



**SMART INDUSTRIAL INNOVATION AS
ENABLER TO DRIVE NEW VALUE CHAINS
FOR TEXTILES AND AEROSPACE**

GALACTICA NEW VALUE CHAINS



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EXPLORATION AND IMPLEMENTATION OF NEW VALUE CHAINS

GALACTICA project aims to support the creation of new industrial value chains around textile and aerospace sectors based on advanced manufacturing.

GALACTICA project provided a range support and services to favor emergence of new concrete solutions and innovative value chains. This was done through two types of support instruments:

Pioneer Acceleration voucher supported the exploration of new cross-sectoral value chains focusing on developing a Minimum Viable Product (MVP);

Orbital Projects voucher aimed to support the demonstration of new cross-sectoral value chains connecting the different sectors of GALACTICA with initial market tests of the products and services developed.

Through the Cascade funding, GALACTICA project financed 51 projects, of which 29 Pioneer Acceleration, and 22 Orbital Projects, involving a total of 82 SMEs from the textile, aerospace and advanced manufacturing sectors, coming from 18 European countries.

This publication aims to be a sharing point about the new technicalities and opportunities created within the new value chains generated through the support provided to SMEs by GALACTICA.

The structure of this document is composed of 4 sections, each of them focused on a specific thematic area, representing the technological domain of the new value chains supported by GALACTICA, namely:

1. **Circular Textiles**
2. **Space**
3. **Smart Textiles**
4. **Lightweight Materials**

The final section is horizontal to the four areas, as it aims at pointing out the synergies developed (or with a strong potential for development in the near future) among the technologies and the thematic areas themselves.

The GALACTICA partners.

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1. CIRCULAR TEXTILES

In the EU the consumption of textiles accounts on average for the fourth highest negative impact on the environment and on climate change. These negative impacts have their roots in a linear model that is characterized by low rates of use, reuse, repair and fibre-to-fibre recycling of textiles, and that often does not put quality, durability and recyclability as priorities for the design and manufacturing of apparel.

Extending the life of textile products is the most effective way of significantly reducing their impact on the climate and the environment. To achieve this, product design and product recycling have a key role.

Increased durability will enable consumers to use clothing for longer and at the same time support circular business models such as reuse, renting and repair, take-back services and second-hand retail, in a way that creates cost-saving opportunities to citizens.

The selection of raw materials used in the textile industries is one of the most important steps for brand owners and textile manufacturers. It is estimated that EU consumers discard about 5.8 million tons of textiles every year, which equates to 11.3 kg per person (Beasley, 2014).

Textile SMEs are and will be more and more concerned with the recycling of textiles and the adoption of best practices for the circularity of their production. The product passport, that is shortly going to be introduced will reinforce the need for sustainable solutions and require anticipative actions to prevent harmful consumption models.

NEW VALUE CHAINS

Projects funded under GALACTICA have developed different solutions that all share a common goal: to support and develop innovative solutions toward the circular economy in the textile sector.

The main value chain domains are:

Circular PLA Textile

Development of bio-based garments, in order to create a fully circular market
Agriculture! annual plants, hemp and flax, for the production of cellulosic fibers

RFID new technology to evaluate the accuracy and efficiency improvements on the inventory and stock management of current items in warehouse
Non-intrusive smart shelving systems to manage the inventory in real time and enhance the customer experience at the store
Supply chain traceability

Recycling of carbon fibers
Textile re-use via a closed-loop system for synthetics
Recycling of natural raw materials (i.e. potato leaves)
Using waste raw materials from silk fiber production for space food during space mission
Transformation of recycled materials from scraps, now destined for landfill or incineration, into a second raw material

High-performance and non-corrosive textile reinforcement to produce thin-walled concrete components
Development of semi-automated sorting system able to categorize different fiber types according to composition and color by employing advanced manufacturing solutions
Detection and separation of different materials to have a higher quality output material
Development of a new accessory for the dyeing process by merging two technologies, in order to make existing machinery more eco-friendly, less polluting and energy and water-saving, while also allowing the use of a range of dyes that are not normally used in the garment industry, because they are not reliable when working under oxygen exchange conditions

TARGET MARKETS

THE MAIN TARGET MARKET SEGMENTS FOR CIRCULAR TEXTILES



LEVEL OF COMPETITION

The level of competition varies according to the proposed solution and the target market; the innovations proposed by GALACTICA-funded projects show a general low level of competition, due to innovative solutions that are either not in the market or are more advantageous in terms of sustainability and durability than existing ones. The textile sector has a strong need of solution in terms of circularity, deriving by the consumer demand, the legislation in force or entering in force in the short term and the pressure of environment related interest groups.



COMMUNICATION CHANNELS

B2B (Fairs, Matchmaking)

C2B (Recyclers, Direct Contacts)

B2C (Social media, Podcast, Blog, Landing page)

Webinars

INNOVATION TECHNOLOGY

The main technologies developed and used in the frame of Galactica project:

MECHANICAL PIIOCESSES

Consolidation of the fabric with a thermoforming process
Innovative product drying technology (silkworm pupae) and lyophilization
3D printing process

CHEMICAL PIIOCESSES

Chemical recycling of hemp cellulose
PLA molecular recycling
Separation of polyamide using clean and low impact process
Merging a nebulization technology and a closed nitrogen system to make the dyeing process more eco-friendly, less polluting, and energy and water saving
Chemometrics combined with powerful machine learning algorithms to discriminate synthetic tissue residues to increase recycling performance

DIGITAL TECHNOLOGIES

Alternative systems to barcode, RFID, QRcode for the Tracking
Technology enabling completely self-sovereign data sharing in industrial value chains

ARTIFICIAL INTELLIGENCE

Hardware configuration and software development in a track and trace platform
Semi-automated sorting system
Software for identifying polyamide 6 textiles to enable separation from other synthetic textiles



Automatic technology to detect and separate impurities from the raw materials



Shoes made out of a vegan alternative to leather



Bidirectional thermoplastic prepreg made out of recycled carbon and polyamide 6

CHALLENGES FOR THE NEXT YEARS

The biggest challenges for the development of a new solution in the crea of circular textiles:

- To maintain advantage in the long run

- The value chain organisation

- To create a specific segment and narrow it down as much as possible within the overall market of circular products

- Overcome current technological limits of recycling technologies

- Constantly renovate the technological proposition to the market

- Support the value proposition by mean of recognized certifications and technical test results



2. SPACE

In recent years, the space sector is impacting more and more non-space markets via its technologies; this spread is strongly supported by space agencies and organisations which are promoting initiatives to support new applications and start-ups. In this scenario, it is clear that the space sector is continuously becoming more important in our economies and the role of private entities in space exploration is not neglectable anymore. Thus, it is challenging to gather in only one group or analyses the variety of influences, challenges and vision faced and embraced by the space sector and its technologies. However, similarly to other sectors, the desire to shape the space solutions under the value of a more sustainable application appears relevant from both entrepreneurs and institutions. For this reason, and for the increasing competition, all projects adopting space technologies look particularly focused on efficiency: maintain or increase the level of performance of the solution while reducing the elements which could negatively impact its utilization such as weight, responsiveness and volume. This "sustainable" direction is confirmed also for the upcoming years since it also supports the creation of successful solutions from a commercial point of view, which was a weak point for European companies in the space sector. In addition, the birth of space-tech companies focused on preserving and protecting the space environment are increasing as well. For example, companies committed to reduce the space debris and non-operative satellites especially from low and medium Earth orbits. Finally, it is worth mentioning the growing number of solutions in deep-space such as space mining, security, in-orbit services and in-situ manufacturing. This brief report clearly shows these trends and provides a light overview of the environment where space-tech companies are operating.

NEW VALUE CHAINS

GALACTICA supported numerous projects focused on space-related applications, in combination with textile and/or advanced manufacturing technologies. In this area, the projects ranged from the development of a zero-defect prediction software - which detects potential quality defects in manufacturing for the aerospace industry - to the production of innovation habitation systems for both the Moon and the Earth.

The utilisation of **innovative materials** was deeply investigated by the GALACTICA beneficiaries, for example through the realisation of tailored 3D fabric pre-forms for optimised mechanical properties and thermal conductance of composite materials. Additive manufacturing was also involved in the combination of nanoparticles to transform satellite structures into extremely effective heat conductors.

Satellites were at the centre of attention for many companies, with the development of modular and versatile electric propulsion systems for nanosatellites, also with a focus on very low orbits thanks to the utilisation of air-breathing systems. GALACTICA also supported the realisation of the first European cost-effective ceramic combustion chamber for rocket engines dedicated to in-space applications.

Solutions were also developed **for the safe management of satellites**, for example developing sensors based on additive manufacturing to monitor their altitude or realising an inflatable passive de-orbiting device based on advanced technical textiles. Safety of flights was also tackled, with a solution dedicated to the hazards created by bird collisions with airplanes.

Lastly, synergies between textile and aerospace were created in the integration of electronics into dynamic structures, also forming the basis for origami-inspired lightweight and compact solar panels, aimed to solve the limitation of conventional solar panels for space applications.

Overall, the projects supported by GALACTICA contributed to increasing the competitiveness and innovation level of the European space sector, thanks to the realisation of solutions with high potential for growth on key markets thanks to a robust multi-sectorial approach.

TARGET MARKETS

The target market is B2B. The majority of beneficiaries targets satellite manufacturers or services, which represent 41% of the global space economy, equal to €128 billion in 2017. Other customers range from manufacturers of aerospace parts, to aircraft manufacturers, to orbital launchers, to in-orbit service providers, to space agencies. Most of the targeted companies are part of the NewSpace phenomenon and as such they aim at reducing costs and providing new products and services, transforming the old market segments and expanding into other ones, such as precision agriculture.

GALACTICA beneficiaries have focused on versatility that leads to even more certifications. Some of the proposed solutions deal with this through modularity, defect traceability and a system to automatically certify the components.

LEVEL OF COMPETITION

The level of competition in the sector is considered high due to the number of players that are populating the market and the presence of big incumbents. However, all the solutions proposed by GALACTICA seem to have cutting edge advantages, since they are either completely new or more advanced in terms of price, dimensions or performance. Barriers to entry are still generally high due to large capital needed and tight regulations.

Tips for a successful enter in the space targets:

- Mentoring them on certifications to overcome entry barriers

- Providing contacts with potential clients or partners

- Giving them visibility through relevant European aerospace clusters (Corallia and CTA), fairs and social media

COMMUNICATION CHANNELS

The most common are the social media, the matchmaking events, the webinars and also the networking and the direct B2B contacts. In the aerospace sector is also quite important to be part of the European Space Agency Platforms, such as ESA STAR platform and Dealroom platform including startups, high-growth companies and investors.

The participation in space events and programmes is extremely promising, such as the CASSINI Hackathons, the ESA Business Incubation Centres (BICs), the ESA Business Accelerators, and yearly events and exhibitions such as the Paris Space Week, the Bremen Space Tech Expo Europe and the Industry Space Days.

INNOVATION TECHNOLOGY

Noobed 3D Fabric Reinforced composite material alternative for replacing a specific type of aluminum "insert" used on satellites

Novel technology and concept for innovative habitation systems for Moon and terrestrial applications, included methods to set up habitats, shelters, and infrastructure by using in-situ resources

Scale prototype of an inflatable passive de-orbiting device for satellites based on advanced technical textiles

Advanced modular and versatile electric propulsion system for nanosatellites

Functional new Horizon sensor prototype (complete unit redesign, manufacturing and assembly using additive manufacturing, prototype technical testing), used for Earth detection and Nadir vector determination in satellites

Combination of the technologies- rigid-flex PCB and flight-grade Nomex Textile material, developing an MVP to validate the supply/manufacturing chain for the FRET technology

AI technology that digitalizing manual aerospace operations through high-precision motion tracking of worker skeleton and hands

New technology for a bio-based composite lay-up used in aeronautics against a bird-strike

Air intake prototype for satellites, for reducing the altitudes of the satellites' orbits in the Earth Observation and Telecommunications sectors

Lightweight new technology for developing a deployable solar panel for the aerospace industry using textile materials

Cost-effective ceramic combustion chamber for rocket engines dedicated to in-space applications

New technology that combines nanoparticles, additive manufacturing and two-phase devices to transform the satellite structures into extremely effective heat conductors, decreasing thermal challenges



3D carbon fabric for satellites



Air intake prototype for satellites



Biobased composite against bird strike

CHALLENGES FOR THE NEXT YEARS

- High cost for the development of the components or products
- Long timeframe for the certification and validation in relevant environments
- Adapt the established B2B business model of SpaceTech companies into the emerging B2C models, which are less risk!
- Certifications, that make time to market longer
- Acquisition of a commercial advantage, not only technical, for European companies

'de Concini, A., & Toth, J. (2019). The Future of the European Space Sector: How to Leverage Europe's Technological Leadership and Boost Investments for Space Ventures. European Investment Bank.



3. SMART TEXTILES

The product development has progressed tremendously in every field of engineering and technology. Textiles are not lagging behind on the pace of such development. Smart textiles are, nowadays, one of the areas that provides more added value to textile materials integrating different areas of knowledge such as materials science, design, nanotechnology, electronics, and computer engineering, among others. The result are new technologies, new processes, new fibers and new advanced textile materials.

According to various studies the market for smart textiles and wearables is expected to enter an exponential growth phase with estimates of almost 3 bn US\$ for the European market alone in 2024². The majority of the applications are concentrated in 4 main fields: Protection & Defence, Sports & Fitness, Industrial and Technical Applications (transportation, architecture) and Medical & Healthcare³. These new smart textiles represent a huge potential for SMEs as there are more agile and driven to offer customised solutions with interesting cross-sectoral value chain impact and transfer potential across a broader range of specific applications, providing scale-up opportunities.

The classification of smart textiles varies in the literature considering both the performance and the level of intelligence, namely sensing and degree of reaction/activation. In this report, two major categories will be considered: Passive smart textiles and Active smart textiles. Passive smart textiles are those fabrics whose features are enhanced when compared to traditional materials and active smart textiles include sensing and, in some cases, the ability to activate a change or reaction to adjust the conditions of the wearer.

²SmartX: The European Smart Textiles Accelerator - <https://www.smartx-europe.eu/about-smartx/>

³Smart E-Textile Materials - <https://www.intechopen.com/chapters/73836>

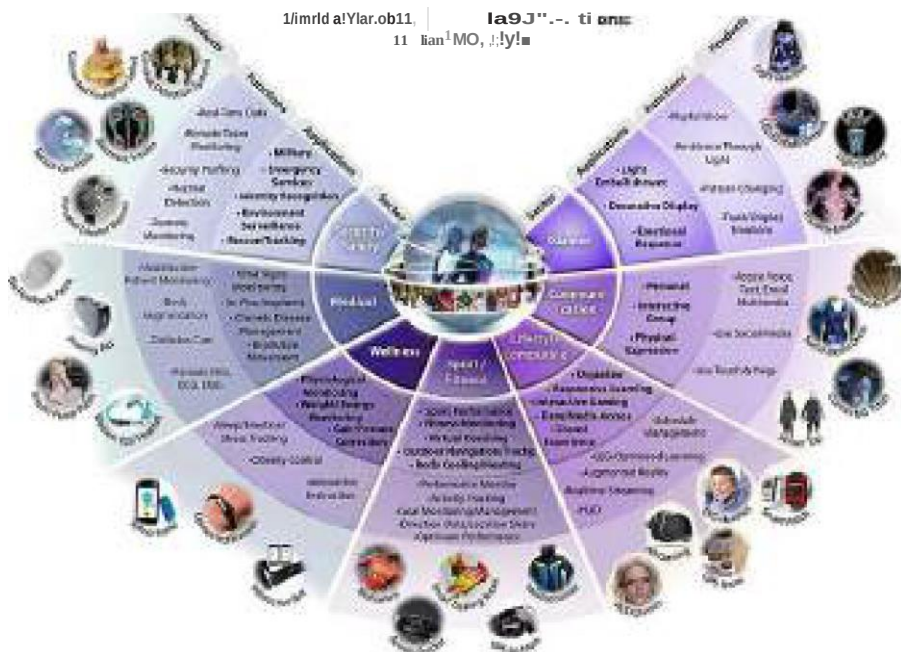


Figure 1 - Application areas and product categories for wearables (Source: Beecham Research)

NEW VALUE CHAINS

Passive smart textiles

New materials:

A bio-based antimicrobial finishing agent targeting the aerospace and technical textile industry

A solution, based on the processing of nanomaterials in the form of paste or dough, avoiding nanoparticles powder handling

New processes:

Development of a pipeline of an automated generation of knit instructions, which allows to knit 3D surface geometries with complex anisotropic mechanical properties and functional requirements of aerospace applications

Active smart textiles

New sensorised materials for technical clothing:

Wearable (IoT) system integrated into the textile measuring the vital signs of the pilots to determine fatigue signs

New sensorised and responsive/reactive materials for technical clothing:

Cooling system converting electrical energy into a temperature gradient between two opposing surfaces

Active thermal load management system for space suits, preventing health threatening situations that may lead to mild or even potentially fatal health issues, operating based on a number of parameters such as body and ambient temperature, heart rate, and even additional physiological measurements

3D knitted garment layer that provides active support for astronauts' hands that allow capturing small single-finger gestures, and wirelessly transferring information to control any instrument or equipment

New sensorised materials for non-clothing technical uses:

Introduced and distributed fiber optic sensors and multipoint sensors embedded in technical tapes, made with special fabrics to be infused in fiberglass composites

Developing a prototype based on a lightweight, flame- retardant and high-speed data transmission tape for the aerospace sector

Edge computing applications in aircrafts to help airlines in occupancy management of seats and cabins, through embedded sensors in seats and floor, that inform their customer service departments about inflight customer behavior

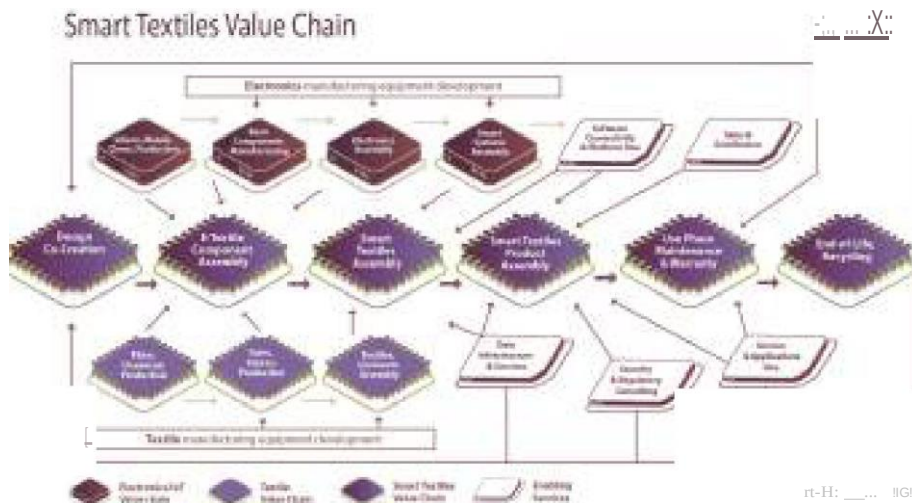


Figure 2 - Smart Textiles Value Chain (Source: SmartX Project)

TARGET MARKETS

TARGET MARKETS FOR SMART TEXTILES

Personal Protective Equipment (PPE)
Transportation: Automotive, aeronautic and aerospace
Sportswear and wearables
Medical and healthcare
Military applications
Heat protection
Civil engineering (building and geo applications)
Interior and living - architecture
Energy sector

LEVEL OF COMPETITION

Europe is particularly strong in achieving the integration of complex heterogeneous technologies (e.g. combining microelectronics, photonics, materials, nanotechnology) into multifunctional prototype systems and testing them in the right environment. This is due to the active presence of universities, RTOs, and SMEs combining multi-disciplinary skills and expertise. Moreover, a strong expertise in industrial equipment provides the tools and techniques for testing and characterization of these devices (e.g. mechanical stress, humidity).

However, there is a fierce competition in this high economic potential sector and Europe is currently lagging behind the US and South Korea in patent filings, despite the good performance of individual companies with technical textile and medical device expertise.

Nevertheless, Europe is a leader in creativity and innovation and has the most creative designers in the world. This is a strong asset for the competition in smart textile and wearables. Maintaining its competitiveness and moving towards products with a higher value added is of strategic importance to win new markets and compete on a global scale. The major driving factors for the growth of the smart textiles market include implementation of advanced technologies in smart textiles, miniaturization of electronic components and an expanding wearable industry, among others.

COMMUNICATION CHANNELS

The channels depend a lot on the target market, e.g. fashion and sports are very much B2B and B2C, but military, garment, technical is more B2B.

B2B (Fairs, Matchmaking)
B2C (Social media, Podcast, Blog, Landing page)

INNOVATION TECHNOLOGY

Main technologies developed in the frame of GALACTICA project:

Bio-based antimicrobial finishing agents
Nanomaterials handling for textile coating
3D knitting computer driven instructions
Textile embedded sensors either in garment or non-clothing applications
Active self-management textile embedded electronics
Machine Learning and Simulation software



Active thermal load management system for space suits



Smart fabrics together with edge computing applications in aircraft far seat and cabin occupancy management

CHALLENGES FOR THE NEXT YEARS

There are several technical challenges yet to meet to achieve reliable, performant and manufacturable smart textiles and smart clothing:

New component integration methods, e.g. integration and miniaturization of sensors, actuators or power sources that comply with thermal and electrical requirements
New interconnection technologies and technologies for integrating electronics on textile substrates
Integration and assembly technologies, e.g. pick-and-place techniques for device mounting, stretchable module integration into the fabric, or chips placement on the foil using self-assembly principles
A fully automated process for integrating electronics into textiles
The development and integration of energy-related systems (e.g., batteries, photovoltaic cells) are required to obtain energy-autonomous, self-powered wearables

On the usage of the smart textiles some issues still need to be improved as:

Durability of the systems, including washability and long-term accuracy in performance
User-friendliness, including the ability to use/wear the garments without assistance
Mobility, including weight reduction
Cost versus product lifespan or durability
Comfort and physical aesthetics, including breathability, absorbency, drape, handle, etc.
Health and safety and the lack of Standards and Regulations

4. LIGHTWEIGHT MATERIALS

The implementation of composite materials in the aerospace sector continues to grow due to their good mechanical properties, lighter structures, eco-efficient life cycle, higher levels of efficiency and sustainability, as well as their design flexibility. Today, it is also possible to take advantage of the opportunities of digitalization, which allows process development times to be reduced. This allows short, medium and long term challenges to be set. In aeronautics, compared to metallic materials, composite materials reduce the weight of the vehicle and finally the cost of fuel per passenger by 20% to 50%. In addition, the use of composite materials represents 50% of the weight of a conventional airliner, weighing around 4,500kg, achieving fuel savings of 20% compared to an aircraft made of aluminum.

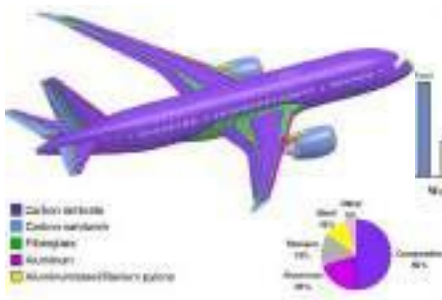


Figure 3 - Use of materials in the aircraft⁵

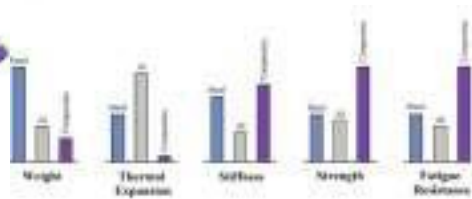


Figure 4 - Properties of composite materials compared with Al and Steel⁶

On the other hand, analyzing the manufacture of carbon fiber composites from different processes such as fabric cutting, end-of-life disposal, tape end removal and other processes involves a large amount of waste. Looking at the annual evolution of carbon fiber demand from 2009 to 2022, carbon demand in the last year was more than 120,000 tons. This is why recycling carbon fiber is very important to avoid the environmental impact of landfilling or incineration of waste containing carbon fiber. It is also true that recycled carbon fiber has inferior mechanical properties compared to virgin carbon fiber, but it can be applied in other sectors, such as the textile sector, where the mechanical performance of these recycled fibers is sufficient.

However, on an industrial scale, there are no procedures that allow the reuse of large quantities of fresh, partially or fully cured prepreg material. It should also be noted that, the production of virgin carbon fibers requires a great deal of economic and energetic effort.

⁵Source: <https://iberiacompositech.com/blogs/materiales-compuestos-en-el-sector-aeronautico>

⁶Source: <https://creaturp.net/materiales-compuestos/>

NEW VALUE CHAINS

Projects funded under GALACTICA focused on composites and followed a common ambition: to develop the next-generation composites materials, more sustainable and with high performance, and explore novel manufacturing processes.

GALACTICA supported R&D projects to:

Develop innovative additive manufacturing process for the fabrication of composite structures dedicated to aerospace industry (such as biomaterial printing, 3D composite printing)

Increase the impact resistance of hybrid composites via graphene implementation

Develop innovative fibers in order to get higher mechanical resistance

Overall, these innovations are expected to result in:

Reducing cost for production of renewable lightweight materials

Light-weight products containing more and more sustainable, bio-based materials

Business models and circular value chains for lightweight bio-based components

R&D plays a crucial role in the development of lightweight solutions for all stages of the value chain, which is described below.



Figure 5 - Lightweight materials value chain⁷

⁷Fischer, P. (2021). Advanced technologies for industry-Product watch. Lightweight materials.

TARGET MARKETS

The lightweight materials industry, although very competitive, has high growth potential over the next years due to their high potential of sustainability. The EU has the potential to become a major hub for lightweight materials production and application, notably in the automotive and aerospace industry. Indeed, the European composites market size was worth €16 billion in 2018 and is estimated to register an annual growth rate of 7.5% from 2020 to 2025 owing to increasing demand for lightweight materials in various energy intensive value chains such as wind energy or transport.

However, lightweight material companies from the EU face strong international competition from companies from the United States and the Asia-Pacific region.

The figure below describes the strengths, opportunities, weaknesses challenges and threats for the lightweight materials value chain.



Figure 6 - Strengths, opportunities, weaknesses challenges and threats for the lightweight materials value chain'

Main target market segments are:

Aerospace
Transportation: Automotive, aeronautic
Heavy Industry
Military applications
Medical and healthcare
Civil engineering (building and geo applications)

COMMUNICATION CHANNELS

Physical products -> Communication to promote the innovation to:

- New business partner (B2B)**
 - OEM**
 - Supplier**
 - Clients (B2C)**

The communication happens through: Fairs expositions, social media (videos), matchmaking, webpage, direct contacts, pitch contests.

INNOVATION TECHNOLOGY

Weight reduction by advanced composites materials

Improvement of characteristics of the composites by changing the layer, the resin, adding other materials - leads in comparison to the same toughness using less weight



Bimaterial printing

Weight reduction by advanced manufacturing methods

New ways of production processes to obtain enhanced fabrics and composites



Fuselage of an aerial robot prototype by large-format AM using sustainable composite materials and advanced textiles

Weight reduction by improvement and development of new machines

R&D on new machines that permit new combinations of lightweight fibres for the future (e.g., thermoplastic composites, hybrid composites...)

Improvement of environmental impact through use of recycled raw materials



Optimised drone rotor manufactured using 3D composite printing techniques

CHALLENGES FOR THE NEXT YEARS

Reduction of the environmental impact in the production process of composite materials in aeronautics

Improvement strategy for the use of waste Carbon Fiber-Reinforced Polymer (CFRP) composite materials obtained from production plants

Reduction of the "Buy to fly ratio", which is the ratio between the material purchased and the material that remains in the part at the end of the process

Increase annual material savings, also reducing the material cost per part

Better strategy for reused and/or recycled prepreg for applications in aeronautical secondary components and for other sectors

SYNERGIES WITH OTHER KEY ACTIVITIES

LIGHTWEIGHT MATERIALS

The development of improved composites that reduce the environmental and cost impact in the aerospace industry made out of lightweight fibers of the textile industry using Advanced IVmanufacturing could have impact on many other sectors:



Strong synergies for the design of advanced products can derive by the combination of lightweight and textile for applications in the SPACE industry, but not only. Other application examples:

- Automotive**
- Architecture/Infrastructure**
- Energy**
- Medical device**
- Marine**
- Pipe/Tank/Container**
- Sports & Recreation**
- Transport**

SPACE-TEXTILES



A strong potential is embedded in the textile-based applications for the aerospace industry, and transports in general. Infinite cooperations can be set up to replace traditional components (not recyclable and heavyweight) with textile based composites.

Some examples emerged by GALACTICA:

- Integrate smart applications on textiles for solar panel management
- Use advanced technical textiles to build an inflatable passive de-orbiting device
- Use satellites
- Use Fused Filament Fabrication (FFF) technology to create structural textile elements that can be combined with lunar dust to create habitats, infrastructures or parts of a spacesuit
- Circular PLA textile applications in aerospace (upholstery of aircraft, seats, working clothes)

Space, textile and, for instance, agrifood can interlace as follows:

- Improvement of a commercial Horizon sensor (HSNS) for Earth detection and Nadir vector determination in satellites

Similarly, other sectors, like building, food and PPE, can benefit from the same 3 ways overlapping:

- Construction industry - Use of textile reinforcement in combination with 3D printing formwork to produce thin-walled, free-form and self-shading facade components
- Aerospace food and AM - Use of organic waste from the silk production process used as part of the astronauts' daily diet
- Textile sector and farming sector - Farmers can provide textile sector with natural raw materials, to be possibly used for aerospace/building components development

As a conclusion, by profiting of the experience of GALACTICA, it can be stated that the combination of textile and aerospace, if crossed by AM solutions, can open doors for multiple opportunities for new products/solutions, owing a high level of technological content, suitable for new and unexplored market niches. Aerospace and AM are sectors where the R&D play a crucial unavoidable role in the successful market exploration and in the profitable permanence on that market against competition. Textile has innovation potential that still is little explored and exploited; if such potentiality is combined with the aerospace and AM, and with the addition of the right dose of entrepreneurial capabilities, the synergic result has a undefeatable potential for a successful business development.



PARTNERS



ATEVAL



CTA



EMC2



Science Park
The High Tech Incubator
Graz



<https://galacticaproject.eu/>

