EU Support to Research & Innovation for Aviation Safety

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Amsterdam, 22 April 2015
Content

◆ Aviation Drivers & Overall Context
◆ Scope: - Aviation, - Safety, - Research & Innovation
◆ Aviation Safety: Pillars, Evolution, Global View

◆ Europe's Vision Flightpath 2050
◆ Flightpath 2050 Goals
◆ Safety Related EU Projects

◆ Horizon 2020 Overview
◆ Transport / Aviation
◆ Future Sky Safety
**Society**
- Mobility
- Safe
- Secure
- Resilient
- Affordable
- On time
- Usability

**Energy**
- Fuel price variations
- Dependence
- Finite resources
- Alternative Fuels

**Environment**
- Global Warming
  - Kyoto Protocol (no aviation)
  - EU Emissions Trading Scheme
- Noise & Emissions (1.6% GHG):
  - CO$_2$, NOx, soot, contrails
  - ~2.4 kg CO$_2$/l Kerosene

**Economy**
- Industry
- Employment
- Competitiveness
- WTO

Right now 500,000 persons are flying world-wide
Aviation contributes 88 b€ to EU GDP (ref. 2011)
◆ **Aviation** (domains): Commercial / General; Fixed Wing / Rotorcraft; UAS; …

   *N.B. FP7/Horizon2020: Civil Commercial Transportation …*

◆ **Safety** (definition): state in which the risk of harm* to people or property damage is reduced to, and maintained at or below, a socially **acceptable level** through a continuing process of **hazard identification** and **risk management**.

   *N.B.: harm: unintentional (Safety) / intentional (Security).*

◆ **Research**, Technological Development and Demonstration activities in FP7 -> Horizon 2020 (incl. **Innovation**).
Aviation Safety relies on three pillars:

◆ **Technology**, systems design and operations,

◆ **Regulation** including certification and qualification,

◆ **Human** performance (individual & organizational) to operate the whole chain of Aviation activities

*Research & Technology Development can underpin the three pillars.*
Continuous progress, but …

**Figure 1:** Number and Rate per 10 Million Flights, Scheduled Passenger and Cargo Operations, Fatal Accidents Worldwide, 1994-2013

Source: EASA Annual Safety Review 2013
Air travel has doubled every 15 years. Air traffic will double in the next 15 years. World annual traffic growth from 2011-2021 is 5.1%. From 2021-2031, it is projected to be 4.4%.
Figure 2: Scheduled Commercial Air Transport Fatal Accident Rate per Million Flights by World Region, 2004-2013

Source: EASA Annual Safety Review 2013
In 2050, European aviation has achieved unprecedented levels of safety and continues to improve.

- Manned, unmanned, legacy and next generation, autonomous aircraft and all types of rotorcraft operate simultaneously in the same airspace and in most weather conditions.

- A holistic, total system approach to aviation safety is integrated across all components and stakeholders. This is supported by new:
  - safety management,
  - safety assurance and
  - certification techniques that account for all system developments.

- The occurrence and impact of human error is significantly reduced through new designs and training processes and through technologies that support decision-making.

- Just culture has been adopted uniformly across Europe as an essential element of the safety process.

- Advanced on-board monitoring systems allow the aircraft and air transport system to predict and mitigate technical and operational issues, including weather, before they arise.
Overall European air transport system:
1 accident per ten million commercial aircraft flights.

• For specific operations, such as search and rescue, the aim is to reduce the number of accidents by 80% compared to 2000 taking into account increasing traffic.

• Weather and other hazards from the environment are precisely evaluated and risks are properly mitigated.

• The European air transport system operates seamlessly through fully interoperable and networked systems allowing manned and unmanned air vehicles to safely operate in the same airspace.

• Air vehicles resilient by design to on-board and on-the-ground safety (and security) threat evolution, internally and externally to the aircraft. Safety (and security) are integrated early in the design phase - innovative certification procedures are invented.
<table>
<thead>
<tr>
<th>SAFETY</th>
<th>FP1-3</th>
<th>FP4</th>
<th>FP5-6</th>
<th>FP7</th>
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<td>certification</td>
<td>Eurice 96/Cira</td>
<td>Jartel 97/NLR</td>
<td>Musca 105/EADS</td>
<td>COFCLUO 06/Uni</td>
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<td>safety</td>
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<td>Desire 98/NLR</td>
<td>Asicbi 04/SME</td>
<td>ISAAC 04/Ale</td>
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<td>Cockpit / Cabin systems</td>
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<td>Firedetex 00Ai</td>
<td>ATENAA 04/Selex</td>
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<td>Anais Thales</td>
<td>Natacha SME</td>
<td>ECAB 06/Ai</td>
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<td>Cross-wind, vortex, turbulence</td>
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<td>ILDAS 06/NLR</td>
<td>Lightning 05/SME</td>
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<td>EURICE 96/CIRA</td>
<td>ACIDS 02/SME</td>
<td>EXTICE 08/Cira</td>
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<td>ADFCS 2 01/Bae</td>
<td>SINSAC 06/Uni</td>
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<td>HICAS 98/DLR</td>
<td>CAST 00/Agu</td>
<td>ADDSAFE 09/SME</td>
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<td>Damage tolerance, crashworthiness</td>
<td>Crashv 96/Bae</td>
<td>Crasurv 96/Bae</td>
<td>Admire 01/Alenia</td>
<td>Airlaw 08/Cranfield</td>
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<td>structural health monitoring and hardening</td>
<td>Posicos 00/DLR</td>
<td>DAMASOS 98/Uni</td>
<td>IDA 02/Ai</td>
<td>VULCAN</td>
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<tr>
<td>Human factors</td>
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<td>Daton 04/Uni</td>
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<td>Issac 04/Alenia</td>
<td>Human 108/Ottis</td>
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**OPTICS**

- ASCOS
- Svetlana
- SAFAR
- SMAES
- ACROSS
- AircraftFire
- WAKE - NET
- WAKE
- STORMS
- JEDI-ACE
- Daniela
- Hisvesta
- Picasso
- AISHA II
- Iapetus
- Wasis
- Iapetus
- AAS
- Man4Gen
- APIMOD
What is Horizon 2020?

- The EU Framework Programme for Research and Innovation

- A €79 billion research and innovation funding programme (2014 - 2020)

- An investment in future jobs and growth

- A means to address people's concerns about our livelihoods, safety and environment
Three main pillars

- Excellent Science
- Industrial Leadership
- Societal Challenges
Coverage of the full innovation chain

Societal challenges

Industrial leadership

Excellent science

Basic Research
Technology R&D
Demonstration
Prototyping
Large scale validation
Pilots
Market uptake
I. Excellent Science

- **European Research Council** (13 095 Million €)
  Supporting top researchers from anywhere in the world (for research in EU or in associated countries).

- **Future Emerging Technologies** (2 696 Million €)
  Supports visionary thinking through collaborations between science and engineering.

- **Marie Skłodowska-Curie Actions** (6 162 Million €)
  Training/career development, international exchanges.

- **Research Infrastructures** (2 488 Million €)
  Access to world-class facilities (incl. e-facilities)
II. Industrial Technologies (13 557 Million €)

- Information and Communication Technologies
- Nanotechnologies, Advanced materials, Biotechnology, Advanced manufacturing & processing
- Space
  + Access to risk finance
  + Innovation in SMEs

70% of technical innovations hinge on new materials
What is Horizon 2020?

Three Pillars

Societal Challenges (funding in € million)

- **Health**, demographic change and wellbeing 7 472 M€
- **Food** security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy 3 851 M€
- Secure, clean and efficient **energy** 5 931 M€
- Smart, green & integrated **transport** 6 339 M€
- Climate action, **environment**, resource efficiency and raw materials 3 081 M€
- Inclusive, innovative and reflective **societies** 1 310 M€
- **Secure** societies 1 695 M€
What is Horizon 2020?

Societal Challenges

- Health: 7472 (9.7%)
- Food: 3851 (5.0%)
- Energy: 5931 (7.7%)
- Transport: 6339 (8.2%)
- Climate: 3081 (4.0%)
- Changing world: 1310 (1.7%)
- Security: 1695 (2.2%)

The image shows a pie chart representing the funding distribution across different societal challenges:

- Transport: €6,339 million
- Food: €3,851 million
- Energy: €5,931 million
- Climate: €3,081 million
- Changing world: €1,310 million
- Health: €7,472 million
- Security: €1,695 million
Sustainable

- Resource efficient transport that respects the environment

Seamless

- Better mobility, less congestion, more safety and security

Competitive

- Global leadership for the transport industry

Responsive

- Socio-economic and behavioral research and forward-looking activities for policy-making

Strategic Research and Innovation Agenda (SRIA) of ACARE (Advisory Council for Aviation Research & Innovation in Europe)
Horizon 2020 - Aviation: Large initiative PPP Clean Sky 2
Building on Clean Sky, going further into integration at full aircraft level
And developing new technology streams for the next generations of aircraft

Clean Sky 2 Budget:
~1.8 billion € EU funding + eq. Industrial contribution
The High Level SESAR Programme Research & Innovation 2020 is addressing the European ATM Master Plan

### Exploratory Research

- Air Vehicle Operations & Technology
- ATM Operations & technology
- Airport Operations & Technology
- System Architecture
- ICT for Information Mgmt., Uncertainty & Optimisation
- Safety
- Security
- Role of the Human in Automation and Ops. Change
- Environment & Weather for Aviation
- Enabling Change: Economics, Legal, Policy & Regulation

### Applied Research, Pre-Industrial Development, Validation

<table>
<thead>
<tr>
<th>AIRPORT:</th>
<th>ATM:</th>
<th>AIRCRAFT:</th>
<th>INFRASTRUCTURE:</th>
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<tbody>
<tr>
<td>Airport Terminal, Surface &amp; Tower Systems</td>
<td>Airspace, Traffic Management &amp; Systems</td>
<td>Air Vehicle Operations, Mission Management &amp; Integration</td>
<td>ICNS, Training &amp; Simulation Systems</td>
</tr>
</tbody>
</table>

- Priority Business Needs – ATM Key Features & Enablers
- Operations, Technical Interoperability & Performance
- Remotely Piloted Air Systems (RPAS) Integration
- System(s) Architecture
- Safety & Security Management
- Societal Challenges
- Regulation & Standardisation Planning
- European ATM Master Plan Maintenance
- Preparation for Deployment

### Large Scale Demonstrations

- Airspace Users
- Air Navigation Service Providers
- Supply Industries
- Airports
- National Authorities
- Staff Associations
- ESA

Source: SESAR JU
• Multi-partner transnational consortia (in most cases)
• Public Calls for proposals
• Competitive selection
• Evaluation by independent experts
• Evaluation criteria:
  - Excellence
  - Impact
  - Implementation quality
• EU co-funding for entities in EU and associated countries
Future Sky Safety
an EU-funded €15 million transport research project in the field of European aviation safety.

The project will bring together 32 European partners to develop new tools and new approaches to aeronautics safety over a four-year period.

Kick-off in January 2015 at NLR
The Joint Research Programme focus on two main activities:

**Coordination of institutional safety research programmes**

The national research establishments participating in the programme will coordinate the safety research executed under their national institutional research programmes. The set-up of new institutional programmes will be coordinated, national results will be shared amongst the establishments, the hiring of PhDs will be coordinated, etc.

**Collaborative safety research**

Gaps in safety research that remain even after the coordinated effort of the research establishments will be tackled in this second part of the programme where the research establishments will cooperate with universities, industry, SMEs and airlines.

*The Joint Research Programme on Safety will be open and in coordination with EASA, IMG4, SESAR Joint Undertaking, EUROCONTROL and on-going projects.*
Aerodays 2015
7th European Aeronautics Days

www.aerodays2015.com
Thank you for your attention!