Aerospace Districts: Acceleration of the Strategic Transfer of Regional Advancements

Initial report on the SWOT analysis, relevant networks, and innovation barriers mitigation

D2.2 – Initial report on the SWOT analysis, relevant networks, and innovation barriers mitigation

Abstract:

Task 2.3 (*SWOT analysis*) aims at elaborating coherent SWOT in the different ecosystems. Each SWOT will be done by each local partner following a framework that is presented in this deliverable D2.2. This common framework will allow having a global and coherent view of the different ecosystems, allowing future connections or collaborations.

This task will be complemented by other 2 tasks (2.2 and 2.4) on external networks and on innovation barriers and mitigation measures, and overall these elaborations will be completed in two different phases corresponding to two different deliverables. In D2.2 *Initial report on the SWOT analysis, relevant networks, and innovation barriers mitigation*, the common framework for the SWOT analysis will be established and presented, in order to support each partner in the execution and completion of the SWOT analysis for each ecosystem. The framework includes four Strategic Business Areas and a dozen of Key Success Factors for each of them. The analysis will then be presented in that same deliverable, together with an analysis on external networks and on the innovation barriers and mitigation measures.

In the next deliverable D2.3 *Final report on the SWOT analysis, relevant networks, and innovation barriers mitigation*, the SWOT analysis can lead to the definition of the future potential for each partner and help elaborate a common scenario for the five partners of the consortium, in order to grow exploiting opportunities and external networks and overcome threats and innovation barriers.

Keywords:

Innovation, regions, aerospace, international cooperation, SWOT analysis.

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Table of contents

Acronyms and terminology

Term	Definition
E-R	Emilia-Romagna
ESA	European Space Agency
EU	European
HE	Horizon Europe
KSF	Key Success Factor
OEM	Original Equipment Manufacturer
SBA	Strategic Business Area
SWOT	Strengths, Weaknesses, Opportunities and Threats
SDGs	Sustainable Development Goals

List of figures

List of tables

1 Introduction

The AD-ASTRA project deals with the collaboration of five European (EU) regions with a shared interest in fostering their aerospace sectors. According to the European Innovation Scoreboard 2023 [1], innovation performance in Europe has increased by about 8.5% between 2016 and 2023. The EIE work programme under Horizon Europe (HE) aims to feed this increment and make it better and better. This is also the aim of the AD-ASTRA project.

The five regions of the AD-ASTRA project have different innovation capacity profiles, assets, and capabilities. One of these regions is an Innovation Leader (*i.e.*, South Holland) and three of them are Strong Innovators (*i.e.*, Occitania, Emilia-Romagna and Madrid). Three of these four regions have a consolidated aerospace district and the Emilia-Romagna region has an internationally recognized industrial sector (*e.g.*, automotive and motorsport, agri-food, manufacturing, automation), but a less developed aerospace district, and a marked interest in expanding it. To finish, although holding a soundly structured aerospace district referenced at a national and an international level, the Apulian region is overall reported in the scoreboard as a Moderate Innovator.

After elaborating an inventory of the different aerospace ecosystems of the five regions and their well-established interconnections, after working on a list of future regional megatrends and scoring them for each of the regions, it was now time to study the strengths and weaknesses of the partners' regions, but also their opportunities and threats. A common framework allowing a global view of the five ecosystems was used for this SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis and will make future connections or collaborations more easily put in place.

What's more, once the competitive advantages and the critical issues of the ecosystems have been studied, such issues can be seen as innovation barriers, themselves weaknesses for the regions. The regions that are disadvantaged on some specific topics could be inspired or helped by stronger regions on the same topics. Therefore, working on mitigation measures is essential in order to partially overcome the critical issues and reach the regions' full potential.

To finish, interregional cooperation will raise awareness about which barriers need to be addressed and mitigated. Considering advantages or good practices from other regions or participating in internationally relevant networks can be seen as solutions for overcoming these weaknesses.

The purpose of this initial SWOT analysis is to have an overview of each of the five ecosystems and start thinking about innovation barriers and mitigation measures.

Eventually, the final SWOT analysis will go deeper into details of the strong and weak topics for each region and the possible mitigation measures or relevant networks to be put in place in order to have some solutions that can become part of the Final Action Plan. This initial SWOT is therefore seen as the beginning of such a process.

[1] Regional Innovation Scoreboard 2023 - Publications Office of the EU (europa.eu)

2 Definition and identification of the SWOT

2.1 Definition of SWOT

SWOT analysis is a strategic tool used to evaluate the position of an organisation, a territory or a sector and develop strategic planning. This analysis assesses internal strengths and weaknesses and external opportunities and threats. It estimates the current and future potential of the above mentioned structures. In a word, SWOT analysis is a tool for planning purposes widely used at the industrial level.

2.2 Objective of the SWOT analysis for AD-ASTRA

The SWOT analysis for AD-ASTRA assesses the strengths, weaknesses, opportunities, and threats of each of the aerospace ecosystems of the five partner regions of the project: ART-ER for Emilia-Romagna, UPM for Madrid Community region, DTA for Apulia, Toulouse Métropole for Occitania and IQ for South-Holland.

The aim is to **elaborate coherent SWOT in the different aerospace ecosystems**. Each SWOT was done by the local partner for their own ecosystem following a common framework that allows a global view of the five ecosystems.

The objective of the AD-ASTRA SWOT analysis is to get to know the five ecosystems in a precise way, with their own strengths and weaknesses, be able to compare them on a coherent basis, try to find common or on the contrary opposite strengths or weaknesses, possible links between the regions, etc. It should be seen as a **tool for strategic analysis**, thus enabling the consortium to build a possible way towards future connections or collaborations.

2.3 Identifying the relevant items for the analysis

For the analysis to be coherent for the five different ecosystems, it was necessary to **establish a common framework**. This framework aimed at assessing the exact same items for the five ecosystems. These items had to be identified and defined by Toulouse Métropole who was the leader of this deliverable; moreover, they aimed at understanding what elements, practices or attributes contribute to the success of the regional aerospace ecosystems.

The items in the common framework cover only strengths and weaknesses. Opportunities and threats need to be differentiated for and by each of the partners according to their own ecosystem, their knowledge of it, the results of their analysis, the position of their ecosystem in the vaster national or international context, etc.

2.4 Methodology of the analysis

2.4.1 Definition of the SBAs and KSFs

For the purpose of the analysis and for the organisation of a coherent SWOT, **four main Strategic Business Areas (SBAs) were identified**. They cover the entirety of the aerospace ecosystem to be analysed. Then each of the SBA was divided into **Key Success Factors (KSFs)**.

SBAs (par. 2.4.1.1 and Appendix 1) and KSFs (par. 2.4.1.2 and Appendix 1) represent the base for this study; they had to be carefully elaborated since they support the whole analysis.

2.4.1.1 SBAs

Aerospace is a vast sector; in order to be able to assess the strengths and weaknesses in the five partner regions in a comparable way, it was necessary to divide such a vast area into workable units. This gave birth to the four SBAs.

We chose to follow the identification of the different business areas that is used by the famous Toulouse competitiveness cluster Aerospace Valley, namely **Aeronautics, Space** and **Drones**. However we felt it was necessary to add another more general area that would allow us to identify some common and side elements that can interact with and be supportive of the whole aerospace area and its innovation capabilities. Even though it is not technically speaking a "Business Area", we still call it so for the purpose of the study; we named that particular SBA "**Global Support**".

It has to be noted that the consortium decided not to take into account anything that is related to defence. The reasons for such a decision are the following: on the one hand, and for understandable reasons, it can be difficult to find precise and reliable information on the aerospace defence sector. On the other hand, the defence sector often represents a "side market" in our ecosystems: quite a few of the businesses involved in civil aerospace (aeronautics, space or drones) in the five regions can work both for the military and the civil areas. Therefore, scoring both defence and civil industries would be redundant.

2.4.1.2 KSFs

Inside each SBA it was necessary to define KSFs that would enable us to measure the strengths and weaknesses of each region. Some of them are similar in several SBAs, others are more adapted to one single particular SBA. Each SBA was divided into nine to eleven KSFs, each related to specific aspects of the sector. For example, "Research and Development" can be applied to each of the three business areas, and "Hiring Difficulties Mitigation" is applied to the Global Support. They will be further detailed in the next part of this deliverable and in the Annexes.

2.4.2 Scoring definition

The common scoring that was proposed by Toulouse Métropole was between -2 and +2 with a range of five possible scores: -2 / -1 / 0 / 1 / 2 for each of the KSFs and in each of the SBAs. The interest of this negative/positive scoring is that it allows a clear and immediate view of below average results on bar charts.

This scoring pattern was validated by all the partners during one of the partners' General Assemblies and therefore put into service once the KSF were validated.

In order to be able to have a coherent scoring, one or two questions were associated with each of the KSFs in each of the SBAs (see Appendix 1). For each KSF of each SBA, each partner had to **give the score** for its region. However, a single number may have a misleading meaning, and for this reason each partner had to **explain the reason(s)** why a specific scoring has been chosen in one or two sentences. Moreover they had to take into account the elements that are **specific to their territory** (size, population, Gross Regional Product, etc.). For this purpose, Table 1 contains very basic data about each territory:

Table 1. General information about each region of AD-ASTRA consortium

	E-R	Madrid	Apulia	Occitania	South Holland
Population (million)	4,4	6,7	4	5,9	3,7
Size (KM2)	22 500	8 000	19 300	72 000	3 300
GDP per capita (K€) in 2018	36,2	35	19	29	44

It must be said, nonetheless, that the scoring is the result of a qualitative and inevitable personal evaluation of the partners, or of the persons involved in the scoring with the partners and should not be considered as fully exhaustive or completely representative of the whole ecosystem.

2.4.3 Key Success Factors and framework

The list of KSFs amounts to a total of 26 items, some of them being used up to three times in three different SBAs. Each item was accompanied by one or two questions dedicated to the SBA into which the KSF was to be measured. It has to be noted that the KSFs prepared for the Global Support section were different from the ones used for the three industries, namely Aeronautics, Space and Drones. Table 2 shows the list of all the KSFs and the SBAs in which they were used. Black spots represent KSFs that are not applied in a specific SBA.

Table 2. List of the four SBAs and the corresponding KSFs

	Aeronautics	Space	Drones	Global support
R&D				
Business				
Education				
Supply chain				
Employment				
Economic weight				
Political influence				
Circular economy				
Manufacturers				
Geographical position				
Strategic organizations				
Upstream economy				
Downstream economy				
Actors				
Test infrastructures				
Regulation				
Regulatory Lobbies				
Residency services for businesses				
Structures				
Airports				
ACI members				
Financial support possibilities				
Energy				
Enabling actors				
Side elements				
Hiring difficulties mitigation				

Table 3 reports some examples of questions that were associated with the KSFs:

Table 3. List of questions identified to assign a score to each KSF

KSF	Question	Score (-2 to +2)	Reasons for score
Research and Development	Compared to the companies working in the same sector, are there many research centres or labs dedicated to aeronautics /space /drones? Moreover, what is the portion of private and public research centres?	…	…
Energy	Are there any offers in the territory for different aerospace/drones propulsion possibilities: electric, SAF, hydrogen?	…	…

2.4.4 Defining Opportunities and Threats

Once each partner had filled in the questionnaire for his ecosystem, the first part of the working pattern was considered to be completed. The next step was twofold and the two concomitant actions that were taken at that step are presented in Table 4:

Table 4. Steps addressed to identify opportunities and threats

Defining opportunities and threats	Analysing the general results
Each partner analysed their own scoring and results in the light of opportunities and threats, in order to produce their own SWOT analysis. After defining, measuring and putting together the strengths and weaknesses for each SBA, the partners could work on the External elements and define opportunities and threats within their own local context. Each **SWOT analysis** was then made and transcribed in detail by and for each partner.	Alongside this individual SWOT analysis, Toulouse Métropole also gathered all the KSF questionnaires and scoring. Once they were all gathered, Toulouse Métropole worked on a common analysis of the KSFs of all the partners: • sum up the results for each SBA and each partner, • cross analyse the results by partner (1 partner for all SBAs), • cross analyse the results by SBA (1 SBA for all the partners). This general analysis is to be found in part 4 of this deliverable.

3 SWOTs by region

Before realising the "SWOT table" (of which a schematic version has been added in Appendix 2), and for an easier reading, a coloured table reporting the assigned scores of each category was realised for each region.

Apart from showing the scores for each category, a colour was also assigned to each score, which improved the visualisation of each regional situation.

The black colour was maintained to all the NOT APPLICABLE fields.

3.1 SWOT for E-R

The assigned scores for the E-R region are reported in Table 5:

Table 5. Assigned scores of E-R

	Aeronautics	Space	Drones	Global support
Research and Development	1	1	-1	
Business	1	0	-1	
Education	2	2	-1	
Supply chain	2	0		
Employment	0	0	0	
Economic weight	0	0	0	
Political influence	1	2	0	
Circular economy	1	1	1	
Manufacturers	-1			
Geographical position	2			
Strategic organisations	-1			
Upstream economy		0		
Downstream economy		1		
Actors		-2		
Test infrastructures			0	
Regulation			-1	
Regulatory Lobbies			-2	
Residency services for businesses				1
Structures				-1
Airports				0
ACI members				-2
Financial support possibilities				0
Energy				-1
Enabling actors				1
Side elements				-1
Hiring difficulties mitigation				1

Looking more in detail to the results of the previous table, it is possible to observe that the stronger sector in E-R is the aeronautic one while the weaker is the "drones" one.

STRENGTHS

- Education in aeronautics and space sectors due to the presence of four public universities that offer high-level education courses for both the disciplines.
- Research and development in both aeronautic and space sectors due to the presence of numerous public and private research centres.
- The business related to the aerospace sector is an important strength of E-R due to the presence of about 178 companies.
- Political influence for aeronautics and space sectors which are both included in the S3 regional strategy.
- Circular economy for aeronautics, space and drone sectors; indeed, there are numerous subjects/manufacturers dealing with advanced materials, fuel cells, hydrogen propulsion, etc..
- The geographical position of Guglielmo Marconi airport which is reinforced by high-speed railway lines.
- The downstream economy is supported by the presence of 9 companies dealing with ICT and downstream applications. Actually this sector is growing rapidly due to the regional investment on HPC and Big Data Management.
- Residency services for business that include 39 Accelerators and Incubators born to improve the regional offer of services to start-ups and develop relations with national and foreign institutions.
- Presence of regional and national enabling public and private actors in the aerospace sector. In the first case it is possible to mention ANSER, IR4I, Clust-ER MECH and Fly.er while in the second case the National Technology Cluster on Aerospace (CTNA), AIAD, AIPAS and ASAS.
- Regional law for talent attractiveness: hiring is overall an issue for the E-R companies, in particular in the technical fields like aerospace. For this reason, in 2023 the Regional government declared a new law for talent attractiveness.

WEAKNESSES

- Manufacturing in the aeronautic sector is almost absent (a part for components and composites producer). In the E-R region there is only one company OEM which realises a particular type of rotorcraft having a ballistic parachute.
- "Research and Development", "Business" and "Education" are quite underdeveloped in the drones sector. Indeed, there are very few institutions dealing directly with design, realisation and testing of drones and other related components.
- Actors from European Space programmes and Regulatory Lobbies are almost absent in E-R. The only program important to cite is Nereus.

- Absence of regional policies dealing with regulation in the field of drones use.
- There is no experimentation or test infrastructures in E-R in the field of drones at present.
- The operative part regarding alternative energy sources is still underdeveloped in E-R.
- There are only a few events regarding the aerospace sector; in general thus the knowledge of this sector is limited against the E-R population.
- There is only one ACI member on E-R territory.

OPPORTUNITIES

- The inauguration of HPC – LEONARDO and the realisation of Tecnopolo Manifattura - Data Valley Hub represent an important opportunity for growth in numerous fields of aerospace.
- The organisation of the work table on Hydrogen for air mobility is an opportunity to enhance the cooperation and the development of this sector.
- Policy interest in the aerospace sector is an opportunity to receive funding and move forward. Moreover, this aspect is also a good strategy to enhance employment and the economic weight in E-R.
- The presence of high-level universities (such as Alma Mater Studiorum which is in the 154 places of QS World University Rankings 2024) in E-R territory represents overall an opportunity to increase the number of talents in the region and the number of spin-off/start-ups courses dedicated to the drone sector.
- The economic and political weight of E-R at a national level represents an opportunity for all SBAs considered in this study.
- The strongly affirmed "motor valley" and the future "data valley" represent a strong opportunity to exploit technologies in the SBA considered in this study.

THREATS

- The development of the aerospace sector could move interest and money from the affirmed sectors to the new ones.
- There are other regions/countries moving faster in developing the capacity of aeronautics, space and drones.
- The absence of big actors, headquarters and big companies can slow the development of these sectors.
- A low number of skilled people could challenge technological development in the above mentioned SBAs.

3.2 SWOT for Madrid

The assigned scores for Madrid are reported in Table 6:

Table 6. Assigned scores of Madrid

	Aeronautics	Space	Drones	Global support
Research and Development	1	1	-1	
Business	1	1	-1	
Education	2	2	0	
Supply chain	2	2		
Employment	2	1	-2	
Economic weight	2	1	-2	
Political influence	0	0	0	
Circular economy	1	1	-1	
Manufacturers	2			
Geographical position	2			
Strategic organizations	1			
Upstream economy		2		
Downstream economy		2		
Actors		2		
Test infrastructures			-2	
Regulation			2	
Regulatory Lobbies			-2	
Residency services for businesses				0
Structures				1
Airports				-1
ACI members				2
Financial support possibilities				0
Energy				0
Enabling actors				1
Side elements				-1
Hiring difficulties mitigation				-2

Looking more in detail to the results of the previous table, it is possible to observe that the stronger sector in Madrid region is aeronautics and space, being the weaker the "drones" sector.

STRENGTHS

- Complete value chain (Supply chain and OEMs) in both aeronautics and space sectors, as Madrid region is home to a large number of component, manufacturing and support companies related to both sectors of the industry.
- Research and development in both aeronautics and space sectors, with a good number of research institutes and public centres, even large and important ones such as the Instituto Nacional de Técnica Aeroespacial (INTA).
- Education in aeronautics and space sectors due to the presence of five large and prestigious public universities, plus a number of private universities, that offer high-level education courses for both disciplines, and have strong research capabilities.
- Geographical position: Madrid is located in an absolutely central position, both geographically and in terms of resources. It is the capital of the country, and has the Adolfo Suarez-Barajas airport, the largest airport in Spain, nearby.
- Both Employment and Economic weight, As a whole, the Defense, Security, Aeronautics and Space Technology companies billed a total of 11,838 million in 2018. The universities are in constant communication with the large companies in the sector to try to modify supply and demand in accordance with the capacities of the sector, so that it can absorb new graduates. The Spanish aerospace industry orbits over Madrid: The region groups 95% of this sector.
- Space actors have a large presence in the sector in the Madrid region, with the presence of big European Space programs such as: Egnos, Galileo, Copernicus, ESA Space Exploration, etc…

WEAKNESSES

- Lack of skills in new critical technologies: AI, cybersecurity (for the aerospace sector).
- Many opportunities for talented professionals (in competition with the aerospace sector).
- International vocation for many young talented professionals.
- Employment, economic weight and business are quite underdeveloped in the drones sector. Most of the companies or educational centres belong to start-ups and small training companies that seek to gain a foothold in this sector and grow.
- There is no experimentation or test infrastructures for drones in the Madrid region.
- Regarding drones, although all the guidelines and regulations are still being developed, currently in Spain the *Agencia Estatal de Seguridad Aérea* (AESA) is in charge of regulation. However, there are no proper Regulatory Lobbies for drones.

- There are no relevant hiring difficulties mitigations taken by the Spanish government or the authorities to mitigate these kinds of problems in the aerospace sector.

OPPORTUNITIES

- The greater weight gained by some of the companies in the aeronautical sector, such as GMV with the GALILEO operation, can represent a great opportunity in terms of growth.
- The presence of a large number of prestigious universities can be an important point for improving aspects related to drones. They have teams of students dedicated to the manufacture and maintenance of drones, as well as participation in various programs and projects related to them. This could be a great opportunity to invest in the growth of this sector, in all aspects.
- Being the geographical and political centre (the capital of the country), an increase in the region's activity in the aerospace sector is usually reflected at a national level, which represents an important opportunity for the growth of the sector.
- The birth of the Spanish Space Agency represents a milestone in the space sector. Still based in *Sevilla* (*Andalucía*), it represents an incredible opportunity for innovation and opportunities. In addition, it will mean an important political, social and economic implication for the entire country.

THREATS

- There are other regions/countries moving faster in developing the capacity of aeronautics, space and drones.
- Although the Aerospace sector has enormous visibility and weight in the region, excessive specialisation in certain specific branches of the sector can lead to a significant threat to its growth.
- The implementation of the headquarters of the Spanish Space Agency in Seville may not only cause a lower growth of new companies and projects in the region but may even lead to a migration of existing ones.

3.3 SWOT for Apulia

The assigned scores for Apulia region are reported in Table 7:

Table 7. Assigned scores of Apulia

	Aeronautics	Space	Drones	Global support
Research and Development	1	0	-1	
Business	-2	1	-1	
Education	1	1	1	
Supply chain	1	-1		
Employment	1	-1	-1	
Economic weight	0	-1	-1	
Political influence	2	2	-1	
Circular economy	0	-2	0	
Manufacturers	2			
Geographical position	1			
Strategic organizations	-2			
Upstream economy		2		
Downstream economy		2		
Actors		2		
Test infrastructures			0	
Regulation			-2	
Regulatory Lobbies			-2	
Residency services for businesses				0
Structures				1
Airports				-1
ACI members				-2
Financial support possibilities				1
Energy				0
Enabling actors				2
Side elements				2
Hiring difficulties mitigation				-2

STRENGTHS

- Political influence: The regional strategy for S3 encompasses aeronautics and space sectors. Currently, the Apulia Region is leading an ongoing process of internationalisation. Additionally, a bold vision exists to establish an aerospace industrial park at the *Grottaglie* airport in Taranto, Italy's first and only spaceport. This endeavour positions *Grottaglie* as a candidate to become one of the European centres for reusable space transport systems.
- Education: a complete university programme in Aerospace Engineering is present in the Region. The Polytechnic of Bari provides a Bachelor of Science program in Aerospace Systems Engineering. The University of *Salento* also offers a Master of Science program in Aerospace Engineering. The Polytechnic of *Bari* and the University of *Bari* have collaborated to offer a joint doctoral course in aerospace engineering. Another option is the Higher Technical Institute of Aerospace.
- Supply chain: The region boasts the presence of prominent multinational corporations that are driven by the principle of global networking, focusing on the design and production of various parts, components, and subsystems. In particular, there is an established engine overhaul centre of excellence located at Avio Aero in *Brindisi*, along with a centre of excellence specialising in helicopter structures with a focus on composites at Leonardo *Brindisi*. Additionally, Leonardo in *Foggia* (Boeing 787 tailplanes) and *Grottaglie* (Barrel) house centres of excellence in composite processing.
- Enabling actors: the Aerospace Technology District (DTA) continues to play a significant role and is capable of supra-regional cooperation.
- Side Elements: several events and technical dissemination centres are organised and dedicated to the SBAs such as Mediterranean Aerospace Matching (bi-annual regional congress) and Drones Beyond (an annual expo for drones)
- Financial support possibilities: over the past few years, the Regional government has successfully facilitated business investments in the aerospace sector, employing a combination of publicly funded initiatives and incentivisation measures.
- R&D: the existence and ongoing expansion of a research system characterised by unique capabilities.
- Downstream economy: in the European market for earth observation services, several companies in the Region exhibit a commendable degree of maturity and competitiveness.

WEAKNESSES

- Employment: insufficient presence of strategic capabilities within the regional divisions of major corporations. Challenges in attracting and retaining specialised professionals due to other markets' attractiveness. Insufficiency in the availability of specialised human resources.
- Hiring: there is currently a lack of proactive measures taken by businesses and authorities in the Region to address the hiring challenges within the aerospace sector despite the absence of significant obstacles in recruiting suitable candidates.

OPPORTUNITIES

- Geographical position: strategically situated in the central region of the Mediterranean, the geopolitical location offers significant advantages.
- Structures: within a specific timeframe, the *Grottaglie* Airport Test Bed (GATB) will be established to evaluate and advance novel aerial platforms, incorporating a beyond visual line of sight (BVLOS) corridor extending towards the Ionian sea. Additionally, an ambitious initiative is underway to establish an aerospace industrial park at *Grottaglie* Airport in *Taranto*, Italy, which can potentially become Europe's primary hub for reusable space transportation systems, representing the nation's sole spaceport.
- Upstream economy: the region exhibits substantial proficiency in microsatellites and space components, particularly emphasising the design and manufacture of electrical space propulsion systems.
- Test infrastructures: implementing the *Grottaglie* Airport Test Bed (GATB) infrastructure for testing and developing new aerial platforms, including a Beyond Visual Line of Sight (BVLOS) corridor leading towards the Ionian sea, is projected to be completed within a year.
- Residency services for businesses: in recent years, there has been the boasting of many incubators, accelerators, and other services tailored to support the growth of start-ups and scale-ups. Esteemed examples include ESA BIC *Brindisi*, Bari Open Innovation Hub (BOIH), Boosting Innovation iN PoliBA (BINP), and *Puglia Sviluppo*.
- Energy: the Region's primary focus lies in developing the hydrogen sector, intending to cultivate a hydrogen valley within Europe to facilitate the transition of the hard-to-abate sector. Additionally, certain national programs in aeronautics are dedicated exclusively to sustainable aviation initiatives.
- Airport: there are currently four operational airports, with the *Grottaglie* airport standing out as the foremost among them. This distinction arises from its unique status as Italy's inaugural and sole spaceport, strategically capitalising on the commercial space economy.
- Business: the commencement of the ESA Business Incubator Center (BIC) in *Brindisi* is scheduled for October 2023. This establishment aims to facilitate the

emergence of innovative start-ups primarily dedicated to downstream space services and drone services.

- Circular economy: sustainable aviation stands as the foremost priority for all aeronautics-centric initiatives. Numerous projects within the drone sector are dedicated to climate monitoring and the mitigation of adverse effects.

THREATS

- Economic weight: the Region needs to work in the areas of infrastructure provision, as well as to reduce the gap in the distance to national strategic decision-making centres. Companies' competitiveness is sometimes compromised due to insufficient investment in innovation and difficulty accessing credit. Additionally, there is a concentration of turnover on a limited number of customers.
- Strategic organisations: the Region currently lacks the participation of European strategic stakeholders, resulting in a deficiency of a comprehensive and cohesive strategy for the execution of aerospace research endeavours.
- Space actors: no actors from the big European space programmes are present in the Region.
- Drone regulation and lobbies: the region lacks regulatory authorities and lobbies for defining new rules for the drone sector.
- Airport Council International members: no members.

3.4 SWOT for Occitania

The assigned scores for Occitania region are reported in Table 8:

Table 8. Assigned scores of Occitania

	Aeronautics	Space	Drones	Global support
Research and Development	2	2	2	
Business	2	2	1	
Education	2	2	1	
Supply chain	2	2		
Employment	2	2	0	
Economic weight	2	0	-1	
Political influence	2	2	2	
Circular economy	0	0	-1	
Manufacturers	2			
Geographical position	0			
Strategic organizations	1			
Upstream economy		2		
Downstream economy		2		
Actors		2		
Test infrastructures			1	
Regulation			1	
Regulatory Lobbies			1	
Residency services for businesses				2
Structures				2
Airports				2
ACI members				2
Financial support possibilities				0
Energy				1
Enabling actors				2
Side elements				2
Hiring difficulties mitigation				1

STRENGTHS

- Research and development in all three industrial sectors due to the presence of many public laboratories, including CNES and ONERA.
- Businesses, Supply chain and Employment in Aeronautics and Space sectors with the presence of Airbus Final Assembly Line, and the whole integrated supply chain with OEM like Thalès or Safran and a lot of SMEs.
- Education in Aeronautics and Space sectors with famous engineering schools and universities in the region and the public / private Sirius Chair.
- Manufacturers and Economic Weight in Aeronautics with Airbus FAL and some smaller airplane manufacturers.
- Upstream, Downstream economy and Actors in the Space sector with Airbus Defence and Space or Thales Alenia Space, plus a few servers and start-ups using cloud data and ESSP operating signals.
- Political influence of Aeronautics, Space and Drones with the presence of NATO space centre and French Space Command, and Aerospace Valley on the territory. Toulouse is part of the Ariane cities community.
- Residency services for businesses offered by Toulouse Metropole and other cities in the region with a high level of services.
- Strong aerospace structures with many airfields, 16 Airports and 9 ACI members in the region.
- Enabling actors and side elements with several clusters both for aerospace or side activities, and many events and museums dedicated to the sector like Cité de l'Espace or Aeroscopia.

WEAKNESSES

- Circular economy in the three sectors is getting structured, but there is still a lot to do.
- Economic weight of Space and Drones, quite important in Toulouse particularly for space, but not in the region.
- Aerospace is costly: despite important regional funding, financial support possibilities can be insufficient and lack coordination between all the levels (regional, national, European), funding is partly national and not private enough.
- Hiring difficulties in the aeronautics sector despite the presence of skilled workforce and a good level of mitigation measures and employment in drones is low compared to other sectors.
- Airbus headquarters are in Toulouse but Airbus R&D is not in Occitania.

OPPORTUNITIES

- Occitania has a very dense and very rich aerospace ecosystem, with some international structures like the NATO Space Center, which makes Occitania a very attractive region with (new businesses and 50 000 newcomers every year, including aerospace businesses from GB after Brexit). A lot of skilled workforce in the territory.
- A strong industrial culture sticks to the French political will to become more independent.
- French "Loi Climat Résilience" triggers a greener industrial transformation and Occitania aerospace industry will pave the way for other regions and industries.
- Many opportunities around sustainable aviation and SAF: new jobs are created and the sector is growing.
- New skills in regional training facilities like e-VTOL, cyber activities, maintenance, hydrogen… that attract new students.
- Fast developing space sector with a lot of new start-ups.
- Cross-fertilization between sectors is beginning, particularly with space (ex: space for health).

THREATS

- Being a leading aerospace region can bring self-satisfaction and a lack of anticipation.
- As Toulouse and Montpellier are not capital cities, access and infrastructures can be insufficient and this can dampen newcomers' arrivals.
- A dense aerospace ecosystem centred around a few big purchasers can lack the variety and innovation incentives that would make it stronger.
- Some aerospace industries could leave the region for several reasons: French "Loi Climat Résilience" and urban regulation when a lot of land space is required, international competition on funding opportunities and with lower income countries for manufacturing, soaring energy costs, hiring difficulties, etc…
- Airbus international governance could weaken its historical regional roots.
- Brexit led to a decline in strong business capabilities with British firms, which poses a threat to the value chain.
- Slow development of the drones sector, with no real public test beds, could lead to this industry turning away from Occitania.

3.5 SWOT for South Holland

The assigned scores for South Holland region are reported in Table 9:

Table 9. Assigned scores of South Holland

	Aeronautics	Space	Drones	Global support
Research and Development	2	2	2	
Business	1	1	2	
Education	2	1	2	
Supply chain	0	0		
Employment	0	0	1	
Economic weight	0	-1	-1	
Political influence	1	-1	1	
Circular economy	2	-1	1	
Manufacturers	0			
Geographical position	1			
Strategic organizations	0			
Upstream economy		2		
Downstream economy		2		
Actors		2		
Test infrastructures			1	
Regulation			1	
Regulatory Lobbies			1	
Residency services for businesses				1
Structures				2
Airports				-2
ACI members				2
Financial support possibilities				0
Energy				2
Enabling actors				2
Side elements				-1
Hiring difficulties mitigation				1

STRENGTHS

- The creation and testing of new knowledge and technology through Research and development in all 3 subsectors is well established through numerous hotspots housing multiple well renowned R&D facilities, both private and public.
- Around 200 private businesses (mostly SME's) are clustered at dedicated hotspots throughout the Zuid-Holland region, especially in the drone and space sectors.
- Top ranked education in Aerospace Engineering on all levels is an important backbone for the regional aerospace ecosystem, providing knowledge, an innovation infrastructure in the region and international collaboration.
- The ESTEC facility in Noordwijk and Galileo Reference Center are important space actors in connecting regional space businesses to ESA programmes and to drive R&D.
- Circular Economy has become one of the top priorities, especially in the aeronautics sector, building on the regional and national knowledge and expertise in composites.
- There is a strong foundation for aerospace R&D, collaboration projects and cross-sectorial initiatives with an established innovation ecosystem consisting of several aerospace focused fieldlabs and hotspots as enabling actors (i.e. Public-Private Partnerships).
- The region offers research, expertise, knowledge, and infrastructures for the different aeronautics and drone propulsion and energy technologies.

WEAKNESSES

- The regional aerospace sectors struggle significantly with attracting and retaining talent and overall (technical) employment, competing against the growing semicon and medtech sectors.
- Although ESTEC is located in the region, the limited national space budget and ESA contribution together with an inadequate regulatory space lobby and political influence result in limited access to European space programmes.
- There is a lack of regional or national public and/or private funding options as financial support for start- and scale-ups, and SMEs.
- Supportive regulation and legislation in the drone domain lack behind in accommodating growth of the sector in areas such as testing activities and demonstrating applications.
- The downstream space sector is quite fragmented with mostly isolated businesses which hampers overall growth in a thriving sector.
- With only one (commercial) airport, the testing and/or demonstration infrastructure for aeronautics is still underdeveloped in the region.

- The economic weight of the space and drone sectors in the Zuid-Holland region relative to other high tech sectors such as maritime technology and medtech is limited.

OPPORTUNITIES

- The National Growth Fund project 'Aviation in Transition' has yielded several innovation projects in the region surrounding hydrogen (propulsion systems) and advanced lightweight materials.
- More dedicated programmes to improve the valorisation of high value knowledge and IP present at educational and R&D institutions in the region, especially in the space and aeronautics sectors.
- The Long-Term Space Agenda of the national government is a first step in offerring a stronger foundation for national space projects and programs, and for international collaboration.
- Further develop niche products and systems for the New Space economy with a foreseen growth in demand for small- and CubeSats, subsystems and/or components.
- Improve collaboration within the innovation ecosystem in the region on complementary or overlapping topics within the 3 subsectors and with closely related high tech sectors that share technological areas to be able to better support businesses.
- Capitalize on the growing need for a Circular Economy by developing circular composite manufacturing processes, materials and components for aviation.

THREATS

- A growing number of manufacturing companies, especially in the aeronautic sector are relocating to different regions or (low cost) countries, taking manufacturing knowledge and expertise with them.
- The absence of regional space companies in European space programmes due to the limited national space budget can result in the loss of the competitive (knowledge) position on several strategic topics and technologies.
- Lacking regulatory and legislative action allowing for necessary testing and demonstration activities for drone and Urban Air Mobility forces companies to look at other countries for relocation.
- The overall lack of financial support capabilities and political influence in the space and drone sector could drive companies to look elsewhere to develop new technology and innovation.

4 Analysis of SBA's scores

This analysis aims to work on the scores that the regions gave for the different KSFs in each of the SBAs. The scores were the basis for the measurement of the Strengths and Weaknesses of the regions. At this stage there is no cross analysis of the written SWOTs themselves.

Before any analysis is made it must be said that this is no scientific paper. The scores that were given by each of the partners were elaborated on a qualitative basis and reflect a tendency or an orientation more than a factual or scientific position. Therefore all the results of this analysis must be read with caution as they do not necessarily reflect a purely quantitative reality.

4.1 Approach and methodology

In order to analyse and compare the scores that resulted from the Excel files filled in by each of the five partners, the mean value of the scores assigned to each KSF in the four SBAs was considered; for each analysed cases, scores range from -2 and +2 were assigned. Therefore, by analysing the mean values for each SBA, it is possible to compare their weight for each of the five regions of the AD-ASTRA project.

Since the SBAs considered are so different from each other, the analyses were carried out separately for Aeronautics, Space, Drones and Global Support. Taking advantage of this type of analysis, the most developed regions in a given sector and more generally, the strengths and weaknesses within the individual sector were identified.

4.2 SBA Aeronautics

Figure 1 shows the mean scores assigned in the aeronautic sector; as could be clearly seen, all the regions have values higher than 0. This means that in all AD-ASTRA regions the aviation sector is quite present and developed. More in detail, Madrid (pink bar) and Occitania (yellow bar) stand out from the other regions with an average of +1,45 in both cases. This result comes out from the presence of numerous and big manufacturers (*e.g.* AIRBUS) that cover almost all the supply chain and generate a substantial profit and numerous employment.

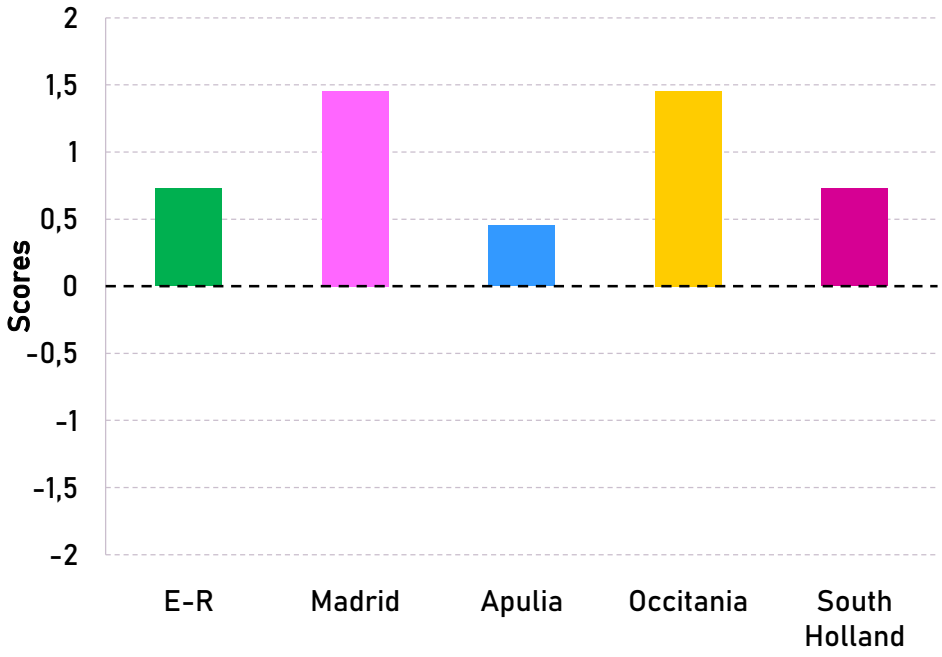

Figure 1. Regional scores for SBA Aeronautics

As could be seen in Figure 2, the comparison among the different KSFs for aeronautics shows that the highest score for the AD-ASTRA regions is for "Education" (green colour in the bar histogram) with a very good mean of +1.8, almost the highest possible. In this regard, a few of the most important institutions of the European territory can be mentioned:

- ***Alma Mater Studiorum* – University of Bologna**: it is ranked #154 in QS World University Rankings 2024 and offers its students a Bachelor's Degree in "Aerospatial and astronautic engineering", a Master's Degree in "Aerospatial science and astronautic engineering" and a Ph.D. course in "Aerospatial science and technology".
- ***Universidad Politécnica de Madrid***: offers its students an entire degree program dedicated to Aeronautical and Space Engineering
- **Polytechnic of *Bari*** and **University of *Salento***: offer bachelor's and master's degree in aerospace systems engineering plus a doctoral course in aerospace.
- **Toulouse Graduate School of Aerospace Engineering** (TSAE) offers its students a joint program between ISAE-SUPAERO, ONERA and ENAC aimed at promoting graduate and Ph.D programs in the aerospace engineering domain.
- **Delft University, Faculty of Aerospace Engineering**; **InHolland University of Applied Sciences, Aerospace Engineering**; Three other Universities of Applied Sciences in The Hague, Leiden and Rotterdam with education in Mechanics and Precision Engineering; Leidse Instruments Makers School, Vocational (Fine) Mechanics education.

Even if the scores are lower than the "Education", the other KSF also have scores higher than 0; more specifically the scores are between +0,5 and +1,4. However the lowest score is for "Strategic organisations" with a negative mean of -0,2 (red colour in the bar histogram of Figure 2). This value is associated with the fact that only few EU networks act as strategic organisations, such as: Pegasus, Galileo, Esa BIC, Tu Delft, NLR, Universeh, European Science Network, etc…

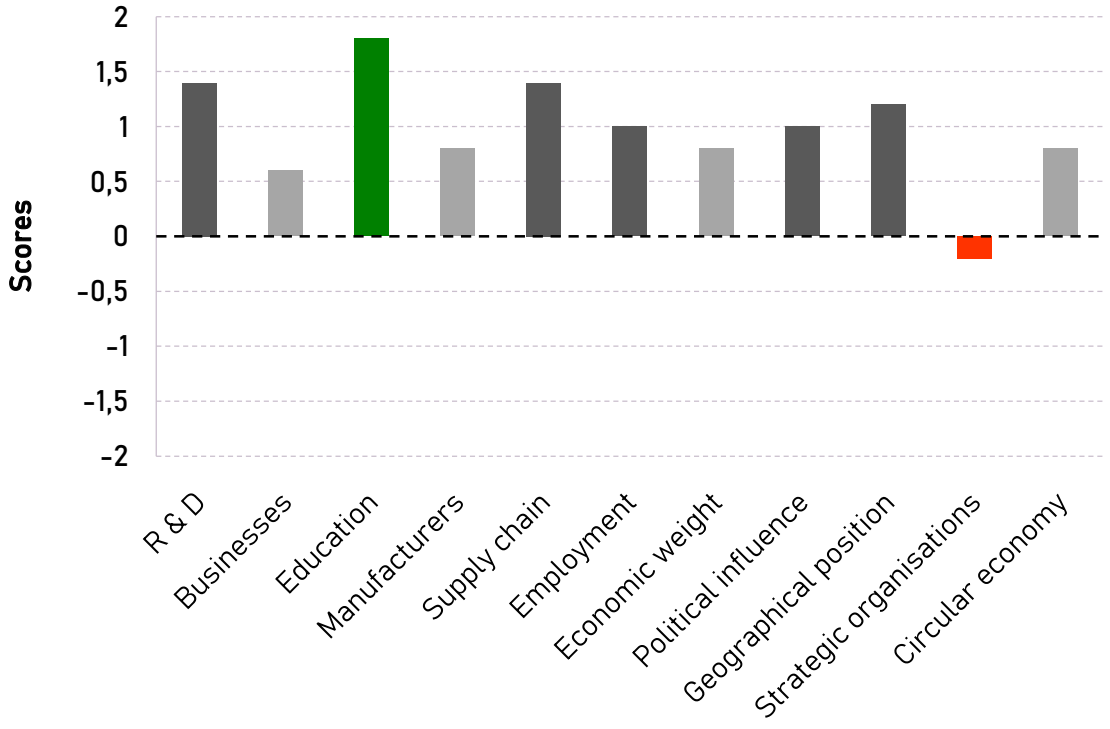

Figure 2. Mean scores for all KSF identified for aeronautical SBA

As a working team, the AD-ASTRA partners will evaluate along the project the possible implications of these results and how far can the good practices from the Aeronautics sector be applied to other, less developed sectors.

4.3 SBA Space

SBA Space is the one where most regions get the second highest scores, after Aeronautics, with a mean of +0.76 all regions included. Even though the mean scores are still very good, as could be seen from Figure 3, the general results analysed for the specific region for SBA Space are more heterogeneous than for Aeronautics. The highest total for SBA Space is for the Occitania region with +1,64, which is a very high grade, closely followed by the Madrid region having a score of +1,01. This is followed by E-R and South Holland having a mean score of +0,45 and +0,36, respectively.

Although the lowest score is for Apulia with a negative score of -0,2, it will probably soon upgrade with the new ESA BIC that is soon to be implanted in the region.

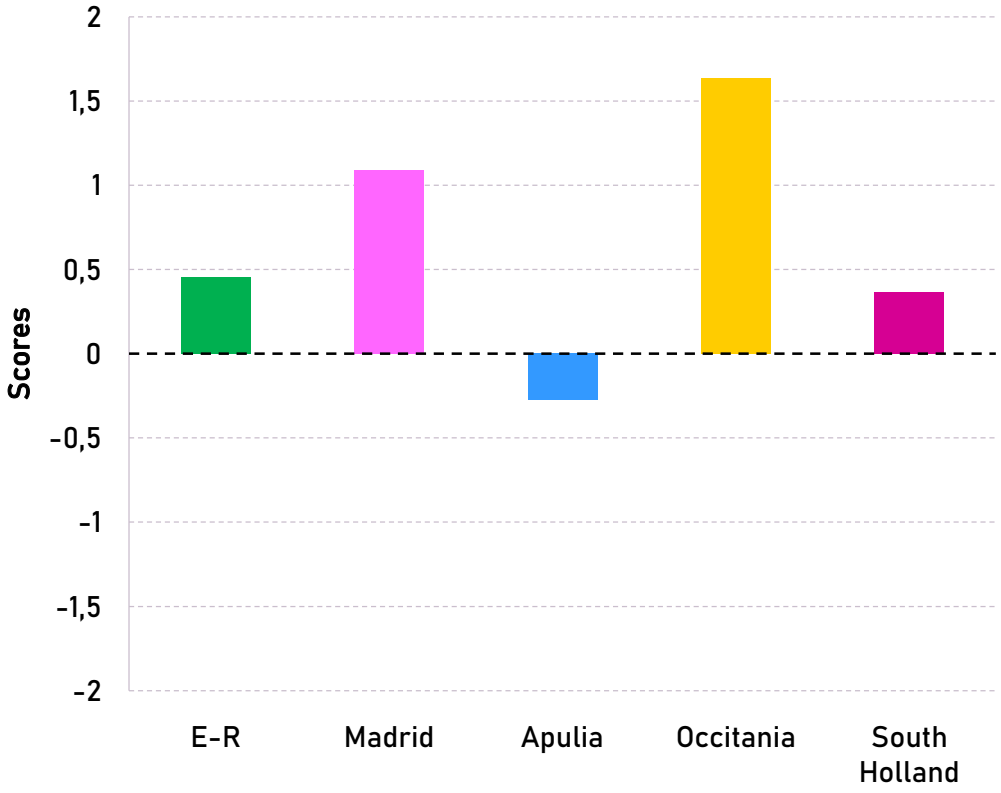

Figure 3. Regional scores for SBA Space

Looking more in detail at the KSF of SBA space (Figure 4) it is possible to observe that even in this case "Education" obtained the highest score (+1,6). Listed below are reported some of the most important vocational schools / technological schools / universities / engineering schools dedicated to the space sector:

- **Alma Mater Studiorum – University of Bologna** is ranked #154 in QS World University Rankings 2024. It offers its students a Master's Degree in "Space missions science, design and applications" and a II Level Master in "Skills in the fundamentals of space mission systems engineering and methods for analysing Big Data obtained from satellites".
- ***Universidad Politécnica de Madrid***, ***Universidad Carlos III de Madrid***, ***Universidad Alfonso X el Sabio***, ***Universidad Europea de Madrid*** and other vocational and professional training, master's degrees that are located in Madrid.
- **Polytechnic of *Bari*** and **University of *Salento*** having a bachelor's and master's degree in aerospace systems engineering, respectively; moreover, the University of Bari has also a doctoral course in aerospace.

- Space schools as **ISAE** (*Institut supérieur de l'aéronautique et de l'espace*), **ENAC** (*Ecole Nationale de l'Aviation Civile*), **IPSA** (École d'ingénieurs Aérospatiale); for "Remote sensing" Toulouse University is classified n°5 by Shanghai + *Cité de l'Espace*.
- **Delft University**, **Faculty of Aerospace Engineering**; **InHolland University of Applied Sciences**, **Aerospace Engineering**; Three other Universities of Applied Sciences in The Hague, Leiden and Rotterdam with education in Mechanics and Precision Engineering; Leidse Instruments Makers School, Vocational (Fine) Mechanics education.

It is also important to mention the R&D KSF which obtained a score of +1,2. Also in this case there are numerous public and private research centres; among other, some of the most important are:

- **E-R**: INAF - OAS (Observatory of Astrophysics and Space Science) which carries out research activities ranging from the evolution of the Universe to the observation of quasars, black holes and galaxies, to stellar evolution and, using the *Loiano* telescope, the search for space debris; CIRI Aerospace (Center for Industrial Research on Aerospace).
- **Occitania**: CNES (Centre *national d'études spatiales*) and Airbus Defense and Space.
- **South Holland**: here are present ESTEC (European Space Research and Technology Centre, is the technical and research heart of the European Space Agency - ESA) and Technical University Delft which has several space research lines at the Faculty of Aerospace Engineering.

On the contrary, the "Economic weight" and "Circular economy" obtained the lower score: -0,2 (red bar in the histogram diagram of Figure 4). Generally, for all five regions the scores on these two KSFs are quite low; among these, only Madrid shows higher values. More precisely, Madrid has the highest score (+1) on "Economic weight" which reflects the very relevant industrial presence in the region of the aerospace sector. In the other cases the scores are quite low even if there is a growing margin. Regarding the "Circular economy", one of the highest value was assigned by E-R and Madrid. E-R included aerospace in the last S3 regional strategy encouraging the realisation of advanced materials, second-life batteries, fuel cells, hydrogen propulsion, etc. while Madrid is united with all the objectives of the SDGs of the Agenda 2030.

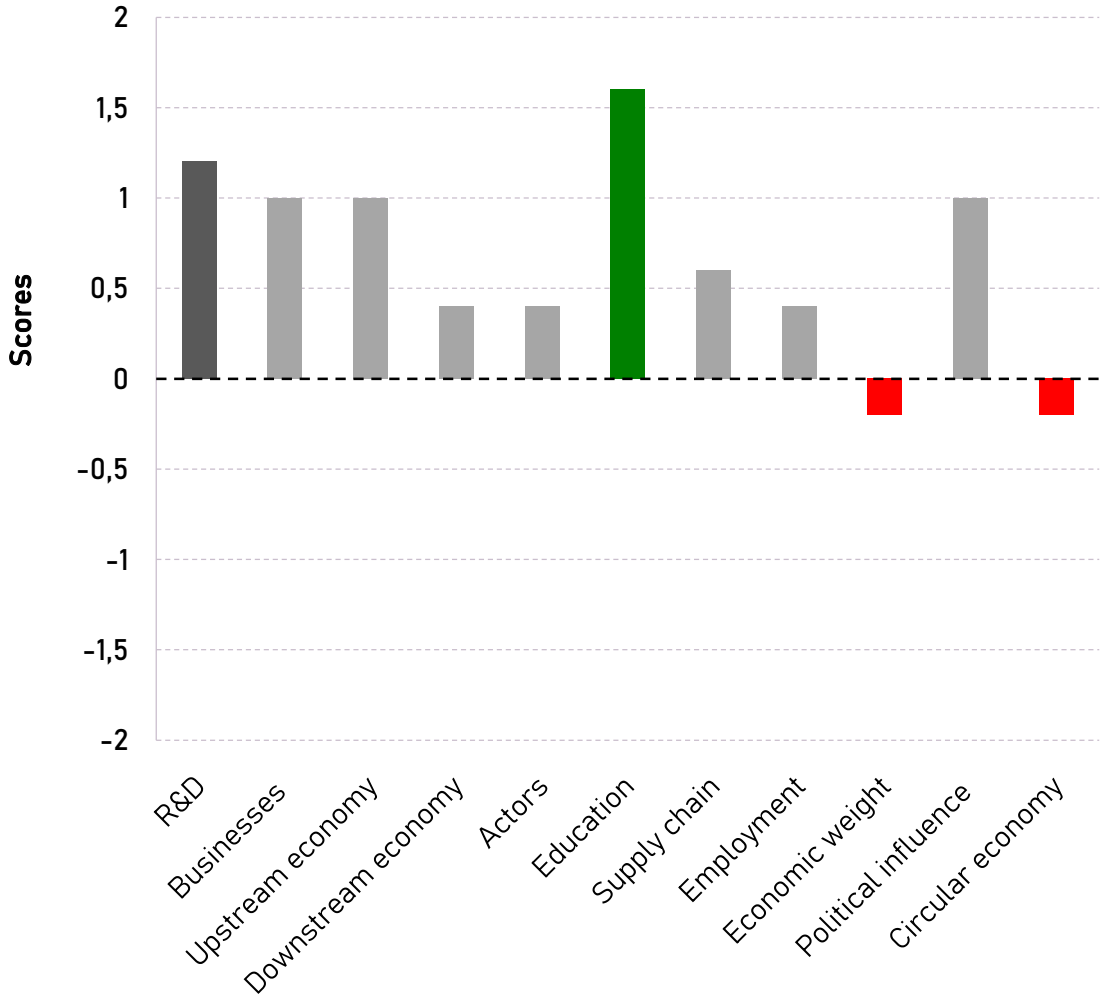

Figure 4. Mean scores for all KSF identified for SBA Space

Also in this case AD-ASTRA partners will evaluate the possible implications of these results and how to improve strategic KSFs as "Circular economy".

4.4 SBA Drones

As could be seen from Figure 5, SBA Drones has poor scores in general; three of the five partners of the AD-ASTRA project have negative scores which means an underdeveloped sector in those regions. Only Occitania and South Holland have +0,8 and +1 scores, respectively. These values reflect (among others) the presence of public and private research laboratories, Education schools, test infrastructures, etc. in both Occitania and South Holland.

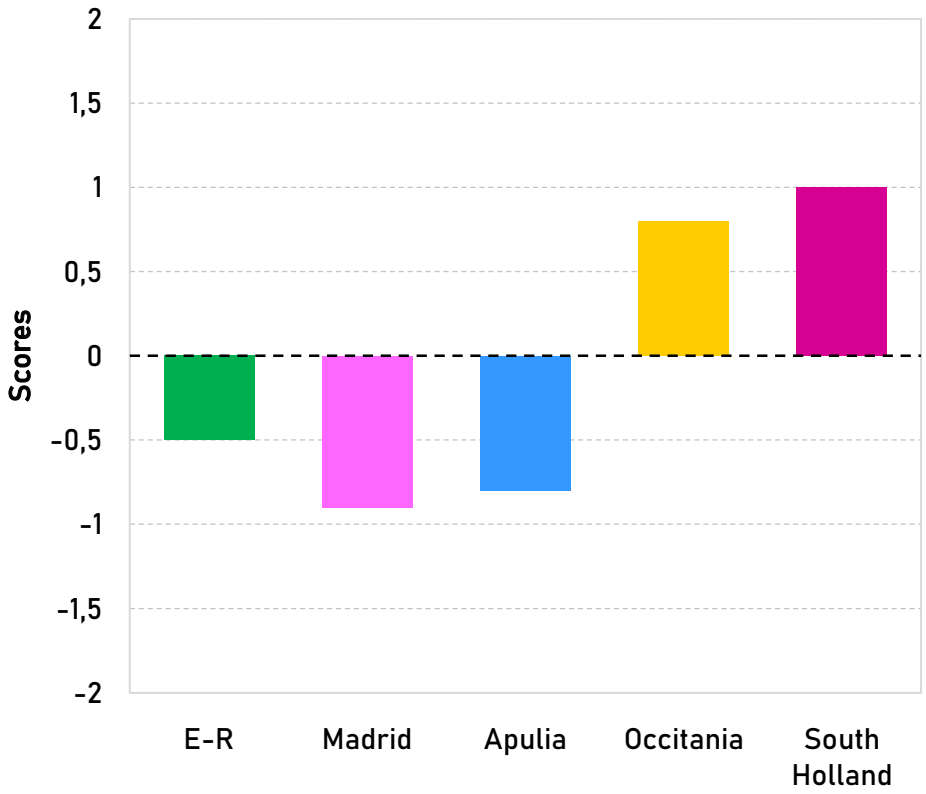

Figure 5. Regional scores for SBA Drones

As could be seen from Figure 6, also in this case the highest score was assigned to "Education" thanks to the presence of numerous drones and piloting schools located in both Occitania and South Holland. On the other hand, the "Economic weight" obtained the lowest score (-1) which reflects the underdevelopment of this sector in the industrial scenario of each region. This result reflects also on the "Employment" which is still low except for South Holland. Another critical point is the absence of "Regulatory Lobbies" which play a central role in the development and deployment of this technology.

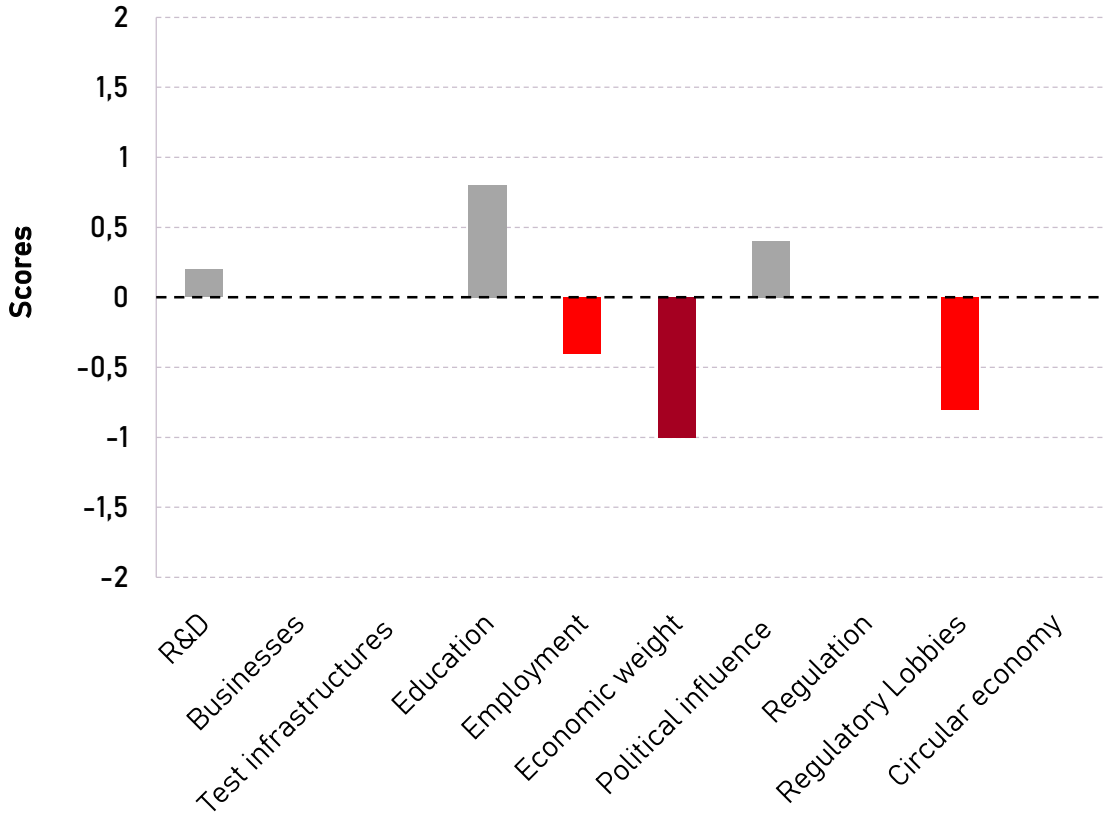

Figure 6. Mean scores for all KSF identified for SBA Space

Also in this case AD-ASTRA partners will evaluate the possible implications of these results and how (if possible) can the economic weight of the drones sector be developed in the AD-ASTRA regions.

4.5 SBA Global Support

SBA Global Support cannot be compared with the other sectors as, strictly speaking, it does not represent an actual business sector but more generally a context around the three aerospace sectors. However, the SBA Global Support was analysed to monitor the situation of different aspects in the regions of AD-ASTRA project. As could be seen in Figure 7, also in this case there are underdeveloped regions like E-R (-0,2) and Madrid (0) due to the low number of airportsor hiring difficulties. On the contrary, Occitania still maintains a high score also in this case proving once again its importance in the aerospace sector. Also Apulia and South Holland are both characterised by positive mean scores of +0,11 and +0,33, respectively.

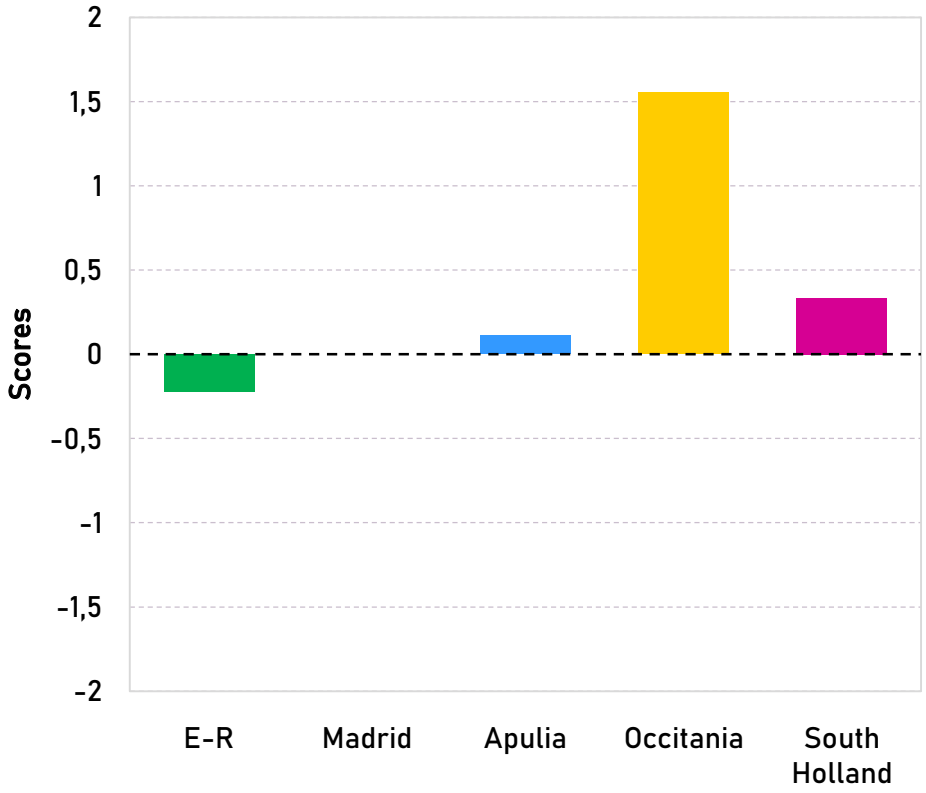

Figure 7. Regional scores for SBA Global Support

Figure 8 shows the AD-ASTRA regions' score for "Enabling actors" KSF which is rather high with a mean of +1,6; this value is in line with the presence of associations, private & public clusters or consortiums present in all five regions. The lowest scores are to be found for two KSFs: "Airports" and "ACI members" with -0.4 means. This score reflects the low number of airports present in some regions which, however, is perfectly in line with the surface extent of the region (*e.g.,* Apulia and South Holland). Occitania, on the other hand thanks also to its extension of 72000 km^2, has 16 airports on its territory.

Apart from "Hiring difficulties mitigation" with a mean of -0,2, the rest of the scores are situated between 0 and 1, therefore above the average of 0.

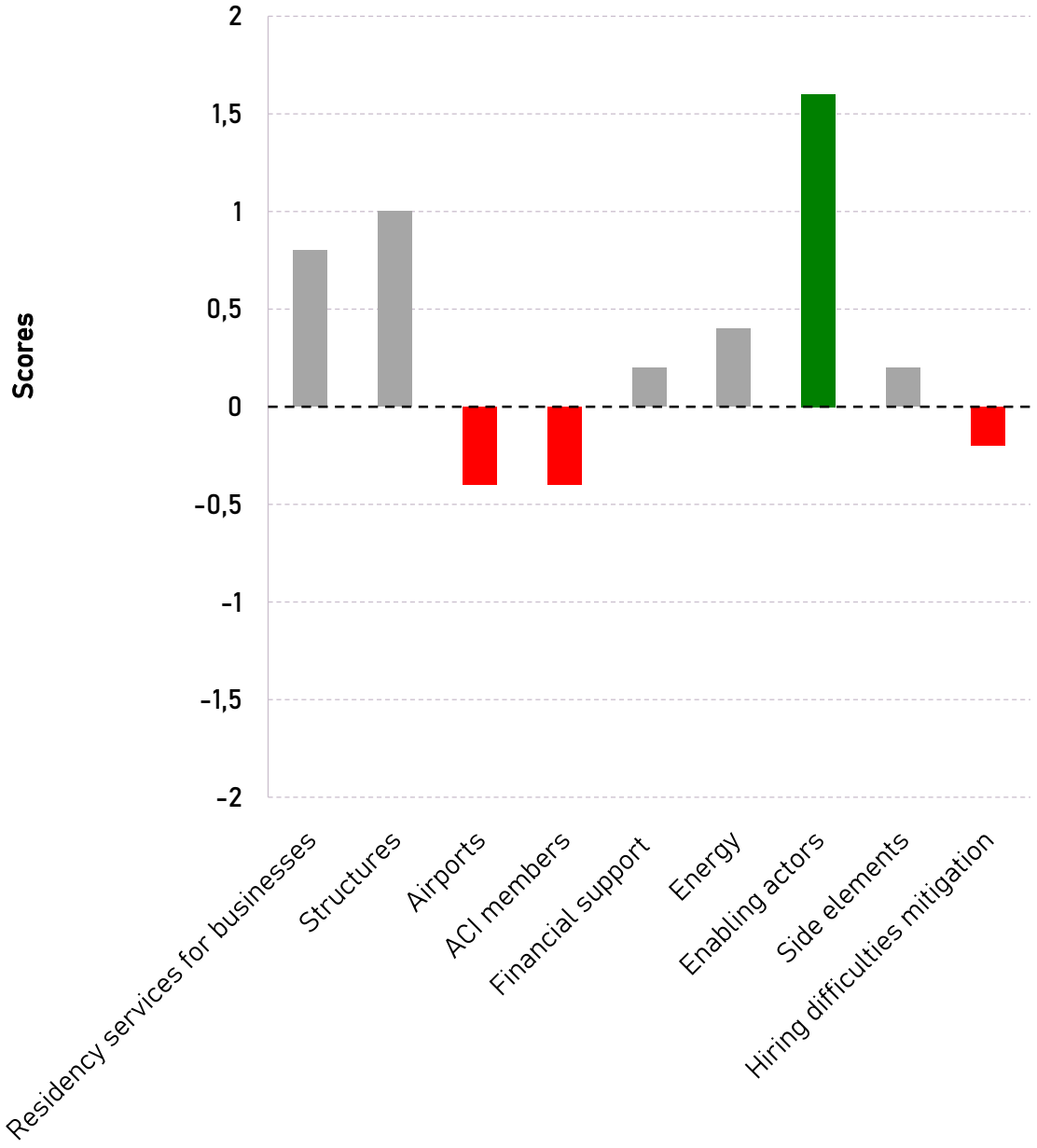

Figure 8. Mean scores for all KSF identified for SBA Global Support

Based on this data, the AD-ASTRA partners will evaluate the possible implications of these results and how can the action of Enabling actors be improved in the AD-ASTRA regions so as to make the general results of this sector increase; and mostly, how can aerospace General support be improved in general in the AD-ASTRA regions.

4.6 Conclusion of general analysis

This general analysis for the *initial SWOT analysis* is just an overview; it is a way to see marked regional differences and the weight of the different SBAs both in general and in the regions. It also enables us to consider the weight of the KSFs in general in the four sectors for the five regions. However there is no detailed comparison, particularly taking some specific KSFs with outstanding results in different regions.

Moreover some questions are asked, that need answering, if possible, or that make up food for thought for further study.

What comes out of this study in terms of comparison of the regions of the consortium is that Occitania stands out as the region that is most turned towards aerospace in general, with a striking peak when it comes to Global Support of the aerospace ecosystem.

While in terms of comparison of the SBA, this study suggests that Aeronautics and Space are the sectors where the five regions of the consortium are most comfortable, with rather matching scores. However SBA Drones and SBA Global support need more levelling between the regions.

In the coming *Final SWOT analysis* we can compare the scores of the regions in a more detailed way, particularly having a closer look at the differences between some specific KSFs by region and trying to make out possible ways to connect with innovation barriers mitigation as are studied below.

To finish, we have seen that the Occitania region, represented in this consortium by *Toulouse Métropole*, has high scores in many of the topics studied in this analysis. Could it be used as a benchmark to which the other regions could be compared?

5 Relevant networks

This task aims to establish links with external networks (Figure 9) to help create partnerships and potential connections with innovation ecosystems at EU levels. These partnerships can provide access to new ideas, resources, and expertise, allowing us to stay at the forefront of innovation and drive growth. Furthermore, building partnerships with external networks can lead to potential collaborations and joint projects. Innovative solutions, products, or services that address common challenges or meet market demands can be developed by aligning goals and resources. Hence, collaborations can enhance competitiveness and increase visibility in innovation.

Figure 9. Collaboration network of AD-ASTRA partners

In particular, the aim is to establish connections with at least three aerospace excellence external networks. Moreover, two areas of interest that overlap within these external networks will be chosen. The first step in establishing connections is to conduct thorough research. This will help identifying the most relevant and reputable networks in the aerospace industry. Once these networks have been identified, efforts can be made to establish connections with them.

Identifying the external network is a challenging task. To do this, we analysed the activities that took place during the South Holland and E-R co-creation events (Figure 10), which included visits and brainstorming phases. In addition to the site visits, co-creation workshops were held to facilitate brainstorming and idea generation. These workshops brought together experts and stakeholders from different backgrounds to share their knowledge and experiences. Through collaborative discussions,

participants were able to identify potential opportunities and challenges in building an external network.

The site-study visits allowed the partners to observe and learn from existing regional aerospace ecosystems. By visiting these sites, AD-ASTRA partners were able to see firsthand and understand the key elements that contribute to their success. This provided valuable insights and knowledge that can be applied to their projects.

The general impressions and suggestions from the two workshops and all combined information provided by the partners were analysed. Additionally, the future activities for the Bari workshop to be held in October 2023 were taken into account, while the main themes for Toulouse and Madrid were supposed. Moreover, the information reported in D1.1 – Innovation inventory was used to enhance the input gathered from the co-creation workshops.

An Excel file was created to gather all the notes and suggestions. On it, some important keywords were extrapolated with which to find a pattern and make connections. By identifying common themes and recurring keywords, it becomes easier to uncover insights and draw meaningful conclusions. In this way, it provides a structured framework to organise and analyse the information effectively.

Moreover, the Excel file will serve as a repository for gathering future input from the missing three co-creation events. Indeed, the Excel file has to be still used in the second phase of this task when the final report will be written and delivered.

For this initial phase, we can identify the most fascinating aerospace connections to explore, based on the extracted keywords. These connections include:

- The **UAM Initiative Cities Community (UIC2),** which is a marketplace platform that focuses on developing mobility demonstrators in the third dimension. It arises from the following keywords: INNOVATION, TEST BED, PUBLIC ADMINISTRATION (PA), AERONAUTIC (in the sense of "unmanned systems")
- **ESA Business Incubator Centre** is the largest network of incubators supporting space-related start-ups in Europe. The objective is to support entrepreneurs with a space-based business idea and help them develop their product while getting their company off the ground. In the process, they create and grow clusters of space-related start-ups across Europe. It arises from the following: INNOVATION, ENTREPRENEURSHIP, SPACE SERVICES, SPACE ECONOMY
- **Enterprise Europe Network (EEN)** is a network to help companies innovate and grow on an international scale. It is the world's largest support network for small and medium-sized enterprises (SMEs) with international ambitions and it has a focus group specifically devoted to ***Aerospace & Defence.*** It arises from the following keywords: INNOVATION, ENTREPRENEURSHIP, R&D, AERONAUTIC, SPACE SYSTEMS

In addition to the networks mentioned above, we could also consider the following networks:

- **NEREUS (Network of European Regions Using Space Technologies)** represents the interests of European regions that use space technologies. It also emphasises the regional aspect of European space policy and programs.
- **European Aerospace Cluster Partnership (EACP)** aims to exchange information and knowledge among partners and develop concrete steps for long-term transnational cooperation between aerospace clusters and companies. This will strengthen Europe's position in the global aerospace markets.

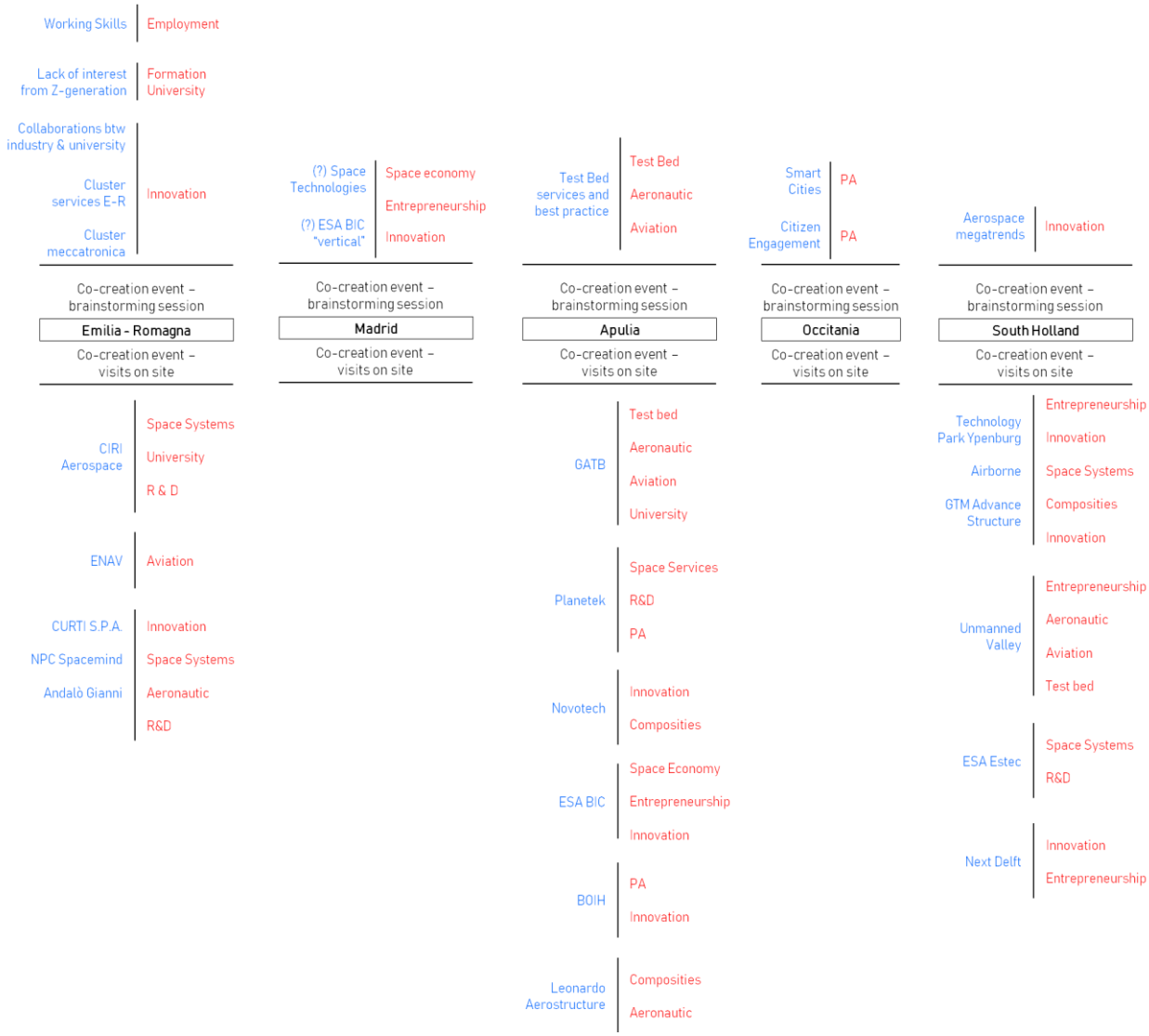

Figure 10. Schematic information about co-creation events

This work will be refined in the following month and more detailed information about network established will be given in the next deliverable D2.2.

6 Innovation barriers mitigation

The competitive advantages but especially the critical issues for each of the examined ecosystems are now identified. These critical issues obstruct innovative development within regions. Held against the advantages and good practices from other regions, these disadvantaged regions may be inspired and helped to partially overcome and mitigate the obstructions.

Inter-regional cooperation will help regions to raise awareness about which barriers need to be addressed to reach its full potential. Similar or joint challenges in two or more regions will be identified and combined to make the most out of the advantages and lessons learned of a partner region.

6.1 What are "innovation barriers"

Innovation barriers are obstacles or challenges that hinder or delay the process of creating valuable innovative (aerospace) ecosystems. These barriers can exist at various levels, including from individual to organisational or from local, to regional to national levels. They can prevent or slow down innovation efforts. Identifying and overcoming these barriers is crucial for advancing innovation and promoting growth in businesses, industries, and societies. Barriers relevant to our regional ecosystems can include:

- Lack of resources: Insufficient financial, human, or technological resources can impede innovation.
- Resistance to change: People and organizations can resist adopting new ideas or technologies.
- Regulatory and legal barriers: Complex regulations and legal constraints can make it difficult to introduce new products or services.
- Market uncertainty: Uncertainty about market demand, customer preferences, and competition.
- Lack of collaboration: A lack of collaboration can stifle creativity and limit access to diverse perspectives.
- Cultural barriers: Cultures that do not encourage risk-taking, experimentation, or learning from failure can hinder innovation efforts.
- Bureaucracy and red tape: Excessive bureaucracy, rigid processes, and cumbersome decision-making structures can slow down.
- Lack of vision or leadership: A lack of clear vision and strong leadership can impede innovation efforts.

For our regions it is important to identify and mitigate these barriers and to drive continuous innovation and remain competitive.

6.2 What are "mitigation measures"

Mitigation measures to overcome innovation barriers can vary depending on the specific context and challenges faced by the aerospace industry or the specific subsectors. Relevant mitigation measures can include:

- invest in research and development (R&D)
- collaboration and create partnerships
- regulatory and policy support to promote innovation
- diversify and attract talent
- embrace the concept of open innovation
- implement continuous learning
- setup clear innovation strategy
- financial support
- leadership and/or political commitment

These mitigation measures can help overcome innovation barriers.

6.3 Methodology to identify barriers and relevant measures

As part of WP 2.1 all regions have identified what megatrends were relevant for each ecosystem. From this overview we can derive which regions are strongest in what sector and above all which regions lack important parts to develop a sector. This does not mean that all regions want to develop all underdeveloped subsectors to fully functioning complete ecosystems. The presence of substantial stakeholders involving companies, institutions and talent, but above all political will and ambitions, ensure that some parts will be developed better than others. Nonetheless, through this evaluation, we can identify notable gaps in specific sectors that hold the potential for enhancement. These deficiencies can be addressed by drawing lessons from other regions or finding ways to cooperate more closely together.

Using Table 10 Long-list Megatrends in Aerospace the following conclusions can be drawn:

- the maximum score per megatrend topic was 3 stars per region with a maxim total of 15
- only one topic "increased automation and artificial intelligence" scored maximum stars, meaning none of the regions face substantial innovation barriers on this topic. This also means that all regions are each other's competitors on this topic but can also be each other's most advanced partner to build even stronger ecosystems.

- for this evaluation only topics scoring 7 stars in total or higher are considered. This means that at least some regions are stronger than others on a topic and should be able to help other regions that are less developed.
- the subsector Airport Technology scores 6 or less on all megatrend topics and will not be considered.

Table 10. Identifying higher and lesser developed megatrend topics for each region

Trends/Regions	E-R	Madrid	Apulia	Occitania	South Holland	Total
Enabling Technologies for Aerospace in General						
Increased automation and artificial intelligence	XXX	XXX	XXX	XXX	XXX	15
Advanced materials and manufacturing processes (including biobased)	XXX	XXX	XX	XXX	XXX	14
Additive manufacturing (3D printing)	X	XXX	XXX	XX	XXX	12
Cybersecurity and digital security	XX	XXX	XX	X	X	9
Health and safety monitoring and diagnostics systems		XX	XX		XXX	7
Space						
Small and cube satellite technologies for research and commerce	XXX	XXX	XXX	XX	XX	13
Earth observation and remote sensing technologies from space	XXX	XX	XX	X	XXX	10
Advanced sensors and instruments for scientific exploration	XX	XX	XX	X	XX	9
Advanced weather forecasting and prediction systems	X	XXX	XX	X	XX	9
Electric propulsion systems for spacecraft	XX		X	XX	XXX	8
Next-generation (laser) communication and navigation systems	XX	X	X	XXX		8
Global positioning systems or satellite-based navigation systems	X		XXX	XXX		7
Aeronautics and Aviation						
Hydrogen powered aviation	XXX	X	XX	XXX	XX	11
Electric and hybrid propulsion systems	XX	X	XX	X	XX	8

Sustainable aviation fuels	XX	X	XX	XXX		8
Digital twins for aircraft design and optimization	X	X	XX	XX	X	7
Drones/AAM						
Urban air mobility and eVTOL aircraft	X	XX	XX	X	XXX	10
Drone-based inspection and maintenance services	XXX	X	XXX		XXX	10
Unmanned aerial systems (air traffic management systems and technologies)	XX	X	XX	XX	XX	9
Advanced aerial imaging and mapping technologies for drones	XX	X	X		XXX	7

6.4 Evaluation from megatrends analysis

The below conclusions can be drawn from Table 10 described per subsector. Conclusions are labelled A) to S):

Regarding Enabling Technologies for Aerospace in General:

A. *Increased automation and artificial intelligence* and *advanced materials and manufacturing processes (including biobased)* are the most advanced topics in all regions and could be considered top priority for future collaboration between the 5 regions

B. IQ and UPM can learn from the other three regions on *additive manufacturing (3D printing*).

C. UPM and DTA can learn from the other three regions on *cybersecurity and digital security*, although E-R is the most developed.

D. E-R and TM can learn from DTA on *health and safety monitoring and diagnostics systems*. IQ and UPM did not identify this as a megatrend at all and should not consider to get involved.

Regarding the Space sector:

E. *Small and cube satellite technologies for research and commerce* are well developed in three regions and medium developed in UPM and DTA and could be considered top priority for future collaboration between the five regions.

F. *Earth observation and remote sensing technologies from space* is well developed in IQ and DTA and the three other regions could learn from them.

G. All regions are medium developed in *advanced sensors and instruments for scientific exploration* and this could be considered top priority for future collaboration between the five regions.

H. All regions can learn from E-R on *advanced weather forecasting and prediction systems*.

I. IQ, TM and UPM can learn from DTA on *electric propulsion systems for spacecraft*.

J. E-R and TM can learn from IQ and UPM on *next-generation (laser) communication and navigation systems*

K. IQ's underdeveloped ecosystem on *global positioning systems or satellite-based navigation systems* can learn a lot from strong developed clusters in UPM and DTA.

Regarding Aeronautics and Aviation:

L. In general E-R and DTA score low on this topic, however some elements of this subsector are present in both regions and have the potential to grow if more cooperation with the other three regions is established.

M. Both *hydrogen powered aviation* and *electric and hybrid propulsion systems* are present in all regions from low, medium to strong clusters and should be considered topics for joint future cooperation.

N. UPM is excellent in *sustainable aviation fuels* and IQ, TM and ART-ER can learn from them.

O. No region is excellent on *digital twins for aircraft design and optimization* but all have some substance present on this topic, which may be considered for future joint cooperation.

Regarding Drones/AAM:

P. All five regions are active in *urban air mobility and eVTOL aircraft*, with DTA being excellent and IQ and UPM having only some activities in this field, however this could be a topic for joint future cooperation.

Q. E-R may be able to learn more on *drone-based inspection and maintenance services* from three excellent ecosystems in IQ, TM and DTA. This topic is not so relevant in UPM.

R. All five regions are medium developed in the field of *unmanned aerial systems* and could consider working together on this topic in the future.

S. E-R and TM can learn from IQ and especially DTA on a*dvanced aerial imaging and mapping technologies for drones*.

6.5 Combining megatrends analysis and SWOT results to find innovation barriers mitigation measures per region

Toulouse Métropole/ Occitania

TM's weakness regarding lack of circular economy: can be overcome by working more closely together with the other 4 regions that are very well advanced in this area (conclusion A).

TM's weakness of low employment in the drone sector and the threat of slow development of the drones sector can be overcome by working closely together on all drone related topics (conclusions P, Q, R, S).

TM's threat of lack of variety and innovation incentives can be overcome by working more closely together with all partner regions on all identified megatrends.

InnovationQuarter/South Holland

IQ's and ART-ER's weakness of lack of supportive regulation and legislation for drones can be discussed with more advanced regions to learn how unmanned aerial system has been implemented elsewhere (conclusion R).

IQ's weakness of not much testing and/or demonstration infrastructure for aeronautics could be partly addressed in joint topic 'digital twins for aircraft design and optimization' (conclusion O) which focuses more on digital solutions instead of physical.

Both TM and IQ identify the threat of future loss of manufacturing capabilities in their regions. Working on new manufacturing methods like increased automation, artificial intelligence and advanced manufacturing processes with the most advanced regional partners could create new opportunities in both regions (Conclusion A, B, C).

ART-ER/Emilia-Romagna

E-R's weakness of lack of alternative energy sources can be overcome by learning from the other regions in respect to hydrogen, electric or bio powered aerospace systems (conclusions M and N).

ER's threat of absence of big aerospace actors can be compensated by taking a leading role in the new manufacturing processes (Conclusions A, B, C) as the regional supply chain for parts to big aerospace actors may grow when working more closely together.

UPM/Madrid

UPM's weakness of lack of skills in new critical technologies can be overcome by creating cooperation projects with more advanced regions (Conclusions A, B, C).

UPM's threat that other regions/countries move faster in developing the capacity of aeronautics, space and drones can easily be overcome by working together on all identified megatrend conclusions and stay on top of developments (Conclusions A to O).

DTA/Puglia

DTA's weakness on aeronautics in general can be mitigated by joining more advanced regions on working on sustainable aviation solutions (Conclusion M).

DTA's weakness on cybersecurity and digital security can easily be overcome by working together with IQ, ART-ER and TM who are more advanced on that topic (Conclusion C).

7 Conclusion

After describing the five partners' regional aerospace ecosystems under Deliverable 1.1 and identifying our European connections under Deliverable 1.2, Deliverable 1.3 focused on the future of our aerospace regions and started determining subjects for long-term cooperation.

Work Package 2 focuses on a deeper knowledge of our ecosystems with their strengths and weaknesses, and also on the involvement of the regions' stakeholders. To that extent, a set of five co-creation workshops are in the process of being worked through, in each of the partners region. They will lead to Deliverable 2.1 (M18).

Deliverable 2.2 is the outcome of Task 2.3: SWOT analysis, Task 2.4: Innovation Barriers and Mitigation Measures and Task 2.2: External Networks. The aim of Task 2.3 is to have an overview of the five regions' ecosystems thanks to a common framework delivered by Toulouse Métropole. This common framework consisted in a list of SBAs and of KSFs. Based on this list (to be found in Annex 1), each partner had to score each KSF for their own region. This scoring was then used in two ways: first to determine the Strengths and Weaknesses of and by each of the regions, leading them to their SWOT analysis, then it was used in order to compare the regions on their aerospace ecosystems. No matter how imperfect it was, this scoring enabled the partners to have a global overview of their five ecosystems.

The complete SWOT analyses made by each partner are presented in the deliverable. So is the general analysis of the scores; what stands out in the general comparison of the scores is that all the regions score rather high in the Aeronautics and Space sectors, and rather low in the Drones sector. The Global Support sector, like the Drones one, is heterogeneous with striking differences in the results.

What also needs to be pointed out in the results of the analysis is the significant position of the Occitania region. Occitania stands out as the region that is most turned towards aerospace in general, with a striking peak when it comes to its Global Support of the aerospace ecosystem. Its position as European leader in Aeronautics and Space clearly appears in the analysis. Could the region therefore be used as a benchmark to which the other regions could be compared?

The reading of the different SWOTs of the partner regions shows that all the regions have a high potential and a high interest in Aerospace. It also shows that some strengths, like a high level of education in aerospace, but also some weaknesses, like hiring difficulties, are common in the five regions. So are some opportunities and threats. The most striking of these commonalities will be studied in more detail in the Final SWOT analysis, and so will the most striking differences.

Concerning innovation barriers mitigation, some innovation barriers were identified in the five regions, partly thanks to the study on megatrends from D1.3, and also the SWOT analyses of the regions. A list of mitigation measures that can help overcome the barriers was also established. The next step was to draw a list of conclusions from the megatrends analysis and apply them to each of the SBAs of the SWOT analysis. To finish, the document presents a list of mitigation measures by partner, namely how the partners can make the most of their collaboration on different topics that could represent innovation barriers for them.

This deliverable is clearly one more step towards a common understanding of the five ecosystems and one more step towards future collaboration. The "learning curve" progression of proficiency and effectiveness in the events expected by the partners is under way. Through such a back-and-forth approach, all partners do acknowledge the possibility to improve and continuously support the complete match-making map of the network (internal and external possibilities).

This is where the name of the AD-ASTRA project - Aerospace Districts: Acceleration of the Strategic Transfer of Regional Advancements – starts taking it full meaning.

Appendix 1

List of 11 KSFs and their related questions for SBA Aeronautics

KSF (Key Success Factor)	Question (s)
Research and Development	Compared to the companies working in the same sector, are there many research centres or labs dedicated to aeronautics? Moreover, what is the portion of private and public research centres?
Businesses	Are there start-ups / micro enterprises / SMEs in that SBA ?
Education	Are there vocational schools / technological schools / universities / engineering schools dedicated to aeronautics?
Manufacturers	Are there aircraft (fixed-wing and rotorcraft) manufacturers?
Supply chain	Are there supply chain aeronautics manufacturers?
Employment	What proportion of the regional workforce is directly employed in the field of aeronautics?
Economic weight	of the aeronautics sector on the territory (compared to other SBAs) ?
Political influence for the development of (innovation in) aeronautics	Is there a real political will for aeronautics ? What is the part of the regional budget that is dedicated to aeronautics?
Geographical Position	Is your region located in a strategic position from a geographic and/or climatic point of view?
Strategic Organisations	Are there Strategic Stakeholders/Actors from european networks located/present in the region (i.e. Pegasus, ecc.)?
Circular economy	How are circular economy and climate change taken into consideration in the aeronautics sector?

List of 11 KSFs and their related questions for SBA Space

KSF (Key Success Factor)	Question (s)
Research and Development	Compared to companies, are there many research centres or labs dedicated to space? Moreover, what is the portion of private and public research centres?
Businesses (new space, services, manufacturers)	Are there start-ups / micro enterprises / SMEs in that SBA ?
Upstream economy	What is the state of the art in relation to the space upstream ecosystem
Downstream economy	What is the state of the art in relation to the space downstream ecosystem?
Actors	Are actors from the big European space programmes present in the region? (Egnos, Galileo, Copernicus, Iris, space exploration etc)
Education	Are there vocational schools / technological schools / universities / engineering schools dedicated to the space sector?
Supply chain	Are there supply chain manufacturers in the space sector?
Employment	What proportion of the regional workforce is directly employed in the space sector?
Economic weight	of the space sector on the territory (compared to other SBAs) ?
Political influence for the development of (innovation in) space	Is there a real political will for the space sector? à political plans + budget + indirect investments like Cité de l'Espace in Toulouse for ex.
Circular economy	How are circular economy and climate change taken into consideration in the space sector?

List of 10 KSFs and their related questions for SBA Drones

KSF (Key Success Factor)	Question (s)
Research and Development	Compared to companies, are there many research centres or labs dedicated to the drone sectors? Moreover, what is the portion of private and public research centres?
Businesses	Are there a lot of start-ups / micro enterprises / SMEs in that SBA ?
Test infrastructures	Are there enough airports, indoor flying test facilities, military fields for developing innovation in drones ? Are they close to drones manufacturers? Are they developing innovation?
Education	Are there vocational schools / technological schools / universities / engineering schools dedicated to the drones sector?
Employment	What proportion of the regional workforce is directly employed in the drones sector?
Economic weight	of the drones sector on the territory ?
Political influence for the development of (innovation in) drones	Is there a real political will for the drones sector?
Regulation	Are there regulation authorities?
Regulatory Lobbies	Are there regulatory lobbies, groups of stakeholders, policy makers involved in defining new rules for the drones industry and use?
Circular economy	How are circular economy and climate change taken into consideration in the drones sector?

List of 9 KSFs and their related questions for Global Support

KSF (Key Success Factor)	Question (s)
Residency services for businesses	What services are offered in your region for innovators? incubators, etc? Does your territory offer specific "housing" services to businesses?
Structures	What kind of aerospace related infrastructures are offered? Are there any (former) airports, test or experimentation infrastructures? …
Airports	How many airports (not airfields) are there in the region? ≤ 2 scores -2 / 3-4 scores -1 / 5-6-7 scores 0 / 8-9 scores +1 / ≥ 10 scores +2
ACI members	How many of them are ACI members?
Financial support possibilities	Do public **local or regional authorities** offer sufficient financial capacities to innovators in the aerospace / drone sector? Same for private financial support (business angles?)
Energy	Are there any offers in the territory for different aerospace/drones propulsion possibilities: electric, SAF, hydrogen?
Enabling actors	Are there (federative) structures and networks in place dedicated to the 3 SBAs in the region, like cluster(organisation)s, industry associations, local, regional, national networks ?
Side elements	Are there events, museums or technical dissemination centres dedicated to any of the 3 SBAs in the region?
Hiring difficulties mitigation	Are there measures taken in your region by businesses and authorities to mitigate hiring difficulties in the aerospace sector?

Appendix 2

In the following pages the Figures from 11 to 15 contain the SWOT analysis of each region; all the figures have a simple and effective graphic visualisation which helps to capture the most important aspects of this type of analysis.

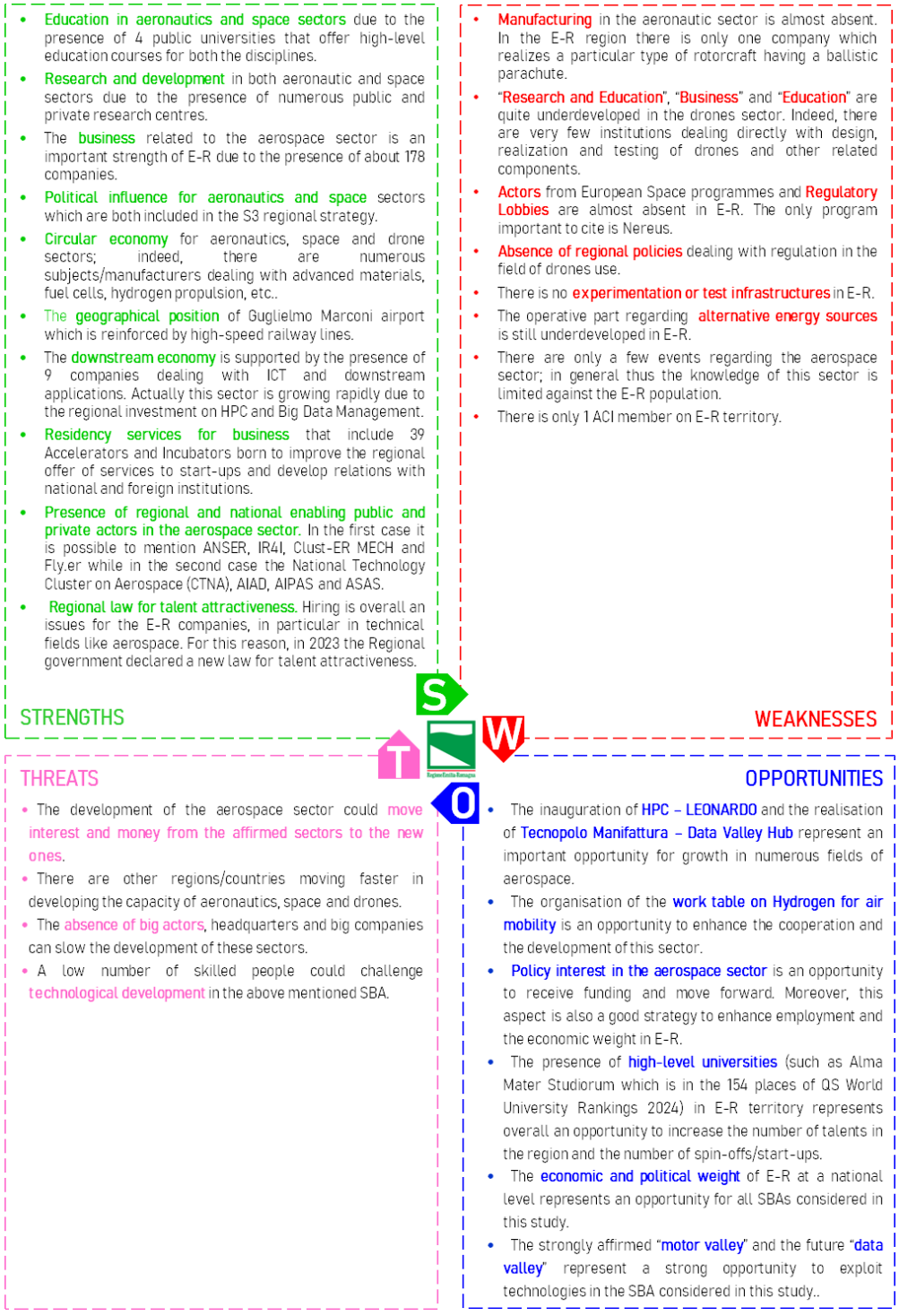

Figure 11. SWOT analysis for E-R

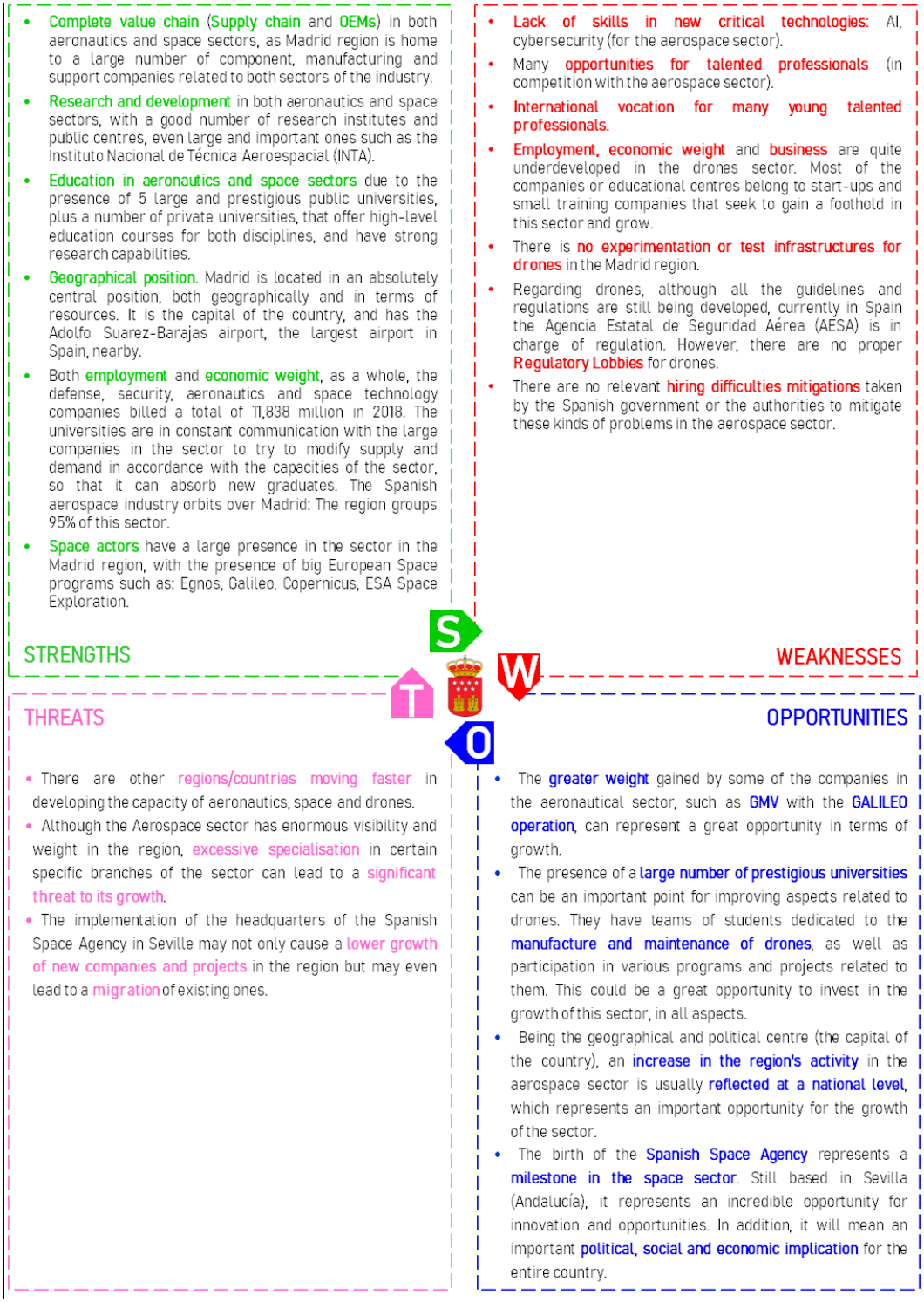

Figure 12. SWOT analysis for Madrid

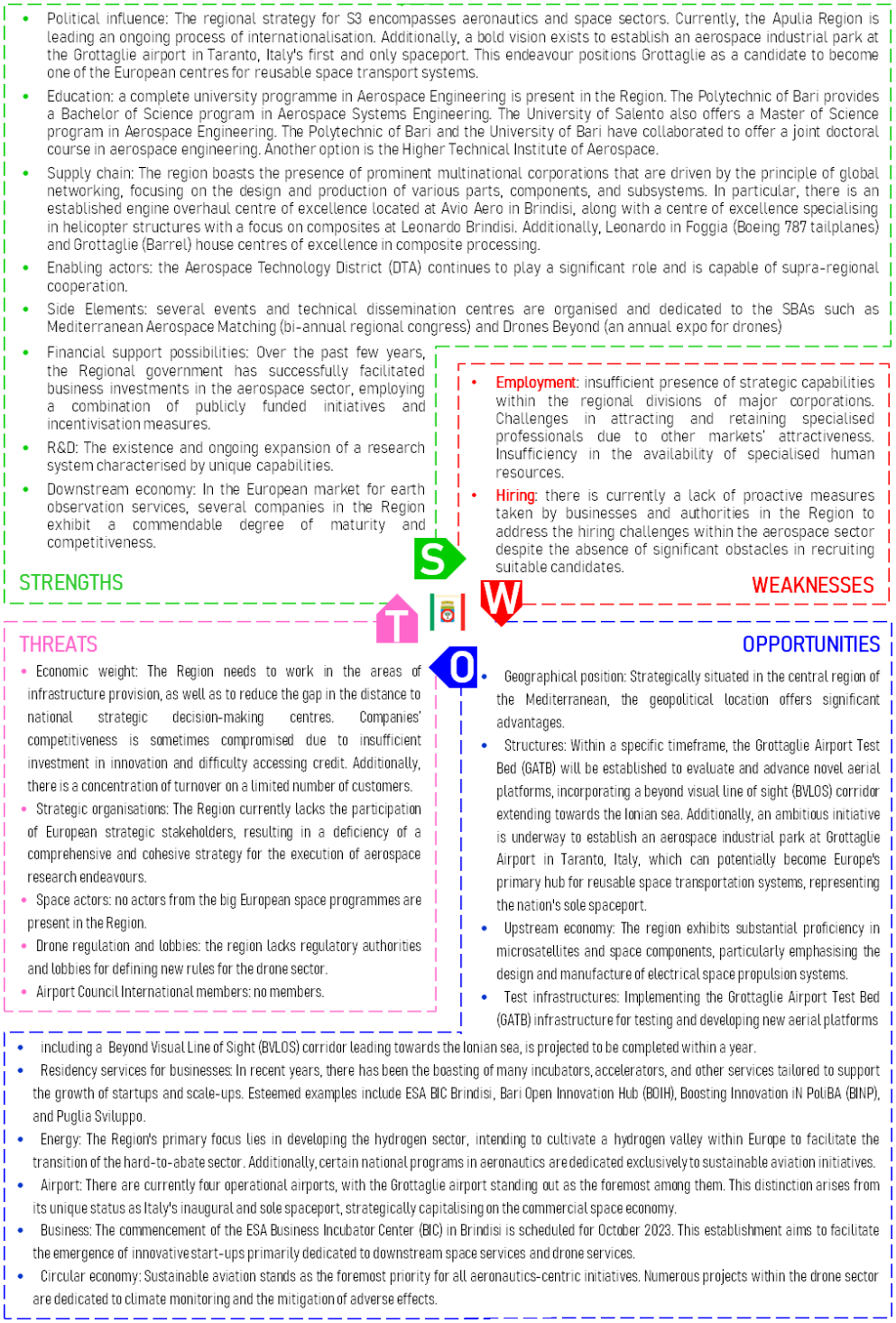

Figure 13. SWOT analysis for Apulia

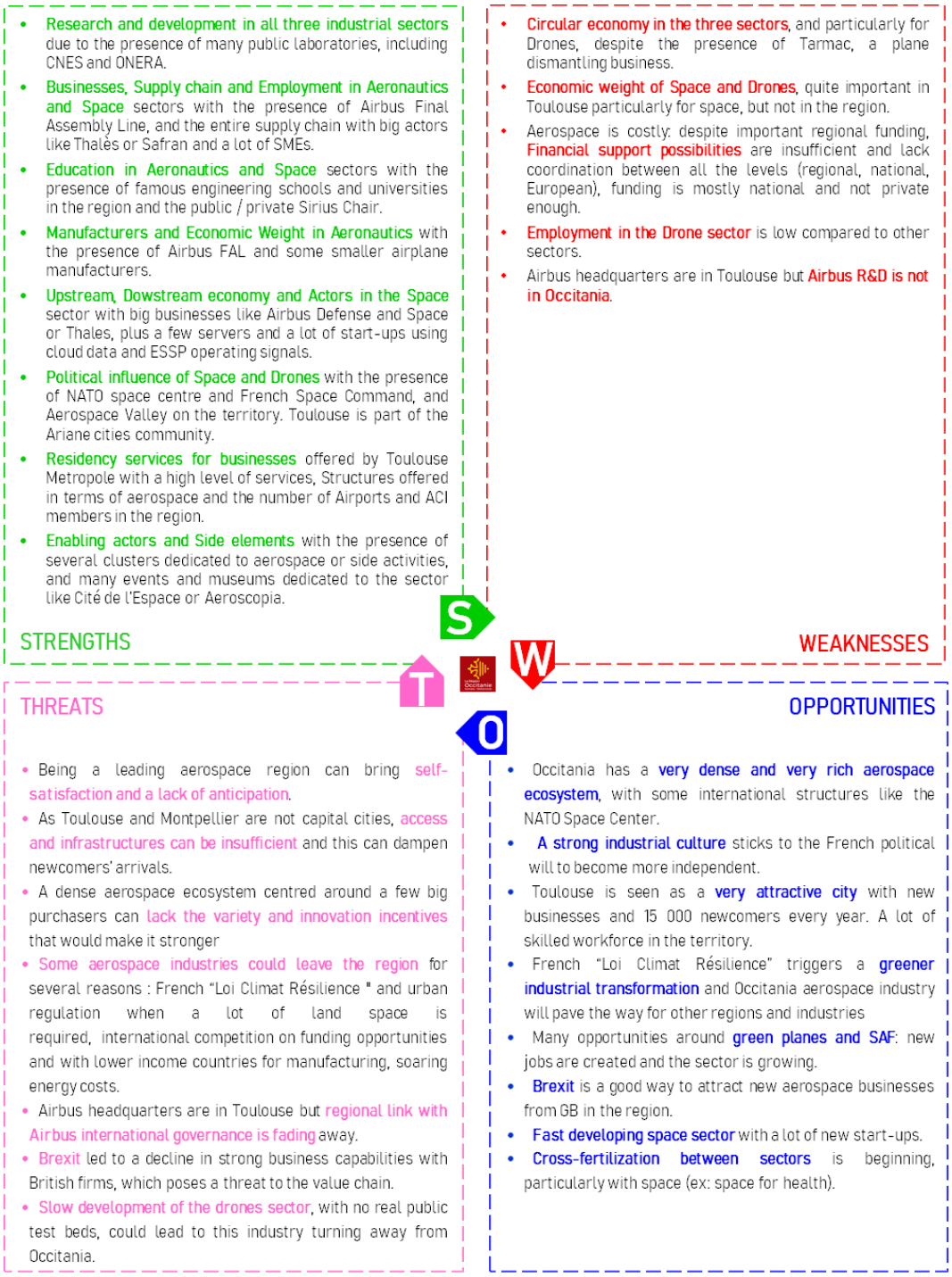

Figure 14. SWOT analysis for Occitania

Figure 15. SWOT analysis for South Holland