# Aerospace Districts: Acceleration of the Strategic Transfer of Regional Advancements

# Report on the interregional workshops and exchange activities

## D2.1 – Report on the interregional workshops and exchange activities

Abstract:

Task 2.1 of project AD-ASTRA relates to co-creation interregional workshops and knowledge exchange activities (*i.e.*, site study visits) and from the beginning of work package (WP) 2 the consortium started to work on this activity, being able to organize a first workshop in South Holland in May 2023 and a last one in Madrid in February 2024. Indeed, the AD-ASTRA project has the scope to create a cohesive and competitive interregional innovation landscape spanning five European regions: Emilia-Romagna, Madrid, Apulia, Occitania, and South Holland, and organizing and participating in interregional co-creation workshops is one of the most effective means to reach this scope.
Thus, this report outlines the organization of five innovation exchange events, each accompanied by a workshop, held across the participating regions. These events served as platforms for sharing aerospace knowledge and insights, uniting stakeholders from diverse regional innovation ecosystems to facilitate idea exchange, fortify existing connections, and forge new interregional collaborations. While events were locally organized, outcomes were harmonized and consolidated across regions, driving forward the overarching goal of fostering aerospace industry innovation cooperation.

Keywords:

Co-creation workshop, aerospace, interregional cooperation, ecosystems

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# Table of Contents



## List of Figures



## List of Tables



## Acronyms and Terminology

| Term | Definition |
|---|---|
| AD-ASTRA | Aerospace Districts: Acceleration of the Strategic Transfer of Regional Advancements |
| ACARE | Advisory Council for Aviation Research and Innovation in Europe |
| ART-ER | Attractiveness Research Territory - Emilia-Romagna |
| DTA | Distretto Tecnologico Aerospaziale |
| E-R | Emilia-Romagna |
| EU | European |
| HE | Horizon Europe |
| IQ | Innovation Quarter |
| STEM | Sciences Technology Engineering Mathematics |
| TM | Toulouse Métropole |
| UPM | Universidad Politécnica de Madrid |
| WP | Work Package |

# 1. Introduction

The AD-ASTRA project aims to establish a connected and competitive interregional innovation ecosystem among five European regions: Emilia-Romagna, Madrid, Occitania, Apulia, and South Holland. These regions share the common goal of promoting the aerospace sector while also encouraging collaboration with other innovative industries. Although each region varies in its level of innovation readiness and possesses aerospace districts at different stages of maturity and consolidation, the project seeks to foster cooperation and innovation across all regions.

This document reports the organization of five innovation exchange events, each coinciding with a workshop, in five different regions. The events aimed to share knowledge within the aerospace field and provide valuable insights for innovation. In each exchange event project partners (in particular the one guesting the event) brought together various stakeholders from each region's innovation ecosystem to facilitate idea and experience exchange, strengthen existing connections, and establish new interregional collaborations.

The project partners collaborated with local agencies and clusters in each region to promote activities and ensure the participation of key stakeholders. While events were organized locally, the partners harmonized and consolidated results across regions to advance the project's overarching goal of fostering innovation cooperation in the aerospace industry. Additionally, they engaged with regional and European authorities to communicate project activities and outcomes, seeking their involvement and support.

# 2. Co-creation workshops

## 2.1. First event in South Holland

### 2.1.1. Co-creation workshop

The first co-creation workshop has been organised by InnovationQuarter (IQ) and it focused on "megatrends" topic; a detailed agenda of the event is reported in Table 1:

Table 1. Agenda of the first co-creation workshop in South Holland.

| Hour | Activity |
|---|---|
| *09.30 – 10.00* | Welcome by InnovationQuarter |
| *10.00 – 11.45* | General Assembly AD-ASTRA<br>• General introduction of InnovationQuarter (IQ)<br>• Introduction of the Aerospace Team from IQ (Niels, Jan, Martijn)<br>• Status of AD-ASTRA Deliverables |
| *13.00 – 15.00* | Co-Creation Workshop (NEXT Delft) |
| *15.00 – 16.00* | Walk-in for the Aerospace Delta Agenda Presentation (NEXT Delft) |
| *16.00 – 17.00* | Program of Aerospace Delta Agenda |
| *17.15 – 19.00* | Drinks and snacks |
| *19.00* | Dinner |

During the first part of the morning, Niels and Jan showed a detailed presentation of IQ and its role in their regional ecosystem that excels in maritime & port, horticulture & food, life science & health, high-tech system & materials, sustainable energy, circular economy, digital technology, cyber security and of course aerospace. To achieve their mission, IQ members are organised around three key activities: internationalisation, investing and innovation as shown in Figure 1.


Figure 1. Key sectors of InnovationQuarter

After the presentation made by IQ, the consortium discussed D1.2 and 1.3 which were due to be submitted at the end of May. Subsequently, all the partners moved at NEXT Delft (Molengraaffsingel 8, 2629 JD Delft) for the co-creation workshop; all the participants are reported in the following Table 2 and Table 3.

Table 2. AD-ASTRA participants.

| Name | Organization |
|---|---|
| Alina Bisag<br>Lorenzo Calabri | ART-ER<br>(Attractiveness Research Territory, Emilia-Romagna) |
| Céline Bizieau | TM<br>(Toulouse Métropole, Occitania) |
| Michele Giannuzzi | DTA<br>(Distretto Tecnologico Aerospaziale, Apulia) |
| Gustavo Morales-Alonso<br>Jose Alvarez | UPM<br>(Universidad Politécnica de Madrid, Madrid) |
| Jan Terlingen<br>Niels Krol | IQ<br>(InnovationQuarter/Aerospace Delta, Zuid-Holland) |

Table 3. Aerospace Delta Regional participants.

| Name | Organization |
|---|---|
| Renate Beausoleil<br>Bastiaan Smit | Province of South Holland |
| Femke Verdegaal | Aerospace Innovation Hub |
| Jos van den Boom | TU Delft |
| Niklaas van Hylckama Vlieg | Enterprise Europe Network IQ |
| Dietmar Lander | Unmanned Valley |

During the first part of the meeting, each participant spent a few minutes presenting itself and its ecosystem. Then the discussion moved to megatrends.

As part of Work Package (WP) 1.3 we have defined what megatrends are, which megatrends are relevant to our regions, and which will have a significant effect on the aerospace domain. Inter-regional crossovers have been identified using the most relevant megatrends. Experiences, future regional trends & ambitions, and potential for collaboration between our aerospace regions will be shared. Our mutual goal is to anticipate to, contribute to, and benefit from these megatrends.

*Methodology to Identify Top 10*

A longlist of aerospace megatrends was generated (Table 4), in which each region has arranged per topic whether:

- there is no activity at all;
- some activity by placing an X if there is:
  - industry available: either manufacturer, supply chain, end users (X);
  - knowledge & talent available: institutions, universities, schools (X);
  - government involved: local or regional, incentives or commitment (X)

If a subject is awarded with XXX, we assume that there is a (reasonably) complete ecosystem present, which is of national and European importance. Together with the Aerospace Delta stakeholders we determined per sector and topic if the IQ ecosystem agrees on the classification and then identify per highlight the possibilities of cooperation between the various regions.

Table 4. Top 10 megatrends

| Trends/Regions | IQ | ART-ER | TM | UPM | DTA |
|---|---|---|---|---|---|
| **ENABLING TECHNOLOGIES** | | | | | |
| Increased automation and artificial intelligence | XXX | XXX | XXX | XXX | XXX |
| Advanced materials and manufacturing processes (including biobased) | XXX | XXX | XX | XXX | XXX |
| Additive manufacturing (3D printing) | X | XXX | XXX | XX | XXX |
| Cybersecurity and digital security | XX | XXX | XX | X | X |
| **SPACE** | | | | | |
| Advanced sensors and instruments for scientific exploration | XX | XX | XX | X | XX |
| Earth observation, weather forecasting and prediction systems | XXX | XX | XX | X | XXX |
| Small and cube satellite technologies for research and commerce | XXX | XXX | XXX | XX | XX |
| **AERONAUTICS AND AVIATION** | | | | | |
| Electric and hybrid propulsion systems | XX | X | XX | X | XX |
| Hydrogen powered aviation | XXX | X | XX | XXX | XX |
| Sustainable aviation fuels | XX | X | XX | XXX | |
| **DRONES/AAM** | | | | | |
| Urban air mobility and eVTOL aircraft | X | XX | XX | X | XXX |
| Unmanned aerial systems (air traffic management systems and technologies) | XX | X | XX | XX | XX |
| Drone-based inspection and maintenance services | XXX | X | XXX | | XXX |

### *Aerospace Delta Agenda*

The Aerospace Delta Agenda 2030 was launched in NEXT Delft, with over 100 representatives from the regional aerospace cluster in attendance and the European representatives of the AD-ASTRA Aerospace Districts cooperation (Figure 3). This agenda, developed through comprehensive discussions with key stakeholders, serves as a collaborative action plan, with a particular emphasis on promoting sustainable aviation and fostering the long-term growth of the regional space and drone industry. During the event, the agenda was presented by Jan Terlingen as a representative from the cluster to Jeannette Baljeu, the regional minister of the Province of Zuid-Holland.

In collaboration with representatives from the aerospace sector, including knowledge institutions, the aviation manufacturing industry, airport technology and service providers, the space upstream and downstream industries, as well as the drone industry and government bodies, IQ developed the agenda. This comprehensive roadmap serves as a regional guide to further strengthen the sector, promote competitiveness, facilitate sustainable growth, and address the specific needs of the aerospace industry. Moreover, it acts as a catalyst for collective action in addressing key societal challenges through the implementation of joint innovation projects.

During the event, two enlightening panel discussions took place, focusing on sustainability and the digital economy in the aerospace industry. The panels included representatives from the Zuid-Holland Aerospace ecosystem and featured Alexander Gunkel from Space4Good and Stephen Hands from Conscious Aerospace. They emphasised the significance of fostering a cooperative regional ecosystem in order to effectively address climate issues through aerospace initiatives. Gus van der Feltz from FSO Instruments and Jeroen Rotteveel from ISISpace shared valuable perspectives on the space and satellite systems under development in the area, discussing the various challenges encountered by the sector.

After the panels, Jeannette Baljeu, the regional minister of the Province of Zuid-Holland, engaged with the audience, delivering concise answers to their questions, expressing the importance of the aerospace sector for the region and addressing the importance of collaboration from a European perspective thanking the AD-ASTRA representatives for their attendance and encouraging the ecosystem to talk to them during the drinks.

Figure 2. Aerospace Delta Agenda event

### 2.1.2. Site visits

The AD-ASTRA members have been accompanied by IQ to a set of site visits in the Zuid Holland region reported in the following paragraphs.

- *Technology Park Ypenburg (https://www.technologyparkypenburg.nl/) welcome by the new managing director Bert Klarus*
    - The goal of TPY Campus is to offer you access to their network, capabilities and different community programmes and events to support all needs, whether it is a startup, scale up, a mature business or an international company. The hub is located at a strong central position, in the middle of the 'Manufacturing Industry' in The Hague.

- *Airborne (https://www.airborne.com/manufacturing/aerospace/)* – Figure 3
    - Airborne is leading the way in the engineering and manufacturing of composite panels for aircraft, satellites and launchers. Through industrialisation, digitalised automation and applying different production process technologies, we are making aerospace components more affordable for our customers and partners. Airborne is market leader in the manufacturing of solar-array substrate panels in Europe, making panels for ESA missions, smallsats and constellations.

Figure 3. The AD-ASTRA consortium visiting Airborne

- *GTM Advanced Structures (https://gtm-as.com/)* – Figure 4
    - Being mainly active in the Aerospace market GTM Advanced Structures supports OEM, (large) component & material manufacturers in product development and by supplying new products. GTM helps companies to realise advanced aerospace structures. Manufacturing dedicated parts & components and providing full support in R&D.


Figure 4. The AD-ASTRA consortium visiting GTM Advanced Structures.

- *Unmanned Valley* (https://unmannedvalley.nl/en/) – Figure 5
    - Unmanned Valley is a field lab for sensor technologies and applications. The field lab is managed by the Unmanned Valley Foundation, an initiative of Delft University of Technology and the municipality of Katwijk. It's a place for startups, scale-ups, established companies, knowledge institutions and governments to research, develop and test technologies and applications related to drones, UAV and other sensor-based applications.


Figure 5. The AD-ASTRA consortium visiting the Unmanned Valley

- *ESA-ESTEC (https://www.esa.int/About_Us/ESTEC)* – Figure 6
    - The European Space Research & Technology Centre (ESTEC) in Noordwijk is the European Space Agency's largest facility in Europe and is the technical heart of the organisation. Most ESA projects are born here and guided through the various phases of development. Some 2800 engineers, technicians and scientists develop and manage all types of ESA missions.


Figure 6. The AD-ASTRA consortium visiting ESA-ESTEC

## 2.2. Second event in Emilia-Romagna

The second co-creation workshop, held in Emilia-Romagna and hosted by ART-ER, was tailored and organised to spotlight the themes of "Skills & International Collaboration". Far from arbitrary, this strategic focus comes out from the willingness to deepen mutual understanding among the five collaborating regions in the AD-ASTRA project: Emilia-Romagna, Madrid, Apulia, Occitania, and South Holland. The aim was twofold: to emerge successful collaborations and to identify the key aspects of these themes, thus enriching interaction among partners. Moreover, the workshop benefited from the diverse participation of stakeholders within the Emilia-Romagna ecosystem, providing each consortium member with an opportunity to showcase the unique strengths and offerings of their respective regions.

### 2.2.1. Co-creation workshop

The workshop has been organised by ART-ER S. cons. p. A. during the event "Aerospace Innovative Ecosystem", the first day of #R2B2023 fair. The detailed agenda of the event is reported in the following Table 5.

Table 5. Agenda of the second co-creation workshop in Emilia-Romagna.

| **Moderator** | **Lorenzo Calabri** |
|---|---|
| *10.30* | Introduction<br>**Lorenzo Calabri - ART-ER** |
| *10.35* | Welcome Address<br>**Adriano Gilli - Regione Emilia-Romagna** |
| *10.40* | The Innovative Aerospace Ecosystem of Emilia-Romagna<br>**Lorenzo Calabri - ART-ER** |
| *10.55* | The Innovative Aerospace Ecosystem of Apulia<br>**Michele Giannuzzi - Distretto Tecnologico Aerospaziale pugliese** (DTA) |
| *11.10* | The Innovative Aerospace Ecosystem of Madrid<br>**Gustavo Alonso - Universidad Politécnica de Madrid** |
| *11.25* | The Innovative Aerospace Ecosystem of Occitania<br>**Céline Bizieau - Toulouse Métropole** |
| *11.40* | The Innovative Aerospace Ecosystem of South Holland<br>**Niels Krol, Jan Terlingen - Innovation Quarter** |
| *11.55* | Space for Skills – Presentation of a white paper on the skills for space<br>**Clust-ER Innovate; Clust-ER Mech; Tecnopolo FC** |
| *12.25* | Co-creation workshops with regional stakeholders on common strategic lines of action to be activated by the 5 ecosystems (*Joint Action Plan*) |
| *13.25* | Closing event - Leda Bologni |
| *13.30* | Networking Light Lunch |

The co-creation workshop started with the introduction speech and welcome address of Regione Emilia-Romagna and ART-ER; subsequently, all the five partners of the AD-ASTRA project introduced their own Ecosystems, Space Skills and International Collaborations (additional information on Space Skills and International Collaborations for each hosted region collaborating in AD-ASTRA project are reported in the Annex 1). Subsequently, a talk on the Space Skills have been also held by Mechatronics and Motoristics Clust-ER, Service Innovation Clust-ER and Tecnopolo di Forlì-Cesena, while an inspiring talk on the next regional steps on the space economy has been held by Vincenzo Colla, the Councillor for Economic Development, Green economy, Employment and Continuing Education at Regione Emilia-Romagna.

During the final co-creation phase, the participants, about 30 stakeholders coming from the E-R regional ecosystem, had a very fruitful discussion with the partners of the AD-ASTRA project. A few images testifying to this event can be found in Table 6.

Table 6. Pictures of the first co-creation workshop in Emilia-Romagna.







The common features that come out after an in-depth analysis of the strengths of each region are reported below:

- **Dense Aerospace Ecosystems**: all regions boast dense and rich aerospace ecosystems characterised by the presence of key industrial players, research institutions, universities, and technical schools.
- **Geographical Location**: each region is strategically located, offering geographical advantages that contribute to its attractiveness and accessibility within the aerospace industry.
- **Educational Institutions**: renowned schools, universities, and research centres are present in each region, adapting to new needs and contributing to the development of a skilled workforce.
- **Industry Presence**: presence of large companies and a strong industrial base within the aerospace sector, specialising in various areas such as aircraft manufacturing, engine overhaul, avionics, composite structures, drones and space components.
- **Investment in Research and Development**: each region invests in research and development infrastructure, focusing on areas such as unmanned aerial platforms, space segment technology, composite manufacturing, and additive manufacturing.

**International Connections**: robust international connections and collaborations with stakeholders from various perspectives, including academia, industry, government, and international organisations.

- **Complete Value Chains**: most of the regions have complete value chains in space, aeronautics, UAVs, airport development, and operations, fostering optimal collaboration and innovation across different sectors.
- **Strong Knowledge Position**: some of the regions have strong knowledge positions in key niche areas such as CubeSats, space solar panels, hydrogen aviation, composites, and advanced air mobility are present in all regions, contributing to their competitiveness and innovation capabilities.

The common features that come out after an in-depth analysis of the weaknesses of each region are reported below:

- **Skills Gap**: across all the regions, there is a noticeable lack of certain skills needed for the aerospace sector, including data analysis, integration engineering, cybersecurity, and quality control. Additionally, there is a demand for emerging skills such as embedded AI, quantum calculation, digital twin, and cyber security.
- **Challenges in Recruiting and Training**: difficulty in recruiting specialists due to incomplete training provision is a shared challenge. Madrid also faces a lack of skills in new critical technologies like AI and cybersecurity.
- **Competition for Talent**: there is competition for talented professionals, especially in Madrid and Toulouse, where opportunities for skilled individuals exist in various sectors, including aerospace. However, Madrid highlights both

international vocation and opportunities for talented professionals also in other industries than aerospace, suggesting diversified job offers.

- **Venture Capital and Funding Challenges**: South Holland faces challenges related to the lack of venture capital and private funding for startups, scale-ups, and innovation projects. This issue is compounded by the scarcity of room for new production facilities, hindering the region's ability to attract companies. This is something that at different levels applies to all the five regions involved.
- **Labour Market Tightness**: across regions, there are concerns about tightening labour markets, especially in technical areas. South Holland mentions a declining manufacturing industry, leading to a decrease of knowledge and skill in the associated sectors.
- **Youth Engagement in Aerospace**: Toulouse and Madrid express concerns about the lack of interest among the younger generation (Generation Z) in the aerospace sector, indicating a broader challenge in attracting and engaging young talent in the industry.

These commonalities highlight the need for coordinated efforts in addressing skills gaps, enhancing training programs, attracting investment, and engaging the younger generation to ensure the long-term sustainability and growth of the aerospace sector across different regions. In addition to this analysis, these topics and others had been faced during the discussion among AD-ASTRA partners and the stakeholders of the E-R region during the workshop. All the inputs are summarised as follows:

- **Lack of interest in aerospace among the younger generations**: all the participants expressed concern about the lack of interest in the aerospace sector among the younger generation, particularly Generation Z. This was attributed to a potential gap in communication and a failure to engage them effectively.
- **Need for Improved Communication**: there was a consensus among participants that communication strategies need improvement, particularly to reach younger audiences. Suggestions included leveraging social networks and modern communication tools that are more aligned with the preferences of younger generations.
- **Importance of Education and Awareness**: educating younger generations about aerospace and space exploration was highlighted as crucial. This includes initiatives such as school visits, astronaut talks, and unconventional hiring methods to attract talented individuals to the sector.
- **Building Skills and Talent Pipeline**: participants emphasised the importance of developing skills and talent in the aerospace sector. Efforts are being made to bridge the gap between industry and academia, such as offering specialised master's programs and supporting new competencies through EU funds.
- **Adapting Training and Hiring Practices**: to attract and retain talent, training and hiring practices need to be adapted to match the evolving needs and interests of the workforce. This includes reorganising educational programs to incorporate new disciplines and adapting training to align with industry activities.

- **Challenges of Instant Information vs. Time-Intensive Projects**: there was recognition of the disparity between the time-intensive nature of aerospace projects and the desire for instant information among younger generations. This presents a challenge in effectively communicating the value and complexity of aerospace endeavours.
- **Need for Space Education**: lastly, the conversation highlighted a general lack of space education among the public, including the difficulty in finding space-related toys and the overall lack of awareness about space exploration.

These outcomes underscore the importance of adapting communication strategies, enhancing education efforts, and bridging the gap between industry and academia to foster interest and talent in the aerospace sector, particularly among younger generations.

### 2.2.2. Co-creation workshop

The AD-ASTRA members have been accompanied by ART-ER to a set of site visits in the Emilia-Romagna Region. All the following research centres and companies represent some of the brilliant examples of the regional aerospace ecosystem:

- CIRI AEROSPACE: The centre for industrial research of Alma Mater Studiorum - University of Bologna, in the Aerospace sector. The partners of the project attended an interesting tour made by the Professors of the Center and obtained information about
    - past and present projects within the Department of Industrial Engineering in Forlì
    - numerous facilities within the Forlì pole.
- ENAV training centre: ENAV is the National Agency for Flight Assistance and located in Forlì it is the national training centre for it. The delegation could see many assets dedicated to learning, with state-of-the-art classrooms, simulators and support services (Figures 7 – 8).

Figure 7. Simulator room in ENAV.


Figure 8. The AD-ASTRA consortium visiting ENAV

- **CURTI S.p.A. Costruzioni Meccaniche**: it is a producer of automatic machines and complex subassemblies for various industrial applications, with a specific division dedicated to Aerospace. The delegation received a brief presentation of the company and then had the opportunity to visit different business units inside the company plant (Figure 9). One of the most interesting products of the company that fits with the topic of the AD-ASTRA project is the Zefhir helicopter equipped with a parachute to increase safety in case problems arise during flight.

Figure 9. The AD-ASTRA consortium visiting CURTI S.p.A. Costruzioni Meccaniche

- **NPC SPACEMIND**: it is a company, solution provider for nano satellite, cubesat and space related applications. The delegation has been welcomed with a brief presentation of the company and then saw some of the products of the company as the ARTICA Deorbiting Sail (Figure 10).


Figure 10. The AD-ASTRA consortium visiting NPC Spacemind.

- **ANDALO' GIANNI srl**: it is a company specialised in complex high-precision mechanical machining, mostly devoted to the aerospace sector. During the visit to the company facilities, the delegation could see many examples of high precision manufacturing of aerospace related components (Figure 11).

Figure 11. The AD-ASTRA consortium visiting Andalò Gianni S.r.l.

## 2.3. Third event in Apulia

For the visit of the consortium in Apulia region on October 24th and 25th, 2023, it was decided to focus on the topic of a workshop on "European regional test beds for research and experimentation for new forms of mobility".

### 2.3.1. Co-creation workshop

The discussion focused on European test beds for researching and experimenting with new forms of mobility, such as urban air mobility. The evaluation of existing test-range solutions within the regions designated by the AD-ASTRA project was carried out, starting from the Grottaglie Air Test Bed (GATB) and the Bari Open Innovation Hub (BOIH) with the primary objective of gathering the most current information and potential opportunities.

**Lorenzo Calabri – ART-ER**

Lorenzo talked about **CICLoPE** (Centre for International Cooperation in Long Pipe Experiments) which is a research infrastructure of the Alma Mater Studiorum - University of Bologna for the study of aerodynamics and fluid dynamics phenomena. It allows the worldwide best space and time-resolved measurements in turbulent pipe flows. This wind tunnel is located inside the 'Ex Industrie Caproni' tunnels (Figure 12), with constant environmental characteristics and a complete absence of external disturbances; it allows experiments to be carried out with extremely high measurement accuracy. The wind tunnel has a test chamber consisting of a circular tube with mirrored walls 110 meters long with a diameter of 1 meter, inside of which the boundary layer is formed (i.e., 50 cm thick). In the large tube, made of carbon fiber, air is passed through at high speed in a controlled environment free of external disturbances, to recreate the conditions found in nature.

Figure 12. The wind tunnel located inside the "Ex Industrie Caproni" tunnels.

After this first introduction Lorenzo presented the **FLYTUN (FLYing TUNnel for UAM testing)**. Actually, the FLYTUN is a project that need to be funded. In the following paragraph is reported a brief description of this unique infrastructure:

- Large scale flying room (10 m in diameter), 120 m long, allowing the complete analysis of unmanned aircraft and the experimental validation of advanced control algorithm.
- Possibility to generate time and space dependent gusts.
- High Reynolds number.
- Possibility to insert obstacles.
- Full and easy access to the test section, and to several other places along the tunnel.
- Highly controlled environmental conditions (no background noise, stable temperature, and humidity).
- Possibility to test ground vehicles.

The unique infrastructure will allow the worldwide best analysis of aerodynamics and flight mechanics effects on drones under the presence of lateral gusts. The gusts, programmable in space and in time are obtained by means of multiple fan systems designed and produced "ad hoc" for this purpose. The very large dimension of the infrastructure allows large models to be tested. The presence of a rail will provide the possibility to extend the analysis to moving ground vehicles. Stable ambient conditions and low noise guarantee a high signal to noise ratio. Besides, the infrastructure will also provide:

- Complete characterization of propulsion units made of battery, electrical motor, and propeller.
- Design and rapid prototyping of novel vehicle configurations.
- CFD and FEA analysis of novel vehicle configurations.

The FLYTUN facility will be realised beside the CICLoPE. Moreover, it will be one-of-a-kind centre for UAS research and development:

- One of the largest flying rooms in the world
- Characterised by very stable environmental conditions
- Unprecedented signal to noise ratio.
- Possibility to fully characterise the effect of wind and lateral gusts on the dynamic of the vehicle.
- Possibility to fully characterise the effect of wind and lateral gusts on the aerodynamic loads of the vehicle.
- Possibility to test at low and high Reynolds number
- Possibility to generate space and time-dependent wind profiles

Such features overcome the limits of existing flying rooms and the inherent constraints of small test chambers in classical wind tunnels. For the first time the aerodynamics and the flight mechanics teams will have the possibility to characterize the **dynamic response** of controlled systems as a function of **steady and unsteady flow**

conditions with high accuracy and **low uncertainties**, in the framework of flying quality assessment of novel flying configurations.

Another fundamental feature that will make FLYTUN a unique infrastructure is the possibility to integrate for the first time in only one place all the facilities necessary to investigate (or design) a vehicle while covering all the engineering aspects, from the aerodynamic analysis to the testing of electric propulsion units, even characterized by very large propellers. Finally, the interaction of complex environmental flows with the drone fans is expected to generate different harmonic content, especially during unsteady manoeuvres. Being able to probe the aeroacoustic signature of a free-flying drone in a realistic urban and wind environment is a necessity for future certification procedures.

Even if it is not directly related to the aerospace sector, Lorenzo presented **MASA**. It is the first **"open air" test bed for the experimentation and certification of autonomous driving** and connected driving technologies (vehicles, components and services) that interact with other vehicles with infrastructures and with other elements of the urban space. In Smart Model Area is an urban area within the city of Modena endowed with the infrastructures necessary for the experimentation of vehicles equipped for autonomous driving. The map shows the streets equipped which are currently part of the area. The tested technologies to be found in the area are: interconnected traffic lights, digital signposting, cameras for the recognition of obstacles, sensors, and smart monitoring

**Gustavo Alonso - UPM**

Gustavo talked about INTA (National Institute of Aerospace Technology - Instituto Nacional de Técnica Aeroespacial) which is the largest RTO in the aerospace sector. It is a Public Research Organisation that depends on the Spanish Ministry of Defence. INTA is responsible for performing scientific research activities and prototypes in its field of knowledge, as well as for providing technological services to companies in the industry, universities, and other institutions. INTA specialises dually in technological research and development in aerospace, aeronautics and hydrodynamics in security and defence technologies. Among the main tasks that INTA is responsible for, it is worth mentioning:

- the performance of various types of tests for checking and certifying materials, components, equipment, systems and subsystems;
- the provision of technical advice and services to official entities and organizations, as well as to industrial and technological based companies;
- its role as the technological centre for the Ministry of Defense.

Gustavo talked also about **CEUS (Test Center for Unmanned Systems,** https://www.inta.es/CEUS/en/inicio/) located in Moguer (Huelva). It is the most important facility in Spain having a 2 km long runway and a testing area of 1 million hectares (Figure 13).

There are other test bed facilities also in UPM – Madrid but they are focused mainly on the technology itself.

Figure 13. Test Center for Unmanned Systems (CEUS) in Moguer (Huelva).

**Céline Bizieau - TM**

There are about half a dozen test beds in Occitania. Near Toulouse, the **Francazal Zone**, belonging to Toulouse Metropole (38 Ha) – Figure 14. The southern part of the former military air base of Toulouse Francazal is becoming an area of innovation dedicated to innovative, sustainable, and green mobility. Toulouse Métropole wishes to make it the hub of a new industrial, academic, and service channel focused on the transport of the future.

**Muret Lherm** airfield is another test zone: the school ENAC uses it for their drones. In **Fonsorbes**, there is a military airfield where some drones can be tested, it's rural and confidential. **Esperces** is another private field, owned by ONERA, the French research organization for aerospace. In **Cahors**, there's a potential long-range project, and drones can also be tested at Tarbes Airport.

Outside the Occitania region, is **CESA Drone**: it is a startup near Bordeaux which has a long-range flight corridor (100 km long) open from October to May. They rent the infrastructure.


Figure 14. Former military air base of Toulouse Francazal.

**Jan Terlingen – IQ / Dietmar Lander – UV (online)**

**Unmanned Valley** aims to bring together expertise from across the UAV industry to promote innovation in unmanned technology, accelerate the development of autonomous systems and sensors, and lead the European industry. The airspace can be used continuously and flexibly, and a corridor to the sea will soon enable BVLOS flying over both land and sea. Unmanned Valley is situated on the former Valkenburg naval air base, in the heart of the area where companies and knowledge institutions that make up the UAV industry are located. It provides the necessary space for the industry. The site presents extensive indoor and outdoor test facilities, various

location options and possibilities for meetings, training and events. In particular 6,000m² office space, 2.000m² indoor drone centre, 25ha outdoor flightbox (Figure 15).


Figure 15. Unmanned Valley

**DronePort Rotterdam** is leading the way in integrating drones and has launched a U-space Airspace prototype to facilitate unmanned air traffic control in the uncontrolled airspace of Europoort and Maasvlakte. This initiative aims to provide insights into airspace management, open opportunities for drone operators, and evaluate the impacts of unmanned air traffic control, setting a precedent for national expansion. The U-space trial aims to prevent conflicts by making all airspace users electronically visible, using Airwayz's Unmanned Traffic Management system. DronePort Rotterdam is actively engaging in these advancements, preparing for a future where such innovations are commonplace and shaping its strategies based on the insights from the U-space prototype.

**Michele Giannuzzi – DTA**

**Grottaglie Airport Test Bed** is an Italian Centre of Excellence for Remotely Piloted Aircraft System Trials. In the near future, both aircrafts with pilots on board and remotely piloted aircraft systems will be operating in the same airspace. This poses not only the need to develop new aircraft platforms and associated ground systems, but also to define new rules and develop new technologies and products for all forms of air traffic control and management, in order to operate safely in the sky.

In 2014, with the backing of the Italian Government, the Italian Civil Aviation Authority (ENAC) devised a plan to qualify the Grottaglie Airport, based near Taranto in the South-east of Italy, as an integrated platform (airport, controlled airspace, systems for control and performance measurement, technological and logistical services), which aims to address these problems by creating facilities for testing, developing and offering innovative services, products and solutions for the aerospace sector. In particular, Grottaglie Airport, thanks to its infrastructure, favourable location and facilities, represents an important test bed for companies and institutions interested in:

- conducting simulations and test trials, on the ground and in-flight, for manned and unmanned aircraft systems;
- carrying out test trials for ATF&M (Air Traffic Flow & Management) systems for product and service development and certification;
- developing products and solutions for territory observation and data management.

Its physical assets are fully equipped, low traffic airport; large runway (45 x 3200 m); large air space (~370sKm; on land, cost, sea), Sparsely populated area. It will be possible to evaluate and advance novel aerial platforms, incorporating a beyond visual line of sight (BVLOS) corridor extending towards the ionic sea.

The GATB infrastructure was launched in 2020 with the creation of a joint DTA, Leonardo, Telespazio, D-flight, and Planetek laboratory for the 'hardware-in-the-loop' simulation of aerial drone operations in ATM and U- space. Currently, DTA, in collaboration with the University of Bari, the University of Salento, and the Polytechnic University of Bari, is carrying out the extension of GATB with the development of 7 new laboratories: 1) Flight test, 2) Datacenter, 3) Advanced computing, 4) Augmented GNSS, 5) Sensors & Payloads, 6) Propulsion systems, and 7) Innovative Aerial Services, each of which is equipped with state-of-the-art equipment and systems to provide research and experimentation services.

By 2024, the GATB will be one of the advanced research infrastructures in Europe. It will contribute to the development of knowledge, research infrastructures, technologies, and experimentation for unmanned aerial systems (drones), air traffic management solutions and services, and innovative air services. These applications will be used in the fields of environmental and territorial monitoring and logistics. GATB will facilitate research in specific technological areas, including space services and data (SATNAV, SATCOM, SATEO, SATMETEO) to support drone operations, artificial intelligence, cybersecurity, innovative propulsion (hybrid, fuel cell), and innovative sensors for airborne applications.

The 'Grottaglie Airport Test Bed' will comprise six advanced technological laboratories and an innovative data centre. These facilities will enable the continuous transfer, analysis, and management of data and information, facilitating the development of innovative flight control applications. Additionally, the data analysis and advanced monitoring services will be based on artificial intelligence algorithms. The GATB will have the ability to coordinate, control, and acquire data from experimental UAS flights in the airspace adjacent to the airport through a dedicated control room.

In accordance with the EU Drone Strategy 2.0 launched by the European Commission in 2022, the GATB will serve as a primary European node to support the Apulian, Italian, and European aerospace research system, both public and private, operating in the broad technological sector of drones.

The laboratories, access to the airport runway and airspace, which have already been designated by ENAV for experimentation, will create a unique addition to the national and European Research Infrastructures (Figure 16).


Figure 16. Grottaglie Airport Test Bed.

Moreover, in Apulia can be also referred to the Bari Open Innovation Hub (BOIH) aims to be:

- an innovation centre on the territory of the metropolitan city of Bari.
- a center for the experimentation and applied research on emerging technologies, mainly autonomous and semi-autonomous driving, using the 5G network.
- a center where to increase the 'understanding' of emerging technologies among local authorities and companies and to initiate targeted and effective 'technology transfer' processes.

On this website are reported the most important test bed infrastructures within **Europe** - https://erea.org/catalogue/categories/flight-test-bed/

## 2.3.2. Site visits

On the 24th October, the project partners visited some aerospace companies all dealing with the Grottaglie Airport Test Bed ecosystem:

- Planetek Italia – Figure 17, was established in 1994, which employs 100+ women and men, passionate and skilled in Geoinformatics, Space solutions, and Earth science. They provide solutions to exploit the value of geospatial data through all phases of data life cycle from acquisition, storage, management up to analysis and sharing. They operate in many application areas ranging from environmental and land monitoring to open-government and smart cities, and including defence and security, as well as Space exploration and EO satellite missions.

Figure 17. The AD-ASTRA consortium visiting Planetek Italia.

- Grottaglie Airport Test Bed – Figure 18, for presenting the Leonardo/Telespazio Laboratory and describing the new infrastructural plant to be settled in the year on the front.

Figure 18. The AD-ASTRA consortium visiting Grottaglie Airport Test Bed

- Leonardo Aerostructures (Grottaglie plant), with a visit to the One Piece Barrel system. As a Boeing strategic risk sharing partner, Leonardo develop and

manufacture about a 14% share of 787's airframe: the horizontal stabilizer at its Foggia plant, *both central fuselage sections at its innovative plant in Grottaglie through "one piece barrel" advanced technology,* plus frames, shear-ties in Pomigliano D'Arco and metal alloy machined parts in Nola.


Figure 19. The AD-ASTRA consortium visiting Leonardo Aerostructures

- Novotech Aerospace Advanced Technology, for the presentation of Automatic Fiber Placement technologies (and related projects) and the SEAGULL seaplane designed and realised by Novotech and all the project related. It is a key partner for many industries working in the aerospace field and other advanced technology sectors. The Company was founded in 1992 as spin-off engineering consulting company from Department of Aerospace Engineering of the University of Naples "Federico II". NOVOTECH has proven capability in design and manufacturing of composite structures, based on low cost and out-of-autoclave automated production processes (as AFP, PCM, RTM and LRI). NOVOTECH recently is involved on the design and manufacturing of the SEAGULL aircraft, a high performing ultralight amphibian vehicle with hybrid motorization, easy and economical, operating in autonomy from any infrastructure.

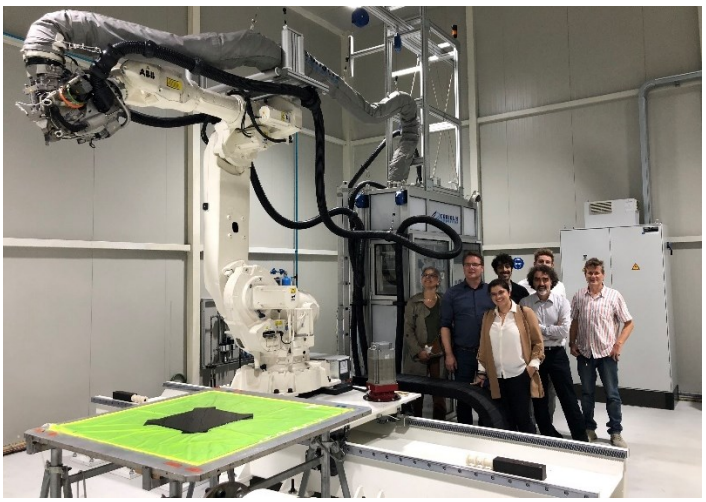


Figure 20. The AD-ASTRA consortium visiting Novotech Aerospace Advanced Technology

## 2.4. Fourth event in Occitania

For the visit of the consortium in Toulouse on January 10th and 11th, 2024, it was decided to focus on the topic of **circular economy in aerospace**. Therefore, one of the co-creation workshops was dedicated to circular economy and the visits of the second day were also oriented towards this specific focus.

### 2.4.1. Co-creation workshop

In the following Table 7 is the programme for the first day of the Toulouse gathering:

Table 7. Agenda of the fourth co-creation workshop in Occitania

| Hour | Activity |
|---|---|
| *09.00 – 10.15* | AD-ASTRA General Assembly #1 |
| *10.15 – 10.45* | Welcome coffee |
| *10.45 – 12.30* | Circular economy co-creation workshop |
| *12.30 – 14.00* | Networking lunch |
| *14.00 – 15.30* | AD-ASTRA tool workshop |
| *15.30 – 16.00* | Coffee break and "galette des rois" |
| *16.00 – 17.45* | AD-ASTRA General Assembly #2 |

The workshops were organised by Toulouse Métropole (Céline Bizieau) at the B612 building, the aerospace innovation centre that belongs to the metropolis of Toulouse. All the partners of the AD-ASTRA consortium were present throughout the day and we had very fruitful discussions: Lorenzo Calabri, Alina Bisag, Jose Miguel Alvarez Romero, Gustavo Alonso, Michele Giannuzzi, Niels Krol, Jan Terlingen. Some 20 local stakeholders or members of the Aerospace Valley competitiveness pole were also present to the two workshops.

During this first meeting, introduced by Céline Bizieau, all the five aerospace circular economy ecosystems of the AD-ASTRA regions were presented.

- **OCCITANIA**: The region is quite active in the circular economy with lots of stakeholders working in the field of aerospace. Some companies which develop biosourced/recycled materials were cited and were also present during the meeting. Moreover, Occitania is currently a big player in the field of aircraft dismantling. There are lots of players also in academic fields, associations & clusters. Moreover, Aerospace valley, Airbus & Tarmac Aerosave also had a call for expression of interest on the end of life of aeroplanes. Some specific regional, national & EU projects on this topic were also cited, interesting initiatives and also the political will in terms of circular economy. It must be noted that Toulouse Metropole is the first French city to get a 3 stars label for being a circular economy city. The label is delivered by the French ADEME organisation.

- **E-R**: The region is quite reactive on the topic of circular economy even if some stakeholders and examples are not directly from the aerospace sector. There are some projects related to the recycling of carbon fibre and only one related to space applications (deorbiting systems for cube satellites). There are also seven wastes to energy plants used to produce electricity and district heating. Some professors from Alma Mater Studiorum - University of Bologna are working on the thematic of circular economy even if there are only a few names. Also, some associations & clusters work on circular economy even if the activities are not entirely dedicated to the aerospace sector. Some examples of projects were also reported and as previously said, most of them are dedicated to the recycling of carbon fibre. In both E-R region & Bologna city, the political will is strong and there are lots of initiatives ongoing.
- **Madrid**: The region has a huge aerospace ecosystem; moreover, many activities related to space application are concentrated in Madrid. People seem to be interested in the circular economy but currently there are few concrete actions. However, some examples of biosourced or recycled materials, dismantling and recycling companies and waste to energy plants were cited. From an academic point of view, there are only a few laboratories and associations working on this topic. The same is true also for circular economy projects. The political will is active from national, regional and city point of view.
- **Zuid Holland**: there are some important players that work in the field of circular economy *e.g.*, AELS (company for the dismantling of aircrafts).
- **Apulia**: in the region there are a lot of important players dealing with manufacturing at large. However, the topic of circular economy is still underdeveloped. For example, there are a lot of projects on composites materials but very few projects for their recycling. In this case, an industrial plant still has to be realised. The first dismantling Unit will be realised in Grottaglie. DTA took into account the topic of circular economy, but they haven't really worked on it.

Generally, for the five regions, it is interesting to note that the circular economy is a very thought provoking and stimulating topic but some of them are not really working on it and implementing it. Some of the region have a strong will but they don't really work on this topic (e.g., Madrid & Apulia).

Once the partners finished their presentation, some of the stakeholders in the room presented their companies.

- **VESO CONCEPT** - Elizabeth Foulatier presented the company and their activities. VESO CONCEPT proposes services to develop and manufacture structural concepts with high added value based on biosourced and/or recycled composite materials mostly in the aeronautics sector. Their field of action covers three aspects: raw materials, product and process. More specifically, Veso Concept focuses on optimization of design & process trying to decrease the toxicity of their materials and wastes using biosource resins and biosource materials.

- **Nobrak** - Valia Neury presented the company NOBRAK whose aim is the manufacturing of composites parts with an innovative technology TFP - Tailored Fibre Placement = Positioning a fibre on a support material by stitching in any orientation. Moreover, they use natural fibres and have almost 0 waste using this technology.
- **Alpha Recyclage** - Fabien Tesseraud and Grégory Farines presented the company Alpha Recyclage Composites and briefly introduced the process that they use for the recycling of carbon fibre. Differently from the other competitors, they use steam (instead of N2) in the pyrolysis process.
- **Pangea aerospace** - Marie-Laure Gouzy talked about her company PANGEA AEROSPACE and some of their projects. For example, they have a fully 3D printed aerospace engine & full reusability of the launcher to avoid the creation of debris.
- **ISAE SUPAERO** - To finish, two researchers from ISAE Supaéro presented their research activities on circular economy in space: Stéphanie Lizy-Destrez from the SaCLab and Augustin Gallois, PhD at ISAE Supaéro. They presented the SaCLaB and talked about launchers sustainability, recycling in space, and space debris mitigation in cislunar space.

At the end of the workshop, two elected persons, both Vice Presidents from Toulouse Metropole (Agnès Plagneux-Bertrand and Jean-Claude Dardelet) made a speech to welcome the partners and the participants. Some pictures of this co-creation workshop are reported in Table 8.

Table 8. Pictures of the fourth co-creation workshop in Occitania.





### 2.4.2. AD-ASTRA tool co-creation workshop

After the networking lunch, the AD-ASTRA Tool workshop took place. Again, all the partners from the AD-ASTRA consortium were present. The idea of this workshop was to present the idea of the tool and discuss the feasibility and best ways with the stakeholders.

A few persons from Aerospace Valley were present at this workshop: Fabienne Daveran, Eric Gouardes, Sophie Champagne, Thaddé Bouchard, Widbenson Saintalmie, Anne-Lise Stephan, Laurent Bizieau. Emilie Aubry from the region Occitanie and Charlotte Voisin from Invest'in Toulouse were also present.

Then the AA tool was presented and explained to all the participants. It was highlighted that it is not a platform but a human centred tool or rather a channel.

According to AV there are two positive aspects for the tool as it was presented:

- There is a good **diversity** in the members of the consortium (five partners, four different types of entities)
- There are only 5 regions that are represented in the tool, so it is more **focused**; there are less actors, less enablers; we know each other well and therefore the service can get closer to SMEs and be more practical (if we compare to Enterprise Europe Network or European Aerospace Clusters Partnership network, they are big networks and this can be a barrier for companies, whereas AD-ASTRA Tool is small and agile, we can take quick action)

Then some approaches for the tool were studied and questions were raised:

- Should we define some KPIs? Create a governance?
- We could map the enablers of all the five regions.
- We could make a demonstration by example.
- We should start with concrete actions.
- Should we choose a bottom-up or top-down approach?
- We could create an event with SMEs to collect their needs.
- We could select a topic and come to the enablers to ask about the needs on this topic.
- How should we get in touch with the potential beneficiaries?
- When it's working, try to enclose the tool into a larger structure, like the EEN network.

Figure 21. AD-ASTRA tool workshop participants

### 2.4.3. Site visits

The AD-ASTRA delegation was accompanied by Toulouse Métropole (Céline Bizieau, Christophe Da Silva and Romain Couteau) to a set of site visits in the Occitania region:

- AIRBUS COMMERCIAL AIRCRAFT – Figure 22: where the delegation had a short presentation of some measures taken by the company in favour of eco-circularity of assembly material (Figure 22). The presentation was followed by a visit to the A350 Final Assembly Line. AIRBUS is present in France, Germany, Spain & UK and represent 48,200 jobs in France. All the parts of aircrafts are assembled in France and come from different facilities in other cities or countries, mostly with the use of the Beluga plane. What does eco-circularity mean for Airbus? It means promoting industrial activity and at the same time trying to minimise the footprint. Here are a few actions implemented in this objective:
    - reuse of products/components/other materials
    - anticipate the regulations
    - they have a digital platform for the use of items
    - due to the fact that they are present on numerous sites, they use a lot of packaging. Now the ambition is for example to use reusable coverage in tissue even though these are more expensive.
    - reuse of aircraft seats, for example in the Airbus training school.
    - support the French paralympic association by creating prosthesis
    - SUNSET project: reuse tools etc by the "association la Machine" and therefore give a second life to those elements directly coming from the production line.
    - Aeronautical heritage museum (AEROSCOPIA): reuse of aircraft parts or entire aircrafts
    - use of aircraft parts for design elements made by local designers
    - collaboration with TARMAC for the interior design elements.


Figure 22. The AD-ASTRA consortium visiting AIRBUS.

- **VESO CONCEPT** – Figure 23: was the next visit, some 20 kms from the city of Toulouse: a very small company making bio-sourced composites. The company was present the previous day at the co-creation workshops. We visited the site (Figure 23) and were presented with some elements from their workshop. We met the business developer Elizabeth Foulatier, and the founder and CEO of the company, David Hardy.


Figure 23. The AD-ASTRA consortium visiting VESO CONCEPT.

- **TARMAC AEROSAVE** is a plane storage, maintenance and recycling company and has three locations, one of them in Francazal Base, right next to the city of Toulouse, where we had a presentation of the activity of the company in Toulouse and its other two locations by Lionel G. Roques. The company was born after the PAMELA project dealing with the aircraft's end of life. Recycling is the real thing that they do and that they were born for. Actually, TARMAC deals with recycling, storage, maintenance. Some of the key points that come out during the presentation are:

- the single pieces that an aircraft is composed of can be more expensive than the entire aircraft;
- they don't buy aircrafts, but are only service providers;
- the lifespan of an aircraft has decreased from 45 to 27 years;
- the number of retired aircraft has increased from 100 to 500;
- the essential require for aircraft recycling, is to have a network nearby
- TARMAC has recovery channels which are fundamental for recycling.

- To finish, Francazal's former army base was also visited, thanks to Pierre Duffau from Toulouse Métropole (Figure 24). The former base belongs to the metropolis of Toulouse and hosts some start-ups in the field of transportation (autonomous shuttle, green planes, etc). It is destined to become the Mobility of the Future hub for the metropolis and is due to host the future Hydrogen Technocampus funded by the Occitanie Region. A good example of cooperation between the region and the metropolis.


Figure 24. The AD-ASTRA consortium visiting Francazal former army base.

## 2.5. Fifth event in Madrid

The fifth and last co-creation workshop, held in Madrid and hosted by Universidad Politécnica de Madrid (UPM), was tailored, and organised to spotlight the themes of "The role of Universities in the innovation ecosystem". The topic was selected not only because the host, Universidad Politécnica de Madrid, is a university, but also because it links with discussions at previous workshops, particularly on cooperation, skills and megatrends.

As usual, the workshop was organised consisting of a visit, so that the delegation of the five collaborating regions in the AD-ASTRA project (Emilia-Romagna, Madrid, Apulia, Occitania, and South Holland) can have a direct contact with the local aerospace ecosystem, followed by a co-creation event, where the partners could interact with local actors, discussing on the selected topic for the workshop.

### 2.5.1. Co-creation workshop

The workshop "Role of universities in the regional innovation ecosystem" has been organised by Universidad Politécnica de Madrid and was held at the premises of the School of Aerospace Engineering. The agenda of the event foresaw a first part where the Innovative ecosystems of the four regions guested by UPM (namely, Emilia-Romagna, Apulia, South Holland and Occitania) have been presented in details, with a particular focus on how the universities are able to bring knowledge and innovation to the industries for concrete application, but also with reference to the institutes/agency involved in Innovation and Technology transfer, specifically working in the field of aerospace but also in other sectors that may activate in some way also aerospace applications, being the perfect link between public labs and industry, and examples of incubators or pre incubators in schools or universities. To bring examples of such activities, remote speeches from Alma Mater Studiorum – Università di Bologna and from ISAE Supaero have also been scheduled.

A group of local stakeholders representing the aerospace ecosystem of the region of Madrid participated in the co-creation event. Like in the case of the visits in the previous day, the idea was to bring together a diverse representation of the regional ecosystem, bearing in mind the topic under discussion, focused on universities as facilitators of innovation and cooperation. Different points of views have been taken, from academia, to start-ups, large companies and institutes, all collaborating in some way with universities. In addition to other professors of UPM, the list of participants included the following people:

- Angel Sanz, Director, Instituto Ignacio Da Riva (IDR/UPM), a research institute of Universidad Politécnica de Madrid
- Rosa Arnaldo, Professor, School of Aerospace Engineering, Universidad Politécnica de Madrid
- Lidia Garcia, CRIDA, a joint research centre between ENAIRE (the Spanish Air Navigation Services provider) and Universidad Politécnica de Madrid.
- Jose Manuel Muñez, Business Development Manager, OESIA Group
- Oscar Lopez, OCCAM Space

- Gema Arboleya, Business Developer, IENAI, a start-up providing innovative missions analysis and space propulsion systems.
- Paolo Tortora, Professor and Director of the Interdepartmental Center for Industrial Research in Aerospace (CIRI-AERO), Alma Mater Studiorum – Università di Bologna
- Augustin Gallois, PhD student, ISAE Supaero

The co-creation workshop started with the introduction speech and welcome address of Madrid and ART-ER; subsequently, all the five partners of the AD-ASTRA project introduced their own Ecosystems, Space Skills and International Collaborations.

The local stakeholders described their own activities which range from satellites, structures for launcher vehicles, actuators, to propulsion systems, etc… In all cases, the local stakeholders focused also on the collaboration with local universities in the region of Madrid (Figure 25 and 26).


Figure 25. Universities at the core of the innovation ecosystem

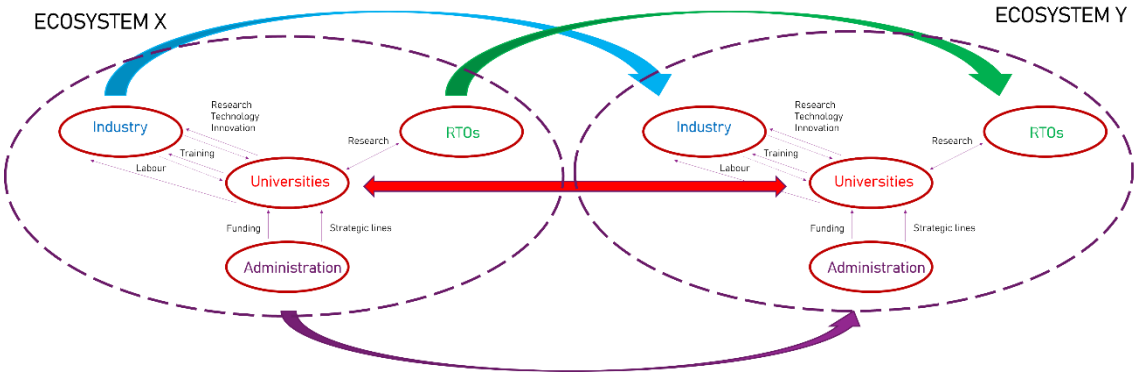



Figure 26. Universities as facilitators of cooperation between innovation ecosystem.

During the final discussion, a strong focus has been put on the fact that it is very difficult for universities to retain students for PhD programs, post-doc positions and careers at university. Offers from the private companies are too attractive for young students and it is not easy to react in a proactive way, having a limited freedom on actions that could be put in practice from the University side.

It is not only a matter of salaries, that are often not competitive, in particular for the PhD positions, but also on the topics and projects that might be developed by the students, who are often very passionate on what they are willing to develop, but then they have to face the restrictions of university programmes that are often not flexible enough to follow the inclinations of the students. Research lines of the departments are often rigid and based on the funding typologies that impose specific topics to be developed. Listening to the passions and interests of the students, giving them more freedom to act, could be a way to retain them, leveraging on their passion.

On the other side, being very hard to change the rules and regulation that manage university (also because not all the faculties have the same issues), at least there are some actions that could be taken with a bottom-up approach:

- Increase collaboration among academia and industries (lecturers and eventually professors coming from the industries, taking classes or permanently moving to universities), not only for being more attractive for students, but also for having a university which is closer to market and quicker and more adaptive in responding to the industry's needs.
- Train students to become entrepreneurs: opening spin-off and start-ups that can remain linked to university.
- International classes.
- Promote use of commercial facilities by industries.
- Promote universities at international level: *i.e.*, having booths at fairs to attract students (this happens sometimes and with some university ready for that, but might become a common best practice), participating in international missions, etc…
- University subsidiaries outside of the country (and eventually of the continent) to attract international students, exporting the specific teaching methodologies.
- Contest and prizes for best scientific solutions (eventually leveraging on originality and thinking out-of-the-box).
- Extra-salaries (regional funds?) for PhD students in particular (and eventually also for professors).
- Leveraging on passions from students on specific and self-chosen topics (wider view on research lines from departments).
- Create student teams, working on specific topics (quite commercial) that can be showcased from a university perspective: *i.e.*, formula student, formula SAE electric or MotoStudent (for motorsport), etc.
- Increase awareness and consciousness on this topic among the citizenship, the regional policy makers, in general over the quadruple helix.

In relation to this issue a major trend that is growing in relation to the University sector is related to private university (both self-standing, then backed from private large enterprises, i.e. AIRBUS) that may adapt much quickly and easily to the changing and the requests of the market. This is something that needs to be taken into account, when considering the overall aerospace ecosystem of a region.

The solutions that the participants at the co-creation workshop tried to put together are just a first step of ideas and suggestions that will be further elaborated in the final part of the project, together with the input coming from the other four co-creation workshops, to become part of the Joint Action Plan.

### 2.5.2. Site visits

The AD-ASTRA members have been accompanied by UPM to a set of site visits in the Madrid Region. The companies and organisations to be visited have been selected to provide the AD-ASTRA partners with a complete representation of the vast and diverse aerospace ecosystem of the Madrid region, and they include:

- A large research centre, such as INTA.
- The site of an international organisation with presence in other AD-ASTRA regions, like the European Space Agency.
- New companies funded under the New Space paradigm, like OCCAM.
- Start-ups from the aeronautics sector, like IDAERO.
- Large industrial groups, like OESIA, represented by one of its most innovative companies: INSTER.
- The university contribution to innovation and the development of new companies: the UPM Business Centre.

All the following research centres and companies were visited, in the order in which they are reported:

- **OCCAM** – Figure 27: The visit began at OCCAM Space, located at the Scientific and Technological Park of Leganes, linked to Universidad Carlos III de Madrid. There, new start-ups like OCCAM are incubated and develop their first steps. OCCAM is a space company focused on the design, development and production of reliable mechanisms and mechanical systems for the Small Satellite Market for flight and ground purposes. The visitors were given a demonstration of the OCCAM's KISS product family (Keep It Simple Separation-system), the modular Clamp-Band for all standard Smallsat interfaces on the Market.


Figure 27. The AD-ASTRA consortium visiting OCCAM

- **UPM Business Centre** – Figure 28: The delegation of the AD-ASTRA partners visited the UPM Business Centre at the Monteganedo Campus of Universidad Politécnica de Madrid (Figure 28 and 29). The Business Centre at the UPM's Science and Technology Park is the result of the initiative and innovative and investigative spirit of the university community. The purpose of the Centre is to promote collaboration with the industrial environment and the partnerships of public and private entities that choose to be strategic partners of UPM in research and innovation. AD-ASTRA partners were given an introduction on the methodology followed at the Centre to promote innovation and entrepreneurship among the UPM community of students and professors. The Montegancedo Business Center provides the opportunity for all entrepreneurs to have quality services in a young, creative and enthusiastic environment, in ideal spaces to share experiences and create ties of collaboration.


Figure 28. The AD-ASTRA consortium visiting UPM Business Centre

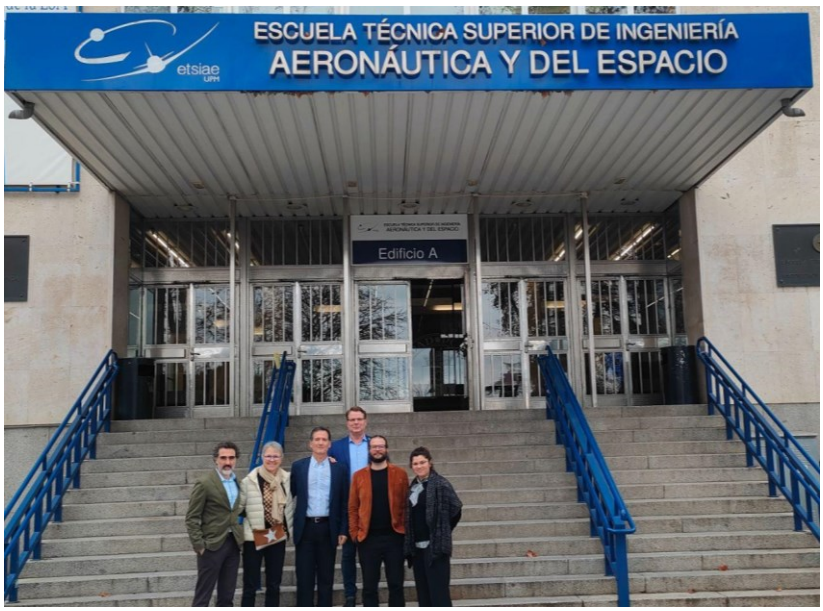



Figure 29. The AD-ASTRA consortium visiting UPM

- INTA – Figure 30: The visit continued at INTA (National Institute of Aerospace Technology), a Public Research Organisation that depends on the Spanish Ministry of Defence. It is responsible for performing scientific research activities and prototypes in its field of knowledge, as well as for providing technological services to companies in the industry, universities and other institutions. INTA specialises dually in technological research and development in Aeronautics, Aerospace, Hydrodynamics, Security and Defence technologies. In particular, the delegation visited the INTA Space Center. The Center has modern facilities and highly qualified personnel to monitor, control, process and disseminate satellite data. The INTA Torrejón Space Center is a modern facility with the latest technological innovations that allow it to address all the tasks necessary in the useful life of a satellite. The delegation was able to witness the pass over the ground station of the recently launched ANSER spacecraft, and the operations that the personnel of the control centre performed during the minutes that each of the two spacecraft was under the direct coverage of the Centre ground station antenna.


Figure 30. The AD-ASTRA consortium visiting INTA

- ESA Villafranca – Figure 31: In the afternoon, the delegation visited ESAC, the European Space Astronomy Centre. ESAC is one of the sites of the European Space Agency, and it is the 'home' of ESA's space-telescope and planetary missions, the place from where science operations are conducted, and where all of the scientific data produced are archived and made accessible to the world. The AD-ASTRA partners received indications on the main ESA scientific missions, while watching the mock-ups of the spacecraft located in the gardens of the facility. Later, the AD-ASTRA partners also visited the control centre of SMOS, an Earth observation satellite of the European Space Agency, and could see interesting examples of the data provided by the satellite.


Figure 31. The AD-ASTRA consortium visiting ESA Villafranca

- IDAERO: Back to the UPM's Science and Technology Park, the delegation visited one of the companies being incubated there, with the support of the ESA BIC of Madrid. IDAERO provides powerful tools for post-processing and custom-made engineering software solutions. For instance, NaxTo, a very fast post-processing environment with which simulation engineers can concentrate on their most valuable tasks, not just on moving data around or repeating time-consuming jobs.
- INSTER: Finally, the AD-ASTRA partners visited INSTER, a company belonging to the OESIA Group, a Spanish multinational engineering company dedicated to technological innovation. INSTER design, develop and manufacture innovative products and solutions for the Defense, Security and Telecommunications sectors. The core of its technology is communications, both satellite and terrestrial, for mobility applications in the military and railway environment, as well as high-capacity fixed point-to-multipoint wireless access for telecommunications operators. The delegation could visit the workshop of the company and examples of several of their products.

# Conclusions

The AD-ASTRA project thanks to WP2 and to the possibility of organizing five in person meetings and co-creation workshops, has made significant advancements towards its goal of fostering a connected and competitive interregional innovation ecosystem across the Emilia-Romagna, Madrid, Occitania, Apulia, and South Holland regions. Indeed, these meetings have been beneficial for several aspects: for the consortium to strengthen shared knowledge and to understand how to effectively work together; for each regional ecosystem to get to know each other ecosystem, understanding strengths and weaknesses of other ecosystems spread in Europe; for the project partners to get in contact with local organizations (site visits) visiting their premises and knowing the best subjects in the sector of Aerospace for each of the regions involved. In particular, it can be outlined the following topics and connections (Table 9):

Table 9. Topics & connections for the events held in each of the five regions.

| **South Holland** | |
|---|---|
| *Co-creation Workshop* | The workshop has been organised during the event/presentation of "*Aerospace Delta 2030*", in the Next Delft.<br>The focus of the co-workshop was on megatrends: which megatrends are relevant to our regions, and which will have a significant effect on the aerospace domain. Inter-regional crossovers have been identified using the most relevant megatrends. Experiences, future regional trends & ambitions, and potential for collaboration between our aerospace regions will be shared. Our mutual goal is to anticipate to, contribute to, and benefit from these megatrends. |
| *Site visits* | Technology Park Ypenburg |
| | Airborne |
| | GTM Advanced Structures |
| | Unmanned Valley |
| | ESA-ESTEC |
| **Emilia-Romagna** | |
| *Co-creation Workshop* | The workshop has been organised during the event "Aerospace Innovative Ecosystem", the first day of #R2B2023 fair.<br>The focus of the co-workshop was on employment skills: there is the need for coordinated efforts in addressing skills gaps, enhancing training programs, attracting investment, and engaging the younger generation to ensure the long-term sustainability and growth of the aerospace sector across different regions. |
| *Site visits* | CIRI AEROSPACE |
| | ENAV training centre |
| | CURTI S.p.A. Costruzioni Meccaniche |

| | |
|---|---|
| | NPC SPACEMIND |
| | ANDALO' GIANNI srl |
| **Apulia** | |
| *Co-creation Workshop* | The workshop was organised during the event "*Drone Beyond 2023*" fair in Bari the 24th-25th of October. The discussion focused on "European test beds for researching and experimenting with new forms of mobility, such as urban air mobility". The facilities taken into consideration were:<br>• ER - CICLoPE<br>• ER - FLYTUN (FLYing TUNnel for UAM testing)*<br>• MADRID - CEUS (Test Center for Unmanned Systems<br>• OCCITANIA - Francazal Airport<br>• ZH - Unmanned Valley<br>• ZH - DronePort Rotterdam<br>• APULIA - Grottaglie Airport Test Bed |
| *Site visits* | Planetek Italia |
| | Grottaglie Airport Test Bed |
| | Leonardo Aerostructures (Grottaglie plant) |
| | Novotech |
| **Occitania** | |
| *Co-creation Workshop* | The workshop was organised at the B612 Building in Toulouse Metropole. It was decided to focus on the topic of "circular economy in aerospace". Therefore, one of the co-creation workshops was dedicated to circular economy and the visits of the second day were also oriented towards this specific focus.<br>It emerged that, for the five regions, the circular economy is a very thought provoking and stimulating topic but some of them are not really working on it and implementing it. Some of the regions have a really strong will but they don't really work on this topic. |
| *Site visits* | AIRBUS A350 Final Assembly Line plant |
| | VESO CONCEPT |
| | TARMAC AEROSAVE |
| **Madrid** | |
| *Co-creation Workshop* | The workshop "Role of universities in the regional innovation ecosystem" has been organised by Universidad Politécnica de Madrid and was held at the premises of the School of Aerospace Engineering.<br>During the final discussion, a strong focus has been put on the fact that |

| | |
|---|---|
| | it is very difficult for universities to retain students for PhD programs, post-doc positions and careers at University. Offers from the private companies are too attractive for young students and it is not easy to react in a proactive way, having a limited freedom on actions that could be put in practice from the University side.<br>Research lines of the departments are often rigid and based on the funding typologies that impose specific topics to be developed. Listening to the passions and interests of the students, giving them more freedom to act, could be a way to retain them, leveraging on their passion. |
| *Site visits* | OCCAM |
| | UPM Business Centre |
| | INTA |
| | ESA ESAC |
| | IDAERO |
| | INSTER |

To conclude, despite the varying levels of innovation readiness and the diverse stages of aerospace district development in each region, the project has successfully facilitated cooperation and knowledge exchange. The organization of five innovation exchange events, coupled with workshops, served as platforms for sharing insights and fostering collaboration within the aerospace sector. This has been obtained thanks to the concerted efforts of project partners, in collaboration with local agencies, clusters, and key stakeholders, that finally gave the opportunity to establish new interregional connections. These activities and the information collected during the co-creation workshops, together with the information related to the SWOT and TOWS analysis conducted in WP2 and reported in deliverable 2.3 (both in terms of regional analysis and common analysis), will serve as a solid starting point for the definition of the Joint Action Plan, that will be developed during WP3 and represents the final result of the project.

# Annex 1

During the co-creation workshop held in E-R, the representative partners of the five regions presented their own ecosystems and additionally they focused on their skills both in terms of strengths and weaknesses. In the following figures are reported the frameworks that each of the four hosted regions (Apulia, Madrid, Occitania and South Holland), presented during the workshop to report peculiarities of each ecosystem in terms of skills to the Emilia-Romagna regional stakeholders. For this reason, E-R did not show any framework during the workshop, because participants (namely stakeholders from E-R) will interact directly with the partners of the project. Furthermore, during the workshop, two clusters of the Region made a presentation specifically on the skill issue, related to aerospace.

The following figures (Figure 32 – 35) report quick information coming from each of the four hosted regions on skills in relation to the corresponding ecosystem. In particular answering this question: "*skills that you know are particularly relevant for aerospace in your region in terms of strength and weaknesses of your ecosystem*".

DTA DISTRETTO TECNOLOGICO AEROSPAZIALE

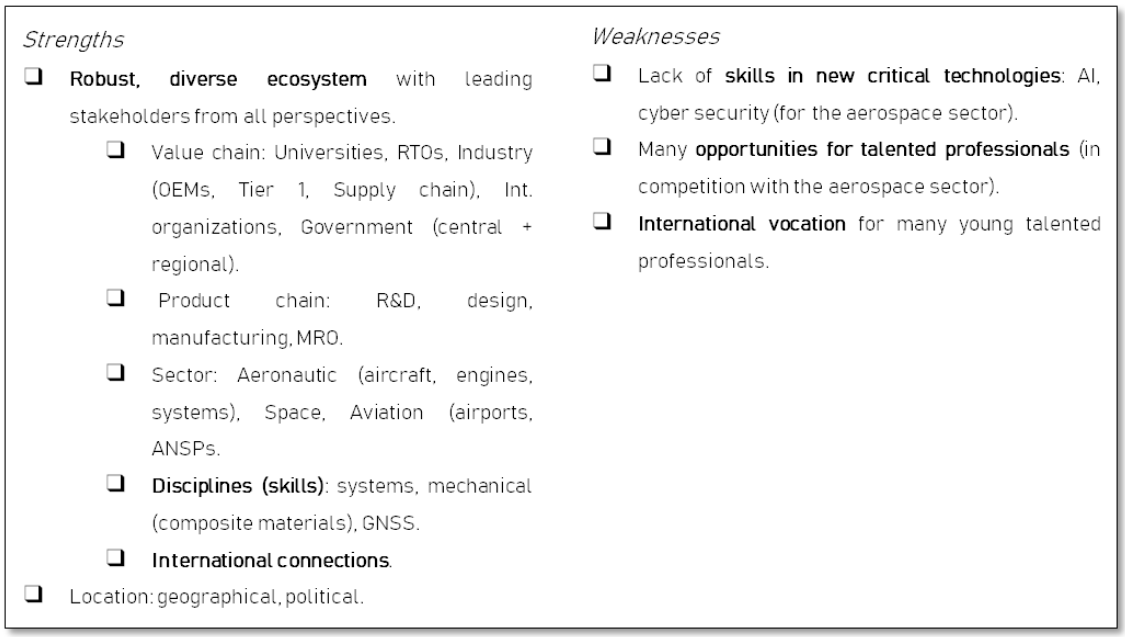
*Strengths*

- Presence of **large companies** inspired by the principle of global networking for the design and production: engine overhaul, helicopter structures centre of excellence, Avionics, composite structures processing, microsatellites and space components.
- A high concentration of **universities** and **research centers**.
- A **medium-high level of technical-scientific secondary education** (universities and higher technical institutes).
- **Investment in research infrastructures** for unmanned aerial platforms, space segment and composite and additive manufacturing production).

*Weaknesses*

- Low presence of **strategic functions** in local units of large companies.
- Low level of **technology and management skills** in SMEs.
- Difficulties in **recruiting specialists** due to incomplete training provision.
- Low level of **technology and management skills in SMEs**.

Figure 32. Skills and weaknesses of Apulia region



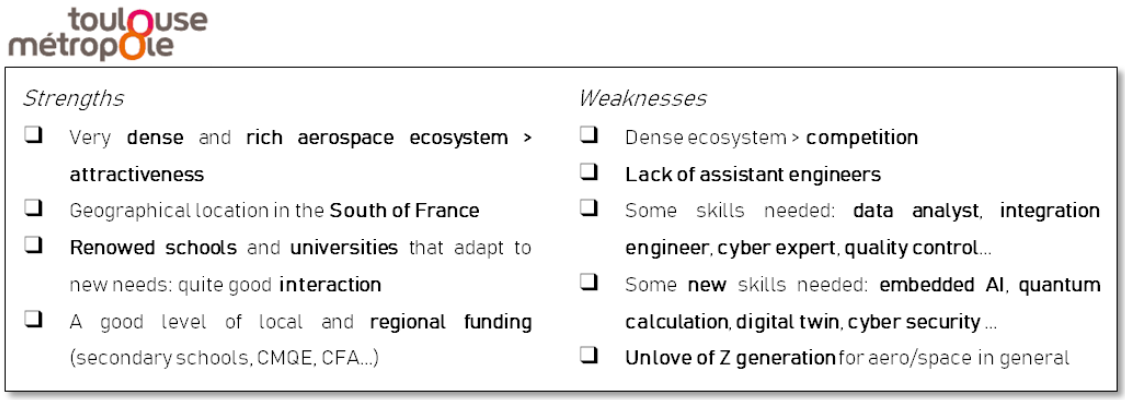
*Strengths*

- **Robust, diverse ecosystem** with leading stakeholders from all perspectives.
  - Value chain: Universities, RTOs, Industry (OEMs, Tier 1, Supply chain), Int. organizations, Government (central + regional).
  - Product chain: R&D, design, manufacturing, MRO.
  - Sector: Aeronautic (aircraft, engines, systems), Space, Aviation (airports, ANSPs.
  - **Disciplines (skills)**: systems, mechanical (composite materials), GNSS.
  - **International connections**.
- Location: geographical, political.

*Weaknesses*

- Lack of **skills in new critical technologies**: AI, cyber security (for the aerospace sector).
- Many **opportunities for talented professionals** (in competition with the aerospace sector).
- **International vocation** for many young talented professionals.

Figure 33. Skills and weaknesses of Madrid region.



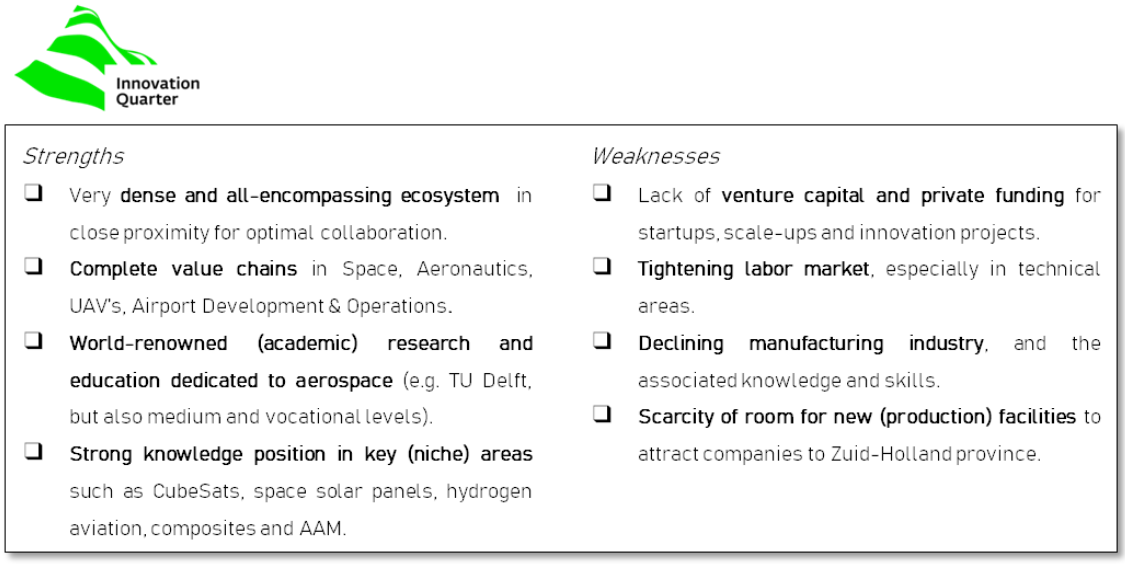
*Strengths*

- Very **dense** and **rich aerospace ecosystem** > **attractiveness**
- Geographical location in the **South of France**
- **Renowed schools** and **universities** that adapt to new needs: quite good **interaction**
- A good level of local and **regional funding** (secondary schools, CMQE, CFA...)

*Weaknesses*

- Dense ecosystem > **competition**
- **Lack of assistant engineers**
- Some skills needed: **data analyst**, **integration engineer**, **cyber expert**, **quality control**...
- Some **new** skills needed: **embedded AI**, **quantum calculation**, **digital twin**, **cyber security** ...
- **Unlove of Z generation** for aero/space in general

Figure 34. Skills and weaknesses of Occitania region.



*Strengths*

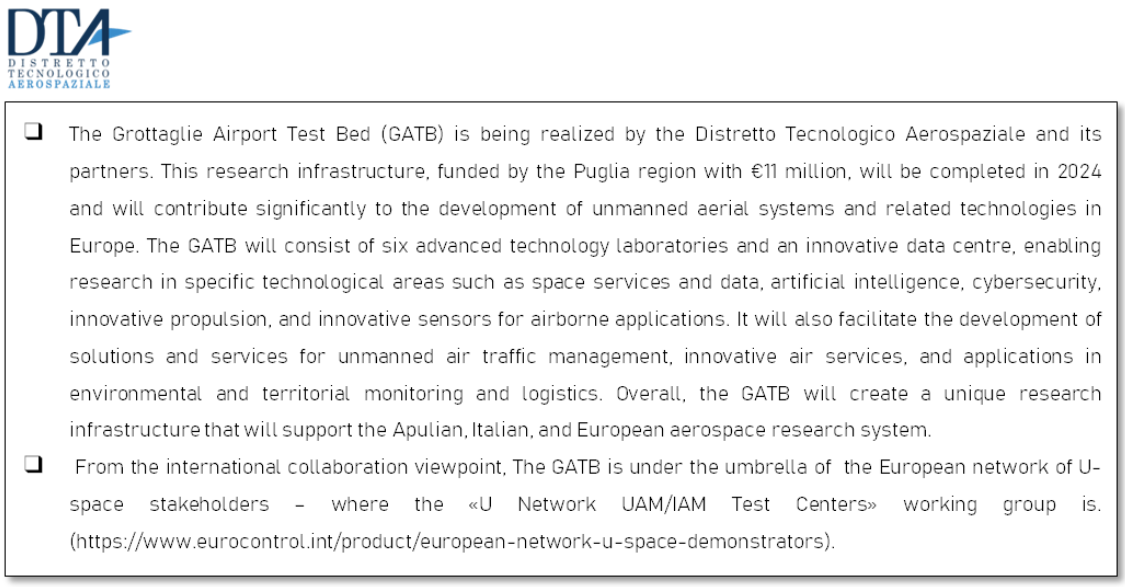
- Very **dense and all-encompassing ecosystem** in close proximity for optimal collaboration.
- **Complete value chains** in Space, Aeronautics, UAV's, Airport Development & Operations.
- **World-renowned (academic) research and education dedicated to aerospace** (e.g. TU Delft, but also medium and vocational levels).
- **Strong knowledge position in key (niche) areas** such as CubeSats, space solar panels, hydrogen aviation, composites and AAM.

*Weaknesses*

- Lack of **venture capital and private funding** for startups, scale-ups and innovation projects.
- **Tightening labor market**, especially in technical areas.
- **Declining manufacturing industry**, and the associated knowledge and skills.
- **Scarcity of room for new (production) facilities** to attract companies to Zuid-Holland province.

Figure 35. Skills and weaknesses of South Holland region.

During the workshop, to complete the information about ecosystems, each speaker presented success story relative to international collaboration (Figures 36 – 39). These are kept into consideration as a model of successful stories for the ongoing AD-ASTRA project. Also, in this case only the four hosted regions reported this information, as a starting point to discuss together with E-R regional stakeholders.



- The Grottaglie Airport Test Bed (GATB) is being realized by the Distretto Tecnologico Aerospaziale and its partners. This research infrastructure, funded by the Puglia region with €11 million, will be completed in 2024 and will contribute significantly to the development of unmanned aerial systems and related technologies in Europe. The GATB will consist of six advanced technology laboratories and an innovative data centre, enabling research in specific technological areas such as space services and data, artificial intelligence, cybersecurity, innovative propulsion, and innovative sensors for airborne applications. It will also facilitate the development of solutions and services for unmanned air traffic management, innovative air services, and applications in environmental and territorial monitoring and logistics. Overall, the GATB will create a unique research infrastructure that will support the Apulian, Italian, and European aerospace research system.
- From the international collaboration viewpoint, The GATB is under the umbrella of the European network of U-space stakeholders – where the «U Network UAM/IAM Test Centers» working group is. (https://www.eurocontrol.int/product/european-network-u-space-demonstrators).

Figure 36. International collaboration for Apulia region.

- GALILEO Service Center in Madrid
  - The European GNSS Service Centre (GSC) is an integral part of the European GNSS infrastructure and provides the single interface between the Galileo system and the users of the Galileo Open Service (OS), the High Accuracy Service (HAS) and the Commercial Authentication Service (CAS).
  - The European Union Agency for the Space Programme (EUSPA) is responsible for the GSC and is supported by Spain, which provides the Galileo Programme the necessary hosting GSC infrastructure and facilities.
  - The GSC is located in Madrid, within the National Institute of Aerospace Technologies (INTA) facilities.
- Galileo GCS (Ground Control Segment).
  - GMV (Madrid) was awarded the maintenance and update of the Galileo GCS, being used to operate the Galileo satellite constellation
- Second generation of the Galileo system (G2STB)
  - GMV has been selected by the European Space Agency (ESA) to develop the test bench for the G2STB.

Figure 37. International collaboration for Madrid region.

- UNIVERSEH: European Space University for Earth and Humanity
- 1° pan-European high level teaching and research programme for space.
- Started Nov 2020 / Alliance of 5 European universities (Toulouse/France, Lulea/Sweden, Krokow/Poland, Dusseldorf/Germany and Luxembourg) + Namur/Belgium & Roma/Italy.
- Coordinated by Toulouse Federal University (itself a federation of 5 schools and universities in the territory of Toulouse).
- Deals with many subjects: from science & engineering, to liberal arts & culture within space sector.
- Beyond UNIVERSEH: research and innovation entity of UNIVERSEH → policy roadmap for 2035 and a vision for 2050 in space.
- Varied missions and objectives: multilingualism, mobilities, entrepreneurship, skills developing with cross-sectorial curricula.

Figure 38. International collaboration for Occitania region.

Innovation Quarter

- "Connecting Space Regions' – collaboration between the German Federal State of Bremen, the Zuid-Holland province, the EU, Enterprise Europe Network together with SpaceNed and the Bremen space cluster organization Aviaspace Bremen. The project aims to develop and execute a joint space action program to strengthen industry and research collaboration on topics such as production ramp-up using smart manufacturing, smart & digital engineering, lightweight materials.
- Rotterdam The Hague Aiport – Hamburg Airport collaboration to realize a hydrogen aviation corridor between the two airports to accomodate (regional) sustainable flights. The airport organizations exchange knowledge and experience to prepare the aiport infrastructure for (liquified) hydrogen refueling.

Figure 39. International collaboration for South Holland region.