



FROM INNOVATION TO SOLUTION

SESAR Exploratory Research

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founding members

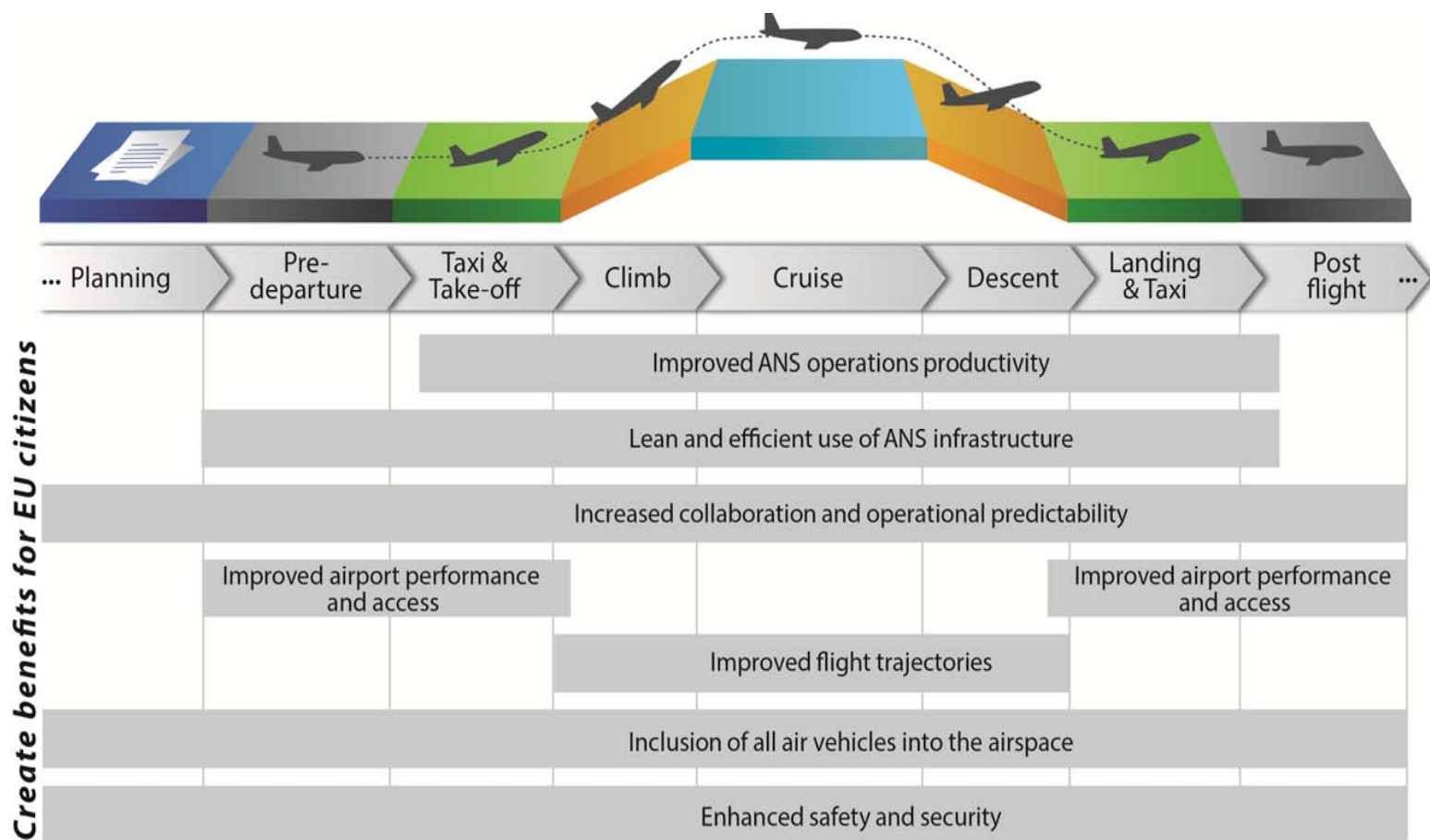


EUROPEAN UNION



EUROCONTROL

SESAR vision targets 7 improvement areas



LOOKING AT THE FLIGHT AS A WHOLE, WITHIN A FLOW AND NETWORK CONTEXT

SESAR to enable step-change in system capabilities

Automation of routine tasks

Three interlocking white gears are shown on a white background. The gears are arranged in a triangular pattern, with one gear at the top and two below it. They are rendered with soft shadows, giving them a three-dimensional appearance.

Automation and use of data communication to ease controllers & support staff workload

Integration of all vehicles

The image is a 2x2 grid of photographs showing different types of aircraft. The top-left photo shows a blue and white helicopter in flight against a cloudy sky. The top-right photo shows a white helicopter on a tarmac. The bottom-left photo shows a grey fighter jet in flight. The bottom-right photo shows a small, multi-colored propeller plane on a runway.

All air vehicles fully integrated in ATM environment (incl. RPAS)

Flight-centric operations



A map of Europe with several blue lines representing flight routes. The lines connect various cities across the continent, illustrating a flight-centric network. The lines are thicker than the ones in the previous slide, indicating a more complex or dense set of connections.

Air users fly their preferred, more direct route in a flow and network context

Integrated systems

**Lean and modular
systems, easily
upgradable and
interoperable**

Sharing of information



Information shared digitally via common information platform

Virtualization



Virtualization allowing dynamic capacity management

FROM INNOVATION TO SOLUTION



Changes to ATM



Delivering best-in-class, globally interoperable and high-performing Air Transport for Airspace Users and Citizens

- Enabling the delivery of safe, cost-efficient and environmentally responsible Air Vehicle & ATM operations, systems and services



High Performing Airport Operations

Capacity, Safety,
Environment, Efficient,
Effective, Networked



Optimised ATM Network Services

Collaboration, Balancing
Demand & Capacity,
Environment, Efficiency



Advanced Air Traffic Services

Synchronisation,
Capacity, Safety,
Environment, Cost



Enabling the Aviation Infrastructure

- Providing shared technical services across the aviation domain
- Communications, positioning, navigation, timing and SWIM information
- Air vehicle operations, systems & services

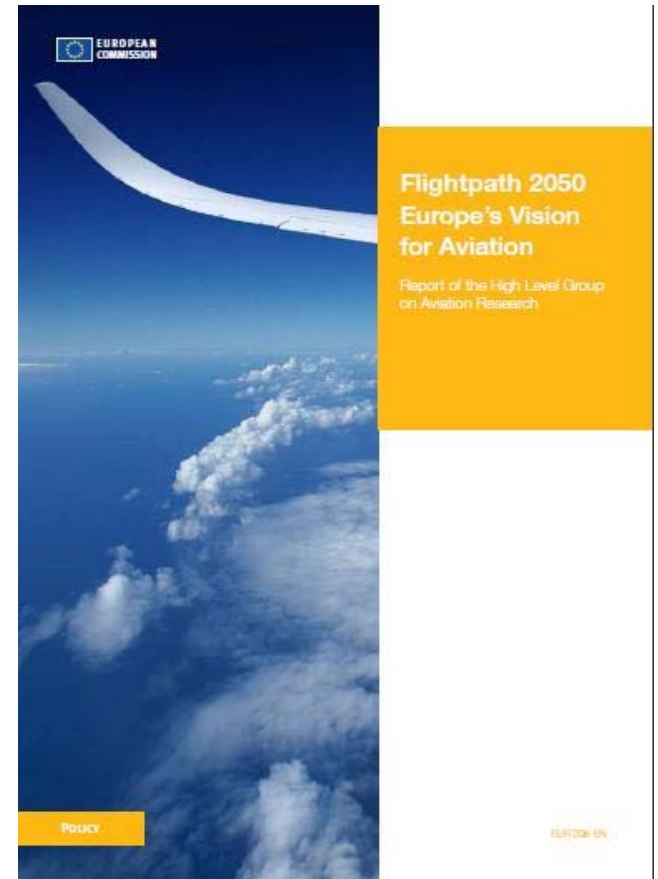
ATM Research in Europe

- HORIZON Transport Challenges smart, green and integrated transport
- FlightPath 2050 - five challenges to aviation beyond the 2050 Horizon
- SESAR 1 WP-E Long-term and innovative research
- SESAR 2020 Exploratory Research (Budget = 85Million Euros)



Exploratory Research Challenges

- Challenge 1 - Meeting Societal and Market Needs
- Challenge 2 - Maintaining and Extending Industrial Leadership
- Challenge 3 - Protecting the Environment and the Energy Supply
- Challenge 4 - Ensuring Safety and Security
- Challenge 5 - Prioritising Research, Testing Capabilities and Education



SESAR Exploratory Research in ATM

SESAR exploratory research drives the development and evaluation of innovative or unconventional ideas, concepts, methods and technologies; that can define and deliver the performance required for the next generation of European ATM system, and thus contribute to its successful evolution

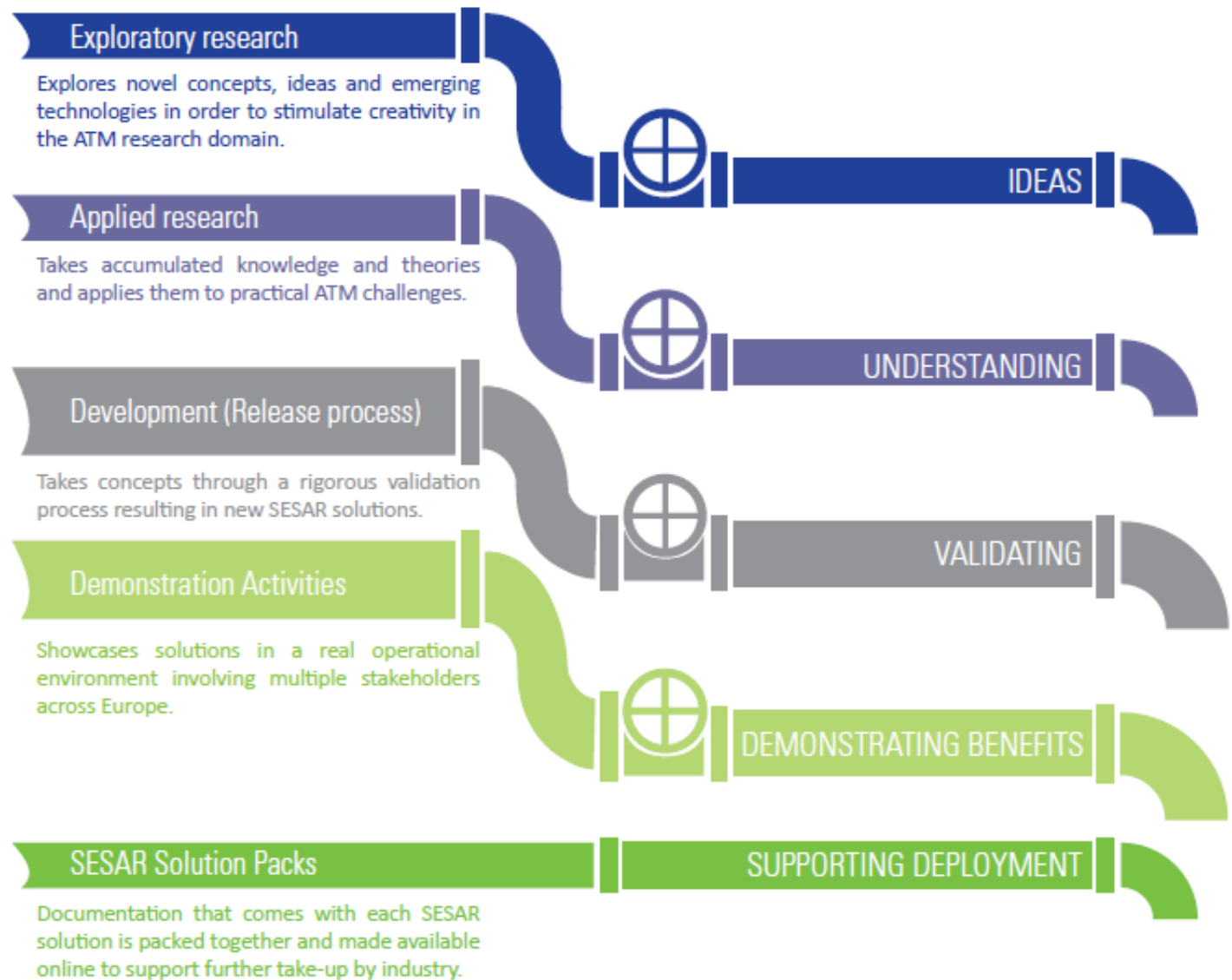


Reviewed, updated and approved by the SESAR
Scientific Committee



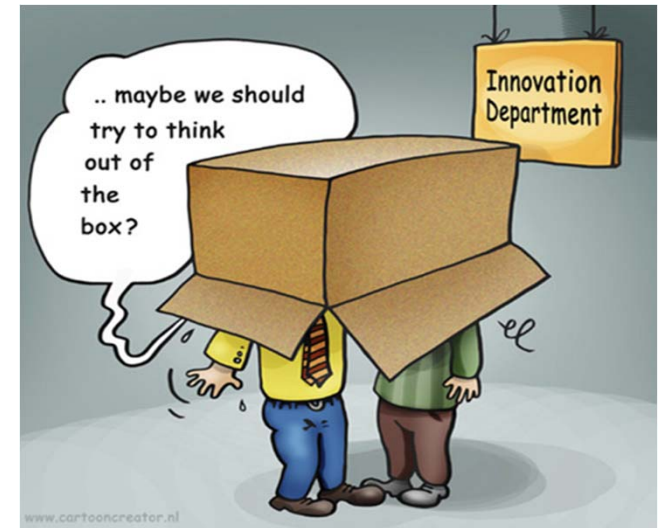
SESAR 2020 R&I Pipeline

Innovation pipeline



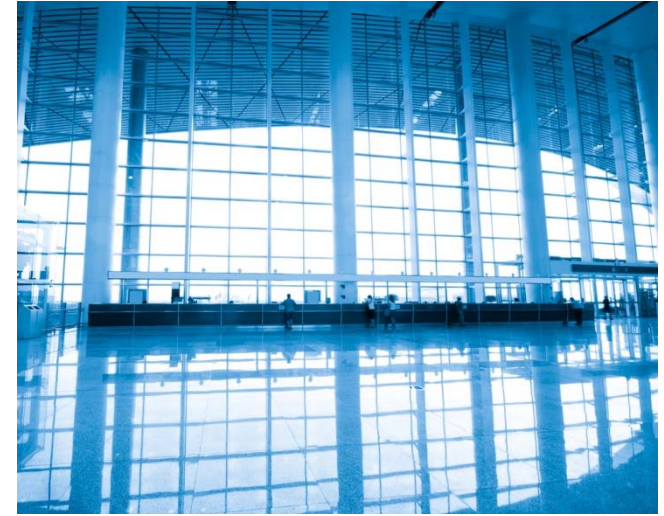
SESAR Exploratory Research Objectives

- To contribute to the European ATM Master Plan towards long term objectives beyond 2035 (i.e. 2050 timescale)
- To contribute to the identification of innovative solutions not yet identified but which would accelerate the realisation of the SES targets
- The delivery sustainable healthy research activities across a range of research networks in Europe



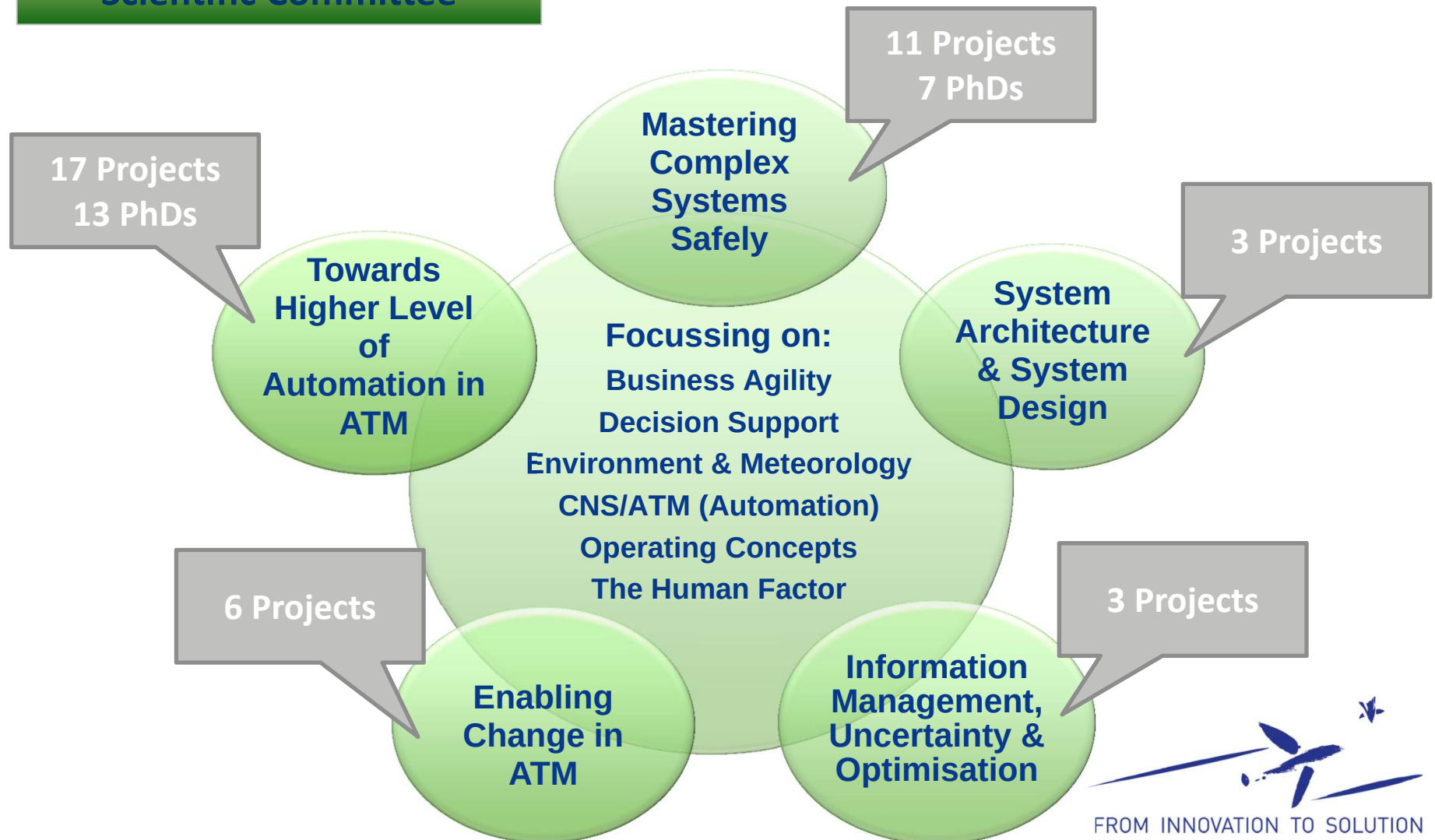
SESAR 1 Long-term Research

- Long-term research in SESAR1 conducted under the frame of WP E.
- A total of **40 projects** of which **26 are ongoing** and **14 are closed**
- The three Research Networks coordinate research, 20 PhD
- HALA! – Towards Higher Levels of Automation in ATM
- Complex World – Mastering Complex Systems Safely
- ALIAS – Addressing the Liability Impact of Automated Systems



SESAR 1- Encouraging scientific excellence in ATM

With guidance from SESAR
Scientific Committee



SESAR 1 Lessons Learnt

- The transfer of long-term research results is difficult into the Industrial Research activities of the main SESAR program
- SESAR 2020 will aim at better bridging the results from Exploratory Research through Industrial Research, Large Scale Demos towards implementation/industrialisation readiness
- Strengthen the link of the ATM research community and SESAR stakeholders through ATM Applications Oriented topics in SESAR 2020



SESAR 2020 Exploratory Research Call

SESAR 2020 ER 1st Call launched 25th of March 2015

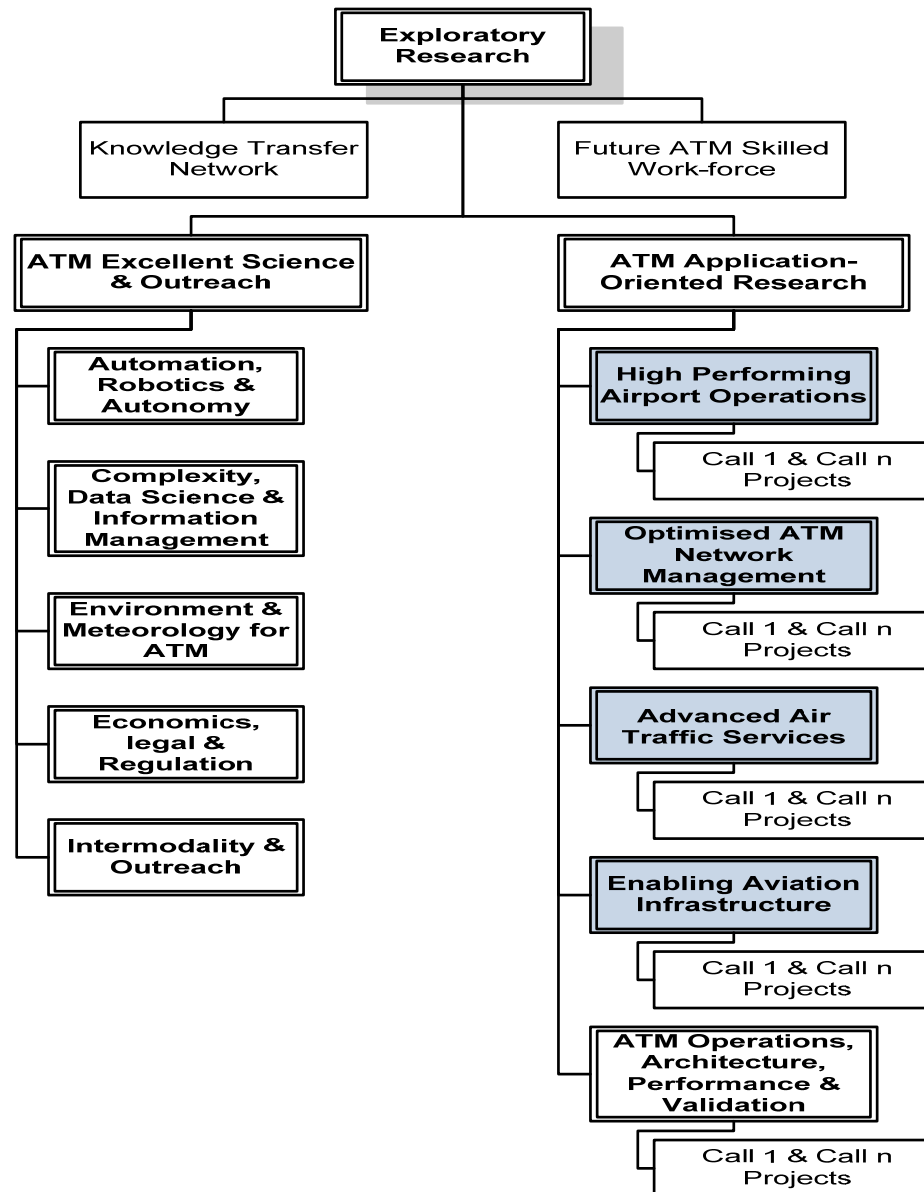
- Call closed on **25th of June 2015**
- **H2020 Open Call** - Research & Innovation Action (RIA)
- **ER 1st Call** covers **11 Topics**
- **20,6 Meuro** co-financing budget
- **100 %** co-financing of eligible costs
- Projects beginning early **2016**

SESAR 2020 Future Exploratory Research Calls

- SESAR 2020 ER 2nd Call is **planned for end 2016**
- SESAR 2020 ER 3rd Call is **planned for 2019**



SESAR 2020 Draft Work Breakdown Structure (WBS)



SESAR 2020 ER 1st Call – Part I

- **Automation of the ATM systems-** new paradigms for human-machine interaction, integration of RPAS or highly autonomous aerial vehicles, degradation of automation and impact on ATM performance including safety & security, automation failure scenarios
- **Data Science & Information Management in ATM** – applying complexity and data science in ATM, automating the extraction of knowledge of raw data, cyber-security, using Ontology engineering models in a network environment
- **Environment & Meteorology in ATM** – 4D trajectories taking into account environmental considerations, airborne and ground MET capabilities integration in ATM processes, weather uncertainty impacts 4D trajectories, impact of climate change



SESAR 2020 ER 1st Call – Part II

- **Challenges of change**

- evolving market pressures
- new market entrants
- new business models
- variable pricing mechanisms for demand-capacity balancing
- unbundling ATM services
- lessons learnt from other industries
- impact on ATM system architecture



SESAR 2020 ER 1st Call – Part III

- **High Performing Airport Operations** - as the pressure increases on airports, new technologies are emerging that may offer significant potential for improved situational awareness for tower controllers.
- **Separation Management and Separation Standards** - to define potential new separation standards and separation management techniques to allow a/c to be more closely spaced
- **CNS** - is the use, or adaptation, of new technologies being developed outside ATM to support ATM CNS needs including analysis of the safety, performance and security implications for the ATM system, CNS are currently characterized by lack of integration, GNSS jamming/spoofing



SESAR 2020 ER 1st Call – Part IV

- **Trajectory Based Operations (TBO)** - TBO is a key element of future ATM operating concepts. It is expected to provide the flexibility needed by airspace users to optimise their operations while simultaneously ensuring the predictability needed at ATM network level for maximum overall performance.
- **ATM Architecture** - research activities are expected to help better understanding and modeling how architectural and design choices influence the ATM system and its various behaviours.
- **ATM Performance** - to address change in the way Air Navigation Services (ANS) are regulated, operated, consumed and financed is now undergoing.



SESAR 2020 Exploratory Research – Call 1

- **ATM Excellent Science & Outreach** - is curiosity-driven and explores unknown research areas. Referred to also as “**fundamental research**”, but also encourages scientists to develop innovative ideas and concepts for the future ATM evolution. Bridging ATM research with wider community and providing scientific support to ATM change, either directly or through connection to other funded research areas in other disciplines and sections if relevant.
- **ATM Applications Oriented Research** - aiming at supporting new concepts for ATM beyond those identified in the ATM Master Plan as well as help mature new concepts for ATM, emerging technologies and methods to the level of maturity required to feed into SESAR 2020 industrial research



SESAR 2020 Exploratory Research Topics

ATM Excellent Science & Outreach:

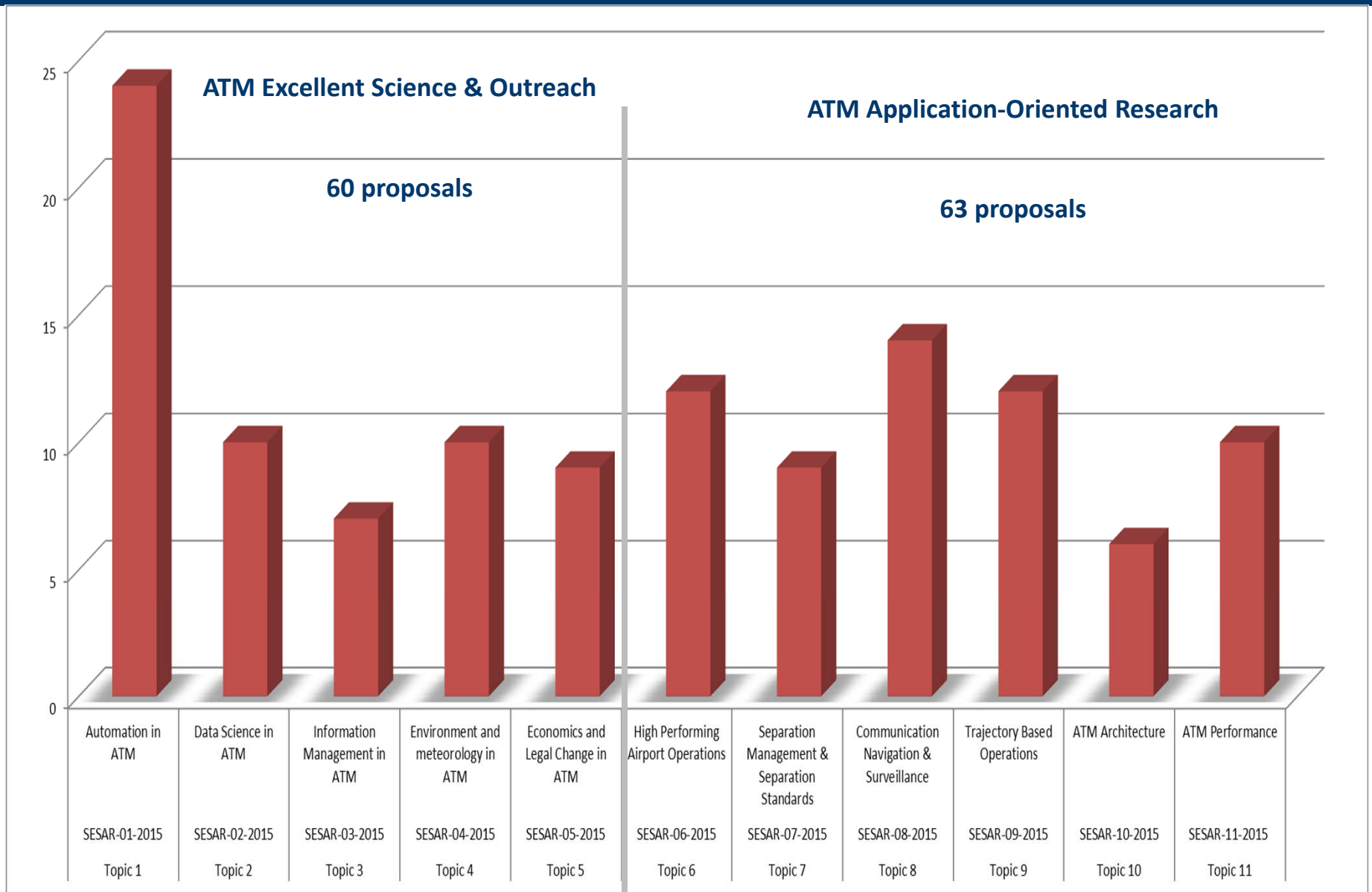
- ER-01-2015 - Automation in ATM
- ER-02-2015 - Data Science in ATM
- ER-03-2015 - Information Management in ATM
- ER-04-2015 - Environment & Meteorology in ATM
- ER-05-2015 - Economics and Legal Change in ATM

ATM Application-Oriented Research:

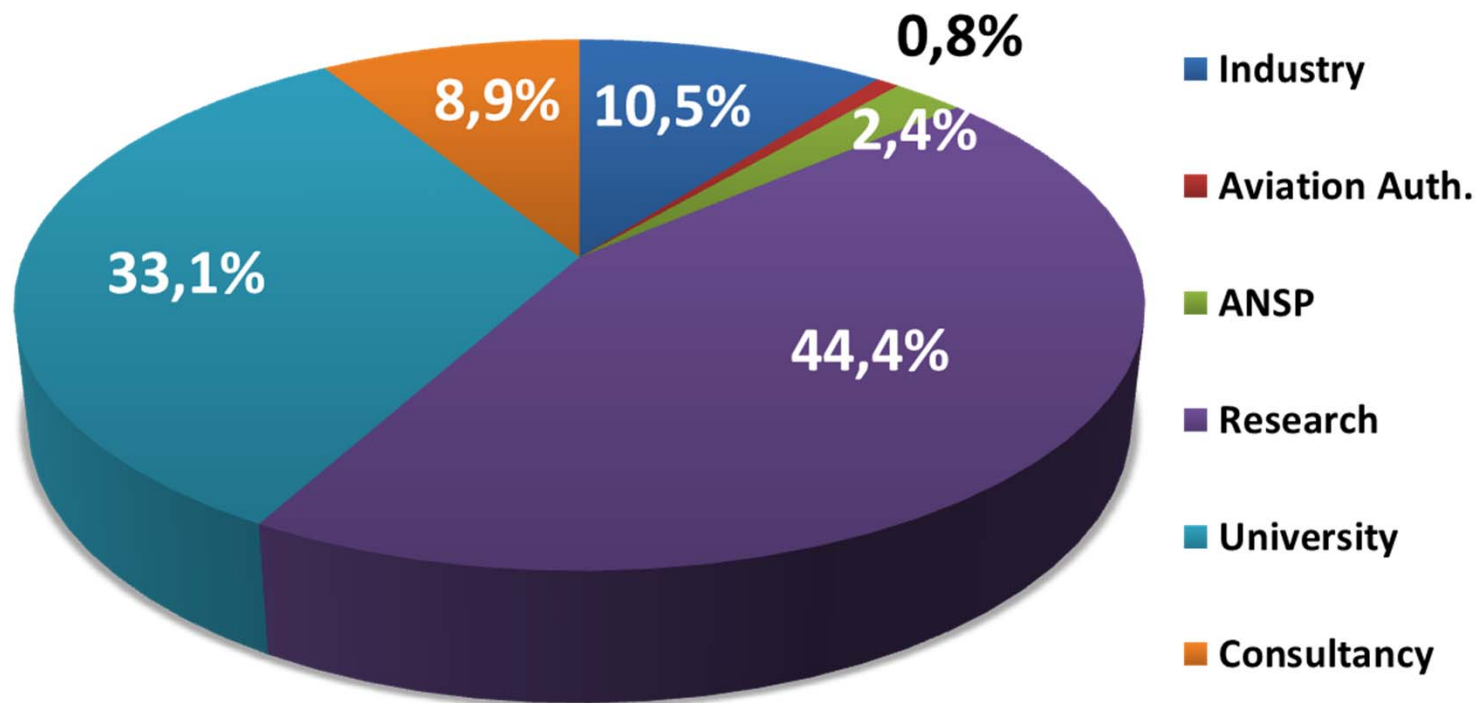
- ER-06-2015 - High Performing Airport Operations
- ER-07-2015 - Separation Management and Separation Standards
- ER-08-2015 - Communications, Navigation and Surveillance
- ER-09-2015 - Trajectory Based Operations
- ER-10-2015 - ATM Architecture
- ER-11-2015 - ATM Performance



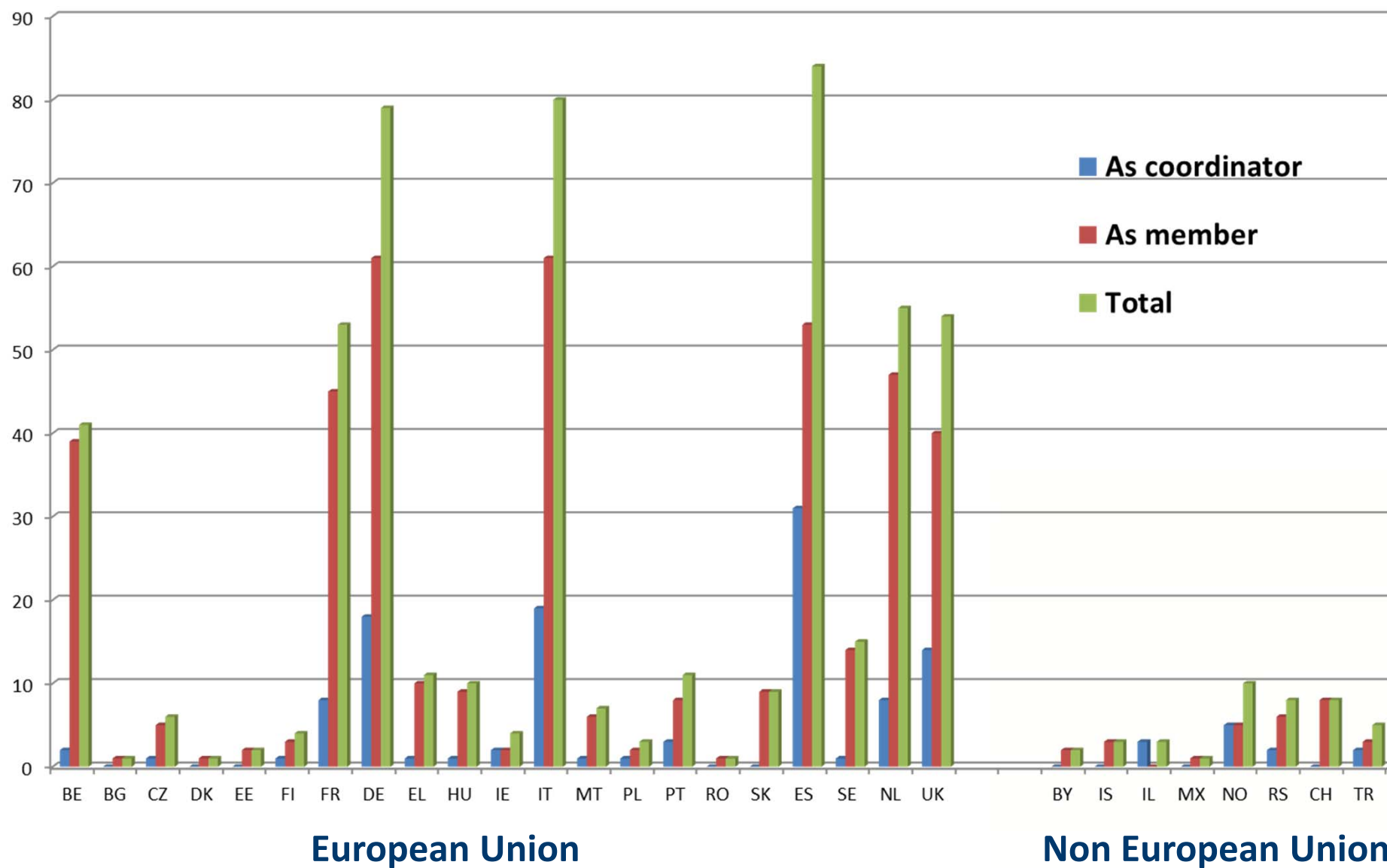
SESAR 2020 1st ER Call Proposals Received



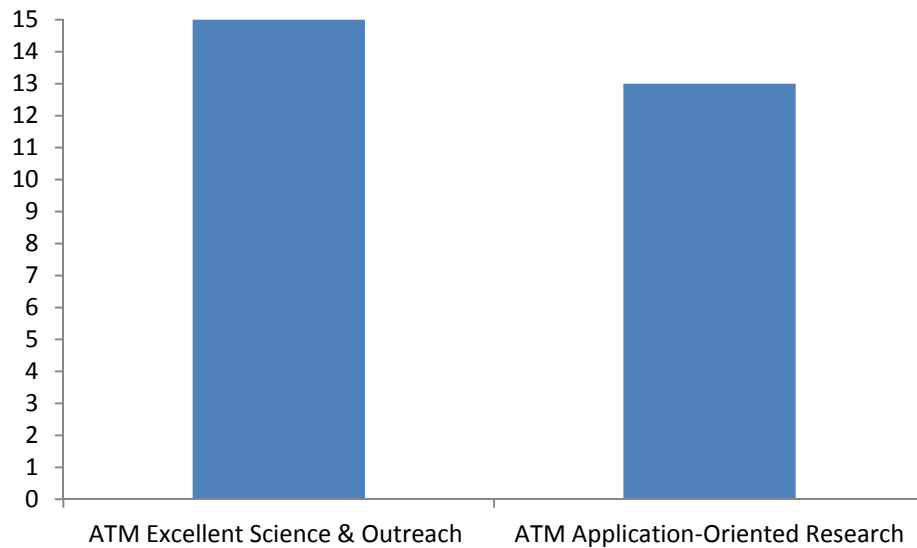
SESAR 2020 1st ER Call distribution by entities



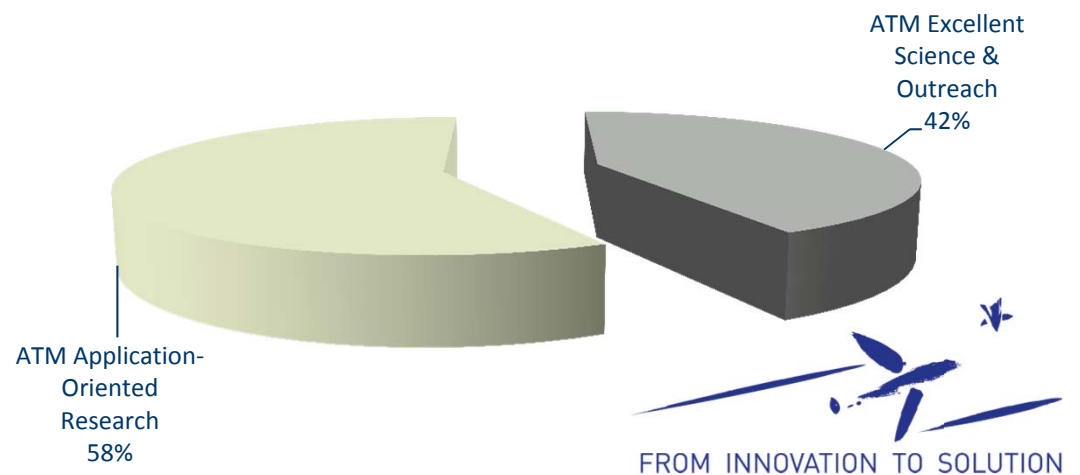
SESAR 2020 1st ER Call Participation by Country



SESAR ER 1st Call Results-Part I

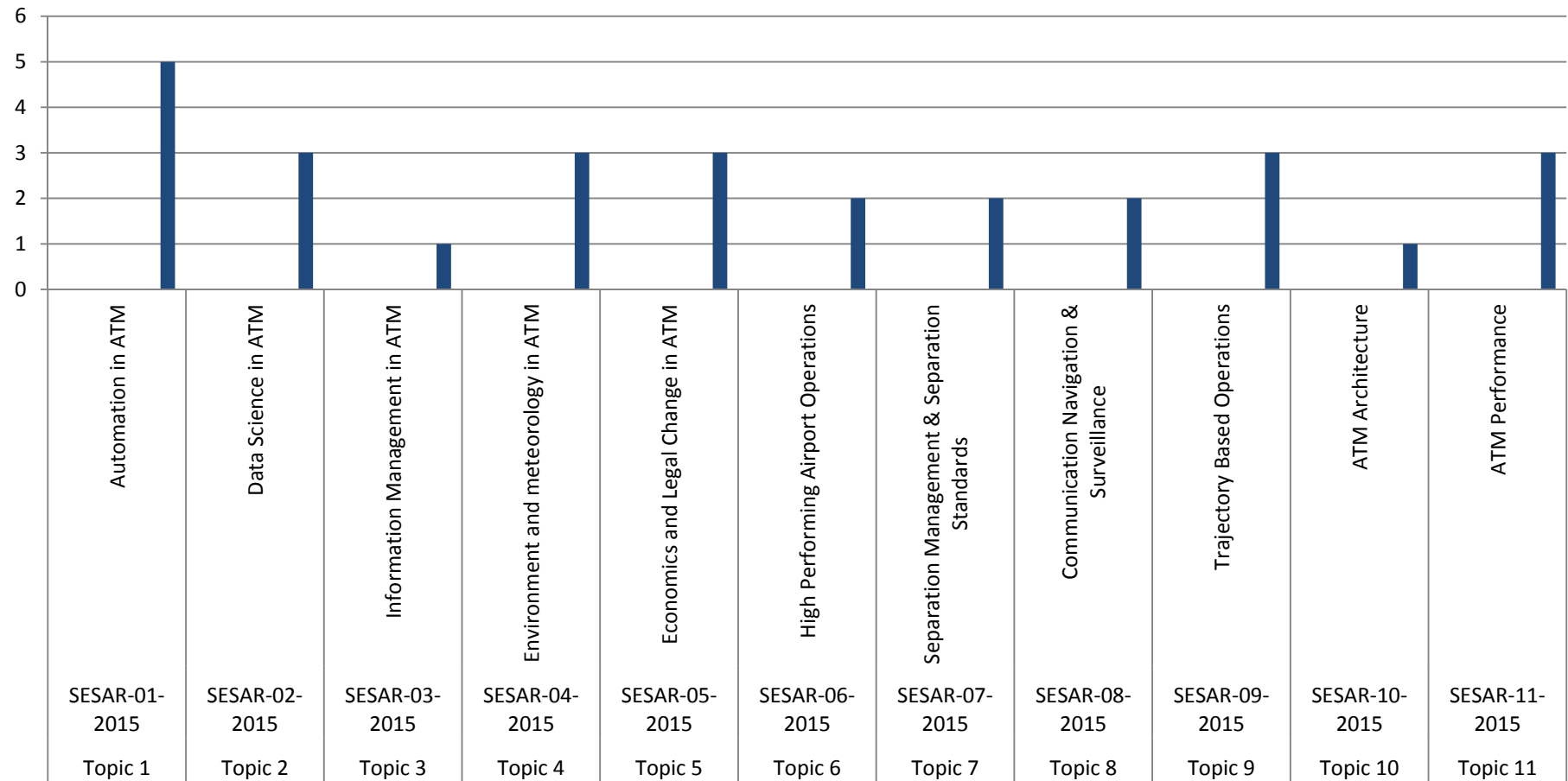


SESAR 2020 ER 1st Call Budget Distribution

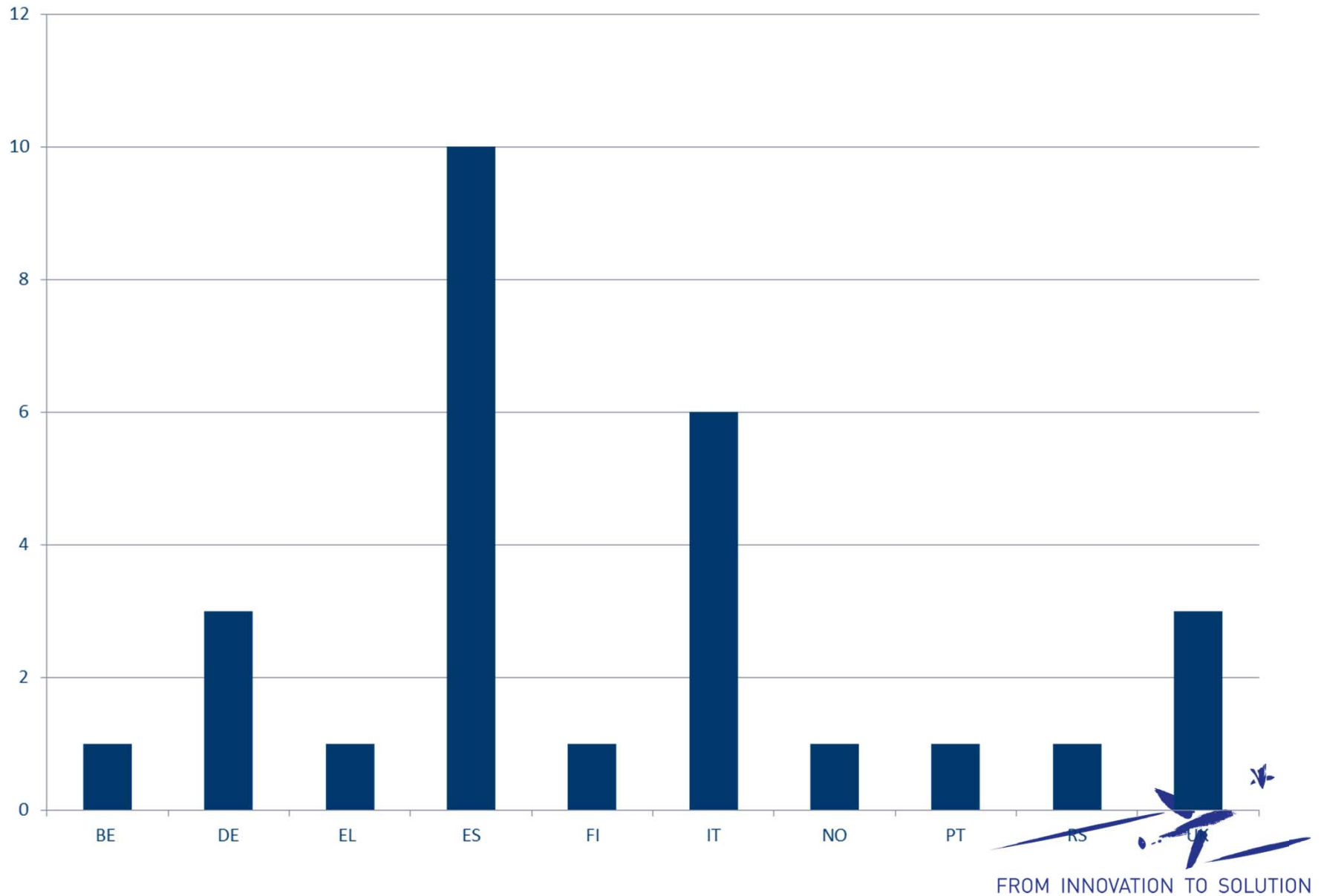


ER 1st Qualified Projects per Topic

ER Projects per Topic



ER Selected Proposals per Country



FROM INNOVATION TO SOLUTION

SESAR 2020 ER 1st Call Lesson Learnt

- Highly competitive 1st ER Call with good quality proposals building upon WP-E results
- Innovative research questions and challenges addressed in the proposals
- Proposals fully in-line with SESAR Vision for the future evolution of the European ATM



SESAR 2020 ER 2nd Call

- How do we identify new disruptive research ideas and concepts relevant to the future evolution of ATM?
- How do follow-up on WP-E results and transfer these results into SESAR Industrial research?
- How can identify research direction addressing future ATM research challenges ?
- How can we create a new long-term research roadmap of benefit to the future European ATM systems?



SESAR 2020 2nd Exploratory Research Call

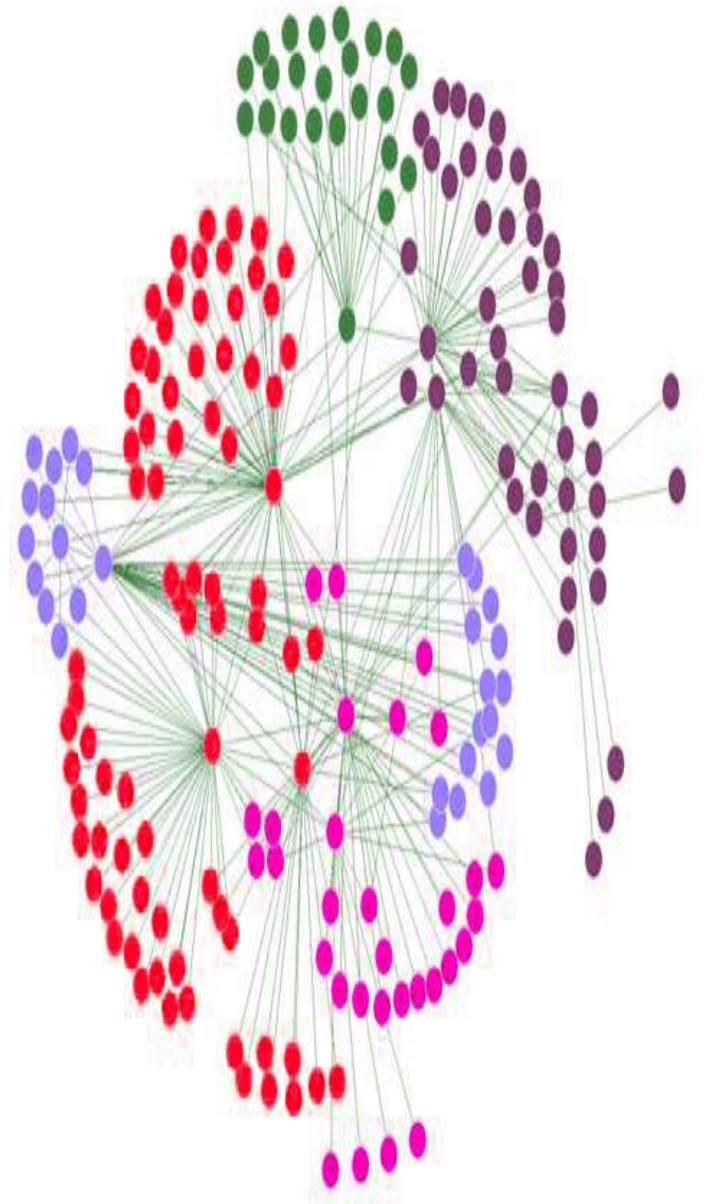
- SESAR 2020 ER 2nd Call to be launched in late 2016
- SESAR ER Call Scope currently being defined
- Call expected to contain Transversal and ATM Applications Oriented topics
- H2020 open calls, so not limited to SJU Members



SESAR 2020 Transversal Activities

Transversal exploratory research activities, aims at the communication and application of research results through the establishment of knowledge network activities and the support for ATM related education of the future ATM skilled work-force:

- **Knowledge Transfer Network** - assessment, coordination and communication transfer of ER results
- **Future ATM Skilled work-force** - PhD, training network activities, Young Scientist Award



SESAR 2020 ATM Applications Oriented Research

- **High Performing Airport Operations -** Enhanced Runway Throughput, Integrated Surface Management, etc.
- **Optimized ATM Network Management** airspace management, etc.
- **Advanced Air Traffic Services -** Enhanced Air & Ground Safety Nets, separation, etc.
- **Enabling Aviation Infrastructure –** CNS, Common Services, etc.
- **ATM Operations, Architecture & Performance -** ATM Resilience, etc.



Conclusions

- SESAR Exploratory Research will be the driver behind innovative and disruptive research ideas
- More budget available in SESAR2020
- ER results will feed the next steps in SESAR Industrial Research
- The link between research and deployment is assured
- Its time to get involved





Thank you for your attention

