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Observation Platform for Technological and Institutional Consolidation of research in Safety & Security

What is the State-of-the-Art of European R&I on data science for aviation safety?

Alex Rutten (NLR)

EASA, Köln, 11th of October 2018

European Commission

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OPTICS2 Consortium

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OPTICS & OPTICS2

2013-2017, Safety

2017-2021, Safety & Security

Improvements to the Methodology

- Prioritisation of the enablers: not all the enablers are equally important
- Strategic assessment of the "big picture“, to ease comparison with International state-of-the-art

Main Goals

“Is Europe performing the right safety and security research?”

- Review of the state-of-the-art of safety and security aviation research
- Assessing current progress against the goals set out by Flightpath 2050 and ACARE Strategic Research Agenda
- Identify gaps and bottlenecks
- Provide recommendations to the Commission
- Interact with ACARE to update/refine the Research Agenda

Main Results

Main Results - Examples

Blocking points:

- Some of the promising research does not seem to **be picked up by industry**
- Some research seems to get **'stuck in the middle'**: medium contribution, medium maturity level
- **Data sharing**: sharing and analyzing truly useful data without affecting the reputations and competiveness of individual organisations

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http://www.optics-project.eu/#main

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Welcome to OPTICS2

OPTICS2 is a Coordination and Support Action of the European Commission, follow-up of the OPTICS Project. It works in close collaboration with ACARE on the topic of safety and security. OPTICS2 provides a comprehensive evaluation of relevant safety and security research and innovation in aviation and air transport. Answering the question **"Is Europe performing the right safety and security research?"** is the goal pursued, with a view to providing recommendations to steer EU Aviation Safety and Security research.

The OPTICS2 goal & approach

Are we doing the right SAFETY and SECURITY RESEARCH?

GOAL

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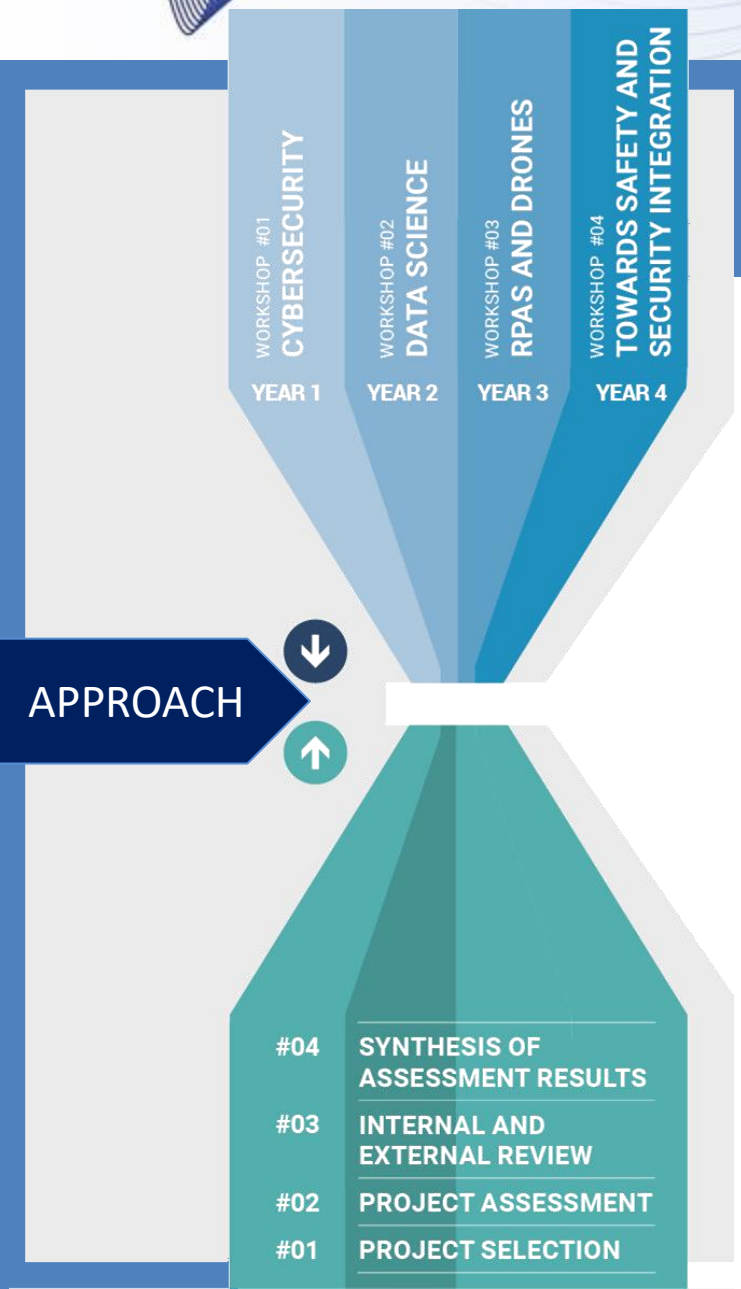
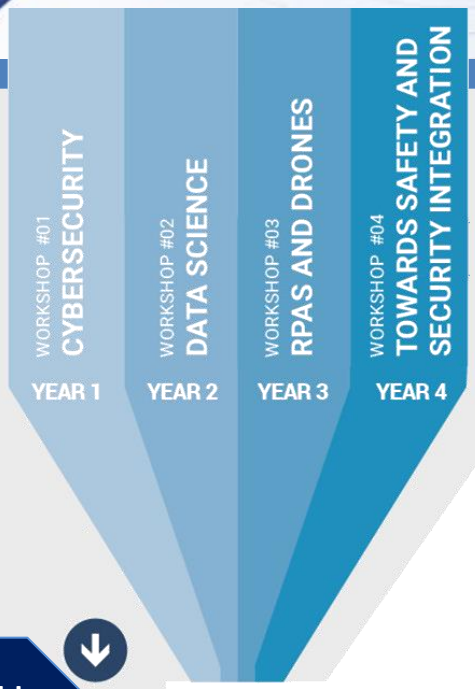


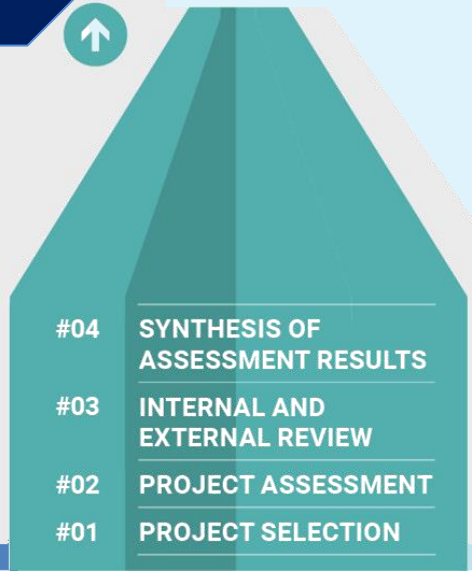
The OPTICS2 goal & approach



Are we doing the right SAFETY and SECURITY RESEARCH?

GOAL

APPROACH



… How do projects contribute to the Aviation Research Roadmap?

The OPTICS2 Team searching and assessing Research Projects

BOTTOM-UP APPROACH

The OPTICS2 goal & approach

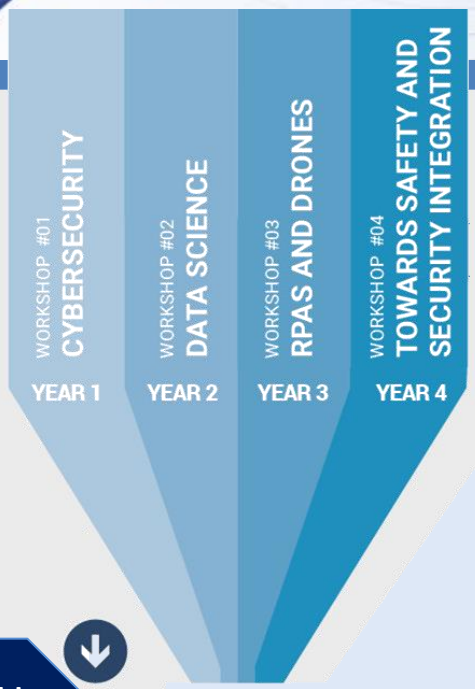
Are we doing the right SAFETY and SECURITY RESEARCH?

GOAL

TOP-DOWN APPROACH…

… **Expert** contributing through **workshops** and **consultations**.

APPROACH



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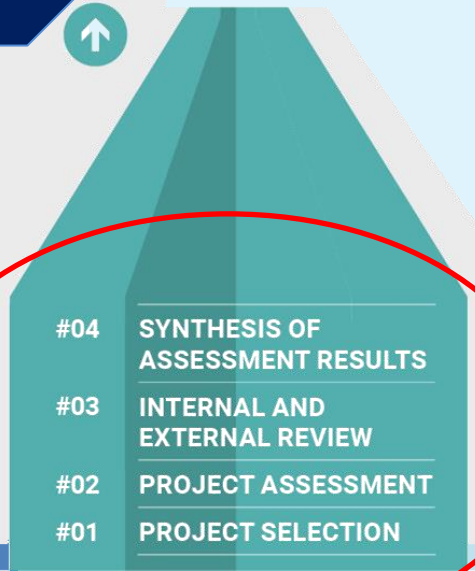
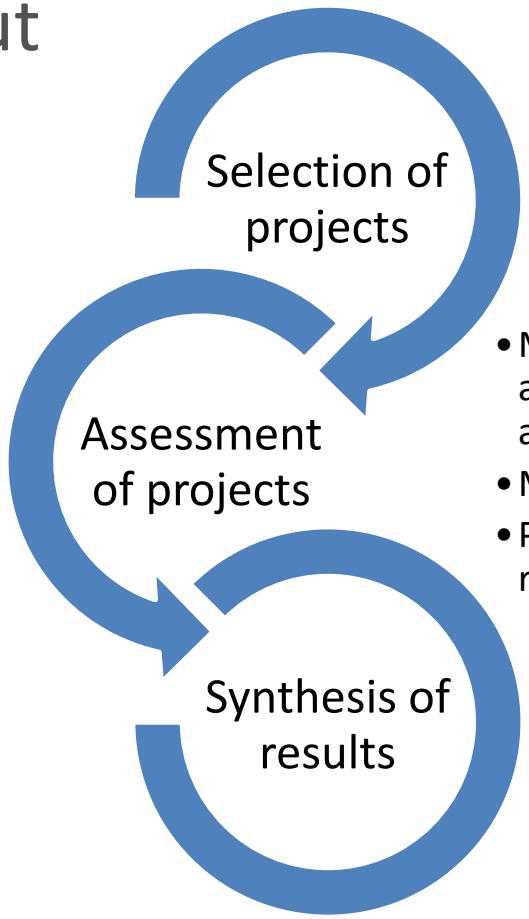


BOTTOM-UP APPROACH

Project assessment

OPTICS2 does not judge quality of the projects, but only the coverage of the SRIA2



- Mapping of projects and preliminary assessment,
- Moderation,
- Project coordinator review

Project assessment

Main criteria to judge the state of an Action Area

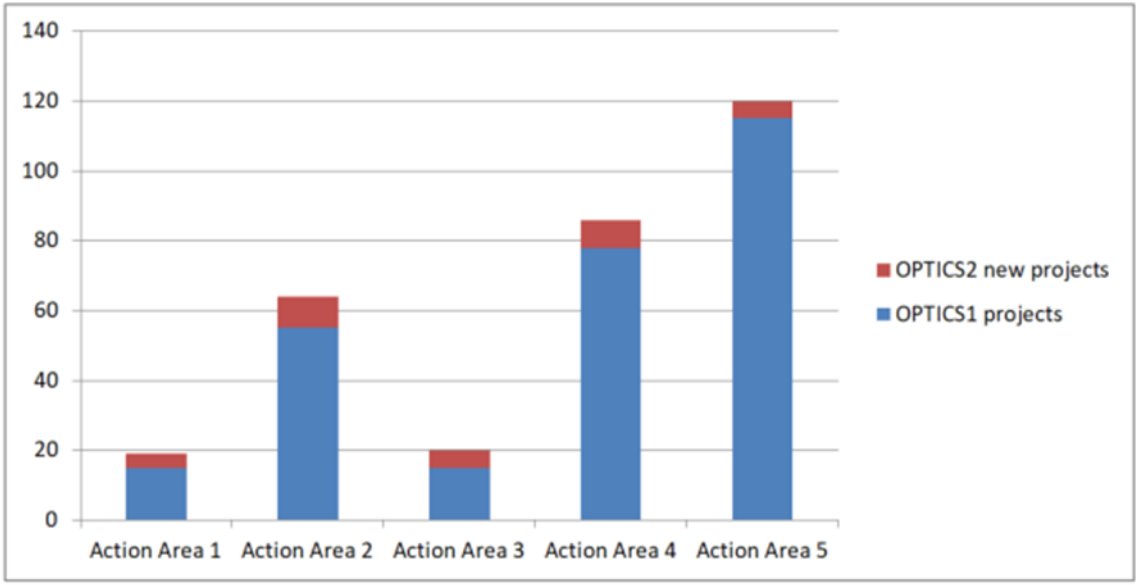
- **Coverage**: degree to which research is addressing the Action Area
- **Maturity**: how close to commercial uptake are the results
- **Ease of adoption**: what are the legal, economical and technical barriers to implementation
- Other elements of the assessment include:
  - Coverage of top safety and security risks
  - Socio-economic impact

Year 1 project assessment

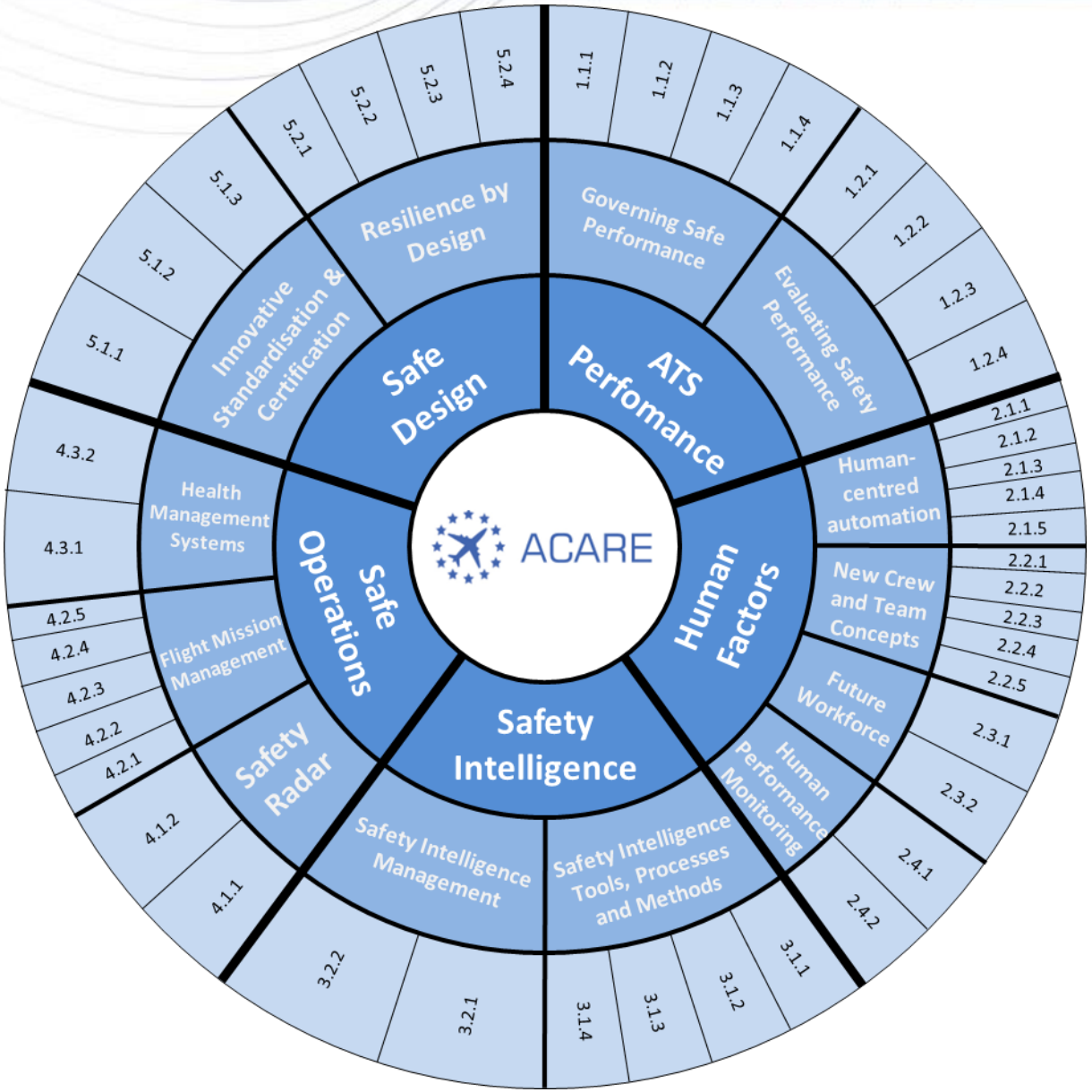
237 total safety projects

25 new projects and 212 projects already assessed against first version of the SRIA

19 projects contributed to Action Area 3

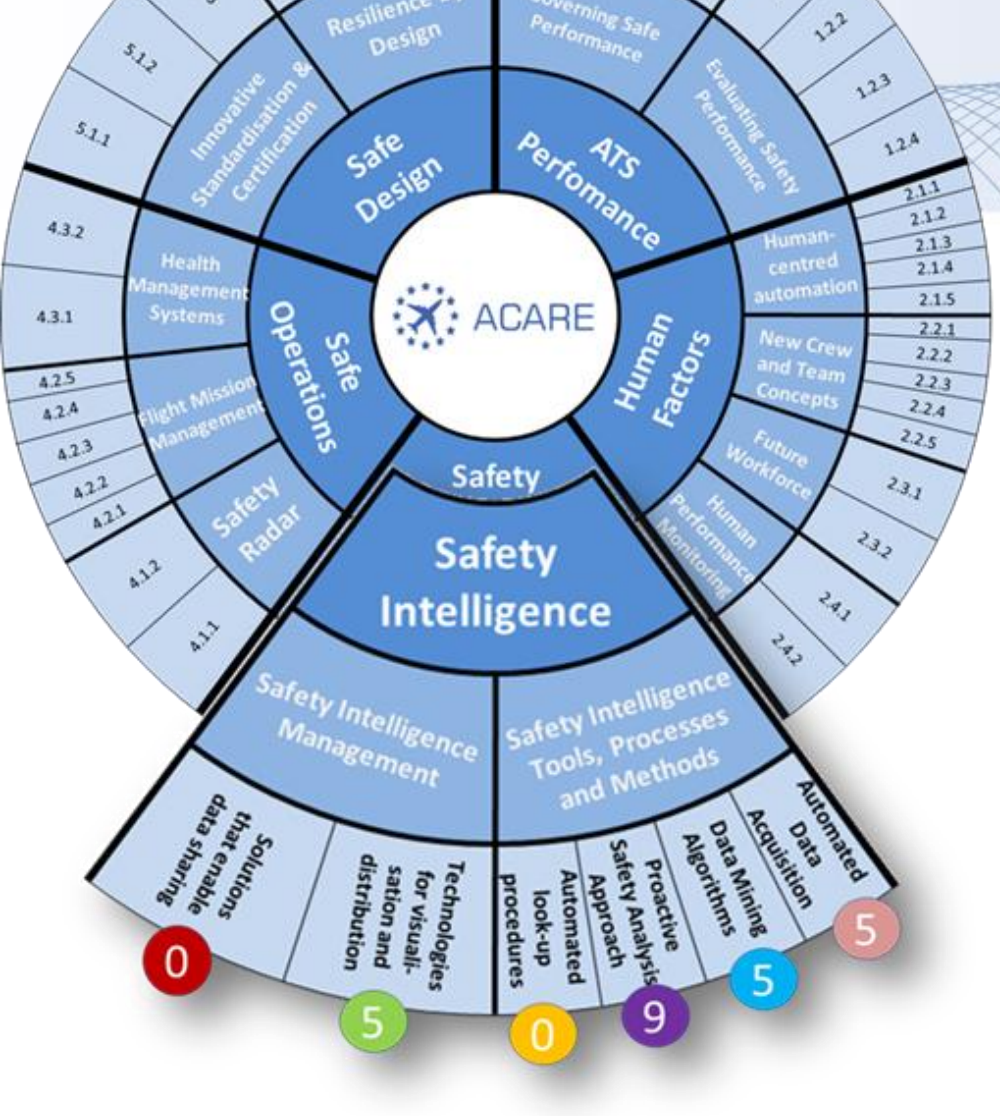


SRIA2: Strategic Research and Innovation Agenda



SRIA2: Action Area 3

Action area 3: Harnessing Safety Intelligence.					
3.1. Safety Intelligence Tools, Processes and Methods				3.2. Safety Intelligence Management	
3.1.1. Tools, methodologies and processes aiming at automating the data capture, streaming, fusion and storage of aviation-related data	3.1.2. Data mining algorithms that support the analysis of past safety events. Tools detecting correlation, causalities and new patterns in the data.	3.1.3. A proactive safety analysis approach that enables predicting future hazards and that moves beyond descriptive and forensic analysis	3.1.4. Efficient automated look-up procedures and mechanisms across heterogeneous data sources including: aviation and multimodal datasets, weather data, voice&video data etc	3.2.1. Methods, processes and technology for the visualisation and distribution of information to organisations and actors across the ATS	3.2.2. Multidisciplinary solutions, including all aviation stakeholders that enable facing the legal, technical and security challenges in data sharing



Number of projects mapped on Action Area 3 'Safety Intelligence': 19
Total number of projects assessed by OPTICS2: 200+
(SESAR: 44 / CleanSky: 10 / FP7: 62 / FutureSkySafety: 5 / Horizon2020: 9 / National Programmes: 113)

SVETLANA
(Safety (and maintenance) improVEment Through automated fLight data ANAlysis)

FSS P4
(Future Sky Safety P4: Total system Risk Assessment)

datACRON
(Big Data Analytics for Time Critical Mobility Forecasting)

WeAC
(Weather in ATM & CDM)

Airplane Fire
(Fire risks assessment and increase of passenger survivability)

COMPASS
(Safety Management in Complex ATM Systems using ICT approaches)

FSS P3
(Future Sky Safety P3: Specific solutions for Runway excursion accidents)

Occurrence Underreporting
(An Analysis of Transport Airplane Occurrence Underreporting)

AAS
(Integrated Airport Apron Safety Fleet Management)

PROSPERO
(PROactive Safety PERformance for Operations)

UFO
(UltraFast wind sensOrs for wake-vortex hazards mitigation)

SESAR STAM 13.2.3
(Advanced short-term ATFCM measures (STAMs))

Runway Incursion Risk Modelling
(Runway Incursion Risk Modeling)

MODNAT
(Probabilistic modelling of natural phenomena)

AWACS
(Airside Watch for Amelioration of Capacity and Safety)

SAMSYS
(Safety Management System for enhanced flight safety)

ELSA
(Empirically grounded agent based models for the future ATM scenario)

FSS P5
(Future Sky Safety P5: Resolving the organisational Accident)

PACAS
(Participatory Architectural Change Management in ATM Systems)

1st year assessment

Safety Intelligence, Tools and Processes

- 5 projects on **data capture**, in wide variety of areas. Many types of data not covered
- Research into **data mining**, limited to 5 projects. Many fields of aviation not covered
- On **pro-active safety analysis**, 9 projects cover a very fragmented field of topics
- No projects on **efficient use of heterogeneous data sources**

1st year assessment

Safety Intelligence management

- 5 projects target **visualisation and distribution of information across the ATS**
- No projects address the **legal, technical and security challenges in data sharing**

Areas for improvement

- Start work to resolve barriers:
  - Technical, organisational, economical, regulatory
- Increase research efforts in:
  - efficient use of heterogeneous data sources
  - the technical, legal, security issues of data sharing
- Expand applications to all areas of aviation

Conclusions

On the positive side:

- data acquisition, data mining, pro-active safety and sharing safety information are addressed by research

However:

- Exploitation of other data sources and broadening the scope to all elements of the ATS is needed
- There are still barriers to operational use

Thanks for your attention!

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