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TABLE OF CONTENTS

1. SHORT OVERVIEW OF THE EUROPEAN AERONAUTICS INDUSTRY	3
1.1. THE ROLE OF AERONAUTICS IN EUROPE	3
1.2. AERONAUTICS AND AIR TRANSPORT	3
1.3. THE LANDSCAPE OF THE EUROPEAN AERONAUTICS INDUSTRY	3
2. EUROPEAN INSTRUMENTS FOR RESEARCH, DEVELOPMENT AND INNOVATION	5
2.1. THE ROLE AND USE OF REGIONAL FUNDS	5
2.2. THE HORIZON 2020 IN AERONAUTICS	8
2.3. NATIONAL PROGRAMS IN EUROPE	10
2.4. BILATERAL CALLS IN AERONAUTICS	10
3. NATIONAL/REGIONAL RESEARCH AND INNOVATION STRATEGIES FOR SMART SPECIALISATION (RIS3)	11
4. SYNERGIES BETWEEN HORIZON 2020 AND EUROPEAN STRUCTURAL AND INVESTMENT FUNDS (ESIF)	14
5. CONCLUSIONS	16

1. SHORT OVERVIEW OF THE EUROPEAN AERONAUTICS INDUSTRY

1.1. The role of aeronautics in Europe

The aeronautics industry is among the most important ones in Europe. According to the ACARE¹ Strategic Research and Innovation Agenda, aviation is one of the top five technology sectors in Europe. Aeronautics has a clear outstanding role on its own but if we consider it as a part of the European vehicle industry on one hand and the enabler of the European air transport industry on the other hand then the importance is even bigger.

The aeronautics industry has three main contributions to the overall European goals:

- as a successful export oriented industry it contributes to the competitiveness of Europe
- as an enabler for the European air transport industry which is getting more and more intermodal with the overall European transport sector, it increases the mobility possibilities for the average European citizen,
- by more and more focus on decreasing the environmental impact of aviation, it contributes to the European sustainability targets.

1.2. Aeronautics and Air Transport

The focus of this study is on aeronautics, air transport industry can be considered more via the development and production of new equipment and IT solutions. Air transport infrastructure (e.g. airports) should not be considered as they are developed on demand bases so there are international airports in all the Member States (MS) with having more or less the same level of service level. However there is a big difference in aeronautics vehicle and equipment research, development and production capabilities in different parts of Europe.

1.3. The landscape of the European aeronautics industry

In terms of aeronautics mapping of the European industry the following classification can be made:

Leading aeronautics countries in Europe

The GARTEUR² states possess the leading European aeronautics industries. The GARTEUR states are the followings: France, Germany, Italy, The Netherlands, Spain, Sweden and United Kingdom. The key Airbus factories located in some of these states have probably the outmost importance. It is a common European interest that the European aeronautics industry keeps on developing both at the Member States level and at the level of the largest

¹ Advisory Council for Aviation Research and Innovation in Europe, <http://www.acare4europe.com/>

² www.garteurl.org

industrial companies in Europe. There are a lot of efforts and concerning studies, documents concentrating on the leading industrial players so they are not in the scope of the present study.

Older EU states with smaller aeronautics industry

The aeronautics industry is concentrated in regions and member states and there are Member States among the older EU states (basically those which are not members of GARTEUR) where the aeronautics industry is smaller. There are obvious differences within this group as there are countries where the production activities are really limited and there are ones (e.g. Austria) which are not big in the overall size but the industry is quite developed and significant compared to the number of population.

Newer EU states with significant capabilities

A fix line is hard to be drawn but there are three counties among the newer Member States where the capabilities are higher mainly due to the level of sport aircraft production before 1990. In the Aviation Valley of Poland there are significant production plants which are mainly owned by larger foreign companies. In the Czech Republic there are several Czech owned smaller companies focusing on general aviation production. In Rumania, there are some companies which are to some extent serve the global supply chain.

Despite the difference, the common issue with the three states which is underlined by their representatives in different aeronautics groups is that the potential capacities are underutilised in these Member States.

Newer EU states with smaller aeronautics industry

The fourth category is those states which joined the EU lately but their capacities in aeronautics do not reach the three states mentioned previously. Such as among the older states with smaller industries the activity levels are quite different, there are countries where there are hardly any related activities to countries where there are many but mainly low scale aeronautics related developments (e.g. Hungary). The common issue in these countries is that many aeronautics engineers don't find a job in the sector so they are finally employed by other industries which is a loss for the European aeronautics industry.



Map 1: The European Union (older and newer states)

2. EUROPEAN INSTRUMENTS FOR RESEARCH, DEVELOPMENT AND INNOVATION

2.1. The role and use of regional funds

The three main financial instruments of the European Union are the followings:

- the Structural Funds
- the Cohesion Fund
- the Common Agricultural Policy (CAP)

The Structural Funds - European Regional Development Fund (ERDF), European Social Fund (ESF) - and the Cohesion Fund³ are financial tools set up to implement the regional policy of the European Union. They aim to reduce regional disparities in terms of income, wealth and opportunities. Most of the support goes to the less developed European regions, but all European regions are eligible for funding under the policy's various funds and programmes. The current Regional Policy framework is set for a period of seven years, from 2014 to 2020. Co-financing is mandatory for the funds; the funding ceiling is from 75% to 85%.

The priorities for the Structural Funds are set at the EU level and then transformed into national priorities by the member states and regions. The layering of the approach can be summarised as follows:

³ Sources: www.europa.eu, www.eutrainingsite.com

- EU Level: Community Strategic Guidelines.
- National Level: National Strategic Reference Framework (NSRF) for each member state.
- Regional Level: Operational Programme (OP) for each region.

Although the Structural Funds are part of the EU budget, the way they are spent is based on a system of shared responsibility between the European Commission and the member state authorities:

- The Commission negotiates and approves the NSRFs and OPs proposed by the member states, and use these as a basis for allocating resources.
- The member states and their regions manage the programmes. This includes implementing the OPs by selecting individual projects, controlling and assessing them.
- The Commission is involved in overall programme monitoring, pays out approved expenditure and verifies the national control systems.

Among the funds the European Regional Development Fund (ERDF) is currently the largest. Since 1975 it has provided support for the creation of infrastructure and productive job-creating investment, mainly for businesses. This fund is the most relevant to aeronautics as this is the most applicable to develop industrial capacities. The ERDF budget will be 185 billion EUR in the period 2014 – 2020. According to the category of regions supported, the support from the ERDF should be concentrated on research and innovation, small and medium-sized enterprises and climate change mitigation. The degree of concentration should take into account the level of development of the region as well as the specific needs of regions where GDP per capita for the 2007-13 period was less than 75% of the average GDP of the EU-25 for the reference period.

Although basically all the regions of the European Union are eligible for funding, most of the budget of the new period (2014 – 2020) goes to the Member States which joined the EU since 2004. The map below shows the intensity difference, the darker the colour the higher the intensity and the overall budget available.



Map 2: The regions of Europe

Within each Member States there are different operational programmes applicable to one or several regions. The operational programmes are carried out usually by calls for proposals. Some of the proposals are for the public sector only and some for the private companies and sometimes for both (e.g. company, university co-operations). Usually each call contains the deadline (there are continuous calls and calls with a fixed deadline), the total budget available, the budget limits for one project and the conditions for application. In most cases there are some general industrial related calls where companies can apply for further developing either their infrastructure or their products. The projects are generally more market oriented than basic research projects and so they are in a higher target readiness range (TRL).

The chart below shows the different TRL categories:

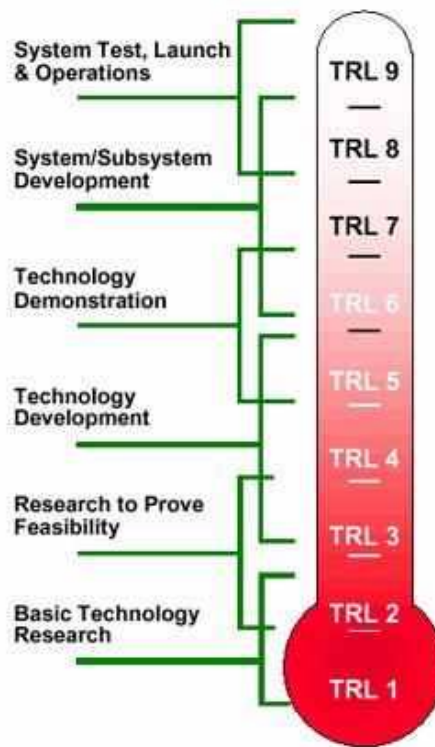


Figure 1: Description of Target Readiness Levels

The calls are seldom dedicated to aeronautics. They are usually more open industry related calls where among others aeronautics related companies can also apply for.

The common name for the different funds is the European Structural and Investment Funds (ESIF) which contains the European Regional Development Fund (ERDF), European Social Fund, Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD), European Maritime and Fisheries Fund (EMFF). Although the ERDF is the most applicable fund from the perspective of the study, the term ESIF will be used in the document to refer to all those European funding mechanisms which are directly executed at Member States.

2.2. The Horizon 2020 in aeronautics

The ESIF can be considered as an indirect European tool as the European Commission is only supervising the programmes and the execution, but the tendering organisations are in contact with the authorities of the Member States. To reach the overall European Union goals the European Commission also launches direct programmes mainly in the field of research. The formerly called Framework Programmes, now Horizon 2020 is the financial instrument to implement the Innovation Union. "Innovation Union is the European Union

strategy to create an innovation-friendly environment that makes it easier for great ideas to be turned into products and services that will bring our economy growth and jobs.”⁴

The Horizon 2020 operates with thematic calls for projects. Projects are executed usually in pan-European consortium of companies, universities and research organisations that applied together for a certain topic of the calls and evaluated successfully. The budget available is nearly 80 billion EUR for the forthcoming period (2014-2020). The projects are usually more research than development oriented and they are focusing a lower TRL level.

Aeronautics falls into the “Smart, Green and Integrated Transport” challenge (thematic domain of Horizon 2020) which will have more than 6 billion EUR funding in the recent period. The transport challenge calls are categorised according to the following objectives:

- resource efficient transport that respects the environment,
- better mobility, less congestion, more safety and security,
- global leadership for the European transport industry,
- a socio-economic and behavioural research and forward looking activities for policy making.

Besides the normal projects (with a budget of few million EUR) which is also called Collaborative Research there are two “mega-projects”, Joint Technology Initiatives (JTI) in the field of aviation:

- Clean Sky 2 with vehicle focus
- SESAR 2 with transport focus

This public-private partnerships are large projects (with a budget of approx. 1 – 2 billion EUR) to reach a certain strategic goal in the domain. Clean Sky 2 as a successor of Clean Sky is focusing on researching and prototyping new commercial aircraft and the main goal is to support the leading European position in this field.

SESAR2 will continue the work of SESAR to overcome of the today’s fragmented European airspace and try to make air traffic control more efficient by reaching to a more “seamless sky”.

Both JTIs focus mainly the TRL in the middle range (prototype level is the ultimate goal). Projects are often smaller than in the Collaborative research and more specific. Consortiums are smaller and often even one organisation can apply.

In general the finding is that for newcomers it is easier to get involved in Collaborative Research than in JTIs where those organisations which have strong skills and references gained by being part of one of the big European supply chains has better chances. Competition in both calls is high and has heavily increased in the last years of FP7.

Although there are other programs than Horizon 2020 that are executed at European level and can be interesting for aeronautics cooperation, but due its large size and outranging importance among the directly Commission led programmes, only the term Horizon 2020 will be used for the research programs executed at European level in the study.

⁴ www.europa.eu

2.3. National programs in Europe

In many states there are thematic development programmes from the state budget. These are either national or regional programs. The budget is obviously higher in the bigger industrial nations and there the range of activities is greater. It is different by Member States whether they have a more generic programme or if they have more focused several programmes in many domains. Some states have their own aeronautics programme, the Austrian Take Off and the German LUFO programs are good examples of that.

2.4. Bilateral calls in aeronautics

Besides the ESIF related programmes which are executed at national level and the Horizon 2020 which is a pan-European programme there are inter-member states programmes which support to create research and development project by including participants from two or more Member States. The ERA-NET program supports the creation of these projects.

The objective of the ERA-NET scheme⁵ is to step up the cooperation and coordination of research activities carried out at national or regional level in the Member States and Associated States through:

- the networking of research activities conducted at national or regional level,
- and the mutual opening of national and regional research programmes.

The AirTN projects⁶ support the joint calls in the field of aeronautics. Bilateral projects were built with the participation of organisations from: Austria, Germany, Ireland, Spain and Sweden.

One of the main boundaries for more cooperative, transnational programmes in Europe in aeronautics is the non-existence of a specific aeronautics programme in most of the Member States. The creation of joint projects in a certain field among two generic programmes is much harder than among two specific programmes (e.g. the LUFO – TAKE-OFF cooperation).

As these projects are generally more development projects (higher TRL level) with strong industrial involvement they provide and added value to Horizon 2020 instruments. In addition to that in aeronautics transnational cooperation is quite often a must as there are no Member States having globally competitive industry in all the aspects of aeronautics.

⁵ Cordis

⁶ www.airtn.eu

3. NATIONAL/REGIONAL RESEARCH AND INNOVATION STRATEGIES FOR SMART SPECIALISATION (RIS3)

National/Regional Research and Innovation Strategies for Smart Specialisation (RIS3 strategies) are integrated, place-based economic transformation agendas that do five important things:

- Focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development, including ICT-related measures.
- Build on each country's/region's strengths, competitive advantages and potential for excellence.
- Support technological as well as practice-based innovation and aim to stimulate private sector investment.
- Get stakeholders fully involved and encourage innovation and experimentation.
- Be evidence-based and include sound monitoring and evaluation systems.

The definition of RIS3 not only facilitate a more efficiently use of ESIF and bring the opportunity of create synergies between different EU, national and regional policies/programs, but can stimulate public and private investments. Due to that, it is useful take into account all regions that include aeronautic industry in their priorities in order to create specifics synergies between Horizon 2020, ESIF and other funds focused on this industry.

In the following table it is possible find information about the regions where aeronautic and space are RIS3 priorities:

Table 1: States and regions with aeronautic and space as RIS3 priority⁷.

Country	Region/Country Name	Contact	e-mail address
Belgium	Région Wallonne	Hennart, Florence	florence.hennart@spw.wallonie.be
Czech Republic	Praha	Pechlát, Jakub	pechlat@urm.praha.eu
France	Haute-Normandie	---	---
	Midi-Pyrénées	---	---
Germany	Baden-Württemberg	---	---
	Bremen	---	---
Italy	Lazio	Bellotti, Rosanna	rbellotti@regione.lazio.it
	Lombardia	De Crinito, Armando	Armando_De_Crinito@regione.lombardia.it
	Piemonte	Crotta, Stefania	stefania.crotta@regione.piemonte.it
	Puglia	Agrimi, Adriana	a.agrimi@regione.puglia.it
	Sardegna	Cadeddu, Gianluca	gcaadeddu@regione.sardegna.it

⁷ <http://s3platform.jrc.ec.europa.eu/map>

Country	Region/Country Name	Contact	e-mail address
Italy	Umbria	Caporizzi, Lucio	programmazione@regione.umbria.it
Malta	Malta	Castillo, Nadine	nadine.castillo@gov.mt
Poland	Podkarpackie	Czerepiuk, Piotr	p.czerepiuk@podkarpackie.pl
Romania	Romania	Predescu, Rolanda	rolanda.predescu@ancs.ro
Spain	Andalucía	Galán, Antonio	agalan@agenciaidea.es
	Cantabria	Rodríguez Puertas, Javier	dginnovindustria@cantabria.es
	Castilla-La Mancha	Alonso Diaz Guerra, Jose Jaime	jjalonso@jccm.es
Sweden	Sweden	---	---
United Kingdom	England	Whitney, Anthony	anthony.whitney@bis.gsi.gov.uk

On the other hand, developments in other areas like optics, electronics, advanced materials, ITC, manufacturing and so on, can supply aeronautic industry. Because of that, it is useful to take into account which European regions have RIS3 priorities indirectly aligned with innovative aeronautic solutions.

In table 2 is shown other regions and its focus area where collaboration with aeronautic industry could be possible:

Table 2: List of States and regions with other RIS3 priorities that could collaborate with aeronautic industry⁷.

Country	Region/Country Name	Area	Contact	e-mail address
Czech Republic	Czech Republic	Eco-innovations (Manufacturing)	Czesana, Veronika	veronika.czesana@msmt.cz
France	Aquitaine	Photonics	Dareys, Didier	didier.dareys@aquitaine.fr
	Basse-Normandie	Advanced materials.	---	---
	Bretagne	Photonics and microelectronics.	Raffray, Hélène	h.raffray@bdi.fr
	Guyane	Remote technology & sensing	Lasselin, Delphine	delphine.lasselin@cr-guyane.fr
	Île de France	Optics, photonics, robotics, complex systems engineering and software	---	---

Country	Region/Country Name	Area	Contact	e-mail address
France	Limousin	Electronics	Vernhes-Daubrée, Cécile	c-vernhes-daubree@cr-limousin.fr
	Pays de la Loire	Electronics and computing, electronic components, advanced materials, advanced manufacturing systems.	Delbos, Lionel	lionel.delbos@paysdelaloire.fr
Germany	Berlin	Optics/Photonics	Varnhorn, Jürgen	juergen.varnhorn@senwtf.berlin.de
	Brandenburg	Optics/Photonics	Kneifel-Haferkamp, Reiner	reiner.kneifel-haverkamp@mwe.brandenburg.de
	Germany	Intelligent mobility (ITC)	---	---
	Sachsen	Photonics and microelectronics	Reitmann, Anja	innovationsstrategie@smwa.sachsen.de
Greece	Dytiki Ellada	Microelectronics	Thomopoulos, Nikos	nthomopoulos@mou.gr
	Kentriki Makedonia	Electronics, electrical appliances and ICT.	Tsanidis, Vassilis	v.tsanidis@pkm.gov.gr
Italy	Toscana	Photonics	Caporale, Albino	albino.caporale@regione.toscana.it
	Valle d'Aosta/Vallée d'Aoste	Sensor technologies, implementation of monitoring networks.	Cappellari, Tamara	t.cappellari@regione.vda.it
Poland	Opolskie	Electro-technique & electronics industry	Tkocz, Arkadiusz	biuro@ocrg.opolskie.pl
	Pomorskie	Electrical engineering	Oberbek, Joanna	j.oberbek@pomorskie.eu
	Slaskie	Microelectronics	Jedynak, Anna	ajedynak@slaskie.pl
Portugal	Lisboa	Manufacturing (reparations)	Barata Silva, Ana	ana.baratasilva@ccdr-lvt.pt
Slovakia	Bratislavský kraj	Navigation systems	Furik, Peter	peter.furik@region-bsk.sk

Country	Region/Country Name	Area	Contact	e-mail address
Spain	Castilla y León	Advanced materials, ICT, advanced manufacturing and processing, sustainability, security & mobility.	Fernández Martínez, Montserrat	fermarmo@jcyl.es
Sweden	Östergötlands län	Advanced materials	Lindberg, Anna	anna.lindberg@ostsam.se
United Kingdom	Wales	Advanced materials. Photonics.	Davies, Alastair	alastair.davies@wales.gsi.gov.uk

4. SYNERGIES BETWEEN HORIZON 2020 AND EUROPEAN STRUCTURAL AND INVESTMENT FUNDS (ESIF)

As stated before, it is important strengthen synergies between different public funding sources with the aim of obtain the more efficient and best use of public funding for promoting the innovation to achieve the EU a competitive global position.

Due to Horizon 2020 pursue maximize the competitiveness impact of research and innovation and ESIF is focus on fostering smart specialization as a capacity building, Horizon 2020 and ESIF are an example of possible source of synergies. In this task are involved national and regional authorities responsible of planning future investments on research and innovation (including from the ESIF), research stakeholders (public and private), NCPs and Commission services.

Create synergies by combining different funds entail:

- Getting a stronger impact on competitiveness, jobs and growth.
- Amplifying projects / initiatives.
- Carrying further the projects of the other instrument towards market uptake/commercialisation opportunities.
- Exploit complementarities while at the same time avoid overlaps and exclude double-financing (fraud).

On the other hand, is needed to take into account that synergies means:

- No substitute national, regional or private co-funding to projects or programmes by money from the other instruments.
- No diversion of funding from the purpose of the respective instrument/operational programme (e.g. smart specialization strategy).
- No simple "run for the money": Maximizing the acquisition of additional funding from Horizon 2020 for a MS/region is no good objective, as this lacks durable impact.

The Commission services strongly encourage synergies through bringing together Horizon 2020 and ESIF money in the same project (possible only for Horizon 2020), or through successive projects that build on each other or parallel projects/roadmaps that complement each other.

Synergies need preparation and efforts at all stages of programming and implementation and by all actors involved:

- Strategic level: awareness and understanding of the opportunities offered by different EU programmes, development of smart specialisation strategies and EU level strategies and plans.
- Program design level: development of work programmes and work plans in the framework of Horizon 2020, and the preparation of the Partnership Agreements and of ESIF programmes (including the choice of priorities, specific objectives, types of actions and beneficiaries, on the basis of an analysis of the needs) in the ESIF framework.
- Implementation level: project selection processes, information services, guidance to potential beneficiaries, monitoring of the implementation, etc.

What is needed to be done by National Research Authorities on the Horizon 2020 side is:

- Think strategically :
 - Provide the Managing Authorities (MA) with an overview/mapping of where the participants/member organisations in KICs, JTIs, EIPs etc. are located to feed into the RIS3 process (or revisions).
 - Set up dialogue with the regional innovation policy makers to be informed on their specialisation priorities and able to draw on this knowledge when discussing the Horizon 2020 work programme (or PPP / JTI work plan) modifications.
 - Learn and communicate about the available RDI capacities in the regions, including those in construction.
- Act in collaboration:
 - Get in touch with the Managing Authorities and seek cooperation with local/national business players.
 - Contact other ministries active in areas related to R&D&I (transport, environment, health, etc.) that could be "lead customers" for innovation in these areas and that might dispose of substantial ERDF & CF funding.
 - Create sectorial or cross-sectorial interest groups and alumni clubs of former and current Horizon 2020 beneficiaries coming from the region.
 - Promote local academia-industry cooperation, cross-border networking and support international connectivity and partner search to facilitate the

formation of trans-national consortia (incl. via EEN, INTERREG, cluster cooperation, EIPs, ETPs, etc.).

- Identify/generate opportunities:
 - o Facilitate transfer of technology, dissemination and take-up of research results from Horizon 2020/FPs, including via: providing information on where FP7/Horizon 2020 project participants are located, invite Horizon 2020 project participants to cooperate with the EENs and find out about relevant MAs and their ESIF opportunities, install a system to inform regional MA about calls for Horizon2020 and other European Programmes proposals that match their RIS3 specialisation fields and invite universities to scrutinise their level of connection to the regional economy.
- Set up suitable implementation mechanisms together with ESIF Managing Authorities:
 - o Introduce a process to channel good but not-funded Horizon 2020 project proposals that are largely located in an OP territory to the relevant MAs and how ERDF / ESF / EAFRD / EMFF funding (based for example on the coordinator's primary location).
 - o Explain the cost models, types of eligible costs, calculation methods and project formats of Horizon2020 to the MA and Ministries in charge of SME support, regional development, innovation in fisheries and agriculture, etc.
 - o Use of international evaluators in domestic calls for proposals.

5. CONCLUSIONS

The aeronautics industry is one of the top five technology sectors in Europe and contribute to the overall European goals (increases competitiveness, increases the mobility possibilities and contributes to the European sustainability targets). Moreover, the European aeronautic industry features an excellent global position, which could be secured by the investment in aeronautics R&D.

There are several independent European Instruments for R&D&I that could be used by the aeronautic industry (Horizon 2020, ESIF, national/regional programmes, etc.), but with the purpose of avoid double funding and obtain the more efficient and best use of public funding, is key the creation of synergies between these programmes.

To create synergies it is essential:

- Think strategic and impact-oriented (not project-oriented).
- Act in close collaboration (not isolation).
- Identify/generate opportunities (in all programmes).

- Set up suitable implementation mechanism.

RIS3 is a useful tool in the search of possible synergies because facilitate the identification of regions focus in aeronautics and other areas that could collaborate in this industry (optics, advanced materials, etc.).

ESIF and Horizon 2020 are two interesting programmes to create synergies in aeronautic, but it is needed to take into account the following recommendations:

- Horizon 2020 Collaborative projects will be used to learn and get the know-how.
- Smart Specialisation in aeronautics or in connected categories (e.g. manufacturing industry).
- National money for basic developments and for those areas where European budget is not accessible.
- ESIF will finance a significant part of the development projects of the aeronautics industrial companies.
- AirTN related co-operations in areas where for the development foreign partners are needed and ESIF can also support the cooperation of states.
- Fostering JTI participation when a certain level of development is reached at an applicable sub-area.