EREA

Association of
European Research Establishments in Aeronautics

FUTURE SKY

European JOINT RESEARCH INITIATIVE for Aviation

Joint Research Programme on

S A F E T Y

EREA

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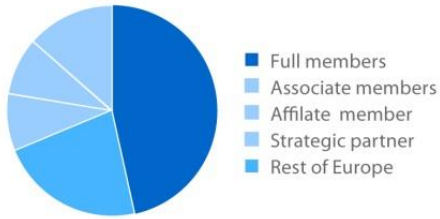
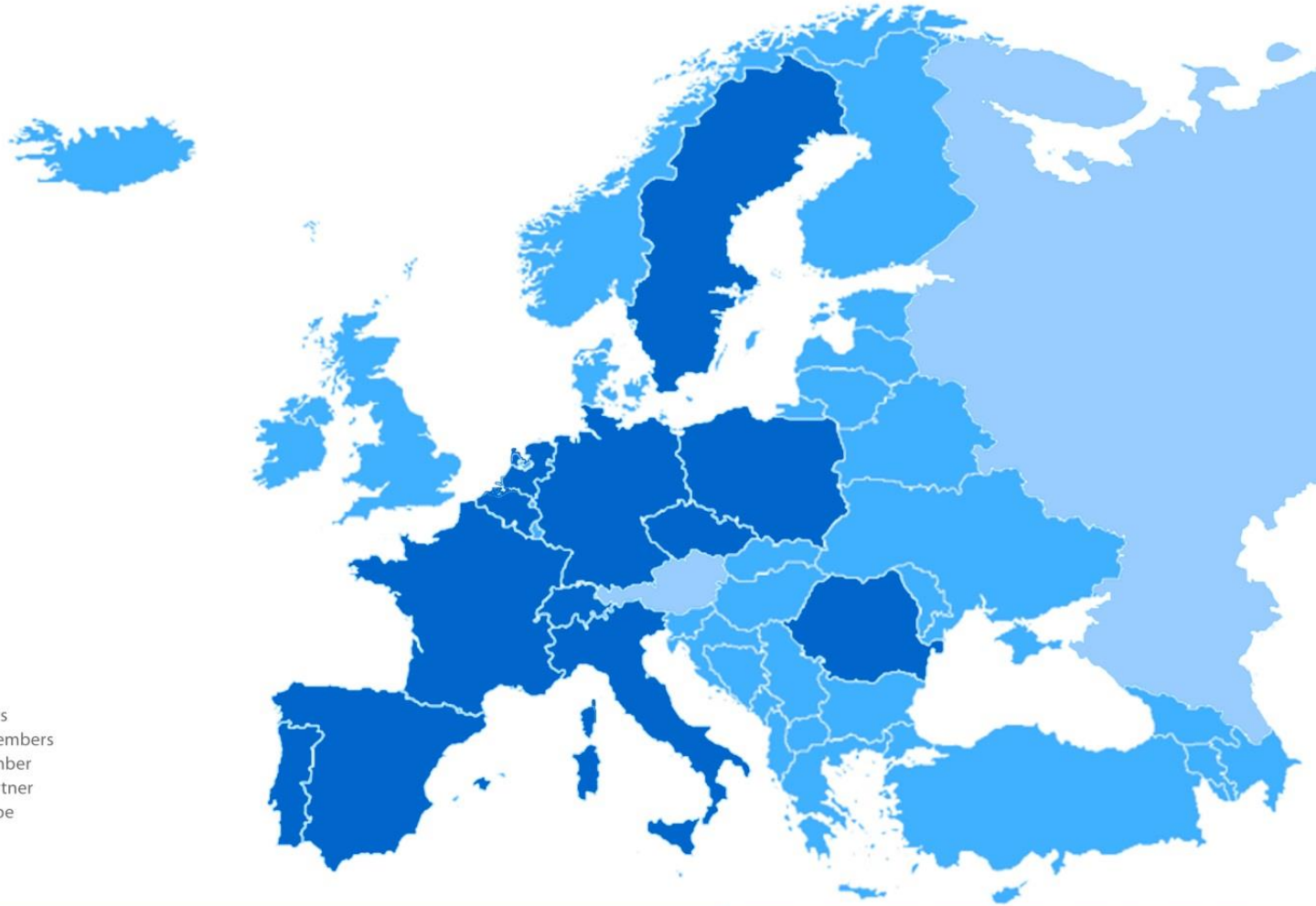




Full members:

CEIIA, CIRA, DLR, FOI, IL, INCAS, INTA, NLR, ONERA, VKI, VZLU, csem

Associate members, Affilate member & Strategic partner

AIT, CIAIM

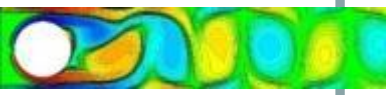
The Role of EREA

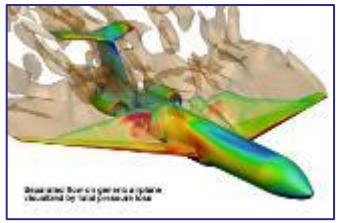
Development & Integration of technologies

Production & commercialisation

Research

Transfer to industry





Universities

EREA

Industrial partners, Spin-offs, Start-ups

EREA in numbers

180

Number of PhD Thesis

5.000

Employees in aeronautics

6.000

Number of Publications

€ 0,5 Bln

Annual research budget

Future Sky Initiative

JRP1

Safety

JRP2

Quiet Air Transport

JRP3

Air Transport Integration

JRP4

Energy

Research infrastructures

NLR **ONERA** **DLR** **t.b.d.**

MG 1.4 Coordinated research and innovation actions targeting the highest levels of safety for European aviation

SPECIFIC CHALLENGE

- Monitoring and mitigation of existing and arising risks, further decrease of accident rates with an integrated approach to safety

SCOPE

- Broad safety roadmap established at system level consistent with other roadmaps from key European organisations and Initiatives
- Technologies and concepts capable of increasing the level of safety
- Coordination of partners 'in-house' research and innovation actions on safety

EXPECTED IMPACT

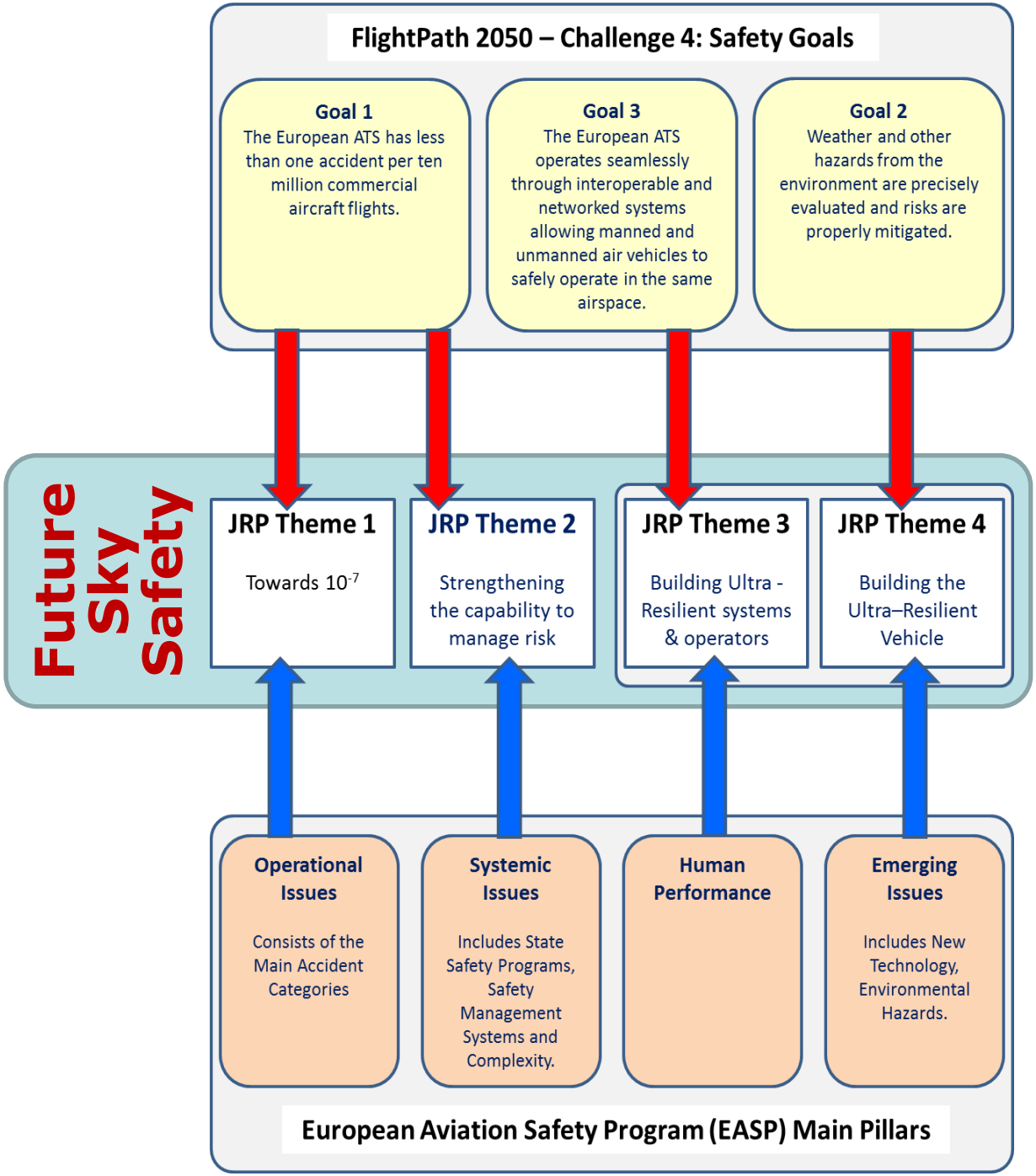
- Less than one accident per 10 million commercial flight departures, 80% reduction of the accident rate specific operations (targets: 2050, ref. 2000), mitigation of weather hazards, overcome fragmentation

Focus, scope & funding

- Two main activities:
  1. Research coordination
  2. Research into specific safety
- Focussed, not every safety concern merits research solution
- Scope:
  - Not Security
  - Not Military.
  - TRL 2 to TRL 4, with work up to TRL 5 in specific domains
- One program, 7 year roadmap, two calls
- Part 1: 15 M€ EU funding, 25M€ budget

Link with Policy:

- Flight Path 2050
- EASP



Nine technical projects

Theme 1 - New protections against todays accidents

P3 Specific solutions for runway excursion accidents

P8 Advanced flight envelope protection

Theme 2 - Strengthening the capability to manage risk

P4 Total system risk assessment

P9 Getting ahead of the curve; emergence detection and big data

Theme 3 - Building ultra-resilient systems and operators

P5 Resolving the organizational accident

P6 Human Performance Envelope

P10 More resilient crew – flight deck automation cooperation

Theme 4 - Building ultra-resilient vehicles

P11 Reducing the effect of environmental hazards

P7 Mitigating the risk of fire, smoke & fumes

Two Calls

P1 Coordination of Institutionally Funded Safety Research

P2 Dissemination, exploitation and communication

Call 1

P3 Specific solutions for runway excursion accidents

P4 Total system risk assessment

P5 Resolving the organizational accident

P6 Human Performance Envelope

P7 Mitigating the risk of fire, smoke & fumes

Call 3

P8 Advanced flight envelope protection

P9 Getting ahead of the curve; emergence detection and big data

P10 More resilient crew – flight deck automation cooperation

P11 Reducing the effect of environmental hazards

Consortium

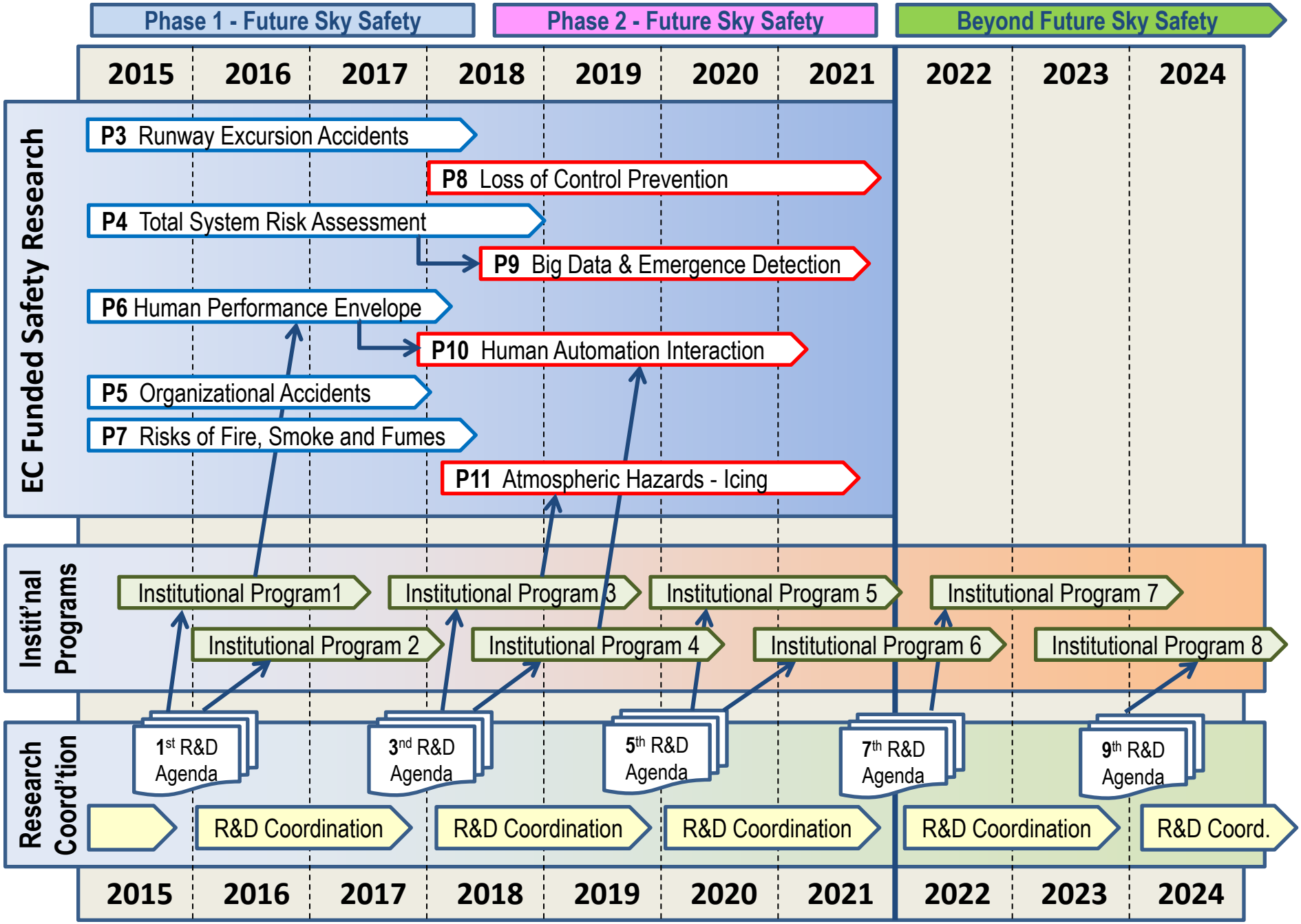
Research	Industry	Universities	Others
NLR - Netherlands	AIRBUS	TU Delft	EUROCONTROL
DLR - Germany	ALENIA	TU Munich	KLM
ONERA - France	EADS CASA	Cranfield	Lufthansa
CEIIA - Portugal	BOEING RT&E	LSE - London	Innaxis
CIRA - Italy	EMBRAER	Linkoping University	BdC
CSEM - Switzerland	THALES	ENSC	UK-CAA
INCAS - Romania	ZODIAC		DGAC-FR
INTA - Spain			ENAV
VZLU - Czech Republic			Deep Blue
FOI - Sweden			
TSAGi - Russia			

Effort distribution:

- Research: 53%
- Industry & others: 32%
- Universities: 15%

Advisory Board

- ICAO
- SESAR Joint Undertaking
- EUROCAE
- FAA
- IMG
- Scientific Advisors *(3)*
- Regulator


Phase 1 - Future Sky Safety
Phase 2 - Future Sky Safety
Beyond Future Sky Safety
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
EC Funded Safety Research
P3 Runway Excursion Accidents
P8 Loss of Control Prevention
P4 Total System Risk Assessment
P9 Big Data & Emergence Detection
P6 Human Performance Envelope
P10 Human Automation Interaction
P5 Organizational Accidents
P7 Risks of Fire, Smoke and Fumes
P11 Atmospheric Hazards - Icing
Instit'nal Programs
Institutional Program1
Institutional Program 3
Institutional Program 5
Institutional Program 7
Institutional Program 2
Institutional Program 4
Institutional Program 6
Institutional Program 8
Research Coord'tion
1st R&D Agenda
3nd R&D Agenda
5th R&D Agenda
7th R&D Agenda
9th R&D Agenda
R&D Coordination
R&D Coordination
R&D Coordination
R&D Coordination
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2015
2016
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2020
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2023
2024

Theme 1 projects

P3 Specific solutions for runway excursion accidents

The European Action Plan for the Prevention of Runway Excursions (EAPRRE) has identified areas were non-ATM research is needed to further reduce runway excursion risk:

1) Flight mechanics of runway ground operations on slippery runways under crosswind conditions,
2) Impact of fluid contaminants of varying depth on aircraft stopping performance,
3) Advanced methods for analysis of flight data to monitor known runway excursion risk factors.

A fourth workpackage will look into new technologies* (e.g. gear technologies, pavement technologies, onboard guidance, etc.) to prevent excursions or the consequences of excursions.

* Other than ROPS

Theme 1 projects

P5 Resolving the organizational accident

- Safety focus has traditionally been on technical failures and human error as they occur in operations
- New approaches consider the overall sociotechnical system in the full operational and organizational context.
- Research will address the effects of organizational structures, processes and cultural phenomena on safety performance in aviation organizations.
- The findings will help to address both the fundamental scientific obstacles and the connection between the scientific theories and their practical application in safety performance management.

Theme 1 projects

P8 Advanced flight envelope protection

- Research into higher levels of fixed and rotary wing flight operations integrity in nominal and off nominal conditions.
  - Flight envelope extensions through development of improved models to predict aircraft behaviour in off-nominal conditions.
  - Development of improved envelope protections
  - Providing better flight envelope awareness to the crew
- Development of methods and tools to retain adequate aircraft performance and controllability in case of system or component failures or "exogenous" events.

Theme 2 projects

P4 Total system risk assessment

- Adequate means for safety risk assessment and safety performance monitoring of large, complex and dynamic systems of sufficient accuracy and depth not yet available.
- Explicit representation of latent factors in risk assessment and data, processes and techniques for continuous updating of the risk picture must be developed.
- Project will build on progress made in several programs (ASCOS, EUROCONTROL IRP/AIP, FAA-ISAM, CATS-NL)
- Project will contribute to the development of a next generation of safety assessment techniques.
- Study the possibility of establishing a capability to monitor safety risk on a continuous basis.

Theme 2 projects

P9 Getting ahead of the curve; emergence detection and big data

- In current diagnostic approaches, risk is identified by exploiting incident and/or accident reports or 'exceedances'. These are pre-defined "knowns".
- This project will develop methods to:
  - Develop data-traps to monitor approach to risk criticality
  - Analyze big data to find evidence of the emergence of new risks
  - Mitigate the identified emerging safety risks before realization
- The methods should allow for concurrent (daily) analysis enabling identification of emergent safety risks profiles.

Theme 3 projects

P10 More resilient crew – flight deck automation cooperation

- Research into startle, surprise and cognitive lock-up in the crew interaction with non-nominal flight deck automation behaviour and unanticipated flight conditions.
- Development of training to help increase crew resilience in case of non-nominal flight deck automation behaviour.
- Development of automation strategies in support of continued flight crew performance in case of automation degradation.
- Building on – and adding to ACROSS, Man4Gen, other.
- This project is not about loss of control of the flight envelope, but findings could also help reduce LoC risk.

Theme 3 projects

P6 Human Performance Envelope

- The Human Performance Envelope is to some extent a new paradigm in Human Factors
- Rather than focusing on one or two individual factors (e.g. fatigue, situation awareness, etc.), it considers a range of factors and how they collectively influence performance.
- Through studies and simulations the project will:
  - Find the points at which performance deteriorates
  - Determine behavioural or physiological markers and recovery measures that could be applied in real-time
  - Identify ways to augment the envelope in order to increase safety and improve performance.

Theme 4 projects

P11 Reducing the effect of environmental hazards

- The physics of icing clouds containing of Supercooled Large Droplets & high altitude ice crystals are still not well known.
- Also building on FP7 WEZARD and HAIC, this project will perform research – including laboratory experiments to:
  - Improve SLD models
  - Further develop 3D ice accretion numerical tools
  - Improvement of 3D numerical tools for aerodynamic aerformance degradation

Theme 4 projects

P7 Mitigating the risk of fire, smoke & fumes

Important knowledge gaps exist around fire behavior of CFRP materials for primary structures, and the risks of fire in the modern cabin environment

- The project will study the fire behavior of CFRP composite structures:
  - Develop better methods to assess thermo-mechanical properties
  - Analyse composite decomposition under various flame and mechanical load conditions and develop better numerical methods
- The risks related to fire, smoke & fumes in the modern cabin environment will be investigated to improve understanding and to explore new mitigating measures & technologies.
- Possible risks associated with Cabin Air Quality will be studied to improve understanding and propose mitigatons.

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