



The essentials
2017
Annual report

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Charles Champion

A WORD FROM THE CHAIRMAN OF THE BOARD OF DIRECTORS

More than ever, the aeronautics and space community contributes to meeting the social and environmental challenges facing the world today. Thomas Pesquet, but also the adventures of Philae and the Rosetta probe and many other iconic successes have encouraged this newfound awareness.

But none of this would have been possible without the passionate women and men at the forefront of their disciplines. And that is at the core of ISAE-SUPAERO's mission. Training future generations of engineers and researchers in excellence. This ambition takes resources.

The current investments, made in 2017 and scheduled as part of the objectives and performance contract for 2017- 2021, are proof of the support received from the French government, but also from the alumni through "L'Amicale" and the Foundation, whose actions I would like to salute.

But this ambition first and foremost relies on a skilled team working with the School's Director, Olivier Lesbre, and I would like to thank them for their unfailing devotion to the students and researchers.

The search for the best aeronautics and space talents has become a worldwide competition and ISAE-SUPAERO must open up to the world even more to maintain its excellence.

That is what we are doing through partnerships with Universities around Europe, but also in the United States, India, Asia and elsewhere, attracting the best students and the best teaching staff, but also encouraging diversity in recruitment – and I would like to point out the actions undertaken by our students with young people to encourage diversity and inclusion.

The world is changing faster and faster.

Technological evolutions have now made possible things that engineers could only dream about a few years ago: embedded intelligence, autonomous vehicles, but also alternative energies, increasingly integrated systems, planetary exploration, increasingly safe air transport, etc.

Competence, innovation and agility are the keywords.

Thanks to its students and teams, thanks to the support received from all our stakeholders, ISAE-SUPAERO will continue to fulfil the mission of excellence entrusted to it, firmly anchored in Toulouse and the Occitanie region, a leader in the aeronautics and space sector in France through the ISAE Group and a partnership with the École Polytechnique, and recognized as such around the world.

C.C.

A WORD FROM THE PRESIDENT



Olivier Lesbre

The Institute celebrated its ten years in 2017 – ten years that have enable us to bring together the ENSICA and SUPAERO teams to constitute a world leader in aerospace engineering higher education, whether in terms of the variety of training courses offered or of the number of degrees on the engineering, Masters or Doctoral levels.

2017 was also the first year in the deployment of the 2017-21 Objectives and Performance Contract which we signed with the Minister of Defense in December 2016. To reassert our position as a world leader, this contract has been developed with 4 objectives: international attractiveness, developing reference research laboratories, consolidating our training offer and ISAE-SUPAERO's position in the local, national and international higher education landscape. We have five years to achieve this and we have already made great progress.

Concerning attractiveness, we have carried out major work on our brand platform and the Institute's visual identity to gain exposure by highlighting our scientific work, our students' successes, developments in our innovations, but also events that take place on our campus such as our second "Journée Portes Ouvertes" (Open House Day) last October, which welcomed 3,000 visitors around our interplanetary alumnus, Thomas Pesquet.

Concerning the development of our research activities, we have inaugurated emblematic scientific facilities on our campus with the aeroacoustic wind tunnel and organized the 9th international drone conference-cum flying competition, IMAV 2017. Our new twin-engine airplane, financed in part by sponsors, will soon enable us to go farther in our experimentation with new concepts in the field of man-system interaction. Lastly, the "Toulouse School of Aerospace Engineering" project, which we have promoted with ENAC and ONERA, has received the "École Universitaire de Recherche" (University Research School) label under the "Programme Investissements d'Avenir" (Investments in the Future Program), which demonstrates

the relevance of our approach in forming partnerships for our research activities with our neighbors in Toulouse with a joint research federation.

In terms of consolidating our training offer, we have maintained the level of excellence in the students recruited for all of our programs. We are still 5th in the ranking of French engineering schools as can be seen in the students' choices after the competitive examinations.

We have reached record numbers of advanced Master students by continuing to adapt our course offering.

We have also innovated in the Ingénieur program with new options, which have been highly successful from the beginning. Lastly, a dedicated team has been set up to redefine the Institute's Continuing Education strategy.

Concerning ISAE-SUPAERO's positioning, which we are developing along three lines – the territorial aspect in Toulouse, the professional aspect based on aerospace engineering and the academic excellence aspect – I have already mentioned our partnership with ENAC and ONERA. I would also like to point out the ISAE Group's structure in the form of an association and expansion to a 5th partner, SUPMECA. Our partnership with I'X is also being reinforced, as well as our exchanges with Georgia Tech in both teaching and research.

The dynamics of our Institute's evolution is in place, and every day we show our ability to live up to our ambition – asserting ourselves as a world leader in higher education in aerospace engineering, relying on the Training-Research-Innovation trio and adopting an active, dynamic, influential stance.

O.L.

Our promise for the future :

At the heart of aerospace engineering's development since 1909, we give you the keys to invent the world of tomorrow.

Our mission: to educate the best engineers, leaders in the aerospace industry and in the world of tomorrow.

Our ambition: assert ourselves as a world leader in higher education for aerospace engineering relying on the 3 pillars of teaching, research and innovation.

Our vision: a wealth of talents, demanding and diverse formative tracks, commitment and passion are the engines of innovation in an increasingly complex world.

Highlights in 2017

/Inauguration of the aeroacoustic wind tunnel, an exceptional tool for research

/Implementation of professional training contracts for students of the Ingénieur program

/ The ISAE Group is organized as an association under the French Law of 1901

A new momentum for our brand to take us into the future through a powerful message backing our efforts every day.

Objectives and performances: the outlook for 2017-2021

The objectives and performance contract signed with the Ministry of the Armed Forces sets the course for the next five years.

4 major objectives

- / Develop the Institute's international attractiveness for the best students and professors from around the world;
- / Develop international reference laboratories in aerospace research in partnerships to promote the ISAE-SUPAERO brand;
- / Constantly develop initial training and continuing education to meet new needs among industry and students;
- / Be an active, influential institution in the changing landscape of higher education and research nationally and internationally.

Human resources

total staff: **539**

number of professors
and research engineers: **101**

Student population

1700 students

Finances

Subventions from French
government:

€34.3 million

total budget: **€60.2** million
€11.4 million in investment,
including €6.9 million in
investments for research.

A new policy for sustainable development and social responsibility



Excellence is in our DNA

Excellence with passion – that is our motto. Excellence is both a powerful marker in our history and in our DNA, and an ambition, a constant desire. In our activities, in our disciplines, in all our professions, at every step of the way, we adopt a positive, dynamic approach. This energy, this movement, is what drives us.

/ Our programs are changing

/ "Ingénieur
ISAE-SUPAERO" MSc

/ CNAM-ISAE-SUPAERO
engineering apprenticeship
training program

/ Master of Science
in Aerospace Engineering
(in English)

More than **30**
post-graduate training
programs in
aerospace engineering

15 Advanced Masters® in
Aeronautics and Space and
in Management (including 11 in English)

5 Certificates of Advanced Studies
for professionals and a catalogue
of continuing education programs
offered by our affiliate, EUROSAT.

6 doctoral schools:
Aeronautics - Astronautics;
Electrical Engineering, Electronics,
Telecommunications; Mechanics,
Energetics, Civil Engineering and
Processes;
Mathematics, Information
Technologies and
Telecommunication; Sciences of
the Universe, the Environment and
Space; Systems.

5 Masters Degrees in the
specialties of astrophysics, space
sciences and planetology; fluid
dynamics, energetics and transfers;
mechanical engineering; information
technology and telecommunication;
applied fundamental mathematics.

285

graduates
in 2017

(205 SUPAERO + 80 ENSICA)

including **59**

international students

36

graduates took a
Research Master's along
with their 3rd year

23

have

a double competence validated by
a second diploma in management,
business administration, economics
or entrepreneurship from the
Toulouse School of Management –
TSM, TSE, HEC, Polytechnique or
the Imperial College Business School.

On average, their
experience abroad
lasts **8** months

9

merit scholarships for degree
courses abroad supported by the
ISAE-SUPAERO Foundation.



"Ingénieur ISAE-SUPAERO" Program

You can now spend the 3rd year of the engineering program in work-study!

Since the start of the 2017 academic year, engineering students can spend the last year of their program on a professional training contract. Ten 3rd-year students have signed work contracts with partner companies (Thales Alenia Space, Liebherr, Air France, Thales Avionics and Freelog, Accenture). From September to March, they split their week between their courses and their industrial mission, which gives them the opportunity to apply the theories studied in class directly. The second part of the contract is spent full-time in the company, where the students-employees are fully operational. The first feedback has been very positive. A win-win contract – an opportunity for businesses to take on and train a young, high-level collaborator; an opportunity for students to gain professional experience and facilitate the entry into the workplace while financing their studies!

The research track... adapted to future PhD students

Students who are attracted by research can now follow an adapted program starting in the 2nd year of their engineering program. After a selection phase, they join the research departments at ISAE-SUPAERO and are involved in work developed with industrial and academic partners. Their training – adapted to the research subject – is

organized in close cooperation with the institution's scientific policy and gives a good preparation to continue on to a possible doctorate degree. In 2017-2018, six students signed up for this new program.

/ Engineering apprenticeship program / the 3rd graduating class

Developing an apprentice program has been an important goal at ISAE-SUPAERO in order to open up sectors of excellence to varied profiles and notably to students from DUT (University Technical Degree) or BTS (Advanced Vocational Training Certificate) programs. In partnership with CNAM, the curriculum meets a need in industry for engineers capable of making an operational link between configuration and production, and proactively understanding maintenance issues, engineers for whom apprenticeship is naturally suited, combining academic and practical knowledge.

The third class in this work-study program graduated in December 2017. Thirty-four apprentices received this precious document and are now "particularly well equipped for (their) professional life", according to the class delegate.

Academic partnership: a double diploma agreement with ESPCI Paris

The ESPCI Paris-ISAE-SUPAERO program is an opportunity for engineering students at the Institute to follow a dual curriculum in 4 years, leading to an engineering diploma from both institutions. ISAE-SUPAERO students have a choice between the chemistry, physics, physical chemistry and biotechnologies sectors at ESPCI Paris and complete a research project at one of the school's laboratories. This is a reciprocal agreement. ESPCI students will join the engineering program at ISAE-SUPAERO in the 2nd year and, after the 3rd year, will receive both diplomas. The first exchanges will take place at the start of the 2018 academic year.

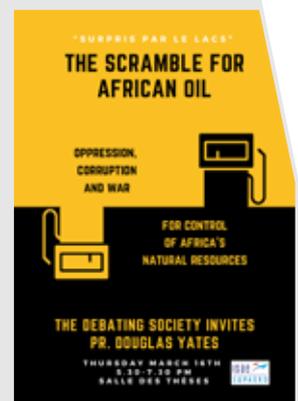
L'X students choose ISAE-SUPAERO!

In September 2017, 31 students from L'X - Ecole Polytechnique chose to join our engineering program. This excellent recruitment puts ISAE-SUPAERO at the top of French schools chosen by L'X students. This is an indication of the good health of the partnership between our two institutions and the students' interest in the specializations offered and the quality of the training. The field of application "Aircraft Design and Operation" and the "Fluid Dynamics" sector are particularly attractive. Some of them also take a Research Master at Université Toulouse III -Paul Sabatier.

"Surpris par le LACS" – Languages, Arts, Cultures and Societies

"Surpris par le LACS" (Surprised by LACS) is a series of discussions / meetings / conferences organized by the Languages, Arts, Cultures & Societies department in close cooperation with the students. These encounters began at the start of 2017 and are an opportunity for everyone to take a breath of fresh air and to be inspired in an original way! The first meeting with Olivier Steiner, author of "La Main de Tristan" (Tristan's Hand), a text that notably won over the students in the "Ecriture(s)" "Writings" workshop. Hosted by Yves Charnet, the workshop is an invitation to weave the music of words, images and emotions along the trail of each individual's imagination.

Another meeting, another surprise: Professor Douglas Yates and a conference titled "The Scramble for Oil: Oppression, Corruption and War for Africa's Natural Resources". Douglas Yates is a professor of Common Law at the Université de Cergy-Pontoise and teaches international relations and African politics at the American Graduate School, Paris and the American University of Paris. He is an expert in African politics and the oil industry. Students from the "Debating Club", coordinated by Anne O'Mahoney, carefully prepared this meetings.



404
students

including **232**
international
students

from **54**
different countries



**Space Applications and Services:
A new Advanced Master®**

With support from Airbus Defence and Space, a new program has been created to meet the growing needs in the field of applications and services using space data and the massive growth of digital information from space.

Nicolas Chamussy, Executive Vice President Space Systems of Airbus Defence and Space, and Olivier Lesbre, Director General of ISAE-SUPAERO, signed the agreement on this new program on February 28th, 2017.

The class of September 2017 had 10 students, 5 of them from Ethiopia.

**Master of Science
in Aerospace Engineering**

The Master of Science in Aerospace Engineering includes an Aircraft Design and Operations program

It has welcomed its second class of 78 students with a program enriched with the opening of an Aircraft Design and Operations curriculum. This curriculum is for students who are particularly interested in innovative civilian aircraft design and research in this field. It is supported by the CEDAR Chair in partnership with Airbus and from the beginning hosted over 20 students.

The incoming class comes from 46 universities, notably including the University of Oxford, the Universidad Politecnica de Madrid, the Politecnico di Milano and di Torino, IIT Madras, the University of Michigan and the Universidade Federal do Rio de Janeiro.

Advanced Master®

High-level training dedicated to airplane, helicopter and drone architectures

Unmanned aircraft (drones) will continue to grow and will account for a significant share of the aeronautical market of the future. In this context, we have updated our Advanced Master in partnership with Airbus Helicopters by including a group of teaching modules dedicated to drones.

This program is the first of its kind in France. It will provide the fundamental skills needed for aeronautical engineers and the specific competencies to identify problems, find alternatives, and to choose and implement solutions for airplanes, helicopters and drones.

“Helicopter, Aircraft & Drone Architecture” is a high-level program with a recognized diploma that opens access to work in current and future aeronautical engineering professions.

Business creation projects with the “MS in Large Project Management”

For 16 years now, students in the joint ISAE-SUPAERO / HEC Advanced Master in “Large Project Management” (Management de Grands Projets) have been doing a case study on Business Creation Projects that they come up with themselves. The educational goal is to show that a feasibility study backed up with the management tools and concepts studied in the classroom makes the project particularly credible and solid. Sometimes a group decides to take the project further and to go into the world of start-ups. The exercise then becomes the best calling card for getting into an incubator. The most recent example was the SOLEN project incubated at HEC. It is a smartphone application that uses a simple photo taken in an apartment to forecast the rate of sunshine for the entire year in the room where the photo was taken. An original, highly promising project that originated at ISAE-SUPAERO and which, since 2017, has benefited from support from major names in real estate such as Foncia and Bouygues Immobilier.



Partnerships and scholarship programs

Partnerships with the institutions that provide financial support to the Master of Science and Advanced Masters® students are essential assets for our attractiveness, notably abroad

- / 3 merit scholarships from the ISAE-SUPAERO Foundation for welcoming international Master students have been granted to 1 Ecuadorian student, 1 Moroccan student and 1 Brazilian student.
- / 4 DGA scholarships: 1 Jordanian student, 1 Pakistani student and 1 Indian student in MS Systems Engineering and 1 Indian student in MS Aeronautical Engineering have received financing from the DGA for all or part of their studies.
- / 7 MBDA scholarships have been granted, including 5 to Indians students and 2 to Indonesian students.
- / CEDAR scholarships: under the CEDAR Chair (Airbus), 4 scholarships have been granted to 1 Turkish student and 1 Lebanese student in Master Aerospace Engineering, 1 Indian student in MS Aeronautical Engineering - Flight Test and 1 Ukrainian student in MS Aeronautical Engineering.
- / GIFAS scholarships: GIFAS has granted 6 scholarships to Master Aerospace Engineering students of American, Indian (2), Serbian, Egyptian and Spanish nationalities.
- / ARISE scholarships: under the ARISE Chair (Thales), 2 scholarships have been granted to 1 Bulgarian student and 1 Spanish student in Aerospace Engineering.



In 2017
26
merit scholarships
were granted,
including **10**
to female students

The Occitanie Region's Regional Professional Training Program (PRFP):

This year, **6** job seekers in retraining have benefited from financing for various Advanced Masters®.



Continuing education

Aerospace Business Integration Program

The closing ceremony of the international ECATA program was held on campus on Thursday, April 27th, 2017. The 10 weeks of training took place at KTH, TU Delft and ISAE-SUPAERO, for a class of 19 delegates, managers and 'high potentials' identified by Dassault, Airbus, MTU, BAE Systems, Liebherr Aerospace, Leonardo and Safran.

Two new advanced studies certificates

/ Human Factors & Neuroergonomics for Aeronautics & Transportation - duration 1 month (100 hours) - April 2017. A new approach to understanding human performances and behaviors in the aeronautical context. This course focuses on fundamental and applied notions in systems design. It also includes advanced training in the use of the five main physiological sensors and develops practice using ISAE-SUPAERO's flight simulators.

/ Earth Observation Applications - duration 1 month (120 hours) - April 2017. Providing knowledge and expertise in fields related to Earth Observation for civilian and environmental questions. This certificate is sponsored by Thales Alenia Space.

Foreseeing and meeting needs

In September 2017, we recruited a manager and a coordinator in continuing education to better understand the needs of our industrial partners and to provide them with suitable solutions, whether in terms of the skills developed or teaching methods.



6
doctoral
schools

200
PhD students

Doctoral program

Member of the University of Toulouse and accredited by 6 doctoral schools, we welcome PhD students at seven ISAE-ONERA doctoral host teams and at the Clément Ader Institute, covering a wide range of scientific disciplines related to the aeronautics and space fields: aerodynamics and propulsion, structures and materials, embedded systems, networks and telecommunications, systems command and control, human factors, electronics, and signals.

The Aeronautics-Astronautics Doctoral School - ED-AA

This Toulouse doctoral school, supported by ISAE-SUPAERO, is designed to welcome bi-disciplinary theses in relation to the aeronautics and space fields. It has consolidated its position this year, not only in terms of the number of enrollments, but also in terms of international reputation (1/5 of the new class members are on international jointly supervised doctorates) and the diversity of topics, bringing together the connections between the social sciences and the so-called hard sciences, for example history and chemistry of materials or sociology and air safety. At the end of 2017, ED-AA had 86 students enrolled.

International mobility assistance for post-graduates

In view of promoting our doctoral training

and strengthening cooperation between our research teams and teams abroad, we have set up a system of international mobility assistance for post-graduates. Six research trips have thus been co-financed, to TU Eindhoven, TU Delft, Polytechnique Montréal (IVADO), University of Michigan, Royal Military College Ontario and the Swartz Center for Computational Neuroscience in San Diego.

Internationally, a 1st jointly supervised doctorate agreement has been signed with Georgia Tech, as well as doctorates jointly supervised with Polytechnique Montréal.

Thesis awards

At the ISAE-SUPAERO talent evening, 5 young doctors received the ISAE-SUPAERO Foundation's Thesis Award, illustrating the excellence and diversity of scientific disciplines: model-driven engineering for embedded systems, non-linear system control, polarimetric speckle imaging, propulsion in hybrid rocket engines, CMOS imagers subjected to radiation. Among the winners, J.-M. Belloir also received the Aerospace Valley Award for his thesis on the analysis of the dark current induced by radiation on image sensors.





Electromagnetic anechoic chamber

/ Research, the foundations of our expertise

Overall turnover:
€28 million

360
researchers
on campus,
including ONERA

89
internationally
peer-reviewed articles

23
patents and invention
disclosures

1
University Research
School supported
by the Institute

2
research units
evaluated by
HCERES

Our scientific strategy aims at developing scientific knowledge while maintaining a good balance between scientific excellence, academic recognition, the training-research connection and proximity to industrial uses. Our research deals with models, methods and tools for the analysis and design of aerospace systems, embedded systems and related systems, from the expression of requirements and specifications through to qualification for certification. Five strategic areas in sciences for aerospace and space systems engineering and related systems guide the research department's activities:

- / Integrated design for system performance and safety of operations
- / Models and optimization for energy efficiency, the environment and competitiveness
- / Earth observation, environmental monitoring and space exploration
- / Telecommunications, networks, and resilient connected cyber-physical systems
- / Data analysis, decision sciences and complexity management.

These strategic areas are in response to the social and industrial challenges of sustainable development and aerospace system performances, including questions of safety, security, resilience, competitiveness, virtualization (digital), new technologies, processes, services and innovative concepts.

Six training and research departments

These ensure training actions and the training-research connection, as well as developing disciplinary or interdisciplinary scientific topics at the laboratories

- / Aerodynamics, Energetics and Propulsion (DAEP)
- / Aerospace vehicles design and operation (DCAS)
- / Mechanics Structures and Materials (DMSM)
- / Complex System Engineering (DISC)
- / Electronics, Optronics and Signal Processing (DEOS)
- / Humanities and languages (LACS).

11 Teaching and Research Chairs: bridges with the aerospace industry and innovation

- / AIRBUS Chair in Eco-Design of Aircraft (CEDAR)
- / MBDA-ISAE excellence program for India and Indonesia
- / AXA Chair – Neuro-ergonomics for aircraft safety
- / Nuclétudes Chair - Impact of radiating environments on space systems design
- / SAFRAN Chair – Aero Engine Innovative Studies (AEGIS)
- / ZODIAC-BNP-Paribas Chair (jointly with the Ecole Polytechnique) - Technological Innovation and Entrepreneurship (ITE)
- / TAS Chair (jointly with ITA in Brazil) - Teaching on small satellite platforms
- / THALES Chair – Architecture and Engineering for Embedded Systems (ARISE)
- / DASSAULT Chair – Aircraft System Architecture (CASAC)
- / TAS partnership– CMOS image sensors applied to space (SaCLab)
- / Airbus Defence & Space and ArianeGroup Chair - Advanced Spatial Concepts





New experimental equipment



New research resources

The aeroacoustic wind tunnel equipped with an 800-kW motor

A new aeroacoustic wind tunnel

The inauguration of the aeroacoustic wind tunnel last September marked a new step in the development of the Institute's research activities. By its size and its performances, this research asset places us among the world's leading centers for fundamental research in aeroacoustics. This wind tunnel will notably be used to work on noise reduction in the approach phase, before landing, and on "airframe noise" (wings, flaps, landing gear, etc.). The air-flow section measures 1.8 m x 1.8 m, with a maximum speed of 80 m/s.

A platform for studying impacts on aeronautical structures

On March 16th, 2017, the Clément Ader Institute, Airbus and IRT Saint-Exupéry inaugurated the STIMPACT platform on the Toulouse Aerospace campus, dedicated to trials and simulation of high-speed impacts on aircraft. Made up of 3 gas

launchers measuring 40, 60 and 120 mm in diameter, for simulating such impacts as birds, debris or hail of different sample sizes. Positioned on scientific, technological and industrial aspects, the platform's purpose is to provide an understanding and modeling of physical phenomena at work within the structure at the time of an impact.

An electromagnetic anechoic chamber

The Electronics, Optronics and Signal Department now has an electromagnetic anechoic test chamber. Among other uses, this new measurement tool can be used for defining radar cross sections and antenna pattern diagrams in a perfectly controlled electromagnetic environment between 2 and 18 GHz. It is used by students at part of their practical work and experimental practices as well as for the department's research activities on microwave/plasma interactions for antennas and stealth.

An anechoic chamber for reducing noise from turbomachines and drones

Dedicated to fundamental or applied research studies, this new equipment is used to gain an understanding of the physical phenomena behind noise in order to reduce it. The chamber comprises a volume of 7x7x7m³. Its cutoff frequency is 83 Hertz and its background noise is less than 25 dB. It is equipped with a set of microphones for measuring acoustic power and locating noise sources. When it was received in July 2017, the first tests consisted in studying different, innovative, silent blade shapes for drone rotors defined at the Department of Aerodynamics, Energetics and Propulsion. Preparation for tests on new air renewal systems for transport aircraft cabins has now begun.

FIRST STEP FOR AN ATMOSPHERIC LASER LIAISON EMULATOR

The ELLAV1 bench is the first part of an Atmospheric Laser Liaison Emulator including attenuations. ELLAV1 was delivered to IRT Saint-Exupéry by Thales Alenia Space in August 2017 under the ALBS (Satellite Broadband Access) project and the OPTO team is in charge of it. Alongside the fully fibered ELLAV1, an atmospheric turbulence effects emulator is currently undergoing development. The partnership with Prof. A. Belmonte of UPC in Barcelona will develop a holographic bench breaking down a laser beam's phase according to statistical models of turbulence. ELLAV2 will be the assembly of the two benches.

Toward a University Research School

In February 2017, a call for projects for the constitution of University Research Schools - EURs (Ecoles Universitaires de Recherche) - was launched under the Investments in the Future Program - PIA3 (Programme Investissements d'Avenir). Relying on a core comprising the Research Federation currently being set up (bringing together ISAE-SUPAERO, ENAC and the Data Processing and Systems Department at ONERA), ISAE-SUPAERO put forward the project for the EUR TSAE - Toulouse Graduate School of Aerospace Engineering - with support from IRT Saint-Exupéry and the main industries in the sector. TSAE includes the engineering programs at ISAE-SUPAERO and ENAC and the curriculum in the Aeronautics and Space Master, which has led to 550 diplomas a year, the leading position worldwide for this criterion. TSAE's goals are to attract the best foreign students for the Master + Doctorate curriculum, to increase their international attractiveness and reputation and to develop the multidisciplinary training-research connection in aerospace engineering. At the end of October 2017, the TSAE project was accepted with 28 others out of 191 projects filed in all.

Congratulations from the Académie des Sciences de Toulouse

The work by two researchers at the Department of Design and Operation of Aerospace Vehicles were honored by the Toulouse Academy of Sciences with an award in the form of medals, diplomas and grants. Prof. Mickaël Causse received the Edouard Maurel Medical Award for all of his

work on the effects of mental loads and emotional stressors on human performances. Dr. Vsevolod Peysakhovich was given the Innovation Award, endowed by the City of Toulouse, for his doctoral work tracing the integration of eye tracking into the aeronautical field.

2017 International Micro Air Vehicle Conference and Flight Competition

The 2017 IMAV Conference was organized by GIS Micro-Drones, chaired by Prof. J.M. Moschetta, from 18 to 21 September. The event included a scientific conference that brought together 280 participants from around the world and a micro-drone flight skill competition, which 30 teams took part in. The Conference's most significant contributions included cooperative drone flight, reducing rotor noise, designing drones for exploring Mars, using drones for archeology, and robust flight of convertible drones.

1st "Rendez-vous Aéro de l'Innovation" (Aero Innovation Meetings)

The product of a collaboration between ENAC and ISAE-SUPAERO, these meetings are designed to be held every year to discuss subjects for which complementary, shared skills exist and which are forerunners in the air sector.

"What place do humans have in aeronautical systems?" was the subject of the first meeting, which was held last November. It included speeches, presentations of recent research results, discussions with the major players in the aeronautics field and with speakers from sectors on the cutting edge of innovation (automobile, health, video games, etc.). Original demonstrations of experimental projects were also organized.



Vulcanair P68 Observer, a new airplane for research and teaching

Alongside the 8 light aircraft that the institution owns, the P68 twin-engine plane is equipped with instruments useful for training students in flight mechanics and experimenting with new man-system interaction concepts.

The plane has test equipment synchronized with crew monitoring sensors (tracking the pilot's eyes, measuring brain activity). Its trap door can be used for experimenting innovative optronic or meteorological sensors. Telemetry provides real-time retransmission of parameters to the classroom, making it a unique resource in the world.



Zodiac Data Systems contributes to the equipment

The acquisition of the Vulcanair P68 Observer led to the signing of a sponsorship agreement with Zodiac Data Systems and the ISAE-SUPAERO Foundation. Thus, Zodiac Data Systems, the Zodiac Aerospace Group's Business Line and world leader in on-board and ground instrumentation and telemetry, has committed to supplying the complete telemetry system for the Vulcanair P68 Observer as part of fitting out the cockpit, from on-board data acquisition to display on the ground.

Class gift 82, strong alumni mobilization

The ISAE-SUPAERO Foundation mobilized the SUPAERO 82 alumni for a first "Class Gift". Their close involvement in collecting an exceptional €90,200 covered 14% of the Vulcanair P68 Observer's purchase price.





Open to the World

Here and everywhere around the world, our activities lead us to enter into interactions with women and men, professionals, researchers, professors students and partners. We have a strong desire to go further, to see further and to widen our horizons and constantly enrich our relations and our collaborations. We are richer for this, and we share this experience.



New international agreements



New outlooks

In 2017, the implementation of development actions and the signing of new academic cooperation agreements provided an institutional framework that notably enables us to secure and ensure the future of our student and research professor exchanges.

In Asia, one of our priority areas for international development, India and Singapore are among our new partner countries. Academic cooperation agreements have been signed with the Indian Institute of Science (IISc) in Bangalore, the Indian Institute of Technology in Madras (IIT-M) and the National University of Singapore (NUS).

Our partnerships in Latin America now include Colombia thanks to a cooperation agreement signed with the Universidad Nacional de Colombia (UNAL, Bogota).

Furthermore, defining cooperation agreements for our international policy have been renewed with prestigious universities in North America – Polytechnique Montréal in Canada and the University of Illinois at Urbana- Champaign in the United States, which offer double diploma programs. On top of that, a new cooperation agreement for a double diploma program has been signed with the University of Michigan, Ann Arbor, USA.

Lastly, the multi-partner agreement (ENAC, INP/ENSEEIH, ISAE-SUPAERO) with Queensland University of Technology (QUT) in Brisbane, Australia, was renewed.

39th Council Meeting on the European Pegasus network on campus

On October 19th and 20th, 2017, ISAE-SUPAERO welcomed the 39th Council of the PEGASUS (Partnership of a European Group of Aeronautics and Space UniversitieS) network. This European network of aeronautics and space universities is made up of 26 universities in 10 European countries (France, Italy, the Netherlands, Germany, the United Kingdom, Spain, Portugal, Sweden, the Czech Republic and Poland), and 4 associate members (representing Russia and Ukraine). ISAE-SUPAERO holds the vice presidency of this network.

Welcome foreign delegations

This year, we welcomed ten foreign delegations representing nine different countries - Mexico, Senegal, Russia, Canada, the Netherlands, China, the United States, Argentina and Morocco. This is an opportunity to strengthen and develop partnerships for international cooperation.

100
academic cooperation agreements, including 33 degree or double diploma programs

27
partner countries

94
partner foreign universities

34 %
of graduates come from abroad



Pegasus-AIAA Conference in Berlin congratulates...

Thibault Marduel, ISAE-SUPAERO engineer, won the 1st prize when he presented the results of his end-of-studies project carried out at Dassault Aviation, on the subject of estimating the dynamic parameters of an airplane on the ground.



The International Astronautical Conference (IAC) congratulates

Baptiste Chide, an ISAE- SUPAERO engineering student, future post-graduate and beneficiary of the ISAE-SUPAERO Foundation, received the first student's prize at the 2017 International Astronautical Conference (IAC) in Adelaide, Australia, with his presentation of his work on the analysis of Martian winds, prepared during his internship at the LATMOS laboratory.

ICI SUMMER PROGRAMS!

/ GEA Aviation Summer Program

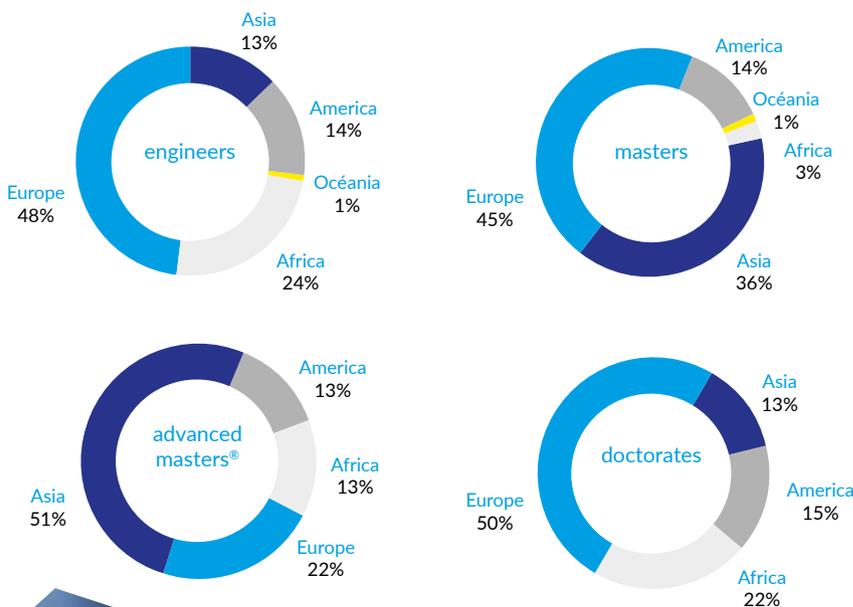
Nous We welcomed 23 students for the "GEA Aviation Summer Program" designed for undergraduate students from American universities that are partners with ISAE-SUPAERO, ENAC and ISAE-ENSMA, but also from non-partner universities. For a period of 6 weeks (June 2nd to July 13th, 2017), the students followed courses and conferences and went on industrial and cultural visits.

/ Communauté des Villes Ariane Summer School

The 18th Communauté des Villes Ariane (CVA - Community of Ariane Cities)

Summer School on space transport systems was organized by the city of Toulouse and ISAE-SUPAERO from July 2nd to 28th, 2017. The event welcomed 32 participants from Barcelona, Bordeaux, Bremen, Heilbronn, Rome, Madrid, Seville, as well as from ESA and ArianeGroup. Along with the courses and teamwork on the topic "The future of European space transport systems: needs, challenges and organization", the participants visited institutes and companies in the Toulouse region, including Airbus D&S, CNES, ONERA/Fauga, Thales Alenia Space and C'Space.

Origin of foreign students, distribution by programs in 2016-2017



250

companies support
our development

More than

30

partnerships signed
with small and
medium-sized firms
and major players

A pool of **1800**
lecturers from
high-tech companies
and academia

High-tech companies at the center of our partnership policy

Beyond the multitude of relations forged with industrial companies in our training programs, notably our pool of lecturers, more than thirty partnerships have been signed with small and medium-sized firms and with major players in aerospace, but also in digital technologies and in energy, enabling us in 2017 to develop actions in the areas of innovation, professors, employer brand development for companies and social awareness. Over 250 companies support financially the development of the Institute's training resources. We would like to thank them wholeheartedly. We are growing for them and thanks to them!

Launch of the Space Chair: ISAE-SUPAERO and the conquest of Mars

We have signed a strategic partnership with Airbus and ArianeGroup for the study of space concepts of the future from the system and architecture aspects. This chair will contribute to developing research and training projects in the context of a Space Advanced Concepts laboratory (SAC Lab).

The day on which the chair and the SAC Lab were launched in December was an opportunity to present the challenge facing this chair and to forge deeper connections between industries, research professors and students. The latter are already involved in the study of different subjects connected to the topics covered at the SAC Lab.

Renewal of the Nuclétudes Chair

Nuclétudes is reinforcing its partnership with ISAE-SUPAERO by extending the professorial chair on A sponsor partnership with Dassault Aviation based on air systems architecture and the optimization of human-complex system interactions the "Impact of radiation environments on the design of space systems" for 3 years. The first key

event: a teaching module on the effects of the natural radiation environment on avionics, launchers and ground-based systems is proposed to the students at the schools in the ISAE Group as part of mobility week.

A sponsor partnership with Dassault Aviation based on air systems architecture and the optimization of human-complex system interactions

In 2017 we saw the synergy between Dassault's engineering teams and the Institute's researchers expand around the CASAC Chair's research topics. A first workshop on neuroergonomics and decision aids was held in January, and a second on system engineering in May, enabling both parties to understand the questions surrounding alerting in order to develop research that includes industrial applicability

GIFAS continues to support the Institute and the ISAE Group

Through merit scholarships, social scholarships, events connected to training, social awareness and the deployment of a digital campus, GIFAS continues to actively support our efforts.



12

company chairs for
education and research



The Career Center: a springboard helping students enter the workforce

Center’s mission is to accompany students from all training programs entering the workforce by creating bridges with businesses. Thus, nearly 600 students have come looking for advice in individual interviews or collective workshops. More than 2,000 job and internship offers have been posted on the Institute’s job board. The Career Center also organizes more than 30 events on campus or at industrial sites jointly with partner companies seeking to improve their employer brand. These are great opportunities for students to imagine their future and to develop their professional project.

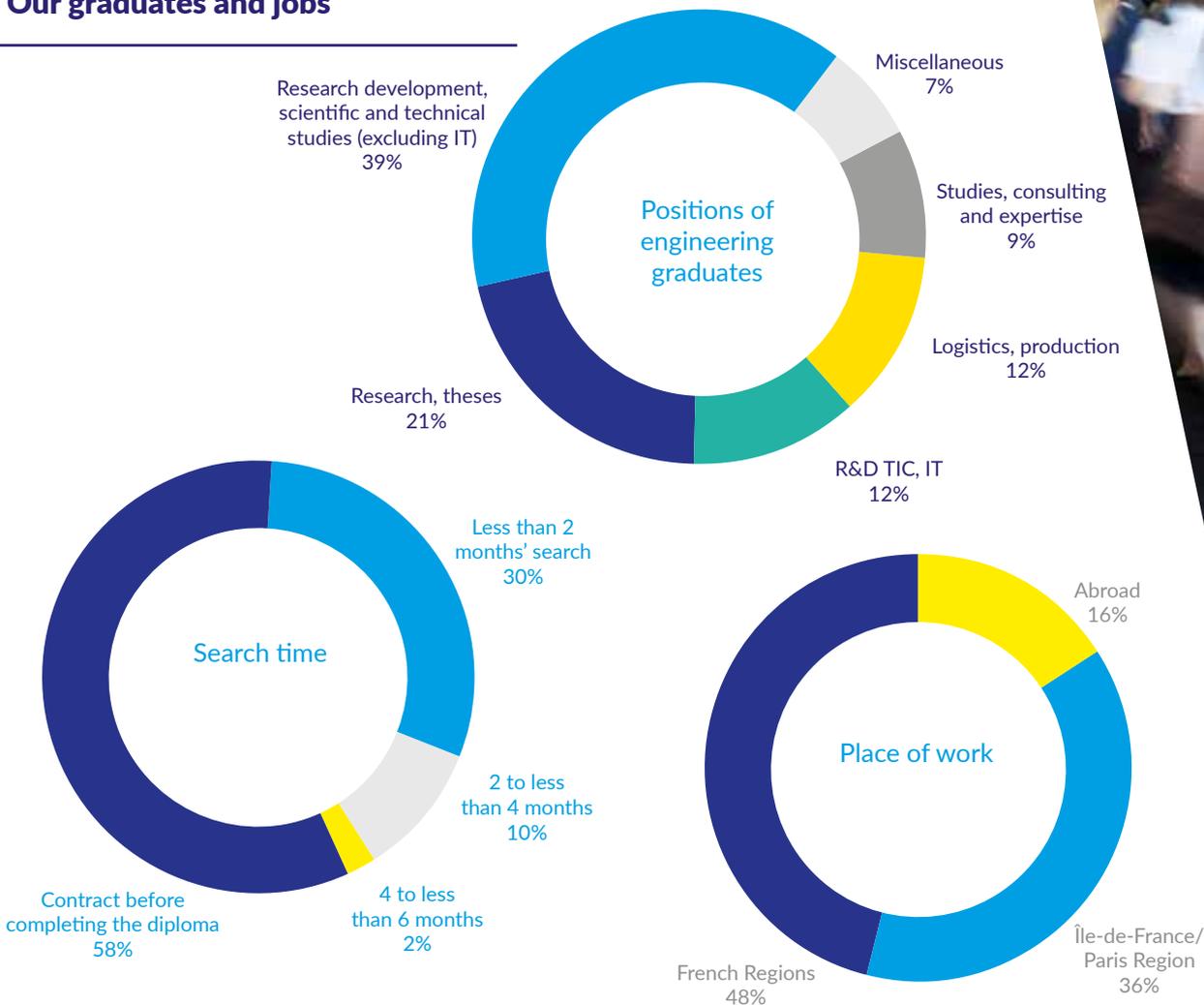
The “SUPAERO Junior Conseil” Dynamic

With twelve study contracts signed for nearly €50,000 in sales, this Junior Enterprise operates on the model of an engineering consulting firm and puts companies and students into contact to carry out studies with a predominantly technical aspect. Among the most memorable there are notably the thermal trials on EyeSat, the CNES’s nanosatellite, and the design of an autonomous solar airplane.

“SUPAERO Junior Council” is the only Junior Enterprise that resolutely focuses on aeronautics and space, an identity that it has reinforced by working with Aerospace Valley and a partnership with the international group SII.



Our graduates and jobs



Main recruiters: AIRBUS GROUP / SAFRAN / ALTRAN / MBDA / THALES / AIRBUS SAFRAN LAUNCHERS / AKKA/ SII / ALTEN / CAPGEMINI/DASSAULT/ZODIAC AEROSPACE

Survey on 1st jobs in the 2016 class of engineering graduates – ISAE-SUPAERO Career Center



Presentation of the Euroglider project to the press at the 2017 Paris Air Show in "Le Bourget"



6000
students

1600
graduates a year

160
partner
universities

The ISAE Group, founded in 2011 by ISAE-SUPAERO and ISAE-ENSMA and joined by ESTACA and the "École de l'Air" in 2012, was designed to bring together under one umbrella all of France's "Grandes Écoles" in aeronautical and space engineering.

The schools in the ISAE Group share a high level of strategic ambition in education, research and reputation in aerospace engineering to provide future engineers with the best skills to meet the technological and socioeconomic challenges of this industrial sector. For the last four years, GIFAS (Groupement des Industries Françaises Aéronautiques et Spatiales – French Aeronautics and Space Industry Group) has provided substantial financial support to the ISAE Group's development. By adopting, in December 2017, the status of an association under the French law of 1901, the ISAE Group has established a system of operation that is both flexible and rigorous, with well-identified governing bodies, financial capacities enabling it to develop inter-school projects and a structure that can welcome new members. That is how SUPMECA joined the Group as a partner in January 2018.

Immersion in space for the ISAE Group's students

The ISAE Group, in partnership with CNES and GIFAS, organizes a "Space seminar" every year for students from the various schools. The goal is to give them an understanding of the problems, stakes and challenges of the civilian and military space domains through conferences, roundtables and workshops.

The topic of the 2017 edition, which took place at ESTACA, was "What Space in 20 Years?" Satellite navigation, space surveillance, observation of the earth, space listening systems, space environment, etc. were all subjects that allowed students to understand a constantly-changing strategic field for which they will be the contributors of tomorrow.

Euroglider, the first electric propulsion glider designed with the ISAE Group's students

Euroglider is a design project for a two-seat glider with electric propulsion to be used for training and practice. Promoted by the "Association Européenne pour le Développement du Vol à Voile" (AEDEVV - European Gliding Development Association) and carried out in partnership with Dassault-Aviation, this project is highly educational for the students at ISAE-SUPAERO, ISAE-ENSMA, the "École de l'Air" and ESTACA because beyond the innovative technical and technological aspects (aerostructure, aerodynamism, propulsion, ergonomics, etc.), the students worked on this project as a real industrial project, including management, the environmental and regulatory framework and economic data.

The initial model of this glider was presented to the press in June 2017 at the Paris Air Show in "Le Bourget".



Amicale ISAE
SUPAERO ENSICA

more than **22 100**
graduates

more than **17 300**
employed

12%
of alumni
are abroad:
420 in
North America,
240 in Asia, etc.

ISAE-SUPAERO-ENSICA alumni association

4 commissions :

- / Relations between the Institute and Professional Organizations,
- / Publications & Social Media,
- / Engineering Professions,
- / Community Coordination.

5 clubs :

- / ISAE Executive Club,
- / History & Memory Club,
- / ISAE Alumni Entrepreneurship Club,
- / ISAE-SUPAERO Women's Club,
- / Culture & Travel Club.

The Alumni network in action:

- / regional chapters, consulates abroad, company correspondents and class delegates
- / highlights: participation in welcoming new engineering students, award ceremonies at "talent night", publication of the alumni directory, general meeting in June
- / ISAEdre, quarterly information bulletin
- / cocktails, dinners
- / more than 3,300 job offers
- / afterwork events and career interviews
- / travel
- / an active presence on social media, notably Facebook and LinkedIn, etc.

ISAE-SUPAERO alumni association works alongside ISAE-SUPAERO:

- / at official bodies, the board of directors, training and research council, juries
- / promoting engineering training among students at scientific preparatory schools and I'X students
- / with the engineering students: participation in the back-to-school chains, "afterwork" welcome events for new students, honor loans granted to needy students, organization of a "diploma itinerary" day and theme dinners with alumni, participation in the graduation ceremony, graduating class sponsorships.

The alumni association is a partner of the ISAE-SUPAERO Foundation and is one of its 4 founding members, with:

- / a representative on the board of directors, who is the general secretary
- / the organization of roadshows at companies, in collaboration with ISAE-SUPAERO.

Increase in donations for the Foundation

In 2017, €280,000 in donation were collected from private individuals and €3.5 million from companies.



Since 2008, the Foundation has supported ISAE-SUPAERO's development thanks to the sponsorship donations that it gathers from individual and company donors, supporting 5 strategic areas – the Institute's national and international reputation, new educational projects, the Institute's commitment

to Excellence and innovative education, entrepreneurship at the School and its OSE l'ISAE-SUPAERO program, promoting social awareness and diversity

OSE l'ISAE-SUPAERO (Dare ISAE-SUPAERO) is a system set up to promote and guarantee equal opportunity for everyone to have access to higher education: 11 high schools and 11 middle schools in the Toulouse academic region take part in the system. They benefit from the commitment of students, research professors, research departments and staff. Academic support, notably tutoring for disabled students, discovering the world of higher education, discovering the industrial and aeronautical sector, and scientific and technical workshops are all organized. GIFAS has renewed its support for these actions.

Social awareness: a day for equality between women and men In March 2017, a Feminine Campus day was organized in partnership with the Isa'Elles Students Club.

As is the case every year, this day lets young women from middle schools and high schools discover the campus, meet women engineers to talk about their educational paths and to give them a look at scientific subjects through workshops.

Claudie Haigneré, French astronaut, scientist and former government minister – and ISA'Elles' "godmother" – was able to meet the young women and to talk with them about her work, her dreams,

and her ambitions – an opportunity for these young women to identify with a role model.

At the end of the day, in cooperation with the ISAE-SUPAERO Foundation and students as part of their Innovation and Creativity Project, a conference titled "Women in Aerospace" was held at the Occitanie Region's "Hôtel de Région". This evening, presented by Claudie Haigneré, was organized around two roundtables: the gender mix at engineering schools and gender equality in the workplace, with women engineers and researchers in social sciences in attendance.



Dynamics of Invention

Teaching, researching, inventing, innovating, shaping the future and giving each individual the resources to take part this collective undertaking.

Exploring the wealth of all the talents, stimulating ambitions, helping dreams take shape to take part in building the world of tomorrow. We are part of this adventure.

FabLab: the cornerstone of an innovation space

The Fabrication Laboratory/FabLab is a production and prototyping space providing access to equipment, and notably digital tools (3D printer and CNC machines, for example). A first dedicated space was open in 2017; a new, expanded "Innovation space»/InnovSpace will be set up in 2018.

Airbus «Fly your Ideas» Challenge

Mukhtar Amin, Master of Science in Aerospace Engineering student, was a finalist at the 5th AIRBUS "Fly Your Ideas" Challenge organized in partnership with UNESCO. The objective was to mobilize universities and students from around the world to find innovative, sustainable solutions for the aviation of the future.

Student entrepreneurial initiatives take off

/ Creation of DIODON DRONE TECHNOLOGY by two students in their 3rd year: A. Tournet and R. Luciani. The company produces inflatable drones.

/ The E-Sign project promoted by two 2nd-year students: A. Carrere and B. Chevalier. This holographic translator of spoken language into sign language won the national Social Cup competition and the regional student business creators' competition (CRECE).

/ BENEFIX, project for an innovative attachment for cycling helmets N. Heugas and B. Morillon, 2nd-year students, won the Ecocampus Sustainable Development Award



SPACE INSPIRES OUR STUDENTS

/ Start-up weekend space edition:
3 days to simulate the creation of a start-up on the subject of space innovation.
First edition in 2017.

/ SUPAERO Space Section obtained the prize for the best high-tech association in France for the 2nd consecutive year

/ The Scube Club (SUPAERO SPACE SECTION) has been working for several years on producing small experimental rockets, mainly sponsored by CNES as part of the PERSEUS program. The club played an essential role in the successful launch in April 2017 of the SERA III rocket, made of composite materials and powered by solid propellant engines, which was launched from the Esrange site in northern Sweden and reached supersonic speed and an altitude of over 5 km.

/ Simulation of life on Mars for 7 students: Simulations of extravehicular outings, deployment of handling scenarios, equipment tests and a study for NASA were on the program of this 3-week simulation at a Martian base set up in the Utah desert, in the United States. Program developed by the Mars Society.





Snapshots of the year

Thomas Pesquet's amazing year!

A 2001 ISAE-SUPAERO graduate, astronaut at the European Space Agency, the tenth French national to fly in space, Thomas Pesquet gave us an amazing space year with his mission on the ISS. He is an ambassador of excellence for our community and beyond.

Community Day: Space is my future

As part of the 30th Planetary Congress held at the Cité de l'Espace in Toulouse from October 16th to 20th, 2017, ISAE-SUPAERO and its social awareness program, OSE, along with Leonid Kadeniuk, the first Ukrainian astronaut, organized discussions and space experiences with some one hundred students from priority neighborhoods and rural areas.



The four schools in the ISAE Group at the Paris Air Show in "Le Bourget"

At the 2017 Paris Air Show in Le Bourget, ISAE-SUPAERO, ISAE-ENSMA, ESTACA and the École de l'Air were united at a joint booth under the ISAE Group banner.





L'ISAE-SUPAERO seen from the air

As part of their 1st year innovation and creativity project, 5 Ingénieur students proposed to display a giant logo on the rooftops, an ambitious, totally innovative concept! The letters were made of gravel, measuring over 10 meters high to make the display visible from airspace.

The ISAE-SUPAERO 10th anniversary book

For the 10th anniversary of the partnership between SUPAERO and ENSICA, this book traces the Institute's history through photos, archives and stories from iconic personalities.



World Sailing Champion

Maëlenn Lemaître, an MS Aerospace Project Management student, has successively taken the titles of French Champion and then World Champion with her crew in sailboat match-racing. This high-level athlete managed to meet this challenge while pursuing her studies alongside the competitions! A chance for this young woman, who is preparing a major new challenge – the Tokyo Olympic Games in 2020





s diplômés
la promotion 2017

Snapshot of the year

A key moment: graduation ceremonies

All our graduates,
their loved ones
and our community
come together to
congratulate them and
wish them all the best
in their careers.



3 students, private pilots taking off for Europe!



Flying a TB20, Pierre, Vincent and Victor-Mehdi, accompanied by an instructor, covered 3,000 km to reach Universität Braunschweig in Germany and the Czech Technical University in Prague, in the Czech Republic, to meet with other aeronautics enthusiasts.

Open House Day, October 14th, 2017

Science was celebrated on the campus, which was open to the general public. 3,000 visitors came to discover our laboratories and research equipment, to meet the student clubs and student start-uppers and to attend presentations of the training programs and meet our guest-star, Thomas Pesquet (2001 alumnus) back from 6 months aboard the International Space Station !

Journée “Campus au Féminin” (Women’s Campus) Day with Claudie Haigneré

Organized by OSE l’ISAE-SUPAERO in partnership with the Student Club, Isa’Elles, Women’s Campus Day enables middle school and high school girls to discover the campus and to meet women engineers. Claudie Haigneré, French astronaut, scientist and former government Minister, and ISA’Elles’ “godmother” was present.

In cooperation with the ISAE-SUPAERO Foundation, the conference titled “Women in Aerospace” was held with two roundtables: the gender mix at engineering schools and gender equality in the workplace.





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