Aviospace - Company Overview

- Turin, September 2014
Airbus Defence and Space

- Europe’s No. 1 in defence and space and top 10 worldwide
- World’s No. 2 in space
- More than 40,000 employees
- Approximately €14 billion in revenue

Global innovation leader spending more than €3 billion in R&D each year.
Aviospace is an aerospace company created in 2004, acquired by EADS Astrium in January 2010, although remaining an Italian registered company with Italian management and personnel.

Main fields of Aviospace activities are design and development of Space Transportation and Exploration systems (ST&E).
AVIOPSPACE can benefit of a network of collaborations with small and medium companies with robust experience in high-quality manufacturing and niche technologies across Italy.

Aviospace is located in Turin

Approximately 30 employees
Aviospace Business Areas

- Space Transportation and Exploration Systems
- Engineering Support
- Wireless Avionics
- Advanced Technologies
- Materials
- Thermomechanical Structures
- Debris Removal
Project: **Hypersonic Morphing for a Cabin Escape System (HYPMOCES)**
Responsibility: Partner
Customer/funding: Deimos/EC-FP7

The main goal of HYPMOCES is to investigate and develop the technologies in the area of control, structures, aerothermodynamics, mission and system required to enable the use of morphing in escape systems for hypersonic transport aircrafts. A large cabin escape system able to change its shape and automatically reconfigure during an abort event after ejection will balance the compromise between the constraints for the integration within the mother aircraft (compactness), the adaptability to the unpredicted environment in case of abort and the required flight performance to ensure safe landing.

In this project, Aviospace has the responsibility for

- Identifying the thermo-mechanical architecture of the morphing mechanism and its kinematics envelope;
- Evaluating the performances in terms of mass and strength as well as the feasibility in terms of materials and technologies;
- Providing the design and aerodynamics and aerothermodynamics analyses.
AVIOSPACE and its partners can offer the full cycle of design and manufacturing of thermal blankets for space systems, starting from the customer requirements, passing through the tuned sizing performed with AVIOSPACE personnel and tools, till the manufacturing and supply of the product to the customer.

The thermal blankets are produced by the same manufacturer already involved in many space programs such as ATV and other ISS systems, in compliance with the aerospace standards for quality.

Project: ExoMars EDM HEPA Filter Thermal analysis
Responsibility: thermal model and thermal analysis
Customer/funding: Aero Sekur/ESA

The function of the HEPA filters used in the ExoMars missions is to allow pressure balance and to avoid bio-burden and particulate contamination passage during launch, entry and Mars surface mission phases. The Aviospace involvement in the project is to perform Thermal Analyses of the filter integrated into ExoMars EDM, evaluating the local thermal conditions and the thermal interactions/interfaces between the filter and the spacecraft.
Aviospace is entitled, in the frame of the ASTRIUM R&T strategy, for the coordination of energy-harvesting related researches performed within ASTRIUM ST. The topic is developed in the frame of a synergic cluster of projects pertinent to the Wireless Sensor Networks.

Project: **Highly Operable Sensor Network (HOSN)**
Responsibility: Prime
Customer/funding: Astrium

This project focuses on sensing nodes development (powered by energy harvesting technologies). The nodes are conceived to be used on-ground, during storage, pre-launch phase, and during ascent/in orbit phases, e.g. Launcher staging to allow communication between stages after separation.

Project: **VERDE-PIEZO**
Responsibility: Coordinator
Customer/funding: Regione Piemonte

This project aims to develop an energy harvesting device based on lead-free piezoelectric materials. The device converts structural vibration energy to electrical energy, allowing – when coupled to a wireless data relay system – an harness-free architecture for sensing units.
Project: **Multiradio**
Responsibility: Coordinator
Customer/funding: Regione Piemonte

The project aims to define and prototype a multi-radio communication platform capable of using, in cognitive and opportunistic mode, heterogeneous wireless communication technologies for monitoring and control of complex systems for industrial and aerospace markets.

The communication platform under development consists of multi-radio nodes able to cooperate for building up an intelligence network, that promotes the opportunistic use of wireless technologies with complementary characteristics in terms of data rate, latency, robustness to radio channel conditions, power consumption, and ability to self-organization in networks.
Project: **Future Launcher Avionic Programme (FLAP)**  
Responsibility: Coordinator  
Customer/funding: Regione Piemonte

This project aims to develop know-how and technologies for launch vehicles, in the domain of GNC and next-generation avionics, with the objective to achieve a functional validation of integrated technologies.

Project: **Wi-Fly**  
Responsibility: Coordinator  
Customer/funding: Digisky

This project considers the development of an integrated system to the technical and administrative management of general aviation aircrafts.  
The system considers a part installed in the aircrafts, which collects data about position, acceleration and other.  
The second part consists in a server which gathers the data and provides a user interface to track all aircrafts data.
Debris Removal

Project: Heavy Active Debris Removal (HADR)
Responsibility: Partner
Customer/funding: Astrium

The project was performed by Aviospace with a close focus on the development of capture system concepts and technologies, and included the participation to an Astrium-internal Concurrent Engineering activity, aiming to define and develop several different ADR mission and system concepts.

Project: Capture and De-orbiting Technologies (CADET)
Responsibility: Coordinator
Customer/funding: Regione Piemonte

The project aims to develop and demonstrate, by the development of ground functional breadboards, key technologies for ADR, including the capture systems and a vision based navigation system, including target in-situ recognition and properties assessment.
Debris Removal

Project: **e.Deorbit phase A**
Responsibility: Subcontractor
Customer/funding: Airbus DS/ESA

The e.Deorbit mission objective is to “Remove a single large ESA-owned Space Debris from the LEO protected zone”. The study aims to achieve a phase-A definition for such mission. It consists of a satellite (chaser) that is launched by a small or medium launcher, performs a rendezvous with the ESA-owned debris (target), captures and removes the target from the LEO protected zone.

The role of Aviospace in the project is the design of the capture mechanism subsystem for the flexible link option.

Project: **Service-Oriented Approach to Active Debris Removal**
Responsibility: Subcontractor
Customer/funding: SSTL/ESA

Evaluation of the feasibility of an Active Debris Removal mission;
Definition of a business model for the implementation of the ADR mission;
Definition of a business plan for future ADR missions and technology roadmaps for the removal of large debris from space.
Debris Removal

Project: **FOAM**
Responsibility: Prime
Customer/funding: AIRBUS Defence & Space

In the frame of different non cooperative target or debris processing systems, the capture device insures the attachment during the whole for re-entry or orbit altitude increase process. This project has therefore the aim of studying a chemical attachment constituted by foam. The use of the foam can allow simultaneous debris capture and attachment to the processing device. The high contact surface provided by the foam, which can adapt to various volumes and shapes, is an asset vis-à-vis various shapes of target, wall surface states, and debris tumbling.

Project: **Versatile Autonomous Concept (VAC)**
Responsibility: Subcontractor
Customer/funding: AIRBUS Defence & Space/ESA

In view of an autonomous access to space, a Versatile Autonomous concept (VAC) based on the ATV know-how has been considered. Aviospace has been involved in VAC phase A/B1 for design activities on Capture mechanisms and operations, and Sensors & GNC for proximity operations.
**Advanced Materials**

**Project: Nanotough**
Responsibility: Verification of the material properties for Space applications
Customer/funding: EU-FP7

This project aims is to develop new materials (polyolefin nano-composites) with improved properties with respect to the engineering polymer ABS.

**Project: Delta development and Pre-Qualification of an European Lightweight Ablative Material for Sample Return Mission (DEAM2)**
Responsibility: Test Plans and Breadboard design
Customer/funding: AIRBUS Defence & Space/ESA

The objective of this project is to complete the material definition and related manufacturing process, to complete its characterisation and to perform a pre-qualification of a European ablative heatshield material for the Earth re-entry capsule of sample return missions (e.g. Mars, comets, asteroids).

Aviospace role is devoted to the preparation of all test plans – assuring that they are properly implemented – and to the design of the more complex specimens to be manufactured.
Project: **PLAsma treatment for textile Fibers (PLAFI)**  
Responsibility: End-user for Space technical fabrics  
Customer/funding: Regione Piemonte

This project aims to develop and validate an innovative methodology, based on plasma deposition on textile fibers suitable for space applications, such as Kevlar, Nextel, beta Cloth, etc. Aviospace is in charge, as an end-user, of the definition of requirements and target application, the selection of fibers for benchmark, and the execution of test campaigns.

Project: **Technology Optimization on nanocomposites (TOP)**  
Responsibility: End-user for Space technical fabrics  
Customer/funding: Regione Piemonte

The goal of the project is to develop a new class of Nanostructured Multifunctional Composite Material (NMCM) by means of RTM (Resin Transfer Moulding) technology.
Project: **M*ateriali Speciali per Veicoli Ipersonici (MASVI)**  
Responsibility: Subcontractor  
Customer/funding: LAER/Italian MoD

MASVI project aims to produce and develop a prototype of a ceramic panel resistant to high temperatures and realized by the combination of different processes: in particular, Pyrolysis of Polymeric Materials (PIP) coupled with compaction in autoclave (useful to reduce the existing porosity) in order to provide a solid support for the following processes of infiltration of the matrix by means of vapors (CVI, ie Chemical Vapour Infiltration) and final sealing of the part by means of deposition of a surface coating through PVD (Pressure Vapour Deposition) technique.  
The process allows to realize reinforced ceramic elements capable, in the case of SiC-SiC materials (SiC matrix and SiC fiber-reinforcement) to withstand operational temperature of the order of 1600 °C.
Project: Sensors for Structural Monitoring (SESAMO)
Responsibility: CFRP samples production and designer of the algorithm for CFRP panels NDI
Customer/funding: MBDA/EDA

The goal of the project is to study innovative sensors to be employed for advanced structural monitoring of stressed materials and deterioration assessment. The technologies under study allow dense instrumentation of structures at relatively low-cost. Two technologies are employed: MEMS and optical fibers.

Project: EHA-InaVico: Electro Hydrostatic Actuation for Industrial Automation and Vibration Control
Responsibility: Project Partner
Customer/funding: Regione Piemonte

This R&D project aims to propose a technology, based on hydraulic circuits, applicable on different sectors. In particular, the project deals with Electro hydrostatic circuits ("EHA"), that is a sealed hydraulic circuits that does not use tanks and servovalves and for which control is performed by the electric motor itself.
Project: **INJECTA**  
Responsibility: Prime contractor  
Customer/funding: AIRBUS Defence & Space

The project allowed Aviospace to develop (TRL 6) a full process of materials functionalization by means of ink-jet printing, including:

- Case-by-case nanoparticle-based ink design and formulation (e.g. both conductive and dielectric inks)
- Printed pattern optimization and printing process set-up
- Wide range of possible substrates (e.g. ceramic, metallic, composites)
- Post-printing thermal treatments

This technology involves the use of a stable and repeatable process, which makes use of less galvanic treatment and waste production. Moreover, mass savings and lower manufacturing costs, as well as the possibility to deal with 3D shapes, make it a competitive alternative to traditional manufacturing techniques.
Engineering Support to Airbus DS Activities

**ARIANE**

- **Avionics, thermal, propulsion, and structural engineering**
  - Aviospace is involved in the frame of integrated engineering team in support of design and production of cryogenic main stage.

**ARIANE-V ME**

- Mechanical analyses for the upper stage

**ATV Program S/W Verification and Test Engineering**

- Aviospace is involved in ground operations and support activities of ATV software test engineering.

**Columbus Operations Engineering**

- Aviospace is involved in astronauts training and support to operations on board Columbus, the European ISS laboratory, under ESA control.

**BIOLAB Microscope Distribution & Cleaning (D&C) Cassette (Funding: ESA):**

- Biolab is a multi-user facility installed in the European Columbus laboratory designed to support biological experiments. Aviospace has been involved in D&C Cassette design refurbishment, integration, and tests execution.

**MPCV**

- Aviospace is involved in the frame of integrated engineering team in support of design and production of fluidic lines.
Past Contracts

ASA: Advanced Structural Assembly (2006)

Moon Descent & Landing (2006-2007)

Transportation Architecture (2007-2008)

Moon NEXT (2008)
Themes of Interest/Business

• Design and Manufacturing of Mechanical Ground Support Equipment;
• Design and Manufacturing of Mechanical Primary and Secondary Structures;
• Design and Manufacturing of Multi-Layer Insulation (MLI);
• Design and Manufacturing of (Nano) Composite Secondary Structure;
• Energy Harvesting;
• European Current & Future Launchers (e.g. Ariane 5, Ariane 5ME, and Ariane 6);
• ISS Operations Support and Astronauts training;
• Mechanical Analyses and Design;
• NEO Exploitation;
• Novel Materials, Materials Processes & Functionalization;
• Space Debris Capture, Removal and related Robotics;
• Space Exploration;
• Space Logistic Vehicles (ATV-derivative Evolutions);
• Thermal Analyses and Passive Thermal Control Design;
• Wireless Sensor Networks.