



ECOLE NATIONALE SUPERIEURE DE MECANIQUE ET D'AEROTECHNIQUE



ISAE-ENSMA

The reference school in aeronautical and space design for CCP,
the competitive entrance examination to Grandes Ecoles



The ISAE Group

1st world center of training and research
in aeronautical and space engineering



Aéronautics - Space - Transport - Energy

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Founded in Poitiers in 1948, ENSMA

has been located since 1993 next to the site of Futuroscope. In fifty years, our school has acquired a reputation for excellence by training more than 5500 high level engineers, supported by a world famous research programme developed through multiple partnerships with large companies, which, in addition, hire many of our graduate students.

The academic training given at ENSMA enables the young graduate engineers to choose jobs in engineering design departments, research and development mainly in the aeronautical and space industries, and more generally in the ground transportation, mechanics and energy industries.

The curriculum is extensive, covering fields such as: fluid and structure mechanics, aerodynamics, energy, thermal science and propulsion, materials and industrial computer science. The school can thus live up to the companies' expectations in terms of reactivity and adaptation abilities.

Thanks to long standing close industrial relations and strong connections with prestigious schools and universities in France, in Europe and throughout the world, our school is ready to take up the big challenges of the next decades in terms of innovation and technological changes and train the engineers of the future who will be able to take responsibilities and to bring performance to the companies of tomorrow.

In 2011, ENSMA turns a corner by taking on the name of ISAE-ENSMA. The ISAE Group will aim to increase the influence and visibility of its members (ISAE-ENSMA, ISAE-SUPAERO, ESTACA, Ecole de l'Air), to promote high-level engineering training in the aeronautical and space fields.

Francis Cottet - ISAE-ENSMA Director

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ENVIRONMENT

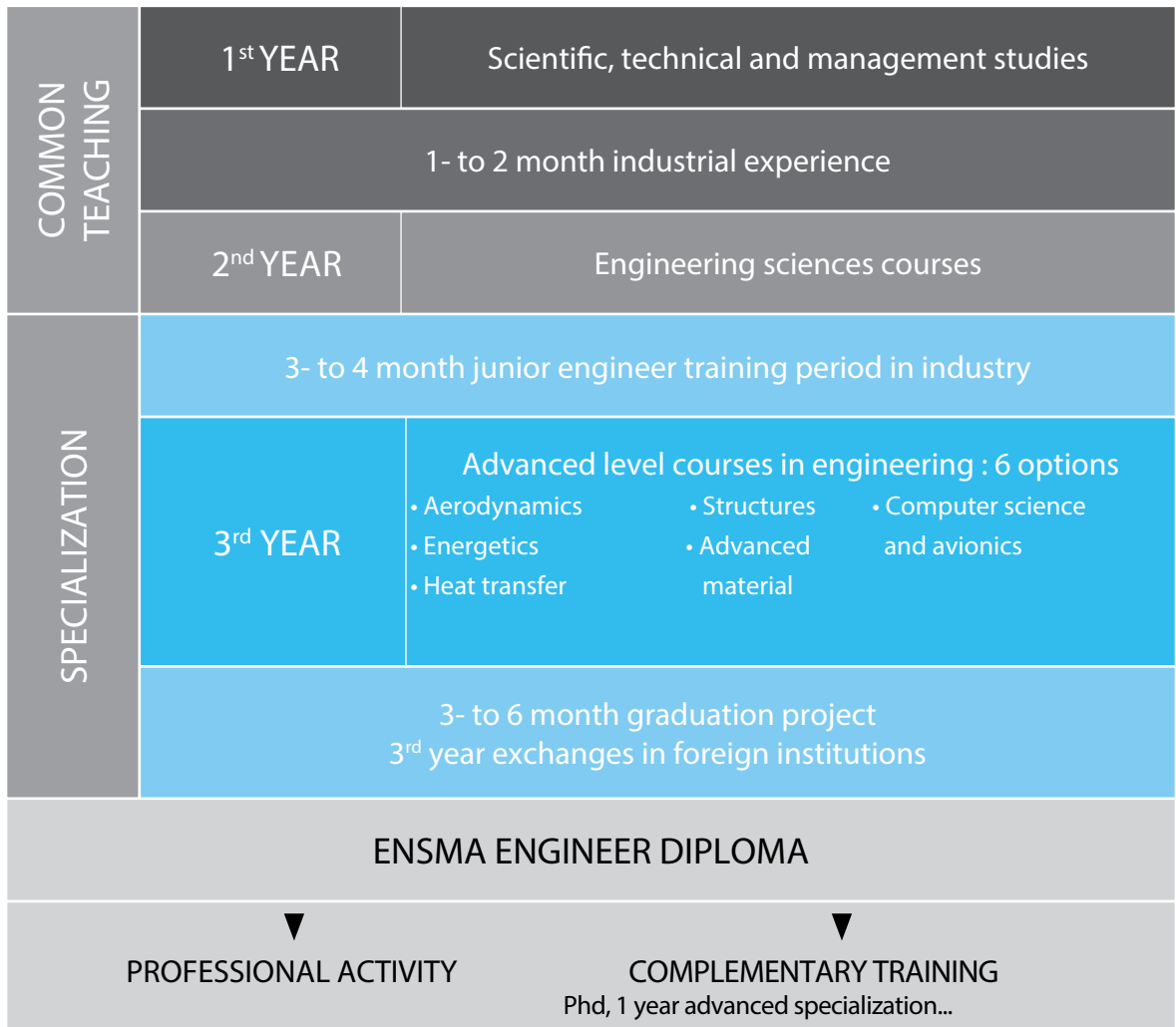
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TEACHINGS



TEACHINGS DEPARTMENTS AT ENSMA

FLUID MECHANICS AND AERODYNAMICS

The basic concepts are taught as of the first year. The students who wish to deepen their knowledge can follow, in third year, specialized courses : extern, intern and numerical aerodynamics and turbulence. The equipment of the school in subsonic and supersonic wind tunnels enables to illustrate the concepts introduced in class.

ENERGETICS AND HEAT TRANSFER

After the thermodynamics of the engines, thermal transfers, combustion and detonics science are covered. All the areas are thus joined together for the entire study of the industrial facilities. The equipment of the school enables to reproduce the phenomena to study them in real size.

MATERIALS AND STRUCTURES

The study of structures and materials, on macroscopic and microscopic scales, starts in first year. More specific subjects are covered (plasticity, damages, laminates, polymers, x-rays...) so that the students familiarize with the modern evaluation methods of the numerical and experimental constraints used in industry.

COMPUTER SCIENCE AND AUTOMATICS

The study of languages and techniques of scientific and industrial computer science is an important part of the core curriculum. The 3rd year option « Computer science and avionics » (software engineering, embedded real-time systems, data engineering, human-machine interface...) trains engineers specialized in the integration of these new tools in this area of interest.

ENGINEERING OF INDUSTRIAL SYSTEMS

The technological culture is at the heart of the engineering sector and the design manufacturing process of an industrial product. From practical examples, the offered teaching is based on CAD using 3-D modeling software supporting the liaison between different fields (structures calculus, aerodynamics, thermal science...). The aim is to the develop synthesis, innovation and open-minded spirit skills towards industry. Technology is taught in 3rd year of studies through engineering design projects.

MANAGEMENT AND LIBERAL STUDIES

In a spirit of internationalization, the school delivers training in foreign languages necessary for the future engineers. Moreover, sport activities are integrated into the teaching with weekly courses and several university competitions. Finally, the resource centre and the library offer the students the opportunity to work in quiet places, have access to a range of diverse documents and the use of the new communication tools.



PROGRAM : PERFORMANCE, RIGOR, IMAGINATION

A TRAINING IN MECHANICS AND AERONAUTICS

Extensive fields of competence :

- combining rigorous theoretical training and a thorough technological experience,
- centered on the fields of mechanics and energetics,
- focused on aeronautics and space, ground transportation and energy industries.

A preparation for an engineer's career to :

- anticipate fast technological developments,
- develop innovation abilities,
- take on the new duties and tasks of the engineer,
- ensure the best integration into the companies.

The development of personal qualities to :

- carry out a professional project,
- learn autonomy and team work,
- communicate.



FIRST STEPS IN COMPANIES

The 3 internships can be performed either in France or abroad.

Blue-collar internship : a 1- to 2 month placement at the end of the 1st year

During this first internship, students work as blue-collar workers and discover the world of production. They learn to value the importance of human and social relations within a company.

Junior Engineer training : a 3- 4 month placement at the end of the 2nd year

This internship, supervised by an engineer, allows them to discover first-hand what the work of an engineer entails.

Graduation project : a 3-to 6 month placement at the end of the 3rd year

Enables the students to supplement their training according to their professional project (industry, research, international ...). A 3-to 6 month placement that can be carried out in a company, in a university or in a research laboratory.

Engineering design project

Developed in partnership with companies, these works allow the students to grasp a problem in general.



ENSMA graduates are mainly recruited by large national and international companies - Airbus Group, Dassault Aviation, Groupe Safran, Renault, PSA, Thales, EDF, Areva, Alstom, ... or by associated service providers such as Altran, Teuchos-Groupe Safran, Altran, Sogeti High Tech, AKKA Technologies...

► Contact : stages@ensma.fr

SOME INTERNSHIPS EXAMPLES :

AIRBUS HELICOPTERS, Munich, Allemagne

Analysis and simulation of impacts on carbon composite components

AIRBUS FRANCE, Toulouse

Devising of automatic tests for the validation of a380 integration simulators

ALTRAN TECHNOLOGIES HORS EST, Vélizy-Villacoublay

Structural bio-composites in automobile industry

BOMBARDIER AERONAUTIQUE, Montréal, Canada

Development of an acoustics analysis code on noise emission from air traffic

CEA-CESTA, Le Barp

Study of laser tests equivalent to hyper-fast impacts

DASSAULT AVIATION, Merignac

Analysis of a refined finite elements model from a plane zone



SAFRAN CERAMICS, Le Haillan

Modeling and thermomechanics optimization of a HP turbine shroud

LIEBHERR AEROSPACE, Toulouse

Modeling of wings de-icing in aeronautics

MBDA FRANCE, Le Plessis

Study and optimization of metal-cased fragmentation

PSA PEUGEOT CITROEN, Vélizy-Villacoublay

Unsteady aerodynamics simulations

RC FORMULA, Haller, Luxembourg

Acquisition, analysis and data processing in car racing : why, how, and issues?

SAFRAN AIRCRAFT ENGINES, Moissy Cramayel

Validation of a thermodynamic model of cfm56 5c/p

THALES ALENIA SPACE, Cannes la Bocca

Applicability of phase transformation materials for the thermal control of an instrument

THE NETWORKS

THE ISAE GROUP

The ISAE Group will enable to strengthen the schools' attraction towards the students, to optimize the adequacy between the training and the employers' need, and to develop research of excellence and international opening.

The schools, from the ISAE Group, deliver high-level engineering trainings (ISAE-ENSMA, ISAE-SUPAERO, ESTACA and Ecole de l'Air), masters, specialized masters, and PhD programs.

POLYMECA

This network facilitates foreign student exchanges and students from any of the following schools specialising in mechanical engineering to complete their third year of studies at one of the other partner schools : ENSIL-ENSCI Limoges, ENSEIRB-MATMECA Bordeaux, SEATECH Toulon, ENSIAME Valenciennes, ENSMM Besançon, ENSTA Bretagne, SUPMECA Paris, and ISAE-ENSMA Poitiers.

PEGASUS

The PEGASUS network is the brainchild of ISAE-ENSMA, ISAE-SUPAERO and ENAC. It aims to promote aerospace studies in Europe and delivers a « Pegasus Award and Certificate » to our students speaking two languages and who's spent at least 5 months abroad.

ISAE-ENSMA is a public school from the Ministry of Higher Education and Research, holding quality labels from CGE and CDEFI.



A PROGRAM WITH A STRONG INTERNATIONAL DIMENSION

One of the ISAE-ENSMA's main priorities is to promote international student exchanges. Since 2012 an international experience is required to be graduated.

Students spend an average of 6 months abroad by :

- performing an internship in a company, a research organization or a university lab,
- participating in an exchange program from one semester to one year,
- obtaining a double degree.

In order to facilitate exchanges, ISAE-ENSMA plays an active role as a member of the GE4 (one or two semesters in the United-States or Russia...), CREPUQ (exchange program with Québec) and PFIEV networks (program supports the training of Vietnamese students). The school also participates in international programs, BRAFITEC (Brazil), ARFITEC (Argentina) and SIAE Tianjin (China).

- **23%** of international students (26 different nationalities),
- **52** partner universities giving the chance to many students to spend part of their studies or performing research projects in institutions worldwide (Africa, America, Asia, Europe, Middle-East),
- **13** double degree agreements.

Examples of international internships :

UNIVERSITY OF CALIFORNIA, Irvine - California

Downstream evolution of a moderately high Taylor Reynolds number, for nearly isotropic, homogenous flow

AIRBUS Germany

Coupling of an ESATAN Film Cooling Model for small Rocket Thrusters to the TMG Finite Element Thermal Solver

ITA, Sao José dos Campos- Brazil

Application of Shape Memory azilys in aeroservoelasticity

VIETNAM GREEN BUILDING COUNCIL (VGBC), Hanoi - Vietnam

Development of a Green Building rating tool for single housing



STRONG INDUSTRIAL PARTNERSHIPS

ISAE-ENSMA has signed partnership agreements with main aeronautical and aerospace groups: Safran Group, MBDA, Dassault Aviation, AKKA Technologies, Altran...

THE INDUSTRY PLAYS A KEY ROLE IN THE ENSMA ENGINEERING TRAINING

Specialised courses given by industrials
Collaboration for the engineering design projects and student projects
Organisation of conferences, professional days and visits of companies
Participation to the ENSMA careers fair
The apprenticeship tax is an essential boost to guarantee the funding of the technical training

POLES OF COMPETITIVENESS

Owing to its expertise in aeronautics, aerospace, ground transportation and energy systems, both at academic and research levels, ENSMA has forged ties with two poles of competitiveness:

- The Pôle mondial AESE Midi-Pyrénées/ Aquitaine, the leading French centre of excellence dedicated to aeronautics, aerospace and embedded systems, which is backed by an industry of some 94,000 staff, which forms a community of 8,500 researchers to which the 4,000 students engineers at the French graduate aeronautical schools must be added. ENSMA, together with its partners in GEA, the Grandes Ecoles Aéronautiques, is a founding member of Aerospace Valley, the council which manages the pole of competitiveness.
- EMC2 is rooted in a historical culture of transformation and implementation of materials in Pays de la Loire. The association has around markets and key technologies, all innovation actors. Small and large companies, research organizations (including Pprime Institute), training centers (including ISAE-ENSMA) contribute to the emergence of R & D projects. Serving the French industrial competitiveness, a main objective: to strengthen the territorial ecosystem of innovation and growth, structuring and animating locally six sectors (aeronautics, naval, ground transportation, energy, boating and capital goods) in a common and transverse dimension: advanced production technology ».

TECHNOLOGY PLATFORM

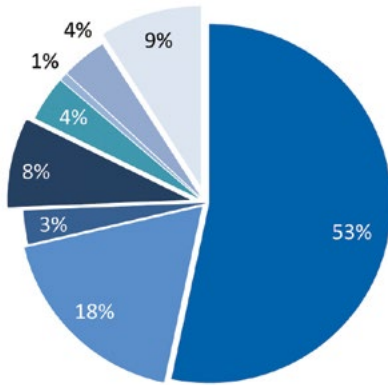
ISAE-ENSMA has developed a platform for technological transfer and innovation support, ESPRITT (ESpace de Recherche, d'Innovation et de Transfert de Technologies). Located at ISAE-ENSMA, a space of about 400 m² has been set up for offices, meeting rooms, computer rooms, relaxing areas, to welcome the people involved in technological transfer and innovation activities, and to support the development of future companies or projects from students.



ENGINEERING CAREERS

An average of 50% of students are hired before graduation, and 23% get their first job in less than 2 months.

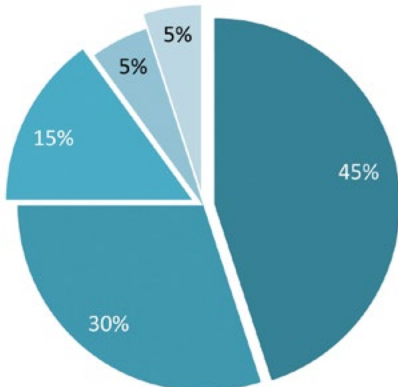
► Contact : emploi@ensma.fr



BRANCHES OF ACTIVITY

- Aeronautics/Space/ Defense (53%)
- Consulting companies/ Design consultants (18%)
- Energy (3%)
- Automobile (8%)
- IT services (4%)
- Finance/ Insurance (1%)
- Scientific R&D (4%)
- Others (9%)

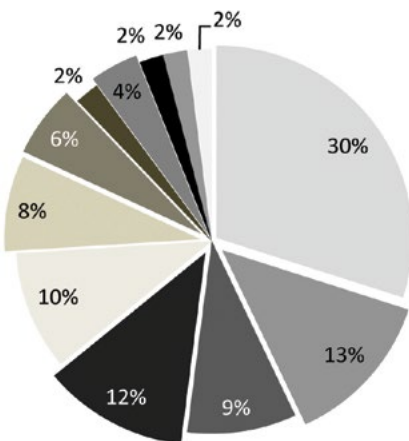
The choice of ENSMA graduates to work in aeronautics/aerospace/defense is in keeping with the wish which most students express when arriving at ENSMA.



SIZE OF THE COMPANIES

- > 5000 employees (45%)
- 250 to 4999 (30%)
- 50 to 249 (15%)
- 20 to 49 (5%)
- < 20 employees (5%)

On average, more than 75% of the ENSMA graduates begin to work for large or very large companies (250 employees or more).



TYPES OF JOBS

- R&D engineer (30%)
- Software engineer (13%)
- Consultant (9%)
- Design engineer (12%)
- Systems engineer (10%)
- Performance engineer (8%)
- Project manager (6%)
- Production engineer (2%)
- Test engineer (4%)
- Business manager (2%)
- Quality engineer (2%)
- Others (2%)

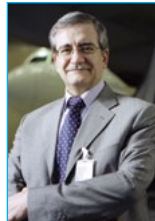
At the beginning of their careers, a large part of ENSMA engineers work in engineering design.

Sources : the graduates employment survey over the past three years.

ENSMA ENGINEERS TESTIMONIES

Alain BASSIL

(Class of 1977)
Executive Vice-President Air France
Operations CEO
AIR FRANCE INDUSTRIES



Passionate with aeronautics and leading-edge technology, I was graduated from ENSMA in 1977 by having a post-graduated specialization in Advanced Automation at SUPAERO.

It allowed me to join Air France being in charge of the implementation of the first numerical flight simulators. I was then in charge of different technical issues, production issues, strategic planning issues and management.

Appointed in 1998 as Deputy Managing Director of Air France, in charge of Air France Industries, the technical and industrial branch of Air France, I have managed the technical aspects of the creation of Air France KLM and the adaptation of the company into this new environment. Since 2010, I am in charge of an extended area of air and ground operations for Air France.

With hindsight, I can tell today that the technical and human training provided by ENSMA allows having an "initial velocity", making easier the adaptation and apprehension of the multiple aspects an engineer has to manage in companies that constantly evolve.

Julien HENRY

(Class of 1983)
Head of Employment section
Direction of Social Relations and Human Resources
DASSAULT AVIATION



After my engineering internship in Dassault Aviation, I have thus found back this company on the strategic matter which was going to lead to the RAFALE programme. After years of programming, simulation and tests, I've had the opportunity to join the engineering and design department on the space preliminary project where I could widen my technical skills by developing futuristic projects like systems of space transports with conventional take-offs.

During these seven years as a design engineer, I have felt the growing need to go beyond the simple technical research activity. In parallel, my sport career (being fruitful by the title of World Champion of Gliding in 1999) led me to get interested in engines and more particularly their individual and collective performances in sport.

I thus naturally integrated the HRD to initially take part in the development of educational tools specifically related to the activities of our airframe manufacturers and then take in charge the social communication before coming to the Head of the Dassault Aviation Employment Section.



Willy-Pierre DUPONT

(Class of 1982)
Head of Airport Operations
AIRBUS



After 13 years spent in the Pilot Studies department of Aérospatiale, where I had the opportunity to take part in the conception of military freighters, special aircraft and Airbus commercial jetliners, like the A318, A2319, A321, A330-200, A340-500/600, I devoted myself exclusively to the A380, from 1996 onwards.

Having followed this project (UHCA, ASX, A2000, VLCT ...) from the very beginning, in the late 1980's, I participated in the attempt to devise a closer framework of collaboration with Boeing (VLCT). I then joined the A3XX leading team which covered a variety of aspects. As a member of that team, I was a witness to the rise of European cooperation in the aircraft industry.

When the program reached its pre-development stage, long before the launching, I was made responsible for airport compatibility, which was not a particularly fascinating aspect, but which quickly became critical for our clients.



Chantal GRESILLION

(Class of 1981)
Director of Lean & Progress
SAFRAN AIRCRAFT ENGINES



After graduating from ENSMA in 1981, I started my career as a Structural Design Engineer successively at Aérospatiale, Dassault Aviation and then Safran Helicopter Engines (Turbomeca).

I then moved on to various positions at Safran Helicopter Engines in Bordes. First as ARRIUS technical engineer, then project manager ARRIEL (turbine engine for helicopters), before taking on hierarchical responsibilities: Head of the Expertises department and then Head of the Materials Processes and Expertises department. Later I assumed responsibility for the Combustion Industrial Competence Center, a great team story that successfully transformed a moribund workshop into an example of performance with drastic improvements in quality, costs and cycles. Alongside this position, I was also a career advisor for the Industrial Manufacturing Department: mostly solicited by women, I became aware of the need for mentoring of my colleagues. From 2011 onwards, the Direction progress Approach was a significant experience: the organization of a «social weighing» and the animation of the ComEx for the restoration of weighing and the construction of the action plan that resulted.

In 2014, I joined Safran's headquarters in Issy-les-Moulineaux as Project Manager and moderator of the Group Progress Steering Committee. Two years with a very clear objective: to organize the synergy within the Group in terms of progress so that each company benefits from it and thus improves its performance and competitiveness. And since March 2016, I am Director of Lean & Progress of the Industrial and Supply Chain Department at Safran Aircraft Engines in Evry Corbeil. It is to put at the service of the company my technical experience, production and progress to meet the enormous stakes of the company, in particular the rise in cadence of the engine LEAP, successor of the CFM56: a beautiful recognition and an opportunity full of challenges!

Céline COUQUET
(Class of 2000)
Engine engineer
Head of adaptation project
RENAULT



RENAULT



In 1993, I went to university and obtained a Master of Mechanics, a 4-year degree in mechanics from the University of Poitiers. This qualification enabled me to be admitted to ENSMA, through a special admission system, in 1998.

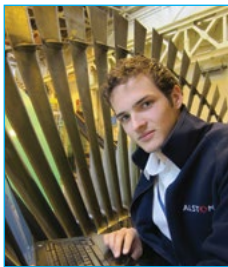
I chose to specialize in energetics and combustion in my third year and complement my training with a postgraduate advanced research degree in combustion within the Combustion and Detonation laboratory.

When I was 13, I decided that I would work on engines and have never changed my mind since. Aeronautics and automobiles have always been my two passions. It was then a matter of choosing the appropriate study path. ENSMA helped me make my dream come true.

I graduated in September 2000, and then joined the Renault facility in Lardy which specialises in the development of the brand's engines. Early 2001, a position as test engineer for single-cylinder engines and combustion was made vacant at Renault Sport in Vitry-Châtillon



Benjamin DUGONE
(Class of 2009)
Engineer Methods and Tools
Rotor Dynamics
ALSTOM Power Switzerland



ALSTOM

Immediately after graduating from ENSMA, I joined the Power subsidiary of Alstom, a world leader in the fields of power generation and rail transport. I started at Alstom Power UK by taking part in the International Graduate Program, literally «international graduate program».

This program consists of a rotation period of two years, during which projects of three to four months are awarded in different departments of the group. I now hold the position of «Engineer Methods and Tools - Rotor Dynamics», on behalf of the Swiss Research and Development Center in the suburbs of Zurich.

The training given to ENSMA - although mainly oriented aeronautics and space - is fairly general to be appreciated by large groups of various sectors.

Caroline AUSSILHOU
(Class of 1996)
Launcher Protection of Ariane 5
Launch Complex Manager
CNES



I had the opportunity to join ENSMA in 1993. During my 3 years there, I greatly appreciated the training I received, which was both comprehensive and geared towards aeronautics, and which combined theory and practice. Furthermore, as ENSMA makes a point of offering its students the possibility to study abroad, through exchanges with foreign universities, I was able to complete both my third year of studies and my graduation project in Melbourne, Australia. This was a great springboard for my career. When I came back at the end of 1996, I had no difficulty finding a job and was hired by IBM France, in the awesome world of microelectronics.

However, I could not long let go of my passion for « flying objects ». In 1999, I joined the Centre National d'ETudes Spatiales, as a member of the department of Ariane Launchers and took part in the development of the new European launcher, the heavy model of Ariane 5.



Jérôme CHARPY
(Class of 2013)
Specialist in stator engineering
MBDA France



Having followed in the third year the option «Energy» with in addition the research master «Combustion», I wanted to go towards a trade with a dominant in combustion. I was hired in the «Stato» department of MBDA Bourges Subdray at the end of the ENSMA in October 2013, as «Specialist in ramjet studies».

The courses offered at ENSMA provide a good basis for understanding and developing technical and social skills.

My various activities correspond perfectly to my expectations: design and follow-up of production of models, piloting and analysis of ramjet tests, realization of models / simulations of engine and subassemblies. In particular, I am in charge of a Franco-English project for the technical responsibility for the combustion chamber of the ramjet engine.



AN ENGINEERING TRAINING AT THE HEART OF A LEADING RESEARCH ACTIVITY

At ENSMA, research is a tradition.

The close relationship between the 5 research laboratories, the teaching departments and industries means that students benefit from state-of-the-art training that introduces them to the latest advances in mechanical engineering and energetics.

THE P' INSTITUTE (UPR 3346)

600 people including 200 researchers and 180 PhD students

The 2nd most important French lab in engineering sciences

Pprime Institute (P') is a research unit specific to CNRS created in 2010 in partnership with ISAE-ENSMA and the University of Poitiers. The research activities mainly concern Engineering Sciences and Physics of Materials.

P' is composed of six laboratories in combustion and detonation, aerodynamics, heat transfer, mechanics and physics of materials and mechanical engineering.

A technological platform called the CEAT (research center in aerodynamics and heat transfer), from the University of Poitiers and ENSMA, gathers heavy research facilities as well as the facilities for the supersonic teaching of the school.

► www.pprime.fr

LABORATORY OF COMPUTER SCIENCE AND AUTOMATIC CONTROL FOR SYSTEMS (LIAS – EA 6315)

40 teachers-researchers and 40 PhD students

The LIAS laboratory was created January 2012 from the merger of the suite LAll laboratory (Laboratory of Automation and Applied Computer Science) and the LISI lab (Applied Computer Science Laboratory).

Although the laboratory is anchored in the Communication Systems community for the fundamental aspects, the LIAS, through its applications, is naturally open to the engineering sciences either for the new modes of propulsion, energy management, water treatment, complex systems modeling, or the optimization of real-time systems. The complementarity of the automatic control, electrical engineering and computer science disciplines is an added value for the application processing, all related to engineering.

The LIAS is composed of three teams: data and models engineering, embedded real-time systems and automatic control & systems.

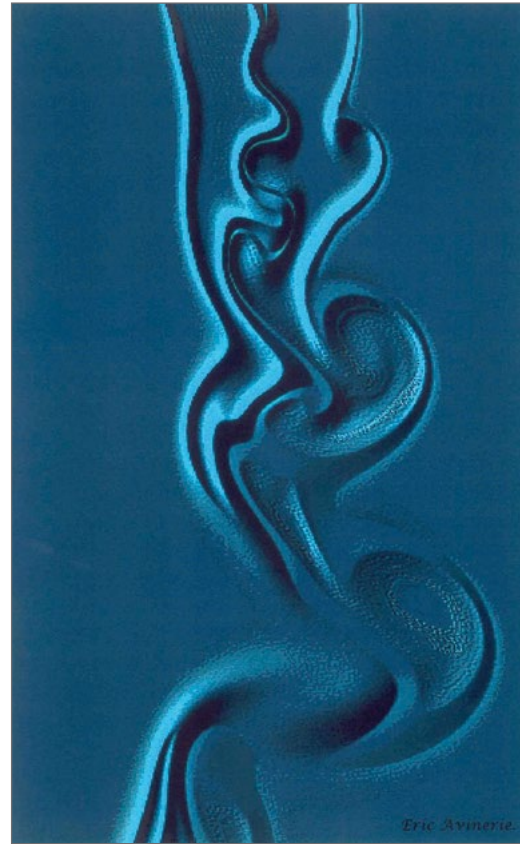
► www.lias-lab.fr

THE P' INSTITUTE

THE THERMAL STUDIES

The purpose of the laboratory is to understand, predict and measure the heat transfers –by convection, conduction or radiation- in solids, fluids, heterogeneous and diphasic media. The main research specialities of the laboratory are natural and mixed convection, aerothermics, and radiation. A novel subject, micro and nano heat transfers, is being researched too.

The laboratory also specializes in applied research for sectors such as the aeronautical, aerospace, transport, food-processing, energy and environmental industries. Thermal sciences are increasingly concerned with the physics of coupled transfers and interact with other disciplines such as electromagnetism, mechanics, chemistry, biomechanics and nanotechnologies and the many implications they have in numerous systems.



Direct simulation of a mixture of 2 vertical jets at different temperatures

THE COMBUSTION AND DETONICS

The mission of the laboratory is to conduct basic research on combustion phenomena (flames, reactive turbulent flows, detonations and combustion chemistry), stock propagation in solids and transfers in porous media.

Concurrently, the laboratory develops applications in the fields of propulsion, the safety of industrial facilities and industrial processes, as well as in environmental protection. The laboratory had forged strong links with industry and large organization in the energy and defence areas.



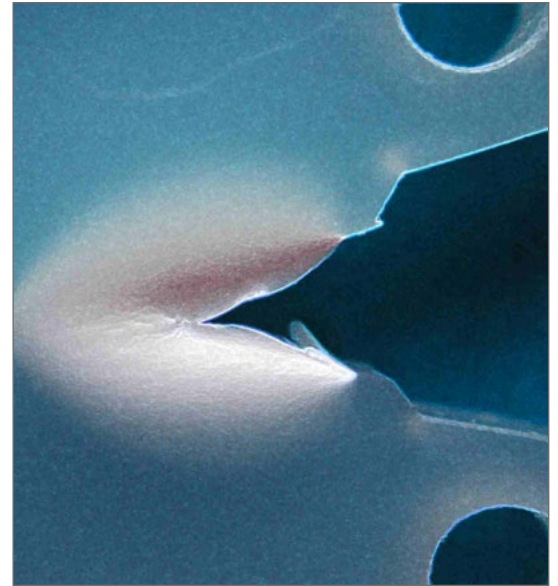
Vulcain 2 - Snecma Groupe Safran

THE P' INSTITUTE

MECHANICS AND MATERIALS PHYSICS

The purpose of the laboratory is to conduct fundamental and applied research into the behavior and the durability of materials tested at different temperatures, in different environments and under different stresses. The emphasis is particularly placed on studying the interaction between the mechanical behavior, the microstructures and the fracture mechanics of specific materials as well as on setting up behavioral laws and performing structural analyses.

Different types of advanced materials (metal alloys, polymers, laminates, ceramics) are studied in their environment by diversified tests (fatigue, flow, heat ageing, shock absorption) coupled with observation methods at different scales and through analytical and numerical modelling. French and Pan-European research programs are developed on these topics in partnership with the transport industries (aeronautical, ground and maritime transport) and the energy sector.



Polypropylene crack - Fabienne Touchard

AERODYNAMICS

The laboratory specializes in fluid mechanics (gases and liquids) at low and very high velocities (super and hypersonic flows). In addition to numerical and experimental studies, research is also done on new theories.

The laboratory tackles issues related to aerodynamics, turbulence, flow control and aeroacoustics, which apply to terrestrial, aeronautical and aerospace transport systems. The laboratory is a key participant in a series of French and Pan-European research programs supported by the industries mentioned above. At The laboratory, wind tunnel tests are conducted and other specific test beds are set up for research.



Fan of the concrete wind tunnel

RESEARCH AREAS

COMBUSTION OF INNOVATIVE PROPELLANTS FOR SPACE PROPULSION- PERGOLA (P' COMBUSTION)

In order to study new storable propellants for rocket engines (lower risk for the user and reduced impact on environment), the Pprime Institute and the CNES are associated to develop a new set on an experimental scale allowing to characterize precisely the combustion of new propellants under pressure, both in terms of ignition and stability of the combustion stability, as well as the propulsion production.

SUPERSONIC AERODYNAMICS (P' AERODYNAMICS)

Study in supersonic wind tunnel on models at simplified and small-scale: force channel, shock display, reduction of sonic bang... Numerical simulation of supersonic flows around simple bodies. Optimization methods for the drag reduction (collaboration with ONERA).

SUPER ALLOYS: HIGH TEMPERATURE CONSEQUENCES

(P' MECHANICS AND MATERIAL PHYSICS)

These studies, managed in partnership with SNECMA Moteurs and TURBOMECA, relate to the durability of Nickel-based, mono- or polycrystalline super alloys, for turbine wheels. The purpose is to control the super alloys ageing in extreme temperature conditions and to evaluate the impact on the residual maturity in fatigue, flow and fatigue-flow.

HEAT TRANSFERS IN AERONAUTICS

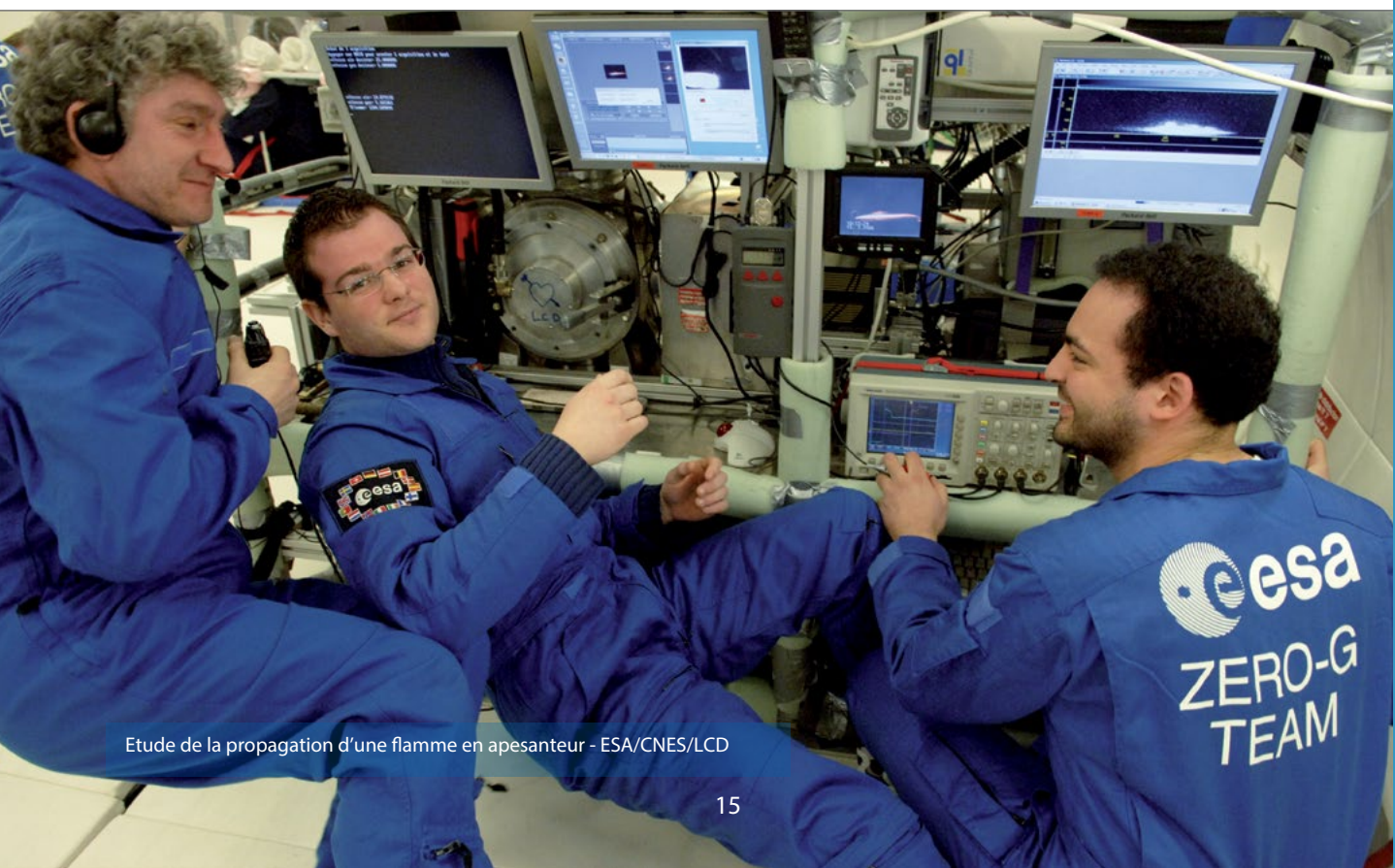
(P' THERMAL STUDIES)

The cooling of aircraft engines is studied by techniques such as: film cooling, jet impingement, multi punchings.... These studies are managed in partnership with SNECMA-Engines (SAFRAN Group), and also lead to European collaborations (ICTB2).

EXCHANGE BETWEEN CAD SYSTEMS

(LIAS)

The laboratory is the source of a data model to allow exchange between heterogeneous CAD systems, CAD model libraries of standard components.



Etude de la propagation d'une flamme en apesanteur - ESA/CNES/LCD

ENVIRONMENT

Located from 1993 on the Futuroscope site, 12 km away from Poitiers, the new buildings with a futuristic architecture allow the students to progress in a highly technological environment.

A large number of apartments (CROUS, HABITAT 86... for one, two or three persons with eligibility for housing allowance) and restaurants (university restaurant, brasserie, snack, pizzeria, saladerie...), a bank, a post-office, a bakery and a shopping center enable the students to line on campus.

A bus service provides a regular link with Poitiers. The exit "Futuroscope" links the site to the Paris-Bordeaux highway (A10). The Futuroscope train station is a 10-minute walk from the school.



SPORT AT ISAE-ENSMA

Sports and physical activities have always been part of the school's curriculum. It gathers students from the three years. Among the many possible activities let us quote:

- Collective sports : basketball, soccer, rugby, handball, volleyball...
- Individual sports : climbing, body building, tennis, swimming, badminton, cross-country race, athletics...

For all these activities, supervised by teachers, the school has exceptional facilities at its disposal :

- a gymnasium with 3 tennis courts, 9 badminton grounds, wall and artificial structure climbing ;
- a body building room ;
- 4 outside tennis grounds ;
- 1 soccer and rugby ground.

Tournaments are organized every year :

- within the framework of the FNSU (National Federation of University Sports),
- for more than 50 years with the 3 aeronautics schools of Toulouse (ISAE, ENAC), and with some European universities.

THE SCHOOL LIFE



Student life at ENSMA is livened up by about fifty associations and clubs managed by the Student Fraternity. Students can thus take part in the activity of their choice.

The different clubs:

SCIENCES

For students who have a scientific project, who wish to design, model or size, the school provides logistical and/or financial support for the realization of these experiments:

- ENSMA Space Project, which brings together space projects such as mini-satellites, experimental rockets, stratospheric balloons, parabolic flights;
- and also: the Dassault UAV Challenge to build a hexacopter, ENSMAero for model aircraft, ENSMAsteel participates in the French Robotics Cup, ENSMArathon Shell takes up the challenge of the car which consumes as little as possible, ENSMA Junior Etudes offers to the industrialists services in the fields of competences of the school ...

SPORTS

The sport, male and female, is very present at the ISAE-ENSMA; a wide choice is offered to students. The BDS (« Bureau Des Sports », sports office) organizes events and supports the different teams:

- ENSMAIR which offers its members (conquered by the baptism of air offered to any new promotion) to learn the joys of piloting at attractive prices, and ENSMA Glider for gliding;
- And also : regatta, rowing, football, rugby, handball, volleyball, badminton, tennis, running, raid, climbing, skiing, surfing, go-karting, roller-skating, pétanque , 4L Trophy, golf, parachuting, bungee jumping ...

CULTURE

The BDA (« Bureau des Arts », arts office) is responsible for coordinating and promoting the activities of the clubs through various events: theater, improvisation, choir, fanfare, rock, dance, pom pom, cooking, oenology, photo, cinema, video games, chess, audio-visual, comics...

WITH HUMANITARIAN VOCATION

The CSF (« Club Sans Frontière », club without borders) contributes, through field actions, to the improvement of living conditions in certain countries of the Third World. He also participates in numerous charity events (Restos du Coeur, Téléthon) and organizes actions (air baptisms ...) for handicapped or disadvantaged people.

A UNIVERSITY CAPITAL



Square Maréchal Leclerc, Poitiers

Capital of Poitou-Charentes territory, lively and dynamic, Poitiers combines with talent, quality of life (citizenship and environmental values), economic and university activity. A vast number of cultural and leisure events liven it up throughout the year and it is possible to practice almost all sports activities thanks to numerous facilities.

Poitiers is naturally a very attractive city with around 140 000 inhabitants. It is located at one hour away from the Marais Poitevin and the Cognac vineyards and less than two hours from the beaches of Charente-Maritime and Vendée as well as the Loire Valley chateaux. Thanks to its location, it enjoys the strong influence from other areas thanks to the high speed train (it takes 1:20 from Paris and 1:05 from Bordeaux) and the air connections.

Situated in an area of art and history, the birthplace of Romanesque art, Poitiers has an exceptional wealth of more than 80 buildings listed as historical monuments.

Poitiers is also one of the most ancient universities in Europe (1431). Poitiers counts nowadays more than 25 000 students out of the 90 000 inhabitants living in the city.

VIENNE, THE COUNTRY OF FUTUROSCOPE

With nearly 2 million visitors a year, 1,000 employees and several thousand spin off jobs, Futuroscope has become the main axis for the development of the Vienne department. Since 1987, its expansion has relied on the presentation of new shows, developed each year, ensuring the international fame of the region.

The Futuroscope Park's activity is original on the theme park market, between entertainment and educational discovery. The Futuroscope Park's mission is to entertain families and arouse curiosity thanks to the strength of emotion and imagination.



The Futuroscope park

LOCATION



TOMORROW STARTS HERE AND NOW!

Only 80 minutes away from Paris on the high speed train, the Futuroscope technology centre has already attracted 220 companies (multimedia, call centers, e-business), 6000 employees, almost 2,000 students and 13 research laboratories...

An original concept from the County Council, the technology centre has become a unique reference site in France, where the activities of tomorrow are starting.



Futuroscope's technology center

ADMISSION SCHEMES

THROUGH CONCOURS

In first year



Concours communs polytechniques

1-by preparatory classes

- Maths and Physics course
 - Physics and Chemistry course
 - Physics and Sciences for the Engineer course
 - Technology and Sciences for the Engineer course
 - Physics and Technology for the Engineer course
- 2-by a « DEUG » in Sciences, a twoyear university degree

Through ATS (Adaptation Technicien Supérieur)

ACCORDING TO ACADEMIC QUALIFICATIONS

Selection on the basis of student's application

1-in first year :

- for students who have a bachelor's degree (mechanics, applied mathematics, physics, electronics ...)
- for students who have a university technological diploma (specialities: Mechanical and Industrial Automation Engineering, Thermal and Energy Engineering, Industrial Engineering and Maintenance, Electrical Engineering and Industrial Computing, Science and Materials Engineering, Mathematics and Physics).
- for students who have a Bachelor's degree in « Sciences and Technologies » from the University of Poitiers
- continuing education: for salaried people who have worked 5 years and who have followed a 1-year preparatory class.

2-in second year :

- MS degree or 1st year Master students (specialization: mechanics, physics, mechanical technology, mechanical engineering, materials engineering).

THE SELECTION OF STUDENTS

Among the students of a class :

- 80% have followed preparatory classes (concours communs polytechniques)
- 10% are selected according to their academic qualifications in first year
- 10% are selected according to their academic qualifications in second year.

AWARDED DEGREES

ENSMA engineering degree



Students have also the opportunity to get a double degree : the ENSMA engineering degree and a degree from the following partners:

- Schools from POLYMECA (ENSMM Besançon, ENSIAME Valenciennes, SUPMECA Saint-Ouen, ENSTA Bretagne Brest, ENSIL-ENSCI Limoges, ENSEIRB-MATMECA Bordeaux, SEATECH Toulon)
- Schools from INSA Group (Centre Val de Loire, Lyon, Rennes, Rouen Normandie, Strasbourg, Toulouse)
- INSTN (CEA Saclay and Cadarache)
- IAE (Poitiers)
- Schools from POLYMECA
- EIAE Madrid (Spain)
- University of Sevilla, ESI (Spain)
- Institutes of Hanoi and Hô-Chi-Minh-Ville (Vietnam)
- IIT Chicago (USA)
- Ohio State University (USA)
- ETS Montréal (Canada)
- Politecnico di Milano (Italy)
- University of Naples (Italy)
- NUAA, Nanjing (China)
- SIAE Tianjin (China)
- UFU Uberlandia (Brazil)
- University of Cranfield (United Kingdom)

Masters of science (english-taught)

- Aeronautical Mechanics and Energetics (AME)
- Turbulence

Masters in cooperation

Together with the University of Poitiers, ENSMA offers Masters and PhD programs.

These degree programs are closely linked to research laboratories that gather 250 CNRS researchers and teachers.

- Air and Ground Transportation
- High Performances Materials
- Computer Science

Apprenticeship training

Engineering degree in Aeronautics and Space from CNAM (apprenticeship), in collaboration with ISAE-ENSMA and in partnership with Aeroteam Poitou-Charentes.

CONTACTS

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Public establishment of the Ministry of National Education, Higher Education and Research

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PRIVILEGED PARTNERSHIPS WITH COMPANIES



Airbus, Airbus Defence & Space, Airbus Helicopters



Safran Aero Boosters, Safran Aircraft Engines, Safran Ceramics, Safran Electrical & Power, Safran Electronics & Defense, Safran Helicopter Engines, Safran Identity & Security, Safran Landing Systems, Safran Nacelles, Safran Transmission Systems



ENSMA has developed strong and long-standing links with industry in terms of internships and recruitment, and has also increased the participation of professional guest speakers in the academic activities (courses, engineering design projects), the meetings between the students and the companies (plant tours and presentations, lectures, round tables, career and student fairs), the presence of industrials in ENSMA's board meetings (board of directors, academic activities and research councils), the apprenticeship tax fund raising...

THANKS to our industrial partners!

