E3 Task Force

Metrics for Safety Key Performance Indicators for the Performance Scheme

Version 2.0

Date 01/06/2011

Proposed issue

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Report

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Document ref.	Status	Date
V2.0	Proposed issue	01/06/2011

Contact name and address for enquiries:

Jean-Pol Henrotte, EC DG MOVE, jean-pol.henrotte@ec.europa.eu

Marieke van Hijum, EASA, marieke.van-hijum@easa.europa.eu

Authorisation:

	Name	Signature	Date
Prepared	E3 Task Force		01/11/2010-01/06/2011
Reviewed	E3 Task Force		01/06/2011

Record of changes:

	Source	Pages	Date
V1.0	Proposed versions sent to the EC and PRB for consultation with the Member States and industry	-	29/04/2011
V2.0	SSC workshop for State Representatives 13 May 2011	9-12, 19, 30, 41-44, 46, 48, 55, 63-68 (new Annex)	01/06/2011

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Part I
Executive Summary

Executive Summary

a. Purpose of the Document

This document is the result of the technical work of the E3 Task Force (EC, EASA, EUROCONTROL) developing proposals for the metrics of the three Safety KPIs as mandated by the Commission Regulation (EU) No 691/2010 (Performance Regulation). This proposal is addressed to the European Commission to serve as the basis for their formal Stakeholder Consultation process. Upon the conclusion of this consultation and the respective changes to this document, the updated document will serve as the basis for developing an amendment to the Performance Regulation, which needs to be adopted by the Commission before the first reference period (RP1) commencing 2012.

b. Legal Background

Commission Regulation (EU) No 691/2010 on the performance scheme for air navigation services and network functions implements Article 11 of the Framework regulation (EC No 549/2004) and defines the key performance indicators (KPI) for the four key performance areas (KPAs): capacity, cost-efficiency, environment and safety. For the safety performance assessment the Regulation defines three safety KPIs:

a) The first safety KPI shall be the effectiveness of safety management for air navigation services providers and national supervisory authorities (NSAs) respectively, as measured by a methodology based on the ATM Safety Maturity Survey Framework.
b) The second safety KPI shall be the application of the severity classification of the Risk Analysis Tool to allow harmonised reporting of severity assessment of Separation Minima Infringements, Runway Incursions and ATM Specific Technical Events at all Air Traffic Control Centres and airports with more than 150 000 commercial air transport movements per year (yes/no value).
c) The third European Union-wide safety key performance indicator shall be reporting of the just culture.

No European Union-wide targets for the above safety KPIs are required by Regulation (EC) No 691/2010 for the first reference period (RP1, 2012-2014). During RP1, the Commission will use the data collected to validate these KPIs and assess them to ensure that safety risk is adequately identified, mitigated and managed. On this basis, the Commission shall adopt new safety KPIs for RP2 if necessary, by revision of Regulation (EC) No 691/2010. Moreover, it is the intention to use the data collected during the RP1 to establish the performance targets for the following reference period.

The safety performance indicators as required in the Regulation (EC) No 691/2010 shall be developed on the basis of two mentioned tools developed by EUROCONTROL (ATM Safety Framework Maturity Surveys (SFMS) and the Risk Analysis Tool (RAT)).

c. Effectiveness of Safety Management (EoSM)

EoSM KPI: Definition of general management objectives at State and ANSP level based on EUROCONTROL ATM SFMS considering EU legislative framework, ICAO SARPs and European Aviation Safety Programme and measured through questionnaires. Assists in identification of safety management areas where improvement is needed.

The Key Performance Indicator 'Effectiveness of Safety Management' is designed to measure on both State level and Service Provision level the capability of the States to manage its SSP and Service Providers to manage an effective SMS respectively. Starting point is the ICAO SSP and SMS framework consisting of several components and elements. Additional components and elements have been added to better reflect the European context.

The resulting framework consists of five main components. The first four components were identified in the ICAO material and are aligned with EU legislation: Safety policy and objectives, Safety risk management, Safety assurance, and Safety promotion. The fifth component, Safety Culture, although not specifically identified either in ICAO SARPs or in EU legislation but being part of the current SFMS, is considered to be necessary to measure EoSM. For all five components, for both State and ANSP levels, general management objectives (MOs) are defined.

The EoSM indicator will be measured by verified responses to questionnaires on State and Service Provision level, based on the EUROCONTROL SFMS. For every question the respondent is required to indicate the level of implementation, varying from 'Initiating' (level 1) to 'Continuous Improvement' (level 5), characterising the level of performance of the respective organisation.

This proposed methodology for measurement of the EoSM for the **State** resulted in substantial changes to the SFMS questionnaire. Applying the same methodology to measure the EoSM of **ANSPs** did not result in substantial changes to the present SFMS questionnaire.

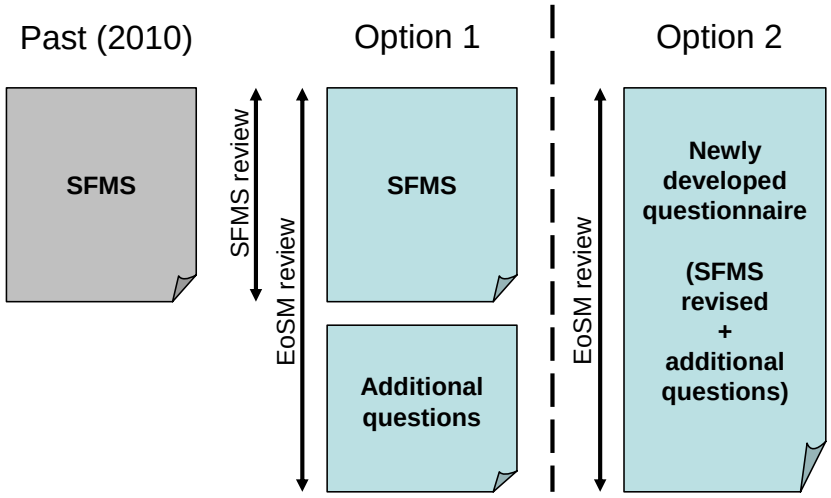
Mechanism for measurement – State level
The questionnaires completed by the NSA/national competent authorities shall be delivered to EASA and PRB by mid July each year during the RP1.

This questionnaire is designed maintaining the structure of the SFMS (Study Areas) with several new questions added in order to fully cover the state obligations relevant to the SSP. For each question States shall provide information on the level of implementation and evidence to justify its answer.

As part of the methodology each of the questions is associated with a weighting factor to compute the overall level of effectiveness. To recognise the achievement of the SFMS so far, two possible options are identified:

Option 1: Use of the current SFMS questionnaire including the proposed revisions of specific questions with addition of a section added to cover the newly identified set of questions.
The advantage of such an approach is the possibility for continuation of the SFMS part of 2010 as the quantification of the existing questions can be maintained. The quantification of the answers given to the new questions can be done separately. The disadvantage is that the evaluation process for each of the respective MOs is less obvious.

Option 2: Use of one single newly developed questionnaire, which includes the revised set of SFMS questions as well as the new questions and a new way of quantifying them. The advantage of this approach is that the questionnaire is specifically tailored to address the MOs. The disadvantage is that the continuation from the preceding SFMS exercise in 2010 is not provided for.



For any of the finally selected options weighting factors for the evaluation of the MOs need to be developed before the start of RP1.

Stakeholders are requested to indicate their preferred option for the revision of the State level questionnaire as well as the reasons why they would prefer it.

Mechanism for verification – State level

The results of the States' self assessment will be verified by means of EASA standardisation inspections, which will also be used for the dispatch and collection of the questionnaires. Standardisation inspections are to be performed in accordance with Regulation 736/2006, which is going to be amended to be able to achieve the objectives of the safety performance monitoring as required in Regulation (EC) No 691/2010. The answers of the self-assessment questionnaires shall be verified by EASA using all the safety-related information available in the Agency. If necessary, EASA shall collect additional safety information from the respective State, or it shall undertake standardisation inspection of the respective NSA to amend the results accordingly. The PRB may request EASA to address during standardisation visits specific issues identified by the PRB.

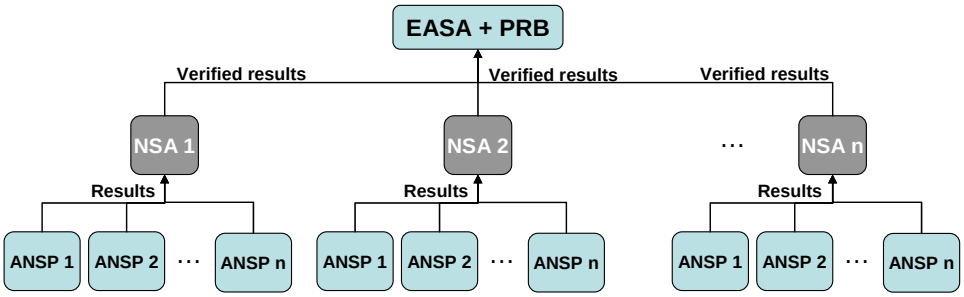
Mechanism for measurement – Service provider level

This indicator addresses EU ANSPs providing ATS and/or CNS services, certified in accordance with regulation (EC) No 2096/2005 (common requirements for the provision of air navigation services).

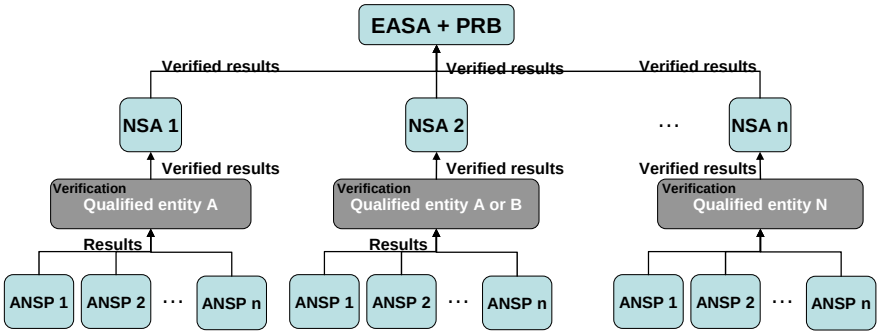
The current SFMS questionnaire can be used to measure the MOs with only minor editorial enhancements to the questions, which do not change either the content of the five possible levels of implementation nor the associated weighting factors for the SFMS Study Areas. Similar to the State part, justification and evidences shall be provided by the ANSPs to justify their answers.

Mechanism for verification –Service provider level

The NSA/national competent authority is responsible for the performance oversight and the verification of the ANSP questionnaires. This verification should take place before the questionnaires and their results are submitted to EASA and PRB.



The current European regulatory framework article 10 of Regulation (EC) No 1315/2007 and article 11 of draft safety oversight regulation published with EASA Opinion No 02/2011) already creates the possibility for the NSA/national competent authority to allocate the detailed verification task to a qualified entity. This qualified entity shall mean a body complying with the requirements defined in the regulations to which a specific task may be allocated by and under the supervision and the responsibility of the NSA.



The implementation of the verification process shall be standardised through the EASA standardisation inspections mechanism.

For both the State level and Service Provider level, EASA and PRB will monitor the performance regarding this indicator based on the received answers and on the results of the verification process by the States and by EASA.

d. Application of the severity classification methodology of the Risk Analysis Tool (RAT) to allow harmonised reporting

RAT severity classification methodology KPI: Application of the severity classification methodology of the RAT. To be measured on the individual occurrence level as yes/no value of application of the RAT methodology for severity classifications of occurrences with category A (serious incidents), B (major incidents) or C (significant incidents) for all separation minima infringements, runway incursions and ATM specific technical events at Air Traffic Control Centres and airports with more than 150 000 commercial air transport movements per year.

The application of the RAT severity classification *methodology* supports and allows for harmonised reporting of the severity classification of occurrences. Therefore, the concept of this indicator is to prescribe the common methodology for occurrence severity classification by defining detailed criteria and specifications for assessment of occurrences.

The way to implement the RAT severity classification methodology is left up to States. The EUROCONTROL Risk Analysis Tool is a possible means of compliance. The RAT tool is being maintained by EUROCONTROL and made available, free of charge, to States and Organisations. In case a State wishes to use a different tool, it has to demonstrate that their tool complies with the defined criteria and specifications.

Mechanism for measurement

The second safety KPI is proposed to be measured as yes/no value of application of the RAT methodology for severity classifications of occurrences with category A (serious incidents), B (major incidents) or C (significant incidents), as a minimum to be used for the occurrence types defined in Regulation No 691/2010. Reporting on application is to be done at individual occurrence level by the assigned state entity. For the reporting of the yes/no value of application of the RAT severity classification methodology, it is proposed to use the EUROCONTROL Annual Summary Template (AST) forms. The European Central Repository (ECR) will remain the central source of safety information in the EU. Therefore compatibility with the ECCAIRS system, the software tool used for the ECR, is an important criteria.

Mechanism for verification

Verification will be performed by means of EASA standardisation inspections in order to be consistent with the verification mechanism proposed for the other KPIs. Standardisation inspections are to be performed in accordance with Regulation 736/2006 including follow up activities as data and responses analysis by PRB and EASA. In addition, the validation of the data will be done by EASA and PRB in cooperation with EUROCONTROL DSS/OVS/SAF.

e. Just Culture

Just Culture KPI: Two separate questionnaires to assess level of implementation of Just Culture within a State and within service providers.

Just Culture is the cornerstone of any incident reporting system as it should be designed to guarantee that safety relevant information may be reported without fear of retribution. This is needed to ensure that the safety feedback loop of the aviation industry works efficiently towards the constant improvement of safety performance.

The Just Culture KPI aims at measuring the level of presence and corresponding level of absence of Just Culture at State level and at ANSP level. The Just Culture KPI is defined through three main areas:

- Policy and its implementation – assessing the existence of a Just Culture policy within organisations (regulatory/supervisory and service provision). The policy is to be measured for effectiveness and not just its mere existence;
- Legal / Judiciary – assessing whether the national legal environment is supportive or not of Just Culture;
- Occurrence Reporting – assessing policies and practices of occurrence reporting.

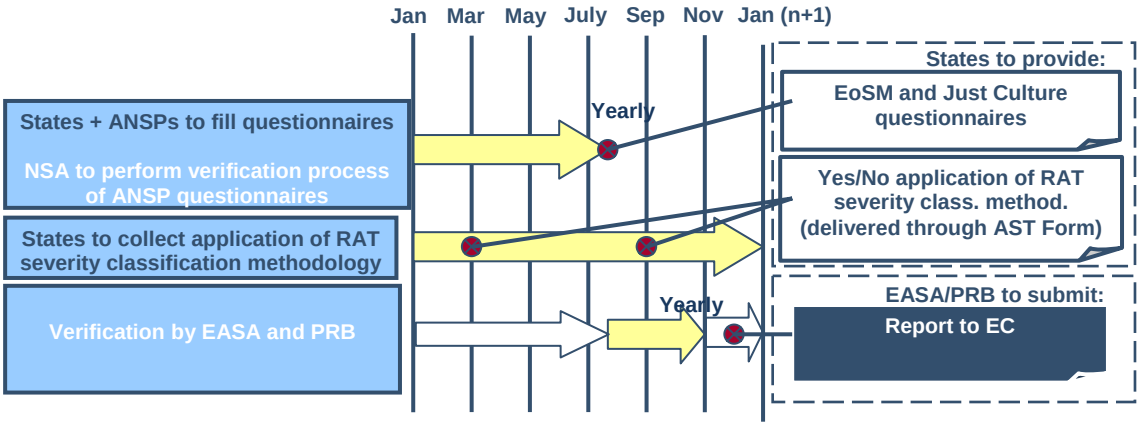
The metric for the Just Culture KPI has been constructed to respond to the criteria of being clearly defined, auditable, verifiable, repeatable and indicative of the level of Just Culture being implemented. In addition, two separate sets of metrics for assessment of the extent of implementation of Just Culture were developed. One to assess level of implementation within a State (which includes questions on legislation, policing, and regulatory/supervisory authorities) and the other within its ANSPs (separate set of metrics for the service provision).

Mechanism for measurement
Questionnaires are designed separately for State and ANSP level containing questions to cover each of the three main areas.

Mechanism for verification
Questionnaires are proposed to be dispatched together with those for the EoSM following the same validation and verification processes.

f. General Timeline

The figure below shows the proposed timeframe for the monitoring process for each year during the RP together with the main "deliverable" dates (KPI reporting and submission of the performance monitoring report to the EC).



The work of the E3 Task Force has been constrained by the contents of Regulation 691/2010, which defines the three safety KPIs, and by the start of the first reference period on 01/01/2012. The report defines the concepts for the safety KPIs and the corresponding mechanisms for measurement and verification. RP1 will put in place the fundaments for performance monitoring and reporting.
The work on the safety KPIs for RP2 is starting now and this opens the possibility to develop more elaborated KPIs for safety leading to effective safety improvements.

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Part II
Technical Part

1 Introduction

1.1 Legal basis

The European legislative framework for the field of ATM/ANS consists on the following legislative package under the single European Sky (SES) legislative initiative:

- The Framework regulation (EC No 549/2004) - laying down the framework for the creation of the Single European Sky;
- The Service provision regulation (EC No 550/2004) - on the provision of air navigation services in the Single European Sky;
- The Airspace regulation (EC No 551/2004) - on the organisation and use of airspace in the Single European Sky;
- The Interoperability regulation (EC No 552/2004) - on the interoperability of the European Air Traffic Management network;

and their Implementing Rules (IR).

These regulations were amended by the SES II legislative package via Regulation (EC) 1070/2009. The SES II package amended Article 11 of Framework regulation lying down requirements for performance scheme for improvement of the performance of air navigation services.

Commission Regulation (EU) No 691/2010 on the performance scheme for air navigation services and network functions implements Article 11 of the Framework regulation and defines the key performance indicators for the four performance areas: capacity, economic, environment and safety. This regulation defines the following safety key performance indicators:

a) The first safety KPI shall be the effectiveness of safety management for air navigation services providers and national supervisory authorities respectively, as measured by a methodology based on the ATM Safety Maturity Survey Framework.
b) The second safety KPI shall be the application of the severity classification of the Risk Analysis Tool to allow harmonised reporting of severity assessment of Separation Minima Infringements, Runway Incursions and ATM Specific Technical Events at all Air Traffic Control Centres and airports with more than 150 000 commercial air transport movements per year (yes/no value).
c) The third European Union-wide safety key performance indicator shall be reporting of the just culture.

It is stated in the Regulation that the indicators shall be developed jointly by the Commission, the Member States, EASA and EUROCONTROL and adopted by the Commission prior to the first reference period.

It is important to highlight that the Performance regulation does not require European Union-wide targets for the above key performance indicators in the first reference period (2012-2014). During the first reference period, the Commission shall use the data collected to validate these key performance indicators and assess them with a view to ensuring that safety risk is adequately identified, mitigated and managed. On this basis, the Commission shall adopt new safety key performance indicators if necessary, by revision of the Annex of Regulation 691/2010. It is the intention to use the data collected during the first reference period to establish the performance targets for the following reference periods.

In the EU, the safety legislative framework is promulgated through the adoption of the EASA Basic Regulation (Regulation (EC) No 216/2008), its Essential Requirements and its associated

Implementing Rules. The safety objectives to be met for each field of civil aviation are defined at the political level in the Basic Regulation and its Essential Requirements.

The safety pillar of the SES II package extended the EASA system to the field of ATM/ANS safety. Therefore, Regulation (EC) No 216/2008 was amended by Regulation (EC) 1108/2009.

The Basic Regulation and its Essential Requirements are adopted by the European Parliament and Council following a proposal of the European Commission, based on an EASA Opinion. These safety objectives have been established to mitigate unacceptable risks. In order to guarantee the implementation of these safety objectives in a uniform manner, the legislator has established that implementing measures (such as Implementing Rules, Certification Specifications, Acceptable Means of Compliance and Guidance Material) have to be developed. Additionally, industry standards are also developed to facilitate the achievement of these safety objectives.

Certifications specifications, acceptable means of compliance and guidance material are nonbinding material adopted by the Executive Director of the Agency through a Decision.
The implementing rules are measures designed to amend non-essential elements of the articles of the Basic Regulation by supplementing the Essential Requirements. The implementing rules are adopted by the European Commission, following an EASA opinion, under procedures established in accordance with the treaties. In addition the BR provides means for ensuring harmonised implementation of safety requirements trough standardisation inspections in the member states carried out by EASA.

1.2 The present system

Before the SES II package, there were no mandatory safety performance indicators within the European legal framework. Each Member State and each ANSP established, as applicable, their own performance indicators at the national level. The need to do so is reflected at the international level, through the ICAO State Safety Programme framework for States and also through the Safety Management Systems framework for the providers. Also, within the EUROCONTROL context some safety performance indicators were developed and published.
However, it has to be highlighted that not all Member States have systematically followed the same approach.

Before the SES II package, European initiatives in the field of ATM such as the EUROCONTROL Safety Framework Maturity Surveys demonstrated to be a useful tool to help in understanding how well State Regulators and ANSPs thought they were implementing ATM Safety Requirements. This tool is presently based on a self-assessment done by State Regulators and ANSPs on how well the safety requirements are met. The self-assessment is complemented by telephone interviews.

EUROCONTROL Risk Analysis Tool is also a tool aimed to harmonise the way Member States and ANSPs classify and analyse ATM safety occurrences.

Today both these tools are voluntary for Member States and ANSPs to use and the results are not disclosed publicly.

These tools have been very useful in a scenario in which the requirements for ATM performance scheme were not yet in force. They were also developed before the total aviation safety system was covered under the same umbrella, the EASA system.

The safety performance indicators as required in the performance scheme regulation (Regulation 691/2010) shall be developed on the basis of the above mentioned tools. However, taking into account the changing of environment (very demanding performance targets for the key performance areas of environment, capacity and economic), it was

recognised that in order to ensure that safety performance levels in the field of ATM are not degraded and to take into account the fact the ATM field is part of the safety system of civil aviation and therefore is part of the EASA system, there is a need to enhance at least the EUROCONTROL Safety Framework Maturity Surveys. There is also a need to define a more robust process for its monitoring and verification.

1.3 The need for enhancement

As already recognised during the adoption of the Regulation (EC) 691/2010, there is a need to modify the EUROCONTROL Safety Framework Maturity Surveys methodology in order to be applied as safety performance indicator 'effectiveness of safety management' for Member States and for ANSPs.
Although this decisions was already taken by the European Commission and by the Single European Sky Committee when they adopted the Regulation (EC) 691/2010 (because the regulation request that SPI effectiveness of safety management to be measured by a methodology *based on* the safety maturity framework), it is important to highlight the reasons why there is need for this enhancement. This justification will help to understand the process followed and the approach taken.

As already explained, the new performance based framework is very demanding in terms of performance targets for key performance areas capacity, economic and environment. The safety performance indicator 'effectiveness of safety management' needs to ensure that while achieving these performance targets, the safety performance levels of the present ATM system are not degraded. Therefore, a self-assessment methodology and a subjective verification mechanism are not sufficient and need to be replaced by a more robust and objective verification mechanism. This verification mechanism should also be compatible with other verification systems for other fields of aviation and should be designed to avoid duplication of verification processes. This is necessary to have a more efficient and effective aviation system and therefore a more efficient and effective ATM system. In this report, it is proposed to make use of the EASA Standardisation Inspections mechanism as the verification mechanism of the data provided by the competent authorities/National Supervisory Authorities for two reasons: because it is a robust mechanism of verification and because it is important to avoid duplication of processes to make the system more efficient.
To allow this to take place, the European Commission, assisted by EASA, is working on an amendment to the Standardisation regulation (Regulation (EC) No 736/2006 on new working methods of the European Aviation Safety Agency for conducting standardisation inspections) to adapt the present working methods for conducting standardisation inspections to be able to accomplish the objective required by the performance regulation for the safety performance indicators.
The standardisation inspections are to be used as verification mechanism for all safety performance indicators in order to ensure consistency.

As it was already recognised during the adoption process of the performance regulation, the effectiveness of safety management for the Member States can not be dissociated from the implementation of the State Safety Programme as required by ICAO. Moreover, this can not be dissociated from EASA system for safety in civil aviation and from the European Safety Strategy as adopted by EASA Management Board which established a European Aviation Safety Programme and which has resulted in the first European Aviation Safety Plan at the end of 2010.
Therefore, in order to measure how effective is the safety management of Member States, there is a need to ensure a consistent approach for the entire aviation system. To do so and to comply with the performance regulation, the methodology for measuring the effectiveness of safety management have been developed starting from the ICAO State Safety Programme in order to extract the main principles that need to be measured (named management objectives) and mapping them with the Study Areas of the EUROCONTROL Safety Framework

Maturity Surveys to be able to make as much use as possible of the present methodology. This is explained in chapter 4.
By doing so, there will be consistency across the entire civil aviation system regarding safety management and it is ensured maximum possible use of the existing EUROCONTROL Safety Framework Maturity Surveys.
Moreover, this will also guarantee consistency with the existing rulemaking initiatives under the EASA umbrella to enhance and integrate the existing European safety regulatory framework (Regulation (EC) No 1315/2007 on safety oversight in the field of ATM) in the EASA system[1].

Regarding the methodology for measuring the effectiveness of safety management for the ANSPs, it has to be highlighted that the present EUROCONTROL Safety Framework Maturity Surveys is very much linked to existing European regulatory framework for Safety (it can be linked to the requirements for safety management system (SMS) for ATS and CNS providers in Regulation (EC) No 2096/2005 or Common Requirements). However, it is important to highlight that as such, it can only be applied to ANSPs which are required by the European Safety Regulations to establish and maintain a SMS (ATS and CNS providers).

It is important to highlight that as in the case of the Member States, there is a need to take into account the current developments to enhance and integrate the ATM field in the EASA system for safety in civil aviation[2]. As required by the EASA Basic Regulation, there is a need to amend the present Common Requirements for ANSPs to require management systems for all ANSPs and therefore the methodology for measuring the effectiveness of safety management shall be developed with this in mind so as to ensure that the safety performance indicators are stable and consistent during the 1st reference period.
For this reason, the approach followed to develop the methodology for the ANSPs has been the same than in the case of Member States. However, the end result is much closer to the EUROCONTROL Safety Framework Maturity Surveys (only few amendments to questions have been necessary in this case) than in the case of the Member States.

Finally it shall be recognised that, while the methodology for measuring the effectiveness of safety management for Member States and ANSPs does not ensure regulatory compliance, it is very much linked to the safety requirements because it measures how well the safety management requirements (State Safety Programme and Safety Management Systems requirements) are implemented and therefore how effective the safety management is. As highlighted by EUROCONTROL in its ATM Safety Framework Maturity Survey report[3], the EUROCONTROL Safety Framework Maturity Surveys was indeed a "useful tool in understanding how well State Regulators and ANSPs thought they were implementing ATM Safety Requirements".

1.4 Content of report

Taking into account the above legislative framework, this report further describes the safety performance indicators as required in the Regulation (EC) 691/2010 and the process followed to develop them for the first reference period of the ATM performance scheme.

Chapters 2, 3 and 4 develop the metrics for the three KPIs. Chapter 5 provides the details of an implementation plan from now until early 2012. Annex A lists relevant acronyms. Annex B and C provide more background information on the EUROCONTROL RAT tool and on the detailed criteria for Separation Minima Infringements. Annex D presents background information on dismissed items for the Just Culture indicator.

[1] EASA Rulemaking task ATM.004 and EASA Opinion No 02/2010
[2] EASA Rulemaking task ATM.001 and EASA Opinion No 02/2010
[3] http://www.eurocontrol.int/safety/gallery/content/public/library/Safrep/ATM_Safety_FrameworkANSP.pdf

It is important to clarify the way the safety performance indicators can be applied in FAB context. As defined today, the safety performance indicators are to be applied for each State, competent authority and ANSPs within each Member State. But there is nothing preventing Member States and ANSPs to apply them within the FAB.

As each State and each ANSP in a FAB has different contributions to the service provided within the FAB and therefore it is expected that they have different contributions to the respective combined KPI, weighting factors will need to be applied to reflect their respective contribution to the KPI. It should also be noted that States involved in a FAB may designate only one competent authority responsible for the safety oversight of all the ANSPs involved in that FAB and also that all the ANSPs involved in a FAB may decide to have a combined SMS. The safety performance indicators should take into account these arrangements.

2 Effectiveness of safety management

2.1 Concept Description

The Key Performance Indicator 'Effectiveness of Safety Management' is designed to measure the capability of a Member State to manage the safety of ATM/ANS within the area of responsibility.

The performance 'effectiveness of safety management' of States/ competent authority should not be measured for the field of ATM/ANS in isolation. The measurement of effectiveness of safety management of State/competent authority shall be done in the context of the entire aviation system. To do so and to comply with the performance regulation, the methodology for measuring the effectiveness of safety management has been developed starting from the ICAO State Safety Programme in order to extract the main principles that need to be measured.

ICAO requires the contracting Member States to establish a State Safety Programme (SSP) and Service Providers to establish a Safety Management System (SMS) to manage and improve safety. The effectiveness of safety management on State level and Service Provision level largely corresponds to the capability of the States to manage its SSP and Service Providers to manage an effective SMS respectively, in the context of the national SSP. Moreover in accordance with the provisions of Regulation (EC) No 2096/2005 the ANSPs shall be compliant in their working methods and operating procedures with the standards in ICAO Annexes 2, 3, 11, 15 etc.

The four components of safety management – being similar for the States and the Service Providers - and their related elements as defined in ICAO Doc 9859 'Safety Management Manual'[4] are used as a basis to define the concept of the effectiveness of safety management indicator, see **Table 2-1**. Components and elements in *italic* have been added to the ICAO framework to better reflect the European context.

[4] ICAO Doc 9859: For State level see Appendix 1 to Chapter 11, and for Service Provision level see Appendix 1 to Chapter 8

State level	Service Provision level
1. State safety policy and objectives: 1.1 State safety legislative framework 1.2 State safety responsibilities and accountabilities 1.3 Accident and incident investigation 1.4 Enforcement policy *1.5 Management of related interfaces*	**1. ANSP safety policy and objectives** 1.1 Management commitment and responsibility 1.2 Safety accountabilities – *Safety responsibilities* 1.3 Appointment of key safety personnel 1.4 Coordination of emergency response planning / *contingency plan* 1.5 SMS documentation *1.6 Management of related interfaces*
2. State safety risk management: 2.1 Safety requirements for the service provider's SMS 2.2 Agreement on the service provider's safety performance	**2. ANSP safety risk management** 2.1 Hazard identification 2.2 Risk assessment and mitigation
3. State safety assurance: 3.1 Safety oversight 3.2 Safety data collection, analysis and exchange 3.3 Safety-data-driven targeting of oversight of areas of greater concern or need	**3. ANSP safety assurance** 3.1 Safety performance monitoring and measurement 3.2 The management of change 3.3 Continuous improvement of the SMS 3.4 *Occurrence reporting, investigation and improvement*
4. State safety promotion: 4.1 Internal training, communication and dissemination of safety information 4.2 External training, communication and dissemination of safety information	**4. ANSP safety promotion** 4.1 Training and education 4.2 Safety communication
5. State safety culture 5.1 *Establishment and promotion* 5.2 *Measurement and improvement*	**5. *ANSP safety culture*** 5.1 *Establishment and promotion* 5.2 *Measurement and improvement*

Table 2-1: Components of safety management and respective elements

These components represent the overarching safety management processes required to manage an SSP and an SMS respectively. Each component is subdivided into elements, which encompass sub-processes, activities or tools specific to the State in the context of its SSP and to the service providers in the context of their SMSs.

In order for the safety management to work effectively, the State and the Service Providers' elements should not be treated in isolation but as related. Requirements promulgated at State level should correspond to the implementation of Service Providers' elements.

The KPI 'Effectiveness of Safety Management' can reach different levels of complexity in the context of ATM/ANS, as it may expand to several ATM/ANS providers in a national context, and to more than one State grouped in a Functional Airspace Block (FAB). In these cases the KPI 'Effectiveness of Safety Management' may need to measure the combined capability of service providers in a national context and that of the corresponding States to manage safety within the FAB (only related to air navigation service provision) and respectively the capability of the corresponding FAB service providers to manage the safety of their activities within that FAB.

It should also be noted that all Service Providers involved in a FAB may decide to have a combined SMS. In this case the KPI 'Effectiveness of Safety Management' at Service Provision level should take into account the performance of the said combined SMS.

In order to develop the metrics 'Effectiveness of Safety Management' the following process has been employed:

- The starting point for the definition of 'Effectiveness of Safety Management' is the ICAO SSP and its four main components, subdivided in a number of elements for the State level and the Service Provision level as laid out above. Components and elements have been added where required to better reflect the European context.
- For each element a Management Objective (MO) is defined, adapted to the European ATM context, with the appropriate references to both ICAO and EU legislation. This is done separately for State level and Service Provision level.
- The 'Effectiveness of Safety Management' will then be measured by the responses on State level and Service Provision level to questionnaires, which are developed as part of this document.
- At this stage the existing 'Safety Framework Maturity Survey' (SFMS) is introduced. The objective is to make use of existing material, achieve for the Stakeholders a high recognition factor of the questionnaires developed within this document in comparison to those questionnaires being used in the past for the SFMS.
- Each MO is mapped to the existing 'Safety Framework Maturity Survey' (SFMS) Study Areas (SAs) and associated questions, in a way that is clear and functions both ways. Given this mapping, at any point a translation from Management Objective to Study Area and vice versa is possible.
- Basis for the questionnaires developed within this document - and from here onwards called the 'Effectiveness of Safety Management Questionnaires' - are the adapted/revised SFMS questionnaires for States (regulators) and Service Providers (ANSP). Some SFMS questions required adaptation and some questions were added. However, this adaptation strived to make optimum use of the current SFMS questionnaires in order to ensure a high recognition factor with the Stakeholders, easing acceptability and practical implementation.
- The revised questionnaires (with all above elements now included), look very similar to the current SFMS questionnaires (including the grouping by Study Areas) and respond to the needs of Regulation 691/2010.

2.2 SSP/SMS Components, Elements and Management Objectives

The following section describes the SSP/SMS components and elements to be measured in order to assess the effectiveness of safety management at State and respectively at Service Provision level. These descriptions are based on ICAO Doc 9859 as referred to above and are being brought into the context of the existing EU legislation.

For each element, one or more Management Objectives are defined that will need to be implemented at State and Service Provision level respectively. Where applicable, the appropriate references to both ICAO and applicable EU legislation (mainly to present Regulations (EC) No 2096/2005 or 'common requirements' and Regulation (EC) 1315/2007) are provided.

It has to be noted that Regulation 2096/2005 and 1315/2007 will be repealed in the near future by new commission regulations and all the references to these regulatory document will have to be changed accordingly.

2.3 State Level

2.3.1 Management Objectives

Component 1 – Safety policy and objectives

Element 1.1 – State safety legislative framework

ICAO:
"The State has promulgated a national safety legislative framework and specific regulations, in compliance with international and national standards, that define how the State will conduct the management of safety in the State. This includes the participation of State aviation organizations in specific activities related to the management of safety in the State, and the establishment of the roles, responsibilities and relationships of such organizations. The safety legislative framework and specific regulations are periodically reviewed to ensure they remain relevant and appropriate to the State."

EU context in the field of ATM/ANS:
The political environment in Europe is complex and not fully covered by the ICAO principles. Many of the competences for the safety management approach that is described in the ICAO documentation have been transferred from the MS to the Union.

The SES packages, the BR and their implementing rules, as well as some other legislation (Directive 23/2003, Regulation 996/2010 etc.) form the EU safety legislative and regulatory framework.

Management objective
1.1 - Implement the EU safety legislative and regulatory framework, including where necessary, by aligning the national framework.

Element 1.2 -State safety responsibilities and accountabilities

ICAO:
The State has identified, defined and documented the requirements, responsibilities and accountabilities regarding the establishment and maintenance of safety. This includes the directives to plan, organize, develop, maintain, control and continuously improve safety in a manner that meets the State's safety objectives. It also includes a clear statement about the provision of the necessary resources for the implementation of the SSP.

EU context in the field of ATM/ANS:
In the EU, the State shall also define the interfaces between the States and EASA with the implementation of the European Aviation Safety Programme and its respective plan and it shall also ensure that the European Aviation safety objectives are met.

Management objective
1.2 – Establish national safety responsibilities and maintain the national safety plan in line

with the European Aviation Safety Plan, where applicable. The national safety plan shall include the state policy to ensure the necessary resources.

Element 1.3 - Accident and incident investigation

ICAO:
"The State has established an independent accident and incident investigation process, the sole objective of which is the prevention of accidents and incidents, and not the apportioning of blame or liability. Such investigations are in support of the management of safety in the State. In the operation of the SSP, the State maintains the independence of the accident and incident investigation organization from other State aviation organizations."

EU context in the field of ATM/ANS:
Through the approval of Regulation (EU) No 996/2010 EU Member States have agreed to establish independent accident and incident investigation process at European level, the sole objective of which is the prevention of accidents and incidents, and not the apportioning of blame or liability. Such investigations are in support of the management of civil aviation safety in the European Union. Each EU Member State maintains the independence of its civil aviation safety investigation authority from other State aviation organisations (e.g. national competent authorities, air operators, aerodrome operators and ANSPs).

Management objective
1.3a – Establish and maintain the independence of the civil aviation safety investigation authorities, including necessary resources.
1.3b – Establish means to ensure that appropriate safety measures are taken after safety recommendations have been issued by a civil aviation safety investigation authority.
1.3c – Ensure that civil aviation safety investigation authorities use subject matter expertise from the ATM/ANS domain.

Element 1.4 - Enforcement policy

ICAO:
"The State has promulgated an enforcement policy that establishes the conditions and circumstances under which service providers are allowed to deal with, and resolve, events involving certain safety deviations, internally, within the context of the service provider's safety management system (SMS), and to the satisfaction of the appropriate competent authority. The enforcement policy also establishes the conditions and circumstances under which to deal with safety deviations through established enforcement procedures, including suspension and revocation of certificates".

EU context in the field of ATM/ANS:
Through the ratification of the EU Treaty, EU Member States have agreed the conditions and circumstances under which they will implement ATM/ANS safety regulations to the satisfaction of the competent body of the European Commission through established EU enforcement procedures.
The Article 68 of EASA Basic Regulation and Article 9 of the framework regulation (Regulation (EC) No 549/2004) requires the establishment of appropriate enforcement measures by the States including the request for Member States to lay down penalties for infringement of the Basic Regulation and its implementing rules. The penalties shall be effective, proportionate and dissuasive.

Therefore, EU Member States have agreed to establish enforcement procedures at national level under which service providers will implement EU safety regulations to the satisfaction of the national competent authority responsible for safety oversight of air navigation service providers. This agreement establishes the conditions and circumstances under which competent authorities may apply enforcement procedures based on national legislation, including suspension and revocation of certificates. These principles are reflected in the Regulation (EC) 2096/2005 and Regulation (EC) No 1315/2007.

Management objective
1.4 - Establish appropriate, transparent and proportionate enforcement procedures, including for the suspension, limitation and revocation of licenses and certificates and the application of other effective penalties.

Element 1.5 – Management of related interfaces

For better describing the relevant management objectives, the term interfaces is used as a means for achieving communication and interaction.

Although this is not directly covered in the ICAO SSP/SMS framework, in the EU context and in accordance with Regulation (EC) No 216/2008, Article 13 and Annex V, as well as Article 3 and Annex I of Regulation 550/2004 set provisions for the qualified entities which shall be ensured by the National competent authorities. When cooperating with other Competent authorities as stipulated in Article 2 of Regulation No 550/2004 proper arrangements and interfaces with the other Competent authorities shall also be established. The involvement of the stakeholders in accordance with Article 10 of Regulation No 549/2004 also implies proper management of the interfaces with the stakeholders.

Examples of related interfaces on State level:

- internal interfaces with different departments/units in the NSA/national competent authority e.g. Operations, Inspectorate, Airworthiness, Licensing)
- external interfaces of the NSA/national competent authority with different entities e.g. MoT, other regulatory bodies)

Management objective
1.5a - Ensure adequate management of the internal interfaces within the NSA.
1.5b - Ensure adequate management of the external interfaces with relevant stakeholders.

Component 2 – Safety risk management

Element 2.1 - Safety requirements for the air navigation service provider's SMS

ICAO:
"The State has established the controls which govern how service providers will identify hazards and manage safety risks. These include the requirements, specific operating regulations and implementation policies for the service provider's SMS. The requirements, specific operating regulations and implementation policies are periodically reviewed to ensure they remain relevant and appropriate to the service providers."

EU context in the field of ATM/ANS:

The State has established the controls which govern how service providers will identify hazards and manage safety risks. These control mechanisms shall be aligned with the European regulations and operating procedures and where these are not existing, then the States shall promulgate the relevant national requirements, specific operating regulations and implementation policies for the service provider's SMS. The associated regulations are EASA Basic Regulation and Regulations (EC) No 2096/2005 and 1315/2007.
There is a link with safety oversight activities, addressed in element 3.1 as well.

Management objective
2.1 - Establish controls which govern how service providers' safety management systems (SMS) will identify hazards and manage safety risks.

Element 2.2 - Agreement on the service provider's safety performance

ICAO:
"The State has agreed with individual service providers on the safety performance of their SMS. The agreed safety performance of an individual service provider's SMS is periodically reviewed to ensure it remains relevant and appropriate to the service providers."

EU context in the field of ATM/ANS:
In accordance with Regulation (EC) No 549 (Article 10), Regulation No 691 (Article 10), the State has agreed with individual air navigation service providers on the safety performance. The agreed safety performance of an individual service provider's SMS is periodically reviewed to ensure it remains relevant and appropriate to the service provided. In the accordance with Regulation No 2096 (Annex II) each air navigation service provider is required to define its own safety performance indicators and targets consistent with the ones contained in the national/FAB performance plans.

Management objective
2.2 - Agree on safety performance of an individual, national or FAB service provider.

Component 3 - Safety assurance

Element 3.1 – Safety oversight

ICAO:
"*The State has established mechanisms to ensure effective monitoring of the eight ICAO critical elements of the safety oversight function. The State has also established mechanisms to ensure that the identification of hazards and the management of safety risks by service providers follow established regulatory controls (requirements, specific operating regulations and implementation policies). These mechanisms include inspections, audits and surveys to ensure that regulatory safety risk controls are appropriately integrated into the service provider's SMS, that they are being practised as designed, and that the regulatory controls have the intended effect on safety risks."*

EU context in the field of ATM/ANS:
In accordance with Regulation (EC) No 1315/2007 the National supervisory authorities shall exercise safety oversight as part of their supervision of requirements applicable to air navigation services as well as to ATFM and ASM, in order to monitor the safe provision of these activities and to verify that the applicable safety regulatory requirements and their implementing arrangements are met. In accordance with the Regulation No 2096 (Annexes II

and V) the requirements for the establishment of SMS are limited to the provision of ATS and CNS. Based on that, the safety KPI for the effectiveness of safety management should be evaluated where certified ATS and CNS providers are overseen.

National supervisory authorities, or recognised organisations as delegated by them, shall conduct safety regulatory audits.

Management objective
3.1a - Attribution of powers to the NSA responsible for safety oversight of air navigation service providers.
3.1b - Establishment of a national safety oversight system and programme to ensure effective monitoring of the air navigation service provider's (ANSP) compliance with the applicable regulations and of the safety oversight function.

Element 3.2 - Safety data collection, analysis and exchange

ICAO:
"The State has established mechanisms to ensure the capture and storage of data on hazards and safety risks at both an individual and aggregate State level. The State has also established mechanisms to develop information from the stored data, and to actively exchange safety information with service providers and/or other States as appropriate."

EU context in the field of ATM/ANS:
The EU has issued Directive 2003/42 on occurrence reporting in civil aviation for EU Member States. This Directive requires Member States to establish a mandatory occurrence reporting system so that hazardous or potentially hazardous events can be recorded. The aim of the Directive is to collect occurrences so that these can be analysed, that trends can be monitored and that appropriate corrective actions can be taken so that accidents in the future may be prevented. Articles 6 and 7 of the same directive require establishment of proper measures for exchange and dissemination of information. As a result, according to Regulation 1321/2007 Member States occurrence information is required to be submitted to a European Central Repository so that it can be available for exchange to the competent authorities of the EU Member States and the Commission. Also, information so collected can be disseminated to any entity entrusted with regulating civil aviation safety or with investigating accidents and incidents within the EU. Further on, Article 15 of Regulation No 996/2010 establishes provisions for communication of information as well as Regulation 1330/2007 for the dissemination to interested parties of information on civil aviation occurrences.

The element of safety communication is also covered under component 4.

Management objective
3.2 - Establishment of mechanisms to ensure the capture and storage of data on hazards and safety risks and analysis of that data at ANSP and State levels as well as its dissemination and exchange.

Element 3.3 - Safety-data-driven targeting of oversight of areas of greater concern or need

ICAO:

"The State has established procedures to prioritize inspections, audits and surveys towards those areas of greater safety concern or need, as identified by the analysis of data on hazards, their consequences in operations, and the assessed safety risks."

EU context in the field of ATM/ANS:
In accordance with Regulation (EC) No 1315/2007 the national supervisory authorities shall establish and update at least annually a programme of safety regulatory audits in order to cover all the areas of potential safety concern, with a focus on those areas where problems have been identified. They shall establish a risk based oversight programme.

Management objective
3.3 - Establishment of procedures to prioritise inspections, audits and surveys towards the areas of greater safety concern or need or in accordance with the identified safety risks.

Component 4 - Safety promotion

Element 4.1 - Internal training, communication and dissemination of safety information

ICAO:
The State provides training on national legislative and regulatory frameworks and promotes awareness of safety risks and two-way communication of safety-relevant information to support, within the aviation authorities, the development of an organizational culture that fosters an effective and efficient SSP.

EU context in the field of ATM/ANS:
The States provides training in EU and national legislative and regulatory framework and promotes awareness of safety risks and two-way communication of safety-related information to support the development of an organizational culture that fosters an effective and efficient SSP within the competent authority. Article 4 of Regulation No 549/2004 requires the states to ensure that national supervisory authorities have the necessary resources and capabilities to carry out the tasks assigned to them. Training requirements for the NSA are also provided in Article 11 of Regulation No 1315/2007.

Management objective
4.1a - Training of NSA personnel on applicable legislative and regulatory framework.
4.1b - Promotion of awareness of safety information and communication and dissemination of safety-related information amongst the NSA's within a State.

Element 4.2 - External training, communication and dissemination of safety information

ICAO:
The State provides education and promotes awareness of safety risks and two-way communication of safety-relevant information to support, among services providers, the development of an organizational culture that fosters an effective and efficient SMS

EU context in the field of ATM/ANS:
The competent authority provides education and promotes awareness of safety risks and two-way communication of safety-relevant information to support, among the air navigation service providers, the development of an organizational culture that fosters an effective and efficient SMS.

Management objective
4.2a - Education/training of ANSP personnel and air traffic controllers (ATCO) training organisations on applicable legislative and regulatory framework.
4.2b - Promotion of awareness of safety information and communication and dissemination of safety-related information with external stakeholders.

Component 5 - Safety culture

Although ICAO SSP and SMS framework does not require the States to establish and promote safety culture within the organisation, safety culture refers to the enduring value, priority and commitment placed on safety by every individual and every group at every level of the organisation. Safety culture reflects the individual, group and organisational attitudes, norms and behaviours related to the safe provision of air navigation services.

Although there is not regulatory reference that requires the States not the competent authority to establish a safety culture, it has been considered necessary by the experts group developing the report to add it here as an essential element of the effectiveness of safety management of a State.

EUROCONTROL documents provide the following description of safety culture: *Safety Culture is the way safety is perceived, valued and prioritised in an organisation. It reflects the real commitment to safety at all levels in the organisation. Safety Culture is not something you get or buy; it is something an organisation has. Safety Culture can therefore be positive, negative or neutral. Its essence is in what people believe about the importance of safety, including what they think their peers, superiors and leaders really believe about safety's priority*.
Based on the above, it is proposed to define Safety Culture as follows: "*Safety culture is the product of individual and group values, attitudes, competencies and patterns of behaviour that determine commitment to, and the style and proficiency of, an organisation's safety management*."

The following management objectives are derived:

Element 5.1 - Establishment and promotion of safety culture

Management objective
5.1 - Establishment and promotion of safety culture within the NSA.

Element 5.2 - Measurement and improvement of Safety Culture

Management objective
5.2 - Establishment of procedures to measure and improve safety culture within the NSA.

2.3.2 Mapping between Management Objectives and Study Areas

Table 2-2 presents the mapping of the Management Objectives derived in section 2.3.1 to the Study Areas of the 'Effectiveness of Safety Management Questionnaire' (EoSM). This

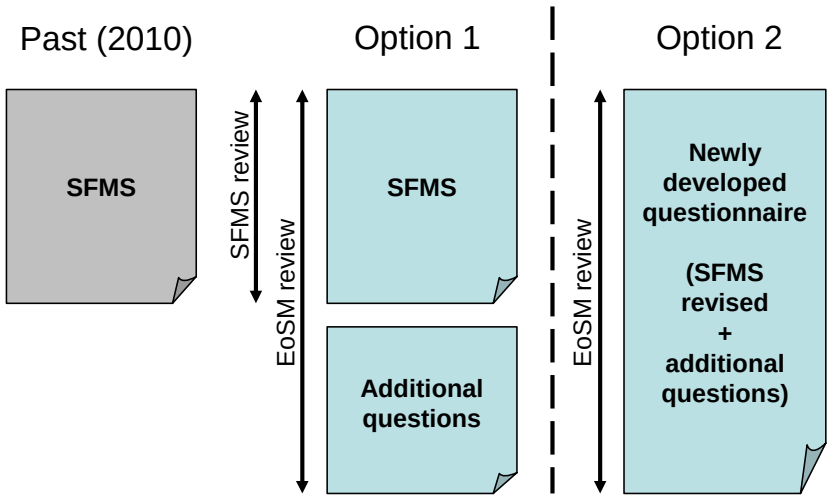
questionnaire (explained in detail in section 2.5) is derived from the EUROCONTROL ATM Safety Framework Maturity Survey (SFMS) by maintaining its structure and adapting questions where appropriate. **Table 2-3** presents the same information, now mapping the SFMS Study Areas to the Management Objectives.

Based on mapping and the above assessment, it is important to highlight that the questionnaire for the States/competent authorities needs to be enhanced: new questions need to be introduced and several existing ones need to be considerable adapted to the new regulatory framework.

As part of the SFMS methodology each of the questions is associated with a weighting factor to compute the overall level of effectiveness. These weightings require review in the light of the changed and added questions. To recognise the achievement of the SFMS so far, two possible options are identified for the purpose of evaluating the answers provided by the States/ competent authorities.

Option 1: Use of the current SFMS questionnaire including the proposed revisions of specific questions with addition of a section added to cover the newly identified set of questions.
The advantage of such an approach is the possibility for continuation of the SFMS part of 2010 as the quantification of the existing questions can be maintained. The quantification of the answers given to the new questions can be done separately. The disadvantage is that the evaluation process for each of the respective MOs is less obvious.

Option 2: Use of one single newly developed questionnaire, which includes the revised set of SFMS questions as well as the new questions and a new way of quantifying them. The advantage of this approach is that the questionnaire is specifically tailored to address the MOs. The disadvantage is that the continuation from the preceding SFMS exercise in 2010 is not provided for.



For any of the finally selected options weighting factors for the evaluation of the MOs need to be developed before the start of RP1.

Stakeholders are requested to indicate their preferred option for the revision of the State level questionnaire as well as the reasons why they would prefer it.

MO	SA – Q
Safety policy and objectives	
1.1	S1-1, S1-2, S1-3, S1-7
1.2	S1-4, S1-5, S1-6, S2-4
1.3a	new
1.3b	new
1.3c	new
1.4	new
1.5	S3-1, S3-2, S3-3, S3-4
Safety risk management	
2.1	-
2.2	S5-1, S5-2, S5-3
Safety assurance	
3.1a	-
3.1b	S6-1, S6-2, S6-3, S9-2
3.2	new S4-1, S4-2, S9-1
3.3	new
Safety promotion	
4.1a	S2-2
4.1b	S7-1, S7-2
4.2a	new
4.2b	S7-1, S7-2
Safety Culture	
5.1	S8-1
5.2	S8-2

Table 2-2: Mapping Management Objectives to Study Areas – State level

SA – Q	MO
State Safety Framework	
S1-1	1.1
S1-2	1.1
S1-3	1.1
S1-4	1.2
S1-5	1.2
S1-6	1.2
S1-7	1.1
Safety Resources	
S2-1	
S2-2	4.1a
S2-3	
S2-4	1.2
Safety Interfaces	
S3-1	1.5
S3-2	1.5
S3-3	1.5
S3-4	1.5
Safety reporting, Investigation and Improvement	
S4-1	3.2
S4-2	3.2
Safety Performance Monitoring	
S5-1	2.2
S5-2	2.2
S5-3	2.2
Implementation of Safety Oversight	
S6-1	3.1b
S6-2	3.1b
S6-3	3.1b
Adoption and Sharing of Best practices	
S7-1	4.1b, 4.2b
S7-2	4.1b, 4.2b
Safety Culture	
S8-1	5.1
S8-2	5.2
Resolution of Safety Deficiencies	
S9-1	
S9-2	3.1b

Table 2-3: Mapping Study Areas to Management Objectives – State level

2.4 Service Provision Level

Scope
In accordance with regulation (EC) No 2096/2005, EU ANSPs providing ATS and/or CNS services shall implement a Safety Management System for covering their services and associated interfaces. It is important to highlight that as such, the effectiveness of safety management indicator at this stage can only be applied to ANSPs which are required by the European Safety Regulations to establish and maintain a SMS: ANSPS providing ATS and/or CNS.

2.4.1 Management Objectives

Component 1 – ANSP safety policy and objectives

Element 1.1 - Management commitment and responsibility

ICAO:
"The [organization] shall define the organization's safety policy which shall be in accordance with international and national requirements, and which shall be signed by the Accountable Executive of the organization. The safety policy shall reflect organizational commitments regarding safety; shall include a clear statement about the provision of the necessary resources for the implementation of the safety policy; and shall be communicated, with visible endorsement, throughout the organization. The safety policy shall include the safety reporting procedures; shall clearly indicate which types of operational behaviours are unacceptable; and shall include the conditions under which disciplinary action would not apply. The safety policy shall be periodically reviewed to ensure it remains relevant and appropriate to the organization."

EU context in the field of ATM/ANS:
The ANSP shall define the organisation's safety policy which shall be in accordance with section 3.1.1 of Annex II of Regulation (EC) No 2096/2005, and which shall be signed by the Accountable Executive of the ANSP. The safety policy shall reflect organisational commitments regarding safety; shall include a clear statement about the provision of the necessary resources for the implementation of the safety policy; and shall be communicated, with visible endorsement, throughout the organization. The safety policy shall be periodically reviewed to ensure it remains relevant and appropriate to the organisation. The safety objectives shall be included in the safety policy and they shall be aligned with the State/FAB safety objectives foreseen in the State Safety Plan, in the European Aviation Safety Plan as well as in the NSA performance plan as adopted by the State.

Management objective
1.1 - Define the ANSP's safety policy in accordance with Regulation (EC) No 2096/2005 (Common Requirements).

Element 1.2 - Safety accountabilities – Safety responsibilities

ICAO:
"The [organization] shall identify the Accountable Executive who, irrespective of other functions, shall have ultimate responsibility and accountability, on behalf of the [organization], for the implementation and maintenance of the SMS. The [organization] shall also identify the accountabilities of all members of management, irrespective of other functions, as well as of

employees, with respect to the safety performance of the SMS. Safety responsibilities, accountabilities and authorities shall be documented and communicated throughout the organization, and shall include a definition of the levels of management with authority to make decisions regarding safety risk tolerability."

EU context in the field of ATM/ANS:
Today European regulations (Regulation (EC) No 2096/2005 and Regulation (EC) No 1315/2007) do not require nominating the accountable executive or accountable manager which owns the safety accountability. Therefore, the proposal for a management objective in the EU regulatory framework cannot cover this objective. Once the existing provisions are amended to regulate this ICAO requirement, the effectiveness of safety management KPI will be modified to include this aspect.
However, In accordance with section 3.1.1 of Annex II of Regulation (EC) No 2096/2005, SMS shall ensure that everyone involved in the safety aspects of the service provision has an individual safety responsibility for their own actions, that managers are responsible for the safety performance of their respective departments or divisions and that the top management of the provider carries an overall safety responsibility (safety responsibility).

Management objective
1.2 - Define the responsibilities of all staff involved in the safety aspects of service provision and responsibility of managers for safety performance.

Element 1.3 - Appointment of key safety personnel

ICAO:
"The [organization] shall identify a safety manager to be the responsible individual and focal point for the implementation and maintenance of an effective SMS."

EU context in the field of ATM/ANS:
The ANSP management shall identify, in accordance with section 3.1.2 of Annex II to Regulation (EC) No 2096/2005, a safety manager to be the responsible and focal point for the implementation and maintenance of an effective ANSP or FAB SMS.

Management objective
1.3 - Define the safety manager to be the responsible and act as focal point for the implementation and maintenance of SMS.

Element 1.4 - Coordination of emergency response planning/contingency plan

ICAO:
"The [organization] shall ensure that an emergency response plan that provides for the orderly and efficient transition from normal to emergency operations and the return to normal operations is properly coordinated with the emergency response plans of those organizations it must interface with during the provision of its services."

EU context in the field of ATM/ANS:
The ANSP shall establish, in accordance with chapter 8.2 of Annex I to Regulation (EC) No 2096/2005, a contingency plan for all services it provides in the case of events which result in significant degradation or interruption of its services. The contingency arrangements shall ensure an orderly and efficient transition from normal to emergency operations and that the

return to normal operations is properly coordinated with the emergency response plans of those organizations it must interface with during the provision of its services.

Management objective
1.4 - Define a contingency plan properly coordinated with the Network Manager, other interfacing ANSPs, other relevant stakeholders and FABs.

Element 1.5 - SMS documentation

ICAO:
"The [organization] shall develop an SMS implementation plan, endorsed by senior management of the organization that defines the organization's approach to the management of safety in a manner that meets the organization's safety objectives. The [organization] shall develop and maintain SMS documentation describing the safety policy and objectives, the SMS requirements, the SMS processes and procedures, the accountabilities, responsibilities and authorities for processes and procedures, and the SMS outputs. Also as part of the SMS documentation, the [organization] shall develop and maintain a safety management system manual (SMSM), to communicate its approach to the management of safety throughout the organization."

EU context in the field of ATM/ANS:
Each ANSP shall develop an SMS implementation plan, endorsed by senior management of the organisation that defines the organisation's approach to the management of safety in a manner that meets the organization's safety targets and objectives. In accordance with section 3.1.2 of Annex II to Regulation (EC) No 2096/2005, the ANSP shall develop and maintain SMS documentation containing the safety policy, establishing the safety objectives and describing the SMS requirements, the SMS processes and procedures, the accountabilities, responsibilities and authorities for processes and procedures, and the SMS outputs. Also as part of the SMS documentation, the ANSP shall develop and maintain a safety management system manual (SMM), to communicate its approach to the management of safety throughout the organization.

Management objective
1.5 - Develop and maintain the relevant SMS documentation that defines the ANSP's approach to the management of safety.

Element 1.6 – Management of related interfaces

For better describing the relevant management objectives, the term interfaces is used as a means for achieving communication and interaction.
Although this is not directly covered in the ICAO SSP/SMS framework, in the EU context and in accordance with section 3.1.2 of Annex II of Regulation (EC) No 2096/2005, SMS shall ensure adequate justification of the safety of the externally provided services and supplies, having regard to their safety significance within the provision of their services (external services and supplies).

Examples of related interfaces on ANSP level:

- internal interfaces in the ANSP e.g. Operations/Engineering and Safety department.
- external interfaces of the ANSP e.g. Purchasing of externally provided services and supplies (power-supply / ICT / engineering).

Management objective
1.6a - Ensure adequate management of the internal interfaces.
1.6b - Ensure adequate management of the external interfaces which may influence directly the safety of their services.

Component 2 – Safety risk management

Element 2.1 – Safety risk assessment and mitigation

ICAO:
"The [organisation] shall develop and maintain a formal process that ensures that hazards in operations are identified. Hazard identification shall be based on a combination of reactive, proactive and predictive methods of safety data collection. The [organization] shall develop and maintain a formal process that ensures analysis, assessment and control of the safety risks in [organization] operations."

EU context in the field of ATM/ANS:
In accordance with section 3.1.2 and section 3.2.1 of Annex II to Regulation (EC) No 2096/2005, the ANSP shall develop and maintain a formal process that ensures that hazards in operations are identified. Hazard identification and safety risk analysis, assessment and mitigation shall be based on a combination of reactive, proactive and predictive methods of safety data collection.

Management objective
2.1 - Develop and maintain a formal process that ensures the management of safety risks.

Component 3 - Safety assurance

Element 3.1 - Safety performance monitoring and measurement

ICAO:
"The ANSP shall develop and maintain the means to verify the safety performance of the organization and to validate the effectiveness of safety risk controls. The safety performance of the organization shall be verified in reference to the safety performance indicators and safety performance targets of the SMS."

EU context in the field of ATM/ANS:
In accordance with chapter 2.2 of Annex I and section 3.1.1 of Annex II to Regulation (EC) No 2096/2005 the ANSP shall ensure that, wherever practicable, quantitative safety levels are derived and are maintained for all functional systems (quantitative safety levels), As required by the performance scheme regulation, safety targets of the ANPS need to be developed in accordance with safety targets established at the national level that also established in accordance with European wide targets whenever they exist.

Management objective
3.1 - Establish means to verify the safety performance of the ANSP and the effectiveness of safety risk management.

Element 3.2 - The management of change

ICAO:
"The ANSP shall develop and maintain a formal process to identify changes within the organization which may affect established processes, procedures and services; to manage the changes, to describe the arrangements to ensure safety performance before implementing changes; and to eliminate or modify safety risk controls that are no longer needed or effective due to changes in the operational environment."

EU context in the field of ATM/ANS:
In accordance with chapter 3.2 of Annex II to Regulation (EC) No 2096/2005 within the operation of the SMS, a provider of air traffic services shall ensure that hazard identification as well as risk assessment and mitigation are systematically conducted for any changes to those parts of the ATM functional system and supporting arrangements within his managerial control. This element could be considered also as part of element 2.1 but since it covers in particular:

- the complete life cycle of the constituent part of the ATM functional system;
- the airborne, ground and, if appropriate, spatial components of the ATM functional system;
- the equipment, procedures and human resources of the ATM functional system

is placed as an element of the safety assurance. This ensures also consistency with the ICAO SMS framework.

Management objective
3.2 – Establish a formal process to identify changes and to ensure that safety risk assessment and mitigation are systematically conducted for identified changes.

Element 3.3 - Continuous improvement of the SMS

ICAO:
"The ANSP shall develop and maintain a formal process to identify the causes of substandard performance of the SMS, determine the implications of substandard performance of the SMS in operations, and eliminate or mitigate such causes."

EU context in the field of ATM/ANS:
In accordance with section 3.1.4 of Annex II to Regulation (EC) No 2096/2005 a provider of air traffic services (and also a provider of CNS) shall ensure that improvements are systematically identified. Safety surveys are carried out as a matter of routine, to recommend improvements where needed, to provide assurance to managers of the safety of activities within their areas and to confirm compliance with the relevant parts of the SMS (safety surveys).
In addition, they shall ensure that methods are in place to detect changes in functional systems or operations which may suggest any element is approaching a point at which acceptable standards of safety can no longer be met, and that corrective action is taken (safety monitoring) and that safety records are maintained throughout the SMS operation as a basis for providing safety assurance to all associated with, responsible for or dependent upon

the services provided, and to the competent authority (safety records). These requirements are related to the need for continuous safety improvements.

Management objective
3.3 - Establish a formal process to systematically identify safety improvements.

Element 3.4 – Occurrence reporting, investigation and improvement

Although ICAO SMS/SSP does not require the ANSPs to directly to deal with the reported occurrences, the requirements come indirectly from the element 3.2 addressing the Member States.

Moreover in accordance with section 3.1.2 of Annex II to Regulation (EC) No 2096/2005 a provider of air traffic services shall ensure that ATM operational or technical occurrences which are considered to have significant safety implications are investigated immediately, and any necessary corrective action is taken.

Management objective
3.4 - Ensure that ATM operational and/or technical occurrences are reported and those which are considered to have safety implications are investigated immediately, and any necessary corrective action is taken.

Component 4 - Safety promotion

Element 4.1 - Training and education

ICAO:
The ANSP shall develop and maintain a safety training programme that ensures that personnel are trained and competent to perform the SMS duties. The scope of the safety training shall be appropriate to each individual's involvement in the SMS.

EU context in the field of ATM/ANS:
In accordance with paragraph 5 of Annex I and paragraph 3.1.2 of Annex II to the Regulation (EC) No 2096/2005, the ANSPs shall develop and maintain safety training programme that ensures that personnel are trained and competent to perform the SMS duties.

Management objective
4.1 – Establish a safety training programme that ensures that personnel are trained and competent to perform SMS related duties.

Element 4.2 - Safety communication

ICAO:
The ANSP shall develop and maintain formal means for safety communication that ensures that all personnel are fully aware of the SMS, conveys safety-critical information, and explains why particular safety actions are taken and why safety procedures are introduced or changed.

EU context in the field of ATM/ANS:
In accordance with paragraph 3.1.4 of Annex II to Regulation (EC) No 2096/2005, the ANSP shall develop and maintain means to ensure that all personnel are aware of the potential safety hazards connected with their duties (safety awareness), the lessons arising from safety occurrence investigations and other safety activities are disseminated within the organisation at management and operational levels (lesson dissemination) and that all personnel are actively encouraged to propose solutions to identified hazards, and changes are made to improve safety where they appear needed (safety improvement).

Management objective
4.2 - Establish formal means for safety promotion and safety communication.

Component 5 - Safety culture

Although ICAO SMS and SSP framework does not require the ANSPs to establish and promote safety culture within the organisation, safety culture refers to the enduring value, priority and commitment placed on safety by every individual and every group at every level of the organisation. Safety culture reflects the individual, group and organisational attitudes, norms and behaviours related to the safe provision of air navigation services.

Although there is not a regulatory reference in the SMS requirements within the European legislative framework, it has been considered necessary by the experts group developing the report to add it here as an essential element of the effectiveness of safety management of an organisation.

Element 5.1 - Establishment and promotion of Safety culture

Management objective
5.1 - Establish and promote safety culture within the ANSP.

Element 5.2 - Measurement and improvement of Safety Culture

Management objective
5.2 - Establish procedures to measure and improve safety culture within the ANSP.

2.4.2 Mapping between Management Objectives and Study Areas

Table 2-4 presents the mapping of the Management Objectives derived in section 2.4.1 to the Study Areas of the 'Effectiveness of Safety Management Questionnaire' (EoSM). This questionnaire (explained in detail in section 2.5) is derived from the EUROCONTROL Safety Framework Maturity Survey' SFMS) by maintaining its structure and adapting questions where appropriate. **Table 2-5** provides the mapping back from the Study Areas to the Management Objectives.

MO	SA – Q
Safety policy and objectives	
1.1	SA2-3
1.2	SA2-1, SA2-4
1.3	SA2-2
1.4	SA4-3
1.5	SA4-1
1.6a	SA7-1
1.6b	SA7-2
Safety risk management	
2.1	SA6-1
Safety assurance	
3.1	SA9-1, SA9-2
3.2	SA6-1
3.3	SA3-1, SA3-2, SA10-1, SA11-2
3.4	SA1-3, SA8-1
Safety promotion	
4.1	SA5-1
4.2	SA4-2, SA8-2, SA8-3, SA9-3, SA11-1, SA11-3
Safety Culture	
5.1	SA1-1
5.2	SA1-2

Table 2-4: Mapping Management Objectives to Study Areas

SA – Q	MO
Safety culture	
SA1-1	5.1
SA1-2	5.2
SA1-3	3.4
Safety Responsibilities	
SA2-1	1.2
SA2-2	1.3
SA2-3	1.1
SA2-4	1.2
Compliance with international obligations	
SA3-1	3.3
SA3-2	3.3
Safety standards and procedures	
SA4-1	1.5
SA4-2	4.2
SA4-3	1.4
Competency	
SA5-1	4.1
Risk management	
SA6-1	2.1, 3.2
Safety interfaces	
SA7-1	1.6a
SA7-2	1.6b
Safety reporting, investigation and improvement	
SA8-1	3.4
SA8-2	4.2
SA8-3	4.2
Safety performance monitoring	
SA9-1	3.1
SA9-2	3.1
SA9-3	4.2
Operational safety surveys and SMS audits	
SA10-1	3.3
Adoption and sharing of best practises	
SA11-1	4.2
SA11-2	3.3
SA11-3	4.2

Table 2-5: Mapping Study Areas to Management Objectives

Based on the mapping and based on the analysis done by the task force, it is proposed to use the questionnaire in terms of structure (SFMS Study Areas) and questions from the EUROCONTROL ATM SFMS for the case of ANSPs. The reason why this has been selected as the most suitable option is because there were no fundamental changes needed, which do not change either the content of the five possible levels of implementation nor the associated weighting factors for the SFMS Study Areas. A weighting for the evaluation of the MOs needs to be developed before the start of RP1.

2.5 The 'Effectiveness of Safety Management' questionnaires

The 'Effectiveness of Safety Management' will be measured by the verified responses on State level and Service Provision level to questionnaires, which are developed as part of this document. The *effectiveness* of safety management is assessed by the level of implementation for each management objective with a discrete scale which contains 5 levels of effectiveness, see Table 2-6.

These 5 levels, also used in the SFMS, are adapted from the maturity levels of the CMMI model[5] and are used to characterize the performance of the organisation and to describe the way an organisation can achieve improvement of its processes.

Similarly as in quality models, authorities and service providers should strive to push their organisation to beyond the level of Implementing and achieve the level of Managing and Measuring and even the level of Continuous Improvement.

Level of effectiveness				
Initiating	**Planning/Initial Implementation**	**Implementing**	**Managing & Measuring**	**Continuous Improvement**
Processes are usually ad hoc and chaotic	Activities, processes and services are managed	Defined and standard processes are used for managing	Objectives are used to manage processes and performance is measured	Continually improvement of processes and process performance

Table 2-6: Mapping Study Areas to Management Objectives

For every Management Objective, one or more questions (statements) are formulated. For every question in the Effectiveness of Safety Management questionnaire, examples will be given for each of the five levels. In addition, a free text column in the questionnaire is to be used to justify why a certain level was answered for that question. Evidences need also to be provided so that it demonstrate that the level answered is the real level achieved.

The Effectiveness of Safety Management questionnaire is based on the EUROCONTROL SFMS questionnaire. As already explained, some SFMS questions required adaptation and some questions were added. However, this adaptation strived to make optimum use of the current SFMS questionnaires in order to ensure a high recognition factor with the Stakeholders, easing acceptability and practical implementation.

[5] Reference: CMMI Product Team. *CMMI for Services, Version 1.3* (CMU/SEI-2010-TR-034).United States: Software Engineering Institute, Carnegie Mellon University, November 2010.

The questionnaire is used for performance monitoring rather than compliance monitoring. It is recognised that for some questions indicating a level of 'Initiating' or 'Planning/initial implementation' could go below compliance with a specific requirement. However, in order to have a good indication of where safety improvements can be made, the full scale of effectiveness levels is being maintained for all questions. Moreover, it is important to highlight that at the present, no further material on *means* of compliance with the existing requirements exists and therefore it is needed to keep all the implementation levels.

The State and Service Provider questionnaire for the EoSM indicator are provided as separate documents to this report in Excel format.

The answers to the EoSM questionnaire will be evaluated using a scoring and weighting mechanism, based on the level of implementation chosen for each answer. Further material will be provided to the States and ANSPs that describes the mechanism for weighting and scoring - which has been applied by EUROCONTROL for the SFMS - in a way that supports the self assessment activities at State and ANSP level. This part of the technical work for the document is foreseen to begin in June 2011 aiming to provide mature enough outcome for the consultation with SSC in September 2011.

For RP1 there will be no European Union-wide targets on the levels of effectiveness to be achieved. The questions developed will be validated during the indicator validation process in RP1.

It is important to clarify the way the safety performance indicators can be applied in an environment where there is more than one ANSP on national level (certified for ATS and/or CNS provision) and for the FAB context. As defined today, the safety performance indicators are to be applied for each State, competent authority and ANSPs within each Member State. But there is nothing preventing Member States and ANSPs to aggregate the results for the different national ANSPs or to apply them within the FAB.

As each State and each ANSP in a FAB has different contributions to the service provided within the FAB and therefore it is expected that they have different contributions to the respective combined KPI, weighting factors will need to be applied to reflect their respective contribution to the KPI. It should also be noted that States involved in a FAB may designate only one competent authority responsible for the safety oversight of all the ANSPs involved in that FAB and also that all the ANSPs involved in a FAB may decide to have a combined SMS. The safety performance indicators should take into account these arrangements.

There can be different approaches towards aggregation and weighting of results for the EoSM indicator both on State and ANSP level within a FAB or between ANSPs providing services in the same State. Two possibilities are

- The use of weighted averages based on traffic size
- Use of average scores together with an assessment of the lowest and highest score

Stakeholders are requested to indicate their preferred approach to possibly aggregate results on FAB level from individual ANSPs and NSAs.

Since it might be difficult at this stage to decide on one single way forward, it could be suggested to use Reference Period 1 as a trial period to further test and develop weighting mechanism.

2.6 Measurement and Verification flow

In order to make best use of existing processes and to avoid duplication of processes in the safety oversight chain, the EASA Standardisation Inspection pre-visit questionnaire mechanism

will be used to distribute the State (competent authority) and Service Provision (ANSP) questionnaires to the competent authority's focal point[6] (**Figure 2-1** → 1, 2).

The competent authority focal point is responsible for coordination within State authorities and for coordination with the ANSP's (**Figure 2-1** → 3, 4, 5). He communicates the response to the questionnaires (both competent authority and ANSP, aggregated where required) to EASA (**Figure 2-1**→ 6).

Mechanism for verification – State level

The results of the States' self assessment will be verified by means of EASA standardisation inspections, which will also be used for the dispatch and collection of the answers to the EoSM questionnaires. Standardisation inspections are to be performed in accordance with Regulation 736/2006, which is going to be amended to be able to achieve the objectives of the safety performance monitoring as required in Regulation (EC) No 691/2010. The answers of the self-assessment questionnaires shall be verified by EASA using all the safety-related information available in the Agency. If necessary, EASA shall collect additional safety information from the respective State, or it shall undertake standardisation inspection of the respective NSA to amend the results accordingly. Based on these results, EASA and the PRB shall jointly review the EoSM KPI in the context of the other three key performance areas (Capacity, Environment and Cost-efficiency. The PRB may request EASA to address during standardisation visits specific issues identified by the PRB.

It is important to highlight that, once established, this verification mechanism will evolve to align with the ICAO principles for Continuous Monitoring Approach (CMA) as global system for continuous monitoring of the safety oversight capabilities of States, including the ability to monitor States' safety performance at the appropriate time. The EASA standardisation inspections are already evolving into that direction through alignment of all standardisation activities with the ICAO CMA. Therefore, it is important to have synergy between the different processes to avoid duplication of work.

[6] According to Regulation (EC) 736/2006 these are the National ATM/ANS Standardisation Coordinators nominated by the Member States

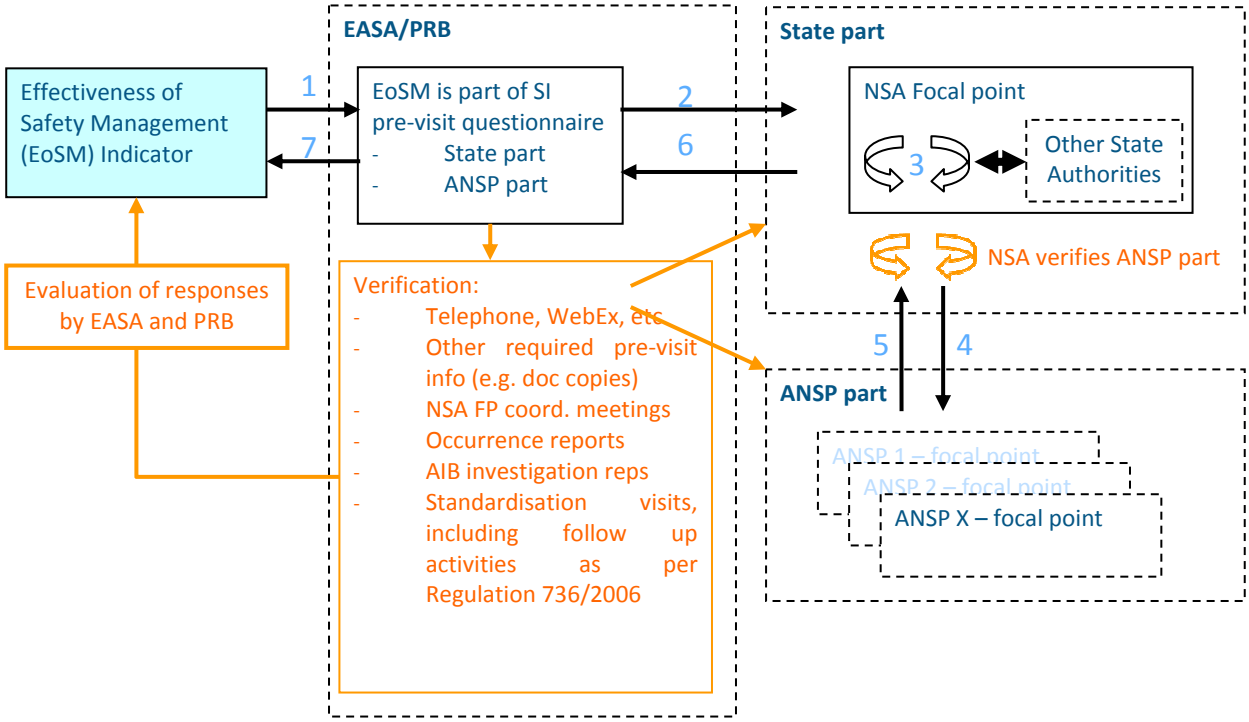


Figure 2-1: 'Effectiveness of Safety Management' measurement and verification flow

Mechanism for verification –Service provider level

The NSA/national competent authority is responsible for the performance oversight and the verification of the ANSP questionnaires. This verification should take place before the questionnaires and their results are submitted to EASA and PRB.

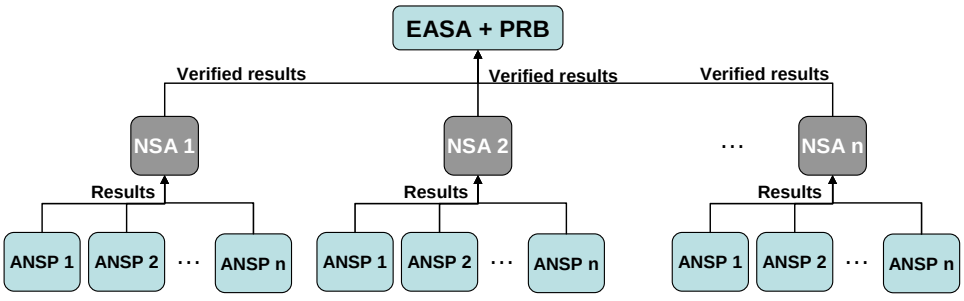


Figure 2-12 – Representation of verification mechanism of the ANSPs (normal procedure)

The current European regulatory framework article 10 of Regulation (EC) No 1315/2007 and article 11 of draft safety oversight regulation published with EASA Opinion No 02/2011)

already creates the possibility for the NSA/national competent authority to allocate the detailed verification task to a qualified entity. This qualified entity shall mean a body complying with the requirements defined in the regulations to which a specific task may be allocated by and under the supervision and the responsibility of the NSA.

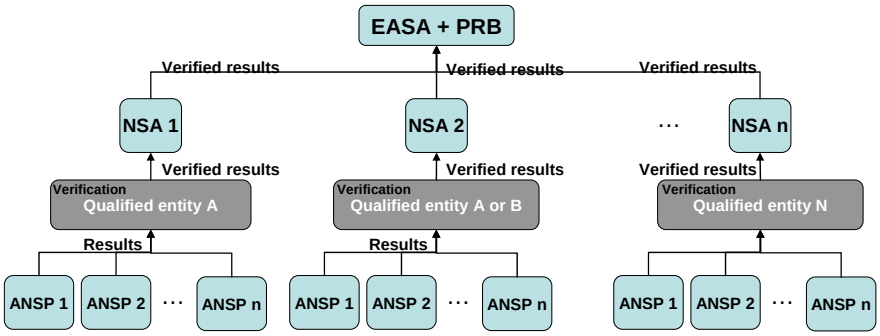


Figure 2-13 – Representation of verification mechanism of the ANSPs (use of qualified entities)

The implementation of the verification process shall be standardised through the EASA standardisation inspections mechanism.

For both the State level and Service Provider level, EASA and PRB will monitor the performance regarding this indicator based on the received answers and on the results of the verification process by the States and by EASA.

The graphic representation of this process can be found in **Figure 2-1**, **2-2** and **2-3**.

Note: In v1.0 of this report, the E3 task force had identified three options for the verification of the ANSP's EoSM self assessment (that had be verified from legal perspective in light of the drafting of the amendment of the implementing rule). As a result of the feedback received during the 13 May SSC workshop with State representatives, this was changed to the mechanism described above (previous option 1). The former option 2 included involvement of the network manager in the verification process. The former option 3 (use of qualified entities) could be covered in the existing legal framework and therefore is also mentioned above.

3 Application of severity classification of Risk Analysis Tool

3.1 Concept description

The second safety KPI shall be the application of the severity classification of the Risk Analysis Tool (RAT) to allow harmonised reporting of severity assessment of Separation Minima Infringement (SMI), Runway Incursions (RI) and ATM Specific Technical Events at all Air Traffic Control Centres and airports with more than 150 000 commercial air transport movements per year within the scope of this Regulation (yes/no value). (ref. Commission Regulation (EU) 691/2010 of 29 July 2010, Safety Key Performance Indicator, Annex 1 Section 2 ref. 1.(b)).

There will be no European-wide targets for the first reference period (2012-2014) although EU Member States may set corresponding targets. NSAs will need to monitor and report on this safety KPI during RP1.

The EUROCONTROL RAT provides a method for consistent and coherent identification of severity and risk elements of ATM related occurrences. The tool comprises so-called severity and risk mark sheets which enable the appropriate scoring of severity and risk of recurrence. Regulation (EC) No 691/2010, aiming at a harmonised way of ATM occurrences reporting, provides requirements for the development and measurement of this Safety KPI only for the *severity classification* part of the RAT tool.

The severity classification scheme of the RAT methodology contains the following severities, see **Table 3-1**.

RAT methodology		**Regulation (EC) No 996/2010 & ICAO Annex 13**	**ICAO Doc 4444 (PANS-ATM)**	**ATM Specific Occurrences**
Severity classification	*Category*	Accident		*Severity classification*
Serious incident	A AA (only for ATM Specific)	Serious incident	AIRPROX – Cat A	Total inability to provide safe ATM services (AA) Serious inability to provide safe ATM services (A)
Major incident	B	Incident	AIRPROX – Cat B	Partial inability to provide safe ATM services
Significant incident	C		AIRPROX – Cat C	Ability to provide safe but degraded ATM services
No safety effect	E		-	No effect on ATM services
Not determined	D		AIRPROX - Cat D	Not determined

Table 3-1: Severity classification scheme

The application of the RAT severity classification methodology supports and allows for harmonised reporting of the severity classification of occurrences. Therefore, the concept of this indicator is to prescribe the common methodology for occurrence severity classification by defining detailed criteria and specifications for the assessment of occurrences.

The way to implement the RAT severity classification methodology is left up to States. The EUROCONTROL RAT tool is a possible means of compliance. It is being maintained by EUROCONTROL and made available, free of charge, to States and Organisations. In case a State wishes to use a different tool, it has to demonstrate that its tool complies with the defined criteria and specifications.

In order to properly measure the application of the RAT methodology for severity classification the different organisational scenarios at State level should be taken into account. In many States the severity classification of ATM occurrences is applied by the ANSPs in the process of the investigation of such occurrences. In other States the NSA or CAA is applying the severity classification after having received the ATM occurrences from ANSPs and/or civil aviation investigation authorities. In general, the RAT methodology should be applied for the relevant ATM occurrences reported by a State to the Commission through the European Central Repository. It is left up to the States how to implement on a national level the organisational arrangements regarding the use of the RAT methodology for severity classification.

For the definitions of the type of occurrences in this safety KPI, reference is made to Directive 2003/42/EC on occurrence reporting in civil aviation (ANNEX II -List of air navigation services related occurrences to be reported – and appendix). It has to be noted that the EC Directive refers to ATM Specific Occurrences instead of ATM Specific Technical Events (for the purpose of this Safety KPI these are considered to be the same).

Annex B presents more details on the RAT severity classification methodology (mark sheets and scoring system), including references to EUROCONTROL documents.
To enable and ensure further harmonisation of the reporting of ATM related occurrences, support could be given to the full use of the RAT methodology, including the repeatability risk elements, which will result in an enhanced overall view on the underlying causes.

3.2 Measurement and Verification flow

It is proposed to measure the application of the severity classification methodology of the RAT as follows:

- Yes/No of application of the **RAT methodology** for severity classifications of occurrences with category Serious incident (A), Major incident (B) or Significant incident (C), for all separation minima infringements, runway incursions and ATM specific technical events (ATM-specific occurrences, including category AA) in accordance with Regulation No 691/2010. Reporting of the yes/no application is to be done at the individual occurrence level.

The scope is limited to severity assessment of the above mentioned occurrences at Air Traffic Control Centres and airports with more than 150 000 commercial air transport movements per year.

Annex C presents the detailed methodology criteria for Separation Minima Infringements. A similar description will be provided for Runway Incursions and ATM-specific occurrences. Because of the level of technical detail, a proper balance has to be found what will be mandated in the amended Implementing Rule and what will be defined through supporting material.

The measurement of the KPI will make use of existing safety data reporting mechanisms with enhancements where needed. It is proposed that the indication of the application of the RAT severity classification methodology on individual occurrence level is included in the EUROCONTROL Annual Summary Template (AST) form. The AST template will need to be enhanced to indicate per occurrence if the RAT severity classification methodology has been applied for the severity assessment. The European Central Repository (ECR) will remain to be the central source of safety information in the EU. Therefore compatibility with the ECCAIRS system, the software tool used for the ECR, is an important criteria.

The national point of contact (EC Directive 2003/42, EC Regulation 1330/2007, Points of contact are competent authorities having the responsibility to manage the collection and exchange of information) will play a key-role to provide the required information for the measurement of the KPI. The national point of contact will collect and verify the information on State level. This is to ensure that consistency remains between the reporting mechanism described in Directive 2003/42, Regulation 1321/2007 (data integration into the European Central Repository) and the EUROCONTROL AST mechanism.

Mechanism for verification
Verification will be performed by means of EASA standardisation inspections in order to be consistent with the verification mechanism proposed for the other KPIs. Standardisation inspections are to be performed in accordance with Regulation 736/2006 including follow up activities as data and responses analysis by PRB and EASA. In addition, the validation of the data will be done by EASA and PRB in cooperation with EUROCONTROL DSS/OVS/SAF through its safety analysis team. The PRB and EASA will evaluate the responses and results of the described process on a regular basis.

For the purpose of pre-verification, a dedicated questionnaire could assist in clarifying the different organisational scenarios at State level regarding severity classification of ATM occurrences. This questionnaire for States could provide the information about which entities that are involved in investigating and classification of ATM related occurrences are applying the RAT severity classification methodology (Table 3-2).

	State level point of contact	
Application of the RAT methodology for severity classification	❑ Please provide a list of entities involved in the severity classification of ATM related occurrences and describe their roles. ❑ How does the State ensure that the RAT severity classification methodology is applied by all entities involved in severity classification of the relevant occurrence types as per Regulation (EC) No 691/2010? ❑ Which entities in your State apply the RAT *tool*? If another tool(s) is used to apply the severity classification methodology, please provide the evidence that it complies with the prescribed criteria for the RAT severity classification methodology.	

Table 3-2: Application of RAT methodology for severity classification - specific questionnaire

4 Just Culture

4.1 Concept description

This chapter describes the concept, metrics and methodology relevant for the measurement of the third safety KPI as specified by the European Commission Regulation (EU) No 691/2010.

According to the Regulation: *The third national/FAB safety KPI shall be the reporting of just culture. This measure shall be developed jointly by the Commission, the Member States, EASA and Eurocontrol and adopted by the Commission prior to the first reference period. During this*

first reference period, national supervisory authorities will monitor and publish this measure, and Member States may set corresponding targets (Annex 1, Section 2, art. 1c).

The same Regulation defines Just Culture (JC): *'Just culture' means a culture in which front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated* (Art. 2k).

Just Culture is the cornerstone of any incident reporting system as it aims to ensure that safety relevant information may be reported without fear of retribution. This in turn will ensure that the safety feedback loop of the aviation industry works efficiently towards the constant improvement of safety performance.

The Just Culture KPI aims at measuring the level of presence and corresponding level of absence of Just Culture at State level and at ANSP level. The metrics have been constructed to respond to the criteria of: clear definition, auditable, verifiable, repeatable and indicative of the level of JC being implemented.

In order to fully assess the extent of implementation of JC within a State and its ANSPs, it is necessary to apply certain metrics to the State framework, which includes legislation, policies, regulatory/supervisory authorities, and a separate set of metrics to the service provision. Therefore, two separate sets of metrics are developed, for application at the State and Service Provision level respectively.

The concept of the JC KPI is defined through three main areas, potentially influencing each other, which can be found both at State and Service Provision level:

- Policy and its implementation – dealing with the existence or non-existence of a JC policy within organisations (regulatory/supervisory and service provision). The policy is to be measured for effectiveness and not just its mere existence.
- Legal / Judiciary – the goal is to assess whether the national legal environment is supportive or not of JC.
- Occurrence Reporting – this is related to policies and practices of occurrence reporting.

Annex D contains the elements that were reviewed and discussed by the group and after due consideration were agreed to be dismissed from the initial list of proposed draft metrics.

It should be however taken into account that it is the first time that any formal reference to the Just Culture concept is made in an European Union legislation. As a consequence, this chapter of the document breaks into new grounds and remains at a fairly general level. As provided by Regulation 691/2010, the first reporting period will be used only for monitoring and not for target setting. For this reason, the main aim of the questionnaires is not so much to identify the existence of Just Culture but rather to identify possible obstacles and impediments to its application. On the basis of the experience acquired during RP1, different objectives and deeply revised questionnaires may be proposed for the second reporting period.

For the same reason, reference is made to "State Level" instead of "NSA" level because, although a large number of questions refer to existing situation in the national authority, a limited number of others deal with elements which go beyond the field of competence of the authority and may have to be addressed at the level of other State entities.

4.2 Elements indicative of the implementation of just culture

4.2.1 Policy and its implementation

A just culture policy is essential at the State level, as well as at the Service Provision level. Such a policy needs to demonstrate commitment for just culture by each organisation, from their top management down to all staff involved in safety-relevant activities. Just culture policy at State level applies not only to State authorities' own staff but must also apply in the relationship with the organisations they regulate to ensure that a coherent just culture policy is enforced throughout the whole safety system. It is therefore important that States put in place a policy to ensure that just culture protection afforded to the staff of a service provider will also be granted by the State authority.

The policy metric of the just culture KPI shall attempt to identify the existence or non-existence of a just culture policy within organisations (regulatory/supervisory and service provision), as well as its real effectiveness.

There are several elements defining an effective just culture policy, each element in turn with a number of sub-elements. These sub-elements are binary, i.e. the answer can only be yes or no.

	State level	**Service Provision level**
Policy elements related questions	❑Is there an explicit JC policy, which is endorsed at appropriate State level and made public? ❑Does it contain a description of what is considered to be unacceptable behaviour [7]? ❑Does it refer to legal provisions which guarantee no punishment for self-reported occurrences (except for the cases defined above)? ❑Does it provide legal support[8] for its own staff in case of prosecution / legal action related to a reported safety event? ❑Does the State require a JC policy in Air Navigation Service Providers?	❑Is there an explicit JC policy, which is endorsed by management and formal staff representatives and made public? ❑Does it contain a description of what is considered to be unacceptable behaviour? ❑Does it guarantee no disciplinary action by the service provider for self-reported occurrences (except for the cases defined above)? ❑Does it provide legal support for its own staff in case of prosecution / legal action related to a safety occurrence? ❑Is there an established and well known critical incident stress management? ❑Are safety actions taken after an occurrence without impact on pay until the end of the investigation?
Roles and Responsibilities clearly defined and implemented	❑Is the role of different State authorities and ANSPs in handling safety reports and the flow of information clearly defined in the State? ❑Is the safety investigation and/or analysis process within the State entirely independent from any judicial authority? ❑Does the State actively strive to implement JC provisions in its legislative framework?	❑Are safety investigators completely independent and separate from any line, competency or ops management? ❑Do safety investigators have full, unimpeded access to all relevant data for investigations? ❑Is access to safety data clearly defined and confidentiality ensured? ❑Are the staff providing CISM clearly nominated and adequately trained?
Training	❑Is there a regulatory requirement to include elements and/or courses on JC for staff working in the competent authority and service providers (ab-initio and recurrent training)? ❑Are qualifications and training requirements as regards JC for State safety investigators clearly defined?	❑Is there regular training and/or briefings on relevant legislation for safety in the context of JC? ❑Are the principles of JC included in all training curricula (ab-initio and recurrent training)? ❑Are qualifications and training requirements as regards JC for ANSPs safety investigators clearly defined?

Table 4-1: Questions - Policy and its implementation

[7] See the definition of just culture in Reg 691/2010
[8] E.g. counseling, court expertise etc.

4.2.2 Legal / Judiciary

Just culture provisions in primary legislation:
Primary legislation often contains general provisions which may impair the implementation of Just Culture or which, on the contrary may facilitate adoption of specific measures or procedures to implement just culture.

A typical example of a legislation impairing the implementation of just culture is a "Freedom of Information Act" which requires all information submitted to a State authority/State owned legal entity to be released to the public upon request. As incident reports are usually submitted to the Civil Aviation Authority, it would be possible for the requester of the information to identify the parties to a reported incident and use the available information to "name and shame". In consequence, the mandatory provision of the information under Freedom of Information legislation may lead to legal action against the reporter or other parties involved.

Inadvertent mistakes considered under penal law as criminal offences related to variations of "endangering the safety of air traffic" may lead to prosecution of individuals for negligently endangering the lives of others (passengers or on the ground). Other provisions in both civil and penal law dealing with the liability of individuals may lead to court cases against incident reporters.
Finally, in the case of cross-border accident/incident, conflicting national laws may apply even if the EU made attempts at regulating this matter (e.g. Regulation 864/2007).

Just culture-related judicial procedures and specific aviation legislation:
Some Member States have introduced special procedures or specific aviation legislation, amongst these are the nomination of a specialised aviation prosecutor or a procedure to evaluate the "honest mistake" and a general immunity from prosecution when incidents are self-reported. Each Member State must have a legislation which protects incident reporting in accordance with Directive 2003/42.

The "aviation prosecutor" can be a person or an entity which would evaluate if a reported occurrence falls under the JC protection or, on the contrary, if there is wilful breach of the law or gross negligence which would warrant to refer the incident to the judicial authorities. The nomination of such an "aviation prosecutor" may be decided through primary legislation as well as through specific civil aviation legal measure.

It is also important to ensure that when an accident or incident occurs, Subject Matter Experts (SME) are invited to participate in all procedures linked to JC such as in the "aviation prosecutor" entity, in case of prosecution at State level or when licensing/disciplinary action is envisaged at State/Service provider level.

Existence of a formal agreement between judiciary authorities and aviation:
Article 12.3 of EU Regulation 996/2010 provides for the establishment of advance arrangements between safety investigation authorities and other authorities likely to be involved in the activities related to the safety investigation such as the judicial authorities. Other advance arrangements addressing Just Culture principles could also be established between aviation entities and judicial authorities.

In one Member State at least, detailed instructions have been issued by the Ministry of Justice to the national prosecutor's office regarding criminal investigation and prosecution in the event of the reporting of occurrences in civil aviation.

	State level	Service provision level
Primary legislation	❑In case there is a Freedom of Information legislation, does it provide for exemptions applicable to safety-sensitive information? ❑If an incident falls under JC policy, do general provisions referring to potential threatening the safety of the public be applicable by judicial authorities under penal law? ❑Are there provisions in the law affording protection from prosecution to individuals involved in safety events, under the principles of JC?	N/A
Judicial procedures and specific aviation legislation	❑Is there an entity within the State, supported by SMEs, with clearly defined rules, which would decide whether relevant safety events are a matter for prosecution? ❑Is there a judicial procedure to ensure that in the case of prosecution linked to an aviation accident/incident SMEs will be involved? ❑Are the provisions of Directive 2003/42 and in particular those contained in its Article 8 (protection of information) fully and effectively implemented in the national legislation?	❑Is the spirit of Directive 2003/42 and in particular of the provisions of its Article 8 fully transposed into internal procedures?
Formal agreement	❑Is there an advance agreement to guarantee appropriate use of safety information? ❑Is there an agreed process to deal with incident matters between the aviation and judicial/police authorities?	❑Is there any agreement between ANSPs and judicial/police authorities to ensure protection of data and individuals? ❑Is there an agreed process to deal with incident matters between the ANSP and its national aviation authorities?

Table 4-2: Questions - Legal / Judiciary

4.2.3 Occurrence reporting and investigation (including automatic reporting)

This part covers the aspects of just culture within the context of occurrence reporting and investigation.

The issues to be considered at the State level relate to legislation pertaining to occurrence reporting and investigation and the protection of the information obtained or derived from it.

For both the level of the State as well as the level of each service provider, it would be important to determine the practical implementation of the just culture provisions. As it is generally agreed that the level of reporting is a good indicator, related questions were included.

	State level	**Service provision level**
	❑Does the State provide regular statistical feedback to the public based on occurrence reports received (e.g. annual reports)? ❑Are Subject Matter Experts (SMEs) involved in making the decision in cases where personnel licenses/rating could be affected?	❑Is the identity of personnel involved in occurrences protected by staff regulations? ❑Does staff subject to investigations based on occurrence reports have access to related information? ❑Is there a requirement for staff subject to investigation to sign their agreement / disagreement with the findings of investigations? ❑Is there a formal procedure to inform staff having reported an occurrence of the progress of the investigation? ❑Does the ANSP provide regular feedback to staff based on occurrence reports? ❑Does the public annual report of the service provider provide feedback on occurrence reports? ❑Has automated reporting been accepted by staff and implemented by the service provider? ❑Is there a separate body, involving nominated Subject Matter Experts (SMEs) making the decision on whether a case is an "honest" mistake or it falls under the "unacceptable behaviour" category?

Table 4-3: Questions - Occurrence reporting and investigation

4.3 Measurement and Verification flow

A questionnaire has been established to allow some form of measurement of the level of just culture applied at State and at Service Provision level. These questions may be replied to by Yes or No. Positive reply gives an indication of a just culture context while a negative reply indicates a potential deficit in just culture. However, it is not expected that all replies should be

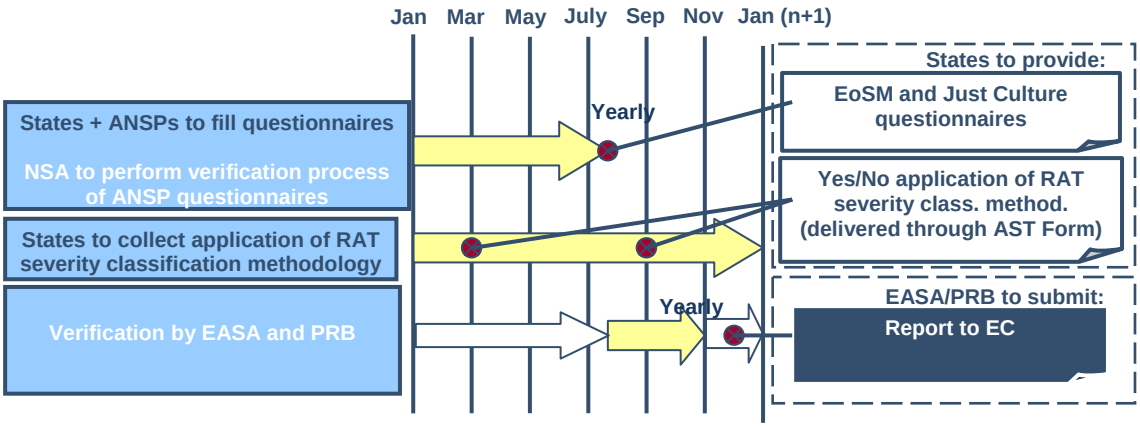
positive but the identification of negative elements would give indication of possible areas of improvement and should be considered as incentives for improving the just culture in a particular State/organisation.

Questionnaires are proposed to be dispatched together with those for the EoSM indicator following the same validation and verification processes.

5 Implementation plan

5.1 General Timeline

The figure below shows the proposed timeframe for the monitoring process for each year during the RP together with the main "deliverable" dates (KPI reporting and submission of the performance monitoring report to the EC).



5.2 Scope and first deliverables

In addition to the technical development of the indicators, a detailed implementation plan will be developed by the PRB and EASA. The scope of the implementation plan is as it follows:

- the full safety data[9] set as described in the Annex IV of Regulation (EC) No 691/2010;
- Safety KPIs as indicated in EC 691/2010;
- metrics and data requirements as developed in this document.

The deliverables following this implementation plan will be:

- a database to host the safety data;
- a data validation strategy to be developed by EASA/PRB;
- the activation of a regular data flow from States to EASA/PRB;
- a process to compile the KPIs;
- a process for getting feedback from States on results;
- a report on the status of ANS safety in Europe as measured by the three KPIs and based on the full safety data set.

[9] 'Data' in the context of this paper refers to numerical data, factual information, evidences, results of survey or inspection protocols, etc.

5.3 Safety data flow

The safety data flow is proposed to be reinforced and – where applicable - commenced by a letter from EC to States. The letter should cover the following topics:

- the list of data requirements related to the three KPIs together with a clear and explicit request to archive and provide these data from now on;
- a reminder that the data set provided by the State shall contain both the data related to the three KPIs and the other data included in Annex IV of 691/2010;
- a high level explanation how the data validation will be organised;
- the date when the data collection activity starts (September 5th 2011) and that it should be completed by the end of March 2012 for the year 2011;
- the contact point(s) for the data collection at European level;
- the contact point(s) for the safety data collection at European level as nominated by the EU NAAs/NSAs following the request[10] of the EASA Approvals and Standardisation Director dated 30 May 2011.

The letter should be sent out as early as possible in order to allow States for archiving and providing the data required under the safety data flow.

5.4 Safety data analyses

Once the data validation is completed, EASA/PRB will prepare a draft report containing the main results and conclusions which emerge from the analysis of year 2011 safety data. The safety data analyses phase should start in February 2012 and it should be completed by mid July 2012, followed by a feedback phase with the purpose of exposing the draft report to the States (see Gantt Chart Figure 5-1). It needs to be decided in which way States will be invited to provide their feedback. The feedback phase should start at the beginning of September 2012 and it should be completed by the end of October 2012. After the reception of the feedback, the draft report will be updated and published.

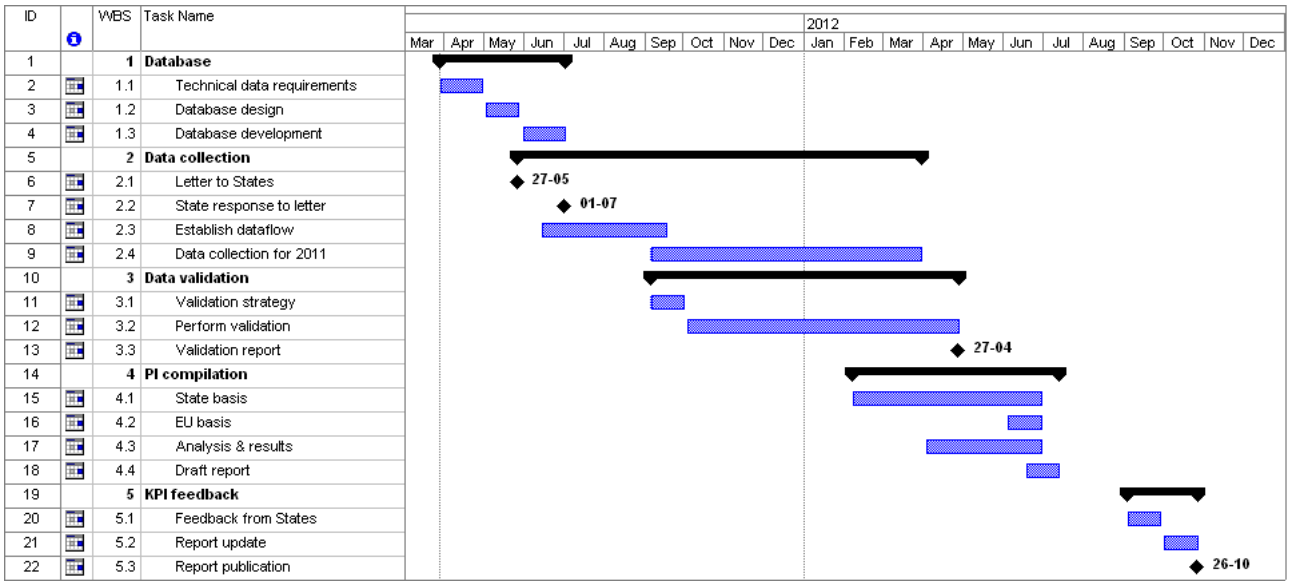


Figure 5-1: Gantt Chart Safety Data Flow and Analyses

[10] This letter requests the Heads of NAA/NSA to nominate a National ATM/ANS Standardisation Coordinator, normally the former ESIMS Focal Point. This would reduce the number of coordinators per State and would ensure coordinated approach to both EASA Standardisation inspections and PRB Safety performance review.

Annex A: Acronyms

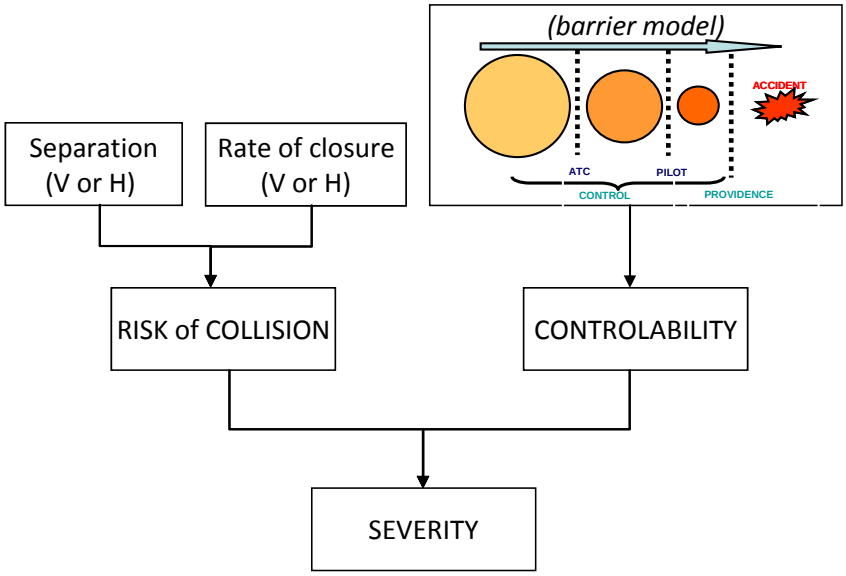
EoSM	Effectiveness of Safety Management
FAB	Functional Airspace Block
JC	Just Culture
KPI	Key Performance Indicator
MO	Management Objective
RAT	Risk Analysis Tool
RI	Runway Incursion
SA	Study Area
SFMS	Safety Framework Maturity Survey
SMI	Separation Minima Infringement
SMS	Safety Management System
SSP	State Safety Programme

Annex B: RAT methodology – Technical Description

The EUROCONTROL Risk Analysis Tool (RAT) provides a method, based on the Barrier model, for consistent and coherent identification of risk elements. By applying a prescribed methodology to come to a severity assessment of an occurrence, introduction of inadvertent bias in the occurrence classification is minimized. By using the same criteria for this severity assessment across Europe, aggregation of such occurrence data becomes far more meaningful.

A (adapted) version of the Barrier model is shown below:

The relationships of the elements of the concept for severity classification are expressed in the figure below:



The different severity mark sheets of the RAT methodology allow the analysis of a single occurrence. The overall severity of one occurrence is built up from the risk of collision/proximity (separation and rate of closure) and the degree of controllability over the incident (both by Air Traffic Controllers and Pilots). The different mark sheets and criteria for the different type of occurrences assist the persons analysing the occurrence to score all the severity aspects resulting in a severity categorisation for that specific occurrence. Depending on the type of occurrence, different criteria and specifications are to be applied.

The Scoring System

The objective of the safety occurrence severity classification exercise is to produce a severity assessment for safety occurrences. The methodology is based on the principles of a question-based scoring system and it provides an objective basis for investigators judgement and, in addition, is easy to use.

In the RAT methodology the scores for the criteria in assessing Severity and Risk are representative for each individual criterion. There is no intention to quantify the importance of each criterion in comparison to others. No hierarchy between criteria and no trade-off shall be done between them. The information to score the criteria shall come from the investigation process and not vice-versa. This is a tool to support the investigator in classifying the safety occurrence in an objective manner. Whenever there is not enough information available to score a criterion or there are disagreements between investigators, the disputed criterion should be left un-scored. This will automatically affect the Reliability Factor for the incident.

The Assessment Procedure

The methodology is to be seen as a guide to severity assessment. Scoring points is not a system that, through calculations, will determine a definite severity and risk for any type of occurrence. There is a need for additional procedures, such as moderation panels to ensure adjustments and smoothing of results based on the operational experience of the investigators. But by using the methodology, the subjectivity of the final assessment will be reduced. Consistent, objective and harmonised assessments will be achieved by investigators from various stakeholders with different backgrounds and cultures (e.g. where appropriate: ANSPs, REGs, airlines, AAIBs.

The methodology provides possibilities for both Quantitative analysis of an ATM occurrence and for Qualitative analysis. In cases where more than one controller and/or more than one pilot crew were involved in the incident with different performances, there is generally a large preference noted from the practice, to use the Quantitative methodology.

There is also a specific methodology to enable the scoring of ATM Specific Technical Events/ ATM Specific Occurrences (i.e. technical incidents affecting the capability to provide safe air traffic services) where the severity is looked at differently i.e. it considers the failure criticality, the coverage of the failure and the required time to restore the ATM function affected or to fail-safe to a degraded mode by introducing contingency measures.

More details on the RAT tool can be found in:
https://www.eurocontrol.int/safety/gallery/content/public/library/Safrep/Risk_Analysis_Tool.pdf

Example Annual Summary Template (AST) form including the severity column:

OCC Reference Number	Date	Type of ATM Incident	Notification Reports	ATM Contribution	Status	Airspace Restriction	Class of airspace	Phase of Flight	Flight Rules	Type of Operations	Type of Flight	Severity	Category of Causes	List of Causes (HEIDI)	List of Causes (National)
INCID 001		Inadequate separation	AIRPROX	Indirect	Investigated	Not applicable	A	Taxiing	IFR	GAT	GA	C	Aerodrome layout and infrastructure	Ground/ground -> Phraseology	Cause 1 (replace with your own national cause)
		Runway Incursion	Human ATC					Take-off	IFR	GAT	CA		Operational ATC procedures	Aerodrome layout and infrastructure	
		Runway Incursion where no avoiding action was necessary	Human ATC											LAHSO	

Separation Minima Infringement - Severity Marksheet: More than one aircraft involved

A. SEVERITY

1. Risk of collision	ATM ground		ATM airborne		ATM overall
Minimum separation achieved	0		0		
Separation + 75% minimum	1		1		
Separation >50%, <=75% minimum	3		3		
Separation >25%, <=50% minimum	7		7		
Separation <=25% minimum	10		10		
Total separation (a)					0
Rate of closure NONE	0		0		
Rate of closure LOW (<=85knots, <=1000ft/mn)	1		1		
Rate of closure MEDIUM (>85 and <=205 knots, >1000 and <=2000 ft/mn)	2		2		
Rate of closure HIGH (>205 and <=700 knots, >2000 and <=4000 ft/mn)	4		4		
Rate of closure VERY HIGH (>700knots, >4000ft/mn)	5		5		
Total rate of closure (b)					0

TOTAL (1-ATM) Risk of Collision (a)+(b)	0
TOTAL (1-ATM Ground) Risk of Collision (a)+(b)	0

2. Controllability	ATM ground		ATM airborne		ATM overall
Conflict detected	0		0		
Conflict detected late	3		0		
Conflict NOT detected	5		0		0
Plan CORRECT	0		0		
Plan INADEQUATE	3		0		
NO plan	5		0		0
Execution CORRECT	0		0		
Execution INADEQUATE	3		5		
NO execution	5		10		0
Loss of separation detected because of STCA	3		0		
No detection (including by STCA)	5		0		0
Recovery CORRECT	0		0		
Recovery INADEQUATE	5		6		
NO recovery or the ATM ground actions for recovery have worsened the situation or ATM airborne has worsened the situation	10		15		0
TCAS triggered (useful RAs only to be considered) or see and avoid pilot decision (in the absence of TCAS)	10		0		
NO TCAS RA	0		10		0
Pilot(s) followed RA (or, in absence of RA, took other effective action, as a result of see and avoid decision)	0		0		
Pilot(s) INSUFFICIENTLY followed RA	0		10		
Pilot(s) INCORRECTLY followed RA (or, in the absence of RA, took other inadequate action)	0		15		0
	TOTAL (2-ATM Ground)	0	TOTAL (2-ATM Airborne)	0	0

TOTAL SEVERITY :	
SEVERITY ATM =(1) + (2-ATM)	0
SEVERITY ATM Ground = (1) + (2-ATM Ground)	0

Runway Incursion - Severity Marksheet: Aircraft – Aircraft Tower

A. SEVERITY

1. Risk of collision	ATM ground		ATM airborne		ATM overall
Safety margin achieved	0		0		
Safety margin infringed minor	1-3		1-3		
Safety margin infringed medium	4-6		4-6		
Safety margin infringed significant	7-9		7-9		
Safety margin infringed critical	10		10		
Total safety margin (a)					0
Rate of closure NONE	0		0		
Rate of closure LOW (<=20knots)	1		1		
Rate of closure MEDIUM (>20 and <=40knots)	2		2		
Rate of closure HIGH (>40 and <=80 knots)	4		4		
Rate of closure VERY HIGH (>80knots)	5		5		
Total rate of closure (b)					0

TOTAL (1-ATM) Risk of Collision (a)+(b)	0
TOTAL (1-ATM Ground) Risk of Collision (a)+(b)	0

2. Controllability	ATM ground		ATM airborne		ATM overall
Conflict detected	0		0		
Conflict detected late	3		0		
Conflict NOT detected	5		0		0
Plan CORRECT	0		0		
Plan INADEQUATE	3		0		
NO plan	5		0		0
Execution CORRECT	0		0		
Execution INADEQUATE	3		5		
NO execution	5		10		0
Loss of separation detected because of Ground safety net (e.g. A-SMGCS Level 2 safety net)	3		0		
No detection (including by Ground safety net)	5		0		0
Recovery CORRECT	0		0		
Recovery INADEQUATE	5		6		
NO recovery or the ATM ground actions for recovery have worsened the situation or ATM airborne has worsened the situation	10		15		0
See and avoid pilot or driver decision	10		0		
No see and avoid action possible	0		10		0
Pilot/ Driver took other effective action, as a result of see and avoid decision	0		0		
Pilot/ Driver took INSUFFICIENT action as a result of see and avoid	0		10		
Pilot/ Driver INCORRECTLY took other action or NO pilot action with no further ATM ground controlability margin	0		15		0
	TOTAL (2-ATM Ground)	0	TOTAL (2-ATM Airborne)	0	0

TOTAL SEVERITY :	
SEVERITY ATM =(1) + (2-ATM)	**0**
SEVERITY ATM Ground = (1) + (2-ATM Ground)	**0**

ATM Specific Technical Event - Severity Marksheet: ATM Specific Occurrences

A. SEVERITY

	1. Failure criticality	
Generic Function		
Specific Function		
Failure		
	TOTAL (1)	0
	2. Extension of the area affected	
ATM Unit(s)/Service Affected		
Extension		
	TOTAL (2)	0
	3. Duration until contingency measures are in place or until the occurrences is terminated by itself, before the contingency measures can be effective	
Duration of failure		
	TOTAL (3)	0
	TOTAL SEVERITY : SEVERITY = (1) + (2) + (3)	0

Annex C: RAT methodology – Criteria for Separation Minima Infringements

The severity part of the risk assessment methodology of the EUROCONTROL RAT follows the principle of evaluating several criteria and allocating a number of points to each criterion, depending on how severe each criterion is evaluated to be.

Each criterion has a limited number of options, each of which has an allocated mark. Certain criteria have an ATM Ground and an ATM Airborne component, therefore both can be counted. Other criteria are only relevant for ATM Ground or ATM Airborne.

The score for severity is then the sum of the scores of such individual criteria.

The overall severity of one occurrence is built up from the **risk of collision/proximity** (itself a combination of separation and rate of closure) and the degree of **controllability** over the incident. For ATM Specific Occurrences (i.e. technical incidents affecting the capability to provide safe ATM services) elements to be considered are the failure criticality, the coverage of the failure and the required time to restore the ATM function affected or to fail-safe to a degraded mode by introducing contingency measures.

As ATM has a ground and an airborne segment, both segments must be evaluated for their specific contributions (except for ATM Specific Occurrences, which are ATM Ground only). Thus, an ATM overall and an ATM Ground severity can be calculated.

In the Controllability section the ATM Airborne part is used to record the pilot execution and the effectiveness of the airborne safety nets.

The result for ATM Overall is represents the overall score for both ATM Ground and ATM Airborne for each criteria being scored. In essence, the severity is calculated as the sum of the scores totalled in each of the two main parts:

1. risk of collision – based on the geometry of the encounter;
2. controllability – based on the barrier model.

Each of the two main parts has further sub-parts, as follows:

1. Risk of collision
    a. Separation – based solely on the minimum distance achieved between aircraft or aircraft and obstacles. The greatest value between the horizontal and vertical in percentage of the standard separation is to be considered.
    b. Rate of closure – based on the vertical and horizontal speed, measured at the moment the separation is infringed. The greatest of the pre-defined intervals for each of the horizontal and vertical speeds are to be considered for the evaluation.

	1. Risk of collision	ATM ground	ATM airborne	ATM overall	RF weight
separation	Minimum separation achieved	0	0	0 ÷ 10 ATM Ground **OR** ATM airborne	
	Separation + 75% minimum	1	1		
	Separation >50%, <=75% minimum	3	3		
	Separation >25%, <=50% minimum	7	7		
	Separation <=25% minimum	10	10		
- c -	Rate of closure NONE	0	0	0 ÷ 5	

	Rate of closure LOW (<=85knots, <=1000ft/mn)	1	1	ATM Ground **OR** ATM airborne	
	Rate of closure MEDIUM (>85 and <=205 knots, >1000 and <=2000 ft/mn)	2	2		
	Rate of closure HIGH (>205 and <=700 knots, >2000 and <=4000 ft/mn)	4	4		
	Rate of closure VERY HIGH (>700knots, >4000ft/mn)	5	5		

The risk of collision mark[11] is the sum of the marks resulting from the two components:

Separation + Rate of Closure.

Example:

- minimum separation achieved was 60% horizontally and 30% vertically;
- rate of closure at separation loss was 160kts and 3000ft/min;
- ATC was providing radar separation.
- Then:
  i. ATM Gnd is scored 3 for separation (greatest of the two separations)
  ii. ATM Gnd is scored 4 for rate of closure (greatest of the two possible marks);
  iii. Total for Risk of Collision is 7.

Controllability is the second major sub-criterion of Severity and describes the "level of control" maintained over the situation (ATCOs and pilots supported by Safety Nets). Both total aviation and ATM ground segments have to be considered from the perspective of control over the situation. The purpose of this step is to balance (positively or negatively) the result of the proximity evaluation in the light of the amount of control that ATC exhibited.

This facilitates an evaluation of the amount of hazard or entropy. If the situation is controlled, even if separation is lost, it is nevertheless recovered by the ATM system and not by chance. For this step it is proposed to follow the typical defence barriers as they apply chronologically.

The first part evaluates whether and how ATC worked the conflict situation between the aircraft later involved in the actual incident. It is important to consider the global picture and not only purely the two aircraft between which separation was lost. In certain cases while trying to work an aircraft pair, ATC could generate an incident between another pair. All aircraft relevant to the incident under analysis must be considered.

Conflict detection refers to ATM ground detection, therefore ATM Overall will inherit the same score as ATM Ground. ATM Airborne is not scored here. There are three possible scenarios:

- 'Conflict DETECTED' includes cases where conflict is detected but ATC decided to accept the situation. It also includes detection made with the support of a predictive STCA (Short Term Conflict Alert) warning that gives sufficient time to execute a plan.
- 'Conflict detected LATE' should not be scored automatically whenever separation is lost; consideration should be taken with regard to the circumstances involved. This criterion should be scored if the conflict was detected late, but there was still time to form a plan

[11] NB: Either ATM Ground or ATM Airborne is to be scored, **never both**. The ATM Airborne is to be used only in cases where ATC is not responsible for providing separation (i.e. certain classes of airspaces - e.g. close encounter between IFR and VFR flights in Class E airspace).

and execute it. In units with predictive STCA, the conflict is detected due to the predictive STCA.

- 'Conflict NOT detected' should NOT be scored in cases such as level busts or other incidents where ATC cannot form a prior plan. Thus, conflict detection is not applicable and a zero should be scored to maintain the Reliability Factor tracked.

		ATM ground	ATM airborne	ATM overall	RF weight
Detection	Conflict detected	0		0 ÷ 5 ATM ground	
	Conflict detected late	3			
	Conflict NOT detected	5			

Planning refers to the ATM Ground plan and therefore ATM Overall will inherit the same score as ATM Ground. The performance, the timing and efficiency of that planning should be assessed. The plan refers to the first plan developed by ATC to solve the detected hazardous/conflict situation. This plan will be referred to in the subsequent Execution steps but not necessarily in the Recovery step.

- When the planning is either late or does not lead to a timely and effective resolution of the conflict then 'Plan INADEQUATE' should be scored.
- When 'Conflict NOT detected' is scored, then 'NO plan' should also be scored.
- Whenever Conflict detection is not applicable (such as Level bust cases) then Planning sub criterion is not applicable and a zero should be marked.

		ATM ground	ATM airborne	ATM overall	RF weight
Planning	Plan CORRECT	0		0 ÷ 5 ATM ground	
	Plan INADEQUATE	3			
	NO plan	5			

Execution refers in general to ATM Ground execution in accordance with the developed plan and therefore in case of no pilot deviation from the instructed plan, ATM Overall will inherit the same score as ATM Ground. Pilot execution will be scored as ATM Airborne. Execution refers to the execution of the first plan developed by ATC to solve the detected hazardous/conflict situation.

- When assessing the execution, the time and efficiency of that execution should be assessed.
- ATM Ground execution is INADEQUATE when it is not timely or not effective. It refers to the same plan developed in the 'Planning' criterion, prior to the system excursion of the safety envelope. It includes the cases when it is contrary to any prior good planning. The pilot execution is scored separately as ATM Airborne.
- When no conflict is detected, 'NO plan' and 'NO execution' apply. No execution also comprises cases when there is detection and a plan but this is not implemented at all.
- Whenever Conflict detection and Planning are not applicable such as deviation from ATC clearance (e.g. runway incursion due to pilot deviation from ATC clearance) then the Execution criterion for ATM Ground is also not applicable and it's scored as 0.

		ATM ground	ATM airborne	ATM overall	RF weight
Execution	Execution CORRECT	0	0	0 ÷ 15 ATM ground	
	Execution INADEQUATE	3	5		

	NO Execution	5	10	+ ATM airborne	

STCA (Short Term Conflict Alert or other similar ground safety net) should be scored when the ATCO failed to detect the conflict without the safety net's support and consequently failed to plan and execute a correct resolution (the conflict has been observed due to safety nets - useful safety nets warning). Cases of false/nuisance alerts should be disregarded.

- When the conflict is detected by the ATCO then a zero should be scored.
- STCA usage in the unit needs careful consideration when scoring this criterion. It needs to make a difference between predictive and current STCA – parameterisation is important. A large time warning in advance will bring warnings that will potentially be nuisances.
- 'No STCA warning' should be scored when the conflict was not detected or detected late by the ATM Ground and STCA should have been triggered according to its implemented logic, but it failed to function. Hence the ground safety net barrier did not work.

		ATM ground	ATM airborne	ATM overall	RF weight
STCA	Loss of separation detected because of STCA	0		0 ÷ 3 ATM ground	
	No detection (including by STCA)	3			

Recovery from the actual incident is the phase requiring immediate action to restore the safety margins (e.g. separation) or at least to confine the hazard. Recovery starts from the moment the safety margins have been breached (potentially due to an inadequate or missing initial plan to solve the hazardous situation). This sub-criterion applies to both ATM Ground and ATM Airborne. Therefore, ATM Overall will inherit the sum of the Ground and Airborne values.

Scoring 'Recovery INADEQUATE' indicates that the ATM reaction, after the actual incident is declared, had not improved the situation.

- When scoring 'NO recovery', consideration should be given as to whether a TCAS RA or pilot "see and avoid" action was triggered, as this could be the reason to not follow the ATC instructions. In this case, there should be no penalty on the ATM airborne part.
- When the aircraft are already diverging, then the Recovery should be scored as 'Not Applicable' and a zero should be given.
- From this step the plan is a new one and is different from the first plan established in the detection/planning phase. It is seeking the performance of bringing the system back within its safety envelope (such as re-establishment of the separation minima). Recovery might include, depending on type of occurrence (e.g. airspace in which it occurred and services to be provided), cases where traffic information or avoiding actions were issued by ATC.

		ATM ground	ATM airborne	ATM overall	RF weight
Recovery	Recovery CORRECT	0	0	0 ÷ 25 ATM ground + ATM airborne	
	Recovery INADEQUATE	5	6		
	NO recovery or the ATM ground actions for recovery have worsened the situation or ATM airborne has worsened the situation	10	15		

Airborne Safety Nets – The TCAS sub-criterion should be scored only for useful TCAS RAs (as per ICAO definitions). A similar logic applies for see-and-avoid environments where TCAS does not function.

- The 'No TCAS RA' option should be used in situations when the geometry of the encounter would require a TCAS RA (based on ICAO TCAS logic) and that did not occur.
- 'TCAS triggered.….' should be scored as not applicable (i.e. a score of zero should be given) if adequate ATC instructions are issued before the pilot reaction due to TCAS RA.
- For cases where TCAS has saved the day, 'TCAS triggered....' will be scored. The score will be assigned to ATM Ground to reflect that the ground barrier has failed and because TCAS is considered to be an integrated component of ATM Airborne and ATM Overall.
- In cases of Runway events, lack of see and avoid should be scored in the case of low visibility and IMC conditions (or during night time), or if the ATM airborne barrier, see and avoid, is not functioning any more in low visibility.

		ATM ground	ATM airborne	ATM overall	RF weight
TCAS	TCAS triggered (useful RAs only to be considered) or see and avoid pilot decision (in the absence of TCAS)	10	0	0 or 10 ATM airborne	
	NO TCAS RA	0	10		

Pilot execution of TCAS RA (or application of see-and-avoid in cases where TCAS is not applicable) and recovery is a criterion to gather the complementary performance to ATM ground.

- 'Pilot(s) INSUFFICIENTLY followed RA' applies when pilot action is not reacting fully in accordance with the TCAS RA, but ATM ground has enough control over the situation.
- 'Pilot(s) INCORRECTLY followed RA (or, in the absence of RA, took other inadequate action)' is scored whenever the pilot actions were either missing or contradictory (e.g. did not follow the RA). A contradictory reaction or non-reaction to a TCAS RA should be considered as the worst possible case.

		ATM ground	ATM airborne	ATM overall	RF weight
Pilot action	Pilot(s) followed RA (or, in absence of RA, took other effective action, as a result of see and avoid decision)		0	0 ÷ 15 ATM airborne	
	Pilot(s) INSUFFICIENTLY followed RA		10		
	Pilot(s) INCORRECTLY followed RA (or, in the absence of RA, took other inadequate action)		15		

The controllability mark is the sum of the marks resulting from its components:

Detection + Planning + Execution + STCA + Recovery + TCAS RA + Pilot Action

Example:
Conflict detected, planning inadequate, execution inadequate by ATC, correct by pilot, STCA not applicable, recovery correct by ATC and pilot, TCAS RA needed but not triggered, pilot response not applicable:

	Detection	Planning	Execution	STCA	Recovery	TCAS RA	Pilot Action	Total
Ground	Yes	Inadequate	Inadequate	N/A	Correct	N/A		6
	0	3	3	0	0	0		
Airborne			Correct		Correct	No	N/A	10
			0		0	10	0	

ATM Overall Controllability = ATM Ground Controllability + ATM Airborne controllability = 16

FINAL SCORES

Once all criteria have been evaluated and scored accordingly, the final score for severity is:

Severity = Risk of Collision + Controllability

For ATM Ground and for ATM Overall respectively.

Example: Severity ATM Ground = 7 + 6 = 13
Severity ATM Overall = 13 + 10 = 23

NOTE: Any criterion that cannot be scored due to lack of data or lack of clarity of the details in the investigation report must be left blank. Any criterion positively known to be not applicable to the particular situation under consideration should be scored as 0 (zero).

Finally, once the overall scores have been calculated as above, the equivalence with the severity for ATM Ground and Overall is as follows:

ATM Ground Value	Severity class
Between 0-9	E
Between 10-17	C
Between 18-30	B
Higher than 31	A

ATM Overall Value	Severity class
Between 0-9	E
Between 10-17	C
Between 18-30	B
Higher than 31	A

Example: Severity class ATM Ground for score 13 = C
Severity class ATM Overall for score 23 = B

Whenever there is not enough information, (Reliability Factor under 70%), the incident should be classified as class D. (Not determined)

Reliability Factor
If a value is recorded for a specific criterion, the RF weight is added to the RF value as follows:

A. ATM Ground - the Full weight is added to the RF
B. ATM Overall
    a. Fore the Separation, Rate of Closure, Detection, Ground safety nets, full weight added if the ATM ground value is recorded
    b. For Execution, Recovery, TCAS half of the weight is added if the ATM ground value is recorded value and half of the weight if the ATM airborne value is recorded
    c. For Pilot reaction, full weight added if the ATM airborne is recorded

Annex D: Just Culture – Dismissed items

Summary description of <u>non-policy</u> related elements for the draft metrics development on the measurement of the "JC" Safety KPI by the E3 TF.

In the development of draft metrics for the measurement of the "Just Culture" Safety KPI a number of elements were reviewed and discussed based on available documentation and on the outcome of a recent SAFREP TF "brainstorming" session on the subject.

(EU) No 691/2010 Art.2 **Definitions** (k):
"Just culture" means a culture in which front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated.

The following elements were reviewed and discussed by the group and after due consideration agreed to be dismissed from the initial list of proposed draft metrics:

- The group reached an overall agreement on the issue of safety reporting in general. It was recognised that safety reporting is for the purpose of improving safety; however it is not to be used as a performance indicator.

- To monitor the safety reporting trends on a continuous basis and, in addition, to assess possible changes in the reporting pattern as a result of accidents, serious incidents and other events, was abandoned for reasons of being considered as unworkable.

- With respect to ensuring confidentiality of reported safety information at EU level, more specifically the confidentiality of data in/from the ECCAIRS system, including the aspects related to the European Central Repository (ECR) has been achieved through EC regulation.

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- With respect to training issues and JC symposiums, workshops and conferences for different entities such as CAA, ANSP, AIB, NSA, common training was considered as possibly useful, (note: Eurocontrol addresses "JC" in its courses at IANS/Luxemburg) however difficult to manage, measure and verify and therefore was abandoned.

- The element related to the ANSP's needing to be confident on the subject of not being prosecuted for corporate liability issues and/or corporate killing, in order to ensure and allow its staff to report and be protected, was abandoned as it is unrealistic vis-à-vis the limitations of the aviation sector in relation to national penal law.

- The element of measuring the track record of personnel in relation to possible suspensions/revocation of licenses, re-training (e.g. resulting from occurrences investigation) or even sackings was abandoned. This for reasons of the assumed difficulties for its implementation, and the existing possibilities for having false records, potential cheating etc, which could easily result in misleading indications.

- With respect to a draft metric in relation to reporting data through mandatory or voluntary mechanisms the discussions concluded and agreed that e.g. a high ratio of voluntary over mandatory could indicate mistrust in the organisation, but could also be manipulated quite easily, therefore this draft metric was dismissed.

- For ANSPs to ensure the accessibility of data for safety assurance is an existing legal obligation under the EU regulatory framework and as such needs to be complied with. Therefore the mere fact of ensuring such accessibility is not necessarily an appropriate indicator for measuring Just Culture.