems.

The need to lighten planes, helicopters and their equipment has led to increased use of composite materials. Safran engines and equipment (whether nacelles, landing gear or brakes) are characterized by heavy mechanical loads and a more difficult environment than for other aircraft sections such as airframes. To develop its composite materials solutions, Safran set up the Safran Composites Center, now part of Safran Tech, with resources and skills in organic matrix composites. Herakles, the Group's center of competence for these technologies, provides core expertise in thermostructural composites for aircraft engines, a

(1) ACARE: Advisory Council for Aeronautics Research in Europe.

(2) FPRTD: Framework Program for Research and Technological Development.



major technological challenge addressed by substantial research efforts. This research, along with work on new metal alloys, and on high-performance coatings compliant with European REACH<sup>(1)</sup> regulations, is coordinated by the Safran Materials and Processes Department. Two platforms are being set up, one for developing the new monocrystalline casting techniques needed for engine development, and one for additive manufacturing, which offers promising openings in design, production and repair of mechanical components.

Research into rocket propulsion, an area in which technological demands are extremely high, remains a Safran priority. A decade's work stood behind the competitive proposal on the Ariane 6 launch vehicle that was put before the European Space Agency (ESA) member states at the December 2014 conference of ministers. To fulfill this major program, which is to provide Europe with sustained space capability over the decades to come, Group expertise in solid- and liquid-propellant space propulsion systems will be harnessed side by side with Airbus expertise through a joint venture, Airbus Safran Launchers.

Herakles also develops new missile propulsion technologies, including thruster and nozzle body technologies, solid propellant technologies and innovative thruster architectures. Research focuses include thrust modulation for tactical missiles, in partnership with MBDA and joint subsidiary Roxel, gas valving for interceptors, and higher-thrust solid propellants with more eco-friendly compositions.

### 1.5.1.2 The more electric aircraft

The move continues toward increased use of electrical energy for aircraft systems and actuators. The movement, which started with the A380 and Boeing 787 programs, will be a defining characteristic of the next generation of short- and medium-haul aircraft. The ultimate aim is overall aircraft energy optimization, covering energy production and energy consumption, for both propulsive and non-propulsive functions. The breadth of its aircraft engine and equipment expertise allows Safran to explore a huge spectrum of solutions to make tomorrow's aircraft more competitive, in terms of performance, functionality and cost of ownership.

By bringing all its aircraft electrical systems expertise together within a single unit, Labinal Power Systems, the Group not only possesses the best technologies in electricity generation, conversion and transmission, but is now able to adopt a whole-system approach to aircraft electricals.

Optimization involves investigation into all forms of electricity generation, from mechanical engine motion to auxiliary power units (APUs) in hybrid solutions combining turbines, fuel cells and batteries. This work involves Labinal Power Systems along with other Group companies (Microturbo, Herakles and Snecma). One of the units of the Safran Tech innovation center is dedicated to developing simulation systems for evaluating advanced global energy and propulsive architectures.

Safran is involved in several technology programs alongside aircraft manufacturers in a European or French context. Work benefits from numerous academic alliances with around 15 CNRS laboratories, and from technology projects undertaken with partners at the cutting-edge of electrical engineering in their sector, such as Alstom, Schlumberger, Schneider Electric and Valeo. Under a partnership with Honeywell, the Innovation Department has carried out a demonstration of the EGTS electric taxiing system on an A320. This new system will reduce aircraft fuel consumption during taxiing; instead of using the aircraft engines for ground maneuvers, electrical energy generated by an APU drives electric motors in the landing gear wheels.

### 1.5.1.3 Avionics

#### NAVIGATION

Air, land, sea, satellite and weapons navigation markets are constantly evolving and expanding: the integration of mobile units into cooperative groups, increasing autonomy requirements, and the required land-onboard continuum via secure links are drivers of renewed demand and associated technologies. Safran's approach relies strongly on breakthrough HRG<sup>(2)</sup> technology, whose characteristics make it possible to design and produce world-leading navigation equipment and weapons at competitive costs. Through its subsidiary Sagem and the Safran Tech sensors unit, the Group continues with the development of MEMS<sup>(3)</sup> technology accelerometers and gyrometers for portable geolocation applications. With its prime expertise in high-integrity navigation systems, Sagem leads the field in drone navigation.

#### ELECTRONIC SOLUTIONS AND CRITICAL SOFTWARE

Because onboard electronic systems for severe environments are key components of many Group products, the Safran Electronics Division runs ambitious projects on controller architectures featuring more efficient processors, and on component packaging capable of withstanding the hotter environments of future aircraft systems. On systems engineering, Safran is working on process harmonization: a modern software development workshop has been set up for Group-wide rollout.

### 1.5.1.4 New services

Innovation efforts are called for, consistent with the growing importance of services in the Group's business. Techniques used to diagnose and forecast the condition of airplane and helicopter equipment and systems bring value for Safran product users, as regards both operational considerations (optimization of maintenance), and fleet management support (evaluation of residual value). To address this need, Safran is developing its Monitoring Services system for managing fleet equipment operating data. Initial rollout of the new system has begun on helicopters.

(1) REACH: Registration, Evaluation and Authorization of Chemicals.

(2) HRG: hemispherical resonator gyro.

(3) MEMS: micro electro mechanical systems.



"Big data" information extraction techniques offer promising development opportunities. Here, the Safran Analytics teams at the Safran Tech center will be stepping up rollout of more agile services, better oriented to value creation for aircraft operators. In addition, Safran founded the Machine Learning – Big Data chair at the Supélec Paris Tech engineering school.

### 1.5.1.5 Dual-use technologies

Sagem harnesses advanced optronics and information and communication technology to develop innovations that will help the Group offer enhanced operational efficacy to armies, navies and air forces. Optronics needs range from imagers operating in one or more wavelength bands through to full image processing systems handling monitoring, detection, identification, fire control and self-protection. Integrated battlefield perception and soldier support solutions are developed using systems that couple infrared sensor and light intensification technologies with other functions such as geolocation and data analysis.

In infrared sensors Safran offers the technologies held by Sofradir, its joint venture with Thales. Both partners transferred their IR detector technologies to Sofradir, giving it one of the world's most extensive product ranges in this field. To extend its technological sources to other types of sensors and their integration in intelligent systems, Safran is working in partnership with Valeo on autonomous vehicle technologies. The partners fund a chair in

this subject at the École de Mines engineering school in Paris, and a joint laboratory will be opening at the Safran Tech site in 2016.

### 1.5.1.6 Advanced security technologies

Safran's leadership, through its subsidiary Morpho, in biometric systems, associated terminals and identity document systems is maintained through significant R&T investment in improving biometric data identification and capture algorithms and in enhancing the performance of anti-fraud and information protection systems. This yields a capability to rapidly build, and then operate, large-scale biometric databases such as that covering the population of India, which has an enrollment rate topping a million individuals per day. Morpho's next challenge concerns the implementation of biometric identification techniques in online transactions systems, which require sensor technologies that can be integrated in mobile phones, along with hardware or software security features that go beyond the current state of the art in smartphone applications. The Morpho Detection Division holds a portfolio of technologies for detecting explosives and illicit substances: technological advances achieved by Morpho Detection since joining the Group include detection of liquid explosives by X-ray diffraction. The combination of high-performance detection systems with biometrics and secure electronic identity documents gives rise to a new strategic focus covering identification and flow control for people and goods, a key growth segment in the coming years, especially in the field of air transportation security.

## 1.5.2 Technical and scientific partnerships

In implementing its R&T strategy, Safran enjoys the support of its partners, which provide it with scientific and technological expertise. Safran thus meets the two prerequisites for success: it identifies known and latent market needs through customer contact, and it adopts an open approach to what is an increasingly complex and multidisciplinary scientific and technological environment.

In 2009, Safran created a scientific council, currently chaired by Professor Mathias Fink, which comprises eight leading international scientists bringing proven expertise in all the scientific disciplines underlying Group businesses. One of the council's main functions is to issue recommendations on the structure and quality of the Group's scientific partnerships.

For the first R&T levels, Safran has developed a network of scientific partners in France in the university and applied research sectors. Safran implements framework agreements with ONERA (the French National Aerospace Research Office), CEA (the French Atomic Energy Commission) and CNRS (the French Center for Scientific Research), which offer access to the best in French scientific research. The Group has long-term partnerships with

many research and higher education organizations, some of whose laboratories form valuable external research hubs. These partnerships also help Safran recruit leading talents: Safran supports the work of around 180 PhD students, runs several international thematic networks on key issues (such as combustion, noise reduction, mechanical engineering and power electronics), and provides support for seven university chairs. Safran is also a founder member of the French Foundation for Aerospace Research (FNRAE), and a front-line contributor to the foundation of three IRT<sup>(1)</sup> technological research institutes. It is a major player in several competitiveness hubs, including System@tic, Aerospace Valley and ASTech.

Safran plays an active role in European Union bodies and programs. Since 2008, Safran has been closely involved in establishing the Clean Sky Joint Technology Initiative, bringing together the leading players in aviation R&D along with the European Commission in a demonstration program on airframes, engines and systems. In 2014, Safran worked to renew this public-private partnership through to 2024: Clean Sky 2 is now operational.

(1) IRT: technology research institutes formed under France's PIA Investments for the Future Program.

Safran takes part in many international cooperative research initiatives, with university laboratories in Europe, the US, Singapore and India. Initiatives to support the Group's international development will shortly be taking shape in a number of countries investing in aerospace technologies, such as Turkey and Morocco.

The intellectual property related to this cooperative work is defined contractually at the beginning of projects between partners. The general principle is that the intellectual property belongs to the partners who performed or co-financed the work, and, at the very least, Safran receives rights of use in its own field.

### 1.5.3 Innovation and intellectual property

Innovation is at the heart of Safran's strategy. The competitiveness of its products is largely based on the successful integration of technological innovation or adjustments, providing the customer with industry-leading performances. Safran's ability to produce innovations that mark a break with existing technology is amply demonstrated across a huge breadth of sectors: EGTS, composite fan blades, hemispheric resonator gyros, detection of liquid explosives by X-ray diffraction, on-the-fly fingerprint detection terminals, etc. The creation of cross-disciplinary teams, capitalizing on the wide range of expertise available in the Group, offers both an efficient and high-performance organizational structure. This approach is typified by the high-potential projects run by the Innovation Department. Safran also develops cooperative innovation, which involves seeking out, assessing and nurturing innovations proposed by suppliers or startups. The capacity to identify then implement efficient cooperative operations with outside partners helps Safran integrate the best technical and technological solutions in its systems and equipment under development, and to shorten time-to-market for innovative and mature solutions.

In 2015, Safran announced the formation of a new subsidiary, Safran Corporate Ventures, to handle financing for innovative startups. In line with the Group's strategy on innovation and transformation, this organization seeks primarily to support innovative startups in the following fields:

- ◆ advanced materials, robotics and new manufacturing techniques;
- ◆ connected sensors and processing of sensor data;
- ◆ onboard energy generation, distribution, transmission and storage systems;
- ◆ solutions and technologies in identity and authentication of connected things and persons.

In September 2015, Safran announced it was taking a stake in Krono-Safe, a spin-off of France's atomic and alternative energy commission, CEA, developing software for dependability-critical equipment in the high-growth sectors of transportation (connected and autonomous vehicles), industry (Internet of Things) and critical industries (Aerospace, Defense and Cyber-security).

The development of technical expertise is also key to preparing for the technological challenges of tomorrow. A process has been set up to determine companies' expertise needs Group-wide and thereby plan ahead for renewals and training of new experts.

Intellectual property is of increasing importance amid globalized markets and ever-fiercer competition. It responds to operational imperatives, while strengthening and securing Safran's commercial positions. The creative and innovative ability of teams is demonstrated by the increasing number of patents filed: more than 900 in 2015. This places the Group among the front-runners in French patents<sup>(1)</sup>. Thomson Reuters also ranks Safran among the one hundred most innovative research organizations worldwide. Overall, the Group's portfolio comprises close to 32,000 intellectual property rights around the world, bolstering its position in its areas of business.

In addition to patent protection, because of Safran's international reach and extensive partnership involvement, the Group gives great importance to ensuring close control over technology transfers and defining precise policy on the matter.

Some transfers are essential for market access reasons. Technologies for transfer, which do not belong to Safran's core technology portfolio, must be clearly identified, accurately valued, and covered by carefully structured long-term partnership arrangements. Under no circumstances may such partnerships restrict the Group's capacity for technological differentiation in the future.

### Dependence

Safran has not identified any dependence on patents, licenses, industrial, commercial or financial contracts, or new manufacturing processes likely to have a material impact on the Group.

There are risks of production delays and cost penalties for Safran in the event of supplier or partner shortcomings, as set out in section 4.1.3, "Partnership and supplier risks".

(1) Second in INPI ranking, April 2015 (for patents filed in 2014).

## 1.5.4 Research and development expenditure

Including the portion funded by customers, the total expenditure on research, technology and development (RTD) was approximately €2.1 billion in 2015, representing 12% of revenue. RTD operations in France amounted to €1.8 billion, representing 86% of overall RTD expenditure. Some 66% of RTD expenditure was self-funded, and can be broken down as follows:

- ◆ Aircraft programs (including LEAP, Silvercrest and A350): 48%;
- ◆ Helicopter engines: 5%;
- ◆ Security and defense: 16%;
- ◆ R&T: 29%;
- ◆ Other: 2%.

(in € millions)	2014	2015
<b>Total R&amp;D</b>	<b>(1,990)</b>	<b>(2,057)</b>
External financing	526	701
<b>Self-funded RTD</b>	<b>(1,464)</b>	<b>(1,356)</b>
% of revenue	9.5%	7.8%
Research tax credit	151	165
<b>Self-funded RTD after research tax credit</b>	<b>(1,313)</b>	<b>(1,191)</b>
Capitalized expenditure	644	495
Amortization and impairment of R&D expenditure <sup>(1)</sup>	(78)	(95)
<b>Impact on recurring operating income</b>	<b>(747)</b>	<b>(791)</b>
% of revenue	4.9%	4.5%

(1) Excluding non-recurring items.

Total R&D increased with the rise in external financing.

Two main factors explain the €108 million reduction in self-funded RTD (down by 7.4% on the 2014 figure):

- ◆ the first version of the A350 (A350-900) came into service in early 2015, thus lightening the RTD load in 2015 compared with 2014;

- ◆ RTD efforts on the LEAP engine programs eased off in the run-up to certification (see section 1.3.1.1).

The €149 million decrease in capitalized expenditure is explained mainly by the reduction in self-funded RTD on the programs for the A350 and the various LEAP engine versions, and by the end to capitalization on the Silvercrest program, as from April 1, 2014.

## ◆ 1.6 Industrial investments

### 1.6.1 Industrial policy and the Factory of the Future

Safran is an established industry reference and a major player in its core businesses of Aerospace, Defense and Security. Its aim is to supply its customers with increasingly advanced technological equipment, meeting ever stricter safety standards, at a lower cost and with shorter timeframes.

Safran's leadership results from the high standards imposed by the Group companies' operators, technicians and managers, under constant guidance from their industrial departments, coordinated by the Group's Industrial Department, which oversees the industrial strategies chosen by the Executive Committee. The Group's employees work in a continuously innovating environment and accept the daily challenge of achieving the highest standards of technological expertise while meeting ever greater demand and the need to produce new innovative products (the LEAP engine, Patroller drone, etc.).

The plants also respond to this demand for performance and innovation that is central to the success of Safran's products and services worldwide. The Group companies, working with the Industrial Department, focus their investments and organization on adapting production sites, preparing for tomorrow's industrial challenges and developing competitive advantages: expertise in new production technologies, digital and data revolutions, organizational transformation, etc.

Thanks to its constant drive for innovation and excellence, the Group has for many years been at the forefront of the Factory of the Future technologies and processes, both in France and Europe. This achievement owes much to close cooperation among the Safran teams responsible for developing the technologies that are successfully implemented on new products. Examples of new production techniques include additive manufacturing and metal

injection molding (MIM), development work on which is closely coordinated both within the Group and with selected partners.

The aim is to develop industrially operable technologies capable of delivering an optimum response to the needs of Safran's customers.

In its work toward the Factory of the Future, Safran is committed to the digital transformation of its production units, by reducing and optimizing development cycles with digital tools, streamlining the supply chain and production line fluidity by networking machines and plants or better controlling manufacturing processes through data analysis.

Safran's proactive industrial strategy of anticipating future challenges and transformations is implemented in line with its

make-or-buy strategic choices by including its French and global supply chain partners. Multiple sites and the reactivity of this industrial configuration allow Safran to develop an international production system capable of achieving local reach to end customers and the best possible balance of production costs across euro and dollar zones.

To keep pace with constant change in practices and technologies, Safran pays great attention to maintaining and developing its employees' skills. This is seen in the Group's training investment, which was exemplified in late 2014 by the opening of the Safran University campus in Massy, France. In 2015, Safran University training courses in industrial, supply chain and purchasing subjects were attended by more than 600 people (see section 5.4).

## 1.6.2 Main industrial investments

Safran's property, plant and equipment investments totaled €758 million in 2015, up by 12.5% on 2014.

The significant increase in investment is to prepare the Group for substantial growth in business, and the industrial upgrades needed for new programs.

Geographical zone (in € millions)	2014	2015
France	473	558
Europe (excluding France)	48	66
Americas	102	75
Asia & Oceania	44	49
Africa & Middle East	7	10
<b>TOTAL</b>	<b>674</b>	<b>758</b>

In 2015, most of Safran's property, plant and equipment investments (74%) were in France, primarily for:

- ♦ the creation of the new Safran Tech R&T center in Saclay (near Paris), which brings together Group-wide expertise to nurture the emergence of disruptive technologies, and includes an additive manufacturing unit;
- ♦ the extension to the Sagem site in Eragny (Paris region), with a view to forming a major technology cluster;
- ♦ the development of a new site in Toulouse (southern France) to accommodate Safran's regional office and Group Shared Services Centers, head office and service teams (Labinal Power Systems, Safran Engineering Services), branch offices for other Group companies and dedicated research laboratories specializing in areas such as the more electric aircraft.

Safran's other investments in France continue the policy of previous years, with:

- ♦ the renovation and modernization of industrial sites across all Group activities, to accommodate production ramp-up and the introduction of new Boeing 737 MAX, Boeing 787, Boeing 777X, A320neo, A330neo and A350 programs, etc.;

- ♦ plant renewal and upgrades at existing sites (Snecma in Gennevilliers, Villaroche and Corbeil);
- ♦ the installation and upgrade of test equipment (Snecma in Villaroche, Messier-Bugatti-Dowty in Villeurbanne).

Safran's main investments outside of France were:

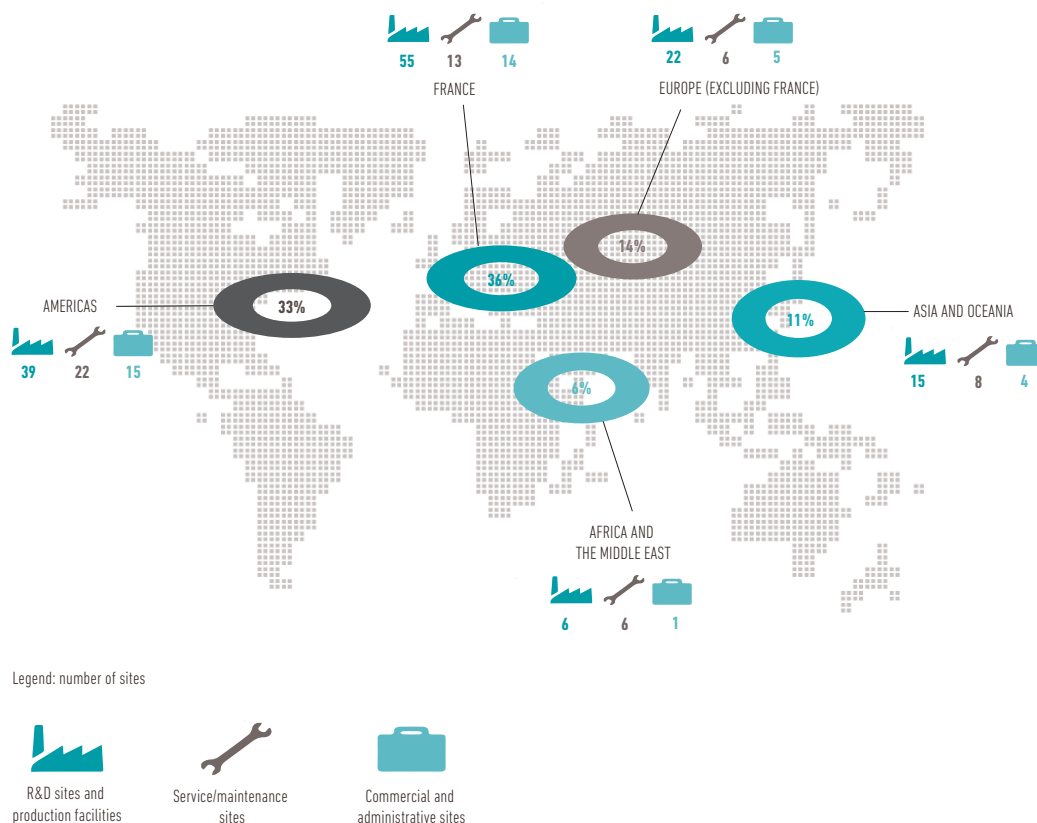
- ♦ the extension to the Snecma's industrial site in Suzhou (China), specializing in machining and assembly of low-pressure modules and parts;
- ♦ the start of construction work on a new production facility in Sedziszow Malopolski (south-west Poland), specializing in the manufacture of low-pressure turbine blades for LEAP and Silvercrest engines;
- ♦ the completion of construction work on an industrial facility in Springfield (Illinois, US) to handle an extension to security business for the US government;
- ♦ the construction of a new Messier-Bugatti-Dowty facility making carbon brakes in Malaysia.

## 1.7 Sites and production plants

Safran's registered office is located in Paris, France.

The Group carries out its activities at production, R&D, and service/maintenance sites worldwide.

The map below shows the Group sites<sup>(1)</sup> in each geographical region, broken down by the main type of site activity. Figures and locations shown here correspond to companies consolidated under the Group, as defined in section 3.1, Note 1.b.



(1) A "site" is a legal entity that can cover one or more sites, each of which may have administrative, production, or service/maintenance functions.

	Main activities at Safran sites				Occupancy	
	Total sites	R&D/production	Service/ maintenance	Commercial/ administrative	Owner*	Tenant
Snecma	27	12	12	3	10	17
Turbomeca	16	6	9	1	7	9
Herakles	12	10	-	2	5	7
Techspace Aero	2	2	-	-	1	1
Messier-Bugatti-Dowty	17	11	5	1	10	7
Labinal Power Systems	39	28	10	1	9	30
Technofan	2	1	1	-	1	1
Hispano-Suiza	2	2	-	-	2	-
Aircelle	8	5	2	1	5	3
Sagem	26	20	2	4	9	17
Morpho	69	37	14	18	4	65
Safran	5	2	-	3	4	1
Other	4	1	-	3	-	4
<b>TOTAL</b>	<b>229</b>	<b>137</b>	<b>55</b>	<b>37</b>	<b>67</b>	<b>162</b>

\* Including seven sites under financial lease.

The Group owns its major and strategic production sites, and tends toward rental of its commercial and administrative sites.

The bulk of Group research and development work is carried out at its main production sites. For this reason, the table shows "R&D" and "production" in the same column.

Because of the diversity of Safran's operations, the notion of "production capacity" does not apply.

There were two significant site and production plant additions in 2015:

#### In France

- ◆ The Safran Tech research and technology center opened in Saclay, outside Paris, accommodating various Group subsidiaries.

#### Elsewhere

- ◆ The Messier-Bugatti-Dowty carbon brakes plant opened in Sendayan, Malaysia.

Environmental factors liable to influence the Group's use of its property, plant and equipment are presented in section 5.5.3. The Group has drafted Health, Safety and Environment (HSE) guidelines which enable it to assess the compliance of its property, plant and equipment, and its operations, with HSE regulations. It also regularly conducts self-assessments and audits.

## ◆ 1.8 Group purchasing strategy

Safran pursues a purchasing policy consistent with its objectives of excellence and competitive performance, and with its industrial policy and corporate social responsibility (CSR) strategy. In accordance with its commitment to the United Nations Global Compact, Safran has developed dialogue with its suppliers on the basis of Global Compact principles on human rights, labor standards, the environment and the fight against corruption.

Safran's purchasing policy seeks to concentrate business with suppliers that meet the demanding requirements and specific rules applicable to the Aerospace, Defense and Security markets,

and that are prepared to commit to long-term undertakings with Safran on a balanced, mutually beneficial basis.

The policy has four main objectives:

- ◆ to build a supplier panel that:
  - enables Safran to meet its current and future needs as regards performance (cost, quality, delivery times), know-how and technological innovation,
  - enables Safran to roll out its CSR strategy upstream through the supply chain;

- ◆ to involve suppliers early on in Group product development programs so that they can meet all customer demands, allowing them to propose innovations and harness the full extent of their know-how on obtaining the best possible cost and performance for products, and full compliance with HSE requirements;
- ◆ to promote common procedures, management tools and metrics across all Group companies to improve its operation and performance with suppliers;
- ◆ to support key suppliers on measures to adapt their organizations and industrial configurations to expectations and shifts in market demand.

It is rolled out:

- ◆ in compliance with the Group's Ethical Guidelines and best practices set out in its Responsible Supplier Relations mediation guidelines;
- ◆ in compliance with Safran's commitments with government authorities, business organizations and other partners;

- ◆ through constant cooperation among Group companies, development of a Safran purchasing network and culture, close coordination among all Group players in contact with suppliers, and involvement of the purchasing team in all product lifecycle phases.

Safran took a number of measures to ensure efficient rollout of its purchasing policy in 2015:

- ◆ supplier relations management was enhanced through an emphasis on value creation, achieved by a more individualized approach to the supplier panel. In September 2015, Safran held a series of Inner Circle meetings with the suppliers concerned;
- ◆ cooperative innovation with suppliers was stepped up to build on the success of open innovation achievements and help get innovative products and services to market more promptly;
- ◆ supplier standards were updated to include CSR aspects and a call to suppliers to commit to rollout of the Group's CSR strategy.

## ◆ 1.9 Safran quality performance and policy

Safran pursues an ambitious quality policy targeting two main goals:

- ◆ customer satisfaction;
- ◆ continuous progress in performance.

This policy involves a permanent drive on innovation, continuous improvement and risk control. It is based on Group-wide methods and tools derived from shared experience and best practices across all Group companies. For even greater efficacy, this year Safran decided to merge its Quality and Progress Initiative Departments, along with the Group's consultancy firm, Safran Consulting, into a single Quality and Progress Department. The resulting synergies strengthen the operations run by the separate teams. This new department seeks to lead Safran to excellence and make each of the Group's companies its customers' preferred supplier.

In 2015, customers continued to express confidence and satisfaction with regard to Safran teams' customer relations, attention and response times. The upward trend in internal quality performance continued, driven, among other things, by the rollout of QRQC (quick-response quality control), an effective method for tackling problems as and where they occur.

Quality and progress teams also started joint work on putting together an operational excellence system for simplifying and harmonizing processes across the Group, and standardizing best working practices. The industrial validation process was also improved in preparation for production ramp-up on new programs.

Safran's quality progress measures are defined and structured in line with the Group-wide quality vision, namely: *to be our customers' preferred supplier*.

The Safran+ progress initiative was launched in 2009 with the aim of driving performance improvements throughout the Group. To achieve this goal, Safran+ defines key areas for progress, sets targets and suggests possible methods. Safran+ is based on a network with centralized organization, and deployed within all of the Group's entities worldwide. This network allows for an array of improvement initiatives, either created by the Group and applicable to all of its companies, or created by the companies themselves for their own internal use. These initiatives may involve either continuous improvement or disruptive projects put forward and coordinated by the Group.

Two such initiatives are permanent and cross-functional:

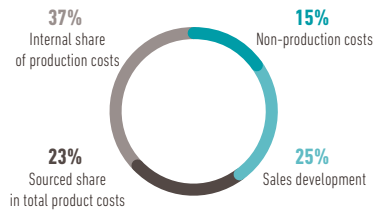
- ◆ participative innovation initiatives offering employees the possibility to improve the Company through their sector;
- ◆ Lean Sigma, with Green Belts, Black Belts and Master Black Belts driving the Group's transformation through a structured and standardized project management approach.

Most projects target at least one of the following objectives:

- ◆ improving customer satisfaction;
- ◆ increasing operating profit;
- ◆ reducing working capital requirements.

Throughout the year, the managers concerned report on progress initiatives to Group executive management at biannual reviews carried out at two different sites per company.

The savings achieved by the Safran+ initiative in 2015 break down as follows:



Progress plan highlights in 2015 include:

- ◆ rollout of the Lean Sigma and participative innovation programs continued throughout the Group:
  - new Green Belts, Black Belts and Master Black Belts were trained and robust rollout of the initiative was developed by an awareness-raising program reaching 80% of Group employees,
  - close to 95,000 on-site ideas were generated and put into practice in workshops and offices;
- ◆ a self-evaluation system on R&D performance was run to focus individual companies' progress dynamics on their own specific challenges. Lean engineering and management-by-sight principles were extended to all Group companies. Design-to-cost (DTC) standards were drawn up and training courses run accordingly;
- ◆ the Purchasing Specification project was extended to new non-production areas, and expressions of needs were standardized to optimize Group purchasing decisions;
- ◆ QRQC<sup>(1)</sup> was rolled out across industrial operations throughout all Group companies. Rollout was also begun among an initial ten or so suppliers common to different Safran production teams;
- ◆ development of the cooperative enterprise network proceeded, to facilitate productive interaction throughout the Group, with regard to idea swapping, problem solving, project and program management, and coordination of teams across different sites in France and worldwide;
- ◆ efficacy was further enhanced by bringing together the Group's progress and quality organizations, along with its consultancy firm Safran Consulting, together under the new Safran Quality and Progress Department in late 2015.

(1) QRQC: Quick-Response Quality Control, a management method that emphasizes constant vigilance and immediate reactions, in order to swiftly solve problems.





## BUSINESS HIGHLIGHTS IN 2015

### Aerospace Propulsion

- ◆ A total of 1,612 CFM56 engines delivered in 2015, up 3% year-on-year (1,560 engines), and 13,252 CFM56 and LEAP engines in the backlog (firm orders and commitments), representing over eight years of production at current production rates;
- ◆ Continued development of engine programs, with the dual certification of the LEAP-1A engine for the Airbus A320neo by the European Aviation Safety Agency (EASA) and the Federal Aviation Administration (FAA) in the US. Roll-out of the first Boeing 737 MAX fitted with LEAP-1B engines and the first COMAC C919 fitted with LEAP-1C engines;
- ◆ Complementary developments on the Silvercrest engine;
- ◆ Export success in Egypt and Qatar for Rafale fighter jets fitted with M88 engines;
- ◆ The Arrius 2R engine for Bell Helicopters' Jet Ranger X certified by EASA and the Arrano engine selected as sole engine on Airbus Helicopters' new H160 helicopter;
- ◆ Airbus Safran Launchers informed by the European Space Agency that it had won the contract to develop Ariane 6.

### Aircraft Equipment

- ◆ Successful ramp-up in deliveries of power transmissions, landing gear and wiring shipsets for the Airbus A350;
- ◆ Growth in deliveries of wiring shipsets and landing gear for the Boeing 787;

- ◆ Record production of thrust reversers, power transmissions, wiring shipsets and landing gear for the Airbus A320ceo;
- ◆ Continued leadership in carbon brakes;
- ◆ Partnership strengthened with Rolls Royce in power transmission systems.

### Defense

- ◆ First commercial success of the PASEO multifunction viewfinder for armored vehicles;
- ◆ Delivery and installation of EOMS-NG observation and fire direction systems for the French navy;
- ◆ Selection of the BlueNaut® inertial navigation system by the US Coast Guard;
- ◆ Sale of the AASM air-to-ground weapons system in Egypt and Qatar.

### Security

- ◆ No. 1 ranking maintained in the US, where Safran supplies 85% of all driving licenses;
- ◆ US-based TSA Pre✓® program extended;
- ◆ Selected to supply ID solutions for elections in Ivory Coast, Egypt and Chad;
- ◆ Participation in the digital ID project in the UK;
- ◆ Selected to help reinforce border controls in UAE, New Zealand and Estonia.

## 2015 ADJUSTED KEY FIGURES

(in € millions)	Aerospace Propulsion		Aircraft Equipment		Defense		Security		Holding co. and other		Total	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Revenue	8,153	9,319	4,446	4,943	1,221	1,266	1,530	1,878	5	8	15,355	17,414
Recurring operating income (loss)	1,633	1,833	426	466	71	64	134	151	(175)	(82)	2,089	2,432
Profit (loss) from operations	1,624	1,214	368	423	74	54	109	133	(193)	(90)	1,982	1,734
Free cash flow <sup>(1)</sup>	380	727	149	153	17	-	97	45	97	49	740	974
Acquisitions of property, plant and equipment <sup>(2)</sup>	362	433	170	181	46	71	59	52	37	21	674	758
Self-funded R&D	894	875	308	229	133	119	129	133	N/A	N/A	1,464	1,356

(1) Free cash flow is equal to cash flow from operating activities less changes in working capital and acquisitions of property, plant and equipment and intangible assets.

(2) Net of proceeds from disposals.



## REVIEW OF OPERATIONS IN 2015 AND OUTLOOK FOR 2016

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## ◆ 2.1 Comments on the Group's performance in 2015 based on adjusted data

### 2.1.1 Reconciliation of consolidated data with adjusted data

#### Foreword

To reflect the Group's actual economic performance and enable it to be monitored and benchmarked against competitors, Safran prepares an adjusted income statement alongside its consolidated financial statements.

Readers are reminded that Safran:

- ◆ is the result of the May 11, 2005 merger of the Sagem and Snecma groups, accounted for in accordance with IFRS 3, Business Combinations, in its consolidated financial statements;
- ◆ recognizes, as of July 1, 2005, all changes in the fair value of its foreign currency derivatives in "Financial income (loss)", in accordance with the provisions of IAS 39 applicable to transactions not qualifying for hedge accounting (see section 3.1, "Accounting policies", Note 1.f).

Accordingly, Safran's consolidated income statement has been adjusted for the impact of:

- ◆ purchase price allocations with respect to business combinations. Since 2005, this restatement concerns the amortization charged against intangible assets relating to

aircraft programs revalued at the time of the Sagem-Snecma merger. With effect from the 2010 interim consolidated financial statements, the Group decided to restate the impact of purchase price allocations for all business combinations. In particular, this concerns the amortization of intangible assets recognized at the time of the acquisition and amortized over extended periods due to the length of the Group's business cycles, along with gains or losses on remeasuring the Group's previously held interests in an entity acquired in a step acquisition or assets contributed to a joint venture;

- ◆ the mark-to-market of foreign currency derivatives, in order to better reflect the economic substance of the Group's overall foreign currency risk hedging strategy:
  - revenue net of purchases denominated in foreign currencies is measured using the effective hedged rate, i.e., including the costs of the hedging strategy,
  - all mark-to-market changes on instruments hedging future cash flows are neutralized.

The resulting changes in deferred tax have also been adjusted.

## Reconciliation of the consolidated income statement with the adjusted income statement

The impact of these adjustments on income statement items is as follows:

(in € millions)	2015 consolidated data	Currency hedges		Business combinations		2015 adjusted data
		Remeasurement of revenue <sup>(1)</sup>	Deferred hedging gain (loss) <sup>(2)</sup>	Amortization of intangible assets from Sagem-Snecma merger <sup>(3)</sup>	PPA impacts – other business combinations <sup>(4)</sup>	
<b>Revenue</b>	<b>18,100</b>	<b>(686)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>17,414</b>
Other recurring operating income and expenses	(15,272)	8	(5)	89	152	(15,028)
Share in profit from joint ventures	45	-	-	-	1	46
<b>Recurring operating income</b>	<b>2,873</b>	<b>(678)</b>	<b>(5)</b>	<b>89</b>	<b>153</b>	<b>2,432</b>
Other non-recurring operating income and expenses	(796)	-	-	133	(35)	(698)
<b>Profit from operations</b>	<b>2,077</b>	<b>(678)</b>	<b>(5)</b>	<b>222</b>	<b>118</b>	<b>1,734</b>
Cost of debt	(28)	-	-	-	-	(28)
Foreign exchange gains (losses)	(3,248)	678	2,485	-	-	(85)
Other financial income and expense	(111)	-	-	-	-	(111)
<b>Financial income (loss)</b>	<b>(3,387)</b>	<b>678</b>	<b>2,485</b>	<b>-</b>	<b>-</b>	<b>(224)</b>
Income tax benefit (expense)	508	-	(806)	(75)	(30)	(403)
Share in profit from associates	4	-	-	-	-	4
Gain on disposal of Ingenico Group shares	421	-	-	-	-	421
<b>Profit (loss) from continuing operations</b>	<b>(377)</b>	<b>-</b>	<b>1,674</b>	<b>147</b>	<b>88</b>	<b>1,532</b>
<b>Profit (loss) for the period attributable to non-controlling interests</b>	<b>(47)</b>	<b>-</b>	<b>-</b>	<b>(3)</b>	<b>-</b>	<b>(50)</b>
<b>PROFIT (LOSS) FOR THE PERIOD ATTRIBUTABLE TO OWNERS OF THE PARENT</b>	<b>(424)</b>	<b>-</b>	<b>1,674</b>	<b>144</b>	<b>88</b>	<b>1,482</b>

(1) Remeasurement of foreign-currency denominated revenue net of purchases (by currency) at the hedged rate (including premiums on unwound options) through the reclassification of changes in the fair value of instruments hedging cash flows for the period.

(2) Changes in the fair value of instruments hedging future cash flows of €2,485 million excluding tax, and the negative impact of taking into account hedges when measuring provisions for losses on completion (€5 million).

(3) Cancellation of amortization/impairment of intangible assets relating to the remeasurement of aircraft programs resulting from the application of IFRS 3 to the Sagem-Snecma merger (€89 million) and cancellation of impairment recognized against brands other than Safran (€133 million).

(4) Cancellation of amortization/impairment of assets identified during business combinations (€153 million) and cancellation of the capital gain on contributions to the Airbus Safran Launchers joint venture (negative impact of €35 million).

Readers are reminded that only the consolidated financial statements set out in section 3.1 of this document are audited by the Group's Statutory Auditors. The consolidated financial statements include the revenue and operating profit indicators set out in the adjusted data in Note 5, "Segment information" in section 3.1.

Adjusted financial data other than the data provided in Note 5, "Segment information" in section 3.1 are subject to the verification procedures applicable to all of the information provided in this report.

## 2.1.2 Overview of the Group's performance in 2015

### Adjusted income statement

(in € millions)	2014 Adjusted data	2015 Adjusted data
<b>Revenue</b>	<b>15,355</b>	<b>17,414</b>
Other income	291	304
<b>Income from operations</b>	<b>15,646</b>	<b>17,718</b>
Change in inventories of finished goods and work-in-progress	275	261
Capitalized production	998	964
Raw materials and consumables used	(9,043)	(10,201)
Personnel costs	(4,744)	(5,061)
Taxes	(275)	(297)
Depreciation, amortization, and increase in provisions, net of use	(639)	(716)
Asset impairment	(66)	(190)
Other recurring operating income and expenses	(108)	(92)
Share in profit from joint ventures	45	46
<b>Recurring operating income</b>	<b>2,089</b>	<b>2,432</b>
Other non-recurring operating income and expenses	(107)	(698)
<b>Profit from operations</b>	<b>1,982</b>	<b>1,734</b>
Cost of net debt	(42)	(28)
Foreign exchange losses	(48)	(85)
Other financial income and expense	(75)	(111)
<b>Financial loss</b>	<b>(165)</b>	<b>(224)</b>
<b>Profit before tax</b>	<b>1,817</b>	<b>1,510</b>
Income tax expense	(522)	(403)
Share in profit from associates	18	4
Gain on disposal of Ingenico Group shares	-	421
<b>PROFIT FOR THE PERIOD</b>	<b>1,313</b>	<b>1,532</b>
<b>Attributable to:</b>		
♦ owners of the parent	1,248	1,482
♦ non-controlling interests	65	50
<b>Earnings per share attributable to owners of the parent (in €)</b>		
Basic earnings per share	3.00	3.55
Diluted earnings per share	3.00	3.55

## Review of operations

### ADJUSTED REVENUE

For full-year 2015, Safran's revenue was €17,414 million, up 13.4% compared to €15,355 million in the same period a year ago. This €2,059 million increase, which includes positive currency impacts amounting to €1,399 million, reflects growth in Aerospace

(Propulsion and Equipment), Security and Defense revenue. On an organic basis (excluding the effects of acquisitions, disposals and currency variations), Group revenue increased by 3.9%, or €598 million.

Organic revenue was determined by applying constant exchange rates and by excluding the effects of changes in scope. Hence, the following calculations were applied:

Reported growth		
Impact of acquisitions, newly consolidated activities & disposals	€(62) million	-0.4%
Currency impact	€(1,399) million	-9.1%
<b>Organic growth</b>		<b>3.9%</b>

The €1,399 million favorable impact of currency variations reflects a globally positive translation effect on non-euro revenues, notably on the portion of the USD-denominated revenue naturally hedged via USD-denominated procurements. The average USD/EUR spot rate was 1.11 to the euro over 2015 compared to 1.33 over 2014. The Group's hedge rate improved to USD 1.25 to the euro for 2015 from USD 1.26 for 2014.

compared to €2,089 million in 2014 (13.6% of revenue). Excluding a positive currency impact of €64 million, the improvement on an organic basis was €283 million, representing 13.5% year-over-year growth. The impact of acquisitions, disposals and changes in the scope of consolidation was not significant.

The improvement was primarily driven by Aerospace aftermarket activities and support services for the landing gear and wheels & brakes businesses. Recurring operating income in Security businesses was slightly up while it was down in Defense activities compared to the prior-year period.

### ADJUSTED RECURRING OPERATING INCOME

Recurring operating margin increased by 0.4pt to 14.0% of sales. Safran's recurring operating income was €2,432 million, up 16.4%

(in € millions)	2014	2015
<b>Recurring operating income</b>	<b>2,089</b>	<b>2,432</b>
% of revenue	13.6%	14.0%
<b>Total non-recurring items</b>	<b>(107)</b>	<b>(698)</b>
Capital gain (loss) on disposals	-	-
Impairment net of reversals on intangible assets	(45)	(641)
Other non-recurring items	(62)	(57)
<b>PROFIT FROM OPERATIONS</b>	<b>1,982</b>	<b>1,734</b>
% of revenue	12.9%	10.0%

### ADJUSTED PROFIT FROM OPERATIONS

Adjusted profit from operations fell 12.5% to €1,734 million, or 10.0% of revenue, versus €1,982 million (12.9% of revenue) in 2014. Non-recurring items represented an expense of €698 million during 2015, compared to only €107 million in 2014, including charges amounting to €654 million related to Silvercrest, of which all intangible assets and other specific assets were written down.

owing to the fall in interest rates, at €28 million from €42 million in 2014. The financial loss also includes the cost of unwinding discounts on certain assets and liabilities (mainly provisions and repayable advances), as well as the impact of any changes in the discount rates used. The cumulative impact of these non-cash items was an expense of €60 million in 2015 and an expense of €55 million in 2014. The interest cost on post-employment benefit obligations amounted to €19 million in 2015 versus €25 million one year earlier. The financial loss for 2015 also includes a non-cash charge of €84 million arising on the translation of provisions denominated in US dollars (non-cash charge of €75 million in 2014) and a non-cash charge of €35 million relating to changes in the fair value of commodity derivatives (non-cash charge of €10 million in 2014).

### ADJUSTED FINANCIAL INCOME (LOSS)

The Group reported an adjusted financial loss of €224 million in 2015, compared to a loss of €165 million in 2014. The financial loss chiefly reflects the cost of net debt, which was down year-on-year

**ADJUSTED INCOME TAX EXPENSE**

Adjusted income tax expense fell from €522 million in 2014 to €403 million in 2015, representing an effective tax rate of 26.7% (28.7% in 2014).

block trade with Bpifrance, announced on May 19, 2015, and the subsequent sale of the residual stake by a financial institution on behalf of Safran, which was completed on July 29, 2015. Safran received total proceeds of €606 million and recorded a post-tax capital gain of €421 million.

**GAIN ON DISPOSAL OF INGENICO GROUP SHARES**

During 2015, Safran sold its entire remaining stake in Ingenico Group, amounting to 5.5 million shares representing 9.1% of Ingenico Group's capital. The shares had been held by the Group since the contribution to Ingenico Group of the Sagem Monetel assets in 2008. The sale was accomplished via an off-market

**ADJUSTED PROFIT ATTRIBUTABLE TO OWNERS OF THE PARENT**

Adjusted profit attributable to owners of the parent grew by 18.8% year on year, to €1,482 million or €3.55 per share, compared to €1,248 million (€3.00 per share) in 2014.

## 2.1.3 Adjusted key figures by business

**SUMMARY OF ADJUSTED KEY FIGURES BY BUSINESS**

The backlog grew 7% to €68.1 billion in 2015 compared to €63.8 billion in 2014.

(in € millions)	Aerospace Propulsion		Aircraft Equipment		Defense		Security		Holding co. and other		Total	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Backlog <sup>(1)</sup>	41,532	44,181	18,435	19,674	2,209	2,389	1,578	1,902	N/A	N/A	63,754	68,147
Orders recorded during the year <sup>(2)</sup>	14,187	10,072	5,854	4,359	1,337	1,446	1,463	2,041	N/A	N/A	22,841	17,918
Revenue	8,153	9,319	4,446	4,943	1,221	1,266	1,530	1,878	5	8	15,355	17,414
Recurring operating income (loss)	1,633	1,833	426	466	71	64	134	151	(175)	(82)	2,089	2,432
Profit (loss) from operations	1,624	1,214	368	423	74	54	109	133	(193)	(90)	1,982	1,734
Free cash flow <sup>(3)</sup>	380	727	149	153	17	-	97	45	97	49	740	974
Acquisitions of property, plant and equipment <sup>(4)</sup>	362	433	170	181	46	71	59	52	37	21	674	758
Self-funded R&D	894	875	308	229	133	119	129	133	N/A	N/A	1,464	1,356
Headcount	25,498	26,268	25,447	25,569	7,411	7,389	8,578	8,667	2,011	2,194	68,945	70,087

(1) The backlog corresponds to orders recorded and not yet recognized in revenue.

(2) Orders recorded represent orders received during the year.

(3) Free cash flow is equal to cash flow from operating activities less changes in working capital and acquisitions of property, plant and equipment and intangible assets.

(4) Net of proceeds from disposals.

### 2.1.3.1 Aerospace Propulsion

#### KEY FIGURES (ADJUSTED DATA)

	2014	2015	Year-on-year change
Quantities delivered			
CFM56 engines	1,560	1,612	3%
<i>(in € millions)</i>			
Backlog	41,532	44,181	6%
Orders recorded during the year	14,187	10,072	-29%
Revenue	8,153	9,319	14.3%
Recurring operating income	1,633	1,833	12.2%
Profit from operations	1,624	1,214	-25%
Free cash flow	380	727	91%
Acquisitions of property, plant and equipment	362	432	19%
Research and development			
Self-funded R&D	(894)	(875)	-2%
% of revenue	11.0%	9.4%	-1.6 pts
Research tax credit	58	66	14%
Self-funded R&D after research tax credit	(836)	(809)	-3%
Capitalized expenditure	475	357	-25%
Amortization and impairment of R&D expenditure	(25)	(27)	8%
Impact on profit from operations	(386)	(479)	24%
% of revenue	4.7%	5.1%	+0.4 pts
Headcount	25,498	26,268	3%

Aerospace Propulsion activities can be split into four key sectors that contribute to business line revenue as follows:

Sector	% of business line revenue	
	2014	2015
Civil aviation	66%	70%
Military aviation	10%	9%
Helicopter turbine engines	15%	13%
Ballistics and space	9%	8%

#### REVIEW OF AEROSPACE PROPULSION OPERATIONS IN 2015

Aerospace Propulsion recorded revenue of €9,319 million, an increase of 14.3% compared to revenue in the prior-year period of €8,153 million. On an organic basis, revenue was up 6.0%.

Revenue growth was primarily driven by services (+22.2%) which represented 53.5% of total revenues. The civil aftermarket (measured in USD) increased 18.9% year on year and continues to be driven by overhauls of recent CFM56 and GE90 engines in the context of a favorable environment for airline customers.

Helicopter turbines and military engines also contributed to overall service revenue growth.

Propulsion OE revenue increased 6.4%. Civil aircraft OE revenue grew slightly as deliveries of CFM56 engines reached a record rate (1,612 deliveries, 52 units more than in 2014). Military OE sales were lower due primarily to Rafale production initially destined for the French military being diverted towards export customers. Softer demand affected helicopter turbine OE unit deliveries, which declined 25%. Revenue was less affected due to currency, mix and pricing.



Recurring operating income, at 19.7% of revenue, was €1,833 million, up 12.2% compared to €1,633 million (20.0% of revenue) a year earlier. This improvement resulted from healthy growth in services as well as from increased OE deliveries of CFM56 engines. The level of expensed R&D increased compared to 2014, primarily due to the Silvercrest program, expenditure on which ceased to be capitalized from the second quarter 2014. The stronger USD and the improvement in the hedged rate had a positive impact on profitability. However, the increase in expenses rebilled by the Holding company had a negative impact on recurring income.

## COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

### Civil aviation

#### Low-thrust engines for civil aircraft (regional and business jets)

##### Silvercrest (9,500 – 12,000 pounds of thrust)

The Silvercrest engine developed by Safran incorporates leading-edge technology to offer unrivaled performance, with very high targets in terms of fuel consumption, reliability and respect for the environment.

Silvercrest was chosen by Dassault Aviation for the company's new Falcon 5X twin-engine business jet, featuring a large cabin and long range (5,200 nautical miles, or more than 9,600 km). Safran supplies the complete integrated powerplant system for this new jet, including the Silvercrest engine (Snecma), nacelle and thrust reversers (Aircelle), and the engine suspension system. Silvercrest was also chosen by Cessna (a Textron Aviation subsidiary) for its new Citation Longitude business jet. In November 2015, Cessna announced changes to its range of business jets, including a redefinition of the Longitude and a different choice of engine appropriate for a smaller design.

At the end of 2015, the Silvercrest program was reviewed in line with the development of Dassault Aviation's Falcon 5X aircraft: complementary developments on the engine and a revised schedule have been agreed with the aircraft manufacturer. The revised schedule provides for engine certification in early 2018, 18 months later than the previous schedule given in May 2015.

On the basis of revised program assumptions, notably new development expenses, lower volumes and a later entry into service, Safran has decided to write down all program-related intangible assets and other program-specific assets resulting in a one-off, non-cash charge of €654 million.

Furthermore, potential contractual penalties during the development phase are capped and entirely covered by provisions.

##### SaM146 (13,500 – 17,800 pounds of thrust)

The SaM146 engine, developed in partnership with Russian engine manufacturer NPO Saturn and with the participation of Italian engine manufacturer Avio Aero, powers Sukhoi's Superjet 100.

A total of 55 SaM146 engines were delivered in 2015 (52 in 2014). PowerJet is a joint venture set up by Snecma and NPO Saturn

to manage the engine program in terms of development, production, marketing and sales, and to provide customer support, maintenance, repair and overhaul services.

PowerJet has also been awarded service contracts for 43 aircraft operated by airline companies Aeroflot and Interjet.

##### Passport (13,000 – 18,000 pounds of thrust)

Through Techspace Aero, Safran has a 7% share in Passport, the new GE engine program designed for the future Bombardier Global 7000 business jet.

Tests continued in 2015 and two Passport engines were assembled onto a Global 7000 during the year. The engine should be certified in 2016 and is expected to come into operation in 2018.

#### Mid-thrust engines for civil aircraft (short- to medium-haul aircraft)

##### CFM56 – LEAP

The LEAP engine reported further commercial success in the year, with new orders and purchase commitments for 1,399 engines in 2015. The backlog for LEAP topped 10,000 for the A320neo, Boeing 737 MAX and C919 programs in January 2016.

On the A320neo, the LEAP-1A model competes with Pratt & Whitney's PurePower PW1100G engine. At December 31, 2015, LEAP-1A had a market share of 53%<sup>(1)</sup> in aircraft for which engines had already been chosen. The LEAP-1B model has been chosen as the sole engine for the Boeing 737 MAX. The LEAP-1C model is the sole Western source for the propulsion system (engine plus nacelle) on COMAC's C919 aircraft.

A record 1,612 CFM56 engines were delivered by Safran during the year, compared to 1,560 engines in 2014. More than 29,000 CFM56 engines have been delivered since the launch of the program. The in-service fleet of CFM56 engines passed the 780 million flying hours mark in 2015 and the engines are used by 559 customers and operators.

Taking into account the 736 orders for CFM56 engines and 1,399 orders for LEAP engines taken during the year, the overall backlog (CFM56 + LEAP) represents 13,252 engines at December 31, 2015, or more than eight years of production at current rates. This success confirms CFM as leader in the market for 100+ seater aircraft.

Throughout the year, the flight test program for the LEAP-1A engine on the A320neo continued under good conditions. Since the LEAP-1A engine obtained dual certification by the European Aviation Safety Agency (EASA) and the Federal Aviation Administration (FAA) in 2015, it will come into operation on commercial aircraft in 2016.

2015 also saw the roll-out of the first Boeing 737 MAX and C919 aircraft. The first flight of the Boeing 737 MAX powered by LEAP-1B engines took place on January 29, 2016 at the airport of Renton (Washington State, US). The LEAP-1B is expected to come into commercial operation in 2017 and the LEAP-1C in 2018 in line with the aircraft manufacturers' schedules.

(1) Source: Safran.

Safran's ceramic matrix composite (CMC) exhaust cone made its first commercial flight in 2015 on a CFM56 engine powering an Air France A320. This was the first time in the world that a CMC part flew on a jetliner in commercial service. Thanks to their exceptional properties, ceramic matrix composites will help meet the most ambitious goals of aircraft. For a given function, they provide significant weight savings over metal alloys.

#### High-thrust engines for civil aircraft (long-haul aircraft)

Deliveries of high-thrust engines were up slightly in 2015, with 695 modules delivered compared to 690 in 2014.

##### GE90

Safran has an interest of 23.7% in this GE program which currently enjoys a sole-source position on the Boeing 777, for which it delivered 221 modules in 2015 versus 234 modules in 2014.

##### GE9X

Since 2014 Safran has participated in the development of GE's high-thrust GE9X engine after it was chosen by Boeing as the exclusive powerplant on its new 777X long-range aircraft. Safran has a stake of just over 11% in the program through Snecma and Techspace Aero. Snecma will make the composite fan blades via CFAN, its joint venture with GE in San Marcos (Texas, US), as well as design and produce the forward fan casing and rear turbine frame using 3D woven composite parts thanks to its partnership with Albany International. Techspace Aero will manufacture the low-pressure compressor and the fan disk.

##### GP7200

Safran delivered 91 high- and low-pressure compressor modules in 2015 compared to 90 in 2014, and has a 17.5% interest in this engine program which powers the A380. In 2015, 78% of the A380 aircraft delivered in the year were fitted with the GP7200 engine.

##### GENx

Safran is a partner on the two GENx engine programs, with a 7.3% interest in the GENx-2B version powering the long-haul Boeing 787 Dreamliner and a 7.7% interest in the GENx-1B version powering the long-haul Boeing 747-8. To meet the needs of the US aircraft manufacturer, Safran delivered 268 compressor modules in 2015, 7 modules more than in 2014.

#### CF6 family – LM6000

A total of 115 modules for the CF6 engines powering certain A330 and Boeing 767 aircraft and LM6000 gas turbines were delivered in 2015. Safran's interest in this program ranges from 10% to 19.4% for the CF6 engine and from 8.6% to 12% for the LM6000 gas turbine.

#### Service agreements

Safran has signed service agreements with GE for its high-thrust GE90, GP7200 and GE9X engines. Service agreements for the GE90 engines were also signed in the year by GE with several airline companies.

#### Industrial operations

Continuing its efforts to develop the engines of the future, in September 2015 Safran kicked off construction of a second open-air engine test stand at its Istres facility (Bouches-du-Rhône, France). The new engine test stand, weighing over 100 tons, is based on a pylon stretching 18 meters high and has a data acquisition system with 1,200 measurement lines, including fuel consumption, dynamic and mechanical performance, and acoustic signature. The installation will be up and running in 2016 to test the LEAP engine and the Open Rotor<sup>(1)</sup> demonstrator. It could also be used for other engine configurations that Safran will be testing in the coming years.

#### Military aviation

##### M88

A total of 22 M88 engines were delivered for the Rafale in 2015, including those fitted on the first three Rafale fighter jets delivered to the Egyptian air force. The in-service fleet topped the 416,000 flying hours mark worldwide during the year.

In 2015, Safran took 48 orders for the Rafale for the export market (24 for Egypt and 24 for Qatar). At the beginning of 2016, during the French President's visit to India, the proposed purchase of Rafale aircraft by the Indian government took a further step forward, with certain marketing aspects still to be negotiated with manufacturers. Discussions are continuing with the United Arab Emirates (UAE) for the purchase of 60 Rafale aircraft and other prospective customers are being canvassed.

##### TP400

The TP400 is the Western world's largest ever turboprop engine. Having been awarded both civil and military certification, the TP400 meets the highest safety standards of global civil aviation and provides potential export opportunities for the A400M.

A total of 59 engines were delivered in 2015 (53 in 2014) and the backlog at the end of the year stood at 571 engines for the A400M aircraft ordered by Airbus Defence & Space.

##### ADOUR

A total of 20 Adour engines were delivered in 2015 for the BAe Hawk trainer aircraft. The backlog at the end of 2015 stood at 39 engines.

#### Spare part and service activities

During the year Snecma inaugurated a new site in Bordeaux (Gironde, France) that will house its Military Engine division. Located near France's Air Force Command (CFA), the SIMMAD military aircraft maintenance organization and the Bordeaux industrial aviation workshop (AIA), this new facility will optimize support services for military aircraft engines used by the French armed forces.

(1) Engine with two counter-rotating, unducted fans developed within the scope of the European Clean Sky research program.

### Ballistics and space

Airbus Group and Safran joined forces during the year in a bid to boost the competitiveness of the European space launcher business by creating Airbus Safran Launchers (ASL). This new 50/50 joint venture opens a new chapter in the history of the space launcher industry, combining Airbus Defence and Space's launcher expertise with Safran's expertise in liquid and solid rocket propulsion.

The initial phase of merging the Airbus Group and Safran space launcher businesses began in January 2015 with the combination of their activities under civil launcher programs and ASL is now prime contractor for the European Ariane 5 launcher. Six launches were successfully carried out in 2015. The excellent reliability of the Ariane 5 heavy launcher was confirmed in the year with its 69<sup>th</sup> consecutive successful launch.

To guarantee Europe autonomous access to space in fully competitive conditions, ASL and the European Space Agency (ESA) signed an agreement in August 2015 to develop the Ariane 6 new-generation launcher, with a first launch slated for 2020. At the time of the agreement, the ESA also confirmed that ASL and European Launch Vehicle (ELV)<sup>(1)</sup> will work together on the P120C solid propellant boosters (for both the Ariane 6 and Vega-C launchers) and that ELV will continue to manage the evolution of the Vega to the Vega-C, whose first launch is expected in 2018.

As part of its new launcher policy, ESA will oversee procurement and the architecture of the overall launch systems, while industry is developing the launchers, with ASL as prime contractor and design authority for the Ariane 6, and ELV for Vega-C. CNES (French national center for space studies) is prime contractor for the Ariane 6 ground segment.

Ultimately, ASL will include all civil and military launch activities of both groups.

Safran is also an important contributor to Vega, the European launch vehicle. Three Vega launchers successfully achieved lift-off from the space center in French Guiana in 2015.

Regarding the naval component of France's nuclear deterrent force, a bench test for the thruster representing the third stage of the M51.3 strategic missile was completed successfully during the year. This test was chiefly designed to validate the technological developments used for the thruster.

In 2015, Space Systems/Loral (SS/L) selected Safran's PPS\*1350 plasma thrusters for its telecom platforms, marking Safran's first export contract for Safran's plasma thrusters. The long-term contract comprises a firm order from SS/L for several thruster flight sets between 2016 and 2018, as well as options on additional

deliveries. It covers different models of the PPS\*1350, including the PPS\*1350-E, which has increased discharge power up to 2.5 kW, enabling it to handle partial orbital raising, along with stationkeeping. The PPS\* is the only thruster of its type now on the global market.

Safran's PPS\*5000 thruster was selected by Airbus Defence and Space in 2014 as leading supplier to fit its Eurostar 3000 Electric Orbit Raising (EOR) satellite platform, for missions calling on electric propulsion for orbit raising. The contract to supply the first PPS\* 5000 flight set was signed in 2015. Delivery of the first flight set to Airbus Defence and Space is scheduled for 2016.

### Helicopter turbines and auxiliary power units

A total of 625 helicopter engines were delivered in 2015.

#### Light helicopters

This segment continued to grow throughout the year:

- ◆ Arriel 2N, the latest edition to the Arriel 2+ engine family, was certified by EASA in January 2015. Selected by Airbus Helicopters, the Arriel 2N will power the new AS565 military helicopter, the AS565 MBe Panther;
- ◆ Airbus Helicopters' H145M fitted with Arriel 2E engines was certified by EASA in May 2015. The first deliveries of this military version of the H145 (formerly EC145 T2) were made at the end of 2015;
- ◆ the Arrius 2R engine was certified by EASA in December. Selected to power the new Bell 505 Jet Ranger X helicopter, Arrius 2R is the only turbine engine equipped with dual-channel Full Authority Digital Entry Control (FADEC) system in the 500 shp engine class. Production of the new helicopter will begin in 2016 at Bell Helicopter's new plant in Lafayette (Louisiana, US).

At the China Helicopter Exhibition (Heli-Expo) held in Tianjin in mid-September, 100 light single-engine helicopters (Airbus Helicopters H125 and H130) fitted with Arriel turboshaft engines were ordered by a Chinese aircraft leasing company. Targeting general aviation operators, these products will enable Safran to play a part in the development of the helicopter market in China.

During the year, the Arriel 2C2 and 2L2 engines were also selected to respectively power the future South Korean Light Civil Helicopter (LCH) and Light Armed Helicopter (LAH). Jointly developed and marketed by Airbus Helicopter and Korean Aerospace Industries (KAI), these new helicopters should be in operation by 2020 (LCH) and by 2022 (LAH).

(1) European Launch Vehicle (ELV) is a joint venture between the Italian Space Agency and Avio S.p.A.

### Medium-weight helicopters

Throughout the year, the Arrano engine underwent numerous development and certification tests enabling its performance levels to be validated. This engine incorporates the results of several research projects, including products and processes validated by the Tech800 demonstrator. Arrano was selected in 2015 as the sole engine for Airbus Helicopter's new H160 model. The engine completed its first flight on the H160 in January 2016 and is expected to enter into service in 2018.

In the first half of the year, the Ardiden 1H1/Shakti engine was chosen by the Indian helicopter manufacturer Hindustan Aeronautics Limited (HAL) to power its future twin-engine light combat helicopters (LCH). This win marks renewed success for Safran in the context of its 50-year partnership with HAL.

In September, the Ardiden 3C/WZ16 engine completed its first flight on an AC352/Z-15 (Chinese name for the helicopter developed in partnership with Airbus Helicopters on the basis of the EC175) at Marignane in France. This was the result of close cooperation with Aviation Industry Corporation of China (AVIC) and will allow Safran to benefit from opportunities offered by the growing helicopter market in China over the next decade.

### Heavy-lift helicopters

Throughout the year, Safran continued tests on the Tech 3000 demonstrator, which will be at the heart of a new family of engines in the 3000 shp range designed to meet the engine needs of new-generation helicopters weighing 10 tons or more. Tech 3000 will enable Safran to validate the design and core performance of such new high-power engines, able to deliver a 25% improvement in fuel efficiency compared to the state-of-the-art engines available today on the market in this segment.

### Helicopter turbine engine services

Although engine repair services and flying hours – particularly by helicopter operators in the oil industry and in emerging countries – are stagnating, maintenance services provided for Safran's turbine helicopter engines advanced in 2015 and new support-by-the-hour (SBH) contracts were signed. At the end of the year, 4,350 engines were covered by service agreements for 410 civil and military customers.

At the 2015 Paris Air Show in Le Bourget, Safran signed a memorandum of understanding with HAL (Hindustan Aeronautics Ltd.) establishing a joint venture to support customers in India and around the world. This joint venture will provide maintenance, repair and overhaul (MRO) services for Safran engines or engines made locally under license, and used in India, particularly by the country's armed forces. The venture will initially provide maintenance support for the TM333 and Ardiden 1H1/Shakti engines.

A new warranty program was launched in 2015. The Turbomeca Care Program® offers users of Safran helicopter engines a wide range of solutions such as warranty extensions for new engines and pre-buy inspections in the case of a resale. The new service, the first to be launched by an engine manufacturer on the helicopter market, will help to enhance the residual value of helicopters fitted with Safran engines.

At the 2015 Paris Air Show in Le Bourget, Safran demonstrated its commitment to remaining a first-choice engine provider of the helicopter industry as it celebrated its engine range passing the 100 million flying hours mark.

### Auxiliary power units (APUs)

During the year Safran continued to develop new auxiliary power units (APUs) for business jets (the APS500[D] and APS2[800] will power Dassault Aviation's future Falcon 5X and Bombardier's Global 7000 business jets, respectively).

A new APU production facility for commercial aircraft was inaugurated in September in San Diego (California, US) to partner Safran's growth on the corporate aviation market.

In March, Safran and Bell Air Aviation A/S signed a five-year support agreement for the e-APU60 fitted on the Danish operator's AW189 helicopters.

As part of the Rafale program, Safran also signed export agreements to supply the APU and starter, and renewed the Global Support Package (MCO) with the SIMMAD military aircraft maintenance organization for a further five years.

### 2.1.3.2 Aircraft Equipment

#### ADJUSTED KEY FIGURES

(in € millions)	2014	2015	Year-on-year change
Backlog	18,435	19,674	7%
Orders recorded during the year	5,854	4,359	-26%
Revenue	4,446	4,943	11%
Recurring operating income	426	466	9%
Profit from operations	368	423	15%
Free cash flow	149	153	3%
Acquisitions of property, plant and equipment	170	181	6%
Research and development			
Self-funded R&D	(308)	(229)	-26%
% of revenue	6.9%	4.6%	-2.3 pts
Research tax credit	46	46	-
Self-funded R&D after research tax credit	(262)	(183)	-30%
Capitalized expenditure	122	98	-20%
Amortization and impairment of R&D expenditure	(37)	(40)	8%
Impact on profit from operations	(177)	(125)	-29%
% of revenue	4.0%	2.5%	-1.5 pts
Headcount	25,447	25,569	-

Aircraft Equipment activities can be split into three key sectors that contribute to business line revenue as follows:

Sector	% of business line revenue	
	2014	2015
Landing and aircraft systems	45%	48%
Engine systems and equipment	26%	23%
Electrical systems and engineering	29%	29%

#### REVIEW OF AIRCRAFT EQUIPMENT OPERATIONS IN 2015

The Aircraft Equipment segment reported revenue of €4,943 million, up 11.2%, or slightly down (-0.9%) on an organic basis, compared to €4,446 million in 2014. Service revenue grew by 15.6%, including the effect of the stronger USD, and accounts for 29.9% of sales.

Deliveries of wiring shipsets and landing gear to Airbus for the A350 program grew in line with the program production rate.

Those for the 787 program, which had driven strong OE growth throughout 2014, showed modest increases this year. Lower deliveries of A330 thrust reversers are the reflection of an announced assembly rate drop of that aircraft. 104 nacelles for A380 were delivered in 2015, compared to 112 in 2014.

Growth in services was driven primarily by carbon brakes and landing gear aftermarket. Safran is the world leader in carbon brakes for commercial aircraft over 100 seats with over 7,500 aircraft equipped worldwide.

Recurring operating income was €466 million (9.4% of revenue), an increase of 9.4% compared to €426 million (9.6% of revenue) in 2014 including a 1.2% organic improvement. The good performance in carbon brakes and landing gear aftermarket activities, as a result of a larger installed base and continued air traffic growth, continued to contribute to profit growth. In nacelles, a favorable pricing effect was offset by lighter overall OE volumes (increasing A320 and regional business jet nacelle deliveries did not entirely compensate for lower A380 and A330 nacelle deliveries) and a slight decline in support activities. In electrical systems, pricing pressure is temporarily weighing on margins. Strong cost reduction and productivity actions are now in place to mitigate the impacts and drive operating margin improvements. Lastly, the increase in expenses rebilled by the Holding company to the various subsidiaries has had a negative impact on operating margins.

## COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

### Landing and aircraft systems

#### Landing gear

A total of 1,370 landing gear units were delivered by Safran in 2015, on a par with the units delivered in 2014.

To meet the increase in production rates of the Boeing 787 aircraft, 127 units were delivered by Safran in the year (118 in 2014). Deliveries consisted of all landing gear versions, including the new Boeing 787-9 jetliner. A total of 32 units were also delivered during the year for the new A350 aircraft (16 in 2014).

During the year Safran was selected to become the main service provider for landing gear maintenance on the entire Airbus A320 fleet operated by IAG (International Airlines Group). This new contract cements Safran's position in landing gear maintenance and repair services.

#### Wheels and brakes

At December 31, 2015, more than 7,500 aircraft were equipped with carbon brakes, giving Safran a share of over 50% of the market<sup>(1)</sup> for 100+ seater civilian aircraft equipped with carbon brakes.

Safran's market share on Airbus A320ceo aircraft fitted with carbon brakes represented 72%<sup>(1)</sup> at December 31, 2015. Safran was also selected by Airbus to supply carbon brakes meeting the requirements of its new A320neo single-aisle aircraft. Already selected by eight airline companies for a cumulative total of almost 600 aircraft at December 31, 2015, Safran's carbon brakes for the A320neo offer better cooling and lower maintenance costs compared to those for the A320ceo.

Safran's market share on Boeing 737NG aircraft fitted with carbon brakes represents 65%<sup>(1)</sup>. A long-standing partner of Boeing, Safran was selected by the US aircraft manufacturer in 2014 to supply wheels and carbon brakes for all models of the Boeing 737 MAX (new engine option). At December 31, 2015, four airline companies had chosen Safran carbon brakes for the Boeing 737 MAX, representing a cumulative total of 50 aircraft.

Safran's electric brakes for the Boeing 787 Dreamliner continue to capture market share and at end-2015 had been chosen for 305 aircraft operated by 32 airline companies. Electric brakes are currently fitted on 187 in-service aircraft.

(1) Source: Safran.

### EGTS™

To meet the demand for more integrated equipment offerings from both aircraft manufacturers and airlines, Safran and Honeywell set up a joint venture, EGTS International, in 2012. This venture allows them to pool their complementary expertise and work together to develop and market a new EGTS, i.e., taxiing without the use of engine power.

Persistently low oil prices are contributing to a challenging environment. EGTS International continues to work with prospective partners and customers to assess alternative means of bringing EGTS to the market.

The EGTS joint venture has rolled out a campaign among its major future customers to confirm commercial assumptions.

### Landing and braking control systems

In all, 2,850 landing and braking control systems and associated systems equipment were delivered by Safran to its clients' assembly lines in 2015.

Lifting, steering and braking systems continued to be successfully delivered for the A350 in the context of a major ramp-up.

In the field of innovation, Safran continues to offer its customers services that draw on the analysis of data from equipment and control systems so that it can offer preventive maintenance and therefore increase operational fleet availability, particularly for the Airbus.

### Engine systems and equipment

#### Nacelles and thrust reversers

During the year Safran was selected to supply PERT® (Planar Exit Rear Target) thrust reversers to equip the two turbofan engines on the Citation Longitude, Cessna's future super-midsize business jet. The patented PERT thrust reverser features two blocker doors that serve as the engine's exhaust exit during flight, and are deployed on landing for the reverse thrust function. This concept combines thrust reverser effectiveness with an optimized weight.

A number of decisive advances were made in 2015:

- ◆ first flight for the A320neo fitted with the LEAP-1A engine nacelle;
- ◆ roll-out of China-based COMAC's first C919 aircraft featuring the LEAP-1C integrated propulsion system package (CFM engine/ Nexcelle nacelle);
- ◆ first test flight of a A380 nacelle with electroluminescent marking developed by Safran.

During the year Safran also successfully completed the Critical Design Review of the nacelle for the Rolls-Royce Trent 7000 engine on the A330neo (Airbus A330 new engine option).

### Services

In nacelle-associated services, Safran signed a service agreement with Qatar Airways to provide maintenance support for nacelles fitted onto its A340 fleet.

### Mechanical power transmission systems

In 2015, Safran and Rolls-Royce created Aero Gearbox International, a 50/50 joint venture specializing in the design, development and production of accessory drive train transmission systems and in aftermarket services. The new venture will capitalize on its parent companies' combined experience and expertise, encompassing the entire range of Rolls-Royce's future civil aircraft engines. Aero Gearbox International is already working on the Trent 7000 engine powering the Airbus A330neo and the BR 700 NG engine for Bombardier's new business jet programs.

### Industrial operations

Within the scope of their Aero Gearbox International joint venture, Safran and Rolls-Royce began the construction of a new mechanical power transmission plant in south-east Poland. The new plant will ultimately house approximately 110 workers and is expected to be operational at the beginning of 2017.

To meet the needs of the LEAP and Silvercrest programs, Safran announced that it was to start building a new production plant in 2016 located in south-east Poland. The plant will have a surface area of 8,000 sq.m. and will employ approximately 100 people to produce low-pressure turbine blades. Safran will extend its existing capacity in Poland to produce low-pressure compressors.

### Electrical systems and engineering

#### Power generation and distribution systems

Safran can call on its engineering and research teams to develop cutting-edge electrical solutions for all the energy needs of an aircraft. Driven by its ambition to continue developing in this critical Aerospace segment, in 2014 Safran finalized its acquisition of Eaton Aerospace's power distribution businesses, putting it in an ideal position to successfully pursue its development in the "more electric" aircraft field.

In 2015, Safran was selected by Textron Aviation to design, develop, produce and provide support for the main power unit generation system of the future Cessna Citation Longitude business jet.

It was also pre-selected by Honeywell to develop and supply the ram air turbine (RAT) for the Boeing 777X program.

At the 2015 Paris Air Show in Le Bourget, Safran entered into a long-term agreement with Pilatus Aircraft Ltd on the provision of power generation systems for the Pilatus Porter aircraft family. Safran will also provide in-service and aftermarket support for the lifetime of these aircraft.

### Electrical wiring interconnection systems (EWIS)

Safran was chosen by Airbus to design and produce the wiring harness for the fuselage (excluding the nose section) of the Beluga XL, a modified version of the A330 cargo plane, whose maiden flight is planned for 2018. Design work has already begun for Safran Engineering Services teams working on-site at its client's premises in Toulouse. Production of the wiring harnesses will be shared between Safran's plants in France, Morocco and Mexico.

In February 2015, the first harness to be fitted to the wing-tips of the C919 was delivered by the joint venture Saifei (51%-owned by COMAC and 49%-owned by Safran). Based in Shanghai, Saifei specializes in design, development, production and customer support for EWIS systems for the Aerospace market in the Asia-Pacific region.

As part of the restructuring of its North American operations, in early 2015 Safran announced that it intended to transfer its EWIS activities currently based at Salisbury (Maryland, US) to its plant in Denton, Texas. The restructuring also includes the opening of a new plant in Chihuahua in Mexico to accommodate certain activities transferred from Denton. This strategic decision was taken in response to an increasingly competitive market resulting in strong downward pressure on prices.

Over the next four years, Matis Aerospace (a 50/50 joint venture between Safran and Boeing) will start to produce engine harnesses for CFM's LEAP program and wiring harnesses for the Boeing 737, 777 and 787 families and for Dassault's Falcon 5X business jet. In 2016, the Casablanca plant will be extended by 4,380 sq.m. in order to increase production capacity.

In the middle of May during Sikorsky's annual supplier summit in West Palm Beach (Florida, US), Safran was awarded Gold Supplier status by the helicopter manufacturer for the fifth consecutive year. Gold Supplier recognizes best-in-class performance in quality, delivery and customer satisfaction.

Safran has continued to step up its deliveries for the various aircraft in the A350 range. The engineering studies are nearing completion with the end of the development phase and the beginning of production.

### Ventilation systems and electrical engines

Safran customer satisfaction in terms of both service and product quality was recognized and rewarded in 2015. The Company was awarded the prize for the most progress made in Airbus Helicopter's "SQIP" supplier category. Safran also ranked within the "Excellent" category in Airbus' survey of around 118 of its airline customers for the quality of its aftermarket services.

Safran was selected to produce FADEC (Full Authority Digital Engine Control) cooling systems for LEAP-1B engines. This new contract enables Safran to benefit from an exclusive partnership on the LEAP engines developed by CFM International, set to power the future generation of single-aisle civil aircraft.

**Engineering services**

In 2015, Duncan Aviation and Safran strengthened their existing partnership to create a new STC, or Supplemental Type Certificate (a US aviation authority-approved major modification or repair to an existing certified aircraft) for FANS-1/A (Future Air Navigation System), an avionics system that provides direct data-link communication between the pilot and the air traffic controller. This solution will power Bombardier's Challenger 601-3A/3R business jet.

Research expenses are set to decrease for engineering companies with the end of the development of major programs, such as Boeing 787-10 and Airbus A350. Since late 2014, this decrease has already been significant and is expected to amplify in the next few years, forcing Safran to find new areas for growth and to adapt the scope of its activities.

**2.1.3.3 Defense**

## ADJUSTED KEY FIGURES

(in € millions)	2014	2015	Year-on-year change
Backlog	2,209	2,389	8%
Orders recorded during the year	1,337	1,446	8%
Revenue	1,221	1,266	4%
Recurring operating income	71	64	-10%
Profit from operations	74	54	-27%
Free cash flow	17	-	N/A
Acquisitions of property, plant and equipment	46	71	54%
Research and development			
Self-funded R&D	(133)	(119)	-11%
% of revenue	10.9%	9.4%	-1.5 pts
Research tax credit	35	37	6%
Self-funded R&D after research tax credit	(98)	(82)	-16%
Capitalized expenditure	26	24	-8%
Amortization and impairment of R&D expenditure	(11)	(21)	90%
Impact on profit from operations	(83)	(79)	-5%
% of revenue	6.8%	6.2%	-0.2 pts
Headcount	7,411	7,389	-

Defense activities can be split into three key sectors that contribute to business line revenue as follows:

Sector	% of business line revenue	
	2014	2015
Optronics	41%	41%
Avionics	49%	49%
Electronics and critical software	10%	10%



## REVIEW OF DEFENSE OPERATIONS IN 2015

Full-year 2015 revenue of €1,266 million was up 3.7%, or down 1.6% on an organic basis, compared to revenue of €1,221 million in 2014. Revenue was flattish in all activities, as expected. In optronics, the end of deliveries of FELIN equipment to the French Army was offset by the strong increase in sales of sighting systems for combat vehicles and naval applications. The slight decline in Avionics sales was driven by a drop in volumes of inertial navigation and flight control systems, partially compensated by the growing contribution of support activities and aircraft information systems revenue. Order intake was strong in 2015 and indicative of a positive future revenue trend.

Full-year 2015 recurring operating income at €64 million (5.1% of revenue) was down 9.9% compared to €71 million (5.8% of revenue) in 2014. The decline is principally due to the run-off of the deliveries of FELIN equipment, not yet fully offset by new contracts, and to an unfavorable mix of products. Additionally, investments to improve industrial performance and sustained R&D effort to maintain technological differentiation put temporary pressure on margins and will drive future profitability improvements.

## COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

## Optronics

## Modernizing infantry

Following the last FELIN equipment suite deliveries for soldier modernization programs to the French armed forces, in 2015 Safran developed several upgrades to the system in response to an order from the French Directorate General of Weapons Procurement (DGA), reducing the equipment's mass and taking account of on-the-ground feedback.

Safran also provides support for the systems delivered and used in active service.

FELIN continues to attract interest outside France, with its good performance in the French armed forces further cementing its reputation.

## Portable optronic equipment, sight equipment and drones

## Thermal goggles and imagers

A host of commercial success stories in portable optronics in 2015 confirms the front-ranking position of Safran technology, particularly with its JIM multifunction goggles. Over 600 goggles were delivered to France and the export market in 2015, including 480 for the French Army. Over 8,000 goggles are now in-service or on-order across the globe.

Throughout the year, Safran supplied portable optronics equipment such as goggles (JIM, Vector and Moskito), telemetric rangefinders and digital magnetic compasses, either directly or through its subsidiary Vectronix (in Switzerland and the US) to

various countries including the US and the UK. In 2015, Vectronix also launched its new higher-usability, lower-weight MOSKITO TI onto the market.

Safran also continued to invest in R&D to develop new portable optronics products allowing it to maintain its leadership over the long term.

## Onboard optronic equipment

**Sea:** During the year Safran delivered and installed EOMS-NG observation and fire direction systems for anti-aircraft defense frigates operated by the French Navy. In the periscope business, Safran successfully completed the Critical Design Review for optronic attack masts following its selection in 2014 to develop and supply this equipment for the French Navy's Barracuda submarines. The last two optronic surveillance masts for the same Barracuda submarines also successfully completed the acceptance tests. On the export market, the Group scored a number of commercial wins in Canada, the Middle East and Asia with its Vigy Observer panoramic stabilized observation system, and with the Vampyr new-generation optronic surveillance system.

**Air:** Through Optrolead, its joint venture with Thales, Safran continues to take an active role in the design contract for fourth-generation airborne gyro-stabilized pods incorporating several types of sensors, which will offer industry-beating performances particularly adapted to very long-range MALE (medium-altitude long-endurance) drones. The DGA awarded Safran the last tranche of this design contract in 2015.

As part of the Tiger helicopter program, the DGA awarded the Company the design contract for the first stages in the development of the STRIX new-generation turret-mounted observation and sighting systems.

**Land:** The new PASEO multifunction sight for armored vehicles was unveiled at the Eurosatory tradeshow in 2014 and has attracted keen interest both in France and from international customers. The first major commercial contract wins for PASEO were recorded in 2015:

- ◆ in France, as part of the infantry modernization program (Scorpion), the Ministry of Defense awarded Nexter, Thales and Renault Trucks Defense the contract to develop two vehicles: the Griffon multi-role armored vehicle and the Jaguar reconnaissance and combat armored vehicle. Through its joint venture Optrolead (Thales Optronique SA/Sagem), Safran took an order to adapt 500 PASEO optronic sights for these two vehicles;
- ◆ in the export market, the Group took an order from CMI Defence for around 1,500 PASEO sights to equip turrets on tanks operated by armed forces in the Middle East.

Renault Trucks Defense selected Safran to supply triple-sensor imagers that will be fitted to the remotely-operated turrets of the Griffon, representing 855 units in total under the Scorpion program.

## Drones

In 2015, the Patroller drone operated successfully in homeland security tests in Portugal within the scope of AIRBEAM (AIRBorne information for Emergency situation Awareness and Monitoring), a European integrated project.

Harnessing its experience in drone flight control, during the year Safran took part in the Civil Drone Committee under the authority of the DGAC<sup>(1)</sup> with other major aviation players, contractors, drone operators and some 20 SMEs.

In early 2016, Safran was awarded the contract for the French Army's tactical drone system with Patroller. The contract provides for the delivery of 14 drones starting in 2018: two systems each with five drones, and four drones for training purposes.

Safran worked on the DGA's invitation to bid for the new French tactical drone throughout the year in an effort to meet the urgent needs of the armed forces. The Patroller system crystallizes the industrial drone expertise developed by Safran over the past 25 years and draws on a network of French SMEs. The contract will enable Safran to boost employment and the skills available in its plants, where the drone's final integration and the ground station will be completed. The Patroller system has aroused considerable international interest thanks chiefly to its versatility and dual positioning in both civil security and military air surveillance.

## High-performance optics

Safran subsidiary Reosc was selected by the European Southern Observatory (ESO), the foremost intergovernmental astronomy organization in Europe, to manufacture the fourth mirror (M4) for the 39-meter diameter European Extremely Large Telescope (E-ELT). Installed in Chile and expected to be operational as from 2024, the E-ELT will be the biggest telescope ever made.

## Avionics

### Navigation systems and sensors

Investments made by Safran over the past few years in Coriolis, a world-class industrial facility based in Montluçon (France), has enabled it to meet the high-precision demands of its French customers in the following segments:

- ◆ aerospace (Rafale, A400M and NH90 for Dassault Aviation, Airbus Defence and Space and Airbus Helicopters, respectively);
- ◆ sea (deterrent and attack submarines and surface ships for the French Navy and DCNS);
- ◆ land (precision orientation and location for Nexter or TDA Armements);
- ◆ missiles and space (strategic and tactical equipment and engines for Airbus Defence and Space, Thales Alenia Space and MBDA).

Safran also met the needs of its export customers throughout the year.

Thousands of cutting-edge inertial systems and sensors were produced in Coriolis in 2015, including gyrolasers and hemispherical resonator gyros (HRG), vibrating Quapason™ gyroscopes and vibrating accelerometers. These technologies are incorporated into Safran's SIGMA, BlueNaute and EPSILON inertial systems, which are among the market leaders across the globe.

From a commercial standpoint, the BlueNaute navigation system was selected on two occasions for different types of ship by the US Coast Guard, the leading reference in navigation in the US.

Following the Rafale's advances in the export market (Egypt and Qatar), Safran received orders to deliver the equipment suite including the two inertial navigation systems, the load system interface unit (BISE), and the flight control units for each fighter aircraft.

### Seekers and guidance systems

Sales of the Rafale in Egypt and Qatar were accompanied by major contracts for the AASM (Modular Air-to-Ground Weapon), allowing production to continue after 2018. Safran also took an order for ADIR infrared seekers for Mica air-to-air missiles in Egypt.

### Flight control and actuation systems

In 2015, Airbus Helicopters chose Safran to supply the redundant backup computer for the electric flight control systems on its future X6 helicopter.

Throughout the year, Safran also continued to work on the flap controls for Dassault Aviation's Falcon 5X (computer and actuators), and on the Horizontal Stabilizer Trim Control System (HSTCS) for Embraer's KC-390 military transport aircraft, which completed its first flight in February 2015.

### Onboard information systems/Data management and services

The Aircraft Condition Monitoring System (ACMS) data recording device and its upgraded version offering Wireless Extension For ACMS (WEFA) on the ground was selected by several new airline companies in 2015, including Indigo, GoAir and Lufthansa (second order), as well as a number of Chinese airlines.

Some 20 new Flight Data Management (FDM) service agreements based on Cassiopée infrastructure were signed in 2015 with customers in Europe, Africa and the Middle East. Demand remains brisk for the Analysis Ground Station (AGS) solution, which stores, reads and analyzes flight data, particularly at the end of 2015 in Japan with ANA and in China with China Southern.

(1) Directorate General for Civil Aviation.

### Electronics and critical software

Fadec Alliance Inc., a joint venture set up by GE and Fadec International (itself a joint venture between Safran and BAe) supplies next-generation Full Authority Digital Engine Control (FADEC 4) devices to be fitted to the LEAP and Passport engines.

In 2015, FADEC 4 successfully completed the milestones for the three aircraft onto which it will be fitted (A320neo, Boeing 737 MAX and C919).

GE Aviation also chose Fadec Alliance to supply the FADEC for its GE9X engine powering the Boeing 777X. Several milestones were completed in 2015, including the launch and preliminary design review.

The 1,000<sup>th</sup> Electric Brake Actuation Controller (EBAC) for the Boeing 787 was produced in September.

Finally, the Group continued to develop the FADEC control software for Snecma's Silvercrest engine and for Turbomeca engines.

### 2.1.3.4 Security

#### ADJUSTED KEY FIGURES

(in € millions)	2014	2015	Year-on-year change
Backlog	1,578	1,902	21%
Orders recorded during the year	1,463	2,041	40%
Revenue	1,530	1,878	23%
Recurring operating income	134	151	13%
Profit from operations	109	133	22%
Free cash flow	97	45	-54%
Acquisitions of property, plant and equipment	59	52	-12%
Research & development			
Self-funded R&D	(129)	(133)	3%
% of revenue	8.4%	7.1%	-1.3 pts
Research tax credit	12	16	33%
Self-funded R&D after research tax credit	(117)	(117)	-
Capitalized expenditure	21	16	-24%
Amortization and impairment of R&D expenditure	(5)	(7)	40%
Impact on profit from operations	(101)	(108)	7%
% of revenue	6.6%	5.8%	-0.8 pts
Headcount	8,578	8,667	1%

Security activities can be split into two key sectors that contribute to business line revenue as follows:

Sector	% of business line revenue	
	2014	2015
Identity and Security	87%	85%
Detection	13%	15%

## REVIEW OF SECURITY OPERATIONS IN 2015

The Security activities reported 2015 revenue of €1,878 million, up 22.7% compared to prior-year revenue of €1,530 million. On an organic basis, revenue increased strongly by 11.0%.

All activities reported organic increases in revenue. Identification grew strongly, particularly Government Solutions activities in South America, Europe and the Middle East/Africa. Revenue also grew in the US (Federal and State enrollment contracts and driving licenses). Smart chip sales increased thanks to higher volumes in banking and favorable mix in telco. Detection revenues were higher than a year ago due to the strong increase in CTX tomographic equipment shipments and to the success of the new trace detection system Itemizer 4DX.

Recurring operating income was up 12.7% at €151 million (8.0% of revenue) compared to €134 million (8.8% of revenue) in 2014. The growth results from the increased contribution of government ID contracts, principally in Europe, the Americas and the Middle East/Africa. Investments in new commercial offers to address new markets, notably in digital identity, were partially offset by the positive impact of cost reduction actions, particularly in the smart chip business.

## COMMERCIAL AND INDUSTRIAL DEVELOPMENTS

### Identity and Security

#### Government solutions

Safran supplies identification solutions for governments under various agreements. These can include population data collection and listing, and production and personalization of identity documents. The widespread growth of digital technologies and the intensifying shift towards electronic management of government services creates new opportunities for growth. Safran has a comprehensive range of solutions and services for government markets, from ID document management to use.

The main contracts won by Safran in 2015 in the field of civil identification solutions were linked to planned elections in Africa. In Ivory Coast, Safran updated the electoral roll and supplied over 6.3 million voter cards thanks to the deployment of 20,000 secure biometric MorphoTablets. These tablets made it possible to record citizens' biometric data and verify their identity on election day. MorphoTablets, which were used to secure the voting process, also helped to ensure a smooth legislative election process in Egypt. Safran also signed a contract with Chad's Independent National Electoral Commission to supply a biometric enrollment system that also manages electoral rolls along with biometric voter cards for the 2016 presidential elections.

Safran is the only supplier of enrollment services for the TSA Pre✓® program run by the US Transportation Security Administration

(TSA). The TSA Pre✓® program is an expedited security screening program which allows passengers considered low-risk to receive expedited security screening when departing from over 150 US airports. In January 2016, over 2 million US passengers were enrolled in the program.

As part of the Aadhaar program in India, at end-December 2015 the Unique Identification Authority of India (UIDAI) had delivered almost 960 million unique identification numbers to Indian residents. Safran is the only supplier present at all levels of this project, which encompasses data base management, biometric sensor supply and population enrollment. Alternate usages have been confirmed for the technology following on from the project, in particular for the banking and telecom operator industries.

In digital identification solutions, Safran increased its business in the UK and the US. In the UK, it launched SecureIdentity, a new mobile application allowing citizens and residents to securely access online government services while guaranteeing data confidentiality. In the US, Safran launched its first project for mobile driving licenses on smartphones with employees of the Iowa Department of Transportation. Ultimately, Iowa residents will no longer need to present their physical driving licenses since the authorities will accept the digital license in routine checks. In 2015, Safran delivered over 70 million driver's licenses to 41 States in the US, covering around 85% of the US population.

#### Business solutions

Safran sold almost 160 million bank cards to financial institutions in 2015.

To consolidate its presence on the banking market, Safran put in place a number of strategic partnerships for the production and customization of bank cards mostly incorporating state-of-the-art EMV (Europay International, MasterCard, Visa) payment technology. Partnerships were established in Brazil with Elo, a Brazilian payment association founded by Banco do Brasil, Bradesco and Caixa; in the Philippines with Banner Plasticard; and in Panama with FESA Card Panama. Safran also teamed up with Visa for the JMV Wave dual interface chip card, available for Visa financial institution clients in Asia-Pacific, Eastern Europe, Africa and the Middle East. The JMV Wave card has been designed to meet all of Visa's current requirements for contactless payment technology, Visa payWave, in these regions. To reinforce online transaction security, Safran also acquired AirTag, a French start-up specialized in innovative mobile payment solutions for banks, payment networks and retail.

To meet the new digital needs of its customers, Safran is moving the full range of its technologies to the cloud. In the US, it launched Identix® Trusted Identity-as-a-Service (TlaaS), a new cloud-based multi-biometric platform designed to prevent fraud and identity theft and to protect consumers and businesses.

In telecommunications, Safran sold almost 600 million SIM cards and secure devices to operators in 2015.

Safran also supplied Airtel, India's leading mobile network operator, with an electronic Know-Your-Customer (eKYC) solution for its subscribers. In using Aadhaar, the Indian ID system, digitalizing ID data facilitates subscriber transactions thanks to electronic documents, prevents fraud and allows new customers faster access to the services subscribed. The growing market for the Internet of Things also represents an opportunity for strategic partnerships. Safran and Telit announced that they had developed a telecommunications solution within the scope of an ERA GLONASS (Emergency Road Assistance based on Global Navigation Satellite) project in Russia. This project has been launched to introduce a sensor-based in-vehicle emergency call system. In case of an accident, the system automatically dials an emergency number thanks to the integration of an embedded SIM card within the vehicle's telematics control system.

### Public security

In the field of public security, Safran helps police forces and government bodies detect and identify potential threats in public places in order to protect people and property.

Safran has invested heavily in R&D to be able to offer a range of innovative solutions that facilitate the work of private security organizations and improve identification on the ground. Morpho Video Investigator (MVI), which combines face recognition software with advanced video analytics, is designed to expedite suspect identification on a large number of videos. The new handheld device MorphoRapID™ 2 features fingerprint and face matching algorithms and enables people identification and ID document verification in real time. Safran also joined forces with Microsoft to develop Morpho Cloud, a multi-biometric IaaS (Identity-as-a-Service) solution. Morpho Cloud is backed in the US by the Microsoft Azure Government platform and complies with the stringent security standards for data storage issued by the FBI and the US government. Since it was launched, MorphoWave™, the first contactless biometric fingerprint scanner that can capture four fingerprints from a single wave of the hand, has picked up a series of prestigious awards. It was certified by the FBI for meeting the image quality specifications standards and for its compatibility with existing systems.

Regarding work with police forces, Safran landed several contracts on the strength of its biometric expertise. In Australia, the police in the State of Victoria chose Safran to supply biometric identification systems under a ten-year contract. Safran will provide full service as part of this contract, including the upgrade of existing equipment and new biometric enrollment stations.

Safran was chosen by the Zambian Police Service to roll out and provide maintenance support for a rapid DNA search solution to expedite suspect identification. The Zambian Police Service has also been provided with enrollment stations, mobile handsets and the MorphoBIS mobile fingerprinting device.

In the field of border controls, Safran won several major contracts in the Middle East, Asia-Pacific and Europe. The Interior Ministry of the United Arab Emirates chose Safran to set up an "e-Border" project which covers implementation of a fully integrated multi-biometric border control system in five airports. The Group also signed a new five-year contract with New Zealand Customs Services to roll out next-generation e-Gates in the country's main airports. These technologies will help simplify and expedite passenger control at borders while providing enhanced security. Safran made a decisive breakthrough in air passenger data collection and processing by winning a tender to supply an Advanced Passenger Information/Passenger Name Record (API-PNR) system to the Estonian government. Following the contract it won in France in 2014, this marks its first international project on this booming market.

### Detection

#### Computed tomography and X-ray diffraction detection systems

Following on from the five-year contract it announced in 2012, Safran received another order from the TSA to supply 40 CTX 9800 high-speed explosives detection systems (EDS) estimated to be worth over USD 40 million. These systems are to be deployed in 11 US airports. Safran also signed its third ILS (Integrated Logistics Services) contract with the TSA to provide system maintenance support. This three-year contract worth USD 221 million follows the success of the previous ILS contracts awarded in 2005.

Safran also signed major contracts in the UK, Turkey, India, Canada and Mexico for the supply of CTX explosives detection systems designed to improve security screening of luggage in hold and airport operational capacities. Some of these contracts also provide for the supply of maintenance services.

#### Spectrometry-based trace detection equipment

Safran supplies explosives trace detectors (ETD) for screening luggage, passengers and air freight. In response to the demands of new European legislation on screening passengers for explosives, Safran delivered over 900 Itemizer 4DX systems to major airports, including in Austria, Denmark, Germany, Italy, Portugal, Spain and the UK. These contracts place Safran as the leading supplier of explosives trace detector systems approved by the European Civil Aviation Conference (ECAC) for European airports.

## ◆ 2.2 Comments on the consolidated financial statements

### 2.2.1 Consolidated income statement

(in € millions)	2014	2015	Year-on-year change
<b>Revenue</b>	<b>15,044</b>	<b>18,100</b>	<b>+20.3%</b>
Other operating income and expenses	(13,589)	(15,272)	
Share in profit from joint ventures	45	45	
<b>Recurring operating income</b>	<b>1,500</b>	<b>2,873</b>	<b>+91.5%</b>
Other non-recurring operating income and expenses	(107)	(796)	
<b>Profit from operations</b>	<b>1,393</b>	<b>2,077</b>	<b>49.1%</b>
Financial income (loss)	(1,771)	(3,387)	
Income tax benefit	292	508	
Share in profit from associates	18	4	
Gain on disposal of Ingenico Group shares	-	421	
Profit (loss) from continuing operations	(68)	(377)	
Profit (loss) for the period attributable to non-controlling interests	(58)	(47)	
<b>PROFIT (LOSS) FOR THE PERIOD ATTRIBUTABLE TO OWNERS OF THE PARENT</b>	<b>(126)</b>	<b>(424)</b>	

#### Consolidated revenue

Consolidated revenue climbed 20.3% year-on-year to €18,100 million from €15,044 million in 2014.

The difference between adjusted consolidated revenue and consolidated revenue is due to the exclusion of foreign currency derivatives from the adjusted figures (see section 2.1.1). Neutralizing the impact of foreign currency hedging increased consolidated revenue by €686 million in 2015 while it decreased consolidated revenue by €311 million in 2014. This year-on-year change in the revenue impact of foreign currency hedging results from movements in average exchange rates with regard to the effective hedged rates for the period on the portion of foreign currency denominated flows hedged by the Group. For example, the hedged EUR/USD rate in 2015 was 1.25, against an annual average rate of 1.11, which explains why netting out the effect of foreign currency hedging gives a consolidated revenue figure that is higher than adjusted consolidated revenue.

Year-on-year changes in revenue excluding the impact of adjusting items are analyzed below (see section 2.1.2).

#### Recurring operating income

Recurring operating income was €2,873 million versus €1,500 million in 2014. The difference between recurring operating income and adjusted recurring operating income (see section 2.1.1), which came in at €2,432 million, reflects:

- ◆ amortization charged against intangible assets measured when allocating the purchase price for business combinations, representing €89 million for 2015 versus €147 million in 2014 for the May 2005 Sagem-Snecma business combination;
- ◆ amortization charged against intangible assets measured when allocating the purchase price for other business combinations, representing €153 million for 2015 versus €134 million for 2014;
- ◆ a positive €683 million impact resulting from foreign currency hedging transactions (negative €283 million impact in 2014).

Changes in adjusted recurring operating income are analyzed above (see section 2.1.2).

## Profit from operations

Profit from operations came in 49.1% higher at €2,077 million for the year, compared to €1,393 million in 2014. Profit from operations includes recurring operating income of €2,873 million in 2015 (€1,500 million in 2014) and a non-recurring loss of €796 million (€107 million non-recurring loss in 2014).

The difference between consolidated non-recurring loss and adjusted non-recurring loss, which stands at €698 million, reflects:

- ◆ impairment losses of €133 million taken against brands other than Safran which were valued individually at the time of the Sagem-Snecma merger in May 2005;
- ◆ a gain of €35 million on the revaluation of operations and investments transferred by the Group to Airbus Safran Launchers (ASL). These transfers were carried out as part of the first phase of the operation to create a 50/50 joint venture between Safran and Airbus Group.

Changes in profit from operations based on adjusted figures are analyzed above along with other non-recurring items (see section 2.1.2).

## Financial income (loss)

The Group reported a financial loss of €3,387 million in 2015 versus a financial loss of €1,771 million in 2014.

Two items account for the difference between consolidated and adjusted financial loss for 2015 (see section 2.1.2):

- ◆ changes in the fair value of currency instruments hedging future cash flows, which had a negative impact of €2,485 million in 2015 (negative €1,922 million impact in 2014). This amount is recognized in full in financial income (loss) in the consolidated financial statements. However, the impact of changes in the fair value of financial instruments hedging future cash flows is

neutralized in the adjusted financial statements. These changes relate to volatility in the EUR/USD exchange rate, since the currency hedging portfolio was priced based on a year-end exchange rate of 1.09 at December 31, 2015 and 1.21 at end-2014;

- ◆ the impact of foreign currency hedging on the portion of foreign exchange denominated flows hedged by the Group, representing a net loss of €678 million in 2015 and a net gain of €316 million in 2014. This impact is recognized in financial income (loss) in the consolidated financial statements and within profit from operations (mostly in revenue) in the adjusted income statement.

## Income tax benefit (expense)

Income tax benefit in 2015 came in at €508 million compared to €292 million in 2014.

Changes in the tax effect are primarily due to the impact of foreign currency hedging on the portion of foreign exchange denominated flows hedged by the Group, representing a net loss of €678 million in 2015 recorded in financial income (loss) (net income of €316 million in 2014), and changes in the fair value of currency instruments hedging future cash flows representing a negative impact of €2,485 million in 2015 recorded in financial income (loss) (€1,922 million in 2014).

## Consolidated profit (loss) attributable to owners of the parent

Consolidated loss attributable to owners of the parent amounted to €424 million in 2015, including the net-of-tax gain on the sale of Safran's remaining shares in Ingenico Group totaling €421 million, compared to €126 million in 2014.

## 2.2.2 Simplified consolidated balance sheet at December 31, 2015

The simplified consolidated balance sheet at December 31, 2015 presented below is taken directly from the consolidated financial statements included in section 3.1 of this document.

(in € millions)	2014 adjusted <sup>(1)</sup>	2015
<b>Assets</b>		
Goodwill	3,420	3,590
Property, plant and equipment and intangible assets	8,464	8,593
Investments in equity-accounted companies	771	765
Other non-current assets	674	1,403
Derivatives (positive fair value)	406	408
Inventories and work-in-progress	4,265	4,518
Trade and other receivables	5,827	6,515
Other current assets	673	870
Cash and cash equivalents	1,633	1,845
<b>TOTAL ASSETS</b>	<b>26,133</b>	<b>28,507</b>
<b>Equity and liabilities</b>		
Share capital	6,491	5,893
Provisions	3,329	3,456
Borrowings subject to specific conditions	713	708
Interest-bearing financial liabilities	3,165	2,628
Derivatives (negative fair value)	1,636	4,108
Other non-current liabilities	836	703
Trade and other payables	9,618	10,602
Other current liabilities	345	409
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>26,133</b>	<b>28,507</b>

(1) The data published for December 31, 2014 have been restated to reflect the impact of the change in accounting policy resulting from the retrospective application of IFRIC 21, Levies (see section 3.1, Note 3.b).



## 2.2.3 Change in net debt

The year-on-year change in the Group's net debt for 2014 and 2015 breaks down as follows:

(in € millions)	2014	2015
<b>Cash flow from operations</b>	<b>2,468</b>	<b>2,813</b>
Change in working capital	(111)	(60)
Acquisitions of property, plant and equipment	(674)	(758)
Acquisitions of intangible assets	(267)	(500)
Capitalization of R&D expenditure	(676)	(521)
<b>Free cash flow</b>	<b>740</b>	<b>974</b>
Dividends paid	(511)	(540)
Divestments/acquisitions of securities and other	(512)	321
<b>NET CHANGE IN CASH AND CASH EQUIVALENTS</b>	<b>(283)</b>	<b>755</b>
Net debt at January 1	(1,220)	(1,503)
<b>Net debt at December 31</b>	<b>(1,503)</b>	<b>(748)</b>

Cash flow from operations is calculated by taking profit or loss before tax and adjusting for income and expenses with no cash impact, for example net charges to depreciation, amortization and provisions and changes in the fair value of financial instruments hedging future cash flows<sup>(1)</sup>. The Group's ability to finance working capital needs, acquisitions of property, plant and equipment and intangible assets, and dividends out of operating activities rose by €345 million over the year, from €2,468 million in 2014 to €2,813 million in 2015.

Operations generated €974 million of free cash flow (40% of adjusted recurring operating income in 2015 compared to 35% in 2014), €234 million more than in 2014. Free cash flow generation of €974 million results from cash from operations of €2,813 million, an increase in working capital needs of €60 million – a modest increase in light of the rise in production volumes and the resources needed to meet output rates – and rising R&D and capital expenditure in preparation for future growth. Working

capital needs were kept in check in the second half of 2015 despite delays in payments due from the French government, amounting to €118 million at December 31, 2015.

Dividends paid in the year include the final dividend payment of €0.64 per share in respect of 2014 and an interim dividend of €0.60 per share in respect of 2015, representing a total payout of €517 million.

Divestments/acquisitions of securities chiefly relate to the sale of Safran's remaining interest in Ingenico Group during the year, which generated gross cash inflows of €606 million in 2015.

The net debt position was €748 million at December 31, 2015 compared to €1,503 million at December 31, 2014.

At December 31, 2015, Safran had cash and cash equivalents of €1,845 million and €2,520 million of secured and undrawn facilities available.

(1) See section 3.1, "Consolidated statement of cash flows".

## 2.3 Comments on the parent company financial statements

The financial statements of Safran for the year ended December 31, 2015 were prepared using the same accounting principles as those used for the 2014 parent company financial statements.

### 2.3.1 Safran income statement

(in € millions)	2014	2015
Revenue	461	563
Other operating income and expenses	(645)	(640)
Loss from operations	(184)	(77)
Financial income	753	1,645
Non-recurring items	(16)	(19)
Income tax benefit	101	99
<b>PROFIT FOR THE PERIOD</b>	<b>654</b>	<b>1,648</b>

Revenue came in at €563 million in 2015 versus €461 million in 2014 and chiefly includes billings of general assistance services provided by the parent company to its subsidiaries, as well as specific amounts billed to certain subsidiaries (rent, employees, IT services) and miscellaneous services related to projects (research projects for example) managed by the parent company on behalf of all of its subsidiaries. The €102 million year-on-year increase in revenue in 2015 results primarily from the development of centralized research projects and from the growth in volume of IT services and services provided by Shared Services Centers on behalf of subsidiaries and rebilled to those companies.

Other operating income and expenses represented a net expense of €640 million in 2015 and a net expense of €645 million in 2014, reflecting the tight rein on external charges and payroll costs despite the increase in business.

Loss from operations totaled €77 million in 2015 and €184 million in 2014.

Safran reported financial income of €1,645 million in 2015 and €753 million in 2014. This figure includes dividends and, in 2015 in particular, interim dividends received from subsidiaries

for €1,661 million (€758 million in 2014), net interest income of €8 million (net interest expense of €8 million in 2014), foreign exchange losses of €2 million (foreign exchange gains of €10 million in 2014), and net additions to provisions for impairment of financial assets or exchange losses totaling €22 million (€7 million in 2014).

The Company reported a non-recurring loss of €19 million in 2015 (€16 million in 2014), chiefly reflecting the impact of (i) derecognizing the share of the merger deficit allocated to the Snecma brand (negative €56 million impact) and (ii) the net capital gain of €32 million on the transfer of shares in Europropulsion, Regulus, Arianespace and Arianespace Participation to Airbus Safran Launchers (ASL).

The income tax line represented a benefit of €103 million under the Group's tax consolidation regime in 2015 (€136 million income tax benefit in 2014). This benefit also includes a net charge to the provision for the transfer of the tax saving relating to the French tax group from Safran to its loss-making subsidiaries, in an amount of €4 million (€34 million in 2014).

On account of the above, profit for the year came in at €1,648 million, compared to €654 million in 2014.

### 2.3.2 Safran simplified balance sheet at December 31, 2015

(in € millions)	2014	2015
<b>Assets</b>		
Non-current assets	9,912	10,131
Cash equivalents and marketable securities	1,363	1,489
Other current assets	2,866	3,314
<b>TOTAL ASSETS</b>	<b>14,141</b>	<b>14,934</b>
<b>Equity and liabilities</b>		
Share capital	5,806	6,927
Provisions	728	746
Borrowings	2,815	2,327
Other payables	4,792	4,934
<b>TOTAL EQUITY AND LIABILITIES</b>	<b>14,141</b>	<b>14,934</b>

The increase in share capital in 2015 reflects profit for the year of €1,648 million, dividends paid in 2015 for a total of €517 million (€267 million for the remaining 2014 dividend balance and €250 million in 2015 interim dividends paid in December 2015), and a net reversal from tax-driven provisions amounting to €11 million.

Changes in non-current assets result chiefly from the change in intragroup loans accounting for an increase of €266 million, and the derecognition of the share of the merger deficit allocated to the Snecma brand, accounting for a decrease of €56 million.

The decrease in borrowings chiefly reflects the €662 million decrease in commercial paper debt and the remeasurement of USD senior unsecured notes at the closing exchange rate (positive impact of €114 million).

### 2.3.3 Information concerning supplier payment periods

(in € millions)	Amounts due	Amounts not yet due		Total trade payables
		Amounts due in 0-30 days	Amounts due in 30-60 days	
December 31, 2015	2	10	88	100
December 31, 2014	8	19	132	159

## 2.4 Outlook for 2016

Safran's 2016 outlook is applicable to the Group's structure as of December 31, 2015 and does not take into account the impact in 2016 of the finalization of the regrouping of its space launcher activities with those of Airbus Group in their joint venture, Airbus Safran Launchers (ASL). Guidance will be revised as necessary upon finalization of Phase 2 of the operation. Safran expects the contribution of its space launchers activities to ASL to be accretive to adjusted recurring operating margin.

Safran expects on a full-year basis:

- Adjusted revenue to increase by a percentage rate in the low single digits compared to 2015 (at an estimated average rate of USD 1.11 to the euro);

- Adjusted recurring operating income likely to increase by around 5% with a further increase in margin rate compared to 2015 (at a hedged rate of USD 1.24 to the euro). The hedging policy largely isolates adjusted recurring operating income from current EUR/USD variations except for the part generated in USD by activities located in the US, subject to the translation effect when converted into euro;
- Free cash flow representing more than 40% of adjusted recurring operating income, an element of uncertainty being the rhythm of payments by State-clients.

The full-year 2016 outlook is based on the following underlying assumptions:

- ◆ Healthy increase in Aerospace OE deliveries;
- ◆ Civil aftermarket growth by a percentage in the high single digits;
- ◆ Start-up costs of series LEAP production;
- ◆ Reduction of self-funded R&D of the order of €100 – 150 million with a greater drop in capitalized amounts as spending declines on LEAP, A350, helicopter turbines as they come closer to certification and entry into service. As a result of decreasing capitalization and increasing amortization of R&D costs, expensed R&D is expected to rise by around €100 million;

- ◆ Sustained level of tangible capex, including expansions, new production capacity and tooling, around €850 million, as requested by production transitioning and ramp-up;
- ◆ Profitable growth for the Security business;
- ◆ Continued benefits from productivity improvement.

## Factors with a potential impact on results

Major risk factors that could have an adverse impact on the Group's business, financial position or results of operations are described in chapter 4.

## ◆ 2.5 Subsequent events

### OCEANE bond issue

On January 5, 2016, Safran launched an offering of €650 million worth of zero-coupon bonds convertible and/or exchangeable for new and/or existing shares ("OCEANE"), maturing on December 31, 2020. The bond issue was settled on January 8, 2016. The bonds were issued at a price of 104% of par, offering a negative yield of 0.79%. The conversion price of €89.32 corresponds to an issuance premium of 45% on the reference share value, reflecting investors' appetite for the quality of Safran's signature.

Considering that the issuance comprises 7,277,205 bonds, each potentially convertible into one Safran share, the maximum dilution would be 1.7% if Safran decided to provide only new shares.

The issuance is described in section 3.1, Note 32 (Group consolidated financial statements), section 3.3, Note 5.6 (parent company financial statements) and section 7.2.3.2.

### Capital Markets Day 2016

On March 14, 2016, Safran held an investor meeting (Capital Markets Day) for financial analysts and investors. In plenary sessions, the Group's management presented Safran's strategy, its business model and its innovation initiatives notably in civil engines and aircraft equipment. The Group also identified financial trends and objectives for the medium term. The presentations, of which a summary was disseminated using a regulatory information service, are available on Safran's website [www.safran-group.com/finance](http://www.safran-group.com/finance).

The salient points of this communication were:

- ◆ the announcement of the divestment of the detection business, and review of strategic options to ensure the development of the identity and security businesses;
- ◆ Safran reiterated its outlook for 2016 and identified trends and specified objectives for the following years.

The period 2016-2020 will see several trends, on which Safran will keep investors current, in particular concerning currency exchange rates, as follows:

- ◆ renewal of the Group's flagship product with the transition from CFM56 to LEAP, the effect of which on OE margins will be visible from 2016 to 2020, while maintaining an overall margin for this segment in the mid to high teens, in particular thanks to the momentum of the civil aftermarket activity;
- ◆ improvement of about one point per year in the operational performance of the Aircraft Equipment, Defense and Security activities;
- ◆ during the transition period, the Group margin (adjusted recurring operating income as a percentage of adjusted sales) should remain consistent with the record set in 2015;
- ◆ average free cash flow for the period at 50% of adjusted recurring operating income.

Safran has three main objectives for 2020, exiting this transition period:

- ◆ adjusted consolidated sales in excess of €21 billion;
- ◆ adjusted recurring operating margin trending above 15%;
- ◆ a very strong increase in free cash flow compared with 2015.

These trends assume current accounting standards. They include the advantages of a medium-term hedging policy that enables Safran to benefit from the improvement in the EUR/USD exchange rate, at least until 2020, under the conditions specified in the Group's latest publications. They also take into account the average spot rate assumption given in the presentations published on March 14, 2016. Safran is assuming that ASL will be consolidated using the equity method as a joint venture during 2016, with full-year consolidation starting in 2017. The free cash flow objective is subject to the usual uncertainties regarding the rhythm of payments by state-clients.