

# Aeronautical and Space Structures

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## ■ Objectives

In an increasingly competitive international context, the research on innovative materials combined with optimization of calculation methods for structures, and their statistical, dynamic and thermal certification are major assets for industrial architects in the aircraft and spacecraft sectors. The «Aeronautical & Space Structures » prepares engineers with a future career in design, research and development, certification, testing and qualification, in-depth, multi-disciplinary know-how in mechanical engineering applied to structures. This Master program is the European reference in the field.

The program aims to grow expertise in numerical calculation for the most advanced structures, knowledge in materials as well as an understanding of their interferences with the environment (in particular loads and fluid-structure interactions).

The dynamics of flexible structures, modeling and active and passive structural control of complex elements are the core focus of this masters program.

The goal of the ADVANCED MASTERS® program is to train specialists in the field of design, optimization and certification of light structures who have mastered methods of modeling and analysis of aircraft structures and space vehicles in the industrial context.

## ■ Learning approach

### First semester:

some 351 hours of courses delivered from September to March on the premises of ISAE by permanent ISAE-SUPAERO faculty and visiting lecturers from industry providing the latest industrial expertise including: lecture courses, design offices, lab work, numerical simulations, CAD, lab sessions, industrial visits.

### Second semester:

completion of a professional thesis in a company or a laboratory, in France or abroad for four to six months, validated by the thesis defense.

## ■ Organization

### Head of program

- Prof. Yves GOURINAT  
yves.gourinat@isae-supaero.fr

### Course duration

One year full time

### Course start date

September

### Location

ISAE-SUPAERO

### Teaching language

English

## ■ Syllabus

### Aerospace structures: methods & tools for engineering & dynamics: 52 h

- Flight dynamics: an introduction
- Aerodynamics: an introduction
- MATLAB standards
- Structural dynamical control: an introduction
- Structural shells-analysis & modeling
- Advanced numerical models

### Aerospace systems architecture: 109 h

- Aerodynamics loads
- Aircraft structural loads
- Architecture & structure of launch vehicles
- Helicopters: architecture & design
- Satellites: architecture & structures

### Aerospace structures: dynamics & physics: 114 h

- Finite elements: application to aeronautical structures
- Flexible aircraft: dynamics & aeroelasticity
- Dynamical active control of structures
- Advanced computation of aircraft structures
- Advanced structural dynamics

### Aerospace programs & technologies : 56 h

- Aerospace materials: experimental approach
- Aerospace materials: rheology & durability
- Computer Assisted Design & Drawing
- Commercial aircraft: strategies for design & innovative programs

### Times project : 20 h

Team Innovative Management for Evolved Strategies

## ■ Career opportunities

This program, unique in France, has trained over 120 engineers. Today, graduates of the program are working as research or design engineers in international companies in the aeronautics, space and mechanical engineering sectors.

The advanced scientific level of the MS AES program also paves the way for career opportunities in research in solid mechanics and structures.

### Companies recruiting our students

Altran, Astek, Airbus Group and its subsidiaries, Aéroconseil, Aerazur, ASSYSTEM Etudes, ATKINS, AXS Analyse de Structures, Air France, Bertrandt SA, Dassault Aviation, Dassault Falcon Jet, PSA, Latécoère, Renault, Seditec, Segula, Sodern, Sagem, SAFRAN Snecma, Snecma Propulsion Solide, SAFRAN, Messier, SAFRAN Turboméca, Transiciel, Safran Engineering Services, SEGIME, Sogeti High Tech, Thales, ESA/ Astec, Thales Alenia Space, Renault, Clairis Technologies, DLR (Germany),...



## Testimonies

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

*I choose ISAE-SUPAERO 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 aeronautic 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.*

*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-SUPAERO with the objectives of acquiring more technical and specialized knowledge on aerospace structure and gain a recognize expertise in this field.*

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

*First the complete and global training of all the disciplines that are studied: it gives us a strong basis to adapt and success 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.*

*The first strongest asset 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 is the renown of the school. Having ISAE-SUPAERO on a resume really makes a difference in the recruitment process, and the expertise we gain during the formation is really recognized by the recruiters.*

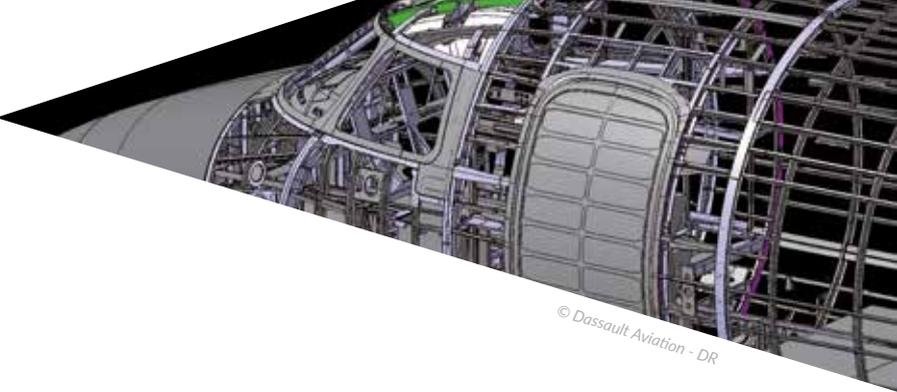
### **Which are your career plans?**

*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 aeronautic 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.*

*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.*

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

**PIERRE GAMBIER**  
*France, Aircraft Stress Solution, engineer at Airbus, graduated  
in 2011*



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## ■ Admission procedures

### 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

#### Application website :

<http://admissionsmasters.isae-supaero.fr>

### Selection and admission

#### 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

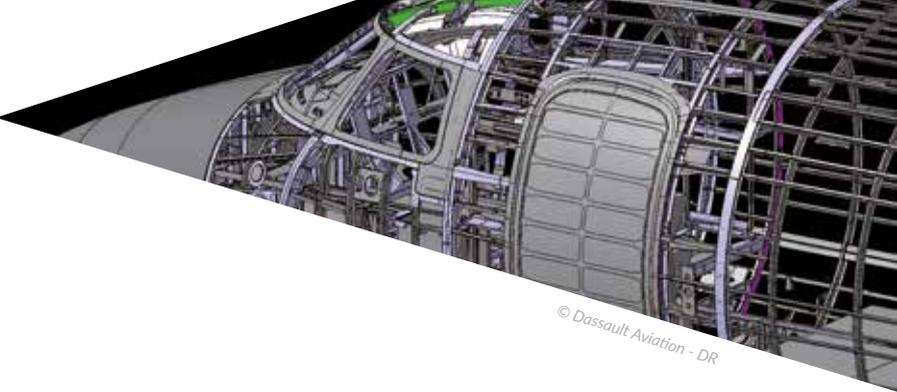
### Language requirements for Masters in English

<b>TOEFL (IBT)</b>	or	<b>TOEIC</b>	or	<b>IELTS</b>	or	<b>CAE/FCE</b>
						
<b>85 points</b>		<b>785 points</b>		<b>6.5 points</b>		<b>170 points</b>

### Language requirements for Masters in French

#### Language qualification requested

Score B2-Common - European Framework of Reference for Languages



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## ■ *Your contacts*

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