SAFRAN

OUR IN-HOUSE MAGAZINE
NO. 6 — JANUARY 2020

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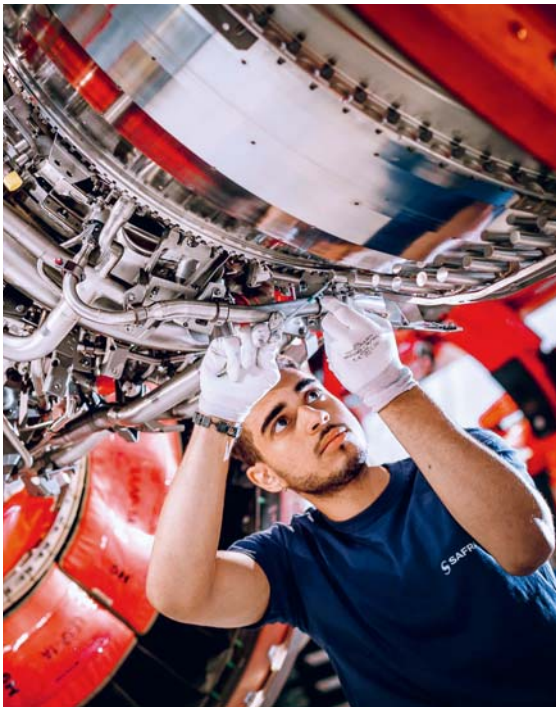
ONE TEAM

ONE BUSINESS



Top: Final assembly of a LEAP-1A engine. *Bottom:* Safran Seats employees receive training at the Cwmbran plant in Wales.

ONE FUTURE

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Design and production: BABEL
Photos by: Cover: Safran, Contents: R. Soret/Safran; A.Wiseman/Capa Pictures/Safran, P. 3: T. Laisné/Safran , P. 4: A. Martin/Safran, P. 5: P. Stroppa/Safran, P. Soissons/Safran, P. 6: Babel/Safran, T. Mamberti/Safran, P. 7: A. Daste/Safran, P. 8: M. Ben Mahmoud/Safran, B.Vallet/Safran, P. 9: C. Abad/CAPA Pictures/Safran, P. 10-11: A. Ollier/Safran, P. Boulen/Safran, T. Dosogne/Safran, P. 12: Safran, R. Bertrand/Safran, P. 13: B. Gold/Safran, Safran, P. 14-15: A. Wiseman/CAPA Pictures/Safran, P. 16-17: Laurent Pascal/CAPA Pictures, Safran, P. 18: Adrien Daste/Safran, P. 19: Raphael Soret/Safran, P. 20: A. Gomez/Safran, P. 21: R. Soret/Safran, P. 22-23: O'SHI/Shutterstock.com, P. 24 (patroller): R. Brives/Safran, P. 26: Luis Hagelsieb/Safran, P. 28-29: L. Hazgui/CAPA Pictures, P. 30-31: P. Soissons/Safran, P. 32-33: Freelance's l'agence/Safran, P. 34: R. Soret/Safran, P. 35: 2019 Gulfstream Aerospace Corporation, P. 36: F. Rogozienski/Safran, P. 37: A. Marc/Safran, P. 38: A. Daste/Safran, P. 39: B. Vallet/Safran, P. 40: B. Vallet/Safran, P. 42-43-44: Freelance's l'agence/Safran.
Printer : Imprimerie Vincent.

95,000 employees worldwide

Safran has become an increasingly international enterprise in recent years, with over half of our employees now based outside of France. Concurrently, we have expanded our global footprint. This is of course an advantage, since we are even closer to our customers, no matter where they are located. At the same time, we can call on state-of-the-art expertise to address fast-changing market requirements around the world.
Given our diversity and this global expansion, we have to be, more than ever, an enterprise without borders, one in which our people can have a fulfilling career no matter what country they work in, what job they do and what qualifications they have. Corporate Human Resources, which is increasingly international in terms of both its composition and its objectives, is making its primary goals mobility and helping each employee reach their potential —especially at a time when we are expecting to hire 40,000 new employees worldwide over the next four years. Each and every employee, whether in France, the United States, Mexico, India, Tunisia, Singapore, China or elsewhere, must have the opportunity to develop a fulfilling career within Safran —your enterprise! That's the pledge that I wanted to reiterate as we start the New Year.

Wishing everyone a Happy New Year !

STÉPHANE DUBOIS,
Executive Vice President, Human Resources

ONE TEAM

HAPPY FAMILIES

How about a fun and novel way to learn about Safran Transmission Systems, its programs and products? New hires enjoyed an induction experience featuring a special edition of the kids' game, Happy Families, to learn about their new company.

BOARD NAMES OLIVIER ANDRIÈS AS NEXT CEO

Safran's Board of Directors has chosen Olivier Andriès to succeed Philippe Petitcolin as Chief Executive Officer. The appointment will take effect on January 1, 2021, following a year-long transition period that started on January 1, 2020. At that time, Olivier Andriès will be named Senior Executive Vice President, reporting to the CEO.

WOMEN WHO RUN FACTORIES

Véronique Bardelmann, Zahira Bouaouda and Laura Herrera manage factories that make electrical wiring for aircraft. Véronique Bardelmann directs some 540 employees in Villemur, southwest France. In Morocco, Zahira Bouaouda is the President of Matis Aerospace which has 820 employees. Laura Herrera is in charge of plant 4 in Chihuahua, Mexico with 620 employees.

10,000

airplanes currently fitted with carbon brakes from Safran. They are produced at three different facilities: Villeurbanne, near Lyon in France; Walton, Kentucky in the United States, and Sendayan in Malaysia. A fourth plant will be added in Feyzin, also near Lyon, as announced on July 8 at an event attended by French President Emmanuel Macron.

DARWIN CHALLENGE 2020: INNOVATING FOR THE ENVIRONMENT

Safran Electronics & Defense has pledged to help protect the environment by launching an eco-responsibility challenge. The latest edition of the annual Darwin Challenge is opened to all employees and is designed to foster innovative new ideas by focusing on innovative solutions to help the environment. The winning project will receive development funding for a proof of concept in 2020.

INSITE, OUR GROUP-WIDE INTRANET

Since September 2019, employees at Safran Aerosystems, Safran Cabin, Safran Passenger Solutions and Safran Seats have full access to our intranet, Insite. Following this rollout, we take a closer look at the challenges involved.

Insite is an integrated portal that provides access to information as well as offering a collaborative workspace and a host of applications.

"Thanks to the 'Know Safran Purchasing' app, specifiers can find all the information they need in just a few clicks: buyers' names, procedures, standard specifications, Group contracts, etc. They can benefit from negotiated Group rates, a simple way of generating synergies as part of the integration of these new entities, without creating document overload!" ■

JEAN-PASCAL DE CASANOVE
Integration Project Manager, Safran Purchasing

+72%
of new users, on average, connected to Insite at least once a day in the month following the rollout.

77%
of all Safran employees now have access to Insite.

70
facilities connected to the portal in two months.

100
new contributors trained, out of 1,000 Group-wide.

"By grouping employees around a single information, sharing and services channel, Insite bolsters the Group's culture. Expanding its scope to our new entities is a strong signal in favor of integration," said Pénélope Rault, Insite manager at Corporate Communications, just a few months after the rollout of the portal to some 22,000 new users who joined the Group with the integration of former Zodiac Aerospace companies.

METICULOUS PREPARATION

A large-scale deployment like this required extensive coordination of all those involved. *"We had to meet two technical prerequisites,"* says Chantal Laura, project manager at Corporate IT. *"First, connecting Safran's computer systems while maintaining maximum security. Secondly, installing Outlook, which allows people to identify themselves and connect to Insite."* Once these conditions had been met, the portal was introduced in successive waves at some 70 facilities, working closely with local staff. *"Each time, we checked and double checked the technical configurations and how services were functioning to resolve any problems before the launch date."* explains Chantal Laura. While the technical aspects

VALÉRIE AUGER
Digital Communications Manager, Safran Cabin

—

"Two months after the expansion of Insite, we organized our first Digital Break event in California. This was an opportunity to refresh established contributors' knowledge, train new ones and, in general, introduce all employees to Safran's digital tools. It's important to support users in the post-deployment period, because there are numerous challenges. One of these was publication in multiple language versions. Safran Cabin has a very international footprint, especially in countries that don't use a Latin alphabet, like Thailand. Luckily, we found solutions to adapt the content into the local language. The other major challenge is how often content is updated. Contributors have to take the time needed to grasp Insite tools and procedures, so that publishing becomes a reflex." ■

› were an essential factor, opening Insite to new Safran companies wasn't simply an "IT" project. A management structure was also set up to oversee the portal on a daily basis. It includes an Insite manager at each company, and contributors in charge of publishing content. All received training before the rollout. Now that we have taken this first giant step, Insite teams are looking even further ahead. As Pénélope Rault explains, *"We will continue to improve services, ergonomics and the user experience. That's the aim of our Insite Neo project, which is designed to turn the portal into a full-fledged digital working platform."* ■

NIZAR BEN SAID
Tunisia Communications Manager, Safran Seats
—

"I contribute to the Insite pages for Safran's three facilities in Tunisia: Safran Aerosystems, Safran Seats and Safran Cabin. Since they're not far from each other, they often share the same local news, especially business, cultural or sports events organized as part of our wellbeing at work policy. I harmonize this information. Other subjects are specific to each facility, especially HSE indicators. Feedback from our employees has been very positive. They really appreciate knowing about developments at their facility, company and the Group. They readily started personalizing their profile so they receive content that interests them, and create user groups to manage their projects." ■

The project team *(left to right)*:
Maholy Andriantsitohaina, Richard Branco, Laura Boudena, Pénélope Rault, Iovan Valard, Azdine El Mansouri, Chantal Laura and Damian Tiarks.

AROUND THE WORLD OF SAFRAN

Introducing a team and different individuals from Safran companies, for a quick look at their career paths, their areas of expertise and their vision of Safran.

One Safran x 1,000!

The LEAP® Transient Bleed Valve (TBV) production team at Safran Aerosystems Ducts in Compiegne, France has proudly kicked off the 1,000th One Safran project. Congratulations to all Safran teams who have conducted these projects around the world over the last four years, at 109 different facilities in 16 countries. Drawing on this corporate management standard, they stepped up to the plate to improve their performance and bolster customer confidence.

“It all happens on the assembly line. To deliver quality products on time, I work closely with my team and coordinate a number of operational support functions.”

Arthur Cohin

GE CF34-8 and Airbus 320ceo
thrust reverser assembly line manager
at Safran Nacelles, France

“I lead the production and support teams to deliver thrust reversers that meet customer expectations. We have to ensure everyone’s safety, sustain a good team spirit and promote commitment to continuous improvement. That means not only being a good listener and communicator, plus responsiveness and independent decision-making, but also a forward-looking attitude to foster a shared vision across your team and plan ahead for the contingencies that could arise at any moment. With such a wide variety of tasks, no two days are alike. And that’s one of the things I love about this job, working on the shop floor and being in constant touch with different people. Along with my team, we’re making progress every day.”

Antoine Palladini

Test benches and special machines project manager, Safran Ventilation Systems, France

—

"Over the last four years, I've designed, developed, tested and serviced test benches and special production machines for aircraft fans. To date, I've designed about a dozen test benches. I like working on technical subjects as part of a team, and also devising innovative solutions to combine performance, safety, ergonomics and quality.
To meet our production needs, I have to design or modify tests very quickly, and that's a real challenge.
Safran is now setting up a network of industrial experts, and I was lucky enough to be chosen as a member, so I can share my knowledge of software standardization."

"My role is to design and integrate new technologies that boost the performance of automated machines."

Éric Englebert

Sustainable development project manager, Safran Aero Boosters, Belgium

—

"After 20 years in different production jobs, I became a project manager in the sustainable development department at Safran Aero Boosters.
My goal is to decrease our CO_2 emissions and support initiatives to reduce our ecological footprint.
I oversee talks on environmental issues and finalize solutions with our teams, from the installation of renewable energy sources to savings on consumables. I'm delighted to put my passion and expertise to work for my entity, so we can develop and coordinate actions in the Low-Carbon project and spotlight initiatives in the field."

"Our aim is to develop the Low-Carbon project and support employee initiatives to reduce our environmental impact."

INTERNATIONAL INTERNS: FLOURISHING IN A MULTICULTURAL ENVIRONMENT

Every year, more than 180 young adults are able to join one of Safran's international subsidiaries for a stint as an "international volunteer intern" (VIE). We asked four of these adventurous young men and women to share their experiences.

PAUL TERSEUR,
Design engineering,
Safran Transmission Systems, Germany

"I'm now in my fourth year at the Technology University of Belfort, France where I'm studying mechanical engineering and ergonomic design. As part of the program, we had to do a six-month internship this year. Since I absolutely wanted to go abroad, I applied for a VIE position in the joint venture between Safran Transmission Systems and Rolls-Royce, Aero Gearbox International, in Dahlewitz, Germany. I'm now working with a team of design engineers to develop the accessory gearbox (AGB) for the power transmission on a new business jet engine. I'm learning advanced engineering methods by working with teams in France and the U.K. When I graduate, I'd like to move to Germany, because there are so many opportunities in the two industries that interest me, automobiles and aerospace." ■

JUSTINE COTTY
Communications projects coordinator,
Safran Helicopter Engines, Germany

"With my degree in applied foreign languages, I went to Northern Ireland as part of the European student exchange program, Erasmus. I completed my master's degree in international communications strategy while working at Nissan France. During this time I heard a lot about VIE internships, and I wanted to go abroad again. Administrative details were handled through the Business France site, and the Safran HR team also worked closely with me. This really eased the process and helped me make the right decision. It also made my integration easier, because I didn't speak a word of German. I was warmly welcomed, and the multicultural environment in Germany was a pleasant surprise. Working outside your country makes you more adaptable, and it's a real adventure! You don't have to go to the ends of the Earth for a disruptive experience, either. I'll be in this position until April 2021 and I hope to stay with Safran, in France or abroad." ■

"C'EST LA VIE"?

VIE stands for "volontariat international en entreprise", or international volunteer interns. It's a type of contract that recruits people under 28 years old for a professional assignment in an international subsidiary of a French company. The VIE accelerates these young people's careers and strengthens local teams. As a matter of fact, these companies may offer the intern a job after the assignment.

GAËLLE BRETON
Program quality support
Safran Nacelles, United States

"After completing an internship in Britain at the end of my engineering studies, I wanted to extend my international experience as a VIE intern. The position offered by Safran Nacelles suited me perfectly, since I'd be working in two countries on the same project. Over a period of ten months, I first worked in production quality assurance at the composites unit at the Burnley plant in the UK, where I was assigned to a nacelle project for the new G700 business jet. Today, I'm at Gulfstream in Savannah, Georgia, where I'm the assistant to the operational manager for the G700 nacelle, seconded here for flight testing. It's a very enriching experience, not only for learning English, but also in terms of being open to different work and management cultures. I would eventually like to return to France, where I hope to find a job that has an international component." ■

MARIUS BITEAU
Customer support for the Asia-Pacific zone,
Safran Landing Systems, Singapore

"I'm posted to Singapore until June 2021, where I manage a portfolio of customers mainly located in Southeast Asia. When they contact me with technical questions or claims, I have two options: approve their aircraft to remain in service, pending a few minor repairs; or start the repair process along with the MRO teams if the technical problems are more significant. Being a VIE intern is one of the best ways to build up experience for a young graduate. In addition to perfecting my English and developing my product expertise, I'm learning how to adapt to different cultures. The customer relationship is very different in Europe and in Asia. I don't have any specific career plans after my VIE internship for the moment, but I'd really like to keep working at Safran." ■

CWMBRAN, ON TRACK TO HIGHER PERFORMANCE

The Safran Seats plant in Cwmbran, Wales experienced a major crisis in 2018. But the employees, backed by a largely new management team, embarked on a major transformation.

Production workflows have become more efficient, thanks to the reorganization of workshops.

600 +

employees took training courses in 2019.

30 to 60%

improvement in parts quality, across all programs.

Victoria Foy, recently named head of the plant, in the shop that makes Optima business class seats for United Airlines.

SAFRAN SEATS GB HAS TO BE A TOP-FLIGHT SUPPLIER

—

VICTORIA FOY
Executive Vice President, Safran Seats Great Britain (GB)

How do you see the Cwmbran plant?
I arrived in 2019 to find a company in crisis, but I also saw teams that were willing to fight for our business. The changes over the first year will lay good foundations for the future and help build a stronger business.

What is your vision for Safran Seats GB?
We have to be a top-flight supplier to airlines by boosting our competitiveness and inspiring excellence and trust. I want to engage and empower our teams in this direction.

Any other projects in the pipeline?
Yes, a number of them, from reorganizing the plant to our own entity's culture. Being a part of the Group has many advantages, not least the variety of tools and best practices that we can call on: the Safran Leadership Model, One Safran, the emphasis on continuous improvement, Lean, QRQC (Quick Response Quality Control)...

The Cwmbran facility specializes in the manufacture of business and first class seats for commercial airplanes. At the start of 2019, all financial and operational indicators were in the red.

MANAGING PRIORITIES

"Thanks to a team effort, we were able to meet our top goal, namely the on-time delivery of Optima seats to United Airlines, which accounted for 80% of the plant's workload in 2019," explains Celeste Thomasson, head of Safran Seats GB at the time. *"We also had to deliver new seats to Air France, both linefit and retrofit. Through our major initiative, we were able to restore the trust of these two key customers."* However, the plant's in-depth transformation was not limited to getting deliveries back on track. Other actions were implemented to get to the root cause of various issues.

REORGANIZING AND RESTRUCTURING

Employees now have a brand-new building with all amenities needed for their comfort, including a cafeteria, cloakrooms and showers. In addition to the obvious advantages, this also allowed the workshops to be reorganized for smoother workflows.
"We conducted the transformation collectively, by empowering everyone, identifying hidden talents and coming up with innovative production solutions," says Serge Rière, former Vice President for Production at Safran Seats GB. *"One of my key goals was to make sure we applied Safran's values."* In addition, a production school was set up in one of the newly vacated spaces. Since April 2019, over 100 employees have received two weeks of training, and another 500 have taken shorter courses. The plant set up a special area for customer visits, so that production would not be impeded. At the same time, operations were reorganized to clarify the role of different teams. Team leaders are now on hand daily in the production lines, while new back-office functions have been created. These changes are paying off: since January 2019, cycle times and quality defects per part have decreased by 60% across all programs. The transformation underway at Cwmbran will help restore Safran Seats' overall performance... and other projects are already in the pipeline! ■

ENGINE MAINTENANCE

The assessment TEAM

Safran Helicopter Engines, Tarnos, France

Patrice Ducos and his 14 team members are in charge of the Makila, Turmo and Astazou helicopter engines returned for servicing. We spent a day with this team of analysts, assessment specialists and quality technicians.

We start every day with a QRQC (Quick Response Quality Control) meeting, which involves discussing how to meet our commitments for the day and weekly challenges to resolve any problems as quickly as possible.

8:15 AM

When an engine arrives in our workshop *(here a Makila)*, we perform a borescope inspection and examine all parts. The borescope confirms the reason for the return and gives us an idea of what types of repairs are needed.

9:30 AM

Now it's up to the assessment specialists and fitters who disassemble the engine to examine the module requiring repairs.

10:45 AM

11:30 AM

Employees can use another technique —visual inspection!— to identify the extent of damage to parts.

ASSESSMENT AND REPAIR

—

When an engine needs to be repaired, it's the assessment team that has to identify the reasons for its return, examine the damage and issue recommendations on what's needed. The assembly team will subsequently handle the actual repairs.

1:00 PM

4:00 PM

The last step in the assessment process is drawing up the price quote. The technical report and the quote are then sent by the sales department to the customer for approval. Once the quote is accepted, the engine is sent to the assembly team led by Jean-Pierre Catroux for repairs.

ONE BUSINESS

100

100TH A330NEO NACELLE DELIVERED TO AIRBUS IN SEPTEMBER 2019

A major milestone for Safran Nacelles, responsible for the program from development to integration.

118°

OCTOBER 2019: AIR FRANCE TAKES DELIVERY OF FIRST AIRBUS A350 WITH BUSINESS AND ECONOMY SEATS FROM SAFRAN

In the business class cabin, 34 Optima® seats offer passengers a lie-flat bed, direct aisle access for all and an innovative configuration for optimal cabin density and superlative comfort. In economy class, the 266 Z300 seats can be reclined to 118°.

4

turboshaft engines from Safran Helicopter Engines were certified in 2019: Arrano 1A (Airbus Helicopters H160), Ardiden 3 (AVIC AC352), Ardiden 1U (Hindustan Aeronautics Ltd LUH) and Aneto-1K (Leonardo AW189K). Congratulations to everybody who contributed!

36

INDIAN DEFENSE MINISTER VISITS M88 ASSEMBLY LINES

It's at Villaroche that Safran Aircraft Engines makes the engines for the Rafale fighter. India has ordered 36 Rafales powered by the M88. The first was delivered to the Indian Air Force at Dassault Aviation's Mérignac site on October 8.

Olivier Andriès, CEO of Safran Aircraft Engines, and **Shri Rajnath Singh,** the Indian Minister of Defense, at the Villaroche plant near Paris.

FIRST NARANG REFUELING POD

After seven years of development, Safran Aerosystems has delivered the first NARANG* refueling pod to its customer Dassault Aviation for export. This latest-generation pod will significantly increase fighter range. It features higher fuel delivery rates and easier maintenance, for greater flight safety. The NARANG pod will also be supplied to the DGA (French defense procurement agency). *NAcelle de RAvitaillement de Nouvelle Génération pour avions de chasse (new-generation refueling pod for fighter jets).

LEAP-1A: BEHIND THE SCENES OF THE INDIGO SALES CAMPAIGN

The most significant announcement at the 2019 Paris Air Show was the deal signed with IndiGo by Safran Aircraft Engines sales teams, acting through CFM International. The Indian carrier has chosen the LEAP®-1A to power 280 Airbus A320neo and A321neo twinjets, in a contract also including long-term services. We look back at this remarkable campaign.

LEAP-1A.
Over 600 engines will be delivered to IndiGo from 2020.

Low-cost airline IndiGo was established in 2006. When it placed an initial order for 150 A320neos in 2011, it chose a Pratt & Whitney engine —the LEAP's competitor. Through the CFM International joint venture, Safran Aircraft Engines sales teams began forging a relationship with IndiGo in 2015, when it issued a request for proposals (RFP) with Boeing for 200 LEAP-1B-powered 737 MAX airplanes. Boeing was eventually ruled out, with IndiGo instead ordering 280 more Airbus jets to expand its neo fleet, with the engine to be chosen later.

"Due to availability issues with the competitor's engines, IndiGo chose to lease A320ceos powered by the CFM56-5B, which was a great opportunity for Safran Aircraft Engines," says Pascal Rondouin, Safran Aircraft Engines sales director for IndiGo. *"We finalized the contract in record time, and the customer really appreciated the professionalism of our sales and support teams."*

TRANSPARENT DIALOG

"As we moved to the next stage, we decided to be completely upfront with IndiGo engineers about the LEAP-1A's service entry," continues Pascal Rondouin. *"We held monthly meetings and traveled to India on a regular basis." "Talks were frank, and IndiGo engineers appreciated that CFM International explained all aspects of the LEAP's performance,"* says Norbert Hellouin, at the time regional manager for the Indian subcontinent at Safran Aircraft Engines' sales department. The meetings were constructive and paid off: not long after the start, IndiGo engineering managers submitted a report in favor of integrating the LEAP into their fleet.

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AIRBUS: INDIGO BACK FOR MORE!

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In late October 2019, IndiGo announced it would buy 300 A320 family aircraft in *"one of the largest orders ever placed by an airline,"* according to Airbus. The choice of engine has yet to be announced.

Contract signature at the Paris Air Show, June 17, 2019. Front: Ronojoy Dutta, CEO of IndiGo, and Philippe Couteaux, SVP Sales & Marketing, Safran Aircraft Engines.

Indira Gandhi airport. IndiGo deploys a fleet of over 230 airplanes, making 1,400 daily flights to 54 domestic and 19 international destinations.

COMPLEX REQUIREMENTS

Good news came in 2018, when a member of IndiGo's top management asked us to submit a CFM International proposal for 150 aircraft. *"In two hours, he gave us his roadmap in an extremely professional manner,"* says Pascal Rondouin. *"Their requirements included a lot of flexibility on our part and proved highly complex to model."* Two months before the signing, the scope of the final contract was revealed: 280 aircraft, instead of the initial 150. The size of the order meant close working relations were needed, with two or three meetings a week. In the final month, IndiGo's assessment team of ten specialists took up residence in France to facilitate talks. *"We needed to complete all four parts of the contract: the general terms of agreement, the letter of agreement, which finalizes the terms and conditions for the on-wing engines, plus spares and services,"* recalls Pascal Rondouin. *"We had to convince them on each point, which meant bringing in all the relevant people from across Safran: services and engine programs, the team responsible for modeling the services contract, the contracts and sales financial support team, the legal department, the teams at Safran Nacelles, as well as leasing company GECAS, a GE subsidiary." "Handling the Indian team at Villaroche was a bit tricky,"* says Norbert Hellouin. *"For them, France basically meant Paris. So Villaroche under a blanket of snow wasn't exactly what they had in mind!"*

SNATCHING A VICTORY

In March 2019, the sales teams were called to London for a closing meeting. The CFM International proposal had been favorably received, but a dozen complex points needed to be addressed. The airline's requests were mostly about the flexibility of our offer. *"Flexibility has a price tag. So we refused to give into all their requirements just to win the contract. IndiGo understood that turning to us came at a price —the price of quality, reliability and peace of mind,"* continues Norbert Hellouin. *"The switch from Pratt & Whitney to CFM International was also important for the airline's reputation, since its public image had suffered due to repeated problems with P&W engines, all duly reported in the Indian press."* In May, four weeks before the Paris Air Show, negotiations intensified. The Safran team had the unconditional support of a GE team based in Paris. The last three days were a real marathon, and Philippe Couteaux, Safran Aircraft Engines Senior Vice President, Sales & Marketing, was there

from start to finish. Directly negotiating the various points in the contract meant meetings with the customer alternating with drafting/signing-off sessions at CFM International to make sure GE and Safran were in sync. *"By the last night, our coffee machine had been so overused it gave up the ghost!"* recalls Pascal Rondouin. The deal was finally approved at 2:30 am on Monday, June 17 —the day the Paris Air Show opened— and was signed a few hours later.

SUMMIT MEETINGS

"In India, there's no agreement without good human relations," says Pascal Rondouin. So, our challenge was to connect our senior managers with their counterparts at IndiGo to build the trust needed for a future collaboration with huge financial stakes. The airline's top management met Olivier Andriès and Philippe Petitcolin on several occasions —and their rock-solid support was a decisive factor.

"In 20 years, I've never seen such an intense campaign involving so many engines plus an associated service contract," concludes Norbert Hellouin. For everyone involved, it was an extraordinary campaign with a fantastic outcome. It's a real team success! ■

"In 20 years, I've never seen such an intense campaign. For everyone involved, it's a real team success!"

NORBERT HELLOUIN
Zone Manager for the Americas, China and Asia-Pacific
Deputy in charge of global sales coordination for Safran Aircraft Engines

AN ICONIC DEAL IN MORE WAYS THAN ONE

PHILIPPE COUTEAUX
Senior Vice President, Sales & Marketing, Safran Aircraft Engines

Why is the IndiGo contract such a big deal?

As well as its sheer size —280 aircraft— it sends a clear signal to the market that a rapidly growing airline has the utmost confidence in CFM International, whereas it had chosen P&W for its initial order of 150 A320neos. IndiGo is a benchmark among low-cost carriers, especially for high-growth countries. Its decisions are observed and analyzed by other no-frills operators and may well influence their choices. What's more, this contract is in a region with huge potential. Safran Aircraft Engines predicts passenger traffic on the Indian subcontinent will grow by over 7% a year between now and 2038. Most Indian carriers are already CFM International customers: on November 1, the number of engines in service in this country stood at 468 CFM56s and 112 LEAPs.

PATROLLER, A VERY AMBITIOUS PROGRAM

From homeland security to long-endurance surveillance missions in remote theaters of operation, UAVs —unmanned air vehicles, commonly known as drones— have become essential for today's armed forces.
The Patroller™ drone from Safran Electronics & Defense has been selected by the French army. We take a closer look at this technology saga.

Working on a Patroller drone at Safran Electronics & Defense's Montluçon facility, central France.

AT A GLANCE

—

› 14 Patroller
ordered by the DGA from Safran Electronics & Defense.

› 6 ground stations,
which operators will use to fly the drones.

› 250 flight-hours
since the start of the program.

The Patroller is a long-endurance tactical drone with a multimission, multisensor payload and a wingspan of 18 meters (59 ft). It's designed to perform a wide range of operations as part of overseas deployments and homeland security, including surveillance of borders, coasts and sensitive areas. It can also provide support in the aftermath of natural disasters.

A COMPACT PACKAGE OF ADVANCED TECHNOLOGIES

Carrying a Euroflir™ 410 gyrostabilized optronics pod, the Patroller provides day/night imagery in the visible and infrared portions of the spectrum. It features endurance of over 20 hours, a range of 200 kilometers (124 miles), a payload capacity of 250 kg (550 lb) and a ceiling of 6,000 meters (almost 20,000 ft).

THREE GENERATIONS OF TACTICAL DRONES

Safran Electronics & Defense (formerly Sagem) has been designing and producing tactical unmanned aircraft systems (TUAS) since the 1990s. It provided the French army with the Crécerelle and the Sperwer, then developed the Patroller to meet a specific request from French defense procurement agency DGA, issued in October 2014. After a call for bids to build the future TUAS to replace the Sperwer, Safran was selected in January 2016, beating out Thales. Safran thus consolidated its position as the French army's preferred supplier, with three successive generations of tactical UAVs.

The development of the Patroller was a major undertaking for Safran Electronics & Defense. Starting with an airframe from Stemme of Germany, the company rethought the entire system to meet French army requirements. Safran's aim was to build the first European drone system to be certified to the latest NATO standards, while also being designed for civil aviation certification. In addition to its qualification, a prerequisite for any military aircraft, this certification was crucial, since it allows the Patroller to use civil airspace —one of the customer's primary requirements. Working with government agencies, Safran Electronics & Defense is fully mobilized to meet this challenge.

ALL-OUT COMMITMENT

This mobilization is all the more indispensable because an ambitious program like this is never smooth sailing —as shown by the crash of an aircraft during flight testing at the Istres air base in early December. Engineers now have to study this accident and determine the root causes to resume flights under safe conditions. The program will be delayed a few months, but Safran Electronics & Defense's objective is still the same: to deliver an even higher-performance product to the French army, one that will make everybody in the Group proud. ■

LIFE VESTS: 85 YEARS OF INNOVATION

Inventor of the first inflatable life vests for aircraft passengers in 1935, Safran Aerosystems Evacuation has risen to the rank of global market leader —thanks to its ability to adapt and innovate. From product design to production processes and digital technologies, we look at this business and industrial success story.

Above: Life vest production line at our plant in Liberty, Mississippi.

Left: The 5 millionth life vest produced by Safran Aerosystems Evacuation.

MIRACLE ON THE HUDSON

Life vests and evacuation slides/life rafts from Safran Aerosystems Evacuation have saved lives on several occasions. One example is US Airways Flight 1549. On January 15, 2009, the Airbus A320 ingested birds into both engines and lost power, forcing the pilot to ditch in the Hudson River, New York. Everyone survived!

In 2019, Safran Aerosystems Evacuation produced its five millionth life vest. This milestone was celebrated all the more enthusiastically as many still remember the difficulties of 25 years earlier. *"In 1994, our life vests had become obsolete and too costly to produce,"* explains President Mark Jeffers.

"They only accounted for a small part of our revenues, and management even considered halting production." Instead, they decided to forge ahead. Far from giving up on an activity it had pioneered, the company believed it could become the world's leading supplier of inflatable evacuation systems.

A team called "Vest Quest" was formed to devise a new business plan. Their mission: reduce production costs, meet the requirements of certifying authorities, make the equipment more effective and improve customer satisfaction. Everything was reimagined —from life vest design to manufacturing processes, the number and weight of components and the cost of materials. The situation soon turned around and business took off.

TALKING 'BOUT A LEAN REVOLUTION

Meanwhile, the market had moved on. Conventional life vests with dual air chambers were now being rivaled by single-chamber vests, which are lighter and more compact. Impressed by the space and weight savings on their planes, airlines began placing orders at a sustained pace. The team now faced a second challenge: ramp up production to meet demand. To do so, it adopted Lean Manufacturing methods from the automotive industry. It improved production and inventory management processes, thus shortening cycle times. After a 10% increase in two years, production jumped 17% in a single year. *"This is a result of the choices made by the Vest Quest team, but also the commitment of all our people."* says Mike Johnston, head of the life vests production unit.

According to Mark Jeffers, Vest Quest was the company's first Lean Team. *"The organization we put in place is still going strong,"* he says. *"And we've successfully applied it to our other product lines."*

5 MILLION AND COUNTING

The adventure continues. Safran Aerosystems Evacuation currently produces several hundred thousands life vests a year. For several years now, each vest is fitted with an RFID (radio-frequency identification) tag, which means airlines don't have to visually check under every seat to make sure they're all present. Instead, they use a reader to pick up the signal from each tag. Embedded QR Codes are also offered as an option, speeding up installation thanks to the information in the barcode. And Safran Aerosystems Evacuation is continuing to adapt to emerging market trends to further consolidate its leadership. ■

CUSTOM-TAILORED CASES MACHINED FROM SOLID

Safran Transmission Systems operates automated five-axis machining enters for its cases machined from solid. Between precision machining, shorter production cycles and skills enhancement for operators, innovation for LEAP® engines takes another leap forward!

CASTING OR MACHINING... THAT IS THE QUESTION

Safran Transmission Systems has set up five-axis machining centers at its two factories in France and Poland. These new centers are able to machine parts from solid, providing an alternative to foundry work, which is how we usually make cases. The conventional procedure can result in numerous dimensional variations of up to 2 mm from one as-forged case to the next. By machining them from solid, these variations are reduced tenfold to around 0.2 mm. However, the machining centers must be able to reproduce all the geometric features of the final workpiece. This improvement in quality is achieved thanks to the many size and shape variants of the workpieces to be produced at the new five-axis machining centers. Five-axis machining simply means the cutting tool can move in five different directions simultaneously. The operation is performed using closed-door machining, which automates the production of mechanical parts.

This process has multiple advantages: over and above the quality gains, lower costs and shorter cycle times, operators benefit from key advances in safety and ergonomics at all phases of production.

SKILLS DEVELOPMENT FOR OPERATORS

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Automated five-axis machining centers offer a host of advantages, from easier organization of work tasks to reduced HSE (health, safety and environment) risks. The production machinery is also more complex, requiring a higher level of analysis and monitoring by operators.

A TRIUMPH OF TEAMWORK

The case for a power transmission system is an extremely demanding part to make, with tolerances of a few tens of microns. For this reason, the slightest deformation during the machining process must be eliminated. To meet this challenge, the case design was completely rethought. Even though Safran Transmission Systems has been using this machining process to make cover plates for 30 years, machining cases from solid required no less than two years of research and development. It was a remarkable collaborative effort with engine-maker Safran Aircraft Engines and its supplier Mécafi, which also helped test the procedures and the first machined parts.

In 2016, Safran Transmission Systems geared up for production of the first solid-machined LEAP cases at its plant in Poland.

Power transmission case for the LEAP-1B, produced at our new five-axis machining center.

TECHNOLOGICAL EXPERTISE AND A ONE SAFRAN PROJECT

To support the rollout of this new production capability and the solid machining process, Safran Transmission Systems implemented a One Safran project. For 12 weeks, the teams worked on the production engineering process to great effect.
Their objective was to ensure production schedules are met, achieve the target machining times, produce fully compliant parts and eliminate HSE risks for operators. ■

SHARMICA RAVINESAN

Investments Manager at the Industrial Engineering Department

"To gear up for the production of LEAP-1B cases using the machining from solid method, a multidisciplinary team was set up at our plants in France and Poland. The team was involved in this One Safran project for 12 weeks, and its success really moved the initiative forward.
They focused on FMECA (failure modes, effects and criticality analysis), but also risk analysis, workflow mapping, ergonomic handling solutions, operator training, statistical process control and production engineering of tools and cutting tools. All these methods have helped employees get to grips with the process."

VILLEMUR-SUR-TARN EMBRACES INDUSTRY 4.0

Accelerate the digital transformation and remain the melting pot of innovation projects for rollout across our wiring harness production facilities —that's the chief aim of Véronique Bardelmann, General Manager of Safran Electrical & Power's Villemur-sur-Tarn plant, just north of Toulouse. Her ambition is to ensure the French site stands out for its ability to innovate

"What if automating wiring harness production became possible?" That's the question Véronique Bardelmann asked her teams —convinced of their potential to spawn new ideas and put them into practice. For three years, the plant has been undergoing a digital transformation and innovating to improve the quality of deliverables, boost productivity and make work tasks easier for operators. Spurred by the division's Operations department, the Factory of the Future initiative is accelerating this transformation. *"At Villemur-sur-Tarn, new technologies just weren't finding their way into our workshops,"* says Damien Lemoine, industrial development manager for the division. *"Everything was still manual —production files, monitoring and inspection, etc."*

DIGITAL DAY TO DAY

From customer data to production launch and delivery, a series of agile digital applications has now replaced paper. Operators have their production files on-screen, then electronically sign off on each inspection step. The upshot is better traceability, a smaller carbon footprint and lower archiving costs. A "plug aid" shows them where on the connector each wire is inserted. All workstations are being upgraded. *"We've doubled our installed base of IT equipment —digital's becoming the routine way we work,"* says Damien Lemoine. "Automation isn't easy," adds Véronique Bardelmann. *"The configuration is usually different for each aircraft and it varies during production. So there's little reproducibility and, in principle, no possible automation."*

The teams analyzed each work sequence in the production process to devise an automation strategy. A new machine strips and crimps the wire ends, while another marks, cuts and re-bunches them for each sequence. On a simple harness, like the wiring for the Airbus A350, almost complete line automation is planned.

FURTHER OPPORTUNITIES

Another candidate is inspection. *"We're talking with our Niort plant in western France about implementing camera-based inspection with image recognition, or e-Inspection,"* continues Damien Lemoine. *"We're using it to inspect circuit breakers in electrical cabinets to detect configuration and labeling errors."* Working with Safran ergonomists, Villemur-sur-Tarn is also looking at how cobotics (collaborative robotics) could help protect employees from musculoskeletal disorders.

"Our cobot performs electrical tests on circuit breakers to ensure they're working correctly. It replaces human inspectors, who currently perform 1,200 repetitive tasks every day."

DAMIEN LEMOINE
Industrial Development Manager for the Division

e-Inspection system presented at the management meeting in October 2019.

"Our cobot will perform electrical tests on these same circuit breakers, taking over the 1,200 repetitive, labor-intensive tasks currently performed by humans every day," adds Damien Lemoine. The digital transformation has opened up other possibilities, such as the Data Factory project, which collects digital information, correlates and analyzes it to improve performance. The next stage is real-time on-screen production monitoring, which will enable operators to plan and perform tasks autonomously. *"These advances couldn't happen without the engagement of all our people,"* says Véronique Bardelmann. *"We're supporting them as they embrace these changes, especially through specific training courses and continuous communication."* ■

DIGITAL MANUFACTURING POOL

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In 2017, Safran Electrical & Power put in place a Digital Manufacturing team within its IT department. It aims to develop applications, leverage the value of data and support Factory of the Future projects, such as the initiatives at Villemur-sur-Tarn. *"We're using an agile method called SmartDev, which is an effective way of defining project parameters and making adjustments going forward,"* says Cédric Granelet, manager of the unit.

JOURNEY TO THE HEART OF THE F8X LANDING GEAR

Safran Landing Systems is the world leader in aircraft landing gear. The company equips and supports around 27,000 aircraft from leading airframers, including Airbus, Boeing, Bombardier and Dassault Aviation. Here we take a closer look at the landing gear on the ultra-long-range Falcon 8X, the latest addition to the Falcon business jet family.

Side view of a Falcon 8X

1 NOSE GEAR

2 MAIN GEAR

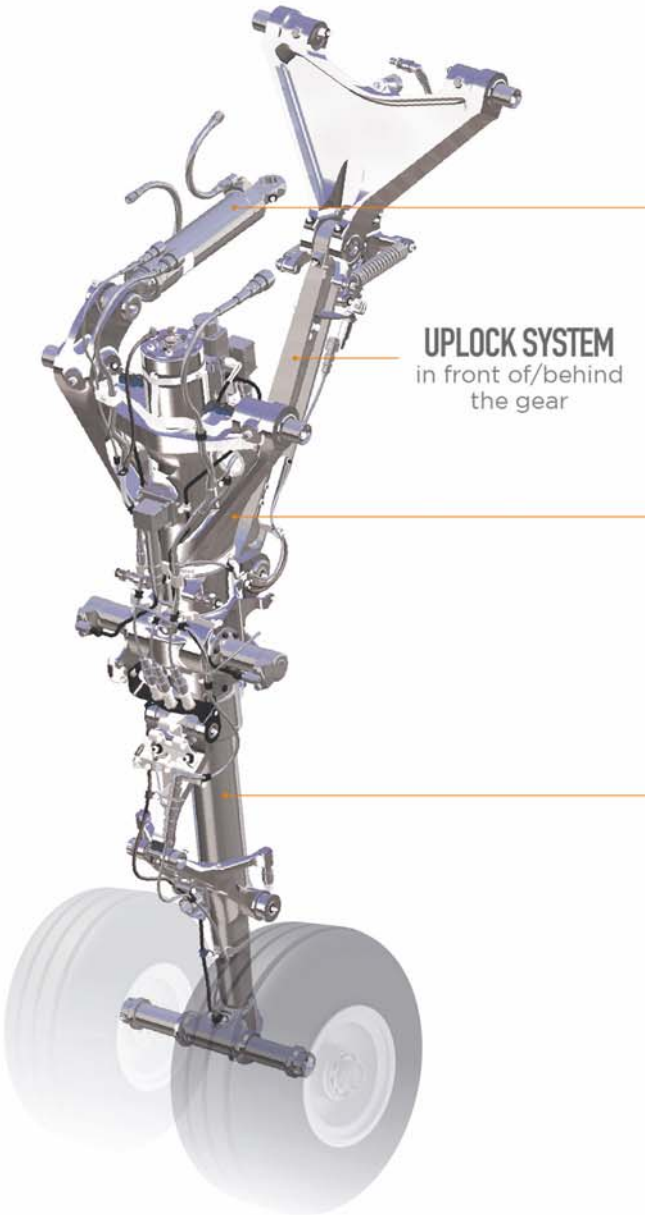
Safran Landing Systems has supplied the landing gear for Falcon business jets from the very first model, launched by Dassault Aviation in 1964, to the latest Falcon 8X. All Falcons have hydraulically retractable tricycle-type landing gear. The main gear retracts inward and the nose gear retracts forward.

1

NOSE GEAR

Weight: 80 kg

Service life: 20,000 flights



UPLOCK SYSTEM

in front of/behind the gear

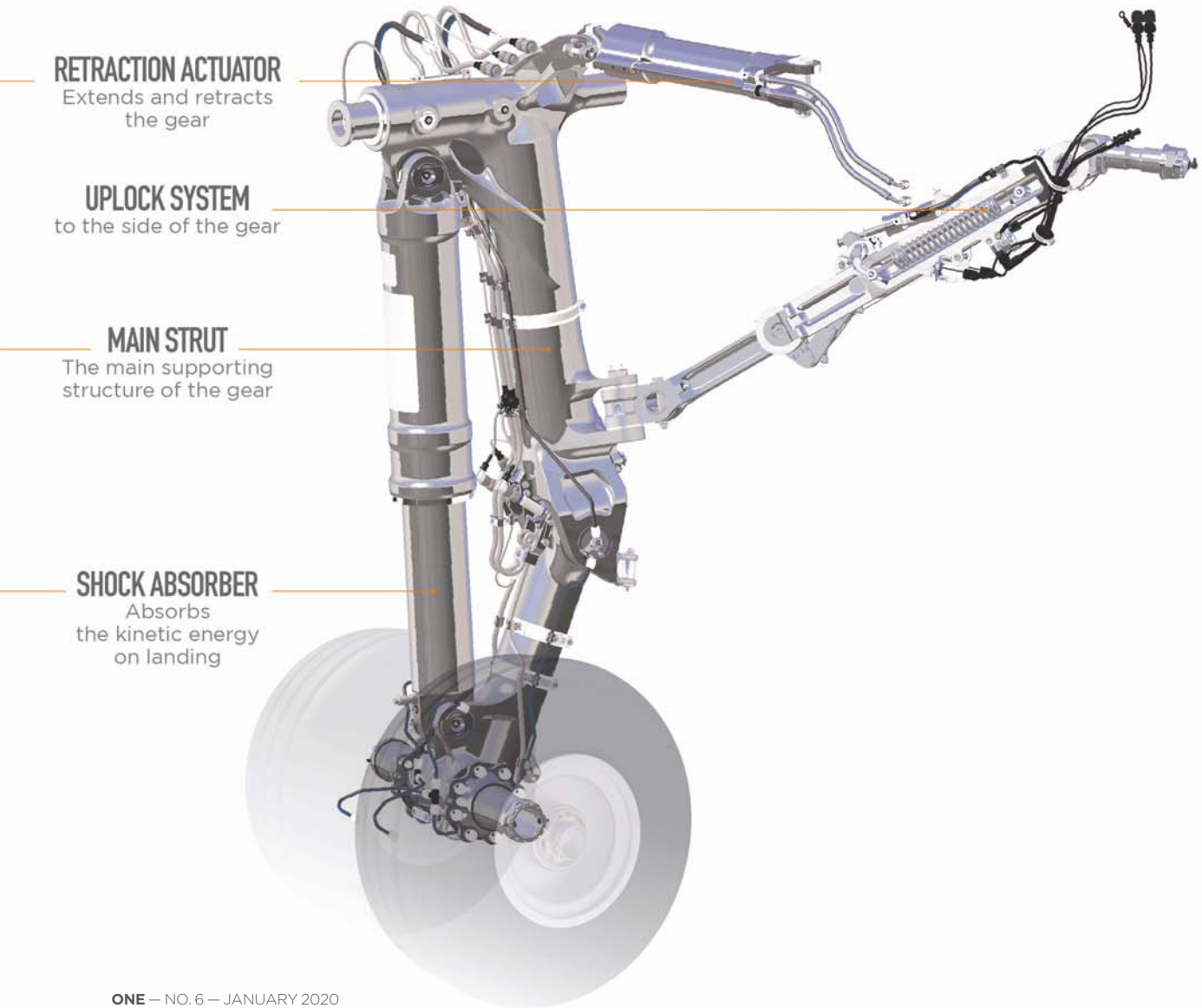
2

MAIN GEAR

Weight: 169 kg
Service life: 20,000 flights

NOSE GEAR/MAIN GEAR: WHAT'S THE DIFFERENCE?

On landing, the main gear must support the aircraft's entire weight — that's 28 metric tons for a Falcon 8X coming in at 200 km/h — until the nose gear touches the tarmac



ONE FUTURE

At Safran Helicopter Engines the I-magine digital workshop allows operating staff to express their needs, help find solutions and participate in development and then application tests with the support of specialized IT teams. This work is carried out according to an innovative and agile methodology known as Boot Camp!

INTRAPRENEURS: SEASON 2

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A Safran jury has selected the seven intrapreneurial teams that will receive advice from the EM Lyon business school, to help them draw up a sound business plan for their innovative project. The next step will be on March 31, 2020, when the winning teams will be chosen to join the "Safran Booster".

MAKING SENSE OF CUSTOMER FLIGHT DATA

More than 80 employees from Safran companies took part in the Flight Data Acquisition Strategy seminar near Paris in early October. This data-driven get-together allowed participants to compare results and share expertise in in-flight customer data, allowing them to identify the challenges and opportunities ahead.

EXCELAB

On September 26, 2019, Safran Board Chairman Ross McInnes *(second from right)* and Jean-Paul Alary, CEO of Safran Landing Systems *(right)*, welcomed Valérie Pécresse, President of the Ile-de-France (greater Paris) region, to lay the cornerstone for a new research lab dubbed ExceLAB in Vélizy, near Paris. Outfitted with a full slate of digital tools, this lab will bring together all testing capabilities for future equipment developed by Safran Landing Systems. It also reflects Safran's strategy to support the gradual electrification of aircraft functions, and features an optimized organization for hydraulic and electric testing.

In October 2019, Safran Nacelles unveiled its nacelle for the Rolls-Royce Pearl 700 engine that will power Gulfstream's new G700 business jet. The company is in charge of the development and manufacture of this premium nacelle, which is now in production.

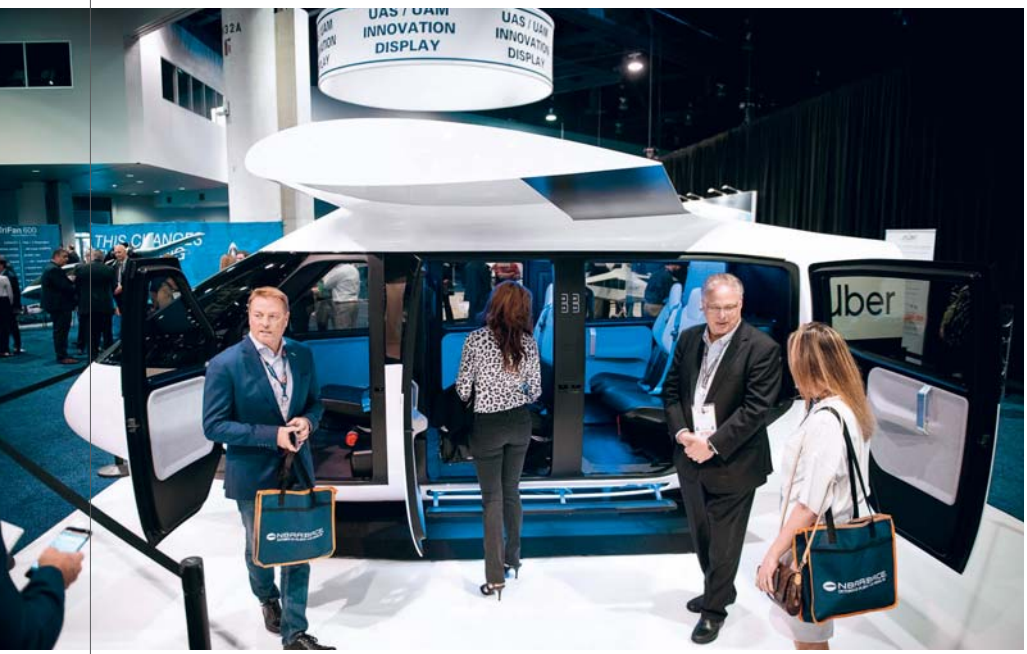
FLYING TAXIS: (ALMOST) READY TO TAKE OFF

Are autonomous flying taxis about to become a reality? Safran Cabin thinks so —and is poised to play a key role in this promising new market. Our Mission Driven Cabin prototype is specially designed to provide future passengers of eVTOL (electric vertical takeoff and landing) craft with an unrivaled flying experience.

Short-distance urban flights have long been the realm of science fiction. But what was once eccentric daydreaming is now happening and, indeed, may actually become a necessity.

A NEW ERA OF 3D INFRASTRUCTURE

Why a necessity? The answer can be summed up in two words: urban congestion. *"Cities are now home to over half the world's population,"* says Norman Jordan, CEO of Safran Cabin. *"Meanwhile, urban transport infrastructure is reaching its limits: speeds are slowing and environmental impact is growing. To achieve efficient and sustainable growth, transport systems must become three-dimensional, instead of two-dimensional. A typical 90-minute car ride today could be turned into a 15-minute flight!"* In recent years, various sectors have taken a serious look at urban air transport: automakers (Audi, Porsche), on-demand transport (Uber) and of course aerospace, with Airbus, Bell, Boeing and Safran out in front. All agree: the future of urban air transport lies with eVTOLs. However, a major issue remains: what kind of cabin should these flying taxis have? Safran Cabin has come up with a revolutionary answer: the Mission Driven Cabin. In May 2018, Norman Jordan and team attended the Uber Elevate Summit in Los Angeles and expressed an interest in working with Uber on cabin development. *"We invited Uber to visit our Safran Cabin design and innovation studio,"* recalls Scott Savian, Executive Vice President, SKY and Research & Technology at Safran Cabin *"We immediately developed an excellent rapport, which became the launch point for a highly collaborative design partnership."*



Cabin mockup unveiled at the NBAA business aviation convention in Las Vegas, October 2019.

"A typical 90-minute car ride today could be turned into a 15-minute flight!"

NORMAN JORDAN
CEO of Safran Cabin

SAFRAN CABIN AT A GLANCE

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> World leader in aircraft cabin interiors, cabin hardware for regional and business jets, cabin liners, galleys, trolleys and containers.
> The company has 6 divisions, 25 facilities and 13,000 employees.

Mockup of the Uber flying taxi at the Uber Elevate Summit in Washington DC, June 2019.

NO STONE UNTURNED

As the world's leading aircraft interior provider, it was only natural for Safran Cabin to tackle the challenge. Still, *"VTOL cabin design is complex,"* says Glen Noda, Industrial Design Director at Safran Cabin. *"For economic reasons, a standard module would be the best solution. Ingress and egress must be easy for passengers with luggage, so the aircraft is grounded for the shortest time. The cabin must be tough and easy to maintain. Above all, it must provide a great experience for passengers of all sizes and ages, who'll often be strangers to each other."* The initial meeting was followed by a year of intense co-creation: *"Interaction between Safran Cabin and Uber was incredibly positive,"* says Ian Scoley, Vice President, Design and Innovation Studio. *"Our industrial resources allowed us to test a myriad of possibilities and make quick changes if needed. We went as far as building six full-scale mockups, with several iterations, looking at the seats, liners, window positions and more —we left no stone unturned!"* This collaboration culminated in a dramatic reveal of a complete Mission Driven Cabin at the Uber Elevate Summit in Washington DC in June 2019.

APPARENTLY SIMPLE

The result is a zen-like cabin for four passengers and luggage: under its apparent simplicity, it infuses wellness while delivering the ease of use required by Uber. The four seats are in a herringbone configuration, so passengers have privacy —they slightly turn their backs to each other— more room and a better view. eVTOLs are a dramatic leap toward this new future. And soon they'll be part of our daily lives!! ■

ELECTRIC MOTORS: MEETING THE PRODUCTION CHALLENGE

Safran Electrical & Power has developed new families of electric generators and motors, GENeUS™ and ENGINeUS™, respectively, along with the GENeUSPACK™ line of smart batteries and the power management system GENeUSGRID™. The company is being asked to provide part or all of the propulsion system for new vertical takeoff and landing (VTOL) aircraft. Today, it's gearing up for production rates and quantities never before seen in aviation.

Safran's ENGINeUS electric motor on display at the 2019 Paris Air Show.

Safran Electrical & Power will have to produce its ENGINeUS electric motors at an unprecedented rate, as the market for these versatile new VTOL aircraft becomes a reality. *"With each VTOL platform requiring eight to twelve electric motors, we will have to produce about a hundred in 2020,"* explains Stéphane Jaspart, the company's Vice President for Industrial Strategy. *"Subsequently, forecasts indicate we'll have to turn out one motor every four minutes. And we'll have to be ready when the time comes."* Previously an executive in the auto industry, Mr. Jaspart came to Safran to share his expertise and transpose the industry's proven mass production methods to aviation. *"Since our production rates could eventually equal those in the auto industry, we will need factories that apply a similar production model, geared to a drastic reduction in costs, impeccable quality control and performance."* In other words, the same demanding require-

Safran Electrical & Power's prototype assembly line at the Réau plant in the Paris area.

ments governing the next generation of aircraft developed by major manufacturers. *"Our approach, based on quality and cost control through automation, as well as internal and external production process control, is applicable to all our products in the aviation industry,"* adds Jaspart. *"It will keep the company in sync with planemakers' evolving requirements."*

OPTIMIZED DESIGN

Plants in the United Kingdom (Pitstone) and France (Réau) have installed the first prototype production lines. Our British teams are in charge of the mechanical parts of the motor, while their French counterparts handle the integrated electronics, testing and final assembly. *"It's the first step before we gear up for actual production,"* points out Jaspart. "Prototyping allows us to sign off on different technical solutions, perform tests and deliver the first motors to our customer. It also means we can streamline the design process, using system engineering solutions. Corporate engineering, local engineering and production engineering teams are all involved very early in the process, working together to optimize the design."

OBJECTIVE: PERFORMANCE!

Once prototypes have been built, the production engineering phase is critical. As Stéphane Jaspart says, *"We have to standardize, automate and digitize our prototyping and then production lines in order to be competitive, ensure cost-effective production and deliver products on time and to spec."* Safran Electrical & Power planned a physical mockup of its first pilot line, followed by a virtual model, to make sure it would deliver the expected performance. *"We also have to review our key production engineering processes, in terms of what we will do in-house, and which components and machines are to be bought in. Today, we are confirming our industrial strategy,"* adds Jaspart. In fact, supplier performance management is a key to the production model, as Jaspart explains: *"We support and audit our suppliers to make sure they can keep up with our new production rate, by automating production or designing new machines. Like all stakeholders in this initiative, they are involved very early in the game."* On the shop floor, employees are also engaged in this process, which includes evolving job responsibilities. *"Operators will become line managers, taking responsibility for controlling and servicing their machines,"* notes Jaspart. *"We will have to support these changes and provide training to enhance skills."* ■

SAFRAN ANALYTICS

Alexandre LACHAIZE

Product manager

Alexandre Lachaize has been a product manager at Safran Analytics since 2019. He tells us how the company's service portal, an online service solution for Group companies, has changed to deliver even better service to internal customers.

What exactly is the Safran Analytics data service portal?

A. L.: IIt's a one-stop digital solution, available to all Safran companies, that we created in 2018. Accessible via Insite, it's a mini-site with multiple objectives. Users can access various trainings to add skills in data analysis, or ask for individual assistance to meet strategic needs in data analysis, for all products and services from Safran companies.

Our aim is to make this site the central platform for everyone dealing with data at Safran. To meet this goal, we have constantly upgraded our portal since it was created in 2018, with support from a multidisciplinary team, comprising experts in UX design, data science, DevOps, data management, programs, transformation, etc. Our project team also contacted various Safran companies so we could better understand their expectations, including Safran Electronics & Defense and Safran Aircraft Engines.

Our advantage lies in our agility. By nurturing a constant two-way dialog with users, we can address their specific concerns. The continuous improvement of our portal means we offer employees a better user experience, with directly available data services.

2018
Creation of the Safran Analytics service portal

9
members of the data expert team.

190,000
lines of code for the portal to operate.

1,400
users.

What are these new features?
A. L.: In addition to the tools already in use, such as Datahub Aero, Data Bootcamp, Data Garage and Data Clinic, what's new and exciting this year is the launch of Data Advisor. It's a sort of TripAdvisor for data tools. Data experts can evaluate systems for data collection, processing, analysis and display. Take Spark, for example, for use by specialists, or Power BI, intended for the general public.
More changes are planned this year, especially the launch of a data blog for people who don't necessarily want to become data scientists. The blog will be adapted for use by all employees.

"Data analysis is within everyone's reach, thanks to the Safran Analytics service portal."

In other words, our service portal becomes a participative forum by favoring shared data intelligence and expert views on these topics. In the final analysis, the aim of this blog is to give users whatever they need to enhance their skills, with practical examples.

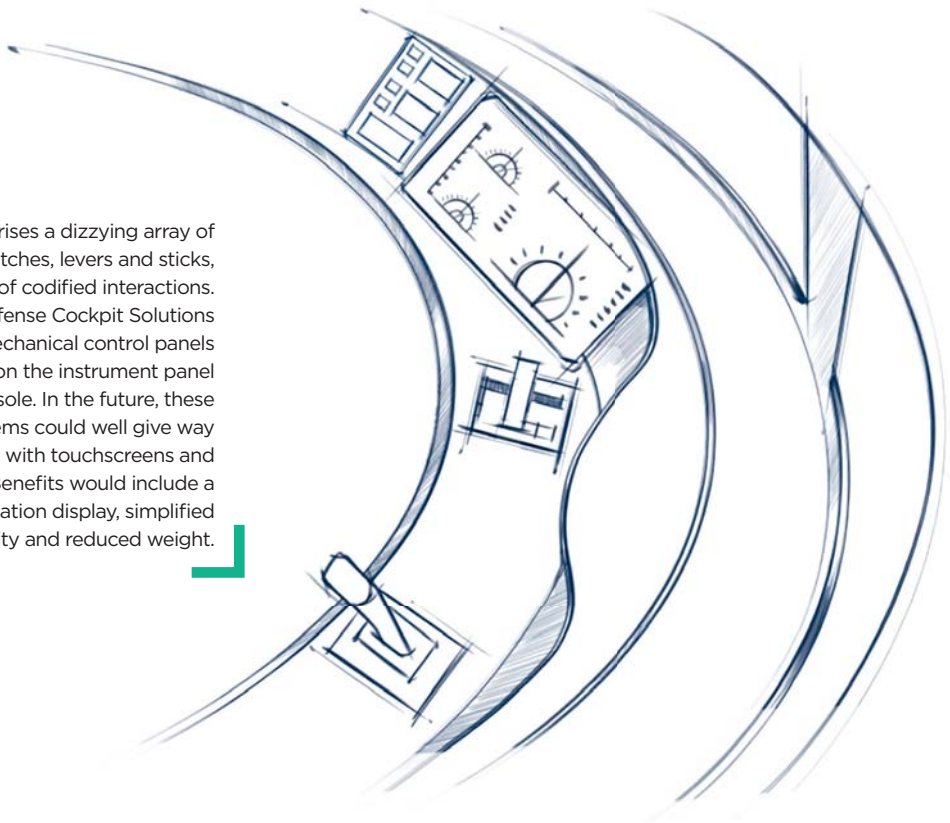
This portal is designed to foster a data culture among all employees. Why is this important for the Group?
A. L.: More than just technological, the challenge is above all cultural. You can't just decree that we have to leverage data to help the company progress; you have to try things out, and that starts by looking at our daily activities with a fresh eye. All of us handle huge amounts of data, without really paying attention or asking ourselves how we can make this data "talk". Our goal is for the portal to allow everyone to realize that data is not just a matter for specialists, but that it's also a mindset, like the Lean approach. We want all companies to change their habits and become immersed in a data culture.
In conclusion, it's important for everyone to remember that Safran Analytics' mission is to "anchor data as a growth driver for the Group." To do this, we must be fully aware of its potential value. In fact, this is such a critical challenge that the dedicated portal team doubled in size in 2019. ■

DESIGNING TOMORROW'S COCKPITS

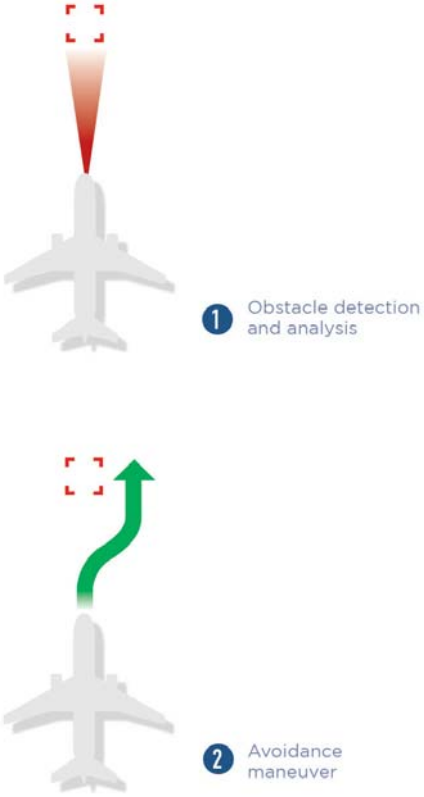
Innovative new mobility solutions are being devised, from flying taxis to reimagined urban logistics. However, this novel approach to transport modes will considerably increase air traffic. And the interaction between different types of platforms will make flying more complex. That's why tomorrow's cockpits will have to be redesigned to keep on ensuring flight safety.

REDESIGNING THE COCKPIT AROUND PILOT AIDS

The human-machine interface is at the heart of this trend, with several approaches being studied. For instance, making flight controls more intuitive would facilitate the pilot's understanding of the aircraft's health and immediate environment. At the same time, increasing automation and digitizing all cockpit functions would reduce pilot workload. At the individual level, monitoring the pilot's health and attention level would further enhance flight safety.



A flight deck comprises a dizzying array of screens, buttons, switches, levers and sticks, requiring an array of codified interactions. Safran Electronics & Defense Cockpit Solutions supplies the electromechanical control panels located overhead, on the instrument panel and on the center console. In the future, these electromechanical systems could well give way to all-digital interfaces with touchscreens and programmable buttons. Benefits would include a more user-friendly information display, simplified controls, higher reliability and reduced weight.



As always, flight safety would be paramount, with the guarantee that the aircraft follows its programmed flight path in autopilot mode. However, current studies are considering the automated programming of a change in the flight plan, if the airplane risks a collision with an unexpected object. That's where "sense and avoid" comes in, a technology Safran Electronics & Defense has helped pioneer. Sensors monitor the airspace ahead, while image-processing algorithms interpret any objects and decide whether an avoidance maneuver is needed. If so, they calculate the safest possible deviation and guide the aircraft accordingly.

Every year,

4.5 BILLION

people want
aerospace to continue
connecting the world,
while also protecting our planet.

We are

95,000

strong, with the confidence
and determination to accomplish our mission
and make access to the sky

even freer, more comfortable, safer and greener.

Happy New Year
and a safe and fulfilling
new decade.

SAFRAN