European Aviation Safety Agency

Report

European Aviation Safety Plan
2011-2014

Draft
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IMPORTANT NOTE

The first Safety Plan has been developed following a bottom up approach. The initial priorities have been set up by aggregating the national priorities provided by the Member States. Future editions will follow a more comprehensive methodology.

1 Executive summary

The management of safety has evolved over the years. The review of the rare accidents that occur is not enough to achieve significant improvement; incidents and occurrences must be analysed to identify precursors. Improving our safety records has become a challenging job that requires collective effort and prioritisation of scarce resources. By publishing a Safety Plan we show our commitment to action.

The Safety Plan closes the safety management cycle by connecting the safety issues identified at European level through the analysis of safety occurrences with the action plans and initiatives launched to mitigate the underlying risks. It states the European will to resolve the key issues that concern aviation Safety.

Developed in collaboration with regulatory bodies, European safety organisations and industry, it builds on their input and relies on their expertise. It proposes a path for the next 4 years that depicts a comprehensible picture of the safety work in Europe across all domains of aviation.

The Safety Plan establishes the first layer of priorities which is further complemented at national level by local safety plans and programmes and at Agency level by an internal safety programme. It builds a network for action. Coordination and close collaboration are key to keeping it up to date and effective.

The Plan is an integral part of a European Aviation Safety Programme, a regional approach to the ICAO requirements for State Safety Programmes. The management of safety risks now becomes a core process in the aviation system in order to foster safety improvement and prioritise resources. This process will allow us to develop subsequent Safety Plans.

This first edition of the Plan encompasses three broad areas: systemic, operational and emerging issues. The risks identified in these areas are mitigated by safety actions that Member States, EUROCONTROL, the European Commission, the industry and the Agency will take on board. All the partners work together, streamline their activities and add their efforts to drive our accident rates even further down.

Among the systemic issues within the Plan is the implementation of Safety Management principles in the States and across industry, along with the enablers of such implementation. These principles will have to be embedded in a system that is becoming more and more complex.

The operational issues cover the main risk areas that affect fixed wing commercial air transport operations: runway excursions, mid-air collisions, controlled flight into terrain, loss of control in flight and ground collisions. Most safety outcomes fall under one of these broad families. Some of the operational issues affecting other types of operation like helicopters or general aviation are also addressed.

Actions to address issues that are emerging, like the introduction of new systems and types of operations, new regulatory and oversight approaches, environmental factors or the next generation of aviation professionals have been also identified in the Plan.

Human factors and human performance affect all the above areas and are addressed at the end of the Safety Plan.

The ultimate value of this Plan resides on the actions it contains and stakeholders' commitment to implementation.

2 Introduction

Safety management involves the identification of hazards, assessment of risks, acting on those deemed to be unacceptable and the continuous improvement of the system. Every year EASA publishes an Annual Safety Review offering the European citizens a high-level view of aviation safety at one moment in time. The safety databases and information systems available to European civil aviation are constantly under review. The outputs of safety analysis work raise questions about safety trends and the significance of specific safety issues.

Regional bodies, States and industry seek to more effectively interact in the resolution of safety concerns. To that end, this first edition of the Safety Plan communicates the intentions at European level to act on the identified concerns. It provides the European citizens with a roadmap of the safety improvement work by linking the issues identified with the actions being carried out.

The Safety Plan offers a development path for safety in Europe, maintaining valuable momentum for improvement, reinforcing stakeholder involvement, and strengthening the considerable safety benefits already derived from collective action at European level.

2.1 Objectives and scope

The main objective of the Safety Plan is to create a common focus on European aviation safety issues as a continuation of the European work to increase aviation safety and to comply with ICAO standards. It starts by compiling the on going work in Europe, hence improving traceability and reinforcing commitment to the current initiatives. This will contribute to avoiding the duplication and overlapping of safety initiatives and competition for resources.

The Plan contains actions for the next **4 years** (2011-2014) and will be updated on a yearly basis. It will not be republished each year; instead annual updates will be published in the interim years to inform stakeholders and the general public of the performance and progress achieved. During the yearly review of the Plan, actions may be revised; however the initial framework will remain unchanged.

The Safety Plan is built on the principle that the planning of the first year (2011) is a commitment and the planning for the following years (2012-2014) might be subject to changes depending on changing priorities and availability of resources. Following this principle, the present 4-year Safety Plan commits the stakeholders to the actions planned for finalisation in 2011. These actions are highlighted throughout the document. The actions for the following years (2012-2014) are indicative and may be revised during the yearly update of the Safety Plan. The Agency's Rulemaking programme is also based on this principle.

The first edition is driven by the national plans and priorities (bottom-up approach). While some safety issues will stay at national level and will be addressed by national State Safety Programmes (SSP), there will be other instances where common issues of pan-European scope will require a collective action. The latter actions are the scope of the present publication.

2.2 Collection process: The Safety Plan Framework

The elaboration of the Safety Plan started by taking into account Member States safety concerns. In order to support the timely publication of the Plan, a request was sent to the 31 EASA Member States in the first quarter of 2010. They were asked to provide the top 5 safety concerns in their State as well as the process by which they had determined them. A total of 15 responses were received from Member States in May 2010. Additionally, input was aggregated with safety information from EUROCONTROL, ECAST and the Agency since these organisations have a pan-European view on safety. The first results were presented to EASAC in June 2010.

The inputs collected were further analysed and classified into three different areas according to the type of issues they highlighted. All of the responses received were placed into one of the following areas:

a) **Operational Issues**, which are closely related to the events that are reported during operation. The relationship between this type of issues and the final outcomes or end states can be supported by data.

b) **Systemic Issues**, which affect the aviation as a whole. These issues play a role in accident and incident causation. They underlie operational issues; thus their improvement has an implicit effect on operational causes.

The above issues can be considered as the reactive elements of the Safety Plan since they address problems that have already happened and for which data is to some extent available. In order to balance the composition of the Plan with a more proactive or forward looking element, a third category of issues named **emerging issues** was also proposed.

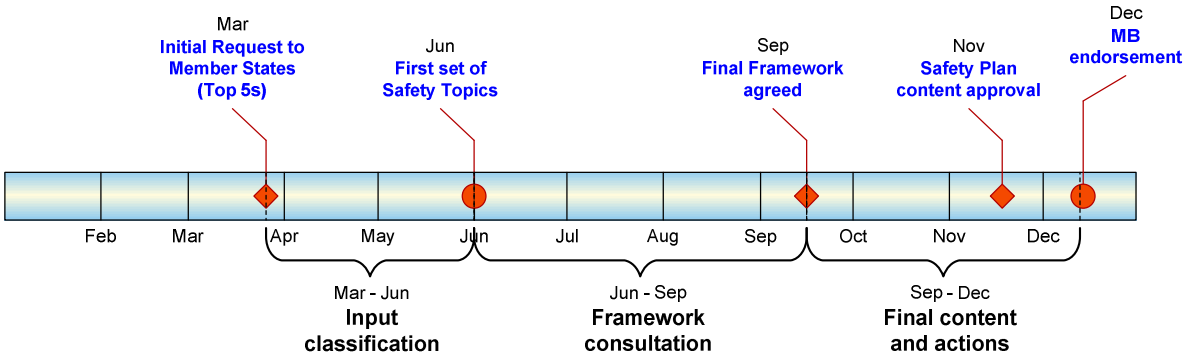
c) **Emerging issues**. This area gives some consideration to safety issues derived from operations or regulations that have not been fully deployed and where data is not always available.

Finally **human factors and human performance** affect all the safety topics discussed within the above areas and it is important to recognise that addressing human factors will bring safety improvements across all those issues. Due to the fact that they have an effect across all domains and the difficulty of associating them to one of the above broad areas, they will be addressed separately in the Safety Plan.

The proposed approach and list of issues was presented to EASA Management Board in June 2010 and constitutes the **Safety Plan Framework**. The framework will remain unchanged during the first 5-year cycle.

SAFETY PLAN FRAMEWORK		
SYSTEMIC ISSUES	**OPERATIONAL ISSUES**	**EMERGING ISSUES**
Working with States to address SSPs	**COMMERCIAL AIR TRANSPORT BY AEROPLANES**	**New products, systems, technologies and operations**
Working with States to foster the implementation of SMS in the industry	**Runway Excursions**	**Environmental factors**
Safety Management enablers	**Mid-air collisions**	**Regulatory considerations**
Complexity of the system	**Controlled Flight Into Terrain**	**Next Generation of Aviation Professionals**
	Loss of Control In Flight	
	Ground Collisions	
	OTHER TYPES OF OPERATION	
	Helicopters	
	General Aviation	
HUMAN FACTORS AND PERFORMANCE		

The above framework has been consulted with ECAST, the Agency and finally agreed by EASAC in September 2010. During the last quarter of 2010 the framework has been populated with actions. The below timeline summarises the main milestones that lead to the development of this first Safety Plan.



2.3 The European Aviation Safety Programme.

A regional approach to the ICAO requirements of State Safety Programmes has been developed in Europe. The European Aviation Safety Programme (EASP) is an integrated set of regulations and activities to improve safety within the EASA Member States. Based on the roles and responsibilities established in the regulatory framework, it places the management of safety at the core of the system and establishes new processes to collectively address safety priorities by all the players, beyond just regulatory authorities.

The risks identified through this mechanism are mitigated by a set of actions collected in a Safety Plan, a public document. The present document is the first attempt at the collective identification of priorities, a process that will evolve in the years to come once the activities designed under the EASP start to get fully deployed.

The EASP is the basis for setting high level safety objectives in support of an overarching Aviation Safety Strategy. The Strategy will set out a clear aim to the European Union's objective of maintaining a high and uniform level of civil aviation safety in Europe. It will aim to move the European Union's management of safety towards a more systematic and proactive one which utilises the best safety management techniques.

The new activities deployed in the EASP are organised around a PDCA (Plan, Do, Check, Act) cycle in order to highlight the focus on continuously improving the approach. Furthermore, the activities carried out to collectively improve safety are conceptually grouped in three functional areas:

- The **rulemaking function** consists of developing all the necessary regulatory material in order to not only take action where a specific safety risk must be mitigated through regulation, but also to create the proper environment for the other actors and stakeholders to best play their role through other implementation measures (such as Acceptable Means of Compliance, Certification Specifications and Guidance Material). In the system set forth by the Basic Regulation, this is mainly the function of EASA[1].

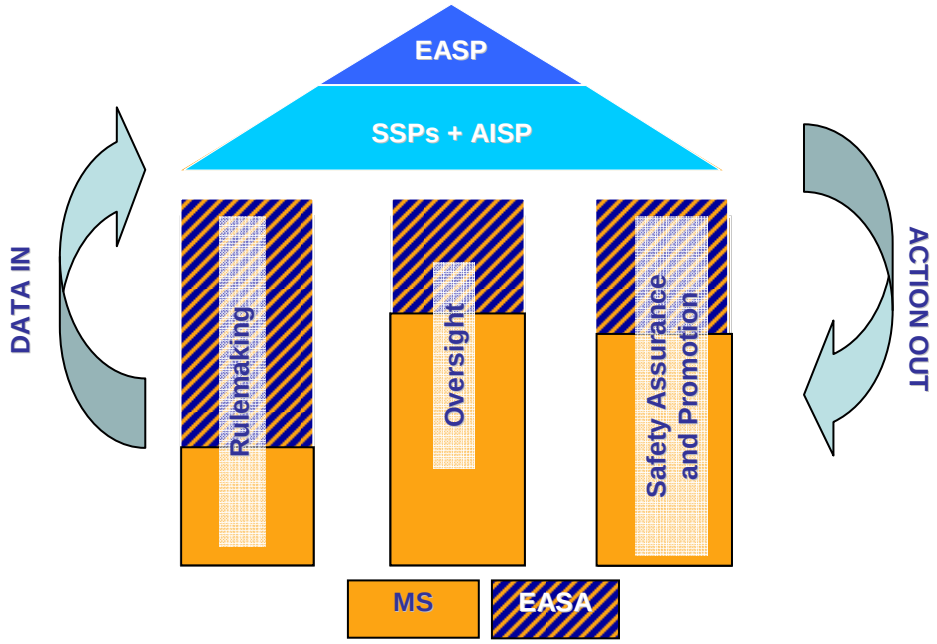
[1] Member States remain competent for the regulation of certain operations and aircraft as detailed in Annex II of regulation EC No. 216/2008.

Through its activity, the Agency helps create the proper regulatory environment for the system to function.

- The **oversight function** is taken here in its broadest meaning. All those who act to ensure that regulated persons, products or services comply with the regulations are included. Oversight encompasses both the review that is done when issuing an approval for the first time, and the continuous surveillance thereafter. The responsibility for carrying out oversight lies with the Member States and EASA, each one being the *certifying authority* according to the split of responsibilities defined by the Basic Regulation.

- The **safety assurance and promotion function** aims at gathering, sharing and analysing safety data coming from accident and occurrence reports, issuing safety recommendations for the improvement of safety, fostering research in particular areas where safety concerns exist and promoting safety through national and pan-European initiatives or communication campaigns.

The following picture summarises the three areas described above also known as the 3 pillars. The split of responsibilities between Member States and the Agency is also highlighted.



The actions identified in the Safety Plan are in line with this principle and have also been categorised in one of the above functional areas, therefore they are labelled as Rulemaking (R), Oversight (O) or Safety Assurance and Promotion (SP) throughout the document, depending on the nature of the activity that is proposed.

In the European aviation system Rulemaking, Oversight and Safety Assurance and Promotion activities are shared among the Member States and the European Institutions. The EASP describes the roles and responsibilities that each of them have while performing these functions.

National SSPs should describe the regulations and activities to manage safety in the Member States. As certain competencies have been transferred from the Member States to the Agency, in order to draw a complete picture of safety in any single State, both SSPs and the EASP would need to be superposed.

When establishing their SSPs, Member States would expand on the tasks allocated to them; thus closing the gap between their safety activities and the parallel activities performed by the organisations they oversee (encompassed on their SMSs). In a similar manner, EASA would develop an Agency's Internal Safety Programme (AISP) that would close the gap between its activities as a competent authority and the organisations it directly oversees.

A public manual explains how the EASP will be implemented in Europe.

2.4 National Programmes and Plans

In Europe SSP requirements have to be implemented at both the national and the regional levels. The present document collects pan-European issues and priorities. National safety concerns remain at the State level. Nevertheless the two are not isolated developments.

The Safety Plan establishes the route that Europe is following to improve safety. National SSPs should reflect how national efforts may contribute to the actions at European level and where the States need to act solely at the national level. As a general principle, when a Member State chooses not to incorporate certain elements of the Plan or incorporate them in a different manner, it should substantiate its decision. This feedback would allow sharing information and would help developing the next versions of the Plan.

The Safety Plan already identifies actions for the Member States to take into consideration; the main ones are highlighted hereafter:

Operational Issues

- Develop safety management activities on their national programmes to improve safety on the operational areas identified in the Plan (runway excursions, loss of control in flight, mid-air collisions, controlled flight into terrain and ground collisions). More precisely:
    - o Prioritise the five areas according to the situation in the State. It is acknowledged that some areas may not be a priority in some States.
    - o Share the actions that are being taken to address the various issues as well as the measures that are in place to monitor their effectiveness. When no actions are taken in a specific State, the reasons for this should be communicated.
    - o Participate in a dedicated workshop to facilitate the exchange of information, improve collaboration and identify the actions that would make the most difference in each operational area.
- Address the recommendations proposed by the EHEST in national programmes and monitor effectiveness.
- Audit and support national aerodromes to ensure that a local runway safety team is in place and is effective.
- Implement actions suggested by the European Action Plan for the Prevention of Runway Incursions and Airspace Infringement Risk Reduction.

Systemic Issues

- Share provisions and plans to implement SSPs in a dedicated workshop.

- Encourage implementation of SMS promotion material developed by ECAST and EHEST by making it publicly available at National level.
- Collaborate with the Agency in the coordination of safety analysis tasks through a Network of Analysts.
- Publish Safety Performance Indicators (SPIs) in use at national level.
- Continue the on-going collaboration through various initiatives to harmonise SMS principles (SMICG) and address human factors and human performance (EHFAG).

2.5 Content of the Plan

The Safety Plan is divided in four areas, each one addressing the safety topics presented in the Safety Plan framework.

- Section 3 addresses *Systemic Issues*
- Section 4 addresses *Operational Issues*
- Section 5 addresses *Emerging issues*
- Section 6 addresses *Human Factors and Performance*, which affect all of the above areas.

Within the above sections, each safety topic has been described introducing issues of more detailed scope. At the end of each section there is an action lists with the activities that are proposed to address the subject safety issues. Commitments for 2011 are highlighted in yellow.

Together with each action the following information is included:

- An identifier (No.).
- The issue that it addresses.
- A brief description of the action.
- The action owner or key stakeholder that will be responsible for its implementation (it does not mean that it is the only one contributing to the action). Being owner of an action means to be able to report on its progress.
- The expected completion date (as a minimum; in some cases also starting dates are provided).
- The actions type: rulemaking (R), Oversight (O) or Safety Assurance and Promotion (SP) according to the functional areas that are part of the EASP. When a rulemaking task has been created or a research project has been launched, the reference is provided in brackets (e.g. ATM.001 refers to a rulemaking task as it can be found in EASA's rulemaking programme).
- The deliverable that is expected as a result of the actions. It allows evaluating the completion status on a yearly basis and serves as a first measure of progress.

The below table serves as an example of the format chosen to present the Safety Plan's actions:

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**

Several other appendixes clarify the acronyms and define the terms used throughout the document (attachment A), and provide a brief description of the different working groups and initiatives at European level dealing with aviation safety (attachment B).

2.6 Monitoring progress and effectiveness

In collaboration with all the stakeholders, the Safety Plan should be reviewed every year. The proposed list of actions should be updated with the incorporation of new actions. Moreover the status of those actions that are due for completion during the current year should be revised. An action should be closed when the proposed deliverable is developed. When the action could not be closed during the due date, the causes for the non completion should be recorded and a new date should be proposed. This allows measuring the progress and effectiveness of the Safety Plan. A progress report will be included in the yearly update of the Plan.

2.7 Communication

It is recognised that an important part in the success of the Safety Plan is played by an adequate outreach to the interested parties and proper communication of the intentions behind it. To that extend EASA has already started to take the lead by adequately informing stakeholder about the approach and expectations in various European (e.g. ESSI, NAAs partnership meetings) and international fora. During the next months, the Safety Plan will continue to be presented at various safety events and further communicated through press releases and information on public websites. Support from stakeholder to further propagate the message would greatly contribute to foster implementation. The Agency, in cooperation with the Member States, will establish a communication plan.

3 Systemic Issues

Systemic issues are system-wide problems that affect aviation as a whole. Their association to a particular safety event or circumstance is not always obvious. In most scenarios, they become evident by triggering factors and play a significant role in the development of safety occurrences. They often relate to deficiencies in organisational processes and procedures.

This is why systems approaches to safety and a greater emphasis on organisational and managerial factors on the part of industry organisations and regulatory authorities have been growing over the past two decades. The systemic issues addressed herein stem from the recognised benefits of a move towards a more performance based approach to safety where the safety capabilities of industry organisations and authorities are demonstrated up front instead of waiting for incidents and accidents to happen.

The first Safety Plan focuses on State Safety Programme (SSP) and Safety Management System (SMS) implementation, where both authorities and industry stakeholders have responsibilities. Measuring safety performance, sharing safety information and implementing a just culture throughout the organisations involved emerge as key enablers to embrace this approach to safety.

The above elements have to be incorporated in a system with many interdependencies. Long term growth, increasing levels of integration and technical advancements make up for a complex aviation system and bring about new safety issues. These are also given some consideration in this first part of the Safety Plan.

All these issues are essential in creating the strong foundation on which more specific improvements can successfully stand.

3.1 Working with States to address SSPs

ICAO Standards in Annex 6 — *Operation of Aircraft*, Annex 8 — *Airworthiness of Aircraft*, Annex 11 — *Air Traffic Services*, Annex 13 – *Aircraft Accident and Incident Investigation*, Annex 14 — *Aerodromes* and parts of Annex 1 — *Personnel Licensing* call for States to establish an SSP. Standards for SSP include requirements for States to require implementation of SMS by specified industry organisations. ICAO Annexes provide Standards and a set of SMS frameworks from which States can establish specific SMS requirements.

ICAO describes the SSP as a "*management system for the management of safety by the State*"[2] and "*an integrated set of regulations and activities aimed at improving safety*"[3]. The SSP provides a structured mechanism for meeting State responsibilities for safety management using a systematic, data-driven, risk-based approach. It provides an approach to system safety that stresses performance of safety critical processes in service provider activities and in State oversight functions.

In addition to the traditional *surveillance* role, Civil Aviation Authorities have now a new role to play, namely that of the *promotion* of a positive safety culture in the organisations under their supervision. This aims to develop a philosophy of systematic and explicit management based on the analysis of potential risks, which will enhance aviation safety in the State.

[2] ICAO Doc 9859, *Safety Management Manual (SMM)*, para. 6.3.1
[3] ICAO Doc 9859, para. 6.3.2

Actions in this area target the improving of coordination and sharing of best practices among Member States. The Agency will take the lead by presenting the elements of the approach adopted at European level and reinforcing the linkage with the national SSPs in a dedicated workshop. Additionally, this will provide a forum for Member States to share their provisions and plans to implement SSPs. Furthermore, the first European requirements for Competent Authorities will see the light in 2012[4]. They will be tailored to the domains of operations and flight crew licensing. Nevertheless requirements will be progressively extended to other domains of aviation. A workshop will follow up after the first regulatory package comes out in order to share experiences regarding implementation of SSP.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
SYS1.1	Improve coordination and sharing of best practices among States.	Present the European approach to safety management in a workshop and improve coordination with Member States. MS should share the provisions and plans to implement SSPs.	EASA & MS	2011	SP	Workshop
SYS1.2	SSP Requirements.	Publish European requirements for Aviation Authorities (AR) in the domains of air operations and flight crew licensing.	EASA & EC	2012	R	Opinion/ Decision
SYS1.3	Incorporation of SSP in all domains of aviation.	Incorporate SSPs and enablers in the IR for airworthiness (enablers are supporting tools like system safety analysis, occurrence reporting and human factors).	EASA	2013	R (MDM.055 and .060)	Opinion/ Decision
SYS1.4	Incorporation of SSP in all domains of aviation.	Incorporate SSPs and enablers in the requirements on Competent Authorities in ATM/ANS.	EASA & EC	2012	R (ATM.004)	Opinion/ Decision
SYS1.5	Incorporation of SSP in all domains of aviation.	Incorporate SSPs and enablers in the requirements for aerodrome oversight authorities.	EASA & EC	2012	R (ADR.001)	Opinion/ Decision
SYS1.6	Safety Management promotion and information.	Organise a workshop with MS to share experience on national implementation of the Authority and Organisation requirements.	EASA	2013	SP	Workshop

[4] The development of these requirements includes consultation with the Member States.

3.2 Working with States to foster the implementation of SMS in the industry

Implementation of Safety Management Systems (SMS) by aviation organisations is essential to a robust aviation safety strategy. Each organisation will have to set up its own system and demonstrate its effectiveness.

States have two key responsibilities with respect to an organisation's SMS: promulgation of SMS requirements (typically in the form of regulations) and a process for acceptance and continued oversight of the SMS. Additionally, organisations may also be subject to safety performance assessments by third parties as a part of existing business arrangements.

According to the International Air Transport Association's (IATA) Safety Report[5], in almost 25% of accidents in 2009, deficient safety management on the part of the operator was noted as a contributing factor. The same report mentions safety oversight and investigation deficiencies on the side of the States in a similar percentage of accidents.

In parallel to the requirements for authorities, aviation organisations will be required to start SMS implementation according to European standards as of 2012. The initial requirements will cover the domains of air operations and flight crew licensing. These requirements will be further extended to other domains of aviation. Aerodrome organisations will follow in 2012 and ATM and airworthiness in 2013.

In preparation for the European rules, extensive guidance material has already been developed that addresses SMS principles and implementation in commercial aviation, helicopters and aerodromes. This material has been developed by the different teams of the European Strategic Safety Initiative (ESSI). They will continue to develop and promote best practices to facilitate SMS implementation. Member States should encourage the implementation of this material across their organisations.

In the ATM domain, EUROCONTROL has produced guidance and best practices and will support MS and ANSPs through the partnership established by the European Safety Programme for ATM (ESP+).

At the international level, EASA together with European MS and other international authorities will seek to promote a common understanding of SMS principles and requirements via the Safety Management International Collaboration Group (SMICG). International activities on SMS also include the European participation at all levels in the development of a new ICAO Annex dedicated to Safety Management.

Safety Actions

No.	Issue	Actions	Owner	Dates	Type	Deliverable (Measure)
SYS2.1	SMS require-ments.	Publish European requirements for Aviation Organisations (OR) in the domains of air operations and flight crew licensing.	EASA & EC	2012	R	Opinion/ Decision

[5] Every year IATA publishes a Safety Report aimed at collating and analysing accident data to identify trends and develop prevention strategies to enhance safety. The report is focused on the air transport industry and uses more restrictive criteria than ICAO Annex 13 accident definitions. In total 90 accidents met the IATA accident criteria in 2009.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
SYS2.2	Incorpora-tion of SMS in all domains of aviation.	Incorporate SMS and enablers in IR for airworthiness (enablers are supporting tools like system safety analysis, occurrence reporting and human factors).	EASA	2013	R (MDM.055 and .060)	Opinion/ Decision
SYS2.3	Incorpora-tion of SMS in all domains of aviation.	Incorporate SMS and enablers in the requirements for aerodrome operator organisations (part OR).	EASA & EC	2012	R (ADR.001)	Opinion/ Decision
SYS2.4	Incorpora-tion of SMS in all domains of aviation.	Incorporate existing SMS and enablers in part OR for ANSP.	EASA & EC	2013	R (ATM.001)	Opinion/ Decision
SYS2.5	Promotion of SMS.	Develop and promote SMS best practices for fixed wing commercial aviation and aerodromes.	ECAST	2011	SP	Best Practice
SYS2.6	Promotion of SMS.	Develop and promote SMS best practices for helicopter operations.	EHEST	2011	SP	Best Practice
SYS2.7	Promotion of SMS.	Encourage implementation of promotion material developed by ECAST and EHEST.	MS	2011	SP	Best Practice published by MS.
SYS2.8	Promotion of SMS.	Develop and promote SMS guidance and best practices for ATM.	ECTRL	2011	SP	Best Practice
SYS2.9	Promotion of SMS.	Support to ANSP SMS implementation; develop a structured approach to the identification of safety key risk areas and to gathering information on operational safety and SMS best practices from the industry; harmonise SMS approaches in FABs.	ECTRL, MS and ANSP	2014	SP (ESP+)	Methodo-logy & Training material
SYS2.10	SMS Interna-tional cooperation .	Promote the common understanding of SMS principles and requirements in different countries, share lessons learned and encourage progress and harmonisation.	EASA and MS through SMICG	Cont.	SP	SMICG Products
SYS2.11	SMS Interna-tional cooperation .	Contribute to the work on the new ICAO Annex on SMS and represent the European position.	EC EASA ECTRL	2012	R	Participa-te in ICAO activity Report.

3.3 Safety Management enablers

The implementation of safety management principles in the Member States and in the industry organisations brings along safety issues related to sharing safety information among stakeholders, implementing a just culture and measuring safety performance at various levels. These are addressed herewith.

Sharing safety information

One of the key elements to the success of the safety management approach is the free flow of safety data and information. A significant increase in the amount of information available to support proactive safety analysis is required due to continued SSP and SMS implementation. Member States authorities should move towards the exchange of more intelligence with the industry and among themselves and less raw data.

The first Safety Plan seeks to facilitate networking between safety analysts and the common understanding of risks across the industry.

Experience shows that before an accident happens, a number of similar less significant events occur that may have indicated the existence of more serious safety risks. Thus beyond accident investigation, an important element in accident prevention is the collection and analysis of occurrences[6]. Many of the safety analysis tasks in States are similar and would benefit from better coordination, from the development of common tools and methods to sharing of best practices. Networking will be applied to the benefit of safety analysis through the creation of a European Network of Analysts.

Different organisations use different categorisation of risk factors. This generates a problem when trying to exchange safety information and comparing trends. In order to be able to share information on the risks posed by the different events to the aviation system, it is important to have a common understanding of risk and to be able to measure risk performance in a comparable way across the aviation domain. Several methodologies to classify risks exist in the industry in various domains. Building upon the existing work, the Safety Plan supports European efforts to find a methodology that enables the reliable and comparable risk classification of events.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
SYS3.1	Coordination of safety analysis tasks.	Coordinate the safety analysis at European level through the creation of a European Network of Analyst.	EASA & MS	2011	SP	Network ToRs
SYS3.2	Comparable risk classification of events across the industry.	Propose a common framework for the risk classification of events in aviation based on existing work.	EASA, ECTRL & MS	2013	SP	Study Report

Implementation of just culture

A globally accepted definition of "just culture" does not yet exist. However, it is generally accepted that individuals should not be punished for 'honest, unintended errors', but should

[6] Operational interruptions, defects faults, or other irregular circumstances that have or might have influenced flight safety and that have not resulted in an accident or serious incident.

be held accountable for wilful violations and gross negligence. Individuals are less willing to inform of their own errors and other safety problems or hazards if they are afraid of being punished or prosecuted. However, this does not imply a "no-blame" culture, as this is neither feasible nor desirable – some level of accountability must exist. This is equally important in the front line as well as at management positions.

While the concept of "just culture" originally came about in an effort to develop an organisational safety culture based on trust and information sharing, over the past decade this has expanded to overcome tensions between safety investigation processes and possible judicial consequences. This is due to an increasing tendency by judicial authorities to investigate and prosecute aviation safety occurrences.

The introduction of a just culture is still an issue in the majority of States. Changing attitudes to bring in a "just culture" is a slow process, particularly where this involves a shift in wider cultural attitudes. States that are having difficulties may continue to do so for some time, particularly where organisational culture differs significantly from national norms.

The SES II Performance Scheme[7] for air navigation services and network functions has selected to monitor just culture for its first reference period (2012-2014). The PRB is working together with the EC, EASA, States and EUROCONTROL to define indicators and appropriate alert mechanisms. These organisations have already started to define the indications that can be observed at the State level as signs of the implementation of the "just culture" approach. These elements can then be audited during Standardisation visits.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
SYS3.3	Measure implementation of the just culture approach.	Establish a set of indicators for the ATM domain that can be monitored and provide a good indication of the implementation of the just culture approach.	EC, ECTRL & EASA (E^3 Group)	2011	S	Indicators

Development of SPIs with associated data stream

Measurements of safety performance at the State level and at the individual organisation level are essential for effective safety management. This is not only a sound safety management practice, a methodology for developing safety performance measures and safety performance indicators (SPIs) will also be needed to support the ICAO-proposed continuous monitoring approach (CMA).

Measures of safety performance are necessary for effective safety management and decision making. A measurement strategy should provide a set of measures, rather than a single "magic number." These measures should also be interactive, cover all aspects of the systems that they address, and reflect both system failures (e.g. accidents, incidents, regulatory violations) and indicators of the proper functioning of critical system components.

Measures of safety and safety performance should focus on the aviation systems' ability to manage safety risk. If we emphasize the system and individual (human) behaviours that can reduce the likelihood of an accident or the resulting severity of those that do occur, we can better define meaningful measures.

[7] Regulation (EU) No 691/2010 laying down a performance scheme for air navigation services and network functions.

In March 2010, Europe, after evaluating the different usages and needs of safety performance indicators (SPIs), presented a multi layer approach to measuring performance at the High Level Safety Conference that took place in Montreal. *First tier* SPIs aim to provide a general assessment of safety and inform the public or other stakeholders external to aviation about broad safety trends (accidents and incidents). *Second tier* SPIs can help identify specific topics which require safety measures, initiatives or actions. The aim of *third tier* SPIs is to provide information on the effectiveness of specific safety measures, initiatives or actions. Second and third tier SPIs, in their quality of 'choice', are naturally closely associated with safety risk management.

EASA and some Member States in collaboration with international authorities have already started the work towards developing a comprehensive methodology for safety measurement. This task is included in the agenda of the SMICG. Furthermore, Member States should publish the SPIs that are in use at national level and will include them on their SSPs. EUROCONTROL in partnership with MS and ANSPs will develop SPIs to measure performance in ATM. This task is also one of the actions identified in the ESP+ for ATM.

In the ATM domain the principles to measure performance through the establishment of Europe-wide targets and national targets are already defined in the regulation. In the future, the other domains of aviation (e.g. airworthiness, operations and aerodromes) will develop a similar approach aimed at having a unique scheme to measure performance. A roadmap will be developed to sketch the necessary steps. The roadmap will be part of the EASP.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
SYS3.4	Monitor performance at national level.	Publish SPIs in use at national level.	MS	2011	SP	SPIs published
SYS3.5	Lack of a methodology to define SPIs.	Develop a comprehensive methodology.	EASA and MS through SMICG	2012	SP	Methodo-logy
SYS3.6	Continuous monitoring of ATM safety performance.	Develop and populate safety indicators to measure performance on ATM and disseminate general-public information of the ANSPs performance through routine publication of achieved safety levels and trends.	EASA ECTRL MS ANSPs SRC/ SRU	2014	SP (ESP+)	Publica-tion of SPIs and safety levels/ trends
SYS3.7	ATM performance measurement scheme more advanced than in other domains of aviation.	Develop a roadmap containing the necessary steps for all the domains to have a common approach for performance measurement in 2015. The roadmap will be included in the EASP.	EASA, MS, EC & ECTL	2011	SP	Roadmap

3.4 Complexity of the system

The complexity of the aviation system is already challenging and sometimes identified as a factor of accidents. In the near future aircraft, air traffic centres and airline operation centres will be the nodes of a network linked by data-link and satellites as illustrated in the concepts put forward by SESAR and NextGen. This network will be rapidly deployed, leading to an environment where legacy systems as well as older generation aircraft will continue to co-exist with new vehicles (e.g. UAS, sub-orbital planes) and new concepts (e.g. 4D navigation). Increased reliance on out-sourcing/partnerships, on system-wide information management and collaborative decision making can also be expected; thus adding complexity to the aviation system.

The operational concept developed under SESAR relies on elements like System Wide Information Management (SWIM), Collaborative Decision Making (CDM) or a Trajectory Managed environment to name a few. Such a concept can be fully qualified as complex when using the definition included in EUROCAE[8]:

> *Complexity is an attribute of systems or items which makes their operation difficult to comprehend. Increased system complexity is often caused by such items as sophisticated components and multiple interrelationships.*

In order to address the issue of fragmentation of European skies, the Single European Sky will deliver a safer, more performing and sustainable air traffic management system. Europe is committed to a swift implementation of SES. Moreover, the MS and the EC will establish functional airspace blocks so that airspace corresponds to operational requirements and the need of airlines rather than to national borders. A central network function will be nominated mainly aimed at ensuring cohesion of the European network and of the performance targets. The impact of SESAR and its developments in the regulatory activities should be assessed.

In a highly complex system like aviation, the first Safety Plan starts by addressing issues like the adequate transmission of assumptions, the total engineering approach or the proper management of crisis situations.

Transmission of Assumptions

Assumptions made during the design phases are sometimes not well understood when operating or maintaining a system. It is important that these assumptions are adequately passed along by the right entities. This is how the idea of an Operational Suitability Certificate (OSC) concept came about. This particular issue and associated actions are further described in section 5.4.

Crisis Management

Regional events like volcanic ash or the outage of a communication system may affect the entire aviation system, which may also be sensitive to domino effects (propagation of a local event). Therefore there is a need to put in place a proper crisis management mechanism. The response to the volcanic ash crisis has provided a good starting basis.

In April 2010 the eruption of the Eyjafjallajökull volcano in Iceland disrupted air traffic in Europe four days in a row. What wasn't experienced in Europe before the Mt. Eyjafjallajökul eruption was the fact that the volcanic ash affected several States in Europe, covering most of their airspace (upper and lower) for a relatively long period. This raised issues regarding lack of criteria for "safe" ash concentrations and on the management and coordination between the States and different ATM service providers.

[8] SAE document ED-79/ ARP4754 (certification for highly integrated or complex aircraft systems).

During the months following the volcanic eruption, the European Commission, EUROCONTROL and the Agency worked closely together with airlines, regulators, and aircraft and engine manufacturers to issue guidelines to minimise disruption caused by volcanic ash. The improved approach offered Member States greater flexibility in deciding how to manage their airspace, allowing for less flight disruption while still ensuring the highest level of safety.

In addition the Commission and EUROCONTROL decided to create a European Aviation Crisis Coordination Cell (EACCC) to ensure a timely response to any future pan-European crisis severely affecting aviation. This is one step forward towards a more coordinated response in a system with many complex interactions.

Total system approach

The provision of certain functionalities will be ensured by a space, an on-board and a ground segment. The safety assessment of these systems must be done at functional level ensuring an appropriate apportionment of the safety risks.

Moreover, in order to harmonise and improve safety in such a complex system, it is important to deliver a harmonized set of clear and concise rules covering all links in the safety chain, using a total system approach, through an efficient rulemaking process in full partnership with national authorities and taking due account of stakeholders' views. Oversight provisions will follow the rulemaking process.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
SYS4.1	Apportionment of safety budgets across aviation segments.	Develop a methodology based on EUROCAE ED-78A (as part of AMC for ATM systems).	EASA	2014	R, SP	Methodo-logy
SYS4.2	Management of crisis situations.	Continue supporting the European Aviation Crisis Coordination Cell (EACCC) to ensure timely response to any future pan-European crisis severely affecting aviation.	EC, ECTRL EASA, & MS	Cont.	SP	Participa-tion & report of activity
SYS4.3	Total System Approach to rulemaking.	Deliver a harmonized set of clear and concise rules covering all links in the safety chain, together with proper oversight mechanisms using a total system approach.	EASA	Cont.	R, O	Opinion/ Decision Oversight policies and procedu-res.
SYS4.4	Fragmentation of European skies.	Assess impact of SESAR in current rulemaking activities.	EASA, ECTRL	2012-2015	R	RP Update

4 Operational Issues

Operational issues are brought to light by the reporting and analysis of occurrence data. The primary focus of the first Safety Plan is on commercial air transport operations[9], especially those carried out by aeroplanes. Additionally an effort has been made to capture actions that address other types of operation; thus acknowledging the existing initiatives at European level. The latter part will be further developed in future editions of the Safety Plan.

Within the commercial air transport operations by aeroplanes, safety issues have been organised into five different categories, which collect the main events that lead to fatalities in aviation. These events are unrecoverable and represent end states in the series of events that develop into a safety occurrence. Before they occur, usually other recoverable safety issues are triggered that reduce the available safety margin. These may be related to weather, air traffic services, airport services, operations, flight crew, etc. The latter are the issues that the safety actions aim to address.

It is also important to recognise that certain issues like unstable approaches, the encounter with hazardous weather conditions or inappropriate actions performed by the crew have an impact on more than one risk area. Human factor issues also affect different areas and are addressed in section 6.

4.1 Commercial Air Transport by Aeroplanes

4.1.1 Runway Excursions (RE)

According to the definition provided by ICAO, a runway excursion is a veer or overrun off the runway surface. Runway excursion events can happen on takeoff or landing.

Data analysis
IATA's 2009 Safety Report shows runway excursion as the most frequent type of accident in 2009, accounting for 27% of events.

Risk factors
- Absence of in-flight landing performance assessment.
- Failure to perform a go around.
- Tail/crosswinds, reduced visibility, rapid change of these.
- No updated weather information.
- Runway contamination.

The analysis of accident data over the last few years shows that Runway Excursions (RE) remain an important risk to aviation safety. Despite various past initiatives including those launched world-wide since 2001, "*runway safety continues to be one of aviation's greatest challenges*" as recognised by the ICAO 2010 High Level Safety Conference[10].

Runway Excursions have been a well studied topic. Risk factors contributing to the excursions have been identified and in some cases mitigation measures have been proposed. Many initiatives and studies address this particular safety issue.

Given the amount of existing work in this area, the Safety Plan starts by seeking to improve coordination among the various initiatives. Furthermore, as announced at the ICAO General

[9] These operations involve the transportation of passengers, cargo and mail for remuneration or hire.
[10] HLSC Declaration, section 19.1(d)(2)

Assembly in October 2010, ICAO shall lead an effective and global response to safety risks to civil aviation arising from runway excursion and incursion events (A37-WP/82). An action has been captured in the Plan to coordinate ICAO and European initiatives regarding in particular the runway excursion component of the ICAO Runway Safety program.

Barriers
- Relevant pilot training.
- Reliable friction measurement.
- Improved operational braking action.
- On board technology (e.g. ROPS).
- Use of stopping devices (e.g. EMAS).

Undesired events
- Long, floated, bounced, firm, off-centreline or crabbed landings.
- Unstable/de-stabilised approaches that continue to a landing.
- Vertical/lateral/speed deviations or loss of aircraft control while on the ground.

New implementing rules at European level will incorporate requirements to address runway excursions in Aerodromes. They will build on the national approaches and the regulatory framework created by EUROCONTROL and ICAO.

National Plans

Member States are encouraged to include the topic on their national programmes and should share the actions they are taking to address the issue as well as the measures that are in place to monitor their effectiveness. When a Member State decides not to include the topic on their national programme, they should provide a justification for proceeding this way. The input will be used to prepare a dedicated workshop with the Member States in order to identify the actions that would make the most difference in this area.

Reference studies (non-exhaustive list)
- European Action Plan on the Prevention of Runway Excursion (EAPPRE) led by EUROCONTROL in cooperation with ECAST.
- Runway Safety Initiative by Flight Safety Foundation.
- Runway Excursion Risk Awareness Tool by Flight Safety Foundation.
- IATA Runway Excursion Prevention Toolkit.
- UK CAA Runway overrun and excursion task force.
- Runway Friction characteristics measurement and aircraft braking (RuFAB – Research Project EASA.2008/4).
- Take Off and Landing Performance Assessment (TALPA) Initiative by the FAA.
- Work of the DGAC France on unstabilised/de-stabilised approaches (identified as one of the major undesired events in the DGAC Safety Plan) and meteorological conditions.

Safety Actions

No.	Issue	Actions	Owner	Dates	Type	Deliverable (Measure)
AER1.1	Produce a European action plan by combining Authorities' and industry efforts.	Develop and publish the EAPPRE.	ECTRL ECAST	2012	SP	EAPPRE, 1st edition

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER1.2	Coordinate ICAO efforts with European initiatives.	Liaise with ICAO on Runway Excursion, in particular regarding safety promotion aspects. Promote European achievements to ICAO and the outcomes of this ICAO initiative in Europe.	EASA	2011	SP	Contribu-tion to the ICAO Global Runway Safety Sympo-sium 2011
AER1.3	Requirements for RE need to be transposed in certain areas.	Development of European requirements for Aerodrome operations.	EASA & EC	2012	R (ADR.002)	Opinion/ Decision
AER1.4	Requirements for RE need to be transposed in certain areas.	Development of European requirements for Air Navigation Service provision.	EASA & EC	2013	R (ATM.001)	Opinion/ Decision
AER1.5	Include RE in national SSPs.	Runway excursions should be addressed by the MS on their SSPs in close cooperation with the aircraft operators, air traffic control, airport operators and pilot representatives. This will include as a minimum agreeing a set of actions and measuring their effectiveness.	MS	2012	SP	SSP publica-tion
AER1.6	Share national actions and measures.	Share actions and measures in use at national level to address the safety issue and participate in a dedicated workshop.	EASA MS	2011	SP	Survey, Report & Workshop

4.1.2 Mid-air collisions (MAC)

A Mid-Air Collision (MAC) is an accident where two aircraft come into contact with each other while both are in flight.

It is commonly assumed that any MAC would cause loss of both aircraft and all people on board. In fact, accident and serious incident reports show that there have been a few non-fatal MAC accidents. However, in most cases, total loss is the result.

The main direct operational issues regarding the risk of collision are separation losses due to operational error(s) from flight crews or ATC controllers. Vertical or lateral deviation of aircraft from air trafic control instructions, inappropriate ATC instructions as well as *airspace infringement* are currently monitored and addressed through different safety initiatives at national or European level. Among them *airspace infringement* need particular attention.

Airspace infringement

Airspace infringement, also known as "*unauthorised penetration of airspace*[11]" is a major operational hazard that can result from the division of airspace into different classes and structures, with their associated procedures and services, and its joint use by different categories of users, often with competing objectives and different operational requirements and capabilities.

Data analysis
Severe airspace infringements incidents reported to EUROCONTROL show an increasing trend since 2007.

Risk factors
- Air navigation system equipment deficiencies.
- Deviation from ATC clearances.
- ATC or pilot operational error.

Barriers
- Airborne safety nets (e.g. ACAS alerts).
- Ground-based safety nets (e.g. STCA, APM).

Undesired events
- Separation minima infringements.
- Vertical/lateral deviation.
- Take off without clearance.
- Airspace infringement.

Infringements are not rare events in busy European airspaces and, without prompt action by air traffic controllers and pilots, could result in loss of separation, or even mid-air collision.

Recognising the severity of this threat to aircraft operations and the need to ensure the safe use of airspace and sustainable development of commercial, military and general aviation in the short, medium and long term, the major aviation stakeholder groups in Europe agreed that coordinated actions should be taken to control this aviation risk. The launch of the Airspace Infringement Safety Improvement Initiative in 2006 provided the vehicle for achieving this goal. The initiative compiled a set of improvement measures in an Action Plan issued in 2009 and provided guidance on how they can best be implemented.

Reference studies (non-exhaustive list)
- European Action Plan for Airspace Infringement Risk Reduction (issued in June 2009).
- UK CAA Airborne conflict task force.

Safety Nets

Without an alert by a safety net, hazardous situations can remain undetected by air traffic controllers and pilots. They have been demonstrated to deliver additional risk reduction up to a factor of ten[12].

The imperative implementation of ground safety nets was recommended by the High Level Group for ATM shortly after the Überlingen midair collision. Safety nets as well as operational systems themselves are dependent on the availability and the integrity of altitude data transmitted by the aircraft. EUROCONTROL in the partnership established with MS and ANSPs through the European safety Programme for ATM will continue the work on the evolution of both ground-based and airborne safety nets.

The most effective barrier in resolving airborne conflicts is the correct following of ACAS Resolution Advisories (RAs). EUROCONTROL data suggests that a significant proportion of ACAS RAs are not responded correctly, which supports the need for a review of the

[11] As per the taxonomy used in ESARR 2 and EC Directive 2003/42/EC

[12] Source: Safety Nets Guide (http://www.eurocontrol.int/safety-nets/gallery/content/public/docs/Guide-10.pdf) Released on 19 May 2009.

effectiveness of flight crew training in this area as well as better pilot/ATC coordination during ACAS alert. Section 5.4 deals extensively with flight crew training.

European ATM Requirements

Furthermore, during the period covered by the Safety Plan, European requirements will establish common rules to address the safety issues leading to mid-air collisions in all areas: air navigation service provision, ATM systems and constituents and the oversight functions performed by Competent Authorities in ATM.

National Plans

Member States are encouraged to include the topic on their national programmes and should share the actions they are taking to address the issue as well as the measures that are in place to monitor their effectiveness. When a Member State decides not to include the topic on their national programme, they should provide a justification for proceeding this way. The input will be used to prepare a dedicated workshop with the Member States in order to identify the actions that would make the most difference in this area.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER2.1	Airspace infringement risk.	MS should implement actions of the European Action Plan for Airspace Infringement Risk Reduction.	MS	Per Plan	SP	SSP Publica-tion
AER2.2	Ground-based ATM Safety Nets.	Develop high level specifications completed by guidance material for System Safety Defences (Short Term Conflict Alert, Approach Path Monitoring and Area Proximity Warning).	ECTRL EASA	2014	R	Guidance material
AER2.3	Ground-based ATM Safety Nets.	Create an awareness campaign to promote and support, where appropriate, Europe-wide deployment of ground-based safety nets.	ECTRL	2014	SP	Leaflets, training modules.
AER2.4	Airborne ATM Safety Nets.	Prepare studies to further evolve airborne safety nets. These studies will collect information on the current performance of safety nets and forecast their performance for possible future operational environment, as well as assessing the performance implications of envisaged changes to the safety nets.	ECTRL	2014	SP	Study report published.
AER2.5	European ATM requirements.	Requirements on Air Navigation Service Provision.	EASA & EC	2013	R (ATM.001)	Opinion/ Decision
AER2.6	European ATM requirements.	Requirements on Competent Authorities in ATM/ANS.	EASA & EC	2012	R (ATM.004)	Opinion/ Decision
AER2.7	European ATM requirements.	Requirements for systems and constituents.	EASA & EC	2011-2013	R (ATM.005)	Opinion/ Decision

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER2.8	Include MAC in national SSPs.	Mid-air collisions shall be addressed by the MS on their SSPs. This will include as a minimum agreeing a set of actions and measuring their effectiveness.	MS	2012	SP	SSP Publica-tion
AER2.9	Share national actions and measures.	Share actions and measures in use at national level to address the safety issue and participate in a dedicated workshop.	EASA MS	2011	SP	Survey, Report & Workshop

4.1.3 Controlled Flight Into Terrain (CFIT)

Controlled Flight into Terrain (CFIT) occurs when an airworthy aircraft under the complete control of the pilot is inadvertently flown into terrain, water, or an obstacle. The pilots are generally unaware of the danger until it is too late. Loss of situational awareness is the common human factor component of CFIT together with night and/or IMC conditions.

Data analysis
CFIT was the 4th category concerning fatal accidents in EASA MS operated aeroplanes in the decade 2000-2009 (EASA ASR).

Risk factors
- Fatigue and disorientation.
- Misunderstanding in communication with controllers.
- Weather related (e.g. rain, turbulence or icing).
- Unclear approach procedures.
- Inadequate crew reaction to TAWS.
- Navigation error.

Barriers
- Terrain Avoidance Warning Systems.
- Minimum Safety Altitude Warning.

Undesired events
- Vertical, lateral or speed deviations.
- Unplanned cloud penetration.
- Unstable approaches.

CFIT has been the object of many actions and initiatives in the past years. Most CFIT accidents occur in the approach and landing phase of flight and are associated with non-precision approaches.

More widespread equipment of aircraft with TAWS, greater awareness of approach and landing risks, constant descent angle approaches (CDA) and minimum safety altitude warning systems are among the known mitigation measures that are being implemented to alleviate the risk of CFIT. The residual risk is being addressed through various regulatory changes.

Fatigue plays also a role in many CFIT events (it is also a factor in all type of human errors and aircraft accidents). Amendments to flight time limitations regulations will mitigate part of the risk in the short term.

In addition to the above immediate measures, the Plan also captures long term changes that are being introduced in the Certification specifications for large aeroplanes to mitigate the risk during the approach and landing phase.

Reference studies (non-exhaustive list)
- ALAR Toolkit by Flight Safety Foundation.
- Work of the DGAC France on unstable approaches.

National Plans

Member States are encouraged to include the topic on their national programmes and should share the actions they are taking to address the issue as well as the measures that are in place to monitor their effectiveness. When a Member State decides not to include the topic on their national programme, they should provide a justification for proceeding this way. The input will be used to prepare a dedicated workshop with the Member States in order to identify the actions that would make the most difference in this area.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER3.1	Electronic Checklists, smart alerting and automatic altitude call-outs.	Amend CS-25 to introduce requirements aiming at reducing approach and landing accidents by: ▪ Implementing interactive electronic checklist and smart alerting systems in new type-certificated airplanes. ▪ Incorporating human factors principles into checklist design for new type-certificated airplanes. ▪ Developing requirements for automatic aural altitude call-outs on final approach	EASA	2012-2014	R (25.026)	Decision
AER3.2	Aircraft Design.	Amend CS-25 to introduce requirement aiming at reducing approach and landing accidents by: ▪ Identifying flight-critical system components as the basis for design guidance, continuing airworthiness, and maintenance. ▪ Issuing design guidance to ensure flight-critical system components are fault tolerant and are subjected to critical-point, flight-realistic-condition, certification testing/analysis.	EASA	2012-2014	R (25.027)	Decision
AER3.3	Fatigue.	Updating of Flight and Duty Time Limitations and rest requirements for commercial air transport with aeroplanes taking into account recent scientific and technical evidence.	EASA	2011	R (OPS.055)	Opinion

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER3.4	Include CFIT in national SSPs.	Controlled flight into terrain shall be addressed by the MS on their SSPs. This will include as a minimum agreeing a set of actions and measuring their effectiveness.	MS	2012	SP	SSP Publica-tion
AER3.5	Share national actions and measures.	Share actions and measures in use at national level to address the safety issue and participate in a dedicated workshop	EASA MS	2011	SP	Survey, Report & Workshop

4.1.4 Loss of Control In Flight (LOC-I)

Loss of control usually occurs because the aircraft enters a flight regime which is outside its normal envelope, usually, but not always at a high rate, thereby introducing an element of surprise for the flight crew involved.

Data analysis
This is the category with the highest number of fatal accidents in EASA MS operated aeroplanes in the decade 2000-2009 (EASA ASR).

Risk factors
- Hazardous weather (icing, windshear, etc).
- Loss of situational awareness.
- Aircraft malfunction.
- Mismanagement of the automation and mishandling of the aircraft.

Barriers
- Flight envelope protection.
- Pilot training (on stall warnings, abnormal conditions, etc).

Undesired events
- Operation outside aircraft limitations.
- Vertical, lateral or speed deviations.
- Unstable approaches.

Loss of control in flight has been one of the most significant causes of fatal aircraft accidents for many years. It has also been addressed by several safety initiatives and many actions have been implemented. The residual risk is being addressed through various training and risk awareness communication campaigns as well as regulatory changes.

Among the known mitigation measures we find pilot training either on unusual attitude recovery in flight simulator and recurrent training programmes or monitoring skills for multi crew pilots. Pilot training and automation management are widely addressed in section 5.4 of the Safety Plan.

Other mitigation measures that protect aircraft against loss of control include the protection against debris impacts and icing conditions. Large aeroplanes specifications are being revised to better address these safety issues. Additionally, several special conditions are being applied to existing products in order to mitigate the risk in the short term.

Aircraft malfunctions are also a contributing factor to a loss of control. This may include engine failure, malfunctions on avionics equipment (like attitude displays, flight crew alerting systems or other electronic displays) or low level fuel scenarios. Certification specifications to large airplanes are also being amended in the short term to address these issues.

The safety Plan also captures research initiatives derived from accident investigations recommendations to investigate water/ice in fuel. FAA and EASA have agreed on an action plan, which encompasses several dedicated research studies relating to the principles of the formation of ice, the role of additive and system-level tests on ice accumulation in fuel.

An initial study will address the literature survey and laboratory testing for the formation and characterisation of ice crystals in aviation jet fuel.

Reference studies (non-exhaustive list)

- UK CAA loss of control Task Force.
- Simulation of Upset Recovery in Aviation (SUPRA) – project financed by the European Commission under 7th Framework Programme.
- Work of the DGAC France on icing (identified as one of the major risk factors in the DGAC Safety Plan).
- International Committee for Aviation Training in Extended Envelopes (ICATEE) initiative to deliver a comprehensive long-term strategy to eliminate or reduce the rate of LOC-I accidents and incidents through enhanced Upset Recovery Training (URT). It is lead by the Flight Simulation Group of the Royal Aeronautical Society.

National Plans

Member States are encouraged to include the topic on their national programmes and should share the actions they are taking to address the issue as well as the measures that are in place to monitor their effectiveness. When a Member State decides not to include the topic on their national programme, they should provide a justification for proceeding this way. The input will be used to prepare a dedicated workshop with the Member States in order to identify the actions that would make the most difference in this area.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER4.1	Protection From Debris Impacts.	Develop a new paragraph of CS-25, which would cover the protection of the whole aircraft against the threat of tire/wheel failure. Identified as a common priority for JAA-FAA-TCCA joint rulemaking	EASA	2013	R (25.028)	Decision
AER4.2	Protection of aircraft in icing conditions.	Upgrade the existing CS-25 certification specifications to ensure that Large Aeroplanes safely operate in icing conditions including Super cooled Large Drop (freezing drizzle, freezing rain), mixed phase and ice crystal.	EASA	2012	R (25.058)	Decision
AER4.3	Aircraft malfunction	Improvement of flight crew alerting systems and electronic displays to reflect advances in technology.	EASA	2011	R (25.037)	Decision

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER4.4	Fuel System Low Level Indication / Fuel Exhaustion Associated crew procedures.	Amend CS-25 by introducing new provisions and associated AMC addressing safety recommendations in order to better protect Large Aeroplanes against fuel exhaustion/fuel low level scenarios.	EASA	2012	R (25.055)	Decision
AER4.5	Water/ice in fuel.	Launch a study to assess the full understanding of vapour water behaviour in fuel under cold temperature conditions.	EASA	2011	SP (Research Project WAFCOLT)	Study Report
AER4.6	Include LOC-I in national SSPs.	Loss of control in flight shall be addressed by the MS on their SSPs. This will include as a minimum agreeing a set of actions and measuring their effectiveness.	MS	2012	SP	SSP Publica-tion
AER4.7	Share national actions and measures.	Share actions and measures in use at national level to address the safety issue and participate in a dedicated workshop	EASA MS	2011	SP	Survey, Report & Workshop

4.1.5 Ground Collision

This category includes any cases of loss of separation on the ground either in or around the aerodrome or on active runways. Both collisions during ground operations and collisions during landing or take off associated to runway incursions are included here.

Among the reported occurrences in this area we find runway incursions, ramp incidents or issues related to ground handling.

4.1.5.1 Runway Incursions

A Runway Incursion is defined as "any occurrence at an aerodrome involving the incorrect presence of an aircraft vehicle or person on the protected area of a surface designated for the landing and take off of aircraft". (ICAO Doc 4444 - PANS-ATM)

Runway incursions are a key safety area in ground safety and one the key issues identified by the SAFER[13] analysis process and are being monitored by the EUROCONTROL governing bodies – the Permanent Commission and Provisional Council.

An example of a solution that has been widely implemented within Member States is the publication of runway hotspots in the AIP to increase awareness by flight crews.

[13] The Safety Analysis Function of EUROCONTROL and associated Repository (SAFER) system collects and analyses ATM occurrence data. Its results present a high-level aggregation of safety experience in terms of ATM-related accidents and incidents, including extensive year-on-year trend information.

Member States should continue the implementation of the European Action Plan for the Prevention of Runway Incursions (EAPPRI), together with a sustained focus on the Runway Safety Programme.

This action plan is the result of the combined efforts of organisations representing all areas of aerodrome operations that are totally committed to enhancing the safety of runway operations by advocating the implementation of the recommendations that it contains in the ECAC area. The ICAO secretariat has lent its strong support to the work of this group and urges all States to fully implement the ICAO provisions relevant to runway safety.

Data analysis
Information available suggests that there may be up to one incursion every day in Europe
(European Action Plan for the Prevention of Runway Incursions)

Risk factors
- Weather.
- Aerodrome design.
- Simultaneous use of intersecting runways.
- ATC and crew phraseology.
- Multiple line ups at different entry positions.
- Blocked communication.
- Call sign confusion.

Barriers
- Use of TCAS display by the flight crew to provide situational awareness.
- Enhanced Vision System (EVS) for improved awareness of runway occupancy.
- Standard ICAO markings and lightning.

Undesired events
- Ground navigation error.
- Aircraft departure runway entry contrary to ATC clearance
- Aircraft runway crossing after landing contrary to ATC clearance
- ATC runway occupancy clearance error or misjudged
- Vehicle or towed aircraft runway crossing contrary to ATC clearance

The 56 recommendations it contains, when implemented, will enhance runway safety by the consistent and harmonised application of existing ICAO provisions, improving controller - pilot - vehicle driver communications and working procedures at the aerodrome, and by the subsequent increase in situational awareness.

Reference studies (non-exhaustive list)
- UK CAA Runway Incursions Steering Group (RISG)
- Work done by the DGAC France on runway incursions (identified as one of the major undesired events in the DGAC Safety Plan).
- European Action Plan for the Prevention of Runway Incursions (EAPPRI) by EUROCONTROL.

Note: Runway incursion prevention could also mitigate the risk of runway excursions caused by an aircraft needing to avoid the incurring party.

The human factors elements that may lead to runway incursions will be explored under the actions proposed in section 6.

National Plans

Member States are encouraged to include the topic on their national programmes and should share the actions they are taking to address the issue as well as the measures that are in place to monitor their effectiveness. When a Member State decides not to include the topic on their national programme, they should provide a justification for proceeding this way. The input will be used to prepare a dedicated workshop with the Member States in order to identify the actions that would make the most difference in this area.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER5.1	Runway safety.	MS should audit their aerodromes to ensure that a local runway safety team is in place and is effective. Member States will report on the progress and effectiveness.	MS	2012	S	Audit plan included in SSPs. Progress Report.
AER5.2	Runway incursions.	MS should implement actions suggested by the European Action Plan for the Prevention of Runway Incursions.	MS	Per Plan	SP	SSP Publica-tion
AER5.3	Runway incursions.	Development of Implementing Rules based on transferred tasks from the JAA and the EUROCONTROL EAPPRI report.	EASA	2011-2014	R MDM.085	Opinion/ Decision
AER5.4	Include RI in national SSPs.	Runway incursions should be addressed by the MS on their SSPs. This will include as a minimum agreeing a set of actions and measuring their effectiveness.	MS	2012	SP	SSP Publica-tion
AER5.5	Share national actions and measures.	Share actions and measures in use at national level to address the safety issue and participate in a dedicated workshop.	EASA MS	2011	SP	Survey, Report & Workshop

4.1.5.2 Safety of Ground Operations

Data analysis
IATA's 2009 Safety Report shows ground damage as accounting for 10% of the reported events in 2009.

Risk factors
- Airport facilities: inadequate overrun area/trench/ditch/proximity of structures.
- Aircraft malfunction.
- Ground events (e.g. loading, fuelling errors, agent interruptions).
- Maintenance events (e.g. aircraft repairs on ground, maintenance errors).

Ground operations involve all aspects of aircraft handling at the airport as well as aircraft movement around the aerodrome except when on active runways. The safety challenges of ground operations are partly to do directly with those operations, for example ensuring that aircraft are not involved in collisions and that the jet efflux from large aircraft does not hazard small ones. Even more important, ground operations are about preparing aircraft for departure in such a way that the subsequent flight will be safe too, for example correct loading of cargo and baggage, sufficient and verified fuel of adequate quantity and quality and the correct use of ground de/anti icing facilities where appropriate.

Among the safety challenges with the potential to cause the biggest risk to aircraft safety (considering frequency and potential outcome) are loading errors and serious collisions between vehicles and aircraft, undetected prior to flight.

The first European requirements in the aerodrome domain will mitigate through European rules some of the issues that are related to airport facilities.

Barriers
- Flight crew pre-flight external checks.
- Maintenance and operational procedures.
- FOD control programs.

Undesired events
- Ground navigation errors.
- Incorrect aircraft configuration: brakes/thrust reversers/ground spoilers/engines.

National Plans

Member States are encouraged to include the topic on their national programmes and should share the actions they are taking to address the issue as well as the measures that are in place to monitor their effectiveness. When a Member State decides not to include the topic on their national programme, they should provide a justification for proceeding this way. The input will be used to prepare a dedicated workshop with the Member States in order to identify the actions that would make the most difference in this area.

Reference studies (non-exhaustive list)
- ECAST Ground Safety Working Group.
- UK Ground Handling Operations safety Team (GHOST).
- IATA safety Audit for Ground Operations (ISAGO).
- IATA/ECAST Ground Operations Manual (IGOM/EGOM).
- Ground Accident Prevention Programme (GAP) launched by Flight Safety Foundation in 2003.

Safety Actions

No.	Issue	Actions	Owner	Dates	Type	Deliverable (Measure)
AER5.6	Transposition of requirements into EU regulation in the domain of Aerodromes.	Requirements for aerodrome operator organisations and oversight authorities.	EASA & EC	2012	R (ADR.001)	Opinion/ Decision
AER5.7	Transposition of requirements into EU regulation in the domain of Aerodromes.	Requirements for aerodrome operations.	EASA & EC	2012	R (ADR.002)	Opinion/ Decision
AER5.8	Transposition of requirements into EU regulation in the domain of Aerodromes.	Requirements for aerodrome design.	EASA & EC	2012	R (ADR.003)	Opinion/ Decision

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
AER5.9	Include Ground Operations in national SSPs.	Risks to ground operations should be addressed by the MS on their SSPs. This will include as a minimum agreeing a set of actions and measuring their effectiveness.	MS	2012	SP	SSP Publica-tion
AER5.10	Share national actions and measures.	Share actions and measures in use at national level to address the safety issue and participate in a dedicated workshop.	EASA MS	2011	SP	Survey, Report & Workshop

4.2 Other types of operations

As highlighted by EASA's Annual Safety Review 2009 and identified by Member States, significant safety concerns exists in operations other than commercial air transport performed by aeroplanes. The Safety Plan starts by highlighting the significant work of the ESSI in helicopters and general aviation in addressing some of the risk areas. This section will be expanded in future versions of the Safety Plan.

4.2.1 Helicopters

The European Helicopter Safety Team (EHEST) is committed to the goal of reducing the helicopter accident rate by 80 percent by 2016 worldwide, with emphasis on improving European safety. Member States and Industry involvement on the implementation of its recommendations is key to achieving this goal.

Additionally the Safety Plan proposes actions for Member States to address the recommendations provided by EHEST in their SSP. The Member States are encouraged to include these recommendations as part of their national campaigns and SSPs to promote helicopter safety.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
HE1.1	Improve Helicopter Safety in Europe through risk awareness and safety promotion.	In cooperation with the IHST, improve Helicopter safety level through risk awareness and development of safety promotion and training material.	EHEST	2012 *cont.*	SP	Leaflets and training material

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
HE1.2	Improve Helicopter Safety through communication.	Develop a communication network focusing on the small helicopter operators and General Aviation, but also reaching out to pan-European organisations and linking to international forums.	EHEST	2011	SP	Report on the commu-nication network
HE1.3	Further implement EHEST recommenda-tions.	MS should address the recommendations proposed by the EHEST as part of their SSPs and monitor their effectiveness.	MS and Industry	2012	SP	SSP Publica-tion

4.2.2 General Aviation

In addition to the activities developed by the European General Aviation Safety Team (EGAST), a review of the on-going initiatives on the improvement to "see and avoid" for General Aviation will be carried out, with special attention to operational needs, scope, opportunities and constraints to augment traffic situational awareness or collision-risk awareness in GA aircraft through electronic means.

Reference studies (non-exhaustive list)

- Better Recognisability of Small Aircraft (BEKLAS). Project initiated by the Federal German Ministry of Transport, Building and Housing. It aimed to analyse the current collision avoidance measures. Based on the results of this analysis strategies were developed to further reduce the risk of a mid-air collision.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
GA1.1	Improve quality of General Aviation safety data	Improve the collection and analysis in Europe of General Aviation fleet usage and safety data for a better evaluation of safety risks.	EGAST	2013 *cont.*	SP	Report on GA usage and safety data in Europe.
GA1.2	Improve General Aviation Safety in Europe through risk awareness and safety promotion.	Improve General Aviation Safety level through risk awareness, sharing of good practices and safety promotion among stakeholders in Europe.	EGAST	2012 *cont.*	SP	Leaflets and training material.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
GA1.3	See and avoid for General Aviation.	Perform reviews of on-going local/national initiatives looking at improvements to see and avoid for GA with the aim to identify best-practices and promote standardisation.	EASA	2011	SP Research	Study report published.

5 Emerging issues

This section anticipates issues that are emerging or where potential hazards exist for the immediate or near future. Giving consideration to safety issues derived from operations or regulations that have not been fully deployed incorporates a forward looking element in the Safety Plan, thus complementing the reactive approach illustrated in previous chapters. Developing a possible picture of the future with some of the trends that are more relevant to aviation is one of the actions captured in this section.

The nature of the issues identified in this chapter is twofold: on one hand, it addresses safety aspects of changes and trends that impact aviation; on the other hand, it copes with the introduction of new products, systems, technologies and operations for which safety regulations may need to be updated.

Actions will not only deal with uncertainties at early stages of development but also with gathering data that are lacking from operations. Gaps in safety data can be mitigated by specific research actions either to produce simulation experiments (at different scales) or by gathering operational experts input on safety issues and prioritising them.

In addition to new products, systems and technologies, consideration is given to issues related to the environment like the effect of climate change in aviation, possible evolution of the role of the regulator and oversight authorities as well as personnel training as one of the key issues that the next generation of aviation professionals will face.

5.1 New products, systems, technologies and operations.

This section addresses the introduction of new designs, technologies or types of operation for which regulatory updates are needed and highlights some of the more relevant trends that will influence aviation in the years to come.

The next generation of aircraft will offer significant cost savings and efficiency by reducing drag (lighter weight composite materials) and using very efficient engines or new propulsion concepts. Average aircraft size will need to fit the future demand of air traffic[14].

New developments are also prominent in the CNS/ATM area, like new passenger services (onboard internet access), evolution of on board technologies or future operational improvements (NextGen & SESAR Programmes). Foreseen upcoming enablers can be new datalinks (with L-band, Satellite and WiMax on airport), RNAV/RNP procedures deployment and Air/Ground Communications Security. New architecture standards, new antenna standards and changes in using frequencies are also expected[15]. A change to fiber-optic would improve the modularity and the flexibility of the network and reduce weight and cost in the mean time.

An emergence of new vehicles is anticipated: VLJ, ELA, UAS, tilt-rotor, sub-orbital aeroplanes, and potentially development of airships and supersonic business jets. The importance of flight simulators will most probably increase in the same way to fulfil pilot training and flight test schedules. Design and production activities will rely more and more heavily on computer tools.

[14] http://www.airbus.com
[15] 2010 AEEC Thalès General Session

The first actions propose to develop methodologies that allow creating a possible picture of the future and assess future risks. It continues by appointing the programmed regulatory updates that will allow introducing the new types of operations.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
EME1.1	Methodology to assess future risks.	Adapt or create a robust method to assess future risks based on expert judgement, project studies, questionnaires and scenarios.	EASA	Sept. 2012	SP	Methodo-logy
EME1.2	Common possible picture of the future.	Adapt or create a methodology to develop a common possible picture of the future. Such methodology should envisage cooperation with other bodies such as EUROCONTROL, SAE or ACARE.	EASA with ECTRL, SAE ACARE	Early 2012	SP	Methodo-logy
EME1.3	UAS further regulation.	Development of IR for the operations of UAS.	EASA	2012-2014	R MDM.030	Opinion/ Decision
EME1.4	Operations with VLJ.	Review of Implementing Rules in relation to the operation of Very Light Jets.	EASA	2012-2015	R MDM.064	Opinion/ Decision
EME1.5	Powered Lift (Tilt rotor) pilot licensing and operations.	Review of Implementing Rules for pilot licensing and operations in relation to the experience gained in the BA609 certification process.	EASA	2012-2015	R MDM.070	Opinion/ Decision
EME1.6	Sub-orbital planes regulation.	Regulate sub-orbital planes.	EASA	2011-2015	R	Opinion/ Decision

5.2 Environmental factors

Environmental factors have a major impact on aviation. This impact varies from advantages when using a jet stream to increase ground speed, delays because of weather avoidance up to serious hazard encounters in flight.

Some types of weather or rapid weather changes can be a significant hazard to aviation. Currently, most hazardous weather phenomena are windshear and turbulence, icing, lightning strikes, hail, reduced visibility, extremely cold weather operations and volcanic ash.

Some weather hazards are taken into account as part of the aircraft certification specifications. In addition, an extensive network of weather forecasting and reporting is being used to allow avoidance of the weather in the first place.

The effect of atmospheric changes caused by climate change and volcanic ash can have important consequences on aviation safety. These were discussed during the International Air Safety & Climate Change Conference that took place in Cologne on 8-9 September 2010.

Climate Change

Although many are seeking a more sustainable aviation system, until now less attention has been given to the potential impact of climate change on commercial aviation safety. Significant incidents have occurred in environments that have exceeded aircraft specifications. This year has been of particular concern as aircraft operators have encountered the effects of volcanic ash in the atmosphere. It is clear that extreme weather conditions continue to present a hazard to aviation and by exploring the topics of severe icing, strong winds and extremes in temperature, mitigation and implementation measures can be sought.

On the 8 and 9 September, the International Air Safety & Climate Change Conference (IASCC) took place in Cologne. The event brought together over 180 experts who discussed how atmospheric changes caused by climate change and volcanic ash can have important consequences on aviation safety. It enabled the international aviation community to meet face to face and discuss key safety issues.

Industry, associations, national and international government agencies and research institutions participated on the event. The objective of the conference and its workshops was, as a first step, to raise awareness of the issue and outline an action plan. It provided a new forum to identify risks and work towards effective safety measures.

The issue is a global one and international cooperation is essential.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
EME2.1	Effect of climate change on aviation.	Establish a network to increase awareness and provide dissemination, coordinate research and avoid duplication. Establish roadmaps and identify precursors (data bank).	EASA	2011	SP	Network ToR.
EME2.2	Effect of climate change on aviation.	Take regulatory action as appropriate to cover well identified issues like icing (in particular ice crystals). Develop rules as identified by the network.	EASA	Depen-ding on outcome of network	R	Opinion/ Decision
EME2.3	Effect of climate change on aviation.	Complement activities by development of Standards and special conditions.	EASA	Depen-ding on outcome of network	R, O	Special Condition

5.3 Regulatory and oversight considerations

Regulatory considerations

The role of regulators will have to evolve and has started to do so. The trend towards performance-based safety regulation will increase due to the introduction of SMS. The "total system approach" to safety should also be widely implemented due to the continuously growing level of integration of aviation systems. The total system approach is built-in in Europe-wide regulatory activities.

State and/or Regional Safety Programs will gradually be in place in accordance with ICAO Requirements. Regional cooperation will increase, including the establishment and functioning of Regional Safety Oversight Organisations (RSOO) to make better use of resources to cope with a complex system with many interactions.

In such an evolving environment, it is important that the legislator and all parties involved in the process ensure a smooth and gradual transition to the new structure of the rules, enhance public awareness by dissemination of clearly arranged and practical information and to promote timely training.

Oversight considerations

The above is likely to lead to an evolution of safety oversight as well. Risk-based oversight should become gradually the norm; the role of approved organisations will evolve towards more privileges and responsibilities, the role of standardisation bodies and professional organisations should become more critical in the overall safety oversight function, EASA standardisation activities will evolve towards a more proactive approach and will cover all domains of aviation.

Experience shows that a prescriptive purely compliance based reactive standardisation inspection approach, which entails punitive measures, can easily create an atmosphere of distrust leading to concealment of critical issues. On the other hand, a performance based proactive approach which is more subjective and based on trust without any means for verification would equally fail, which is unacceptable in an area like aviation where safety is of paramount importance. Only a well balanced combination of both, reactive and proactive components (compliance and performance) can safeguard an environment that would foster a reliable continuous improvement process.

There is a third mechanism, which is important for a system to be able to learn and continuously improve, the feedback loop of the experience gathered in the field to the regulatory processes. It can be concluded that all three mechanisms are equally important for a successful standardisation strategy.

With the gradual extension of the Agency's remit from the fields of initial and continuing airworthiness, into the fields of air operations, flight crew licensing, ATM/ANS and finally aerodromes, the standardisation process has to evolve in order to integrate these new remits, each of which has its own characteristics. This will be done in a collaborative way together with Member States. The fact that every field of aviation has a different history and level of accomplishment in terms of harmonisation efforts poses some challenges for the integration process.

While the current standardisation inspection annual program of the Agency is largely based on regular inspection intervals, it has become obvious that a new concept called Continuous Monitoring Approach (CMA) would allow optimising EASA's standardisation inspection activities. The idea is to establish a web based tool that would allow Member States to enter significant changes of relevant information directly into the EASA database when they occur. An intended risk based planning mechanism based on specific risk factors and indicators

would allow tailoring the size of the teams, the scope, the depth and the timing of standardisation inspection visits to identified risks.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
EME3.1	Well balanced standardisation programme.	Establish a well balanced standardisation programme based on three pillars, regulatory compliance verification, pro-active standardisation and a regulatory feedback mechanism.	EASA	2014	O	Updated Policy/ Procedu-res
EME3.2	One uniform standardisation process for all fields of aviation.	Develop and implement one uniform standardisation process for all fields of aviation as covered by the Basic Regulation and related Implementing Rules.	EASA	2014	O	Updated Policy/ Procedu-res
EME3.3	Implement CMA.	Develop and implement a Continuous Monitoring Approach involving a risk based targeting.	EASA	2014	O	Updated Policy/ Procedu-res

5.4 Next Generation of Aviation Professionals

New technologies in aircraft design, manufacturing and operations were developed over the past decades and have led to a new generation of aircraft. Other developments are ongoing. The training requirements for aviation personnel, although continuously amended, need to be adapted after a careful evaluation of how far they are still adequate to enable aviation professionals to meet the challenge.

In addition, as noted by ICAO in the NGAP Symposium of 2-4 March 2010, the demand for aviation professionals will globally exceed supply. Training capacity will be insufficient to meet demand and learning methodologies may not be appropriate to the learning styles of the next generation. Keeping the knowledge of experts when they retire or leave the industry is also very difficult. Other issues are accessibility to affordable training, competition with other industry sectors for skilled employees, a lack of harmonisation of competencies in certain domains and a lack of awareness by the "next generation" of the types of aviation jobs available.

Some interesting estimates have been presented to ICAO: in the next 20 years, airlines will have to add 25 000 new aircraft to the current 17 000-strong commercial fleet worldwide. And by 2026, there will be a worldwide need for 480 000 new technicians to maintain these aircraft and over 350 000 pilots to fly them.

The challenge today is to adapt training requirements in ways which respond to the strong demand for pilots, while maintaining or improving the level of safety. First priority should be to evaluate training methods and philosophies for pilots as well as certifying staff involved in the maintenance of aircraft with the aim to enable aviation personnel to meet the demands of new procedures and increasingly complex technologies in a developing market. Such methods, which include Competence Based Training (CBT) and Evidence Based Training

(EBT), as well as distance learning, need to be evaluated and rules adapted to ensure that their use can only positively affect the level of safety required by the travelling public.

Both for pilots and aircraft maintenance certifying staff, the content of type training courses should be standardised and adapted to each existing type and variant, as well as to future types and variants as they enter the market. The manufacturer, as the holder of an aircraft type certificate, should provide the minimum content of the type-training, for all types and variants, for pilots and aircraft maintenance certifying staff.

Aviation is also becoming more and more integrated and daily relying on real-time digital technologies. This trend will be accelerated by SESAR in Europe and NextGen in the US, which will introduce new technical solutions. Training methods for ATM personnel should also be addressed.

Changes in the field of Air Traffic Management (ATM) and Air Navigation Services (ANS) may also require the modernisation of training and competence provisions. These competence schemes will in general be under the responsibility of the respective employers. This presents a need for high level provisions for the service providers, to ensure that their personnel are suitable and qualified for the tasks in question and that procedures are established in respect of their training and continuing competence.

The EASA Internal Group on Personnel Training (IGPT) has been set-up in EASA to follow-up the EASA International Conference on Pilot Training of Nov 2009. The IGPT is composed of experts from all operational Directorates of the Agency. Two priority actions have been decided to complement to the NGAP actions presented earlier:

- Development of an Automation Policy: Modern aircraft are increasingly reliant on automation for safe and efficient operations, whether commercially operated or not. Due to the advantages of automation it is required for certain operations and for precision navigation. This can cause problems to senior pilots who may be less comfortable with automation while the new generation of pilots may lack basic flying skills in case of automation failure or when there is a need to revert to a lower automation level, including hand flying the aircraft.

- Development of a Training Implementation Policy: To reduce differences in training implementation in Europe, there is a need to improve oversight at Member States' and EASA levels, and the Agency should reinforce standardisation with regard to Flight Crew Licensing and training related aspects of Operations. Appropriate training implementation measures are needed so that training is enhanced and does not result in lowering training and safety standards. The resulting Training Implementation Policy will concentrate on the implementation of rules addressing training, and provide recommendations for improving the implementation of rules or the rules themselves.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
EME4.1	The demand for aviation professionals may exceed supply and aviation personnel have to cope with new procedures and increasingly complex technologies.	Evaluate new training methods such as Competency Based Training (CBT), Evidence Based Training (EBT) and distance learning, and adapt as necessary training standards and rules to ensure that the level of safety can only be positively affected. Priority will be given to the training of pilots but also of certifying staff involved in aircraft maintenance.	EASA	2014	R	Opinion/ Decision
EME4.2	Standardise type training courses and adapt them to each type and variant, both for pilots and aircraft maintenance certifying staff.	Publish requirements for the holder of an aircraft type-certificate to provide the minimum content of the type-training for pilots and aircraft maintenance certifying staff as part of the Operational Suitability Data (OSD) as well as the results of an operational evaluation.	EASA	2011	R (21.039)	Opinion/ Decision
EME4.3	Modernise training and competence provisions in ATM and ANS.	Develop high level provisions for air navigation service providers to ensure that their personnel are suitable and qualified for the tasks and that procedures are established in respect of their training and continuing competence.	EASA	2014	R	Opinion/ Decision
EME4.4	Address the problem of increasing pilots' reliance on automation.	Develop an Automation Policy	EASA (IGPT)	2011	SP	EASA Policy
EME4.5	Reduce possible differences in training implementation among States.	Develop a Training Implementation Policy.	EASA (IGPT)	2012	SP	EASA Policy

6 Human Factors and Performance

A projected increase in passenger numbers over the next decade, the move towards a Single European Sky and next generation aircraft technology, together with constantly shifting political, economic and regulatory frameworks demand that the role of the human in achieving the highest possible standards of safety within the aviation industry is seen as essential.

The entire aviation system, through people, processes and performance, relies predominantly on individuals and teams for safety, efficiency and effectiveness. In practice, people are required to communicate, apply judgments and make decisions and in doing so are constantly exposed to the risk of error. Therefore, human factors and performance of individuals and organisations affect all aspects of aviation and should not be addressed in isolation.

The emphasis on human factors is especially important at a time when the evolution of integrated Safety Management Systems (SMS) seeks to further improve safety and performance. Accordingly, the practical application of human factors principles and level of awareness among aviation communities should be fully considered in the development of integrated Safety Management Systems. Human error is still cited as the main cause or contributory factor(s) in more than 75% of incidents and accidents.

One important aspect of human factors is a person's relationship and interaction with other people. Another and perhaps even more important human factors focus is on giving individuals important cues to the existence of problem situations and conditions and suggesting proven methods to avoid or deal with them. Anticipation of problems is one key to designing and operating systems that successfully avoid accidents.

A significant feature of human behavior and performance is variability. The human factors problems that lead to accidents are rarely the result of a consistent pattern of behavior. Most often, a human operator who has displayed "normal" or even exemplary performance for most of his or her career falls prey to a human factors problem and begins or contributes to an accident sequence. After the fact, trained accident investigators can usually discover what went wrong. These investigations form the basis for advice to prevent future recurrence of the problem. Disseminating these research results helps prevent these problems altogether by giving each operator the knowledge and tools that support identifying and preventing human factors failures during actual operations.

A new European Strategy for human factors in civil aviation will address these provisions, including a commonly held definition of the term 'human factors'. The work will remove inconsistencies and resolve current disparate arrangements with respect to the regulation, governance, training, licensing, audit and assurance of human factors activity.

The European Human Factors Advisory Group (EHFAG) is an existing body of recognised human factors experts drawn from National Aviation Authorities (including the FAA), industry, professional associations and research organisations. This group is tasked with drafting the European Strategy for human factors and subsequent Action Plan on behalf of EASA.

Improvements in human factors are built-in in the planned rulemaking tasks to extend the incorporation of Safety Management Systems to the airworthiness (initial and continuous) domain (MDM.055 and MDM.060); thus providing the adequate regulatory receptacle for the developments of the EHFAG to be taken into consideration.

In the ATM domain EUROCONTROL and the FAA have issued a white paper on human performance. Human performance, in the context of ATM, refers to the performance of jobs, tasks and activities by operational personnel – individually and together. Human performance, as a domain, focuses on optimising the people element in complex work systems such as air traffic management. It covers all aspects of integrating people into systems including such diverse areas as getting the workstation and controller tools right, ensuring there is adequate staffing, and managing 'human error'.

The expertise of human performance specialists and the tools they use have been recognised as key ingredients for both SESAR and NextGen programmes to advance ATM infrastructures in the Europe and USA. EUROCONTROL and ANSPs will continue to work together in the deployment of ATM human performance activities through the partnership established by the European Safety Programme for ATM (ESP+).

The approach to human factors and performance should become systematic and centric for all industry. Understanding and managing human performance is critical for the future of aviation. No matter how advanced the concepts and systems become, humans will be on centre stage as the decision makers, and human performance will remain the key driver of aviation performance.

Safety Actions						
No.	**Issue**	**Actions**	**Owner**	**Dates**	**Type**	**Deliverable (Measure)**
HFP1.1	Strategy for human factors.	To develop an EASA human factors strategy in conjunction with EHFAG to enable and endorse human factors and human performance across civil aviation activities including rulemaking, regulatory oversight and standardization.	EHFAG	2011	SP	Strategy
HFP1.2	Action plan development.	Develop an Agency action plan on human factors based on the strategy and evaluation of the results of the questionnaire of December 2009.	EHFAG	2012	SP	Action Plan
HFP1.3	Support ATM human performance .	Support to ANSP in the deployment of ATM human factors activities.	ECTRL, ANSPs	2011-2014	SP (ESP+)	Best Practices

Attachment A: Acronyms and Definitions

Acronyms

ACARE	Advisory Council for Aeronautical Research in Europe
ADREP	Accident/Incident Data Reporting
AER	Aeroplanes
AISP	Agency's Internal Safety Programme
AIP	Aeronautical Information Publication
ANSP	Air Navigation Service Provider
ATM	Air Traffic Management
CAST	Commercial Aviation Safety Team (US)
CBT	Competence Based Training
CDA	Continuous Descent Angle
CFIT	Controlled Flight Into Terrain
CMA	Continuous Monitoring Approach
COSCAP	Cooperative Development of Operational Safety and Continuing Airworthiness Programme of ICAO
EACCC	European Aviation Crisis Coordination Cell
EAPPRE	European Action Plan on the Prevention of Runway Excursion
EASA	European Aviation Safety Agency
EASP	European Aviation Safety Programme
EBT	Evidence Based Training
EC	European Commission
ECAC	European Civil Aviation Conference
ECAST	European Commercial Aviation Safety Team
EGAST	European General Aviation Safety Team
EHEST	European Helicopter Safety Team
EHFAG	European Human Factors Advisory Group
ELA	European Light Aircraft
EMAS	Engineered Materials Arresting System
EME	Emerging
ESP+	European Safety Programme for ATM
ESSI	European Strategic Safety Initiative
EVS	Enhanced Vision System
FAA	Federal Aviation Administration
FOD	Foreign Object Debris
GA	General Aviation
HE	Helicopters
HFP	Human Factors and Performance
HLSC	High Level Safety Conference
IASCC	International Air Safety and Climate Change Conference
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ICATEE	International Committee for Aviation Training in Extended Envelopes
IGPT	Internal Group on Personnel Training of EASA
IHST	International Helicopter Safety Team
IMC	Instrumental Meteorological Conditions
MAC	Mid-air Collision
MS	Member States
NAA	National Aviation Authority
NextGen	Next Generation Air Transportation System
NGAP	Next Generation of Aviation Professionals

O	Oversight
OSC	Operational Suitability Certificate
PRB	Performance Review Body
LOC-I	Loss of Control In Flight
R	Rulemaking
RE	Runway Excursions
ROPS	Runway Overrun Prevention System
SES	Single European Sky
SESAR	Single European Sky ATM Research Programme
SMICG	Safety Management International Collaboration Group
SMS	Safety Management System
SP	Safety Assurance and Promotion
SPI	Safety Performance Indicator
SSP	State Safety Programme
SWIM	System Wide Information Management
SYS	Systemic
TAWS	Terrain Awareness Warning System
VLJ	Very Light Jets
UAS	Unmanned Aircraft Systems
URT	Upset Recovery Training

Definitions

Aeronautical Information Publication
An Aeronautical Information Publication (AIP) is a publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. (ICAO Annex 15 - Aeronautical Information Services)

Airborne safety nets
Airborne Safety nets provide alerts and resolution advisories directly to the pilots. Warning times are generally short, up to 40 seconds. Pilots are expected to immediately take appropriate avoiding action.

Airspace infringement
Airspace infringement occurs when an aircraft penetrates an area into which special clearance is required without having such clearance.

Controlled Flight Into Terrain
Controlled Flight Into Terrain (CFIT) occurs when an airworthy aircraft under the complete control of the pilot is inadvertently flown into terrain, water, or an obstacle. The pilots are generally unaware of the danger until it is too late.

European Aviation Safety Programme
European regional approach to the ICAO requirements of State Safety Programmes. It contains an integrated set of regulations and activities to improve safety within EASA Member States.

Ground-based safety nets
Ground-based safety nets are an integral part of the ATM system. Using primarily ATS surveillance data, they provide warning times of up to two minutes. Upon receiving an alert, air traffic controllers are expected to immediately assess the situation and take appropriate action.

Non-precision approach
A non-precision approach is an instrument approach and landing which utilises lateral guidance but does not utilise vertical guidance. (ICAO Annex 6) For pilots of older aircraft, in which use of automated systems to assist in flying the approach is limited, a high degree of piloting skill is required to fly such approaches accurately and the frequent practice which many pilots need to achieve this can be difficult to come by if precision approaches are the normal method used.

Mid-air collision
A Mid-Air Collision (MAC) is an accident where two aircraft come into contact with each other while both are in flight.

Loss of separation
Loss of separation between aircraft occurs whenever specified separation minima are breached. Minimum separation standards for airspace are specified by ATS authorities, based on ICAO standards.

Level bust
A *level bust* occurs when an aircraft fails to fly at the level to which it has been cleared, regardless of whether actual loss of separation from other aircraft or the ground results. Level busts are also known as Altitude Deviations.

Loss of Control In Flight
Loss of control usually occurs because the aircraft enters a flight regime which is outside its normal envelope, usually, but not always at a high rate, thereby introducing an element of surprise for the flight crew involved.

Occurrences
Operational interruptions, defects faults, or other irregular circumstances that have or might have influenced flight safety and that have not resulted in an accident or serious incident.

Runway Excursion
According to the definition provided by ICAO, a runway excursion is a veer off or overrun off the runway surface. Runway excursion events can happen on takeoff or landing.

Runway Incursion
A *runway Incursion* is defined as "Any occurrence at an aerodrome involving the incorrect presence of an aircraft vehicle or person on the protected area of a surface designated for the landing and take off of aircraft". (ICAO Doc 4444 - PANS-ATM)

Safety Management System
A Safety Management System (SMS) is a systematic approach to manage safety, including the necessary organisational structures, accountabilities, policies and procedures (ICAO). ICAO through various Annexes to the Chicago Convention has incorporated requirements for service providers in various domains of aviation to have an SMS.

State Safety Programme
According to the ICAO definition it is an integrated set of regulations and activities aimed at improving safety. ICAO requires contracting States to implement SSPs.

System Complexity
Complexity is an attribute of systems or items which makes their operation difficult to comprehend. Increased system complexity is often caused by such items as sophisticated components and multiple interrelationships (EUROCAE/ SAE Doc ED-79/ ARP4754)

Attachment B: Working Groups

EASAC
The **European Aviation Safety Advisory Committee** (EASAC) was established by the Executive Director of the Agency in October of 2009. The main objective of the Committee is to advise on a European Aviation Safety Strategy and propose a European Aviation Safety Programme and Plan. The first Plan is the present document, endorsed by the Committee.

The EASAC is chaired by the Executive Director of the Agency and composed of safety experts' ad persona from Member States, the European Commission, EUROCONTROL, Industry and EASA. The Committee reports regularly to the EASA Management Board.

EARPG
The **European Aviation Research Partnership Group** (EARPG) prepares proposals and suggests priorities for research topics to be funded by relevant sources available. Identification of research needs is based on: certification experts' experience, evidence of accumulation of safety related concerns resulting from safety analysis of incident and accident databases, Safety Recommendations stemming from incident and accident investigations and proposals by the European Strategic Safety Initiative (ESSI) and its safety teams ECAST, EGAST, EHEST.

The research results are expected to lead to recommendations and improvements of safety or environmental protection through changes to requirements, compliance and guidance material. The EARPG membership consists of the Agency's research focal points, EASA Member States with an interest in research, the European Commission and EUROCONTROL It shares information with authorities from Non-EASA Member States, particularly the FAA and Transport Canada, on on-going research and where appropriate, co-ordinates future research activities. The group interfaces with Industry and Research Institutions on a regular basis through workshops.

ECAST
The **European Commercial Aviation Safety Team** (ECAST) is a component of European Strategic Safety Initiative (ESSI). ECAST addresses **large fixed wing aircraft operations**, and aims to further enhance commercial aviation safety in Europe, and for European citizen worldwide. It was launched in October 2006.

ECAST is a partnership between EASA, other European regulators and the aviation industry. ESSI is based on the principle that industry can complement regulatory action by voluntary committing to cost effective safety enhancements. ECAST cooperates with CAST and with other major safety initiatives worldwide, in particular under the Cooperative Development of Operational Safety and Continuing Airworthiness Programme (COSCAP).

EGAST
European General Aviation Safety Team (EGAST) is a component of European Strategic Safety Initiative (ESSI). General Aviation (GA) is a high priority for EASA. EGAST creates a forum for sharing best practices, improving data sources, and promoting safety.

EGAST's mission is to promote and initiate for all sectors of General Aviation best practices and awareness in order to improve safety, thereby reducing the accident rates. The team may make non binding recommendations. EGAST will help EASA and the industry focus their resources on combined safety promotion efforts to reach the goal of reducing accidents

EHEST
Launched on November 2006, the **European Helicopter Safety Team** (EHEST) brings together manufacturers, operators, research organisations, regulators, accident investigators

and a few military operators from across Europe. EHEST is the helicopter branch of the ESSI, and also the European component of the International Helicopter Safety Team (IHST).

EHEST is committed to the goal of reducing the helicopter accident rate by 80 percent by 2016 worldwide, with emphasis on improving European safety.

EHFAG
The **European Human Factors Advisory Group** (EHFAG) is an existing body of human factors expertise drawn from national Aviation Authorities (including the FAA), industry, professional associations and research organisations. This Group will be tasked with developing a human factors strategy and action plan on behalf of EASA.

ESSI
The **European Strategic Safety Initiative** (ESSI) is an aviation safety partnership between EASA, other regulators and the industry. ESSI's objective is to further enhance safety for citizens in Europe and worldwide through safety analysis, implementation of cost effective action plans, and coordination with other safety initiatives worldwide. ESSI was launched in June 2006 by EASA as a ten year programme and has three pillars: ECAST, EHEST and EGAST

IGPT
The Agency's Internal Group on Personnel Training (IGPT) has been set-up by the Agency to follow-up the EASA International Conference on Pilot Training of 29 Nov 2009. Its first meeting took place on 27 Jan 2010. Building on proven internal expertise and competences, the IGPT bridges Design, Certification, Training, and Operations by creating a forum to address training within the Agency and deliver the official Agency's position on the subject. The IGPT is composed of experts from all operational Directorates and adopts a total system approach in training based on the three pillars Rulemaking, Oversight and Safety Promotion. The IGPT addresses all types of training and checking for all types of personnel and operations. Regarding pilot training, this includes flight and type rating training, including both ab initio and recurrent elements, all categories of aircraft, all types of operations, and pilots with different backgrounds (e.g. those trained on highly automated glass cockpits aircraft and those pilots trained on older generation conventional aircraft).

PRB
On 29 July 2010, the EC adopted a Decision designating EUROCONTROL acting through its Performance Review Commission (PRC) supported by the Performance Review Unit (PRU) as the **Performance Review Body** (PRB) until 30 June 2015. The EUROCONTROL Organisation accepted to be designated as PRB on 15 September 2010.

SM ICG
The **SMS International Collaboration Group** (ICG) created in Feb 2009 is a collaboration activity between aviation authorities in order to promote the common understanding of SMS principles and requirements in different countries, share lessons learned and encourage progress and harmonisation. The ICG consists of a core group and a participant group. The core group is comprised of authorities with resources and expertise for product development. It includes members from the FAA, EASA (supported by FOCA of Switzerland, the DGAC of France and UK CAA), ICAO, TCCA, CASA of Australia and NCAA of Brazil. The participant group tests and reviews the core group's work products and resources. The ICG interacts with several industry members and groups, including CAST, ECAST and the SMS ARC.