Masters of Science, Advanced Masters & Certificates in Aerospace Engineering & Management
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*The programs may be modified before the start of academic year*
A word from the Director of Masters Programs

Are you looking for high-level training towards a Master’s degree or Advanced Master’s degree, to prepare you to enter the fascinating world of aeronautics and space?

The Institut Supérieur de l’Aéronautique et de l’Espace can help you to make this project a reality.

ISAE-SUPAERO is now a major world actor in the training of engineers and masters students in aerospace, and the leader in Europe in the number of graduates. The Institute’s reputation is not just built on its prestigious programs, the renown of its faculty staff or the excellence of its research, but also on the quality of its graduates, their technical and managerial skills, their ability to work in an advanced high-tech sector, their entrepreneurial and international spirit.

Our programs are offered on the ISAE-SUPAERO campus or at our educational partners’ permises. Classes are taught by permanent ISAE-SUPAERO faculty staff and a unique network of several hundred affiliate professors from research centers and European aerospace companies.

In 2017 Airbus Defence and Space and ISAE-SUPAERO have joined forces to launch the advanced master “Space Applications & Services”. This new and unique course in France aims to respond to extensive training needs among space sector professionals in order to stimulate development of new applications, fully harness the potential of space systems and increase international trade.

Moreover, Airbus Helicopters and ISAE-SUPAERO have reinforced their partnership by offering an innovative program, the advanced master “Helicopter, Aircraft and Drone Architecture” to answer the growing need of aeronautics manufacturers and designers of drone systems who are seeking engineers capable of switching easily from one type of aircraft to another.

Projects are an important part of our programs, whether they are carried out in our research laboratories or within ISAE partner companies. This way, we ensure that our students’ training is constantly evolving and always adapted to the needs of companies. Our “internship and careers” office assists all students in the construction of their professional plans and integration into this professional world.

Today, over one third of ISAE-SUPAERO graduates are International. On the SUPAERO renovated campus, in the heart of the scientific complex of Toulouse, our 1,600 Master’s, Advanced Master’s and PhD students are immersed in an international environment that is unique in Europe: our laboratories have been fully renovated in 2015 and give access to students with exceptional facilities, among them structures and materials manufacturing and testing facilities, low and high speed wind tunnels, a turbojet test bench, embedded systems platforms, communication and navigation platforms, a research flight simulator, a micro UAV flight tests room, a SOCATA TB 20 flight laboratory, a satellite ground station, a satellite simulator, etc.

By choosing ISAE-SUPAERO, you will open the doors to an exciting life of excellence. We hope to share this prospect with you when you join one of our programs.

Didier Delorme
Director of Masters programs
Master of Science, Advanced Masters & Certificates

ISAE-SUPAERO has developed a wide range of master’s programs in aeronautics, space, embedded systems and management to provide the global aerospace industry with highly qualified engineers and managers capable of developing and delivering innovative solutions to the constantly evolving challenges facing industry and our society today.

To satisfy international demand for junior and senior engineers and managers, ISAE offers two types of degrees: Master of Science and Advanced Master. The Institute also delivers a range of professional certificates to managers looking to expand their skills in specific areas.

### Master of Science (Master)

The Master of Science is a two-year program undertaken after undergraduate studies, including a Bachelor's degree or an equivalent degree. It provides higher qualification for employment or for further doctoral studies. The master is accredited by the Ministry of Higher Education and Research in line with the Bologna process established in 1999 to harmonize the European higher education systems.

The two-year ISAE-SUPAERO Master of Science degree program is internationally renowned and highly regarded as an innovative program in science and technologies. The ISAE-SUPAERO Masters’ program is designed to prepare engineering students to find and develop solutions to today’s and tomorrow’s challenges facing the world and the aerospace industry. The program combines lectures, tutorials, research projects, and a master’s thesis to be carried out in an aerospace company or an ISAE laboratory.

Fully taught in English, the program is particularly suitable for students with a bachelor’s degree in mechanical and electrical engineering mechatronics, aeronautics or the aerospace field.

### Advanced Master’s Program (MASTÈRE SPÉCIALISÉ®)

The «MASTÈRE SPÉCIALISÉ®» is a collective trademark and label owned by the «Conférence des Grandes Ecoles» or CGE, a network of the some of the finest French engineering schools. This label is attributed to specific training programs delivered by schools within the CGE. The highly rigorous accreditation process ensures the excellence of program content.

The Advanced Master’s program is a one-year course of professionally-oriented advanced studies, undertaken after completion of a Master’s degree. Advanced Master’s degrees delivered by ISAE-SUPAERO provide participants with unique, state-of-the-art knowledge and know-how in a specific domain for which aeronautics or space companies have a genuine need. Courses are delivered by specialists or experts from industry or state Organisations in collaboration with ISAE-SUPAERO faculty. ISAE-SUPAERO’s Advanced Master’s program combines theoretical lectures, tutorials, case studies and personal projects to grow students’ knowledge of aerospace system approaches. Attuned to aerospace global market needs, the program draws participants from all over the world with a wide range of qualifications, profiles, cultures and professional experiences. Consequently, the program offers participants an outstanding opportunity to expand their personal development skills, grow their international network, and leverage employment opportunities after graduation.

The ISAE-SUPAERO Advanced Master’s program ensures that students acquire:

- in-depth, advanced knowledge in a specific area of aerospace-related expertise,
- dual competency in management,
- professional skills in an emerging field.

### Certificates (Certificats d’Études Spécialisées)

A number of post-graduate certificates are offered to professionals who want to grow their skills in technical areas such as UAV systems, aeronautical maintenance and support, helicopter engineering, earth observation systems and human factors.

Upon completion of these short courses (from one to three months), participants are awarded a diploma from the institute. Participants may earn ECTS credits upon completion of courses.

### 6 Reasons to Choose an ISAE-SUPAERO Masters Program

- Make your passion for aerospace engineering a reality thanks to our world-class Masters programs
- Engage with the most advanced research driving our innovative science and technology curriculum
- Collaborate with ISAE-SUPAERO renowned experts from industry and research
- Benefit from our ongoing partnerships with the leading aerospace companies
- Acquire international experience in the European aerospace capital
- Connect to the ISAE-SUPAERO alumni network of 19000 graduates around the world (67 countries)
Industrial partnerships

**The Chair for Eco-Design of Aircraft**

Airbus and ISAE have signed a partnership agreement to create a “Chair for Eco-Design of Aircraft”. **CEDAR** will permit to attract Masters students to aircraft design. These students will develop projects from real industrial cases, in the field of “Future Aircraft Design”. The Chair also funds scholarships to attract the best international students in this field.

**The GIFAS Programme of excellence**

ISAE and ISAE-SUPAERO Foundation have signed a sponsorship agreement with GIFAS (Groupement des Industries Françaises Aéronautiques et Spatiales) thereby setting up a scholarship programme for European and non-European students.

**The MBDA Programme of Excellence**

In December 2013, ISAE and the ISAE-SUPAERO Foundation have signed a sponsorship agreement with MBDA, the world leader in missiles and missile systems, thereby setting up a Programme of Excellence for India at ISAE-SUPAERO and a Programme of Excellence for Indonesia at ISAE-SUPAERO.

**The Chair for Embedded Systems Architecture and Engineering – ARISE**

Thales have signed a sponsorship agreement with ISAE-SUPAERO and ISAE-SUPAERO Foundation, on novembre 23th, 2015 in order to create a chair called « ARchitecture et Ingénierie des Systèmes Embarqués » or ARISE. This chair aims to support and develop engineering of embedded systems.

**Close partnership with industry**

ISAE collaborates closely with the leading aerospace firms including: Airbus Group and its subsidiaries, SAFRAN, Thales, Altran, Capgemini, Aéroconseil, Dassault Aviation, Rolls Royce, Alenia, BAE systems, Air France, SOGETI, CNES, ONERA, and others.

**Key actions**

Close collaboration with industry is fostered thanks to:

- The many affiliate lecturers who intervene in our courses bringing their expertise, cutting-edge knowledge and the latest best practices to our students,
- studies and research,
- continuing education courses designed for working engineers and executives,
- meetings between students and companies.

**Aerospace Industry strongly represented within ISAE-SUPAERO**

In addition, companies are strongly represented on the various Boards of the Institute which include distinguished leaders from industry. The Board of Governors is responsible for the Institute’s major strategic directions; it includes among its members high profile leaders appointed for their scientific, engineering, and business expertise in particular in the aerospace field. This close collaboration with industry, fed by our innovative research, ensures that our degree programs both anticipate and answer the needs of aerospace industry today.
The pedagogical approach of the ISAE-SUPAERO Master’s program is research-driven and designed to encourage students to engage in a wide variety of research opportunities throughout the program and beyond.

ISAE-SUPAERO is deeply committed to offering its students full access to its research capabilities as well as its academic and industrial partnerships, covering the entire field of aerospace engineering. From a research policy point of view, the dual objective is to foster the development of new knowledge as well as to answer the needs of the aerospace industry. The main research partners of ISAE-SUPAERO are ONERA (the French Aerospace Lab.), LAAS-CNRS and OMP (Astronomical Observatory Midi-Pyrénées), the largest French laboratories in the engineering science and space fields. ISAE has numerous long-term research and development agreements with the main European aerospace companies: Airbus Group (Airbus Defense & Space, Airbus Helicopters), SAFRAN (Sncma, Turbomeca, Microturbo, Technofan), Thales Alenia Space, Rockwell-Collins, MBDA, and Liebherr Aerospace. Reflecting its longstanding commitment to aerospace higher education and research, ISAE is a member of the management board of the Aerospace Valley cluster (550 aerospace companies and higher education and research institutions from the Aquitaine and Midi-Pyrénées Regions).

ISAE-SUPAERO scientific activities are organized into 5 training and research departments and one aerospace centre:

- The **Electronics, optronics and signal Department** is organized into 4 research groups:
  - microwaves and optronics for embedded systems
  - image sensor research team,
  - signal, communication, antennas and navigation
  - space systems.
- The **Complex systems engineering Department** this department concentrates research driven in the multidisciplinary scientific fields of mathematics, computer science and control theory. It develops methods, techniques and tools that make it possible to understand, analyze, evaluate, control and design the functional and operational behavior and performances of complex systems.
- Finally, the **Design and control of air and space vehicles Department** is dedicated to the efficient and safe design and operation of vehicles. The three research groups : Air&Space Vehicles Design, Decision and Control, Neuroergonomics and Human Factors are using unique experimental platforms like instrumented aeroplanes, moving base flight simulators, satellite ground stations or brain sensors to perform their activities. The research carried out at DCAS is multidisciplinary by nature and implies close collaboration with other departments and external laboratories.

All 5 departments support a micro-aerial vehicle development program at an international level, on the basis of student projects, research and innovation projects, and international competitions.
Objectives

To support its steadily growing and to maintain business competitiveness, the global aerospace industry needs high qualified engineers or researchers. Design complex aerospace systems involve multinational geographically disseminated teams of project managers or various experts working in collaborative environment through integrated development platform tools. The Master of Science in Aerospace Engineering is intended to educate graduate students in subjects relevant to these demanding challenges and needs of the industry.

Giving students competences in engineering science, technology and design related to aeronautics and space, the MSc AE is designed to be multidisciplinary preparing future engineers to easily and efficiently work on aeronautical systems, space systems and their applications, with emphasis on the complete life cycle of the system. With a large spectrum of knowledge the MSc AE allows students to tackle various aspects from design to operations of products and systems either in a research organism or in an aerospace company in a multinational environment.

The MSc AE includes a total of 4 semesters of 30 ECTS each. The first semester of the MSc AE focuses on the common core curriculum, while the second semester offers a wide choice of electives.

In the third semester, students choose from among six concentrations spanning the main areas of aeronautical and space systems design including: «Advanced aerodynamics and propulsion», «Aeronautical and space structures», «Aerospace systems and control», «Embedded systems», «Space systems», and «Systems engineering». Students have extensive opportunities to develop a scientific skills approach through research projects in ISAE-SUPAERO laboratories in second and third semesters along with on-the job skills during internships in the aerospace industry.

Students complete a master’s thesis in the fourth semester.

Learning approach

The ISAE-SUPAERO Master’s program is designed with a combination of lectures, tutorials, study cases and projects to be performed in industrial environment or in ISAE-SUPAERO’s laboratories. It is taught in English.

The MSc AE program includes three-semester academic session, in ISAE-SUPAERO’s premises, provided by permanent professors and experts from aerospace industry bringing current knowledge and experience.

The last semester consists in a master thesis to be performed in a company or a laboratory in the aerospace sector. After the thesis, students having obtained 120 credits under examination will be awarded the Master of Science in Aerospace Engineering from ISAE-SUPAERO.

Syllabus

Common core - 405 h
Sciences & engineering
- Aircraft systems, Space systems, Airworthiness, Control, Aerodynamics & propulsion, Flight dynamics, Aeronautical structures, Applied mathematics, Computer sciences

Foreign languages
- French as a Foreign Language.
- French speakers can choose among: German, Arab, Chinese, Spanish, Italian, Japanese, Portuguese, Russian
- Intercultural workshop

Systems engineering

Semester 1: 30 credits

Common core (102 h)
- Mathematics – Mechanics - Optimization
- Foreign languages
- Electives (120 h)
Students conduct a thesis in industry or in a laboratory, in France or abroad and supervised by a tutor from the host organization and from ISAE. The Master thesis is concluded by the writing of a report and a public defense.

Optional programs (120h):
Students may complete their major with a 1-month optional program before starting the semester 4: Earth observation applications or Human factors (at the suggestion of the research project tutor).

Foreign languages:
During the two-year program, students attend «French as foreign language» classes, in order to become independent users.

This gives graduates a clear advantage when applying for high level engineering positions in the Aerospace industry as they are able to understand and express themselves clearly in three languages: English, their native language and French.
Organisation

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Head of program major Advanced Aerodynamics and Propulsion
■ Prof. Marc JACOB
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Heads of program major Aerospace systems & control
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■ Prof. Yves BRIERE
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Head of program major Aerospace structures
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Head of program major Embedded Systems
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Head of Program major Space systems
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Head of program major Systems engineering
■ Prof. Jean-Charles CHAUDEMAR
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Career opportunities

Toulouse is at the hub of the European aerospace industry, and hosts leading European engineering and postgraduate institutions.

MSc AE Graduates get senior positions in major aerospace industries or consulting companies (aircraft, rotorcraft, engine, aerospace systems, space launchers, satellites, …), equipment manufacturers and government agencies, as researchers, experts, designers and heads of projects or managers.

Several MSc AE graduates are recruited for PhD studies at ISAE-SUPAERO or other worldwide universities.

Companies recruiting our students
AIRBUS, AIRBUS HELICOPTERS, AIRBUS DEFENSE AND SPACE, AIRBUS India, AIRBUS China, ALENIA, ALTRAN, AKKA, AMADEUS, AVIC China, BOMBARDIER AEROSPACE Canada, BERTRANDT Germany, CNES, COMAC China, ESA Netherlands, GENERAL ELECTRIC Indonesia, GENERAL MOTORS Mexico, MTU Germany, SAFRAN, Ariane Group, SAFRAN India, SHELL Netherlands, SOGETI, THALES, THALES ALENIA SPACE, VALEO… and many other companies, governmental bodies, universities and research centers all over the world.

Duration of studies: Two year full time
Beginning of classes: September
Location: ISAE-SUPAERO
Teaching language: English

Two-year program Organisation

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I applied for the ISAE-SUPAERO Aerospace Engineering master’s program because I was looking for a motivating professional and personal challenge. I wanted to enhance my technical skills through an education that was flexible and well adapted to the current aerospace market needs. Indeed, the close relation of ISAE-SUPAERO with the industry has as a result a master’s program that is perfectly in line with the aerospace industry expectations.

Aerospace engineering is a worldwide, international industry, and therefore in my opinion a key asset of this master was the international, open-minded atmosphere it provided. Working alongside with classmates coming from all over the world and living in a foreign country was a self-changing experience, and it is an outstanding preparation for an actual aerospace engineering job. Furthermore, the master schedule included a well-balanced combination of lectures and research. Personally, I chose a full-year research project on deeply studying and programming finite element models. I believe that the reputation of the university has been earned through smart choices that result today in the best preparation for a career in aerospace.

Right after completing my master studies I started working as a Mechanical Engineer at Airbus Defence and Space. Currently I design satellite platforms, I study their mechanical behavior and qualify their capacity to withstand the dynamic and static loads through their lifetime.
At the end my decision was ISAE-SUPAERO for three facts. The first one it seemed to be well structured and a clear specialization in aeronautical structures was possible, swillecond the fact that the school has a very good reputation and third the opportunity to get to know south of France with all its aspects (Language, Culture, Country).

2/ According to your experience, which are the strong assets of the Master you did?

For my part three main parts are very positive of this master. The first is the university’s relation to industry which could be seen in lectures by e.g. Airbus Engineers, industrial visits and connection to job offers (e.g. internship). Second the school has nice resources in terms of software and test facilities. Third the student life with its internal character and different clubs (sports, music, etc) gave a very good personal life balance.

3/ Which are your career plans?

At the moment I’m focusing on my first job offer which directly came after this Master. Currently I’m employed as a Junior Consultant at Altran Benelux (Brussels) with a VIE contract. My work will combine Customer Support with structural calculations (Fatigue and Damage Tolerance).

In future I want to be part of aeronautical projects with specialization in structural design / calculation.

SUNDAY Cecily, USA, Robotics Mechanical Engineer at NASA Jet Propulsion Laboratory - Graduated in 2014

I applied to the ISAE-SUPAERO master’s program because I was looking for a graduate school that would provide me with both a strong academic and personal challenge. In the end, I chose this program over my other options because it best satisfied these two goals. On one hand, the academic schedule, which includes a balance of lecture, research, and work components, matched my subject interests and learning objectives. On the other hand, I had the opportunity to immerse myself in a foreign language and experience first-hand a different culture. Consequently, I have found that one of the strongest assets of this program is the opportunity to work alongside a culturally diverse group of peers. The international aspect of this program creates a number of unique opportunities that would not be possible otherwise. For example, I was able to choose a research project where I collaborate simultaneously with US and French space agencies. From a personal standpoint, I now have friends from across the program, I began working as a Robotics Mechanical Engineer at the NASA Jet Propulsion Laboratory. My current tasks support future Mars and Venus missions.

Which are your career plans?

At this point, I am looking forward to growing inside the company, as it offers me great responsibility and opportunities to learn, and to moving gradually to even more challenging positions, alongside my progress. Bottom line for me is to evolve on a career level that keeps me challenged and adaptive, able to bring new solutions.

Michael TORNACK – Germany, Junior Consultant at Altran Benelux – Belgium - Graduated in 2015

1/ Why did you choose ISAE-SUPAERO and apply for the master «Aerospace Mechanics & Avionics»? What were your objectives?

My objectives for the master I chose were clearly a high level master in aeronautics with English as teaching language. Additionally I focused on masters with a major in structures.

Andra TONIE - Croatia, Customer Support Manager, Air France Industry - Graduated in 2014

Why did you choose ISAE and apply for our master? What were your objectives?

I chose ISAE-SUPAERO after evaluating the best aerospace schools in Europe on several criteria: program variety, international openness, professional network and reputation. In addition, the masters program “Aeronautical and Space Systems” allowed me to enter the aerospace world with a B. of Eng. in Electrical Engineering and Computer Science. My objectives were to get the best quality education available for the aerospace industry, through a rich program, offering not only courses but also practical projects, research and placement in the industry.

According to your experience, which are the strong assets of the Master you did?

Definitely the 2 semesters of research (followed by 1 semester of thesis) and the strong network ISAE-SUPAERO has with the industry. Not only that I managed to publish a paper following my research work, but the large project offered me a view of assets and work needed in a totally innovative environment, seeing a topic in detail, producing results that can be used and from which you learn beyond the usual institutional activities; also, all of these, while having a research tutor close to answer to all your questions. This counted as a strong and reliable work experience the moment that I started looking for a job following my masters program, and it is also part of the knowledge I use in my current job.

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Andra TONIE - Croatia, Customer Support Manager, Air France Industry - Graduated in 2014

Why did you choose ISAE and apply for our master? What were your objectives?

I chose ISAE-SUPAERO after evaluating the best aerospace schools in Europe on several criteria: program variety, international openness, professional network and reputation. In addition, the masters program “Aeronautical and Space Systems” allowed me to enter the aerospace world with a B. of Eng. in Electrical Engineering and Computer Science. My objectives were to get the best quality education available for the aerospace industry, through a rich program, offering not only courses but also practical projects, research and placement in the industry.

According to your experience, which are the strong assets of the Master you did?

Definitely the 2 semesters of research (followed by 1 semester of thesis) and the strong network ISAE-SUPAERO has with the industry. Not only that I managed to publish a paper following my research work, but the large project offered me a view of assets and work needed in a totally innovative environment, seeing a topic in detail, producing results that can be used and from which you learn beyond the usual institutional activities; also, all of these, while having a research tutor close to answer to all your questions. This counted as a strong and reliable work experience the moment that I started looking for a job following my masters program, and it is also part of the knowledge I use in my current job.

Which are your career plans?

At this point, I am looking forward to growing inside the company, as it offers me great responsibility and opportunities to learn, and to moving gradually to even more challenging positions, alongside my progress. Bottom line for me is to evolve on a career level that keeps me challenged and adaptive, able to bring new solutions.
Objectives
The Aeronautical industry market is facing a rapid and continuous increase worldwide as shown by the record breaking contracts recently signed by both Airbus and Boeing. These two industry leaders forecast an increase of close to 5% in activity over the next years and estimations indicate that the annual increase of large commercial airplanes will induce a doubling of the number of aircraft by 2030. Nearly sixty percent of the turnover is subcontracted all over the world and concerns mostly production and manufacturing activities. As a consequence, most aeronautical subcontracting companies will have to increase their production rates but also to keep up to date with technological changes; moving from metallic processes toward composite materials processes. Moreover the aircraft manufacturers have changed their supply chain structure in the last years, and subcontractors are now required to manage more complex parts and to take over, on their own, the qualification processes.

The Advanced Master course AMPAS, is designed by Mines Albi and ISAE with the support of aeronautical industry partners. It will give a specialization to master level students allowing them to take over high level responsibilities in airframe structure manufacturing plants. It is especially well suited to students who have followed general studies in mechanical engineering, material science or equivalent and who would like to gain a major chance to be recruited by aeronautical industry.

To reach this goal, AMPAS master students will develop:
- general knowledge of flight dynamics constraints and airframe design
- knowledge and understanding of the airframe materials and processes and their qualification constrains
- knowledge, understanding and practice of the prevalent processes for structural applications with either metallic or fiber reinforced thermoset composites materials
- ability to use state of the art simulation tools for definition and optimization of metallic sheet forming and RTM/infusion process

Organisation
Heads of Program:
- Prof. Fabrice SCHMIDT
  fabrice.schmidt@mines-albi.fr
- Prof Catherine MABRU
  catherine.mabru@isae-sup aerofr

Duration of studies: One year full time

Beginning of classes: September
Location: Mines Albi, Campus Jarlard, Albi (70% of courses) ISAE, Toulouse (30% of courses)
Teaching language: English

Learning approach
First semester: academic term of 500h and 45 credits, provided by permanent professors of Mines Albi and ISAE and expert practitioners from aerospace industry to bring current knowledge and experience. The teaching, balancing academic lessons with more applied practice, includes:
- lectures and exercises
- process simulation sessions
- laboratory sessions
- practical sessions
- industrial conferences
- industrial and workshop visits
- multidisciplinary project of 80h
- written report and oral presentation

Second semester: Professional thesis in the aeronautical industry or in an academic research lab in collaboration with aeronautical industrial partners, in France or abroad. The duration is from 5 to 6 months and corresponds to 30 credits. Students are supervised by a tutor from the host Organisation and from Mines Albi or ISAE. Thesis is concluded by the preparation of a final report and an oral dissertation in front of a jury.

Syllabus
The academic course consists of modules aiming to provide a deep knowledge of the three main material families used in airframe structures (i.e. aluminum, titanium and long fiber reinforced polymer composites) and their related forming routes in aeronautical industries.
Processes for Aeronautical Structures
- ISAE-SUPAERO - École des mines d’Albi -

It is also devoted to gain knowledge in aircraft architecture, on aeronautical supply chain specificities, lean manufacturing and quality management requested to be able to take over technical and Organisational responsibilities in industry.

A team project (80 hours) will demonstrate the ability to address an aeronautical part processing following the theoretical and professional skills.

Part 1 - Aircraft, material and process basic scientific knowledge - 130 h
Flight Dynamics AMPAS - Aircraft and airframe architecture AMPAS - Computer Aided Design (CATIA)- Aluminum and titanium alloys - Epoxy and thermoplastic composites - Assembly processes - Material and processes qualification - NDT for metallic and composite materials - Optical techniques for assembly aid

Part 2 - Composite structure forming and machining processes - 110 h
Physical phenomena description and modeling related to thermoset based manufacturing - Raw material and composite quality control - LCM/RTM processes - Autoclave Vacuum Bagging (monolithic - sandwich) processes - Composite material trimming, drilling and assembly - RTM/Infusion Simulation

Part 3 - Metallic structure forming and machining processes - 109 h
Material behaviour and mechanical models - Cold and hot sheet forming processes - Surface treatments - Machining additive manufacturing - Sheet forming simulation

Part 4 - Industrial Organisation and management - 70 h
Supply chain structure and Organisation - Materials management and Lean manufacturing - Supply chain improvement and collaborative processes - Quality requirement, management and tools

Part 5 - Integrated Team Project - 80 h

Career opportunities
Advanced Manufacturing Processes for Aeronautical Structures Master course offers challenging career opportunities for young engineers or more experienced engineers, who require a postgraduate program to enhance and/or focus their technical and management skills towards aeronautical industry sector.

Career opportunities are numerous and growing over the world, in Tier 1 and Tier 2 subcontracting companies, as well as in aircraft manufacturers, aeronautical maintenance companies. Graduated AMPAS students can find employments as process, industrialization, production, quality, research and innovation engineer, product, project and production manager, …

Companies recruiting our students
AIRBUS GROUP EFW (Dresde), AIRBUS OPERATIONS SAS, ALTEN, AKKA Engineering Process, ARMINES, AVIC COMAC, Fabrica Argentina de Aviones, FORMTECH (Breme), P3 GROUP, SAFRAN Aircraft Engineering, SAFRAN Electronics and Defense, SAFRAN Nacelles, SAFRAN Power Unit, VENG SA (Argentina)

TESTIMONY
Michael TANIS, France, Project manager A320 NEO, graduated in 2015

Why did you choose ISAE and apply for our master ? What were your objectives ?
After five years of working experience in the chemical industry, I integrated the Advanced Master AMPAS in order to enter the aeronautical industry and work on projects I have always been interested in: airplane production and assembly. I chose the ISAE for its international renown, the industrial pertinence of its courses, and its top notch teachers. I also chose it for the strong links the school has with the key players in this industry. Participating in the AMPAS program is a great opportunity to gain expertise in specific aeronautical technologies and processes and to acquire knowledge about global industrial Organisation and optimization tools.

According to your experience, which are the strong assets of the Master you did ?
One strong asset of this Advanced Master’s program is to provide the possibility of acquiring industrial skills focused on specific aeronautical technologies such as the forming of composite and metal materials. Another is that the theoretical classes are associated with laboratory sessions and visits to the companies. This Organisation allows the students to have an overview of the classroom vision of the technology and its on-the-job use in an industrial environment. Not to be overlooked, the master’s program is conducted in English, providing the students with the opportunity to be prepared to work in an international environment.

Which are your career plans ?
The six-month internship, which brings the Master’s program to a close, puts classroom theory into practice. I worked on the restructuration project of the A380 Final Assembly Line. Thanks to this opportunity, after graduation I was able to integrate the A320 Final Assembly Line as a project manager for the NEO (New Engine Option) program. I am responsible for the coordination of the industrial ramp up activities. My other responsibilities include the coordination of projects deployed to mitigate the industrial disruptions inherent in the introduction of a new program. My next challenge would be to lead a team in a long-term industrial project, managing a group of people towards achieving the project’s goals.
Objectives

The global and booming aviation market is characterized by low volumes, highly complex products with long lifecycles and high values, governed by restrictive regulatory requirements set by international aviation safety bodies, with constant safety concerns and with a huge growth and competition in the aircraft maintenance, repair and overhaul business (MRO). MRO plays a key role for defence and civil aviation industry encompassing a wide range of complex activities: engine overhaul, heavy checks, line maintenance, component maintenance, major airframe modifications and a wide range of support services. Through regular maintenance, MRO ensures the continued airworthiness and safety of aircraft, at acceptable costs and with the best availability.

Today, the aviation industry is facing tremendous challenges. To compete, aviation companies in all segments must strengthen their ability to increase productivity and production rates with products and services that meet customer demands, with a focus on continuous critical assessment of cost and performance. So, the continued support for MRO is an intrinsic part of aeronautical and maintenance manager, including service lifecycle management, service organizations, configuration management, reducing costs and improving service quality and efficiency.

The objectives of the Master in Aeronautical Maintenance and Support (AMS) are to provide students with up-to-date exposure to modern techniques and methods, know-how, innovation, regulations and standards applied in aviation industry, putting an emphasis on life cycle cost management making services more profitable, available and reliable.

The master aims at providing a wide range of knowledge from aeronautical engineering to management of maintenance organisation in the respect of international regulations within Integrated Logistics Support methods. Merging academic teachings, up-to-date ILS and maintenance concepts delivered by experts from industry and authorities, it prepares attendees to face, successfully, the competitive and fast changing MRO worldwide business.

With the Master in Aeronautical Maintenance and Support, ISAE-SUPAERO addresses the current needs of manufacturers, design offices and customers support departments, airlines, MRO and authorities. MS AMS is the only one in Europe which addresses both Maintenance and Integrated Logistics Support for civil and military aviation business in an integrated program.

Organisation

Head of Programme: Joël JEZEGOU
joel.jezegou@isae-sup-aero.fr

Duration of studies: One year full time
Beginning of classes: September
Location: ISAE
Teaching language: English

Learning approach

First semester: academic session of courses from September to March.
More than 500 h of lectures, tutorials, practical sessions, CAD, visits of industries (Airbus Group, Sabena Technics, Liebherr Aerospace, Air France, DGA, etc.).

Second semester: students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host organisation and a professor from ISAE-SUPAERO. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Teaching staff

Teaching staff is composed of ISAE-SUPAERO’s permanent professors and experts from aerospace and aviation industry with aeronautical industrial background (Airbus Group and its subsidiaries, Air-France, AIA, CEAT, Turboméca, Safran, Sogerma, Sogitec, etc.) or from airworthiness authorities (Bureau Veritas, DGAC) related to maintenance vouch for the quality of teaching dispensed.

Syllabus

Part 1 - Aeronautical Engineering - 285 h
Part 2 - Maintenance and Support in Aircraft Design – 75 h

Part 3 - Reliability and predictive maintenance – 34 h
RAMS techniques and modelling – Predictive maintenance and data analytics.

Part 4 - MRO Execution and Organization - 109h

Part 5 - Continued and continuing airworthiness – 35 h

Part 6 - Human Factors and Safety Management System - 20 h
Human factors and SMS & SMS implementation in MRO

Part 7 - Customer Support- 20 h
Customer support and services

Part 8 - Supply Chain and Logistics - 25h
Supply chain and logistics – Aircraft recycling.

Career opportunities
It is intended to students who envisage management position in aircraft manufacturers, airlines, and MRO organisations on civil market or military forces and in aviation authorities CAMO organization, maintenance and logistics support in aerospace industry.

Companies recruiting our students
Airbus, Aeroconseil, Liebherr Aerospace, Safran, Sogeti High Tech, Thales Aerospace, Thales Avionics, DGAC, Air france, Corsairffy, South Africa Airways, Denel (South Africa), Embraer (Brazil, Mecachrome (Canada), Lan Chile (Chili), COMAC (China), AVIC (China), Philotech Gmbh (Germany), Hal (India), Royal Air Maroc, Lot (Poland), PZL Swidnik (Poland), Portugal Air Force, Singapore Air Force, China Airlines (Taiwan), Taiwan Air Force, Tunisair, Sh&E: International air transport consultancy (USA), Sabena Technics, ATR-Aircraft, Groupe ORTEC ...

TESTIMONIES

Yann CHOULOT, France, Production Methods Engineer at Air France, Graduated in 2016
Why did you choose ISAE and apply for the advanced master «Aeronautical Maintenance and Support» ? What were your objectives ?
Knowing that air traffic will grow for the next few years, it seemed to me that maintenance was a good choice for a future successful career. Technologies on aircraft equipment and structures are evolving over the years and there is an essential need on the market to find competences to support aircraft fleets. ISAE’s Specialized Master was a great opportunity to develop competences within the aeronautical maintenance field.
According to your experience, which are the strong assets of the advanced Master you did ?
The strength of this Master is to allow experts from the aeronautical industry such as Airbus, Dassault etc to teach different courses to students. This approach allowed me to clearly identify what was expected within the industry.
Which are your career plans ?
I would like to build a strong technical background related to maintenance workshops in order to occupy Management positions.

Bertrand LAPORTE, France, Head of MTECH services - MTechnologie, Graduated in 2015
Why did you choose ISAE and apply for the advanced master «Aeronautical Maintenance and Support» ? What were your objectives ?
I wanted to be trained on the aeronautical way of working, and adapt my skills on trouble shooting and maintenance team management to the aeronautical standards. My objectives were to transfer my former experience of service manager in other industry to Aeronautical Service Manager.
According to your experience, which are the strong assets of the advanced Master you did ?
Regarding my internship, configuration management & MSG-3 analysis (on A320Neo CFM Nacelle until Maintenance Working Group ).
Regarding my actual work, Ground Support Equipment (Project Leader for A320Neo AIRBUS US Mobile facility), then Trouble shooting, Human Factors and Organisation of a maintenance department ( Service Manager).
Which are your career plans ?
Build up a team and manage the Service Department concerning France, Spain and Belgium within the Broetje-Automation Group.
Objectives
Aircraft airworthiness must be considered as a coherent process running from the design of the aircraft to the monitoring of its technical condition in airline service. The Master in Aviation Safety - Aircraft Airworthiness covers both the technical aspects of certification and the legal and economic implications. This course has been designed to give future managers a broad understanding of the issues and priorities which, as far as aeronautical construction is concerned, have an international dimension.

Air transport deregulation and the development of a global economy necessarily imply an increase in vigilance on behalf of both the regulatory authorities and the industry. Progress regarding safety has been constant. During the last 30 years, the accident rate per flight hour has been reduced by a factor of 10. This is becoming insufficient due to the considerable increase in traffic. Current trends should encourage us to make even more improvements, and this necessarily involves trainings. The Master in Aviation Safety Aircraft Airworthiness will provide future operators with the key to success in times to come.

Organisation
Head of Program ISAE-SUPAERO: Joël JEZEGOU
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Head of Program ENAC: Pascale PUEL
pascale.puel@enac.fr
Head of Program École de l’Air: Cne PIERRE

Duration of studies: One year full time
Beginning of classes: September
Location: ISAE: from September to November; ENAC: from December to February and École de l’Air (Salon de Provence): March.
Teaching language: English

Learning approach
First semester: academic session of 18 courses from September to March, provided by permanent professors of ISAE-SUPAERO, ENAC & École de l’Air and experts from aerospace industry giving their current knowledge and experience, including: lectures, tutorials, practical sessions, industrial visits.
Second semester: students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host organisation and from ISAE-SUPAERO or ENAC. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Syllabus
Part 1: Aeronautical techniques and study of the aircraft - at ISAE-SUPAERO - 238 h
- Flight dynamics
- Aeronautical Materials and Structures
- Engines and powerplant
- Avionics
- Aircraft General Systems
- Qualification tests of on-board systems and equipments

Part 2: Air Transport safety - at ENAC - 290 h
- Certification procedures
- Certification of aircraft systems
- Aircraft Systems safety analysis
- On-board software and hardware
- Air transport safety and human factors
- Production Organisational approval
- Operating procedures
- Continuing airworthiness
- Post Type Certificate activities

Part 3: Airworthiness at École de l’Air (Salon de Provence) - 34 h
- Airworthiness of state aircrafts
Career opportunities

This Master prepares students to various job either in civil and military aerospace industry (manufacturers, maintenance organizations, airlines, ...) or in civil and military aviation authorities.

Companies recruiting our students

Airbus Group and its subsidiaries, AKKA, Safran, Civil Aviation Authorities of Algeria, of South Africa, of China, of Colombia, of Malaysia, DGAC (Civil Aviation Authority of France), Malaysian Air Force, French Ministry of Defence, Venezuelan Ministry of Defence, Royal Air Force of Oman, Royal Jordanian Airforce, South Africa Airways, Embraer (Brazil), Hal (India), SONAIR (Angola), AVIC (China), COMAC (China), IATA Belgium, Altran.

TESTIMONIES

Saurav MOHANTY, India, Consultant Engineering at Altran France, Graduated in 2015.

Why did you choose ISAE and apply for the advanced master «Aviation Safety Aircraft Airworthiness”? What were your objectives?

Aircraft worthiness is the discipline to judge the complete structural validity and safety. It requires abundant knowledge and technical experience to evaluate an aerial vehicle’s fitness to work, not only according to the theorized plan, but also according to indefinite practically probable situations.

After working for 4 years in aircraft maintenance domain, I was amazed to see how much aircraft manufacturers are involved in keeping the aircraft safe in operation even after the aircraft is operated by its operator. I came to a realization that enhancing my design and technical skills with depth knowledge of safety and airworthiness will provide me an edge; this is why I decided to advance my education in this field by pursuing Advanced Masters in Aviation Safety and Aircraft Airworthiness at ISAE-SUPERO & ENAC.

The fact that master is shared by ISAE, ENAC and Ecole de l’Air which are the most esteemed aeronautical universities was one of the other reasons. They are very well established and the fact that they are located in Toulouse at the epicenter of the aerospace industry gives them a superior advantage in terms of proximity and providing strong industry links.

According to your experience, which are the strong assets of the Master you did?

The strongest asset of this Advanced Masters is its pragmatic approach. The professors who gave us the lectures on a wide range of technical, regulatory and operational topics were the people directly from the industry who could share the firsthand experience after years of working on the specified domain.

Secondly, the enriching international environment with students coming from all over the world opens a plethora of knowledge and opportunities which develops an individual personally and professionally.

Which are your career plans?

After successfully completing my internship at ATR, I was offered a position of Consultant Engineer by Altran France to continue my activity at ATR. Working with a manufacturer has an advantage of its own; it opens up the door to different domains which further enhances the skills and knowledge of an individual. I would like to continue my activity and gain expertise in the different fields and gain significant knowledge working with different manufacturers, operators and MROs. Long term goals; I would love to have a MRO of my own. But for that, there is a long way to go!

Nathalie TITECA-HASEVOETS, Belgium, operational and technical expert” for the SESAR program at IATA - Belgium, Graduated in 2014.

Why did you choose ISAE and apply for the advanced master «Aviation Safety Aircraft Airworthiness”? What were your objectives?

This particular Master has the advantage of combining courses at ISAE and ENAC universities. Obtaining a degree from those two well-known Toulouse universities was a real challenge for me, as I left school 25 years ago. I wanted to combine my background of airlines Captain and operational/ technical expert for international organizations with the strong theoretical and practical training given at those universities.

According to your experience, which are the strong assets of the Master you did?

The scope of the Master is very wide: Aircraft systems, performance, Safety, Human factors and all airworthiness aspects are explained by professionals. An internship period of 8 months is also planned: it gives the opportunity to work for major companies based in Toulouse.

Which are your career plans?

I am waiting for opportunities in an international organisation like EASA, ICAO, EUROCONTROL, EUROCAE...
Objectives

Embedded Systems are an essential aspect of our daily life, in all domains, from transport systems (aeronautics, space, road, rail and sea), to energy sectors and also to communication systems (e.g. smartphones).

As part of the AeroSpace Valley, Toulouse has established itself as a strong place for the design of advanced critical embedded systems. Toulouse has one of the greatest concentrations of Embedded Systems industry in Europe with the major aerospace and equipment manufacturers working either for the aeronautical, space or car industry, including Airbus Group and its subsidiaries, CNES, Continental, Thales.

The Embedded Systems Master Program has been defined to provide the industry with well-trained engineers willing to participate in this challenging environment. The Embedded Systems Master Program is a one-year professional course, designed by the INP-ENSEEIHT and ISAE-SUPAERO partners, with the support of the embedded systems industry to prepare students to challenging projects for the aerospace domain.

Aware of the real need for a multidisciplinary approach, the program prepares students with in-depth and comprehensive knowledge of the underlying technologies involved in embedded systems. The program focuses on both theoretical and concrete aspects. It aims at:

- developing competencies, both at system-level and function level design for the engineering of Embedded-Systems, based on strong basics of complementary subjects: electronics, computer science, energy conversion and management, automatic control, telecommunications and networks;
- developing the system approach through integrated projects to master specific methods and tools applied to the following domains: aeronautics, space and automobile.

The training for this Master’s degree is multidisciplinary. It covers all hardware (electronics, energy), software (computer science, links with network, modeling, analysis and certification) and control issues of Embedded Systems within an integrated system based perspective.

Learning approach

First semester: an academic session of 536 hours of teaching, provided by permanent professors of ISAE and INP-ENSEEIHT and experts from industry bringing current knowledge and experience. Teaching activities include lectures, tutorials, and labs, a multidisciplinary project of one month that aims at integrating the academic session into an industrial case study.

Second semester: students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host Organisation and from ISAE-SUPAERO or INP-ENSEEIHT. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Syllabus

Embedded Systems require a collaborative training approach with a broad spectrum of knowledge, interweaving experts from all concerned fields: electronics, energy, science, networks and control systems.

Hence, the academic session of the Master program consists of a 536 hours long program covering the five disciplinary fields while focusing on the architectural aspect and a set of application-oriented lectures and seminars.

Part 1 - Embedded Systems - Core - 178 h

Real-time languages – Design and Validation of DES – Feedback control – Signal processing – Microprocessor and DSP architecture – Architecture, design and Synthesis of hardware systems – RF Front-end Architecture – Electromagnetic compatibility
In the short term I would like to stay in France and get a deeper experience on aeronautics and automotive systems etc). On the other hand, I got many classes on different subjects that I didn’t know and that, in my opinion, match the needs of a challenging embedded system industry (Real time programming, control theory, aeronautics and automotive systems etc). I really appreciated to hear their lectures and to dialogue with them. In addition, «Embedded Systems» encompass number of different topics such as software, hardware, networks, security, system engineering, etc.. The other strong asset of this master is that it covers all those main topics and provides the student key notions in various domains.

Which are your career plans?
A few months after I graduated, I got my first job as field application engineer at SIGFOX. This position is a perfect match for my interests and skills. I use my previous professional experience and the additional competencies learnt during the Master to propose innovative software architectures in order to address the next challenges of embedded systems in Space industry.

Which are your career plans?
After the master, I was hired in a R&D department of a french satellite manufacturer. I use my previous professional experience and the additional competencies learnt during the Master to propose innovative software architectures in order to address the next challenges of embedded systems in Space industry.

Career opportunities
Embedded Systems offer challenging career opportunities. The Master is designed either for young graduates or experienced engineers, who require a postgraduate program to enhance their technical and management skills. This Master concerns any industrial sectors where embedded systems are used: aeronautics, space, road, rail and sea, energy industry, communication systems, etc. Career opportunities in this area are numerous and are growing in a variety of large and small companies. This Embedded Systems Master qualifies students for employment as designers, developers, research engineers and project managers in design and development of innovative embedded systems.

Companies recruiting our students
Accenture, Airbus Group and its subsidiaries, Altran, Astek, Atos Origin, CS Communications & Systèmes, DCNS, Motorola, Realix, Safran, Seditec, Sogeti High Tech, Sopra Group, ESA, GE HEALTHCARE TECHNOLOGIES (India), Indian AirForce, Philips R&D (Netherland), Thales Alenia Space, SIGFOX, …

Nicolas CHATONNAY, France, Graduated in 2014, Software Architect at THALES ALENIA SPACE
Why did you choose ISAE and apply for our master? What were your objectives?
After 10 years spent in the mobile phone industry as a software engineer, it was time for me to explore other industrial domains. I wanted to make a pause in my professional career, first to refresh some of my competencies, second to get the key notions on embedded systems and finally to ease my career reorientation. From an engineer perspective, it is still good to see other things and to challenge himself. This is why I decided to apply for the Embedded Systems Advanced Master program.

According to your experience, which are the strong assets of the Master you did?
One of the strongest assets of the Master are the conferences held by several engineers and researchers from various industries (automotive, space, aeronautics). I really appreciated to hear their lectures and to dialogue with them. In addition, «Embedded Systems» encompass number of different topics such as software, hardware, networks, security, system engineering, etc.. The other strong asset of this master is that it covers all those main topics and provides the student key notions in various domains.

Which are your career plans?
After the master, I was hired in a R&D department of a french satellite manufacturer. I use my previous professional experience and the additional competencies learnt during the Master to propose innovative software architectures in order to address the next challenges of embedded systems in Space industry.

Jon REGUEIRO, Spain, Graduated in 2013, «Field Application Engineer» at SIGFOX
Why did you choose ISAE and apply for our master? What were your objectives?
ISAE is very well known because of its excellence on the aeronautics and space domain. I chose this school because I am a passionate of aeronautics and I wanted to get closer to this industry. Moreover, I considered the Embedded Systems advanced master would help me add very competitive skills to my Telecommunication Engineer background.

According to your experience, which are the strong assets of the Master you did?
This master helped me enlarge some competences I already had thanks to my background (RF communications, VHDL programming and networks). On the other hand, I got many classes on different subjects that I didn’t know and that, in my opinion, match the needs of a challenging embedded system industry (Real time programming, control theory, aeronautics and automotive systems etc).

Which are your career plans?
In the short term I would like to stay in France and get a deeper experience on the IoT and embedded systems domain. Later, my plan is to move to the US and join a challenging and innovative project on the same field.

INCOSE certification in ISAE-SUPAERO
At the end of the first semester, all EMS students are encouraged to participate in a one-month complementary program in preparation for ASEP* level of INCOSE (International Council on System Engineering) certification. INCOSE certification consists of an exam which has an international-recognized value to validate knowledge and skills in systems engineering.

*Associate Systems Engineering Professionnal
Objectives

The Advanced Master “Helicopter, Aircraft and Drone Architecture (HADA)” is designed and developed by ISAE-SUPAERO and Airbus Helicopters. This 2-semester program provides high-level of engineering and technical competences for careers in aircraft, helicopter and drone business world.

This new program will offer the acquisition of the basic skills required for aeronautical engineers (architecture, certification and structures) and specific skills to identify problems, generate alternatives, choose and implement solutions on aircraft, Helicopters and drones. These latter (drones) will be developed to represent a significant part of the future aerospace business world. Industrial, regulatory and logistical challenges will therefore emerge. As a result, the future aerospace engineers interested by engaging in these innovative projects will need to mobilize and developed new skills and expand their knowledge fields. This program offers a complete training from systems to structures through aerodynamics, flight dynamics and certification while encouraging and taking into account the diversity of the profiles of the selected students.

By adapting to the updated required skills, this ADVANCED MASTER® is a high level of training, with a degree recognized by the professional sector, and adapted to the present and future aeronautical engineering.

Organisation

Heads of Program:
Prof. Anis HOR
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Prof. Jean-Marc MOSCHETTA
jean-marc.moschetta@isae-supaoero.fr

Duration of studies: One year full time

Beginning of classes: September

Location: ISAE from September to December, Airbus Helicopters premises (Marignane) from January to February

Teaching language: English

Learning approach

First semester: academic session from September to February, provided by permanent professors of ISAE and experts from aeronautical industry giving their current knowledge and experience (Airbus Helicopters, Airbus Group, Safran/Turbomeca, Thales, etc.). Including: lectures, tutorials, and practical sessions.

Second semester: students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host Organisation and from ISAE. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Syllabus

Aircraft structures, Aircraft architecture and certification – 120 h
Aircraft architecture
Certification
Computer Aided Design
Structures

Fixed-wing Aircraft – 130 h
Engines and powerplant
Aircraft linked-systems
Avionics systems
Flight dynamics

Helicopter – 125 h
Helicopter: Aerodynamics and flight qualities performance
Helicopter dynamics
Helicopter construction materials and techniques
Helicopter Systems
Helicopter: Prototypes, tests and production quality assurance

Drone – 120 h
Drone systems: design and mission
Payload and sensors for UAV’s
Drone safety and airworthiness
Drone guidance and navigation
Drone operation and human factors
Neutral network for control and diagnostic
Career opportunities

This programme prepares attendees to a wide range of professional opportunities from design, certification and operations of civil and military aircrafts, drones and helicopters in France and overseas.

Companies recruiting our students

Altran, Airbus Group, Airbus Helicopters, Safran-Turbomeca, Thales, SAGEM, Dassault Aviation, Gendarmerie Nationale, SONAIR (Angola), Helibras (Brazil), AVIC (China) HAL (India), Pawan Hans Helicopters Ltd (India), Airbus Helicopters Mexico, Air Force of Algeria, Navy of Brazil, Air Force of Chile, Air Force of India, Pakistan Army, Air Force of Tunisia, Sauber F1 team...

TESTIMONIES

Akhil ANANT, India, Engineer at Airbus India, graduated in 2015
ISAE-SupAero is one of the oldest «Grande Ecole» in Aeronautics and Space sciences. It is a world famous institution with equally renowned alumni; these and many other factors got me excited about the prospect of studying here. I was keen on applying for the advanced master «Aircraft and Helicopter Engineering» as I wanted a course which could teach me about the domain of Aircraft & Helicopter Design and their structures. This course offered me that combination. This course was the closest match to my previous experiences and background and the fact that this course is offered along with Airbus & Airbus Helicopters, meant that the industry exposure was brilliant!!

The degree was very practical along with a strong industry oriented focus. The visits to the various organizations, manufacturers and research labs along with the working professionals, who also teach at the university, gave me a chance to learn a lot within a short period of time. In fact all the accelerated learning has been helping me to this day with my current job.

My career plans were to work as a Structure design engineer, which is my current role at Airbus India. Going forward, i guess my plans are to gain expertise in this field with a better end-to-end understanding of the ever so fascinating aeronautical industry and grow along with the organization.

Tanguy DENANTE, France, Aero Designer at Sauber F1 Team, Graduated in 2014

Why did you choose ISAE and apply for our master ? What were your objectives ?
When I was studying in engineering school, I worked during 6 months as a trainee at the Rotor design office of Airbus Helicopters. After that great experience, I was determined to work in the Helicopter industry as an engineer. That is why I decided to apply to the ISAE master, in order to have the strongest background as possible in helicopter engineering before applying to a job offer.

According to your experience, which are the strong assets of the Master you did ?
The advanced master «Helicopter Engineering» entirely in English was very well thought and organized. More than 15 different subjects from basic to some very specific ones only applicable to helicopters. The common core syllabus in cooperation with the maintenance master also was interesting in order to get strong basis in aeronautical technique and a good general culture of this world. Finally, the best asset of the master was the 5 weeks training session in Airbus Helicopters (Eurocopter at that time) called «Specific Helicopter Training».

Which are your career plans ?
Currently, I use everyday what I have learnt in the master for my job. My goal is to obtain more and more experience in order to improve my skills and access to a technical expert job in a aeronautical office design. My greatest wish will to become a technical expert in a Bureau of Investigation for Civilian Aircraft Safety, but that will be for later!
Objectives
Since fifty years, satellite systems have demonstrated their excellence to collect and distribute data in a vast coverage area for the benefit of thousands of users. Within the global telecommunications industry, space communications display one of the most profitable businesses in permanent evolution. Companies of the sector, both system and service providers, are constantly looking for junior executives offering the expertise matching the specifics of space communications.

The Space Communication Systems program is tailored to provide students with necessary and up-to-date knowledge for mastering different aspects of digital communications, signal processing, and networking applied to communication or navigation systems. Such systems are strategic in aeronautical or space applications.

The program is built on the following foundations:
- a global approach of system design and analysis by taking into account the environments, the limitations and the constraints, the interfaces and the expected performances,
- expertise in the disciplines contributing to the design of these systems: signal processing, digital communications, networking, etc.
- simulation tools and field techniques,
- development of applications for the space, aeronautical and embedded-system domains.

Learning approach
First semester: academic session of around 500 hours, provided by INP-ENSEEIHT, ISAE and Télécom Bretagne’s permanent professors and experts from the aerospace industry bringing current knowledge and experience, including:
- lectures, tutorials, experimental and practical sessions, online exercises, practical works in team, simulation with MATLAB, OMNET++, or specific softwares,
- demonstrations in laboratory, implementation of digital communication chain with software defined radio, navigation receivers (GPS, sensor hybridization ...), conferences.
- 3 projects carried out in pairs for about 100 hours globally.

Second semester: students have to conduct a professional thesis in the aerospace industry or in a laboratory, in France or abroad, supervised by a tutor from the host organisation and from INP-ENSEEIHT, ISAE or Télécom Bretagne. The thesis is concluded by technical and project management report and a public defense.

Syllabus
Part 1 - General teaching - 130 h
Signal processing, Digital communications, Spread spectrum techniques, Coding applied to the satellite channel, Network & telecommunication protocols, Simulation of networks, Project

Part 2 - Space and specific techniques - 202 h
Orbits and satellite platforms, Propagation & radio-frequency links, Space communications systems, Satellite constellations for communications and positioning, Satellite payload, Earth station and terminals, Digital navigation receivers, Project

Part 3 - Applications - 188 h
Satellite based networks, Embedded systems, Mobile & aeronautical, communications by satellites, Financial and legal aspects, Overview of applications via satellites, Project management, tutored project.
Career opportunities
This Advanced Master in space communications systems offers students various positions in systems design and project management for space companies and agencies.

Companies recruiting our students
Electronics and telecommunications companies: Alcatel, Airbus Group and its subsidiaries, Thales, Safran, St Micro

TESTIMONIES

Alexandre VANSTEENE, Network & telecommunication engineer at Airbus Defence and Space, Graduated in 2014
Why did you choose ISAE and apply for the advanced master «Space Communication Systems»?
Before joining the Space Communication Systems advanced master, I graduated from a French engineering school (Computer Science major). I decided to pursue a Master to combine two passions (computer science and aero spatial/aeronautics). Choosing the SCS Master has been quite a natural choice for two reasons: the reputation of ISAE and the perfect match between the knowledge I acquired during my curriculum and the one I wanted to gain.

According to your experience, which are the strong assets of the Master you did?
The Space Communication Systems advanced master offers several advantages. The program is divided in two distinct parts: an academic semester and an internship allowing to provide both theoretical and practical knowledge. The academic semester allows to get a deep understanding of how a space communication system works. High quality courses are taught by reknown academic professors and experts from the industry (immense into industry practice). Numerous tutorials and long projects constitute a good complement to theoretical knowledge by allowing to manipulate and use state of the art satcom equipments. The advanced master staff is deeply involved to make the program work at its best. To illustrate this point, two visits have been organized (satellite teleport and satellite assembly facilities) giving a sense to what is theoretically studied all the year long.

Which are your career plans?
I found a job in the satcom field immediately after my end of studies internship carried out at Thales Alenia Space. The position I have matches accurately with the SCS Master subject. I work for a French satellite communication earth stations integrator. I am in charge of designing & sizing earth stations used for satcom transmission systems. The SCS Master was absolutely required in term of knowledge to hold this position. I am applying what I learned during the SCS year almost every days. Technologies in the satcom world evolve very fast and I think that there is a lot of potential for the future!

Chunbang WU, China, Engineer, CAST, Graduated in 2011
Why did you choose ISAE and apply for our master? What were your objectives?
ISAE is well known in aeronautic and aerospace field all over the world. It is CAST (China academy of space technology) recommends me choosing this school and applying for Advanced Master. My objectives were to improve my basic theory in Space Communication System and to enhance the tighten friendship with European company.

According to your experience, which are the strong assets of the Master you did?
In my study period, the deepest impression is that teachers have broad and deep knowledge, strong system concept and accurate logic, such as Professor Michel Bousquet. He provided many chances to visit the well-known aerospace company and communicate with the experts.

Which are your career plans?
After going back to China, I will continue my work in CAST. I will use my knowledge learned from ISAE to the aerospace program of China. I will become a general designer of satellite system.

Daniel Philip VENMANI, India, Graduated in 2010
France, a land of Fashion and food, the land of TGV, is superior in its technology also. And that is the prime reason I opted for France as a destination to do my Masters Studies. France, being one of the leaders in wireless communications with Satellite Communications and Telecommunications, bearing major concerns like the Airbus Group, Thales attracted me to pursue my Masters in Space Communication Systems.

And, to its credit, ISAE is the best place to begin a career in communications, where in numerous research works are being carried out in domains like Ad-Hoc networks, Wireless Networks, Resource Allocation for satellite links, Radio engineering for satellite systems etc.

ISAE, best known for its exclusive training for engineers in the field of Aeronautical Engineering, is no way inferior for Satellite communications as well. Best professors like Marie Laure Boucheret, Michel Bousquet, Laurent Franck are all known for excellent academic and research accomplishments in their respective field. World class Labs that are opened throughout the day, easy access to libraries and above all always-smiling and most willingly helpful staff will make the stay more pleasant.

In short, I could conclude that «ISAE- Not so foreign!» to me, as I have all my motherland feelings inherited in it while studying there! Today, I find myself as a Doctoral Candidate with Orange Labs, thanks to ISAE!
Objectives

The first objective of this program is to give students a broad understanding of space systems and their environment, constraints and capacities in the fields of earth observation, communications and navigation.

The second program objective is to help students, based on real examples and experimental work, to grasp the value of space systems in terms of creating space applications and services in different fields by integrating or not other data. Students will propose and design tools and solutions in fields including the environment, agriculture, transportation and urban planning, among others.

Students shall be capable of both better understanding the performances of space systems and in turn identifying user needs, and developing new complementary integrated applications and services using data and pictures from space systems and other sources (aerial photographs, for example, or field data…).

Organisation

Head of Program: José RADZIK
ejose.radzik@isae-supcaero.fr

Duration of studies: One year full time
Beginning of classes: September
Location: ISAE-SUPAERO Toulouse
Teaching language: English.

Learning approach

The program is divided into two full-time semesters including:

- 7 months of courses delivered in Toulouse, mainly at ISAE-SUPAERO
- A 4-6 month mission to be completed in a laboratory, an SME, and in particular at AIRBUS DEFENCE & SPACE

Core curriculum and options:

The Advanced Masters program, which delivers 45 ECTS, is solely comprised of a core curriculum common to all participants and organized in the following teaching blocks:

- 45 hours of courses on space systems, the main aim of which is to understand the possibilities and constraints of these systems, as well as their functional description and future projects. New Space and constellations will be covered.
- 47 hours of coursework devoted to digital issues, divided into the « big data » aspect and digital communications and networks, a prerequisite to a solid understanding of the performances and use of space systems for different applications,
- 254 hours of coursework covering three theme-based teaching blocks (Earth Observation, Space Telecommunications, and Satellite Navigation) allowing to better understand related requirements and challenges, space system performances, the processing and use of space data to develop different types of services in diverse fields. The 254 hours are split as follows:
  - 115 hours of coursework devoted to satellite-based earth observation and applications and services directly using space data,
  - 25 hours focusing on the principles, performances and use of satellite navigation and positioning systems completing the panorama of satellite systems used for applications and services under development in many areas,
  - 114 hours on space telecommunications and related services,
- 25 hours devoted to space application-related legal, regulatory, and economic/business issues.

These legal issues cover data law as well as telecommunications frequency management and Space Operations Law. The value chain and the economic context as well as marketing tools shall be addressed.

- A 20 hour course on integrated services and applications will concretely address examples of the development of services using space data, among others. Users of these services may participate in this training.
A conference series shall complete the program in the areas of space and geopolitics and the major principles of intellectual and industrial property rights.

**Company internship, professional thesis:**

Once coursework has been completed, students shall complete a personal project prepared within the framework of a company internship. This project shall last from 4 to 6 months, with a maximum of 35 hours per week. Upon completion of the project, the student shall defend his or her professional thesis in front of a jury. Students shall earn 30 ECTS for the thesis.

Overseen by an academic advisor and in-company tutor, the project entails the acquisition and development of knowledge and skills within a professional framework.

The subject, which must be approved by the academic advisor and the Director of the Advanced Masters programs, must:

- Give the student the opportunity to prepare for professional activities targeted by the program,
- Be a genuine issue of concern to experts working in the field,
- Must be related to the needs of companies in activity sectors covered by the program.

Students who have already acquired professional experience prior to the program, may complete their project in a research center or laboratory.

**Syllabus**

**Space systems – 45 h**

- Space systems introduction

**Digital techniques – 47 h**

- Big data and cloud
- Digital communication and networking basics

**Earth observation – 115 h**

- Remote sensing and sensors

- Image processing and data analysis
- Earth observation applications and services

**Navigation and positionning – 25 h**

- Navigation: performances & applications

**Space telecommunication - 114 h**

- Broadband satellite communication systems
- Satellite broadcasting
- Telecommunication satellites for mobiles
- Satellite telecommunication business

**Space economics and regulations – 25 h**

- Space applications economy and marketing/laws and regulations

**Services and integrated applications – 20 h**

- End-user integrated applications and services

**Career opportunities**

This advanced master degree offers career opportunities in a wide range of fields:

- Jobs related to crossdisciplinary use of space data (observation of the earth and its atmosphere, telecommunications, data positioning, data from scientific missions and exploration) in complex information systems
- Consulting jobs to identify and define requirements, and implement application solutions using space data,
- New jobs related to New Space challenges.

The advanced master «Space Applications and Services» guarantees a high level of expertise required for today’s and tomorrow’s international space-related jobs.

Program graduates go on to work as Project Leaders, Business Engineers, Business Development Managers, Consulting Manager, Research Engineer, Expert in Space Applications.
Objectives

The advanced master TAS Aero program leads to a one-year professionally-oriented master’s degree with an emphasis on Aerospace Engineering (AE). For some students having a passion for flight testing, the master TAS Aero offers a Flight Test Engineering major (TAS Aero - FTE).

The MS TAS Aero enables students to develop a high level of competence in engineering science, current technology, engineering design and management of aeronautical systems, or flight test performances. The TAS Aero programs are highly multidisciplinary and aimed at developing engineering skills to easily enter the work world with great opportunities and significant chances of advancement on aeronautical projects, either in a research facility or in a company in a multinational environment.

The programs are specially designed for students starting immediately after the completion of their master and for industrial employees who have enrolled through their companies’ continuing education programs.

The TAS Aero curriculum includes a broad spectrum of subjects with the following objectives:
- to develop an integrated approach of the product design development, while acquiring necessary skills in the disciplines and techniques of the aeronautical sector,
- to facilitate work on multidisciplinary projects in aeronautics with a very practical approach,
- to develop skills in team building and team process at a multinational level,
- to develop project-management and programme management skills for international use,
- to understand the global economic environment of the aeronautical sector.

A major in Aeronautical Engineering and a major in Flight Test Engineering are offered concurrently.

The major in flight Test Engineering - TAS Aero FTE - focuses on the test to be conducted during aircraft and equipment development and certification.

This major TAS Aero FTE is particularly suitable for engineers with little or no prior experience in the field and also for those already involved in aeronautics who require further knowledge of the above concerns.

Graduates of this master are capable of working in flight test department to contribute to various kinds of flight testing (certification tests, envelope expansion, performances, handling qualities and aircraft systems...).

Organisation

Heads of Program:
- Prof. Philippe PASTOR (major AE)
  philippe.pastor@isae-supaero.fr
- Prof. Éric POQUILLON (major FTE)
  eric.poquillon@isae-supaero.fr
- Prof. Jean-Marc MOSCHETTA («UAV systems» program)
  jean-marc.moschetta@isae-supaero.fr
- Prof. Raphaëlle ROY («Human factors» program)
  raphaelle.roy@isae-supaero.fr

Duration of studies: One year full time
Beginning of classes: September
Location: ISAE
Teaching language: English
Learning approach

First semester: academic session of around 490h, provided by ISAE’s permanent professors and experts from aerospace industry bringing current knowledge and experience, including:

- lectures, exercises,
- labs with Matlab,
- engineering and design study seminars,
- laboratory sessions,
- written report and oral presentation,
- practical sessions,
- team work and team business game,
- in-flight practical study and industrial visits (Airbus, CEAT, etc.).

Second semester: students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host organisation and from ISAE. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Career opportunities

More than 1100 students from 55 countries have been trained over the last 30 years and now work as research engineers, designers, project managers, program managers, and consultants, etc.

Companies recruiting our students

Altran, AKKA, Airbus Group and its subsidiaries, ATR, C&D Aerospace, Aeral industries, Dassault Aviation, Hurel Hispano/Aircelle, Labinal-Comcas, Latécoère, Mazeres Aviation, Sagem, Liebherr Aerospace, SAMP, SEGIME, ESA/ASTEC, CNES, DGA (French MoD), Brussels Airlines Fly (Belgium), Cenaero (Belgium), CTA (Brazil), Embraer (Brazil), Bombardier (Canada), AVIC (China), COMAC (China), Hal (India), Chilean Air Force, Indian Air Force, Mig (Russia), RUAG AEROSPACE (Switzerland), TUNIS AIR (Tunisia), Exa Corp (USA), Venezuela Air Force,…
### Syllabus

<table>
<thead>
<tr>
<th>Detailed Program</th>
<th>Hour</th>
<th>TAS Aero - AE</th>
<th>TAS Aero - FTE</th>
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<tr>
<td>ISAE Digital Services Introduction</td>
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<td><strong>STRUCTURES</strong></td>
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<td>Aircraft Structures</td>
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<td>Materials for Aerospace structures</td>
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<tr>
<td>Computer Aided Design (CATIA)</td>
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<tr>
<td><strong>FLIGHT PHYSICS AND SYSTEMS</strong></td>
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<tr>
<td>MATLAB Standardisation - Harmonisation</td>
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<td>Flight Techniques</td>
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<tr>
<td>Flight Dynamics</td>
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<td>Propulsion</td>
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<td>Flight test technics and methods</td>
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<tr>
<td>Human factors in aeronautics</td>
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<td>Flight test experimentation</td>
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<td>Helicopter in-flight tests</td>
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<td><strong>AERONAUTICAL ENGINEERING &amp; DESIGN</strong></td>
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<td>Aircraft Design</td>
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<td>Aerospace Engineering Environment</td>
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<tr>
<td>Mastery of aeronautical Products</td>
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<td></td>
</tr>
<tr>
<td>Inregrated Team Project</td>
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</tbody>
</table>

**Certificate**

MS TAS aero students can also prepare a certificate in “Human factors and neuroergonomics for aeronautics and transportation”. These 120-hours program provides participants with a high-level multi disciplinary approach to understand human behavior and performance.
**TESTIMONIES**

**Jitendra SINGH, India, Director of Engineering, Safran Helicopter Engines - India, graduated in 2016**

*Why did you choose ISAE and apply for the advanced master «TAS Aero-FTE»? What were your objectives?*

I have worked in aerospace industry for over 15 years in India, Europe and USA. I had started my career in Indian Defence Organisation, and was also the Program Manager of India’s first Regional Jet program (NCAI). In recent years, I was deployed to Military Flight Test environment at Indian Air Force Test squadrons. Therefore, I came to study at ISAE SUPAERO to develop my expertise in the area of Flight testing & certification particularly of Civil aircraft. I would like to thank Mr Philippe Galaup for recommending me the FTE course; his advice was very well timed and helped me make a decision to come to the school. About 10 years ago, I also graduated Masters of Aerospace Engineering from Delft University of Technology (Netherlands), and did internship at ETH Zurich Switzerland.

**According to your experience, which are the strong assets of the Master you did?**

The rigorous program was imparted by the Test Pilots, Flight Test Engineers and Industry Experts from Airbus/Dassault/EPNER/DGA CEV/NOMA/Airbus Helicopters. As an FTE, we flew 4 types of aircraft at 3 different airfields with 4 Pilots. We performed various Flight tests Experiments that included Airspeed calibration, Aircraft performance, Handling qualities, Acceptance and Evaluation flight. Apart from the flight experiments, the ground courses were of high scientific caliber and demanded academic excellence; which was aimed to bring out the best in us. Thanks to Prof Eric Poquillion (the Head of FTE) for his rich expertise in Flight testing and certification, who himself is a graduate from EPNER (French Test Pilots School).

I am grateful to Supaero that I have an exciting stage at CFM LEAP Flight Test Team to support the flight test campaign of Airbus A320 NEO program at its flight test center in Toulouse.

My experience wouldn’t be complete if I don’t mention about the impressive Sports facilities and multitude of clubs at Supaero. I particularly enjoyed my time at Football, Swimming, and Ping-Pong club.

**Which are your career plans?**

I am responsible for supporting Build lines, Flight Test & Qualification of HAL Helicopters for Military application. I find my job quite interesting because on one hand I have the management responsibility to contribute to Company’s growth, and on the other hand I support the development activities as a Flight Test Engineer. I owe this to the rigorous training at ISAE SUPAERO which helped me get this unique position.

Similarly, last year I had “once-in-a-lifetime” opportunity to work in Safran Aircraft Engines for A320neo Flight Test & Certification campaign at Airbus Flight Test Center in Toulouse France. Further, my career plan is to continue to contribute to the development & testing of novel aeronautical products with focus on efficient Engines.

**Samuel BARCHECHATH, France, Planning test for development aircrafts at Airbus flight test centre, Graduated in 2014**

*Why did you choose ISAE and apply for the advanced master?*

Choosing ISAE was clear. Since 1908, the school is deeply linked to the history of aeronautics, very strong in Toulouse and has contributed to the global aviation history. All around the world, ISAE is one of the best aerospace references for its high level and quality of teaching and I knew that I could be fully confident on the rich and leading edge technology of this Advanced Master, taught for more than 30 years.

But mainly, subjects of this Advanced Master fit with my interests and my professional expectations and especially FTE option has confirmed my choice.

**What were your objectives?**

On the one hand, as I already have an aeronautical experience in flight simulation domain, I wanted to direct my professional activity towards a more practical and test aspect. On the other hand, it was important for me to cement between professional knowledge already acquired, to strengthen and expand my skills in subjects such as mainly aerodynamics, handling qualities and flight test techniques.

**According to your experience, which are the strong assets of the Master you did?**

Teaching quality, availability and support of teachers as well as experts and specialists from industry can allow accentuating my theoretical knowledge and being aware of the reality of aeronautical industrial world for a better understanding of aircraft manufacturer difficulties.

More for FTE training, the team spirit was also a strong and necessary point, brought by Eric Poquillion and also by our two pilots.

**Which are your career plans?**

I have worked for 13 years on many kinds of flight simulator platforms. This provides me knowledge and experience on this important part of an aircraft development cycle. Now, I foresee to access to a position that requires working on theoretical topics and their practical validation on aircraft, in narrow collaboration with data analysis, flight test or in airline.

**Jeanne PLANTINET, France, currently working for the Customer Services of Airbus in Toulouse, within the Engineering Support team specialized in Cabin systems & facilities, Graduated in 2013**

«First of all, my interest for aeronautics came very soon during my training at ICAM Nantes where I studied General Engineering. This is the reason why I chose to do all of my internships in this domain. Once graduated from ICAM, I really wanted to be specialized in aeronautics, as I was targeting this domain for my professional career. My main objectives were to acquire a very thorough knowledge of aeronautical engineering and to be in contact with professionals from this domain. Hence, by the prestige of this school and the diversity of their specialized masters, ISAE rapidly became my first choice.

I thus integrated the specialized master TAS Aero Eng, which offers a very complete training, as we had courses in all the aspects of the aeronautical domain (Structures, Propulsion, Flight controls, Avionics, Maintenance, etc.). Moreover, we had the opportunity to develop relationships with professionals from Airbus, Dassault, Latécoère, etc. On a general point of view, studying in ISAE also enables me to be part of an important network of aeronautical engineers, which is very rewarding for an engineer career.

As for my professional objectives, I firstly want to work in technical jobs in order to acquire a good background, and then after several years orientate my career to manager positions with more responsibilities. Moreover, I really appreciate to work for a big aircraft manufacturer as Airbus, which offers a lot of opportunities.»
Objectives

The TAS Astro - Space Systems Engineering Advanced Master program is a one-year professional course of study. The TAS Astro Advanced Master allows students to develop a high level of competence in space science, space systems engineering and space project management. The TAS Astro program is highly multidisciplinary and is aimed at developing engineering skills to easily enter the work world with great opportunities and significant chances of advancement on aerospace projects, either in a agency or in a company in a multinational environment.

The program is designed for students starting immediately after the completion of their graduate degree and for industrial employees who have enrolled through their companies’ continuing education programs.

The TAS Astro curriculum includes a broad spectrum of subjects with the following objectives:

- to develop specific skills applied to space sector, in design development, space systems engineering and management of space projects,
- to acquire high competences related to technical aspects, international economical and legal concerns of space projects.

Organisation

Head of Program: Prof. Stéphanie LIZY-DESTREZ

stephanie.lizy-destrez@isae-supraeo.fr

Duration of studies: One year full time

Beginning of classes: September

Location: ISAE

Teaching language: English

Learning approach

First semester: academic session of around 560h, provided by ISAE-SUPAERO’s permanent professors and various experts bringing current knowledge and experience from research center (ONERA), Space agencies (CNES, ESA), or European aerospace industry (Thales Alenia Space, Airbus Defense & Space/Space Transportation, Airbus Defense & Space/ Satellites, Safran/ SNECMA, etc.).

This first semester includes:

- lectures, exercises, labs,
- engineering and design study seminars,
- laboratory sessions,
- written report and oral presentation,
- practical sessions, team work and industrial visits.

Second semester: students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host organisation and from ISAE. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Syllabus

Part 1 - Missions and Systems

Space environment and effects
Mission analysis and orbital mechanics
Systems Dependability
Satellite design
Satellite based localization systems
Satellite engineering and design
Design of Launchers
Space communications systems
Human Spaceflight

Part 2 - Environment and Space projects

Space project and systems
Space project financial and legal aspects
Aerospace Engineering Environment
Systems Engineering of Space Systems
Integrated Team Project

Part 3 - Sub-systems

Real time control of space system
Estimation and filtering
Advanced control and applications
Satellite AOCS
Launchers guidance and control
Satellite electrical systems
On board data handling sub-systems: functions and architectures
Satellite thermal control systems
Part 4 - Standardisation and Conferences

Quality Seminar - Seminar «vehicle design: system aspects of atmospheric re-entry» - Electrical propulsion conference - Space mechanisms conference - History of Space Exploration conference - Space tourism and suborbital vehicles - Introduction to space systems - Spacecraft operations.

Career opportunities

TAS Astro Advanced Master program leads students to technical employment either in international industries or in research centers in aerospace world.

Current positions are: Project Managers of space systems, Experts in industry or public research laboratories, or in Consulting and services companies, etc.

Companies recruiting our students

Altran, Airbus Defense & Space, Aéroconseil, Astek, Atos Origin, Bertin, Eutelsat, Eurologic, GIST, Saipem, Seditec, Safran, Sopra Group, Transiciel, Thales Alenia Space, CNES, ESA, CTA (Brazil), Inpe (Brazil), DLR (Germany), Instituto Mexicano de Comunicaciones (Mexico), GTD Sistemas de Información (Spain), Hispasat (Spain), Aerospace Computing Inc/AMES (USA),…

Armelle FRENÉE-SCHMIDT, Young Graduate Trainee (YGT) for REXUS/BEXUS programme at ESA, European Space Agency, Graduated in 2016

Why did you choose ISAE and apply for the master «Space Systems Engineering»? What were your objectives?

First, I heard about the TAS ASTRO during a training week organised by my engineering school (ESTACA) at ISAE (SUPAERO campus) thanks to a former student. I was already intending to continue my studies because my wishes were to learn more about project management without losing technical aspect. Moreover I am a space enthusiast and it was impossible to imagine carrying on my studies without a space application. That is why it was difficult to find the adequate master. Finally, thanks to a presentation of the different masters offered by ISAE and ISAE website, I had enough information to understand that the Space Systems Engineering master was exactly the one that I have been wished.

My objectives were first to take the opportunity to reinforce my technical background (satellite technology, space environment, space mechanics...), then to discover new aspects such as legal and financial ones and finally to get knowledge in system engineering to learn tools.

According to your experience, which are the strong assets of the Master you did?

First of all, we applied most of the theoretical knowledge! Which means that we were really able to try. It is still better when you can try because you can really feel and understand what you are doing. So it is impossible to be bored, on the contrary! The master is composed of a lot of different courses plays out in a very dynamic schedule until the internship. And because the major part of the assessment is made by projects, it enables to work with different teams which contribute to maintain a good dynamic and motivation all along the year. Finally, this master is performed in an international environment which is a significant and interesting characteristic of the TAS ASTRO.

What are your career plans?

After the TAS ASTRO, I performed an internship at Arianespace in French Guyana and it was for me an impressive discovery of the operational phase. Then, I applied for a YGT position for REXUS/BEXUS programme. I really use what I have learnt during the master and at the same time, this position enables me to work also in the field thanks to a lot of missions, especially launch campaigns in Kiruna. That is why my wishes are now to work in the field, in AIT (Assembly, Integration and Testing) for launchers or for sounding rockets and why not working directly on operational phase for launch campaigns!

Matías JÁUREGUI LORDÁ - Argentina, PhD at National University of La Plata, Argentina, Graduated in 2014

Why did you choose ISAE and apply for the advanced master TAS Astro?

I choose the Advanced Master «Space Systems Engineering» because I needed to gain knowledge in space engineering, field that is not possible to study in my country. I choose ISAE because it is a world class institute.

What were your objectives?

The interaction with professionals that are currently working in the space industry and the possibility to see what they are doing at the moment

Which are your career plans?

I’m doing a PhD right now in space engineering. My plan is to grow as a professional along with my country space improvement.
Objectives

Aeronautical, Space and Defense business is, by nature, complex, innovative with high technical added value. Placed at the heart of political, economic, environmental and technological issues, in France, in Europe and worldwide, it requires a prospective vision from decision makers. It is based on specific industrial processes, characterized by long, costly and risky cycles (R & D, production, maintenance & support).

In this context, project management in aerospace environment requires mastering a wide scope of knowledge, know-how and expertise adapted to the specific needs and issues of this challenging worldwide business.

To answer to these concerns, ISAE-SUPAERO, École de l’Air and ENAC gather their expertises to develop the Aerospace Project Management (APM) advanced master.

The professionally-oriented APM advanced Master provides students with an overview on military or civil international Aerospace industry and gives up-to-date skills, cutting-edge knowledge, and necessary competences for successfully leading Project or Program teams in global aerospace and defence industry.

With an emphasis on operations, the program is designed to those beginning their career in management of projects or to professionals aiming at enhancing their competences for a fast career evolution. The program of the APM is taught, by experts or lecturers with extensive aerospace project experience, with a combination of formal presentations, in-class exercises and study cases. The objectives of this practical approach are to provide students with current techniques and tools in project management taking into account industrials, economical or legal specificities of the Aerospace business.

Organisation

Heads of Program:
- ISAE: Prof Philippe GIRARD
  philippe.girard@isae-supaoer.f
- École de l’Air : Pierre BARBAROUX
  pierre.barbaroux@defense.gouv.fr
- ENAC: Prof Nicolas PETEILH
  nicolas.peteilh@enac.fr

Duration of studies: One year in full time or two years in part time

Beginning of classes: September

Location:
- ISAE-SUPAERO (Toulouse)
- ENAC (Toulouse)
- École de l’Air (5 weeks in Salon de Provence - October November)

Teaching language: English

Learning approach

The comprehensive training program is organised into four teaching parts:

First part: Overall overview of aerospace industry (60 hours)

The first part provides the students with an in-depth overview of word-wide aeronautics and space industries enabling them to have an overall understanding of technologies, products, innovation and strategy stakes in the global civil and defence market.

Second part: methodology (207 hours)

This part leads to a good understanding of Project management tools (WBS, planning, needs specification, etc). Models and Methods of Project management for Aerospace context with specificities for high stakes and long cycle programs.

Third part: economic and financial aspects (166 hours)

This part leads to a good understanding of economical stakes for nations or industries and the role of politics. How to evaluate the cost of a long term program, the investment return hope, but also how to manage cost during development or manufacturing phase.

Fourth part: knowledge management in multicultural team project (73 hours)

This part underlines the necessity to integrate and federate competences around a common objective; how to motivate people for a long term project. How to integrate intercultural management within international Program to avoid conflicts and change resistance.
In each of these parts the risks evaluation and control will be systematically underscored as well as Quality concepts and indicators dedicated to Aerospace context.

**Professional thesis**

During semester 2, students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host organisation and from ISAE or Ecole de l’Air. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

**Teaching staff**

The teaching staff is composed of professors, lecturers and consultants for ISAE and Ecole de l’Air (CReA). Several consultants, experts into project management are invited to deliver their knowledge from their own experience.

On top of that many experts from industries, most of the time heads of aerospace programs will illustrate with parts of the courses.

**Career opportunities**

APM advanced master program leads students to integrate or to become Head of Aerospace program team. To conceive and pilot complex projects with permanent care of costs and risks control in Aerospace companies or in defense institutions.

**PMI Certification**

The APM program offers you to get PMI Certifications: CAPM or PMP. In an increasingly changing world, professional certification ensures that project managers to meet the demands of space projects through the globe. By offering an additional month of training, you will be specially prepared to CAPM or PMP exams. Volunteers will have opportunity to complete the APM diploma with a PMI certification well known and appreciated through the world and which open door to success. Teachers for preparation are certified themselves and experts of PMBOK reference.

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**TESTIMONIES**

**Déborah Fernandez, France, Innovation Project Manager at Air France Industries KLM Engineering & Maintenance, graduated in 2016**

*Why did you choose ISAE and apply for the Advanced master «Aerospace Project Management»? What were your objectives? After completed an engineering degree at ESTACA, I wanted to complete my technical knowledge with an Advanced Master in management. Aeronautics has always changed at the mercy of projects and project management skills were missing in my training. I had three objectives for this additional year: first, acquire project management skills and specific tools to lead projects properly and successfully. Secondly, I wanted to work in a multicultural environment with classmate coming from all around the world. But most of all, I wanted to consolidate my professional project.*

*According to your experience, which are the strong assets of the Master you did? I chose to integrate “Aerospace Project Management” Advanced Master because the program offered exactly what I was looking for. I knew that the quality of the lectures would be very high thanks to speakers coming from the industry. The infrastructures and means provided to students are awesome and community associations are really encouraged. Moreover, as a passionate, taking classes in the top three aeronautic schools at the same time was a dream and a great pride.*

*Which are your career plans? I did my professional thesis within Air France Industries in the Innovation Department where my mission was to lead a project in collaboration with a start-up for cabin maintenance. Thanks to the master, I reached my internship’s objectives and I was hired as an innovation project manager. Getting responsibilities just after graduation is very promising and I will probably apply for a bigger project in few years after having consolidated my knowledge.*

**Ludovic FRAUMAR, "Mechanical Systems Engineer » at ArianeSpace, France, graduated in 2015**

*Why did you choose ISAE and apply for the advanced master «Aerospace project Management»? What were your objectives?*

I decided to apply for this advanced master because it offers a comprehensive training, through 4 main complementary modules.

*My objectives were, first to have strong theoretical knowledge about project management, which was a natural complement to my engineering degree (master of science). Then, I wanted to build a real network, by studying in a cosmopolite environment and in three of the best European engineering schools. But most of all, this year was for me the opportunity to adjust and prepare my professional project.*

*According to your experience, which are the strong assets of the advanced Master you did? I think this advanced master has 4 main strengths: the quality and excellence of the lectures that fit the current aerospace environment, the actual support of the administration team, the diversity of the trainees in terms of diploma, experience, age or nationality, and, last but not least, the living environment, including the opportunity to be part of the student and associative life like I was at SUPAERO Space Section.*

*Which are your career plans? I have started my career in an operational and technical job, as a mechanical systems engineer. I believe that, before bearing some managerial responsibilities, it is important for me to know more the launch campaign activities. I will be able after few years to apply for a project management responsibility. Eventually, I would like to create my own structure in order to share with others what I have learnt, in a teaching or coaching activity.*
Objectives

Systems Engineering is an interdisciplinary discipline of engineering combining all sciences and technologies into an integrated team from design, to development, up to operations and disposal of competitive and complex systems. Systems Engineering approach is the capacity to federate and control various, interweaving and complementary engineering activities. This approach goal is to deliver satisfying systems, on-time, within expected budget, with the level of quality and performances meeting requirements of an open and competitive market. Systems Engineering process implements technical processes (requirement engineering, design, integration, verification, validation, etc.) as well as project management processes, agreement processes and enterprise processes. The Systems Engineering Master degree program is a one-year professional course of study, designed in partnership with the industry. **This program aims at providing worldwide industry with skilled professionals in Systems Engineering able to specify, design, deploy and maintain competitive and complex systems, fit to purpose, in various industrial sectors:** space, aeronautics, air traffic control, land transport systems, maritime transport, health industry, energy, communication systems, etc.

Organisation

**Head of Program:** Prof. Jean-Charles CHAUDEMAR  
jean-charles.chaudemar@isae-supero.fr  
**Duration of studies:** One year full time  
**Beginning of classes:** September  
**Location:** ISAE  
**Teaching language:** English

Learning approach

The one-year course is split into 2 semesters in ISAE premises - lectures, integrated team project, etc.- and 4-5 months of internship.

**First semester:** academic session of around 500 h, provided by ISAE’s permanent professors and experts from industry bringing current knowledge and experience, including: lectures, tutorials, industrial study cases. And 45h devoted to the coaching of the Integrated Team Project run all along the semester.

**Second semester:** students have to conduct a professional thesis in aerospace industry or in laboratory, in France or abroad, supervised by a tutor from the host organisation and from ISAE. The thesis is concluded by the preparation of a report and an oral dissertation in front of jury.

Syllabus

**Teaching part (First semester)**

**Part 1: Academics**

Systems Engineering Introduction (SEI)  
Project Management Introduction (PMI)  
Project Technical Management (PTM)  
Systems Engineering Data Technical Management (SEDTM)  
Systems Modelling and Analysis (SMA)  
Systems Dependability (SD)  
Systems Performance Assessment & Management (SPAM)  
Optimise, Decide, Justify, Verify & Validate (ODJVV)  
Requirements Engineering (RE)  
Systems Design and Architecture (SDA)  
Introduction to Verification & Validation  
Integrated Logistic Support (ILS)  
Airbus Study Case: Systems Engineering & Certification of the A380 (A380)  
Systems Engineering of Space Systems (SESS)  
DASSAULT Study Case: Systems Engineering at Dassault aviation (DAV)  
DGA Study Case: System of Systems (SoS)  
Systems Engineering Methods and tools (SEMT)  
Introduction to Space System (ISS)

**Part 2: Integrated Team Project (ITP)** 45 h of coaching

Career opportunities

For Open-minded students with open mind, who want to achieve systemic vision, who do like working in integrated team, who like challenges, who are convinced that we can have fun while working, this Master will offer huge job opportunities in Systems Engineering.

Systems Engineering is now a real and permanent concern for any business players, from Major Governmental contractors,
to equipment manufacturers, to prime contractor integrating systems, and services companies such as Airlines for instance. Systems Engineering jobs are characterized by many disciplines:
- multidisciplinary - mechanics, electronics, information technology, etc,
- strong interface with project management,
- permanent concerns all along the life cycle of a system.
Need of Systems Architects is increasing for both industries developing, producing and maintaining large complex systems (aircraft, ships, military and defence systems, cars, etc.) and other industries developing and producing smaller high technology products (cameras, mobile phones, printers, computers, etc.). This Master program offers students great opportunity to join Engineering Team Systems within industries in different economic sectors.

<table>
<thead>
<tr>
<th>Companies recruiting our students</th>
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</thead>
<tbody>
<tr>
<td>Altran, Dassault Aviation, Airbus Group and its subsidiaries, EGIS Avia, Arianespace, ALTEN, AKKA, Seditec, Hispano Suiza, Thales Alenia Space, INPE (Brazil), AVIC (China), COMAC (China), Thales China, Geo-Informatics and Space Technology Development Agency (Thailand).</td>
</tr>
</tbody>
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**TESTIMONIES**

**Raphaël FLAMEMBAUM, France, Critical Software Engineer at Airbus Space & Defense, Graduated in 2014**

*Why did you choose ISAE and apply for our master? What were your objectives?*

Having a passionate interest in aerospace and aeronautics, once I heard that ISAE SUPAERO offered the possibility to get an advanced master degree in Systems Engineering, I jumped in the opportunity for me to enlarge my field of competences. I knew that with my background in Embedded Systems, given by ENSEIRB-MATMECA Engineering School, it would be interesting to work on larger scale Aerospace systems.

*According to your experience, which are the strong assets of the Master you did?*

The master offers to work closely with the industrial world. Thus, the student is involved in the real work dealt day to day in high tech and worldwide leader companies. Hence, once you arrive in your internship or your real job place, you are rapidly operational.

*Which are your career plans?*

I am currently working on Critical Software dedicated to navigation at the crossroad of Space and Aeronautics and I learn a lot. This would be a stepping board to continue to improve my competences. Then, step by step I hope getting more and more involved in Systems Engineering.

**Mahesh MADHAVAN-NAIR, India, SAFRAN Engineering, Graduated in 2013**

*Why did you choose ISAE and apply for our master? What were your objectives?*

For me, ISAE is one of the best institutes in the world to produce world class engineers discovered with high end technologies taught by experts from globally renowned companies and institutes. Basically I am a Mechanical Engineer specialized in Thermal Engineering. I have been working in Aircraft Mechanical Systems for 6 Years. My initial objective was to capture some specific categories of systems engineering in which I was lagging and not experienced. But, this course gave me an excellent exposure of its theory and its practical applications on different domains. I could also master in the areas in which I was experienced by applying the theory and concepts from the experts.

*Which are your career plans?*

I have been working in AVIC as a Radar System Engineer for 6 years. My reasons for applying to the SEN Advanced Master were to have a systematic view of complex system development and also to practise my experiences.

The strengths of SEN are:
- first the knowledge of Systems Engineering. I get a lot of knowledge for the system development, system design, verification and so on. I also increase my capability for analysing and solving problems, especially complex problems.
- then the quality of the education. The professors are very professional. There are professors from industry. So they can give us practical experiments about their job.
- last but not least, the international atmosphere. We can be involved in an international team during the SEN master program. My plan for the future is to continue the Radar System Engineer (at AVIC) with the new skills that I gained in ISAE in the Systems Engineering master.

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**INCOSE certification in ISAE**

At the end of the first semester, all SEN students are encouraged to participate in a one-month complementary program in preparation for ASEP* level of INCOSE (International Council on System Engineering) certification. INCOSE certification consists of an exam which has an international-recognized value to validate knowledge and skills in systems engineering.
Objectives

Under the aegis of the DGA, ISAE-SUPAERO and EPNER joined their expertise setting up the first Master’s degree in Flight Test Engineering for pilots and engineers using the synergy of their recognized competences in aerospace education.

EPNER is one of the world leader Flight Test School offering high-level courses for Flight Test Pilots and Flight Test Engineers. EPNER offers fixed wing and rotary wing courses for test pilots and engineers.

ISAE-SUPAERO and EPNER studied and developed a comprehensive program integrating their competencies and existing courses to provide EPNER flight test courses attendants with a Master’s degree Specialized in Experimental Flight Test Engineering of ISAE-SUPAERO besides the EPNER qualification.

The Experimental Flight Test Engineering Master is a 12-month course organized by ISAE-SUPAERO and EPNER aiming at providing either Flight test Governmental Organisations or Aircraft manufacturers with high-qualified test pilots and flight test engineers. Aware of the necessity to conduct flight tests program in close coordination between pilots and engineers, the original spirit of this program is to prepare pilots and engineers to work in integrated team.

The objectives of the Master is to develop theoretical and applied skills of experienced pilots and engineers for the preparation, implementation and report of flight tests either of aircraft or complex embedded-systems, in the best safety conditions. After graduation, these skilled professionals are able to participate to civilian certification of new or modified aircraft, to aircraft or equipment development program, to military acceptance program, either fixed-wing or rotary-wing.

The course is split into two periods:

- 2-month courses in basis sciences and French aeronautical communication skills organised at ISAE-SUPAERO campus, in Toulouse,
- 10-month Experimental Flight Test course, for fixed wing or rotary wing for pilots and engineers, given at EPNER in Istres.

Organisation

Head of Program: Prof. Éric POQUILLON
- eric.poquillon@isae.fr
Duration of studies: One year full time
Beginning of classes: end of June
Location: ISAE-SUPAERO and EPNER-Istres
Teaching language: French

Learning approach

Academic session consists of around 450h of ground and simulators courses, provided by ISAE-SUPAERO and EPNER’s permanent professors and experts from industry bringing current knowledge and experience.

And around 110 flight hours on more than 20 airplanes for fixed-wing stream and 15 helicopters for the rotary-wing stream.

All along the program, students conduct professional theses, assessment of aircrafts or embedded-systems. These theses are concluded by the preparation of a report and an oral dissertation.

Syllabus

<table>
<thead>
<tr>
<th>ISAE part</th>
<th>International attendees</th>
<th>French attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Flight mechanics</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Automatic control and aircraft control</td>
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<td>✓</td>
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<tr>
<td>Visits of companies</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Advanced aeronautical French</td>
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<tr>
<td>Aeronautical phraseology</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Aircraft preliminary design</td>
<td>✓</td>
<td></td>
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<tr>
<td>Human factors</td>
<td>✓</td>
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</tbody>
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Crédits photos : © AIRBUS 2005_photo by exm company/P. Masclet
© AIRBUS 2006_photo by exm company/P. Masclet
Advanced Masters in French Engineering (ISAE-SUPAERO, EPNER - the French Flight Test School)

EPNER part
System engineering introduction
Safety of flight tests
Basics of aerospace techniques
Documentation, procedures applied in flight tests programs
Performances tests
Propulsion tests
Handling tests
Embedded-systems tests
Specific test (fixed-wind): flight envelop extension, certification, acceptance, assessment, etc.
Specific test (fixed-wind): flight envelop extension, specific flights, synthesis activities
Professional thesis

Career opportunities
The Master intends to prepare skilled professionals, pilots or engineers for:
• Managers of flight tests implementation, flight envelop extension of aircraft or embedded-systems in close cooperation with design and development offices,
• Managers of flight tests centers.

Organisms recruiting our students
Flight Test Centres, Air Force, Navy, Army, Airbus Group and its subsidiaries, Germany, BWB Germany, Dassault, ESA, Canadian Flight test center...

Admission procedure
Selection and admission by the French Ministry of Defence, contact us for more detailed information.

CPT Luca S. Parmitano, Air Force Italia, Graduated in 2009, selected by ESA
I was selected by my government for this advanced master which is related to the EPNER test pilot school course. As the master is still taught in French, I wish to advise future students to learn French, it will help them to better understand the French culture, which in turn will help them to better understand the courses, even when they are in English. Plus, knowing the language will help them to enjoy the beautiful city. Regarding my career, let’s say the master helped me get my future job: in September 2009, I joined the European Space Agency to start astronaut training.

American Officer, Graduated in 2011
Why did you choose ISAE and apply for our master? What were your objectives?
I came to ISAE as part of the MSIEVEX, associated with EPNER. My objectives were to work on mathematics, aviation, and aeronautical engineering subjects in French, in order to expand my knowledge of French engineering practice and begin my training as a Flight Test Engineer.

According to your experience, which are the strong assets of the Master you did?
The greatest strength of the MSIEVEX program for me was the wealth of expertise available through our instructors and administrators, even in a short course like ours (only two months, during the summer). I am grateful that so many talented and knowledgeable professors dedicate their summer weeks to working with the MSIEVEX students. I also appreciate the inclusion of our Alliance professor and the French language course, because as a foreign student, having an excellent French teacher to complement the purely technical subjects was imperative. I will know more about the specific strengths of the ISAE MSIEVEX program working together with the Program A stage at EPNER after I have spent more time at EPNER!

Which are your career plans?
I will return to the United States in September 2012 to work as a Flight Test Engineer (Rotary-Wing specialty). I will spend at least three years in a FTE-RW job, and then I will build on that experience as an engineer and a field grade officer in the US Air Force.
Objectifs
Dans un contexte compétitif international croissant où la recherche de matériaux nouveaux associée à l’optimisation des méthodes de calcul des structures, leur certification statistique, dynamique et thermique sont des atouts majeurs pour les architectes industriels du secteur des aéronefs et spatonefs, ce mastère offre, aux ingénieurs destinés aux métiers en conception, en recherche et développement, en certification, ou aux essais et qualification, une culture approfondie et multidisciplinaire en génie mécanique appliqué aux structures. Ce mastère constitue une référence en la matière.

L’enseignement vise à développer une expertise au calcul numérique des structures les plus avancées, une connaissance des matériaux ainsi que sur leurs interférences avec l’environnement (notamment les charges et interactions fluides-structures).

La dynamique des structures souples, la modélisation et le contrôle structural actif et passif des éléments complexes constituent le noyau central des enseignements de ce mastère.

L’objectif du MASTÈRE SPÉCIALISÉ® est de former des spécialistes dans le domaine de la conception, optimisation et certification des structures légères capables de maîtriser les méthodes de modélisation et d’analyse des structures d’aéronefs et de véhicules spatiaux dans le contexte industriel.

Organisation de la formation
Chef de programme : Prof. Yves GOURINAT  
<yves.gourinat@isae-suprema.fr>
Durée : un an à temps plein  
Rentrée : début septembre  
Lieu : ISAE  
Langue : français mais certains cours sont dispensés en langue anglaise avec d’autres mastères de l’ISAE.

Méthode pédagogique
Second semestre : réalisation d’une thèse professionnelle en entreprise, en laboratoire, en France ou à l’étranger d’une durée de quatre à six mois, validée par une soutenance.
aéronautiques et spatiales

Programme d’enseignement

Harmonisation - 51 h

Enseignements académiques - 370 h

Projet en équipe Intégré - 22 h
Intégrer toutes les dimensions d’un projet : composante technique, gestion de projet et gestion d’équipe.

Perspectives professionnelles

Plus de cent-vingt ingénieurs ont été formés à cette spécialisation unique dans l’enseignement supérieur français. Ils occupent aujourd’hui des fonctions d’ingénieurs-recherche ou d’ingénieurs de conception dans des entreprises internationales des secteurs aéronautique, spatial ou du génie mécanique.

Le haut niveau scientifique de la formation MS SAS autorise également des ouvertures effectives vers les métiers de la recherche en mécanique des solides et des structures.

Les entreprises qui recrutent nos étudiants

TÉMOIGNAGES

Virginie VERRIERE, France, France, Navigability and process Engineer at Airbus, Graduated in 2014

Why did you choose ISAE and apply for the advanced master «Structures Aéronautiques et Spatiales» ? What were your objectives?

I choose ISAE because I wanted to integrate a school that was already well implemented in the industrial aeronautical environment; I wanted to have a strong first contact with industrial and scientific actors of the aeronautical and space domain. With my background in materials physics, I wished to have a strong training in structures, with the most used tools and methods in these fields, the roadmap and the state of the art of the specialties of aeronautics and space.

According to your experience, which are the strong assets of the Master you did ?

According to my experience, the main assets of the Master are, first the complete and global training of all the disciplines that are studied: it gives us a strong basis to adapt and succeed at all industrial and academic subjects proposed in the field of structures. The second asset is the fields where are the experts from, who are introduced to us and taught their disciplines: they are from industrial and/or academic environments, or even research laboratories.

Which are your career plans ?

After an internship at CNES, I had the opportunity to integrate Airbus for a mission in airworthiness certification processes: it is the chance for me to know aeronautical environment in details, its particularities, its constraints and its roadmap. I would like then going on about materials and structures fields, particularly in research and development for that I have already skills and 5-year-background.

Pierre GAMBIER, France, Aircraft Stress Solution engineer at Airbus, Graduated in 2011

Why did you choose ISAE and apply for our master ? What were your objectives ?

My previous school was a general engineering school. Although it gave me a good overview of the engineering world, it left me a taste of unaccomplishment in the field I liked: structure.

I came out of my previous engineering degree with a pretty good file and recommendations, so I applied for the master’s degrees at ISAE with the objectives of acquiring more technical and specialised knowledge on aerospace structure and gain a recognise expertise in this field.

According to your experience, which are the strong assets of the Master you did ?

The first strongest asset of the SAS master is the uniqueness and quality of the teaching and the teachers. We had access to the knowledge of former or current renown industrial specialists in each topic we studied, turning each lesson into a very special moment where we could learn from the very best !!

The second strongest asset of the SAS master and of all the ISAE master’s is the renown of the school. Having ISAE on a resume really makes a difference in the recruitment process, and the expertise we gain during the formation is really recognised by the recruiters

Which are your career plans ?

Working in Airbus in the Structure engineering field. Currently I’m starting to work as an Aircraft Stress Solution Engineer for the A350 XWB program, supporting the use of new Finite Element Model softwares.
Objectifs

Former des spécialistes moteurs capables de concevoir et d’utiliser des turbomachines aéronautiques et terrestres, des moteurs d’engins spatiaux, ayant une solide formation en mécanique des fluides et sachant adopter une approche systèmes complexes.

Acquérir des connaissances approfondies en aérothermique et technologie des systèmes propulsifs (turboréacteurs, turbines à gaz, statoréacteurs et moteurs fusées).

L’accent est mis tout particulièrement sur l’aérodynamique interne (turbomachines et combustion).

Organisation de la formation

Chef de programme : Prof. Guillaume DUFOUR

guillaume.dufour@isae-supaero.fr

Durée : un an à temps plein

Rentrée : début septembre

Lieu : ISAE

Méthode pédagogique

Premier semestre : environ 450 heures d’enseignement dispensées de septembre à avril dans les locaux de l’ISAE-SUPAERO par les professeurs permanents de l’ISAE-SUPAERO et par des experts et professionnels apportant les dernières connaissances de l’industrie dont : cours magistraux, bureaux d’études, travaux pratiques, visites de sites industriels, travail en équipe.

Second semestre : réalisation d’une thèse professionnelle en entreprise, en laboratoire, en France ou à l’étranger d’une durée de quatre à six mois, validée par la soutenance.

Programme d’enseignement

Conception et opérations des aéronefs - 84 h

Les grands enjeux aéronautiques - Etat de l’art de la propulsion aéronautique - Mission et Environnement des aéronefs - Conduite du vol et facteurs humains - Enquêtes accidents et réglementation - Conception moteur : De la mission à la spécification (civil et militaire) - Performances et cycles (on- et off-design) - Méthodologies de design et d’expérimentation - Intégration à l’aéronef (contraintes et tandem avion/moteur, focus nacelle et systèmes annexes) - Approche multidisciplinaire - Avants projets et innovations incrémentales et en rupture.

Dynamique des fluides - 280 h


Projet ingénierie entreprise - 98 h

Intégrer toutes les dimensions d’un projet : composante technique, gestion de projet et gestion d’équipe.

Perspectives professionnelles

La plupart des ingénieurs issus du MASTÈRE SPÉCIALISÉ® occupent des postes de cadres supérieurs chez les motoristes ou avionneurs du secteur aéronautique et spatial, au sein de SSII ou encore dans le domaine de l’énergétique générale auprès d’entreprises publiques et privées.

La formation peut aussi permettre la poursuite en thèse doctorale.

Les entreprises qui recrutent nos étudiants

Airbus Group, Aéroconseil, Altran, ALSTOM POWER, Seditec, Safran, SAFRAN Snecma, SAFRAN Turboméca, SEGIME, SOGETI High Tech, Transiciel, Astek, Sagem, Thales, DGA SPAe, CEPR SACLAY, SNPE, ESA, Alcatel, DAHER LHOTELLIER, HUREL HISPANO, MATIS BENELUX, NUMECA INTERNATIONAL (Belgique),…

Crédit photo : © Michel Chauvin
des avant-projets. Après quelques années, je pense me diriger vers des activités liées aux essais moteur. Par la suite, je souhaiterais rejoindre le support technique au client afin de répondre à des problématiques de mises en services et de suivi des flottes. Enfin, à plus long terme, intégrer progressivement des activités de management d’équipe.

**Thomas LAMBOT, France, ingénieur à la NASA, diplômé en 2012**

Pourquoi avez-vous choisi de suivre le Mastère Spécialisé® «Systèmes de Propulsion Aérospatiale» proposé par l’ISAE ?

J’ai depuis toujours été passionné par le domaine aérospatial. Que ce soit avions, hélicoptères ou fusées. Dès que quelque chose volait, c’est tout ce qu’il fallait pour attirer mon attention. Après avoir fini mes études d’ingénieur en Belgique, je voulais me spécialiser dans un domaine qui m’a toujours tenu à cœur : la propulsion. Ce domaine étant multidisciplinaire, les formations qui lui sont consacrées essentiellement ne sont pas très nombreuses. En discutant avec des connaissances j’ai appris que l’ISAE, dont la qualité d’enseignement dans le secteur aérospatial n’est plus à démontrer, offrait exactement ce que je cherchais. J’ai sauté sur l’occasion, ai soumis ma candidature et ai été accepté !

Selon vous, quels sont les points forts du programme que vous avez suivi ?

Le mastère SPA a l’avantage d’avoir des professeurs experts dans leur discipline, venant du monde de la recherche ou d’entreprises. Tout ce que l’on apprend ou revoit est directement appliqué au secteur de la propulsion.

Un autre point fort est les différents bureaux d’études : que ce soit pour le design d’un moteur de fusée, l’étude de résultats de simulation CFD sur un aubage de turbine ou le travail sur un banc d’essai moteur.

Finalement, un des plus grands atouts du mastère est son stage en entreprise qui, dans pas mal de cas, débouche directement sur un job.

**Aujourd’hui, quels sont vos projets professionnels ?**

Après mon stage à NASA Ames sur le projet «Millimeter-wave Thermal Launch System» (un système expérimental de propulsion de fusée étudié là-bas), j’ai reçu une proposition pour rester travailler sur ce projet ou je développe maintenant un prototype qui devrait décoller d’ici un an. Dans le futur, je souhaiterais rejoindre une des nombreuses compagnies émergentes du secteur spatial privé, pour développer les moteurs fusée de demain.

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**David TESTA, France, Concepteur en Systèmes d’Équilibrage Axial de turbopompes à hydrogène liquide chez SNECMA VERNON, diplômé en 2014**

Pourquoi avez-vous choisi de suivre le Mastère Spécialisé® «Systèmes de Propulsion Aérospatiale» proposé par l’ISAE ?

Ayant initialement suivi une formation d’ingénieur en Mécanique des fluides et ayant un goût très prononcé pour les moteurs d’avions et les turbomachines en particulier, j’ai décidé de suivre le MS Systèmes de Propulsion Aérospatiales afin de compléter et perfectionner mes connaissances sur ce domaine. De plus, c’était une opportunité pour moi de suivre une formation technique de qualité à l’ISAE, une des meilleures écoles de France dans le secteur Aéronautique et Aérospatial. Soucieux d’appréhender en profondeur le fonctionnement et la conception des moteurs d’avion ou de fusée pour travailler dans de grands groupes aérospatiaux, ce MS m’a permis de monter en compétences sur cette thématique et il m’a fait découvrir une large palette de métiers entrant en jeu dans la conception d’un moteur.

Selon vous, quels sont les points forts du programme que vous avez suivi ?

- Qualité des enseignements : réelle volonté de la part des intervenants de faire découvrir leur passion à des étudiants curieux et intéressés. J’ai vraiment pu voir que les intervenants avaient à cœur de faire découvrir leurs univers et les problématiques industrielles actuelles aux étudiants.
- Pluridisciplinarité : beaucoup de disciplines sont abordées dans la formation, offrant une vision d’ensemble des métiers intervenant dans la conception et le fonctionnement d’un système propulsif.
- Bi - dimensionnalité : la formation offre aux étudiants une vision industrielle mais aussi de recherche en laboratoire qu’il est important d’avoir à l’esprit dans ce secteur.
- Liberté : la formation fait preuve d’une certaine souplesse dans le choix des projets scolaires encadrés laissant certains degrés de liberté aux étudiants qui peuvent ainsi aborder des thématiques plus ciblées sur leurs projets professionnels ou selon leur curiosité.

**Guillaume GARSON, France, ingénieur thermodynamicien aux avant-projets chez SAFRAN SNECMA, diplômé en 2013**

Pourquoi avez-vous choisi de suivre le Mastère Spécialisé® «Systèmes de Propulsion Aérospatiale» proposé par l’ISAE ?

J’ai choisi d’effectuer le MS SPA après avoir eu un parcours plutôt atypique. J’ai débuté mes études supérieures avec un DUT Génie Thermique et Energie à l’UT de Marme-la-Vallée. J’ai souhaité poursuivre avec une formation d’Ingénieur Généraliste en alternance (SAFRAN SNECMA) au sein du CESI de Paris. Enfin, souhaitant me spécialiser et acquérir de solides connaissances techniques dans le domaine de l’aéronautique et plus spécialement la propulsion, j’ai décidé d’effectuer le MS SPA.

Aujourd’hui, je ne regrette absolument pas mes choix et principalement celui d’avoir fait le MS SPA qui m’a propulsé dans la vie active avec une aisance étonnante. En effet, lors de la recherche de stage il m’a fallu refuser de nombreuses offres qui m’étaient proposées. De plus, peu de temps après avoir débuté mon stage au sein de SAFRAN SNECMA, il m’a été proposé un poste et j’ai pu signer une promesse d’embauche.

Selon vous, quels sont les points forts du programme que vous avez suivi ?

Indiscutablement, l’enseignement technique qui nous a été fourni a été de très grande qualité. Les bureaux d’études proposés permettent directement d’appliquer l’enseignement reçu et traitent tous de problématiques industrielles.

Le cadre de l’ISAE où est dispensé le MS SPA est également à prendre en compte. Vous évoluez pleinement dans environnement très agréable et au sein d’une ville jeune et dynamique.

**Aujourd’hui, quels sont vos projets professionnels ?**

Je souhaiterais parcourir le plus possible le cycle de vie d’un moteur. Je vais, à l’issue de mon stage, débuter ma carrière en tant qu’ingénieur thermodynamicien aux avant-projets. Après quelques années, je pense me diriger vers des activités liées aux essais moteur. Par la suite, je souhaiterais rejoindre le support technique au client afin de répondre à des problématiques de mises en services et de suivi des flottes. Enfin, à plus long terme, intégrer progressivement des activités de management d’équipe.
Objectifs

La recherche de chefs de projet par les entreprises connaît un essor fulgurant depuis quelques années. Pour répondre à cette demande sur le marché de l’emploi, l’ISAE-SUPAERO et le Groupe HEC ont associé leurs compétences complémentaires et reconnues internationalement pour former des chefs de projet. Le management de projet a pour principe de fédérer sur un objectif bien identifié, pour une durée déterminée et dans le respect de coûts préétablis, une équipe d’experts et des ressources qui apportent leurs compétences spécifiques. Les managers de projets doivent posséder une bonne compréhension et une maîtrise de disciplines très variées comme le marketing, la finance, les achats, la stratégie d’entreprise, le management de l’innovation, les ressources humaines, le team building, mais aussi la qualité, les techniques de planification, la gestion des risques, les choix d’investissement, ...

L’ISAE-SUPAERO et HEC mobilisent leurs experts pour offrir cette formation de haut niveau académique et opérationnelle à des étudiants d’origines diverses et complémentaires, avec une forte orientation internationale.

Les objectifs du mastère MGP sont :

- acquérir une spécialisation de haut niveau, académique et opérationnelle portant à la fois sur l’ingénierie et le management du projet,
- maîtriser les fondements, méthodes et pratiques de management de projets dans un environnement international,
- faciliter l’insertion professionnelle par des rencontres avec les entreprises françaises et étrangères, au travers d’un projet de création d’entreprise, de la mission menée en temps partiel pendant la scolarité et du stage de fin d’études en entreprise validé par une thèse professionnelle.

Organisation de la formation

Chefs de programme

- Prof. Philippe GIRARD
  philippe.girard@isae-supraero.fr
- Prof. Sihem JOUINI
  jouini@hec.fr

Durée : une année à temps plein
Rentrée : septembre
Lieu : ISAE-SUPAERO (Toulouse) et HEC (Paris).
Langue : française mais certains cours sont dispensés en langue anglaise ; une bonne maîtrise de l’anglais est donc demandée.

Méthode pédagogique

Les fondamentaux de la gestion de projets et économie : huit mois d’enseignement intensif d’environ 600 heures de travail effectuées en salle de classe, en septembre à HEC, d’octobre à décembre à l’ISAE-SUPAERO et de janvier à avril à HEC.

Cours magistraux

- Travaux dirigés
- Études de cas individuelles et en groupe
- Débats, conférences et séminaires
- Études de cas informatisées sur tableurs
- Visites de sites industriels ou de projets en cours de réalisation
- Projets de création d’entreprise de quatre mois (étude de cas générale présentée devant un jury de professionnels)
- Projet de cinq mois, réalisé partiellement en entreprise sous forme de missions en alternance
- Stage en entreprise d’une durée de quatre mois minimum, validé par la soutenance d’une thèse professionnelle

Programme d’enseignement

Le programme est constitué de douze modules, certains pouvant être dispensés en anglais.

Trois axes verticaux

Le projet

- Structure projet - Connaître les bases du management de projet et les outils de simulation (conduite de projet, analyse des risques, planification, …) - Coûts et financement - Évaluation et techniques de chiffrage, ingénierie financière internationale, marketing et action commerciale, … - Team building - Techniques de constitution et de motivation des équipes de projet - Méthodes AGILE et de Lean Startup appliquées aux Management de Projets aussi bien pour les startups que pour les Grandes Entreprises.
- Méthodes AGILES et de Lean startup appliquées au management de Projets aussi bien pour les startups que pour les Grandes Entreprises.
L’entreprise
Environnement projet - Comprendre les fondamentaux du monde de l’entreprise et la manière dont l’entreprise intègre le projet (gestion de production, management de la qualité,…)
- Comptabilité et gestion - Analyse comptable et financière, comptabilité analytique budgétaire - Ressources humaines - Réglementation du travail, sous-traitance, expatriation, techniques de négociation, de motivation et d’argumentation.

L'international
Droit des affaires - Comprendre et maîtriser la spécificité des projets de dimension internationale - Économie mondiale - Connaître les financements et les possibilités de couverture des risques des investissements à l’étranger - Management interculturel - Prendre en compte la dimension interculturelle des risques des investissements à l’étranger - Management interculturel - Prendre en compte la dimension interculturelle

Trois axes horizontaux
Structurer et définir
Les grands principes de la décomposition d’un projet en tâches élémentaires : organigramme technique, WBS, phasage, outils de planification, … - Elaboration d’un cahier des charges, d’une spécification technique, …

Chiffrer et financer
Estimation des coûts, simulation de rentabilité et financements possibles de projets.

Manager et négocier
Motivation d’une équipe et outils de communication; ouverture au Leadership.

Perspectives professionnelles
Le MS Management de Grands Projets ouvre des carrières passionnantes vers des métiers porteurs de perspectives d’avenir prometteuses : chef de projets, ingénieur d’affaires / commercial, consultant, responsable logistique / production / exploitation, ingénieurs d’études, acheteurs.

Les entreprises qui recrutent nos étudiants
ABYLSSEN, Accenture, Advancy, Aeroconsul, Air France, Air Liquide, Angon (USA), AREVA, AXA, BearingPoint, BMI SYSTEM, Bombardier Transport, Bolloré, Bouygues Bâtiment, Capgemini Consulting, Chryso, Cofathec, Projs, Costamagna Distribution, CVA (Maroc), CYLAD Consulting, Deltaplu (Chine), Airbus Group and its subsidiaries, Ernst & Young, Framstome, Ge Energy Products Europe, ERDF, GrDF, General Electric/Energy division, Goodrich, GreenAffair, Laboratoires Genévrier, Laboratoires Servier, Le Club des Créateurs de Beauté, L’Oreal, Masaï, Michelin, Mi-GSO, Nafiosa, Procter & Gamble, PSA Peugeot Citroën, PSA Peugeot Citroën (Buenos Aires), Renault, S2E Consulting, Saacke, Seditec, SAFRAN Sncma, Société Générale, Total, Schneider electric, ThyssenKrupp Ascenseurs, 7M Consulting, …

Procédure d’admission
Sélections et admissions organisées par HEC :
www.hec.fr/Masteres-Specialises/Programmes/Management-de-Grands-Projets/Admission

La possibilité est offerte aux étudiants du MS MGP de suivre l’un des 9 certificats développés par HEC et dédiés aux enjeux stratégiques et managériaux de secteurs en plein développement (Luxury avec Kering, Energy and Finance avec Deloitte et Société Générale, …). Programme de 100 heures de cours en langue anglaise sur 8 semaines (optionnel).

TÉMOIGNAGES
Thomas Tiriaux, France, Diplômé en 2016, co-fondateur et chef de produit Solen
Pourquoi avez-vous postulé au MS Management de Grands Projets ? Quels étaient alors vos objectifs ?
Si j’ai postulé au mastère spécialisé Management de Grands Projets, c’était pour acquérir une double compétence ingénieur/manager afin d’accéder rapidement à des postes comportant des responsabilités importantes. Avec un peu de recul, je pense que si j’ai postulé au MGP c’était pour trouver ma voie.
Selon vous, quels sont les points forts de ce programme ?
L’ambiance au sein de la promotion, la diversité des personnes que l’on rencontre au cours de l’année et l’ouverture d’esprit que l’on acquiert. J’aime dire qu’avant le MGP j’avais une vision très limitée de mon avenir, aujourd’hui grâce à la diversité des cours que j’ai suivis, mon avenir n’a de limite que mon ambition.
Quels sont vos projets professionnels ? Suite au MS Management de Grands Projets j’ai monté ma start-up Solen avec deux camarades de promotion. Nous sommes spécialisés dans l’ensoleillement et la luminosité pour les hommes et les plantes. Après un an nous sommes huit et on arrive à se dégager un salaire. L’objectif d’ici 4 ans serait de faire grandir Solen à l’échelle internationale et d’avoir une cinquantaine de salariés. S’il n’est pas communs de faire le MS Management de Grands Projets avant de monter sa startup, cela reste un très bon moyen pour avoir une connaissance élargie du monde de l’entreprise et de son mode de fonctionnement.

Marie Mainguy, France, diplômée 2014, consultante chez Solucom en architecture des systèmes d’information
Pourquoi avez-vous postulé au Mastère Spécialisé® «Mangement de Grands Projets» ? Quels étaient vos objectifs ?
J’ai postulé au mastère MGP pour approfondir les vagues notions de management abordées en école d’ingénieur. Lors de mon stage de fin d’étude, j’étais développeuse. Mais c’est le travail de mon maître de stage qui me paraissait le plus passionnant. Il pilotait de grands projets de transformation de système d’information. Mon objectif lors de mon entrée dans le métier était d’acquérir les connaissances nécessaires au pilotage de projet de transformation de SI, le coeur de la majorité des entreprises.
Selon-vous, quels sont les points forts de ce programme ?
Le premier point fort est la non spécialisation du mastère dans un type de projet. Cela laisse le champs libre à tout changement d’orientation en terme de domaine. De plus, cela permet de rencontrer des profils d’étudiants très divers. C’est un enrichissement d’un point de vue personnel et professionnel.
Le second est la partie «professionnalisante» du mastère. Les missions en entreprise et le projet de création de start-up rapprochent les étudiants de la vie professionnelle qui les attend. Grâce aux missions j’ai pu découvrir le monde du conseil et y avoir une première expérience qui m’a ouvert les portes d’autres cabinets. De plus, de nombreux intervenants sont des professionnels et non des professeurs qui partagent leurs expériences et leur vécu sur le terrain.
Certificates and short courses

In order to anticipate the aerospace industry needs, ISAE-SUPAERO and its subsidiary EUROSAE have developed a dedicated continuing education policy, offering to French and foreign auditors certificates and short courses.

**Certificates**

ISAE-SUPAERO Certificates are offered in the frame of ISAE continuing education programs for professionals who want to reinforce their skills in specific technical domains as «helicopter engineering», «aeronautical maintenance and support», «earth observation applications» and «human factors and neuroergonomics for aeronautics & transportation». These programs take from one to three months. They lead to the award of ECTS credits.

**ISAE-SUPAERO short courses**

ISAE-SUPAERO provides short courses (one week duration) derived from Advanced masters modules and professional training managed by EUROSAE, affiliate of ISAE-SUPAERO school.

**Modules from advanced master programmes**

**Aeronautical engineering**

- **Flight**
  To study the basic concepts of aerodynamics and flight mechanics and thus provide the knowledge which is essential to understanding the operating techniques and the aerodynamic behaviour of an aircraft in its different flight envelopes
- **Structures**
  To study and calculate the distribution of mechanical stresses and constraints in a material, in order to define the operating limits of a structure or item of equipment.
- **Engines and powerplant**
  To provide the methods and means of calculating load distribution in the various parts of an aircraft (wings, fuselage, landing gear, etc.) as a function of its multiple operating phases, in order to determine the sizing of the structures.
- **Avionics**
  The aim of these two modules is to provide a comprehensive view of avionics systems airworthiness issues as a part of the qualification and certification process of Aircraft.
- **General systems**
  To study the various types of system (e.g. hydraulic systems) which exist on an aircraft, in consideration of the concepts of safety, by providing multiple networks.

**Qualification tests for on-board systems and equipments**

This course presents the tests to be carried out in order to obtain the certification of On-Board Systems, with respect to the electrical, electromagnetic, vibrational and climatic environments, particularly as described in DO 160 C, which is the reference document. This course is oriented towards the new conditions dealing with electromagnetic aggressions.

**Helicopter engineering helicopter understanding**

- **Helicopter dynamics**
  To study vibratory phenomena in depth under the aspects of stability, fatigue, monitoring for safety/maintenance and onboard comfort.
- **Helicopter technology systems materials**
  To present helicopter production materials and technologies, as well as calculation methods via adapted finite elements.
- **Systems**
  To present the design philosophy for systems, development methods, and tests and to study a more specific aspect: the man-machine interface.
- **Prototypes - Tests - Production quality**
  To present the creation of a helicopter from prototype adjustment to large-scale production

**Further information and registration:**

Marie GUIBBAL
marie.guibbal@isae-supaero.fr
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**Short-duration specific training programs managed by EUROSAE**

EUROSAE is the ISAE-SUPAERO subsidiary company specialized in short duration trainings, mainly in aerospace field. EUROSAE provides high level trainings to engineers, technicians and company executives willing to improve their professional skills in sciences, engineering and management fields. EUROSAE offer more than 250 scheduled training programs, on-demand trainings upon request from enterprises, and specific custom trainings.

For more information: www.eurosae.com
or contact: philippe.salaberry@isae.fr
Participants
Engineers and technical managers from civil and military aeronautical industry who need technical knowledge in helicopter engineering.

Aims of the programme
To provide high-level of engineering and technical competences for careers in helicopter business world.

Organisation
Course duration: 150 hours from January to mid-February
Teaching language: English
Location: AIRBUS HELICOPTERS - Marignane

Syllabus
- Aerodynamics
- Flight qualities performance
- Helicopter dynamics
- Helicopter construction materials and techniques
- Systems
- Prototypes
- Tests
- Production quality assurance

Partnership with Airbus Helicopters.

CERTIFICATE
Stephen GICHUKI - Airworthiness Inspector - Kenya Civil Aviation Authority

«The training course is one of a kind summarized review of helicopter engineering for a practicing aeronautical engineer or mature engineering student. The training course especially benefits from the great wealth of experience of the specialist facilitators from Airbus Helicopters, diversity of the participants and the on-site plant visits. I found the ISAE-Helicopter Engineering Certificate course valuable for continuous professional development because in a short period I was able to recap on helicopter engineering principles, relevant EASA/FAA certification regulations and various technical developments influencing the global helicopter industry.

As an Airworthiness Inspector working for Kenya Civil Aviation Authority, I will use the knowledge gained in developing suitable strategies for the effective safety oversight of helicopter maintenance and operations. Further, the insight I acquired during the training will be very useful guidance both the governmental and civilian entities in the implementation of their helicopter related activities/projects.»
Aircraft engineering for continued airworthiness and maintenance

Participants
Engineers and managers from civil and military industry organizations working in continued airworthiness or maintenance fields, or who want to move towards those activities.
Engineers and managers from civil and military industry organizations who need good overall knowledge of aircraft airframe, propulsion and systems.

Aims of the programme
To give a comprehensive knowledge of aircraft airframe, propulsion and major systems in order to gain the engineering competencies relevant for airworthiness and maintenance activities.
To give attendees the necessary knowledge to work in aeronautical multi-disciplinary environment.

Syllabus
Flight dynamics
Aeronautical Materials and Structures
Engines and powerplant
Avionics
Aircraft General Systems
Qualification tests of on-board systems and equipments

Lecturers: academic and industry experts.

Organisation
Course duration: 240 h from October to December.
Teaching language: English.
Location: ISAE-SUPAERO, 10 avenue Edouard Belin, Toulouse.
Aeronautical Maintenance and Support

Participants

Engineers and managers from civil and military industry who want to move towards functions in maintenance and support.

Aims of the programme

To provide a comprehensive knowledge of maintenance and support activities and methods, throughout the entire product life-cycle, with a wide cover of technical, operational, management, logistic support, regulatory and safety aspects. To give attendees the necessary knowledge to efficiently work in the competitive and fast-changing MRO worldwide business.

Organisation

Course duration: 310 hours, from January to March
Teaching language: English
Location: ISAE-SUPAERO - Toulouse.

Syllabus

- Maintenance and Support in Aircraft Design
  Operability and Maintainability Influence on Design - Integrated Logistic Support (ILS) and Logistic Support Analysis (LSA) - Configuration Management - Development and evolution of a maintenance program (MSG-3) - Ground Support Equipment - Project (LSA, MSG-3)

- Reliability and Predictive Maintenance
  RAMS techniques and modelling – Predictive maintenance and Data analytics

- MRO Execution and Organization
  Engines and propulsion system maintenance - Avionics and systems maintenance and troubleshooting - Equipment maintenance and test - Organization and management of a maintenance department - Military maintenance organization - Project (MRO Execution and organization)

- Continued and continuing airworthiness

- Human Factors and Safety Management System

- Customer Support
  Customer support and services

- Supply Chain and Logistics
  Supply chain and logistics - Aircraft recycling

TESTIMONY

Stéphane Koffi, assistant of the maintenance manager of the panafrican business airline Comfort Jet Services in Lomé - TOGO

«After completing a double master’s degree in electrical engineering and finance, I’ve started my career over 2 years and a half ago as the assistant of the maintenance manager of the panafrican business airline Comfort Jet Services in Lomé (Togo). As I was new to the aviation industry, I needed to master, as quickly as possible, the specificities of a very particular business. After two years of practical experience in the maintenance department of Comfort Jet Services, I decided to attend one academic semester at ISAE-SUPAERO to acquire high theoretical knowledge in aeronautical maintenance management, and it happened to be a great decision. The Advanced Certificate gave me a broad view of all theoretical and practical aspects of aviation regulations, maintenance, quality and safety management within MROs and airlines, allowing me to get a strong background and fulfill my new duties of quality assurance engineer in my company.»
Participants
The certificate is intended for a wide audience. It is accessible to the scientists but also to the participants with no scientific background (NGOs, EndUsers, Scientists, International Agencies, Politics, Managers, etc) and who want to get knowledge or specialize in Earth Observation and applications.

Aims of the programme
To provide knowledge and knowhow in the fields related to Earth Observation for environmental issues and civil issues. This certificate is sponsored by Thales-Alenia-Space.

Syllabus
The Certificate in Earth Observation & Application is a 4-week programme that focusses on EO applications. Each week is dedicated to one specific topic:

Week 1: EO-related Observation Systems:
Introduction to Earth Observation Systems, Satellite System, Payloads & Sensors, Mission Analysis & Image Quality, Ground Station, Clouds & Data, Image Processing & Data Analysis...

Week 2: Science, Environmental, Social & Political Issues:
EO & COP on Climate Change, Earth Science (Climatology & Glaciology, Oceanography, Forests & Vegetations, Hydrology & Water Cycle, Atmosphere & Meteorology), Sustainable Development, Natural Disasters, Humanitarian Issues...

Week 3: Services, Business & Law:
Business in EO, New Space & Newcomers, Law in Earth Observation, Geographical Information Systems, Applications (Forest Management, Agriculture, Oil, Gas & Mining, Coastal Issues, Civil Surveillance...), Focus on Copernicus Program, EO for Local Authorities...

Week 4: Intelligence & International Issues:
Geo- Intelligence, International & Strategic Issues, EO & Political Issues, National Space Policies...

Course duration: 120 hours, in April.
Teaching language: English.
Location: ISAE-SUPAERO - Toulouse.
Participants

Engineers and managers from civil and military industry who want to develop skills in Human Factors and Ergonomics as well as in the new and growing field that is Neuroergonomics, and Human Factor experts who want to deepen their knowledge on aeronautics and transportation applications.

Aims of the programme

To provide learners with a high-level multi-disciplinary approach to understand human behavior and performance. This course focuses on fundamental and applied concepts to design safer and more efficient systems that integrate the human operator into the loop. Moreover, this course also encompasses a thorough training on the use of the five main physiological sensors dedicated to measure human performance and mental activity. The students learn the know-how of technical, measurements and signal processing issues for each of these sensors. This course emphasizes on practical work using the ISAE flight simulators and real light aircrafts to assess the pilots' brain activity.

Organisation

Course duration: 100 hours in April.
Teaching language: English.
Location: ISAE-SUPAERO, 10 avenue Edouard Belin, Toulouse.

Syllabus

Understanding Human Behavior (25h):
- Vigilance, Fatigue & Rhythms
- Perceptual Systems
- Attention & Executive Control
- Memory & Learning
- Emotions, Stress & Decision Making
- Sensorimotor Behavior
Application Focus: Pilot/Autopilot Conflict, Airline Pilot Experience

Humans at work (25h):
- Cognitive Ergonomics
- Physical Ergonomics
- Human-Computer Interaction
- Social Psychology
Application Focus: Motor Transportation, Cockpit Design, Nuclear Plant Control Room

Physiological markers (25h):
- Eye-tracking
- Electrocardiography
- Electroencephalography
- Near Infra-Red Spectroscopy
Application Focus: Certification

Advanced Techniques (25h):
- Signal processing for physiological data
- Brain Computer Interfaces
- Ethics
- Research Tools
Application Focus: Aviation/Aerospace psychology & medicine, Accident analysis, Experimental work using flight simulators & real light airplanes
A multicultural student population

Origin of master’s international students in 2017

- North America: 4.15%
- France: 39.6%
- South America: 2.7%
- Africa: 4.4%
- Asia - Pacific: 25.65%
- Europe & Russia (except France): 23.5%

Large job opportunities

Position

- 40.5% R&D, scientific and technical studies (other than IT)
- 18% Methods, Production control, Maintenance
- 12% Other
- 9% R&D in IT
- 7% Quality/Security
- 4.5% Sales representative/Marketing
- 9% Advisory and expertise

Business area

- 60% Aeronautics
- 17.5% Space
- 9% Transports
- 2.5% IT services
- 2.5% Energy
- 8% Other

Effective career development

An active network of 19 000 alumni all over the world

Present in 87 countries around the world, the ISAE-SUPAERO alumni network includes all graduates of ISAE-SUPAERO degree programs (SUPAERO engineers, ENSICA engineers, Advanced Masters, Masters of Science and PhD students of ISAE-SUPAERO).

The Alumni Association connects future and past graduates in a vast range of business and industrial sectors. [www.isae-alumni.net](http://www.isae-alumni.net)

The Internship and Career Development Department

Thanks to the close links with its network of industrial partners, the ISAE-SUPAERO Internship and Career Development Department assists students in finding internships and jobs in France and all over the world.
ISAE-SUPAERO is a world-class higher institute for aerospace engineering education and research. Nowadays with a student corpus of over 1600, ISAE-SUPAERO is one of Europe’s largest Aerospace Institute offering graduate and postgraduate programs. Yearly, ISAE-SUPAERO awards around 20% of master’s degrees in Europe in aeronautics and space field. ISAE-SUPAERO develops its worldwide reputation on the prestige of its master’s programs, the fame of its teaching staff, or the excellence of its research but also on the high-value of its graduates, their skills in engineering or management, as well, their capacity to evolve within a very high-technology environment, their enterprising mind and international opening.

Key figures

- 1 «diplôme d’ingénieur» ISAE-SUPAERO in French
- 1 Master of Science ISAE-SUPAERO in English
- 1 «diplôme d’ingénieur par apprentissage» CNAM-ISAE (co-op master program)
- 15 Advanced Masters including 10 in English
- 5 Masters in French
- 6 PhD Programs

More than 1600 students including 1400 masters and more than 200 PhDs

- 85 international cooperation agreements

Identity card

**ISAE-SUPAERO legal Status**: Public Institution of higher education and research.


**Faculty**: 100 professors and researchers.

**Employees**: 400.

A lively campus

ISAE-SUPAERO campus is located in Toulouse, European Capital of Aerospace, along the Canal du Midi (UNESCO world heritage).

It is composed of:

- **Wide range of sports facilities** including swimming pool, tennis and squash courts, sports hall, football and rugby fields, climbing wall and fitness room,
- **6 students halls of residence**: 1000 housing units, all connected to high-speed network, a restaurant.

The campus is close to:

- **ONERA** French aerospace research centre
- **CNES** - French space agency
- **2 CNRS laboratories** (National Center for Scientific Research)
- **University and engineering schools.**

**a set to facilitate settlement of new students in Toulouse city.**

Including: bank account opening, housing insurance, accommodation booking, immigration formalities, public transportation card, SIM card, Guided tour of Toulouse city
Toulouse, European capital of aeronautics and space

Toulouse, European capital of aeronautics and space is the 2nd student city in France (except Paris). The ISAE is established in Toulouse, the European capital of aeronautics and space: Europe’s leading capital for aeronautical activities, also No. 1 in space activities and 2nd world-wide. More than 30,000 people work at 600 establishments linked to the aerospace sector. Toulouse has more than 450,000 inhabitants.

■ Lively city

Living in the heart of the city and the Midi-Pyrénées region enables students to appreciate this unique environment which you can enjoy while preparing your future. On the cultural and festive side, Toulouse, its art of living, its museums, theatres, festivals, cinemas, without forgetting its pubs and night clubs, are easily accessible by public transport. Student life in the «pink city» is particularly rich in events and attractions. Toulouse also means football at the city stadium and rugby at Ernest Vallon stadium, which regularly host major international events.

■ Between seaside and mountains

Living in Toulouse, France’s fourth largest city, you will also benefit from a privileged environment between the Atlantic and the Mediterranean, as well as being close to the Pyrenees ski resorts.
- 1h30 from the Mediterranean,
- 2h30 from the Atlantic ocean,
- 1h30 from the Pyrenees,
- 1/2h from the countryside of south-west France
Common ISAE-SUPAERO’s admission procedures

Masters of Science

Academic requirements
Applicants must have a bachelor’s degree or an equivalent degree, in the following areas:
- engineering: aeronautical, aerospace, mechanical, electrical, electronics, mechatronics, telecommunications, instrumentation, engineering science.
- science: physics, mathematics.

Tuition fees and Funding: see our website

Advanced Masters

Academic requirements
A master’s degree, or an equivalent degree in science or engineering (or in management for advanced masters in management), or bachelor degree completed by 3 years of professional experience.

Tuition fees: see our website

Selection and admission
Admission to ISAE-SUPAERO’s master at:

Selection and admission are made by an admission committee:
- possible interviews can be organized if necessary

Deadlines for application:
- several admission committees scheduled from January to July, see schedule on our website: http://admissionsmasters.isae-supaero.fr

Language requirements for Masters in English

- TOEFL (IBT): 79 points (Inst. code: 9820),
- or TOEIC: 785 points,
- or IELTS: 6.5 points,
- or CAE.

Language requirements for Masters in French

Language qualification requested: score B2-Common European Framework of Reference for Languages

Your contacts at ISAE-SUPAERO

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