

Press kit

IRT Saint Exupéry

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The French Institute of Technology (IRT) Saint Exupéry is exhibiting its first technology platforms dedicated to organic matrix composite and ceramic matrix composite materials at the Paris JEC show from 8 to 10 March

Materials represent up to 40% of the cost of a structural part and have a significant influence on production means definition. Besides, the demand for innovative, multifunctional and high-performance materials to answer the needs of the aeronautical and space industries is in constant evolution. This means that materials are a big innovation lever through studying their properties and developing appropriate production means.

The IRT Saint-Exupéry's research activities, dedicated to the aeronautical and space industries, are focused on three strategic technological domains: high-performances multifunctional materials, more electrical aircraft and embedded systems.

The high-performance multifunctional materials domain's activities are mainly focused on three materials families:

- **Organic matrix composites (OMC)**
- **Ceramic matrix composites (CMC)**
- **Metallic materials and surface treatments.**

Associated research activities are looking to find the best compromise between performance, environmental constraints, design, sizing, manufacturing constraints, robustness, reliability and of course, cost.

The IRT Saint-Exupéry's high-performance multifunctional materials domain will present the equipment dedicated to R&D projects on OMC and CMC for the aeronautical and space industries for the first time at the JEC event.

The IRT's current and future partners on its projects, from the academic or industrial world, large companies and SMEs, will be able to access exclusive platforms:

The organic matrix composites platform is composed of three main pieces of equipment:

- A twin-screw extruder allowing particles integration into the matrix
- A sizing pilot aiming at developing adapted solutions to thermoplastic matrix
- An impregnation line being developed with Huguet Engineering.

A high velocity impact test means is also part of the OMC platform.

For ceramic matrix composites, in addition to means dedicated to liquid processes that are currently being purchased, the IRT Saint-Exupéry will soon be equipped with an MI oven allowing ceramic textures to be impregnated by capillarity at 1,400°C.

Representative models of the thermoplastic impregnation line and the MI oven have been produced especially for the JEC Event. These will be exhibited in **Hall 6, Stand N65.**

Equipment dedicated to organic matrix composites materials

- **Co-rotating twin screw extruder with air cooling system and granulator**



Co-rotating twin screw extruder (photos by Patrick Dumas)

The IRT Saint Exupéry's co-rotating twin screw extruder is capable of producing high performance, thermoplastic polymers at temperatures between 300-400°C. It is equipped with two hoppers that allow the use of carbon fibre powder or granules and can supply the extruder with a flow of material at speeds of anything between 0.2 and 60 litres an hour. Pressure in the barrel can reach 100 bar, with the screw turning at speeds of between 0 and 900 revolutions a minute. There are also eight different temperature zones to help accurately control the temperature the polymer is produced at. A flow of air is used to cool the material as it comes out of the extrusion pipe before it is finally passed through a granulator that transforms the polymer into granules, which can then be reworked as required.

This piece of equipment is available for use by all the IRT's OMC projects, and it can allow researchers to functionalize polyaryletherketone (PAEK) thermoplastic matrix composites by adding particles of different state and shape.

- **Carbon fibre sizing pilot for thermoplastic matrix composites**



Sizing pilot for IRT Saint-Exupéry (photo by Patrick Dumas)

The IRT Saint Exupéry's sizing pilot is a test bench capable of managing five different test activities:

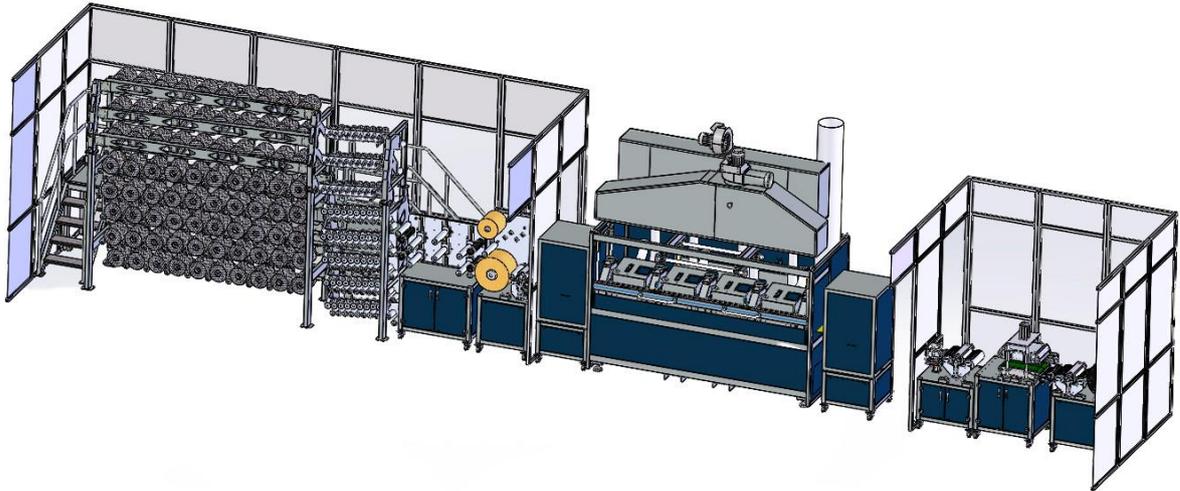
- Stringing materials at a constant tension
- Stretching fibres
- Impregnation
- An oven powered by up to 9 kW of infrared divided across two different temperature zones
- Winding materials at set speeds.

The bench is modular and can be upgraded and has been specially designed for sizing carbon fibre at speeds of between one and 10 metres per minute.

Carbon fibre is made up of thousands of microfilaments of around 5 to 9 μm in diameter, which are not intrinsically joined together. To make the carbon fibre easier to handle and protect it during manufacturing, a small amount of organic matter is added to it during the sizing process. Sizing not only brings the microfilaments in the carbon fibre together but also improves their compatibility with the organic material composites in which the material is included.

Across its industrial projects and lab tests, the IRT Saint Exupéry is addressing the important issue of improving and most importantly adapting carbon fibre sizing techniques for thermoplastic composites.

- **Impregnation line for high-performance thermoplastic materials**



Impregnation line (photo by Huguet/Polyform)

An impregnation line will be installed at the IRT Saint Exupéry during the summer of 2016. The IRT and Huguet Engineering are currently jointly designing this. It will allow researchers to compare different impregnation technologies as well as to manufacture multifunctional high performance prepreg thermoplastic (PAEK, PEI, PAI) reinforced carbon fibre for the aerospace industry.

The impregnation line will be equipped with a creel to allow it to unwind up to 80 carbon spools at the same time, with a perfectly controlled thread tension, allowing it to impregnate up to 300mm of carbon tapes. The line will also be able to unwind non-impregnated carbon tapes such as fabric, UD tapes or NCF.

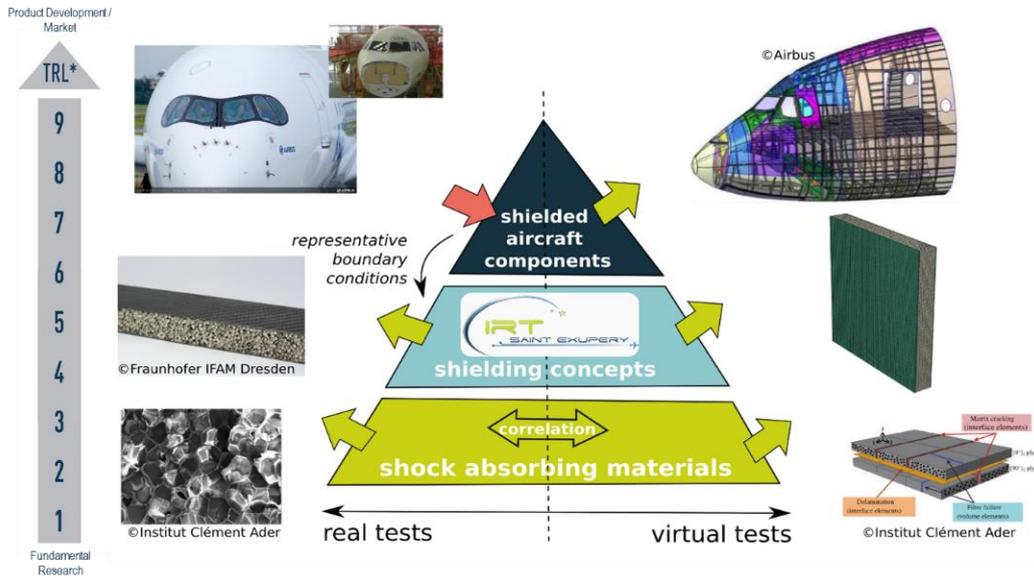
The line will be equipped with a short IR oven with a global power of 200 kW. This oven uses different temperature zones to manage the drying of prepreg materials.

It is fully modular and can be upgraded to meet specific needs. Its design aims to minimize any deformation of the tape during its production.

Optical measurement technologies will be positioned at the end of the line in order to record the quality (width and height) of the prepreg in real time.

A calendar module will be added to the final design in order to ensure porosity a rate into the prepreg of below one per cent.

▪ **High velocity impact test platform**



IRT Saint-Exupery is central to the development process of new impact shielding materials

When maturing material processes or functionalities, the technologies need to deal with the change of scale. In the case of shock absorbing materials, scale changes require special means – such as gas launchers - to characterise the shielding performance of intermediate scale specimens. These means are not commonly available, so IRT Saint-Exupery is looking to provide an alternative solution, in collaboration with the Institut Clément Ader. A test platform has been developed, which will be dedicated to the study and selection of shielding concepts at sizes where the physical phenomena involved are representative of those observed on full-size structures. The first activities are focusing on bird strike tests on shielding concepts of approximately one square metre in size. Special care is being taken with the modularity of the test platform and ensuring its digital simulation supports the representative testing conditions.

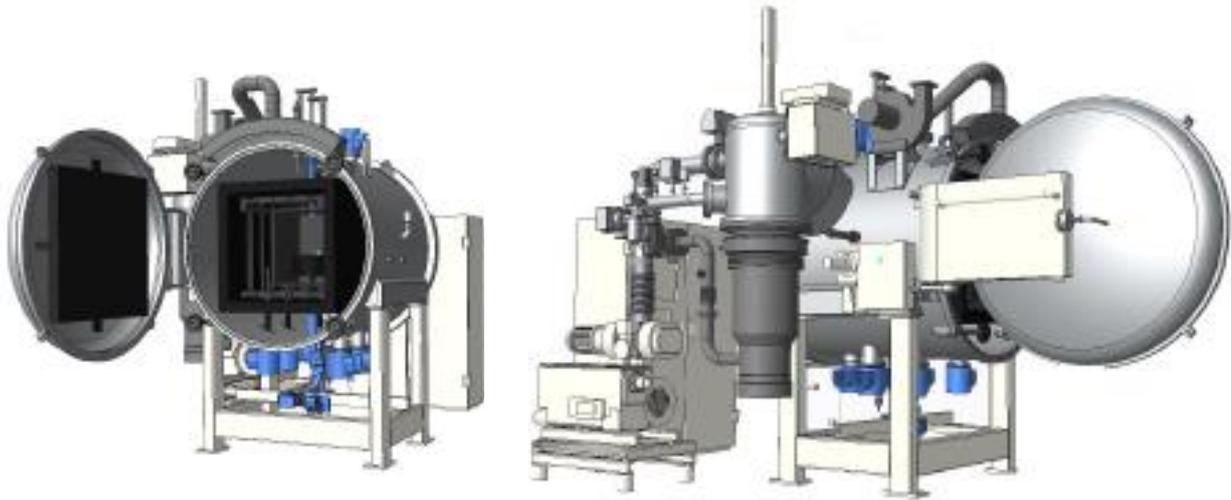
The test platform will enable the best shielding concepts from any material to be selected. The calibration phase is now underway before the first bird strike tests, which are expected to take place during the second quarter of 2016.



High velocity impact test platform shared with the Institut Clément Ader.

Equipment dedicated to ceramic matrix composite materials

- **MI (Melt Infiltration) Oven**



MI Oven (photos by ALD/Polyform)

This piece of equipment is the result of a strong collaboration between IRT Saint Exupéry, its members and the oven's manufacturer ALD.

The oven is currently being assembled at ALD and will be set up on the Aquitaine site of IRT Saint Exupéry in the middle of August 2016.

Its main objective is to perform a fibrous preform impregnation using liquid silicate to produce a ceramic matrix composite (CMC).

Thanks to the oven's pressure/temperature, the silicate alloy will migrate and colonise the capillaries. The IRT is hoping to obtain a high performance thermo mechanical CMC material using this manufacturing process, which is cheaper and faster than the chemical vapour infiltration (CVI) process.

This research means will allow researchers to explore, understand and master all the phenomena appearing during capillary rising.

It also offers researchers the ability to work with a wide range of pressure, temperature, ramp and gas flows.

Besides its high performance capability, which is essential for simulating the right conditions, the oven will have a number of innovative instrumentation and technological options to help researchers understand important phenomena. It will also be big enough to be used in industrial applications.

These technologies are presented by one mobile oven and its multi-zone heating can be individually controlled.

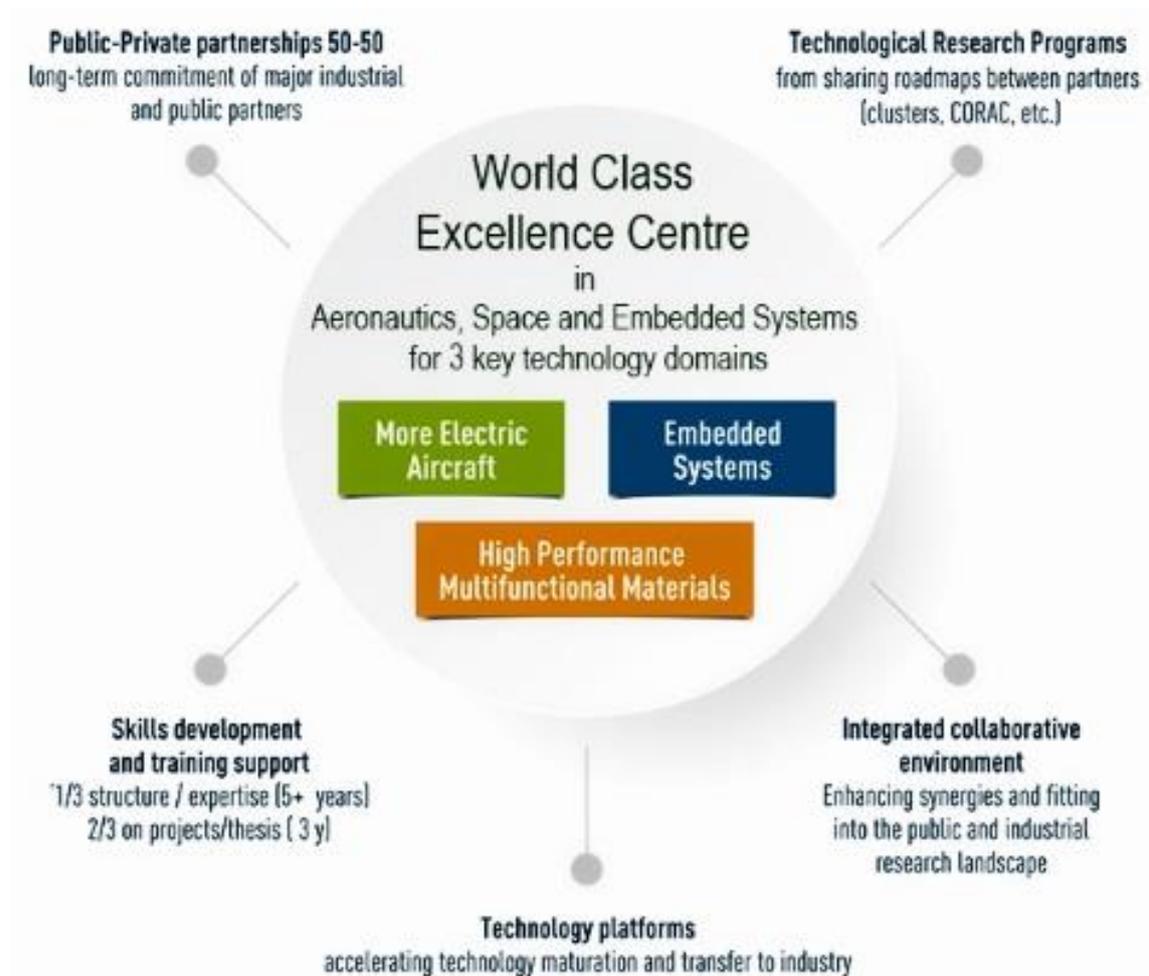
The oven's full instrumentation will allow test tubes to be weighed and state phases to be observed during operation.

The IRT Antoine de Saint Exupéry

Our mission

The IRT Antoine de Saint Exupéry technology research institute brings together public and private partners in R&T activities with a global scope, covering three strategic domains: high-performance multifunctional materials, more electrical aircraft and embedded systems.

Its collaborative, integrated environment can accelerate the development of breakthrough technologies, ensuring their maturity keep pace with the needs of the aerospace and embedded systems industries.



It benefits from top level international scientific skills and technological resources thanks to its industrial and academic partnerships as well as external recruitment. Financed by the IRT and supported in its ecosystem, this creates a collaborative breeding ground between the public and private sectors. Almost 250 positions will be filled in 2016, two-thirds of which will be for researchers for project and thesis work, with the rest being for permanent management and support staff.

Key dates and figures

- Workforce 210
- Area 15.000 m² (2017) 10.300 m² at Toulouse Montaudran Aerospace and 2.800 m² at Bordeaux-Talence
- Partners more than 80
61 industrial partners whose 36 SMEs
18 academic partners, 19 laboratories
- Projects 22 on-going projects ~97 M€
- Budget 327 M€ (2014-2019)
Technology Platforms : 80 M€ invest (2014-2019)

Dates

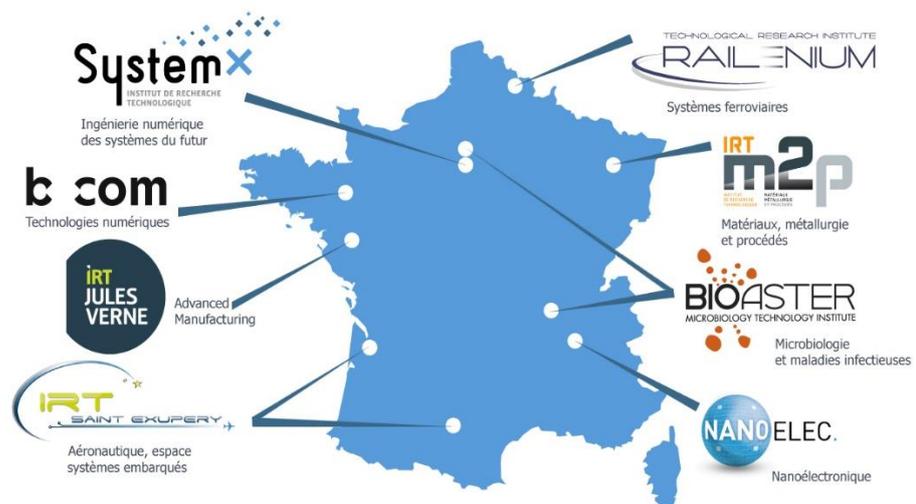
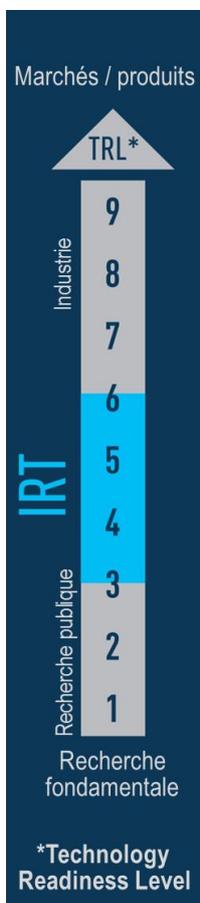
- Mar 21st 2013 Official Launch
- Sep 6th 2013 Agreement signed with the French Government
- May 30th 2014 Special approval given by French Ministry of Education and Research, allowing IRT members to benefit the double tax credit on their contributions

What is an IRT?

The Research and Technology Institutes are tasked with developing highly competitive technological and economic networks. They bring together top academic and industrial know-how and support the development of innovation in strategic areas for French industry.

Each IRT brings together highly skilled people and state of the art technology platforms at its main site. It is responsible for piloting applied research projects up to the demonstrator and industrial prototyping stage (technology readiness level (TRL) 4 to 6) and monitors the economic viability of the findings. It also works to promote French innovation internationally.

The eight IRTs benefit from state funding as part of the Investissements d'Avenir Programme.



Partners

Added value for all

- Shared technological platforms (80 million €)
- Skills development
- Relationships and cooperation between partners leading to very high levels of expertise
- Partners in industry
- Up to 80 % leverage effect (Programme d'Investissements d'Avenir, Crédit Impôt Recherche)
- Supporting incremental technological advances
- Faster evaluation of breakthrough technologies
- Top-down research programmes.

For SMEs

The IRT aims to support SME's competitiveness in the field with its three key technologies with high added value, thanks to its equipment, its skills and those of its partners. Close contact with donor organisations and academics.

- Financial engineering to maximise the leverage effect
- Speed: just 4 months from proposal to project start.
- High impact operations (1 month-1 year).
- Projects dedicated to SMEs and their partners (1-3 years).
- Participation in big group projects (3 years).

For academic partners

- Immersion in the innovation chain
- Annual influx of an additional 50 PhD et post-doctorate researchers
- International guest researchers
- Opportunity to enrich existing engineering courses and look at other requirements
- Development of online training opportunities

Long-term commitment to scientific research to overcome the major technological blockers.

Institutions / Établissements publics



Laboratoires



Grands Groupes



PME - PMI



Founding Members

Réseaux



