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Safran, bringing infinity into view

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**“I’m delighted to be with you to kick off our revamped in-house magazine. Intended for all Safran employees, this magazine is now called ONE.”**

This name symbolizes our lofty shared ambition. With the addition of Zodiac Aerospace, we are now the world’s third largest aerospace company (excluding planemakers), over 90,000 strong and with annual revenues of about 21 billion euros. We must continue to uphold our position and meet the challenges awaiting us in 2018, starting with the ramp-up in LEAP<sup>®</sup> and aircraft equipment production, the integration of Zodiac Aerospace and of course the innovation imperative – while also keeping our costs under control! To meet these goals, we have to maintain the winning attitude that made 2017 so successful.

The aim of our new publication, ONE, is to foster a feeling of belonging and unity. Following our recent refocus on our core aerospace and defense businesses, grouping all companies under the Safran brand and deploying the One Safran operational excellence initiative, all of our actions should be guided by a simple idea: we belong to a single enterprise, whose identity is as rich as its diversity. We must also be fully aware that the integration of Zodiac Aerospace is entering its most intensive phase. I believe that my colleagues from around the world realize that we are going through an exceptional experience, but one that is also very demanding. Our Group needs everybody’s know-how and passion if we are to successfully make this major transition – one in which each and every one of us has a role to play.

*Chers collègues*, we’re now one team – and “ONE” is yours!

**PHILIPPE PETITCOLIN**  
Chief Executive Officer of Safran





**ONE  
TEAM**





### SAFRAN DISCOVERY CHALLENGE: YOUR TURN TO PLAY!

The unique online Safran Discovery Challenge will help all new employees perfect their understanding of our Group right from the time they arrive. Players take a fun and informative journey, designed as an immersive experience with quizzes, videos and games. As they face these trials, they also rack up points and enter a drawing to win a guided tour of a Safran facility.



# 4,500

That's how many of our employees attended the #GenerationLEAP exhibition at Safran Aircraft Engines facilities. The exhibition spotlighted the passion and commitment of everybody who contributed to the design of the new LEAP engine and/or is participating in its historic production ramp-up.

## "GOOD MORNING COMEX"

### WILL THAT BE COFFEE OR TEA?

Safran Electrical & Power's "Good Morning Comex" initiative involves breakfast meetings between employees and members of the Executive Committee (abbreviated "Comex" in French), so they can discuss the latest news and challenges for both their company and the Group.

### 1,000TH LEAP CONTROL UNIT DELIVERED

On January 24, 2018, Safran Aircraft Engines invited representatives of Safran Electronics & Defense to attend a ceremony marking the delivery of the 1,000th electronic control unit for the LEAP engine. On the agenda was a guided tour of the assembly line in Villaroche, near Paris, plus a joint celebration of this unprecedented ramp-up.



### NETWORK: A WORKPLACE WELLBEING PROJECT

More than just a change in office furniture, the NETwork (Nouvel Environnement de Travail) concept is being deployed by Safran Aero Boosters to revamp the entire work environment. The watchwords guiding this project are efficiency, concentration, modernity and ergonomics. More than 500 employees are now working in spaces configured according to these guidelines, which will also be applied to all of the company's Belgian offices in 2020.





## MEXICO

# Composites go 3D in Querétaro

**Philippe Petitcolin, the Chief Executive Officer of Safran, inaugurated the new Safran Aero Composites Mexico plant in Querétaro in February 2018.**

**Querétaro Aerospace Park, February 21, 2018.** Pride and passion can be clearly seen on the faces of the 200 employees of Safran Aero Composites Mexico. In his inaugural address, Safran CEO Philippe Petitcolin underscores Mexico's importance for our Group. *"With the incorporation of Zodiac Aerospace, Safran now has over 11,500 employees in Mexico, making it our third largest employer, after France and the United States."* Olivier Andriès, CEO of Safran Aircraft Engines, adds, *"The name Querétaro has now become familiar to everybody at Safran, since our production facilities in this city have largely contributed to the success of our programs. The plant we are inaugurating today is Safran's sixth in Querétaro. It's also our third jointly-owned plant with our partner Albany International that will make composite parts for the LEAP engine, joining those in Rochester, New Hampshire in the United States, and Commercy in eastern France."* Among those attending this inauguration is Carlos Armando Perez, only 24 but already a methods engineer at Safran Aero



› Composites Mexico. He's pleased to see the recognition by Safran corporate management, adding, "I'm very confident in the future of our plant. We in Mexico are capable of doing great things!" Hired by the company in April 2016, Carlos then spent three months at the American sister plant in Rochester, to learn about the special methods needed to make the LEAP's composite fan blades and cases, using 3D-woven RTM (resin transfer molding) technology. "I was lucky enough to see the production process in Rochester before it kicked off in Querétaro," recalls Carlos. "That allowed me to familiarize myself with Safran's different engineering methods. It was a very enriching experience, and I've maintained a very close relationship with my colleagues in Rochester - in fact, we talk to each other regularly. And that also makes it easier to set up new projects."

#### AN AVIATION FIRST

The steady growth of Safran Aircraft Engines' operations in Querétaro, about 200 kilometers north of Mexico City, reflects Safran's close and very productive relations with Mexico. Safran Aircraft Engines already had a production plant and MRO (maintenance, repair and overhaul) facility in the Querétaro Aerospace Park. Furthermore, since 2010 nearly 600 Safran Landing Systems employees have provided support and production services for landing gear components at two different facilities, in particular main fittings, rods and balance beams for the Airbus A320 and A330, and the Boeing 787.

Safran Aircraft Engines' new plant, in partnership with Albany International, makes composite fan blades for the



**"My greatest challenge was production startup. The pace really picked up, but we met this challenge with flying colors!"**

#### KARLA MORENO

Leader of the non-destructive testing (NDT) unit

LEAP engine. Building and outfitting this plant was a \$100 million investment. In October 2017, just 18 months after project launch, Safran Aero Composites Mexico delivered its first fan blades.

Karla Moreno, leader of the non-destructive testing (NDT) unit, hasn't forgotten that moment: "My greatest challenge was production startup. The first production engineering phase involved relatively few parts. But once production kicked off, the pace really picked up - a challenge we met with flying colors!"

#### TEAMWORK

"We started deliveries two months ahead of schedule," proudly notes Laurent Remuzon, General Manager of Safran Aero Composites Mexico. "By January 2018, we were already delivering three shipsets of LEAP-1B blades a week, or 54 blades in all. We also cap-

italized on the experience of Rochester and Commercy in terms of process improvement. For instance, we hold a daily QRQC (Quick Response Quality Control) meeting with all facilities working for the Safran Aircraft Engines Composites Center of Excellence, to share best practices and quickly address any issues. The first employees at Querétaro were all sent to Rochester for training, for periods ranging from three months to a year, and that created very tight bonds with their U.S. counterparts. We will eventually be making 80% of the blades for the LEAP-1B, exclusive powerplant of the Boeing 737 MAX. These parts are mounted on the fan modules assem-





The inauguration ceremony was attended by Francisco D. Servián, Governor of the State of Querétaro, Gerardo R. Esparza, Mexican Minister of Transportation, Philippe Petitcolin, CEO of Safran, Olivier Andriès, CEO of Safran Aircraft Engines, and Joseph Morone, President and Chief Executive Officer of Albany International.

bled by Safran Aircraft Engines Mexico, also located in the Querétaro Aerospace Park. We will continue ramping up production in the coming months, since our aim is to deliver 20,000 blades a year by 2020!" Along with this increase in volume will come an increase in the workforce. Today, the plant has nearly 230 employees from Safran and Albany, a headcount that will rise to more than 500 towards 2020. This growth is needed to handle not just the production of fan blades, but also outlet guide vanes (OGV), a stationary aluminum component on LEAP engines. "The decision to make OGVs in Querétaro reflects our strategy of making this part in-house," explains Laurent Remuzon. "We'll be turning out some 31,000 OGVs a year. It also makes sense from the industrial standpoint, because half of the production operations, including bonding, painting and NDT, call on the same areas of expertise as for composites. In addition, it was only logical to make these high value-added parts where the LEAP-1B fan module is already assembled."

#### TOP 5!

Safran's expansion in Querétaro is taking place against the backdrop of very favorable economic development for this region, which is home to more than 30 aerospace companies, including Bombardier, GE, Meggitt and ITR. In addition, the aerospace sector can count on specialized training courses from the local university, UNAQ, especially for composites production. Querétaro is now the fifth largest aerospace cluster in the world, trailing only Toulouse, Seattle, Montreal and Wichita. The greater Querétaro area, with over one million inhabitants, also welcomes a number of manufacturers

## SAFRAN IN MEXICO

Safran has operated in Mexico for more than 20 years, and is now the country's leading employer in the aerospace industry, with over 11,500 employees. Its main facilities are in Querétaro, Tijuana and Chihuahua. The Group's first plant in Mexico was built in 1996, in Chihuahua, and is now the world's largest manufacturer of aircraft wiring. Safran's presence in Mexico meets three main objectives: to bring us closer to American customers; to diversify our production zones; and to penetrate new markets.



\*50/50 joint company between Zodiac Aerospace and Embraer

Safran facilities in Mexico.



The new plant in Querétaro capitalized on the experience of Rochester and Commercy to improve processes.

**“We will eventually be making 80% of the blades for the LEAP-1B, which powers the Boeing 737 MAX. Our aim is to deliver 20,000 blades a year by 2020!”**

**LAURENT REMUZON**  
General Manager of Safran Aéro Composites Mexico

› of cars and auto parts (Michelin, Scania, Valeo Sylvania, etc.), electrical appliances (Daewoo, Siemens, Samsung) and IT companies (Huawei, IBM, Ericsson). Laurent Remuzon draws on his own experience to help explain Mexico’s attractions: *“I discovered many positive aspects of working here. I especially like how the Mexicans live and the resulting dynamic team spirit.”* Karla Morena adds, *“I think the secret of this team dynamic is two-way communications between the different parts of our plant, as well as with our French and American colleagues. We learn a lot from the other composites plants. Here in Querétaro, we have everything we need to meet the ramp-up challenge!”* ■

# AROUND THE WORLD OF SAFRAN

Introducing a team and six individuals from Safran companies, for a quick look at their career path and vision of Safran.



## Zodiac Aerospace acquisition team

Representatives from Communications, Accounting, Finance, Legal, Labor Relations, Human Resources, Strategy and M&A.

—  
“We worked together for over a year to carry out the historic Zodiac Aerospace acquisition for Safran. It was a fascinating experience!”



## Véronique Bardelmann

General Manager of the Villemur plant,  
Safran Electrical & Power

“I’m now here in Villemur, working with my team to continue to boost operational excellence for the benefit of our customers. After working for Safran SA, Safran Nacelles, Safran Landing Systems and Safran Aircraft Engines, I still like to discover exciting new products, people and professions. My aim is to better understand our business, markets and customers, so I can make the right decisions, with help from my team!”



## Maxence Poumaere

CEO, MRO in India  
Safran Helicopter Engines

“India is a great market opportunity for Safran, and I’m very proud to be part of this story. The Indian culture is also very rich, so this is a great experience for me, both personally and professionally.”



## Christel Vandegoor

Fitter, Tester, Inspector,  
Safran Aero Boosters

“I work at our plant in Milmort, Belgium, where I instrument engine modules so we can test them for certification. My work is meticulous, and I really like that! It’s also different from day to day, which is very motivating. I’m very lucky to love my work.”



## Christophe Folliot

Line maintenance engineer,  
Safran Aircraft Engines

“I perform repairs and diagnostics both on customer premises and at our Villaroche plant. As the standard bearer for Safran’s expertise, I might be dispatched to an airline customer at any time, anywhere in the world. I like the fast pace! To do our work, we establish relations of mutual trust with our customers.”

## Nelly Medrano

Production supervisor,  
Safran Electrical and Power

“I started working as an operator in 2007 in Chihuahua. When I heard about Safran’s career support program, it was a no-brainer! I went back to school and earned an undergraduate degree, then enrolled in an industrial engineering program – all while continuing to work. Today, thanks to these degrees, I’m a production supervisor, and I’m really proud. It’s never too late to go back to school!”



## Russell Jackson

Production and Technical Director,  
Safran Nacelles Services Americas

“I oversee the nacelle repair chain in the Americas, from the arrival of parts until their delivery. It’s a job where you have to find solutions quickly and know how to adapt! I’m lucky that I can count on a solid, experienced team.”



# OCCUPATIONAL SAFETY IS EVERYBODY'S BUSINESS

The occupational accident rate at Safran has dropped more than 50% since 2011. But this progress stalled in 2017. How can our Health, Safety and Environment (HSE) network help improve these results? We asked some of the actors in occupational safety to share their insights and best practices.



## FRANCIS GAUVAIN

Vice President, Sustainable Development,  
Safran

"The accident rate for 2017 stalled at 21, the same as 2016. To get back on the improvement trail, human behavior in relation to risks is vital. All of our facilities should have an HSE "Gold" label by about 2020, the objective defined by corporate management. To earn

this top HSE ranking, we're lucky enough to be able to call on a global network spanning all of our companies, and including doctors, nurses and experts in safety, the environment, ergonomics, chemical risks, fires and more. Of course, Safran is already well positioned compared with other big industrial groups, but we have to do even better! In fact, we just signed a charter proposed by the French Ministry of the Interior, "7 commitments for road safety", within the scope of our own "road risks" action plan. We have to redouble our efforts in 2018. Everybody should take the same attitude: "See it, act on it!" ■

## CÉDRIC HALÉ

Vice President, Human Resources, Safran  
Nacelles

"Under the impetus of Safran Nacelles management, in mid-2016 we launched a project to completely transform our occupational safety culture. We wanted to go beyond the conventional health, safety and environment (HSE) approach, based on the deployment of prevention and management tools. Instead, we focused on the daily behavior of our employees. The result was expressed as a key principle: "If you see a risk, act!" We therefore bolstered internal communications and deployed fundamental rules on good safety behaviors. These are dubbed "vital rules", and include regular events, such as safety meetings and an annual health & safety day, designed to establish a solid and shared safety culture. Actions such as these allowed us to lower our accident rate from 32 in 2015 to 19 by the end of 2017." ■





## FOUR ACCIDENT-FREE YEARS

In 2017, Safran Aircraft Engines Suzhou passed the milestone of four years without an accident entailing at least a day off work. "HSE is a major concern here," explains Gil-Eric Fabre, General Manager of Suzhou, "and our 5S level (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) is remarkable. During QRQC meetings, our teams are encouraged to address the slightest issue." Top recognition in 2017: Suzhou was awarded Safran's "Gold" label for HSE performance.



### PHILIPPE LABARIAS-CELMA

HSE Manager, Safran Helicopter Engines

"We have organized an annual HSE convention since 2012, attended by about 200 operational managers. Our Executive Committee members also participate, and our CEO gives the opening and closing addresses. During this event, we share information on performance, objectives and best practices. This regular event has become a model, and allows participants to present their local achievements. Discussions during projects at our facilities also helped us develop a real corporate HSE culture, further strengthened by feedback on significant accidents presented in management and executive committee meetings. To reach as many employees as possible, we use ideas such as special screen-savers on their computers. Our dynamic communications effort allows us to pass these messages to all employees." ■

### LAURENT TARRASA

Ergonomics engineer, Safran Electrical & Power

"Occupational safety also depends on long-term ergonomic actions. We took a big step forward by getting ergonomics integrated in our company's major projects. For example, digital traceability, a tool to support and control plug-in connectors, and production engineering for the LEAP engine. Other actions are being conducted at the same time at our facilities. At Vichy, the dynamic storage warehouse for cable drums eliminates handling. At Villemur, access to routing tables was improved by the use of 10° inclined planes, instead of vertical tables. Ergonomics is not a luxury, it's an essential component that improves the sustainability of our production system and ensures employee safety." ■



## POLAND

# Stanisław STYPA

## Supervisor, Assembly shop, Safran Transmission Systems

This manager is tasked with keeping the shop on schedule to deliver products to customers on time and with the requisite quality. For Stanisław, team development is essential.

QRQC update. Along with the methods engineer, we review all recently indicated problems and situations, determining what can be resolved immediately and what needs further study. A new quality alert, concerning the gear tooth load bearing capacity, gets my attention.

We're assembling power transmissions for the LEAP-1B engines powering the Boeing 737 MAX and the CFM56-5B powering the Airbus A320. I organize our production tasks for the day, according to priorities defined the previous day with the production management team.

7:00 AM



8:15 AM



Using shims, we check that the load bearing capacity of the teeth on bevel gears is in line with specifications.



9:00 AM



12 NOON



Scheduling update. The shop manager and I analyze the week's production and organize the following week. Our priority will be the CFM56-5.



## POLAND RISES TO THE LEAP CHALLENGE

### Safran Transmission Systems Poland

is gearing up, so to speak, to keep pace with the fast ramp-up in LEAP production. The facility will make nearly 2,500 power transmissions in 2018, rising to over 4,000 in 2019 – and that's a 300% increase over 2017!



1:30 PM



2:45 PM

**Above:** My colleague Mateusz takes over for the afternoon shift. I tell him how the problem with the gears was solved, and give him my instructions.

**Left:** A Safran+ meeting to review proposed improvements, which generates new ideas. Way to go team!



# ONE BUSINESS



# KUDOS

CFM International's global fleet of CFM56 engines has now recorded more than 500 million cycles. Since entering service in 1982 this landmark turbofan engine has logged over 900 million hours in flight. Some 13,500 CFM56-powered airplanes are now deployed by about 570 operators, and seven million passengers fly on these planes every day. CFM has delivered over 32,000 engines to date, and still has a backlog of orders for over 1,500 more.

## INDIA

On March 10, 2018, CFM International signed a record contract with Spicejet, the Indian low-cost airline, for LEAP-1B engines and maintenance services, worth \$12.5 billion.

# EGNOS

The European Geostationary Navigation Overlay Service enhances the performance of satellite global positioning systems (such as GPS and Galileo). Using ground stations that receive and correlate data, it broadcasts an ultra-reliable signal that can be used to develop secure geolocation applications. Airbus Defense and Space, which designed the electronics unit, asked Safran Engineering Services to develop the integrity chain facility (ICF) software, in charge of checking signal integrity. With this first five-year contract from Airbus Defense and Space, the Group's critical software specialist will contribute to this program as a system integrator.

## ALL NIPPON AIRWAYS SELECTS CASSIOPÉE AGS

The Cassiopée AGS flight data management software from Safran Electronics & Defense is now up and running at All Nippon Airways.

The Japanese carrier, known for its demanding standards and innovative approach to flight safety, is the first airline to include Cassiopée AGS in

its cloud, thus facilitating teamwork. This flight data is now handled immediately after the flight to help debrief pilots and maintenance teams. As always, the aim is to continuously improve passenger safety.

# BACKSTAGE: THE INTEGRATION OF ZODIAC AEROSPACE

Zodiac Aerospace officially became part of Safran on February 13, 2018. “Day One” was a total success, thanks to meticulous preparation, but a number of challenges still lie ahead. We take a closer look at the integration project with the approach of another milestone, the First 100 Days.

Make Safran the world’s third largest aerospace company (excluding aircraft manufacturers): that’s the ambitious goal that led to the acquisition of Zodiac Aerospace, an international leader in aircraft equipment. While this link-up is justified because the two companies are complementary in multiple ways, a certain number of tasks must be completed to unleash its potential. These include organizing and overseeing the link-up, identifying and bringing to fruition the publically-announced synergies, and deploying Safran’s methodological tools and processes to boost operational performance and customer satisfaction. According to Zodiac Aerospace CEO Vincent Mascré, *“We have three top priorities, to be met with the support of Safran: restore a relationship of trust with our customers, improve operational performance and innovate.”*

## A TEAM APPROACH

The integration project is conducted by a mixed team of Safran and Zodiac Aerospace employees, led by Hélène Moreau-Leroy. It is organized around seven projects, dubbed “streams”, in addition to four cross-functional projects. Each stream draws up its own

road map. All of these streams have a common objective, namely to ensure that Safran and Zodiac Aerospace apply the same operating modes, while capitalizing on best practices from both parties.

## FROM OBSERVATION TO ACTION

A successful integration of this type starts with mutual discovery, which is why each stream got underway with an

**“Three top priorities, with the support of Safran: restore a relationship of trust with our customers, improve operational performance and innovate.”**

observation phase. This phase entails a review of operations, understanding strengths, weaknesses and operating modes, assessing needs, etc. The resulting actions will be deployed throughout the operational integration phase. All in all, the integration project

should take about 18 months. The First 100 Days will mark a major milestone, with the construction of a strong foundation of convergence and transformation. We have already launched several priority actions designed to generate fast results, dubbed “quick wins”. These include savings on purchases (logistics, IT, etc.); training Zodiac Aerospace Black Belts to Safran’s Lean-Sigma standards to provide operational support in factories and for programs with issues; extending mobility options to everybody in the expanded Group, etc. *“These challenges are well within our grasp,”* says Philippe Petitcolin, CEO of Safran. *“We have to tackle this latest phase in our shared history with confidence and determination.”* ■



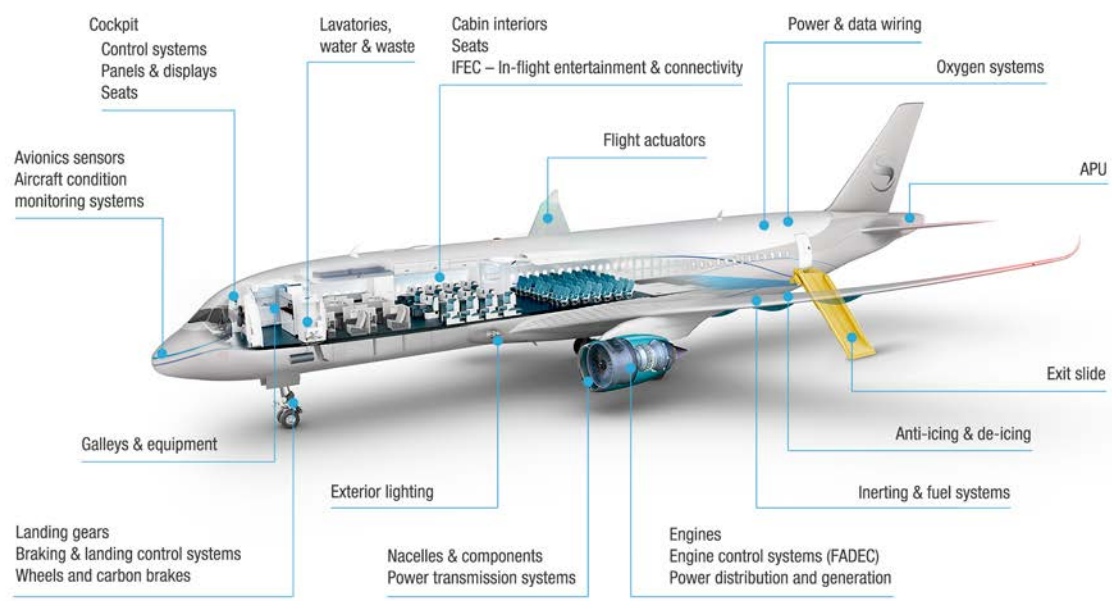
## ZODIAC AEROSPACE'S MARKETS

With the acquisition of Zodiac Aerospace, Safran is bolstering its presence across the entire aircraft value chain (see illustration below), while also rounding out its range of aircraft equipment. Zodiac Aerospace contributes the following.

**Onboard systems**, in-flight and ground safety. Zodiac Aerospace designs and builds a number of systems for aircraft safety and operation.

**Cabin.** The company supplies everything needed to outfit integrated cabins: luggage bins, class dividers, stowages, lavatories, galleys and inserts.

**Seats.** Zodiac Aerospace offers a complete and innovative range of aircraft seats, from economy to first class, designed to improve comfort and seating efficiency.



## INTERVIEW

# Hélène MOREAU-LEROY

Head of the Zodiac Aerospace integration project

**Hélène Moreau-Leroy is leading a project of historic importance for Safran. Portrait of a very engaged and determined woman.**

**You've been in industry for 30 years now. Is there a common thread running through your career?**

**H.M.-L.:** Several in fact, namely international markets, a penchant for this sector, and the constant exploration of new fields and environments. While I didn't have any specific profession in mind when I was young, I was nonetheless attracted by science and engineering, as well as languages and different cultures. I've worked in a number of different areas, including design, industrial project management, purchasing, programs and more. My choices were dictated by the desire to be constantly evolving and learning, and to take a pivotal role in any transformation. Large groups like Safran offer extensive possibilities. It's also a pleasure for me to be exposed to a wide variety of people, experiences and businesses.

**You lived 14 years outside of France: how did this experience shape you?**

**H.M.-L.:** I started my career in the Middle East, then continued it in Asia and Latin America. I also did part of my university studies in the United States and Australia. Today, I continue to travel, for both professional and personal reasons. My love for discovering new cultures and places is reflected in

my career. My love for travel has certainly given me an ability to adapt and to listen, a determination to really understand the people around me, and to constantly call into question my own certainties. All of these experiences are part of my daily life, and now help me manage the very international integration of Zodiac Aerospace. We can't see this project through a strictly French lens. In fact, we often travel to different facilities to see how they function and to better understand their employees.

**Is it hard for a women to make her way in this very masculine world?**

**H.M.-L.:** That's not a source of stress for me. Of course, it's an additional challenge when I take up a new position, and perhaps I've felt more under observation than my male colleagues would in the same situation. Fortunately, once a relationship has been established, and affinities and

skills recognized, the difference in gender becomes a moot point. It's just another difference among many, and one I've never taken too seriously. It's in our companies' interest to promote women and develop diversity. It's easy to surround yourself with people like you - but that's not the right choice. A wealth of ideas and viewpoints fosters creativity, friendly competition and performance. This is especially important in a group like ours, which is so dependent on innovation. No matter what position I've held, I have always sought this diversity. In fact, I need it

**“I hope to inspire the women of Safran to move forward without limiting themselves.”**

**“I reserve time for me and my family, I travel, play sports and other activities. It helps me keep up the pace.”**

day after day, to help forge my decisions.

**Speaking of decisions... what are your objectives on this project?**

**H.M.-L.:** I have several, namely to make the people who are joining us part of one team, to pool our respective potentials for innovation, while retaining our specific qualities, which drive performance, to realize the publically-announced synergies, to deploy the methodological tools and processes recognized by our customers, and more. Quite early in the game, my team and I wondered about how we could measure the success of the integration project, which would last about 18 months. It's a very complex subject! Check with me in five years, and we'll see if you can tell who came from Safran and who came from Zodiac Aerospace. Will we have forged a common identity? Will we still be leaders within our new scope of business? Will we have nurtured all the talent within our Group? Will our complementary fit help us win new contracts? These are the questions that should guide our actions and also allow us to take a step back throughout the project and ask ourselves where we're going.



**How would you summarize this operation?**

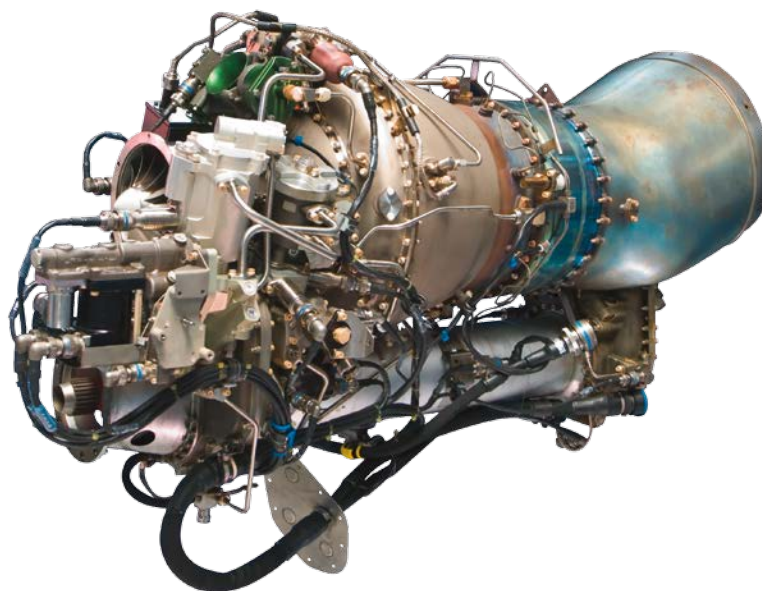
**H.M.-L.:** Over and above the fact that two legendary French giants in aerospace are coming together, this is also a tremendous human story, and one I'm proud to be a part of. Our operational excellence, performance, innovation and other attributes are generated by our people and their efforts. That's why I wanted our decisions to await a preliminary phase where we just listen, analyze and understand. People are really at the heart of this project. ■

**“Diversity in all forms enriches our discussions and fosters a unique kind of creativity.”**

# 40 YEARS OF ARRIEL: ONCE UPON A TIME IN THE AMERICAS

The Arriel turboshaft engine is the iconic best-seller from Safran Helicopter Engines. Over the years, it's also become a benchmark in North and South America. We look back at 40 years of turbo-powered history, with a focus on our presence in Brazil.

The Arriel 2D,  
which powers the  
Airbus Helicopters H125.



Arriel is the story of a tremendous breakthrough in the Americas, not just in Grand Prairie, Texas, where it started, but also in Rio de Janeiro, Brazil. This turboshaft engine has always been a favorite of prestigious customers, including the U.S. Army and Coast Guard, the Brazilian armed forces and a host of police forces in both North and South America. Whether taking passengers on a breathtaking helicopter ride over Rio, or deployed on a Search & Rescue mission in the Pacific, there's a good chance the power is by Arriel!

The Arriel is Safran Helicopter Engines' best-seller, and also one of the most reliable and robust engines in its class. It is offered in two main versions, the Arriel 1, developing 590 to 750 shaft horsepower (shp), and the Arriel 2, with a power range from 830 to 1,000 shp. The upgraded Arriel 2+ variant is designed for the latest rotorcraft, either

single or twin-engine. Today, some 30 different Arriel versions power more than 40 different types of helicopter.

#### A BRAZILIAN SERVICE SPECIALIST

With 174 employees, Safran Helicopter Engines Brasil is one of the company's largest entities outside of France. This facility provides support services for some 450 operators in South America, totaling more than 1,500 engines. In November 2017, the Brazilian company organized a day-long celebration of the

40th anniversary of the first Safran Helicopter Engines office to open in Brazil. Joined by customers and retired staff, they all enjoyed a packed program of festivities, including a concert and food trucks where they could pay with "money" that Safran had minted for the occasion.

Bruno Even, Safran Helicopter Engines CEO at the time, was on hand for the celebration. He commented, *"Our 40 years in Brazil clearly reflect our commitment to providing close support for*





## A VERY DYNAMIC 40!

—

The employees of Safran Helicopter Engines celebrated the anniversary of the company's first sales office in Brazil with the enthusiasm you can see on this photo!

Xerém's employees celebrate the 40th anniversary.

Disassembling an Arriel engine at the MRO center in Rio.





**Bombeiros Brasil Firefighters**  
conducting an exercise over Sugarloaf  
Mountain in the Rio harbor.

our customers' growth. It has also fostered a strong partnership with the Brazilian government and civil society, based on mutual trust." At the same time, this anniversary celebration allowed our colleagues to express their pride in being an integral part of this long shared history, featuring a wealth of twists and turns as both technologies and business conditions changed.

#### 40 YEARS IN BRAZIL

Safran Helicopter Engines opened its first Brazilian facility in 1977, near Rio de Janeiro – and the Arriel engine played a major role. Then known as Turbomeca do Brasil, this subsidiary was founded because the company had to coordinate services for the Arriel engines powering the Ecureuil

helicopters built by Helibras (a subsidiary of Airbus Helicopters) and deployed by the Brazilian navy. The plant underwent major changes during the 2000s, starting in 2002 with the inauguration of a Safran Aircraft Engines servicing facility in Xerém, after Super Puma and Panther helicopters were delivered to the country's armed forces. It was then given a boost by the strong growth in the offshore market, with the arrival of Sikorsky S-76 helicopters, powered by the Arriel 2, as well as the first "power by the hour" contracts. The Brazilian army subsequently modernized its Panther fleet, which entailed the installation of a more powerful version of this engine. The Xerém facility soon won certification by EASA (European Aviation

Safety Agency) and the FAA (Federal Aviation Administration) of the United States, so it could provide maintenance, repair and overhaul (MRO) services for engines deployed worldwide. In 2003, just a year after the support center opened, the first Arriel 1 overhauled in Brazil was delivered to its customer, with the first Arriel 2 following in 2006. Today, the Xerém plant is one of our four centers of industrial excellence around the world. And fully half of the helicopters operating in Brazil are powered by Safran engines.

#### IN THE USA

Charles Claveau, former Vice President of Programs and Strategy, president and founder of the Association of Friends of Turbomeca's Historic Legacy

(AAPHT), and author of the book, *Turbomeca à la hauteur de la légende*, explains that the company's breakthrough in the United States was very successful, and that several generations of American pilots were trained on Safran-powered helicopters. This story really took shape with the sale of Ecureuils ("Squirrels") in the United States, leading to the opening of Safran Helicopter Engines USA. In the mid-1980s, the operator Hélicoptères Union reengined its S-76 machines with twin Arriels, then switched to the Arriel 2 in 1996 for offshore missions on behalf of oil and gas companies. In Canada, the Arriel would also replace Pratt & Whitney engines. Starting in 2004, the Arriel has powered Dolphin helicopters for the U.S. Coast Guard. This fleet passed the mark of a million flight-hours in 2015, and is mainly used for at-sea rescues, coastal and maritime surveillance and environmental protection.

In 2006, the U.S. Army signed a contract for 322 Lakota twin-engine helicopters, with Arriel 1E2 engines. As Charles Claveau points out, "*All American forces deploy Arriel engines. What other French company can make that claim?*" ■

**"We've reached 14,000 flight hours with Arriel 2 engines, thanks to their effective and responsive support services. Safran's excellent work underpins its long presence in Brazil. My thanks to their service department for keeping our helicopters in the air!"**

**DANIEL FABIO DE BRAZ JR.**  
OCEAN Explorer do Brasil



## 3 QUESTIONS FOR

**PIERRE FEITZ**  
Arriel Program Manager

### **Who are our biggest customers in the US?**

The world's biggest Arriel customer is the U.S. Army, with the Arriel 1E2, but the U.S. Coast Guard is also an iconic client, since they save lives thanks to their 240 Arriel engines. The Ecureuil (Arriel 2B, 2B1, 2D) is the helicopter par excellence for tourist flights, used by

customers such as Blue Hawaiian and Maverick.

### **What's the latest news in South America?**

The Brazilian navy's retrofit of their Panther helicopters, with Arriel 2C2CG engines, as well as the commissioning of Arriel 2N-powered AS565 Mbe machines by the Mexican navy; this is the latest and most powerful member of

the Arriel family. The last machine in this order was delivered by Airbus Helicopters at the end of 2017.

### **Any last thoughts about the Arriel?**

"The sun never sets on Arriel." That's not just a catchphrase. I regularly start my day with a phone call from South Korea and finish it with a call from the U.S.!

# THINGS ARE POPPING IN PITSTONE!

March, 2018. Safran's plant in Pitstone, southeast England, is bubbling with excitement. It is about to receive an award from Airbus, the fourth in two years. The whole site was reenergized by Safran's acquisition of Goodrich's electrical systems business in 2013. Today, the results of all these efforts are clearly visible, for the staff and their customers alike.



**Above:** Pitstone has improved its processes, scoring 84% in the latest IPCA+ audit by Airbus, versus 43% in 2011.

**Left:** SQCDP (Safety, Quality, Costs, Deadlines, Performance) and QRQC (Quick Response Quality Control) are applied at four levels, from local production teams to the plant as a whole.



## PITSTONE TIMELINE

- › **January 2013:** Safran acquires this site specialized in electrical power generation and distribution from Goodrich, and it becomes part of Safran Electrical & Power in 2014.
- › **April 2017:** Pitstone earns Airbus Best Performer Gold and Best Improver awards for 2016.
- › **September 2017:** Best Performer Award from Airbus.
- › **March 2018:** Pitstone once again named Best Performer Gold by Airbus.

### A LONG-HAUL EFFORT

Both Mark Wilson and Ed Gibbs were working at Pitstone well before it joined Safran. Mark even worked at Lucas Aerospace, formerly Goodrich Electrical Power Systems. He's been at Pitstone for 32 years and is now head of Airbus operations. Since the Safran takeover in 2013, Mark has seen a difference, as he explains: *"First, management's attitude has really changed, and to everybody's benefit. Before, I managed by telling people what to do. Now, my teams are empowered, engaged and more independent. No more 'putting out fires' - I plan ahead, I provide support, and I identify solutions and improvement paths."*

Ed Gibbs was in charge of the construction of the current Pitstone facility and the move in 2001. As Program Director, he has seen the efforts made and the transformation of the shop. Methods such as 5S, Prompt, QRQC and One Safran have proven their mettle, driven by employees' solid engagement, backed by the company's other

facilities and support functions. He also takes a long-term view, noting that *"Safran arrived with concrete processes, and a clear vision and strategy, so we immediately understood our role."*

### UNDER CONTROL

Safran standards were therefore applied throughout the site, and as a pilot project on the Airbus A330, A340 and A380 lines. *"Our restoration strategy had four main thrusts,"* explains Sébastien Dupleich, head of operations. *"First, we bolstered our planning processes by implementing regular demand, business and order reviews. That allowed us to better match capacity to workload. We also encouraged our operators to develop their versatility and be more flexible. Secondly, we set up daily operational checks with SQCDP meetings. The aim is to track deliverables and performance, while setting up preventive measures. If there's a recurring quality problem, we investigate it immediately to under-*

*stand the root cause and make sure it doesn't come up again. Our preventive approach is very important, covering not only product quality, but also production machinery maintenance, and we have invested to upgrade our machinery and equipment. Another key was an array of improvement projects."*

### ON TRACK FOR EXCELLENCE

The upshot was that the plant's Airbus production lines enhanced their performance and maturity, earning Safran Electrical & Power Best Improver and Best Performer awards from Airbus in the last two years. The operations department, which catalyzed this success, enjoyed a closer customer relationship. *"We really worked to better understand requirements and improve transparency and trust, while meeting commitments,"* says Boris Ribard, Airbus commercial aircraft program manager. What's next? Pitstone is aiming for these same positive results on other production lines and for other customers. They still have a way to go to achieve true excellence. But for Ed Gibbs, being part of Safran is a source of pride: *"Because of all these customer awards, of course, but above all because of this new mindset, namely a burning desire to succeed and to tackle new challenges." ■*

# ONE TEAM, ONE SAFRAN

Many of our employees have heard of the One Safran initiative – in fact, more than 4,000 of us are already actively involved. One Safran is a long-term structural action designed to facilitate and strengthen collaboration between all Safran entities. The ultimate objective is of course to boost performance and customer satisfaction, which means that this initiative is everybody's business!



## CONVERGENCE

Things have been moving faster than ever over the last few years, with increasingly demanding customers who constantly push us to do our best. The market success of our products, especially the LEAP engine, has resulted in an unprecedented production ramp-up. Furthermore, competitive pressures are increasing, spurring our ability and need to develop innovative new products and services.

More than ever, we must now boost collaboration between different Safran entities to meet these challenges. We could all understand each other better by speaking the same language, by discussing not just our successes but above all our difficulties, and by sharing methods and practices. That's the primary goal of One Safran, which is counting on us to pool knowledge about what we do best, and to increase performance across the board.

## STANDARDIZE, SHARE, INNOVATE

In an enterprise like Safran, where innovation is at the core of our identity, the idea of standardization is sometimes misunderstood. But standardization underpins greater efficiency, and allows us to save time and energy by not having to reinvent something that already exists. In turn, we can really focus on things that can be invented or improved. Likewise, standardization is a key to transmitting knowledge to new employees, whether recent graduates, or those joining Safran through an acquisition, such as our 30,000 new colleagues from Zodiac Aerospace. This is important, because we are expecting some 21,000 departures due to natural attrition in the next four years! ■

**“One Safran is both concrete and practical. The proposed tools and methods are easy to use. And people are pivotal to its deployment, which fosters a great deal of pride.”**

One Safran is a reference system jointly developed by our companies and deployed in light of local conditions to generate concrete, sustainable results. For more info, go to the One Safran section on Inside.



## KEY FIGURES

**1** GROUP MANUAL  
simple and modern, replacing the  
quality manuals at all entities.

**160** OPERATIONAL EXCELLENCE PROJECTS  
already launched, including 80  
that generated double digit savings.

**35** SAFRAN FACILITIES INVOLVED  
in the deployment of operational  
excellence standards.



Safran Nacelles is deploying  
a program management  
operational excellence  
project for the SaM146 engine.



**Above:** Self-assessment of the maturity  
of production standards at Safran Landing  
Systems' lab in Vélizy.

**Left:** Team members using the maturity chart  
to evaluate their practices in relation to Group  
standards.

# VOYAGE TO THE HEART OF THE NACELLE

Safran Nacelles is the only manufacturer to cover all segments of the civil aviation nacelle market. The nacelle is a very complex system at the crossroads of engines and airframes. The company's secret is controlling the design of all components, coupled with expertise in composite and metallic materials, plus acoustics.



## AIR SUPPLY FUNCTION

The nacelle determines the air needed for the engine to operate.



## AERODYNAMICS FUNCTION

The shape of the nacelle helps reduce fuel burn by up to 50 metric tons/year.



## ACOUSTICS FUNCTION

The nacelle's acoustic treatment contributes to the engine noise reduction.



## HEAT FUNCTION

The nacelle stands up to extreme temperatures (-60°C to +600°C), to protect the engine and airplane.

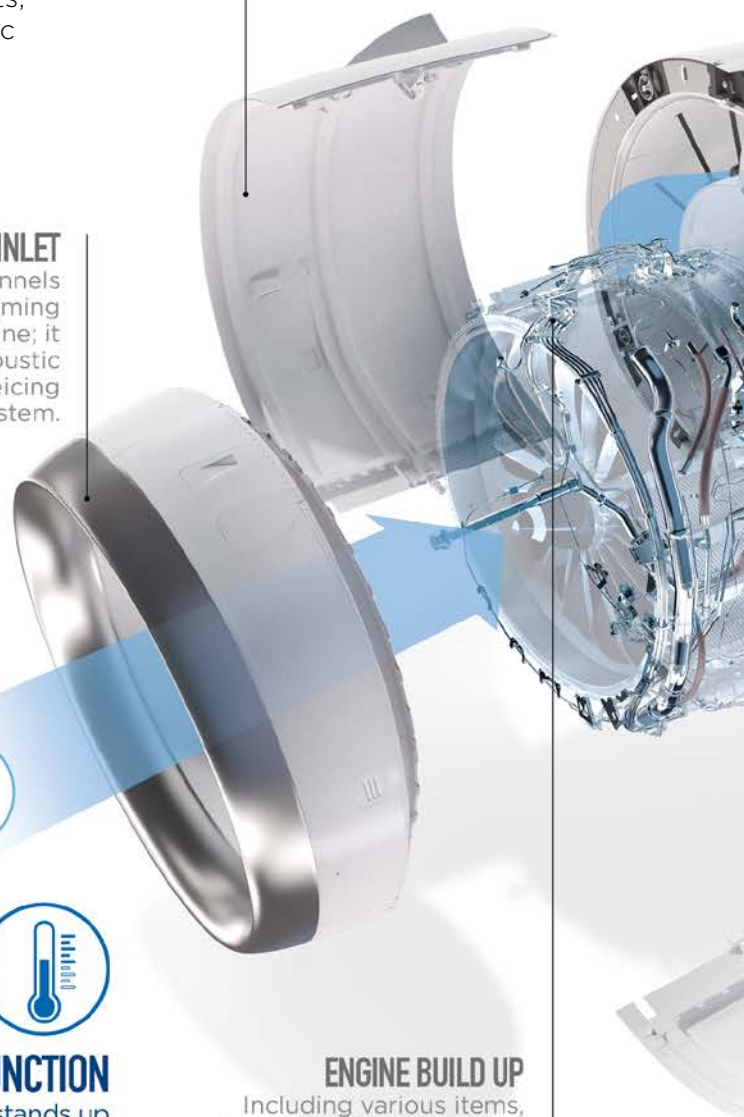


## AIR INLET

Channels the airflow coming into the engine; it includes an acoustic lining and a deicing system.

## FAN COWL

Made of composite materials, protects the engine and its accessories.



## ENGINE BUILD UP

Including various items, such as the wiring harnesses, pipes and valves for the fuel supply, air inlet deicing, fire detection, power supply, etc.



### THRUST REVERSER

Redirects the bypass airflow towards the front to help brake the plane. It reduces brake wear and mainly contributes to braking on short, wet, icy or snowy runways.

### EXHAUST SYSTEM

Comprising the exhaust nozzle and tail cone, it channels the hot gases exiting the engine.



### STRUCTURE

The nacelle helps take up loads between the engine and its mounting pylon, especially when the thrust reverser is activated.



### PROPULSION

The nacelle calibrates airflow at inlet and outlet to ensure maximum propulsive efficiency.



### BRAKING

The thrust reverser in the nacelle reduces braking distance by 20 to 50%.



Cascade type thrust reverser for commercial airplanes



Target-type thrust reverser for business aircraft



### AESTHETICS

Nacelles are painted in the airline's colors.



**ONE  
FUTURE**



### “FURIOUS” DESIGN STUDY HERALDS TOMORROW’S COLLABORATIVE COMBAT

In the near future, warfighters, robots and drones will be teaming up in a connected environment. Soldiers will still be engaging in the actual combat, but they’ll be supported and protected by these autonomous platforms.

France’s defense procurement agency DGA (*Direction Générale de l’Armement*) chose Safran Electronics & Defense in December 2017 to conduct FURIOUS, a preliminary design study program. Through this initiative, French armed forces will be able to test autonomous vehicle, drone and robot demonstrators in different scenarios. Safran’s proven expertise in these areas was a decisive factor in winning the contract.

The Open Rotor demonstrator is off to a flying start, based on a successful ground test program totaling 70 hours. These tests showed the maturity of the technology building blocks in this future aero-engine configuration: counter-rotating fans, control system, reduction gearbox and high-speed turbine.



## SPONSOR AN INNOVATOR!

### MAGIC CHALLENGE

**Since February 2018, Safran employees have been able to meet the Open Innovation challenge by sponsoring an innovator from outside the Group.**

The MaGIC by Yoomap platform allows the in-house promotion of external innovators who harbor potential for Safran.



### SAFRAN TRANSMISSION SYSTEMS BETS ON GROUP’S GEARTRAIN TECHNOLOGIES

The company’s Industrial Innovation and Skills Center in Colombes, spanning 12,636 sq ft, was inaugurated in February 2018. It will develop prototypes announcing tomorrow’s disruptive technologies and test innovative production processes.

... and the winners of Safran’s 2018 Innovation Awards are: in the Field Innovation category, Safran Transmission Systems for the “Modular honeycomb mat”; with the Grand Prize going to Safran Landing Systems for “Ceramic nanofillers in carbon brake disks”.

More information on Insite, Innovation section.

# ELECTRIFYING THE FUTURE TO LIGHT UP THE SKY

Safran is fully involved in the development of “more electric” aircraft, including complete work packages for our customers to meet the economic and environmental challenges facing the air transport sector.



Safran is accelerating the development of electrical equipment for aircraft.



## POWER SOURCES

—

**The only ultimate source of energy on today's commercial airplanes is jet fuel: 95% of this fuel is converted into propulsive power and 5% into three other energy sources: hydraulic, pneumatic and electrical. These so-called "non-propulsive" energies are used to drive various aircraft systems and equipment.**

Safran is the only company to offer all electrical equipment for aircraft, including power generation and distribution, wiring and motors. This defining characteristic means that Safran is ideally positioned to optimize the overall electrical system and lead this revolution. For a number of years now, Safran's scientists and engineers have been focusing their research on electrifying airplanes – which mainly entails replacing the traditional pneumatic and hydraulic systems by lighter electrically-driven systems. The upshot is lower fuel consumption and easier maintenance, which means more environmentally-friendly aircraft. Today, the challenge is getting ready for this latest major disruption in aeronautical technology.

### RESPONSIBLE PERFORMANCE

Several Safran companies are currently working on aircraft electrification. Safran Landing Systems has been developing for several years now an electric taxiing system, which will limit environmental impact on the ground. In this system, electric motors are integrated in the main landing gear, making the aircraft independent during ground maneuvers. This will save a lot of time, of course, but above all, it will

reduce fuel consumption as well as greenhouse gas and particle emissions. Airlines have welcomed this initiative very warmly.

Another area where electricity is being applied is the auxiliary power unit, or APU. The eAPU60 develops 90 kVA (kilovolt-amps) on the ground, and is designed for latest-generation airplanes, helicopters and drones. It has already been chosen for the AW189 from Leonardo Helicopters.

At the same time, Safran is launching a Research & Technology (R&T) platform to develop lighter "smart motors" – electric motors with integrated control electronics. These types of motors could be used for a wide range of applications, including helicopters, vertical takeoff and landing (VTOL) aircraft, bizjets and even single-aisle commercial jets. Other functions are also in the process of being electrified, including tail control surface and thrust reverser actuation. As early as 2011, an Airbus A320 made its first flight with

an electrically-actuated aileron, developed by Safran. Replacing hydraulics with electricity on functions like these means significant weight savings, which in turn offers major ecological benefits because of reduced fuel burn. Boeing's ecoDemonstrator program illustrates all the advantages of electrification, in terms of higher performance, lower costs and enhanced operability. In addition to the environmental and financial advantages, "more electric" solutions should also pave the way to other improvements, such as the development of new functions, easier servicing and preventive maintenance, because of a more powerful and connected health monitoring system.



### › LONGER RUN TIME

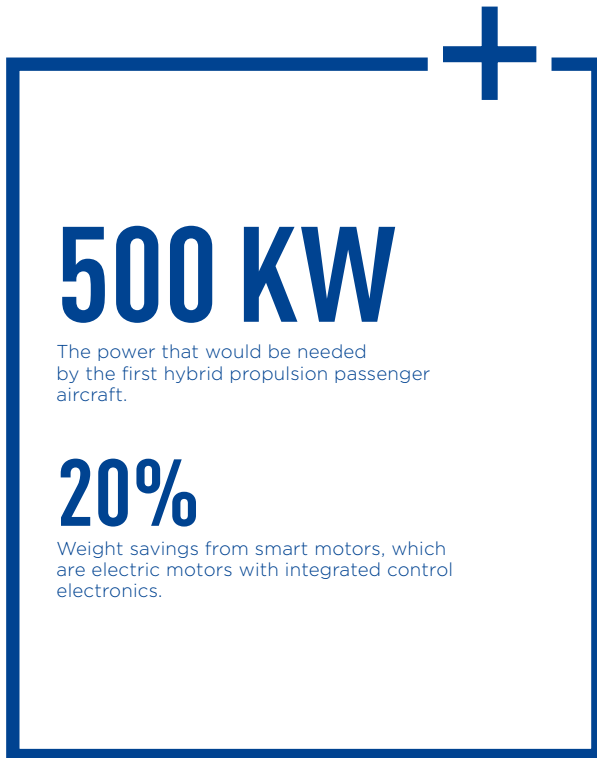
Safran is currently developing a fuel cell rated at 15 kW, which was ground tested at the end of 2017. This is a very promising alternative energy source that could eventually replace current solutions. Since it only consumes oxygen from the air and hydrogen, it emits no toxic releases and is totally silent. *“The fuel cell is a perfect solution for the growing electricity needs on aircraft, while drastically reducing environmental impact,”* notes Robert Vivier, head of innovation programs at Safran. *“The recognized expertise of Safran and partners in this field will contribute to a considerable reduction in pollution and noise. Our innovations are designed to give our customers disruptive, yet economically competitive solutions.”* The fuel cell offers long run time and can operate throughout a flight, including at high altitude. It will

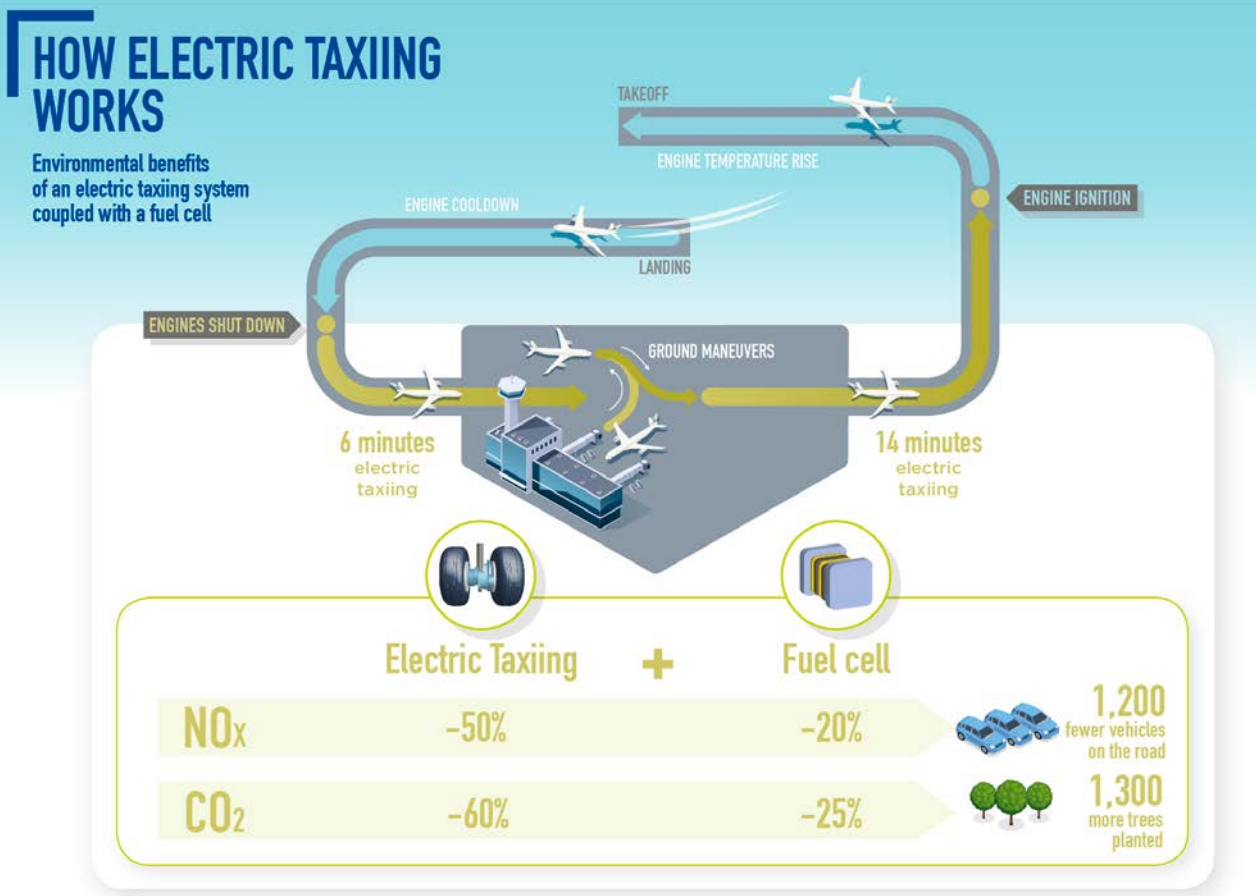
be ready in about five years for non-critical applications in the commercial aviation sector, requiring relatively little power. In the long run, fuel cells are being considered for higher power applications, such as the emergency system, which provides power to the plane in case of a jet engine failure, or certain functions currently handled by the APU.

### UPCOMING CHALLENGES

In commercial aviation, there are still significant barriers to electric propulsion, in particular battery power, energy storage density and recharging times. To power a current single-aisle jet with electric motors would take batteries weighing more than the aircraft itself, over 80 tons! Helicopters are another area of study, especially using hybrid propulsion systems. The idea is to associate a conventional turboshaft

engine with an electric motor, operating together or independently, depending on the flight phase or mission requirements. A hybrid system allows us to rethink the way engines are used, as well as onboard power management, resulting in optimized fuel efficiency coupled with maximum flight safety. All-electric propulsion could eventually be used in certain segments of an emerging market. ■





## SMART MOTORS: LIGHTER AND ECONOMICAL

Smart motors integrate control electronics to save weight. They use less wiring and fewer filters, with only a radiator. These weight savings cut costs by about 30%.



## SAFRAN'S CONTRIBUTION TO THE ECODEMONSTRATOR

In 2018 Safran is supplying a complete electrical system for Boeing's ecoDemonstrator, a program designed to improve aircraft environmental performance. Using four flying testbeds, the program has already tested about 60 technologies.



## ADDITIVE MANUFACTURING

# Olivier DETAILLEUR

**Director of Safran's additive manufacturing programs**

Mastering materials and processes is an integral part of Safran's DNA. Additive manufacturing (AM), known as 3D printing, is one of the Group's main development thrusts. Olivier explains our AM strategy and developments.



### What role does additive manufacturing play at Safran today?

**O. D. :** After several years of a learning curve, additive manufacturing, or 3D printing, has now become part of the production process. With today's heavy workload, we are introducing AM on current products. It allows us to address certain technical issues involving quality or the supply chain. We have already certified several parts, including the drain deflector on the CFM56-7B engine, a swirler for the Arden 1 and 3, Arriel 2 insert, and a turbine guide vane for the eAPU60 auxiliary power unit on Leonardo's AW189 helicopter. In other words, our printed parts are already flying. We are now picking up the pace, with about 20 new parts aiming for certification by the end of 2019. AM is also used on plastics, a more mature technology than for metals. This is one of the development objectives at Zodiac Aerospace, which is already 3D printing several cabin parts in commercial service.

### Tell us about the ADD+ initiative.

**O. D. :** Through this project we aim to unite our AM expertise across different companies and sectors to accelerate its introduction in the production process. Starting next year, Safran Helicopter Engines, Safran Aircraft Engines, Safran Power Units, Safran Transmission Systems, Safran Electrical & Power and Safran Additive Manufacturing will develop and ground test an Arrius-based helicopter engine demonstrator including more than 30% 3D-printed metal parts! The design of some parts will also be transformed: the rear stator module on the Arrius, comprising some 120 different parts, will be a single-piece part!

**“Safran’s approach is very clear: we are upgrading our products and design methods, and we are gearing up to make additive manufacturing a reality at Safran.”**





## 4

3D printed parts certified in February 2018.

## 30%

fewer parts in the future engine for the Boeing NMA, thanks to AM. That's the target!

## 1/3

The share of AM parts on the helicopter engine demonstrator, designed as part of the ADD+ project.

## 1 VS. 120

The number of parts in the ADD+ rear stator module demonstrator, versus 120 today!

### What's the Group's AM road map going forward?

**O. D. :** Additive manufacturing is still a relatively recent addition to our production operations. It creates value of course, but must still gain in maturity. These factors favor an approach based on support and investments, to make sure that Safran leverages value creation. We also know that machinery productivity will improve in the coming years, so we have identified several development objectives.

The first concerns our new products. For instance, the engine to be offered by Safran to power Boeing's future NMA (New Midmarket Airplane), a replacement for the 757, should include about 30% fewer parts than previous-generation engines! Our second focus is on design, to improve the robustness of supply chains, now con-

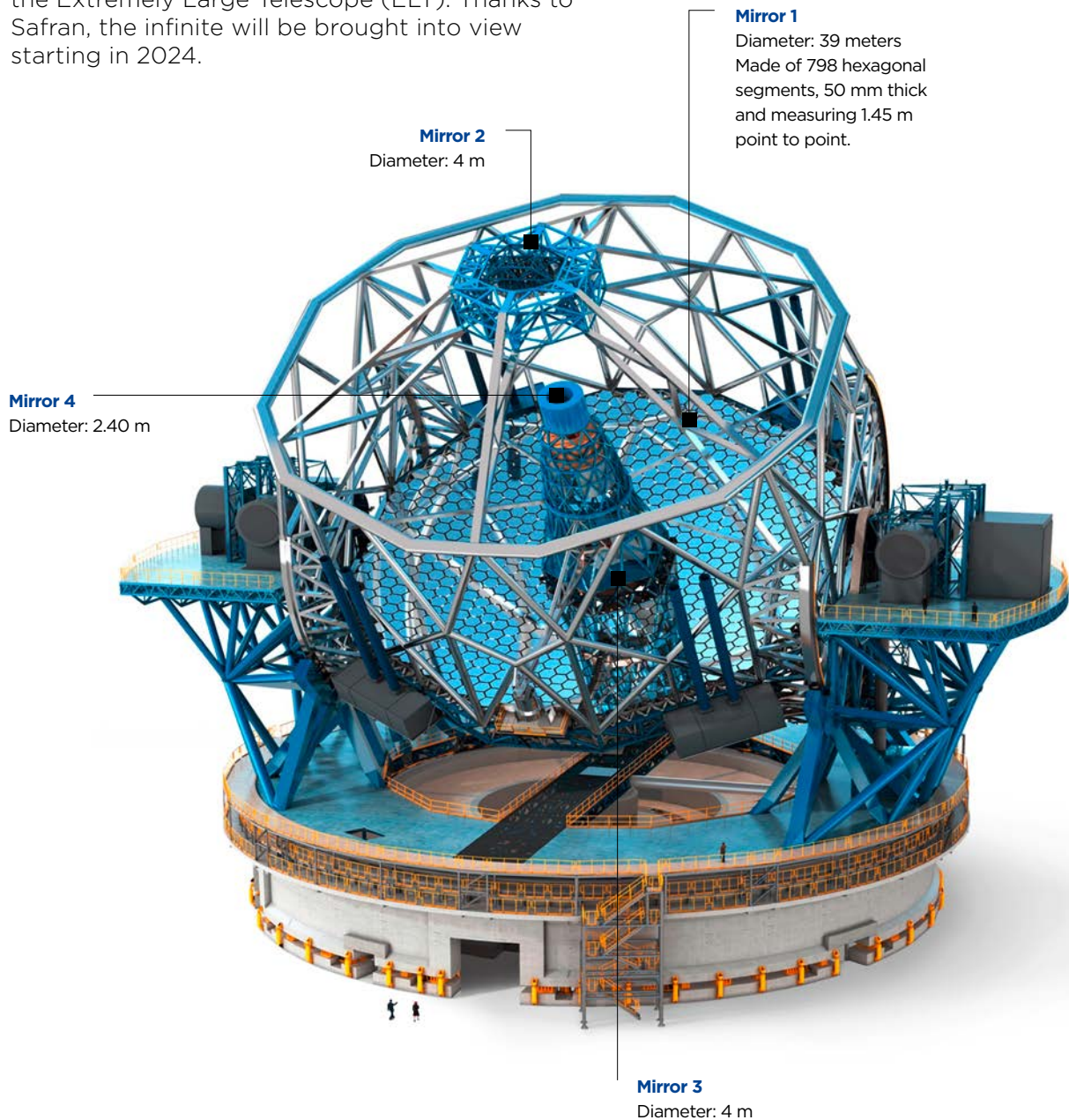
sidered vulnerable. One area of study is using AM instead of aluminum casting for certain new products. The third focus is the role of Safran Additive Manufacturing, our corporate R&T center. We want it to cover all parts manufacturing processes, and not just AM. That will allow it to offer better support for production functions, acting in conjunction with our companies. The fourth thrust is an analysis of how we organize additive manufacturing, from two different viewpoints: the questions of "make or buy", and "centralized or distributed".

We are therefore looking at the potential advantages of a central production unit that would work for all of Safran's business lines, compared with the current more integrated production organizations, including machine clusters distributed among our production

plants. We will be making strategic decisions on these four objectives by mid-2018. ■

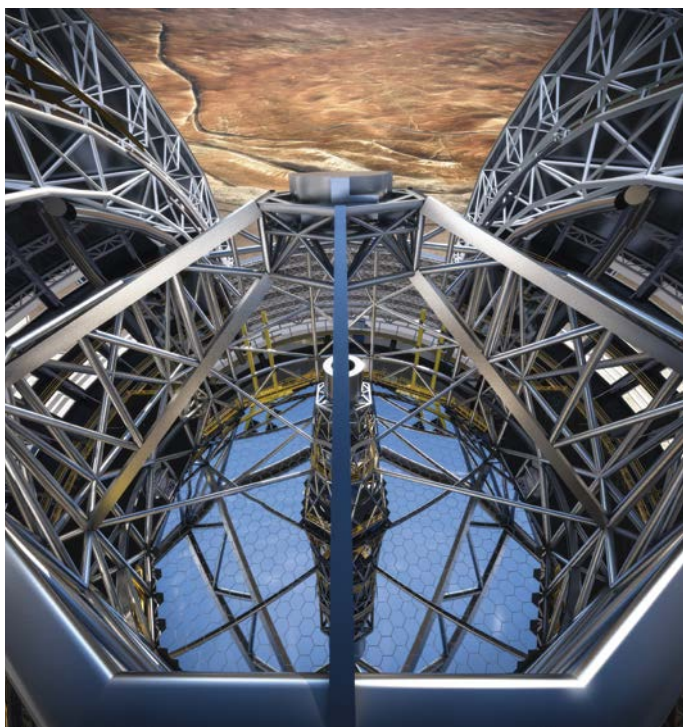
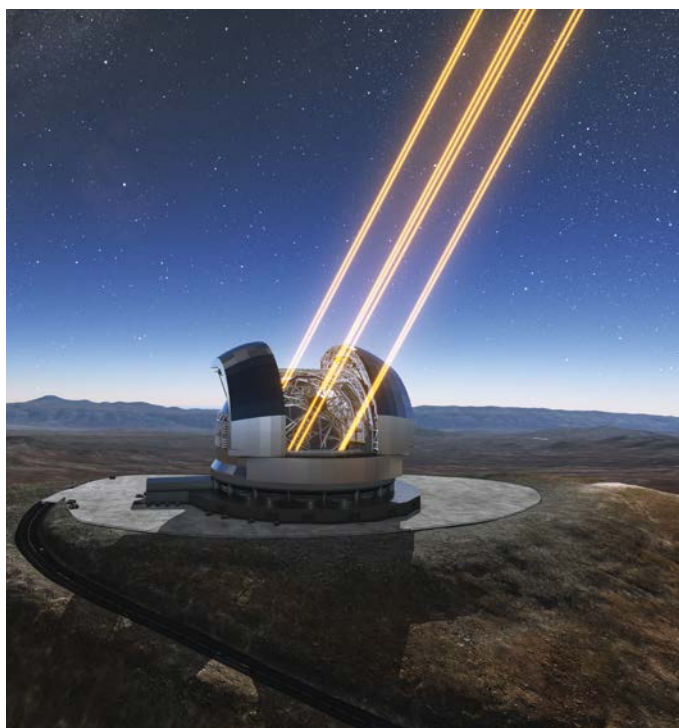
# SAFRAN, BRINGING INFINITY INTO VIEW

Founded over 80 years ago, Safran Reosc, a subsidiary of Safran Electronics & Defense, is the world leader in high-tech mirrors and lenses for observation satellites and telescopes. The European Southern Observatory (ESO) chose Reosc to polish and integrate four giant mirrors on the Extremely Large Telescope (ELT). Thanks to Safran, the infinite will be brought into view starting in 2024.



### ELT, THE LARGEST OPTICAL TELESCOPE IN THE WORLD

Now being built in Chile, the ELT should gather first light in 2024. Four to five times bigger than current telescopes of this type, it will be capable of detecting stars that are 16 times less luminous. Its power will enable astronomers to track organic molecules, while improving our understanding of the origins of galaxies. It should help reveal the secrets of black holes as well as exoplanets (planets circling suns other than our own).



### A MAJOR PRODUCTION CHALLENGE FOR SAFRAN REOSC

The mirrors in this telescope must be polished to a surface smoothness that ensures the virtually perfect capture of stars thousands of light-years away. Reosc also faces the huge challenge of polishing the 798 segments and spares for Mirror 1 in record time. Safran Electronics & Defense is therefore building a real “factory of the future” at its Poitiers site, featuring interconnected production machines and digital data processing of the segments’ 3D models. In a little more than a year from now, this facility will deliver the mirrors that will help us unveil the secrets of the Universe.

# SOCIABBLE, THE APP THAT BRINGS US ALL TOGETHER!



Discover the new social network created by Safran to help you learn about our link-up with Zodiac Aerospace, including strategy, key info and any other questions you may have.

## FOLLOW

Safran and Zodiac Aerospace news in real time

## LIKE AND COMMENT

on your favorite news

## CREATE

your "info wall"

