

Cooperative Network Design

ATM Safety Framework Maturity Survey

Methodology for ATM Regulators

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EXECUTIVE SUMMARY

This document provides an overview of the new ATM Safety Maturity Methodology for ATM Regulators. This new benchmark is intended to be applied not only in Europe but Worldwide and become an ICAO and EUROCONTROL standard. The revised methodology is a joint effort between EUROCONTROL, ICAO and other stakeholders. It will be applicable to ATM safety regulators in ICAO EUR Region from 2010.

Following the accidents at Linate and Überlingen in 2001 and 2002 respectively, and in answer to a request from the European Commission, in 2002 EUROCONTROL commissioned an independent survey of ECAC States' ATM Safety Regulators and Air Navigation Service Providers (ANSPs), to identify how well ATM safety requirements were being met. The objective was to provide a reference point for future development and measurement. In particular the survey sought to identify areas that would provide the most benefit if States and Service Providers were given support to enable them to meet the necessary requirements. The surveys were not intended to be audits, but to provide an overview of how regulators and service providers saw their own system development.

The 2002 survey proved an extremely useful tool in understanding how well State Regulators and ANSPs thought they were implementing ATM Safety Requirements and it clearly identified the areas where support was required. It was therefore decided by the EUROCONTROL Provisional Council (PC) to continue this form of "self-assessment" measurement.

Further surveys were subsequently conducted in 2004, 2006, 2007 and 2008 with the 2002 study being used as the benchmark against which the later studies were compared. Reports have been published for the ECAC area since 2002, and from 2007 an additional report has been published for the whole ICAO EUR Region.

In EUROCONTROL, at the request of the Provisional Council, the Safety Data Reporting and Data Flow Task Force (SAFREP TF) developed a 'Roadmap for the Development of the Safety Key Performance Indicators in ATM'. This Roadmap was subsequently approved by the

PC in November 2007. The roadmap confirmed the ATM safety framework maturity study to be a good example of a 'leading' indicator, i.e. indicators that are identified principally through the comprehensive analysis of organisations (providers, regulators, States). They are designed to help identify whether ANSPs and Regulators are taking actions or have processes that are effective in lowering risk.

In 2007, ICAO decided, at regional level, to adopt the methodology for ICAO EUR Region and Eastern European States adjacent to the ECAC Area were studied in 2007 with an expansion into North African States in 2008. At global level the methodology is being considered by ICAO as a light and easy method of keeping track of States' progress at minimum cost in support of the ICAO Universal Safety Oversight Audit Programme (IUSOAP).

Much has changed in European ATM since the original maturity study methodology was established in 2002 and the last survey using the original methodology and benchmark took place in 2009. It has therefore been necessary for the whole methodology to be reviewed and brought up to date in line with ICAO and European safety requirements. A set of targets for the Study Areas will also be established after the first baseline survey has been completed in 2010 and a thorough analysis has taken place.

The revised Safety Framework Maturity Study was run alongside the 2009 study within a representative sample of ATM Safety regulators to pilot and validate the revised study methodology and documentation. The revised measurements will commence fully in 2010 for all EUR Region States.

Use of the new Safety Framework Maturity Study will establish the extent of progress made by ATM Regulators with respect to the introduction of the 8 ICAO Critical Elements (CE) of a safety oversight system.

This revised ATM Safety Framework Maturity Survey is aligned with both ICAO requirements and approaches.

TABLE OF CONTENTS

1. INTRODUCTION	7
1.1 Background	7
1.2 Safety key performance indicators	7
1.3 Objectives and approach	8
2. STUDY METHODOLOGY	11
2.1 Study areas	11
2.2 Details of the approach	11
2.2.1 Link with the technical scope of work	11
2.2.2 Respondent workload and validation	11
2.2.3 Analysis of the feedback	12
2.2.4 Mechanisms to increase the robustness of the measurements	12
2.2.5 Maturity categories	12
2.2.6 Mapping of Study Areas and ICAO Critical Elements	15
2.3 Methodology flowchart	16
2.4 Study inputs and outputs	17
2.4.1 Structure of the questionnaire and way of completing the questionnaire	17
2.4.2 Structure of the telephone or face-to-face interviews	17
2.4.3 Structure of the results	18
3. QUANTITATIVE ASSESSMENT METHODOLOGY	21
3.1 Methodology	21
3.2 Question mapping and weighting system	21
3.3 Maturity scoring system	21
3.4 Implementation details	22
4. LINKAGE OF OBJECTIVES, RESULTS AND CONCLUSIONS	23
5. PRESENTATION OF RESULTS	23

APPENDICES

Appendix 1 – Detailed Maturity Study Areas Objectives and Associated Maturity Levels	25
Appendix 2 – Glossary	43
Appendix 3 - Acknowledgements	45

FIGURES

Figure 1 – ICAO Critical Elements	11
Figure 2 – Sample of Regulator Questionnaire	12
Figure 3 – Methodology Flowchart	16
Figure 4 – Maturity Level Flow	17
Figure 5 – Sample of What-If Tool	18
Figure 6 – Dashboard Tool	20

TABLES

Table 1 – Regulatory Maturity Study Areas	11
Table 2 – Safety Maturity Categories	14
Table 3 - Study Areas Mapping	15



1. INTRODUCTION

1.1 Background

Throughout the 1990s and early years of the 21st century European Air Traffic Management had developed in a safe and efficient manner through programmes established by EUROCONTROL on behalf of the European Civil Aviation Conference (ECAC). Indeed, Europe had an excellent record in ATM safety. However, accidents at Linate and Überlingen in 2001 and 2002 respectively showed that there was no room for complacency. It was therefore decided that, as part of a general review of the accident causal factors, a comprehensive review of ATM safety systems in ECAC States should be undertaken.

In 2002 EUROCONTROL commissioned an independent survey of ECAC States' ATM Safety Regulators and Air Navigation Service Providers (ANSPs), to identify how well ATM safety requirements were being met. The objective was to provide a reference point for future development and measurement. In particular the survey sought to identify areas that would provide the most benefit if States and Service Providers were given support to enable them to meet the necessary requirements. The surveys were not intended to be audits, but to provide an overview of how regulators and service providers saw their own system development.

The 2002 survey proved an extremely useful tool in understanding how well State Regulators and ANSPs thought they were implementing ATM Safety Requirements and it clearly identified the areas where support was required. It was therefore decided by the EUROCONTROL Provisional Council to continue this form of "self-assessment" measurement. The surveys not only identified where support is required, but they give Regulators and ANSPs the opportunity to assess themselves ahead of EUROCONTROL and ICAO Audits, thus enabling them to identify areas where there are shortcomings. Currently, the safety framework maturity measurement focuses on reviewing the status of the development and implementation of safety management and safety oversight mechanisms within the ECAC region; and also the wider ICAO EUR Region. This fact-based exercise gives an indication of the status of current and future ATM safety

management, regulation and oversight within the ICAO EUR Region. The results are presented in the form of a "maturity score" ranging from zero to 100, for each individual ANSP and regulator, where 100% means that all ATM safety requirements are being met. After 2002 the studies were repeated in 2004, 2006, 2007, 2008 and 2009 with the 2002 survey being used as the benchmark against which the later surveys were compared. Reports have been published for the ECAC area since 2002 and from 2007 an additional report has been published for the whole ICAO EUR Region.

Safety Programmes.

Since 2002 EUROCONTROL's PC have launched a series of safety enhancement programmes (Strategic Safety Action Plan (SSAP) & European Safety Programme for ATM (ESP)). The current series of ATM Safety Framework Maturity Studies is due to be completed in 2009 to coincide with completion of the ESP.

Revised ATM Safety Framework Maturity Survey Methodology.

Much has changed in European ATM since the original maturity survey methodology was established in 2002 and the last survey using the original methodology and benchmark will be in 2009. It has therefore been necessary for the whole methodology to be reviewed and brought up to date in line with ICAO and European safety requirements. A new benchmark needs to be established and it is intended that the revised maturity study methodology be used from 2010 onwards.

1.2 Safety key performance indicators

Within EUROCONTROL, at the request of the Provisional Council (PC), the Safety Data Reporting and Data Flow Task Force (SAFREP TF) developed a 'Roadmap for the Development of the Safety Key Performance Indicators in ATM'. This Roadmap was subsequently approved by the PC in November 2007. The roadmap confirmed the ATM safety framework maturity survey to be a good example of a 'leading' indicator, i.e. indicators that are identified principally through the comprehensive analysis of organisations (providers, regulators, States). They are

designed to help identify whether ANSPs and Regulators are taking actions or have processes that are effective in lowering risk.

The Roadmap for the Development of the Safety Key Performance Indicators in ATM identified the following key activities for the development of leading indicators such as the ATM Safety Framework Survey:

- Workshops with main stakeholder groups (ANSPs & Regulators) to define the methodology and its application;
- Approval by the Safety Team and Safety Regulation Commission;
- Testing of the revised framework maturity survey involving stakeholders;
- Validated mechanism and agreed target for the Safety Framework Maturity survey by stakeholders;
- PC adoption of one set of leading KPIs based on the Safety Framework Maturity Survey Mechanism.

In November 2007, the PC approved the continuation of the safety measurements and anticipated that it would adopt the new methodology during its meeting in November 2009.

In 2007 ICAO decided, at regional level, to adopt the methodology for the ICAO EUR Region and Eastern European States adjacent to the ECAC Area were studied in 2007 with an expansion into North African States in 2008. In 2008 the methodology was also used to assess some ICAO Mid-Region States. At a global level the methodology is being considered by ICAO as a light and easy method of keeping track of States' progress at minimum cost in support of the ICAO Universal Safety Oversight Audit Programme (IUSOAP).

The revised Safety Framework Maturity Survey was run alongside the 2009 survey within a representative sample of ATM Safety regulators to pilot and validate the revised survey methodology and documentation. The revised measurements are fully applicable in all ICAO EUR Region States from 2010 onwards.

1.3 Objectives and approach

Use of the new Safety Framework Maturity Survey methodology will establish the extent of progress made by ATM Regulators with respect to the introduction of ATM regulatory oversight.

Specifically, the aim of the survey is to:

- Determine the level of ATM Safety Regulatory Oversight within the industry;
- Determine the extent to which learning is transferred across the industry;
- Establish a path along which ATM Regulatory Authorities can focus their activities for continuous improvement.

Two factors determine the new approach:

- The methodology used in previous safety framework maturity surveys for the Strategic Safety Action Plan (SSAP) and the subsequent European Safety Programme for ATM (ESP) maturity surveys was considered to be a practical approach that quickly delivered a comprehensive overview of the status of ATM safety mechanisms within each ECAC State;
- Data obtained via the survey's provide comparisons with previous surveys so that required improvements and other issues can be identified.

The new methodology is keeping pace with the modernisation of the worldwide ATM safety regulatory framework. It intends to measure to what extent the ICAO Eight Critical Elements of a State's Safety Oversight System Global are being implemented regionally. It also introduces a maturity scale that has been adapted from CMMI (Capability Maturity Model® Integration) Model, which is a recognised industry standard. CMMI is briefly described in section 2.2.5 Maturity Categories.

The measurements are not a replica of an audit and are not based on detailed evidences. The maturity survey is a unique but blunt instrument based on self assessment which is verified during telephone or face to face interviews. The new methodology, to be applied from 2010

onwards, has strengthened the verification mechanism of the replies through a series of additional validation activities agreed by stakeholders. These are further presented in the section describing what additional measures are taken to further increase the robustness of the safety maturity tool.



2. STUDY METHODOLOGY

2.1 Study areas

The overall status of ATM safety regulation is assessed through the review of a number of key elements of safety management (or "Study Areas"). Each Study Area has a clear definition and is linked directly to both quantitative and/or qualitative results.

The Study Areas follow the ICAO 8 Critical Elements of a State's oversight system and are shown in Table 1 below. A description of what would constitute a mature situation concerning systematic safety framework is given under the individual study areas at Appendix 1:

Area No.	ANSP Study Areas
S-1	State Safety Framework
S-2	Safety Resources
S-3	Safety Interfaces
S-4	Safety Reporting, Investigation and Improvement
S-5	Safety Performance Monitoring
S-6	Implementation of Safety Oversight
S-7	Adoption and Sharing of Best Practices
S-8	Safety Culture
S-9	Resolution of Safety Deficiencies and Concerns

Table 1: Regulatory Maturity Study Areas

The above new dimensions captured in the revised Safety Maturity Framework (e.g. how we translate the ICAO 8 Critical Elements of safety oversight (see Figure 1) into the measurement of safety in operation) are significant changes from the previous version of the safety maturity tool.

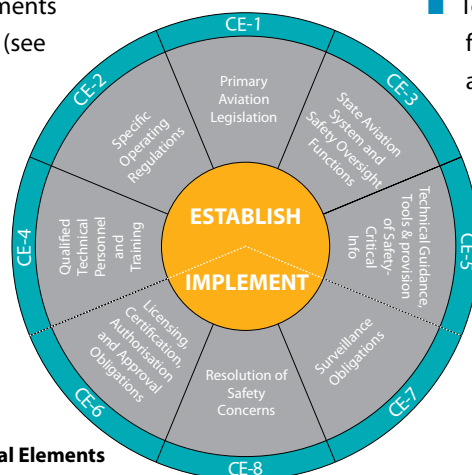


Figure 1: ICAO Critical Elements

2.2 Details of the approach

2.2.1 Link with the technical scope of work

The methodology is designed to take account of a number of essential issues:

- Each Study Area has a clearly defined goal;
- Each Study Area has distinct sub-objectives, as appropriate, to clarify what is being measured and what maturity level is appropriate for Organisations answering the questionnaire;
- Consolidating replies from the Study Areas and across respondents, allows an opinion to be formed with respect to the ATM safety maturity levels.

2.2.2 Respondent workload and validation

The Regulator questionnaires will be pre-completed where possible using the most up-to-date information (e.g. for ECAC States from LSSIP data (if available)) and any available other information for each State (such as data from previous surveys and ESIMS data).

The purpose of this is four-fold:

- To provide a mechanism for internal pilot testing of the questionnaires and to enable review and refinement of the questionnaires prior to issue;
- To ensure that participants receive positive feedback from earlier information they may have provided and as such avoiding duplication;
- To ease the burden on respondents such that they only need to check, edit and return the questionnaire; and
- To provide the basis for a limited form of validation (in conjunction with telephone interviews) of responses provided by the survey interviewees.

Figure 2: Sample of Regulator Questionnaire

The interviews are used to explore and validate the respondents' answers given in the questionnaire and are structured in such a way as to obtain as much feedback as possible on safety related issues. Where agreed between the interviewer and interviewee, responses may be revised and questionnaires re-submitted.

2.2.3 Analysis of the feedback

Analysis of the Regulator's questionnaire feedback is built up as a statistical process with clearly defined logical links between the questions, mapping of the questions to the objectives and weighting of the questions within each Study Area.

Results are compared to the original survey objective, and to the results of the telephone interviews.

Qualitative and anecdotal comments are used in combination with the quantitative results in formulating the conclusions.

2.2.4 Mechanisms to increase the robustness of the measurements

The SAFREP TF and its Regulator members favour the following activities to increase the robustness of the self-assessment maturity measurements:

- Encouragement of peer surveys under the umbrella of EUROCONTROL;
- Random visits prior to developing the survey report (in ECAC it is anticipated that 4-8 random short visits would be conducted each year irrespective of the maturity results of Regulators). During the visits a thorough analysis and completion of the questionnaire and interview will be undertaken with a team of local experts (safety, operational and engineering);
- Results of existing audits (such as IUSOAP, ESIMS) would be taken into account before finalising the survey report;
- Should a Regulator disagree with the final measurement based on the questionnaire and the interview results, the overall maturity report will record details of the disagreement.
- Each ANSP and Regulator may score both ANSP and Regulatory questionnaire to assess both their own progress with regard to increasing their safety framework maturity level, and also to assess progress of the other organisation. EUROCONTROL will cross-check the responses and, where significant differences are found, will liaise with both organisations to resolve any issues.

2.2.5 Maturity categories

The questionnaires have a graded scale of responses that correspond to five categories of safety maturity (Table 2) (from *Initiating* being the lowest to *Continuous Improvement* being the highest). These categories are:

- Initiating;
- Planning/Initial Implementation;
- Implementing;
- Managing and Measuring;
- Continuous Improvement.

These categories have been designed so that, using the specimen answers provided, the regulator in each State can give the most appropriate graded answer to each question. A detailed generic definition for every maturity category is given in Table 2.

All requirements for the previous stage/level must be fully satisfied before proceeding to the next stage of the model. No maturity stages can be skipped.

The 5 categories have been derived from the CMMI (Capability Maturity Model® Integration). The initial Capability Maturity Model (CMM v1.0) was developed by the Software Engineering Institute (following an approach of IBM) and specifically addressed software process maturity. It was first released in 1990, and after its successful adoption and usage in many domains, other CMMs were developed for other disciplines and functions such as Systems Engineering, people, integrated product development, software acquisition, and others.

Lately, CMMI has become a process improvement approach that provides organisations with the essential elements of effective processes. It can be used to guide process improvement across a project, a division, or an entire organization. CMMI helps integrate traditionally separate organisational functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for appraising current processes.

The CMMI models improve the best practices of previous models in many important ways. CMMI best practices enable organisations to:

- more explicitly link management and engineering activities to their business objectives;
- expand the scope of and visibility into the product lifecycle and engineering activities to ensure that the product or service meets customer expectations;
- incorporate lessons learned from additional areas of best practice (e.g., measurement, risk management, and supplier management);
- implement more robust high-maturity practices;

- address additional organizational functions critical to their products and services;
- more fully comply with relevant ISO standards.

CMMI adoption in industry is not a one size fits all. Some¹ adopt CMMI with or in addition to other approaches, such as: *Six Sigma, Agile Methods, TSP/PSP, ISO 9000/9001, IEEE Standards, RUP, Balanced Scorecard.*

For the above reasons the SAFREP TF has adapted the CMMI model to derive the new safety maturity scales for the ATM Safety Framework Maturity Surveys. The ICAO 8 Critical Elements have been used during the adaptation to ensure that the Regulator Safety Maturity Categories follow as closely as possible the ICAO model. In particular the ICAO requirements are taken into account at each level of development.

An ATM Regulator should strive to go beyond the minimum level of competency and push their Organisation beyond *Implementing*. *Managing and Measuring* is about quantitative management. It represents a safety maturity level characterized by improving organisational performance. Historical results for *Implementing* elements can be exploited to make trade-offs, with predictable results, among competing dimensions of business performance (safety, cost, quality of service, efficiency/delays).

Additional *Managing and Measuring* process areas include: *Organisational process performance*: setting norms and benchmarks for process performance & *Quantitative safety management*: executing and managing safety based on statistical quality-control methods.

Continuous improvement represents a process maturity characterised by rapidly reconfigurable organisational safety performance as well as quantitative, continuous process improvement. Additional *Continuous improvement* safety process areas include: *Causal analysis and resolution*: proactive safety management and safety best practice reinforcement & *Organisational innovation and deployment*: establishing a learning organisation that organically adapts and improves.

1- Organisations using CMMI : Accenture, Boeing, Bosch, DynCorp, EDS, Ericsson, Fujitsu, Hitachi, Honeywell, IBM, Infosys, Intel, J. P. Morgan, KPMG, L3 Communications, Lockheed Martin, Motorola, NASA, NEC, Nokia, Northrop Grumman, NRO, Polaris, Raytheon, Reuters, SAIC, Samsung, Social Security Administration, Tata C. S., U.S. Air Force, U.S. Navy, U.S. Treasury Department, Wipro, Zurich Financial Services etc.

Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<ul style="list-style-type: none"> ■ A legislative framework for civil aviation exists. However it is not in line with the complexity of the national aviation system ■ Awareness of the need for a national safety oversight system exists. However neither formal development nor implementation action has been taken. ■ Ad-hoc safety oversight activities are conducted but they are not consistent with national and international obligations. 	<ul style="list-style-type: none"> ■ A gap analysis of the legislative framework has been performed and an Implementation Plan for the safety oversight system has been prepared. ■ Implementation activities have started but they are not yet completed in some major areas (e.g. not all ICAO Critical elements 1-5 are in place). 	<ul style="list-style-type: none"> ■ Aviation legislation, requirements and guidance in the ATM area have been published and implemented. ■ There is a systematic approach to auditing. ■ There is a robust and effective approach to initial and ongoing oversight of the management of safety in operations/engineering and SMS. ■ Where appropriate, formal coordination takes place with other regulators in overlapping or adjoining interfaces. ■ Adequate trained staff are in place and are aware of their roles and responsibilities and are provided with adequate financial resources ■ Relationship (e.g. communication and consultation) with ANSPs is formalised. ■ Resolution of safety concerns. 	<ul style="list-style-type: none"> ■ The Regulatory processes are used to establish consistency across the organization. As a result, the oversight activities that are performed across the ATM industry are consistent. ■ Regulators have a formal process to identify and adopt best practices from the ATM industry. ■ Relationship (e.g. communication and consultation) with ANSPs is not only formalised but also effective. 	<ul style="list-style-type: none"> ■ Regulatory framework and safety oversight function is periodically reviewed with the aim of continuous improvement. ■ Regulatory framework and safety oversight function is embedded in the overall safety system. ■ Regulators have a systemic view of ATM and correlates the oversight of ANSPs with the oversight of Airports, Airspace Users and where appropriate MIL.
<p><i>The State's Safety Oversight System based on ICAO Critical Elements is not implemented and there are no formal plans in place. However some ad-hoc safety oversight elements are in place and used.</i></p>	<p><i>Implementation Plans exist covering regulatory and oversight elements based on ICAO Critical Elements. The plan is not yet fully implemented.</i></p> <p><i>Not all of the regulatory standards for ATM are established. Provided oversight of ANSPs is not effective.</i></p> <p><i>However, most of the elements of ICAO CE1 to CE5 are in place.</i></p>	<p><i>The State's Safety Oversight System is in adherence with all ICAO CEs (CE1 - CE8).</i></p> <p><i>Regulatory framework for ATM is established and oversight of ANSPs is formalised.</i></p>	<p><i>Oversight provided is effective and the State is identifying/adopting regulatory best practices beyond minimal criteria established internationally.</i></p>	<p><i>The State is establishing oversight best practices in the ATM industry.</i></p> <p><i>Procedures and requirements used for oversight are constantly being improved.</i></p>

Table 2 - Safety Maturity Categories

2.2.6 Mapping of Study Areas and ICAO Critical Elements

Mapping of the Study Areas onto the appropriate ICAO Critical Elements is shown at Table 3.

Study Area	ESIMS Strategy Step	CE1	CE2	CE3	CE4	CE5	CE6	CE7	CE8
		Primary Aviation Legislation	Specific Operating Regulations	State civil Aviation safety oversight functions	Technical Personnel Qualification and Training	Technical Guidance, Tool and Provision of Safety-Critical Information	Licensing, Certification, Authorisation and Approval Obligations	Surveillance Obligations	Resolution of Safety Concerns
S1: State Safety Framework	Framework	✓	✓	✓	✓				
S2: Safety Resources	Framework			✓	✓	✓	✓	✓	✓
S3: Safety Interfaces	Framework			✓					
S4: Safety Reporting, investigation and Improvement	Oversight	✓	✓	✓	✓				✓
S5: Safety Performance Monitoring	Oversight	✓	✓					✓	
S6: Implementation of Safety Oversight	Oversight		✓	✓		✓	✓	✓	
S7: Adoption and Sharing of Best practices	Misc					✓			
S8: Safety Culture	Misc								
No mapping with ICAO Critical Elements									
S9: Resolution of safety Deficiencies and Concerns	Resolution of safety Deficiencies			✓		✓			✓

Table 3 - Mapping of Study Area and ICAO Critical Elements

2.3 Methodology flowchart

The implementation process for the methodology applied in ECAC is exemplified as follows:

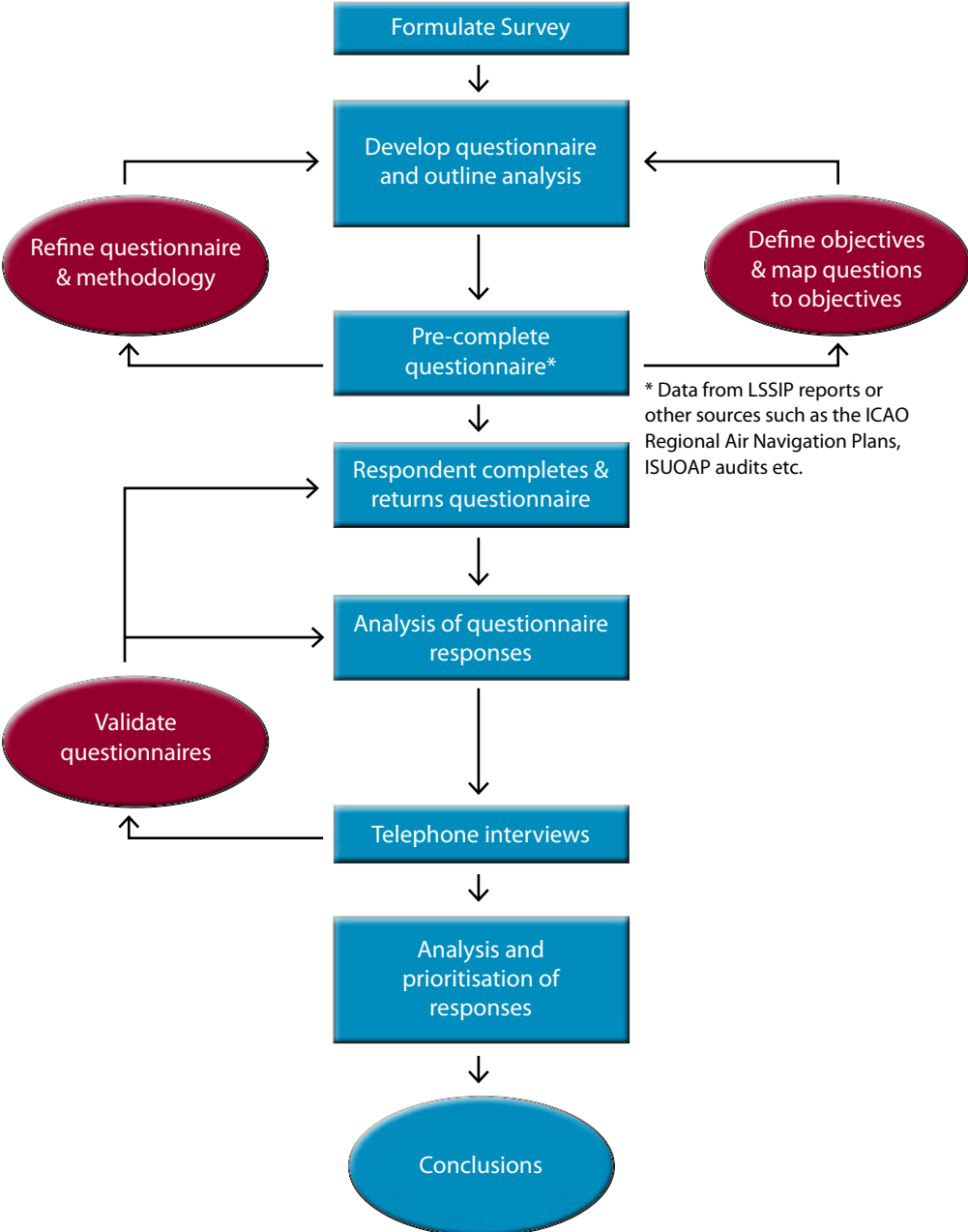


Figure 3 – Methodology Flowchart

Outside of the ECAC Area the phase of pre-completion of the questionnaire with information from other sources, such as LSSIP (previously named LCIP), will not be possible. The external Organisation measuring the safety maturity should search any similar type of information available e.g. in ICAO Regional Air Navigation Plans, ISUOAP audits, etc.

2.4 Study Inputs and Outputs

2.4.1 Structure of the questionnaire and way of completing the questionnaire

The ATM Regulator Maturity Survey Questionnaire covers 9 Study Areas. Each Study Area and, where appropriate its sub-areas, has a description of the five maturity categories as applicable to the element measured. The respondents should review each of the maturity category (progressing from left to right – i.e. from 'Initiating' to 'Continuous Improvement') to determine the appropriate maturity level.

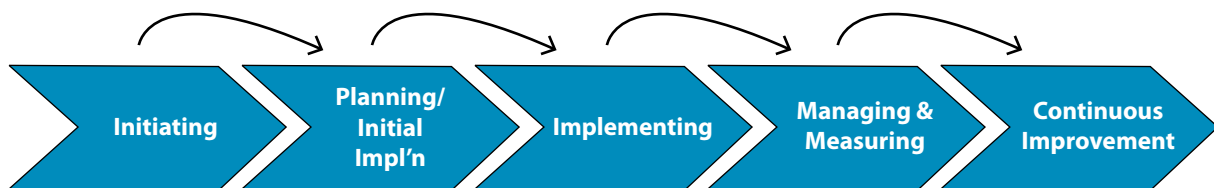


Figure 4: Maturity Level Flow

Only if all the elements of one maturity level are fully observed by an Organisation can that maturity category be selected. If an Organisation has elements in various adjacent maturity categories then they shall take a conservative approach and select the lowest maturity level.

When reviewing the maturing levels from left to right, the respondent shall consider whether all elements in the previous maturity level still apply. There may be occasions when it is more appropriate to revert back to a previous maturity level. Any disparity and uncertainty will be discussed during interviews and clarification may be sought to confirm that a maturity level has indeed been achieved.

2.4.2 Structure of the telephone or face-to-face interviews

Whereas the questionnaires have been designed to generate a 'snap-shot' picture of the current situation with regard to ATM safety mechanisms, the telephone interviews have been designed to review as many issues as possible that influence the establishment of oversight knowledge transfer and plans for continuous improvement within an ATM Regulator.

A brief explanation of the purpose of the interview, expected duration and overall structure of the interview, is provided to the interviewee.

The interview will generally follow the structure of the questionnaire the respondent had already completed.

Open questions are asked to stimulate the interviewee to elaborate on why a certain position in terms of maturity had been chosen (e.g. "What made you decide that your organisation is in a ... stage of maturity?"); what sorts of issues were holding back further development (e.g. "What sorts of things are holding up the further development of your organisation in this area?") And, in some cases, what issues or circumstances had helped the organisation to progress towards maturity (e.g. "You reported to be in category "Initiating" two years ago and now you are reporting to be in "Managing & Measuring". How did you manage to make so much progress in this area?").

The essentials of the conversation will be reported back by the interviewer at each stage to check that the message had been well understood (e.g. "So, what you are telling us here is that...") and these essentials will be captured in a document. To allow interviewees to speak freely, conversations will not be recorded by electronic means.

2.4.3 Structure of the results

The data from the survey can be grouped under two principal headings:

- Quantitative data developed from an analysis of replies provided by respondents;
- Qualitative data from the telephone interviews and from random visits to Regulators.

From this information the following tools and visual information are constructed:

- A Repository tool containing the summary of the interview(s);
- A report detailing the results for each study area including the enablers for reaching certain level of maturity as well as the disablers that prevent further development and increase of maturity (The report will include inter-alia de-identified annual comparison);
- A What if Tool for allocating the priorities for future investments (per Organisation, per group of States or per Regions).

'WHAT-IF' TOOL

The What-If tool is an Excel based tool (a workbook) intended to allow users to explore the potential effects that improvement initiatives may have on the overall safety maturity. For each of the study areas, the user can explore the effect of proposed initiatives targeted on individual states, groups of States with similar characteristics or global initiatives across all States. This workbook also allows initiatives that are targeted at Regulators, making it very flexible.

The "What if" worksheet displays an average result across each of the study areas for Regulators. These data are then plotted onto graphs.

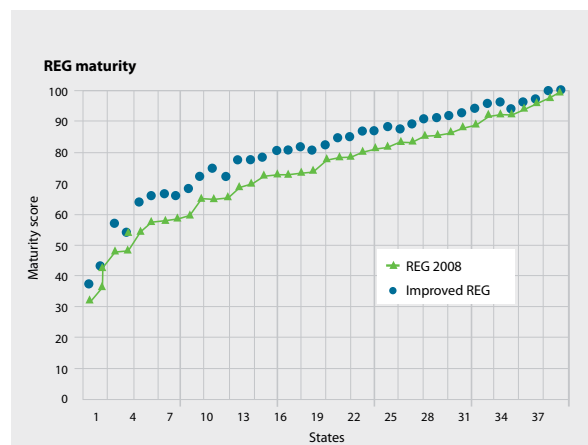


Figure 5: Sample of What If Tool

What if?									
	Study Areas								
	SA1	SA2	SA3	SA4	SA5	SA6	SA7	SA8	SA9
Current average	80,6	80,3	79,7	81,9	83,3	81,9	81,6	NA	79,3
Global improvement initiatives									
Percentage improvement in study area?	0%	0%	0%	0%	0%	0%	0%	0%	0%
Improvement initiatives targeted by size	all	all	all	all	all	all	all	N/A	all
Percentage improvement in study area?	0%	0%	0%	0%	0%	0%	0%	N/A	0%
Improvement initiatives for specific States									
Percentage improvement in study area?	0%	0%	0%	0%	0%	0%	0%	N/A	0%
Improved Average	80,6	80,3	79,7	81,9	83,3	81,9	81,6	NA	79,3

DASHBOARD TOOL

The 'Dashboard' tool is an Excel type tool (a Workbook) that allows users to explore areas where focus needs to be applied to improve the level of maturity. This information can be seen per organisation, per group of organisations or per region. Figure 6 provides an example of what the Dashboard tool could contain, e.g.:

- ❶ Graph 1 shows the overall Average Maturity Score of all participating Regulators. The 'RED' indicators depict those Regulators that are shown in Graph 3.
- ❷ Graph 2 (Maturity by Area) shows the minimum and maximum level of maturity for each Study Area (across all participating Regulators), plus the interquartile range (IQR) or mid-spread. The IQR is a measure of variability, spread or dispersion being equal to the difference between the third and first quartiles.
- ❸ Graph 3 provides a list of all participating Regulators and their maturity level scores for each Study Area. Maturity levels that are less than the 20th percentile are shown in "RED", whilst maturity levels that are more than the 80th percentile are shown in 'GREEN.' This graph will enable users to identify those Study Areas where more targeted activity is required to improve maturity levels.
- ❹ Users can select specific Regulators to analyse.
- ❺ Graph 5 indicates the maturity level for each Study Area for a particular Regulator selected.
- ❻ Graph 6 is another representation of a Regulators maturity level against a set target/s.
- ❼ A reference table of Study Areas.
- ❽ This table indicates the number of organisations that fall within a particular percentile range.

The Dashboard tool will be enhanced over time in accordance with user requirements to enable the drilldown of specific sub objectives within Study Areas.

Another tool is available for each Regulator containing their specific data. This will enable Regulators to identify areas for improvement.

Safety Framework Maturity of ATM Safety Regulators

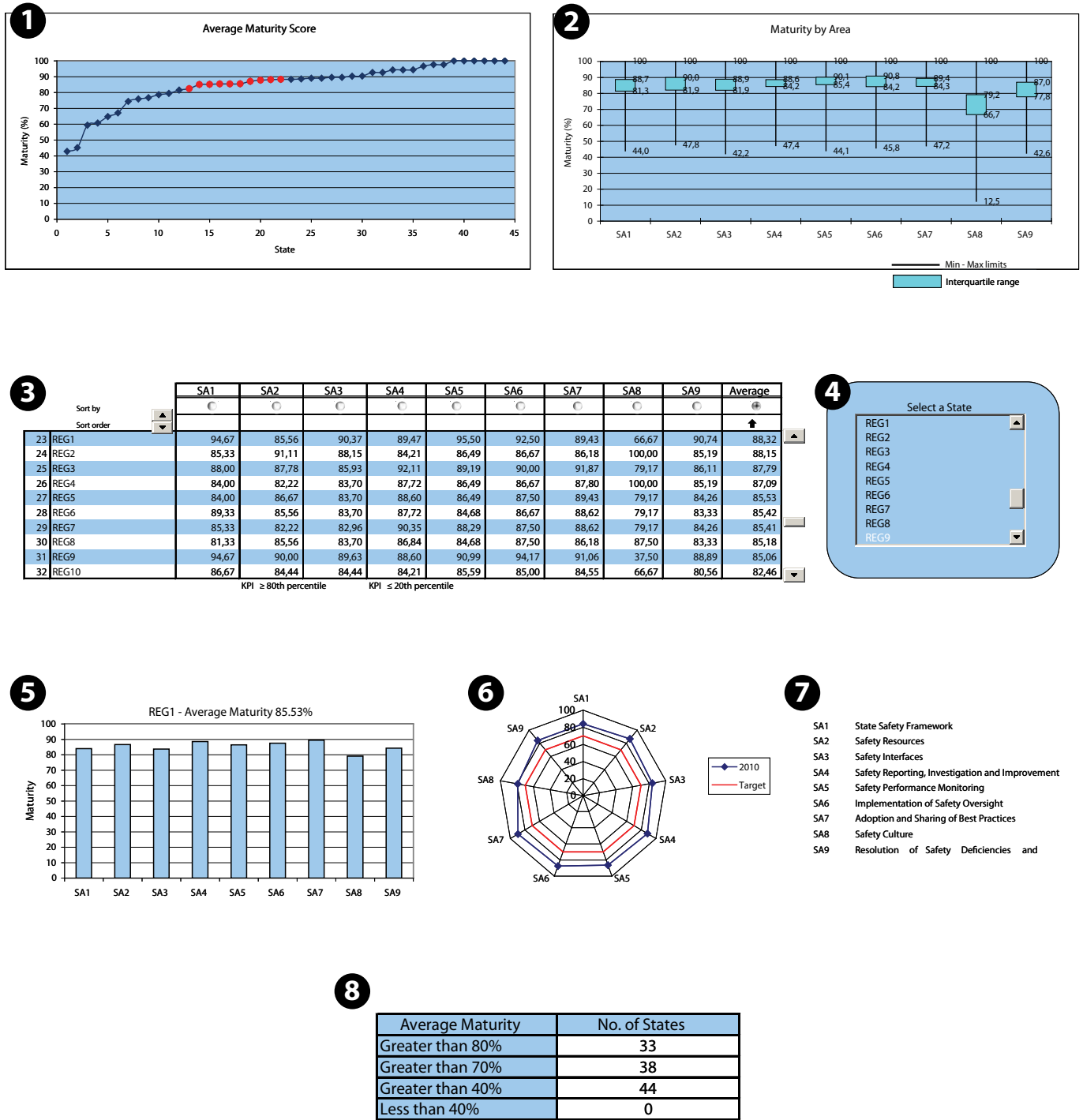


Figure 6: Sample of Dashboard Tool

3 QUANTITATIVE ASSESSMENT METHODOLOGY

3.1 Methodology

Under this method, the performance of each ATM Regulator with regard to safety and safety oversight is quantitatively assessed within each of the Study Areas through a normalised scoring system.

In addition, by taking the average score across all the Study Areas, the overall safety maturity performance of the Regulator can be estimated.

3.2 Question mapping and weighting system

A number of different approaches are used to quantitatively assess the questionnaire responses. These approaches have been developed in order to elicit different types of information regarding the current status of safety management within States. These methods are based on the mapping of the questionnaire objectives with the 9 Study Areas. Under this mapping, subsets are associated with each Study Area.

Additionally, within each Study Area the various associated sub-objectives will typically have differing levels of significance to that Study Area. For example, a response in the *“Planning/Initial Implementation”* category is of greater concern if the question is critical to the Study Area than it would be if the question were of moderate importance to that Study Area. This variation of importance is handled numerically through the use of weighting factors. These weightings will be further validated and improved following the 2010 baseline survey.

Broadly, three types of analysis are undertaken to drive:

- Maturity scoring;
- Un-weighted classification;
- Weighted classification.

These are described in the following sections.

3.3 Maturity scoring system

Under this method, the performance of each State with regard to safety management is quantitatively assessed within each of the Study Areas through a normalised scoring system such that a percentage score (i.e. a score from 0 to 100) is calculated for each State within each Study Area. The scoring system takes account of the fact that the various questions associated with each Study Area have different levels of significance. This is achieved through the application of weighting factors.

In addition, by taking the average score across all the Study Areas, the overall performance of the Regulator can be estimated.

Once the overall scores have been calculated, the Regulator can then be classified according to their score as being either - *“Initiator”* (0-20%), *“Planner”* (20-40%), *“Implementer”* (40-60%), *“Manager”* (60-80%) or *“Continuous Improver”* (80-100%). As in the methodology used from 2002 to 2009, there may be a need for a different classification scheme to be developed once measurements have started and a fairly significant amount of progress has been achieved by Regulators.

The classifications might be totally different from one ICAO region to another. They could be based and dependent on various technical and/or political targets.

3.4 Implementation details

Mathematically, the maturity score is calculated from the questionnaire responses and the assumed weighted factors as follows:

$$S_{i,j} = \frac{100 \sum_{k=1}^{n_{i,j}} r_{k,j,i} \cdot w_{k,j}}{4 \sum_{k=1}^{n_{i,j}} w_{k,j}}$$

Where:

$S_{i,j}$ is the maturity score for State i in Study Area j .

$r_{k,j,i}$ is the numeric value of the response of State i to question k in Study Area j

$w_{k,j}$ is the weight factor of question k to Study Area j

$n_{i,j}$ is the number of questions in Study Area j for which responses were provided by the ANSP i .

An overall score for each State is then estimated by taking the average of the scores over all Study Areas.

4. LINKAGE OF OBJECTIVES, RESULTS AND CONCLUSIONS

Throughout the survey, attention will be paid to maintaining logical links between the objectives, the quantitative and qualitative assessment of responses and the conclusions. These links will underline the credibility of the conclusions and provide traceability.

The telephone and face-to-face interviews will be linked to the questionnaires and will be used in part to validate the responses in the questionnaires.

The interviews will focus on obtaining information on issues that would affect a regulator's ability to develop its ATM safety oversight mechanisms (both positive and negative). These issues will be recorded in a searchable Interview Repository and provided input for the conclusions for each Study Area.

5. PRESENTATION OF RESULTS

The results will be presented in a report that will contain a series of graphs and bar charts showing the percentage of responses and/or States within each level of maturity for each of the Study Areas. The future results from previous studies will be included for comparison purposes. However, 2010 will not have any comparative results from previous studies as it will be the first year that this revised Maturity Study methodology will have been used and there will therefore be no historic data associated with the methodology being used.

Each graph will be supported by:

- A brief comment on the results that highlight the main points of comparisons;
- Comments from the interviews that highlight issues raised by participants.

In addition to the charts, comments are provided based on broader, more open, questions seeking "safety intelligence" on the enablers and disablers and on additional local/national/regional safety programmes.

There will be a high-level report in which the findings will be de-identified, but each Regulator will also be provided with a synopsis of their own study assessment.



APPENDIX 1 DETAILED MATURITY STUDY AREAS OBJECTIVES AND ASSOCIATED MATURITY LEVELS

The following tables in this Appendix provide the detailed objectives for each Study Area together with a description for each maturity level for that objective. The survey Questionnaire is composed of these study areas.

The questionnaires ask participants to chose the category that best describes their organisation and once the questionnaire is completed it becomes a Confidential document and the contents are only released to the State that has completed it. All requirements for the previous stage/level must be fully satisfied before proceeding to the next stage of the model. No maturity stages can be skipped. If an Organisation has elements in various adjacent maturity categories then they shall take a conservative approach and select the lowest maturity level.

S1 - State Safety Framework

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S1-1 There is a well established primary aviation legislation that contains provisions enabling the government and its administration to proactively supervise and regulate civil aviation activities in relation to Air Traffic Management.</p>	<p>There is a primary legislative framework for civil aviation. However it is not in line with the level of complexity of the national aviation system and/or does not cover all ATM oversight aspects.</p>	<p>All of Initiating plus: A gap analysis of the primary legislative framework has been performed and an Implementation Plan for the ATM primary legislation has been prepared.</p>	<p>All of Planning/Initial Implementation plus: Primary aviation legislation covering ATM areas have been published and implemented.</p>	<p>All of Implementation plus: The best practices that are being implemented by other States in the area of establishing primary aviation legislation with regard to ATM are being actively adopted.</p>	<p>All of Managing & Measuring plus: Best practices in the development and establishment of a primary legislative framework including ATM are established with other States and recognised by the ATM industry.</p>
<p>S1-2 There are adequate regulations that address, at least at minimum level, national requirements stemming from primary legislation and international obligations providing for standardised procedures, equipment and infrastructure in ATM.</p>	<p>There is secondary legislation for civil aviation. However, it does not cover all elements of the primary legislation relating to ATM.</p>	<p>A gap analysis of the legislative framework has been performed and an Implementation Plan for the secondary legislation is in place and its implementation has commenced.</p>	<p>The secondary legislation addresses, at least at minimum level, national requirements stemming from primary legislation and international obligations.</p>	<p>Secondary legislation is constantly being evaluated and modified when necessary in order to adjust to the changing ATM environment. The best practices that are being implemented by other States in the area of establishing secondary legislation with regard to ATM are being actively adopted and</p>	<p>Best practices in the development and establishment of a secondary legislative framework including ATM are established with other States and are recognized by the ATM industry.</p>

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
		<i>All of Initiating plus:</i>	<i>All of Planning/Initial Implementation plus:</i>	<i>All of Implementation plus:</i>	<i>All of Managing & Measuring plus:</i>
S1-3 Regulations addressing the minimum level of national requirements are known to staff, and are regularly reviewed, assessed and maintained up to date by the appropriate authority within the Regulatory function.	Staff have only limited knowledge of requirements and there is no formal process that ensures requirements are maintained up to date.	A process has been identified to maintain regulations addressing the minimum level of national requirements but its initial implementation is ad hoc and ineffective.	The process to maintain all regulations addressing the minimum level of national requirements is formalised and systematic. Procedures are kept up to date and changes are notified to staff.	There is a formal process in place to periodically review regulations addressing the minimum level of national requirements which ensures that they continue to be relevant, up to date and effective.	The organisation has an effective mechanism in place to identify changes within the organisation that could affect regulatory processes.
S1-4 There is a Regulatory organisation established and other relevant authorities, supported by appropriate and adequate technical and non-technical staff with safety policies, regulatory functions and objectives in place.	There are safety regulatory bodies in place performing regulatory activities on an ad hoc basis. However, there is no formally nominated Regulatory organisation.	There is an approved plan to formalize the creation of a Regulatory organisation that will perform safety regulatory functions. Implementation has commenced. Recruitment of staff is under way.	A Regulatory organisation has been established and safety policies, regulatory functions and objectives are in place. The Regulatory organisation is supported by appropriate and adequate technical and non-technical staff.	The Regulatory processes are used to establish consistency across the organisation. As a result, the regulatory functions performed across the ATM industry are consistent and an integrated annual planning process is in place.	Safety policies, regulatory functions and objectives are periodically reviewed with the aim of continuous improvement. The Regulatory organisation is establishing safety regulatory best practices for the ATM industry.
S1-5 The regulatory and service provision functions are clearly separated at all levels in the State.	There is no separation of regulatory and service provision functions.	Some of the regulatory and service provision functions are separated. There is a plan in place to establish complete functional separation and implementation has commenced.	Functional separation of regulation and service provisions has been established. However, ultimately they report to the same level of authority.	The regulatory and service provision functions are separated and completely independent.	The separated regulatory and service provision functions and organisations are periodically reviewed and are incorporated within the overall aviation safety system.

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
S1-6 Legislation is in place to ensure the oversight of safety requirements in accordance with national and international obligations.	Existing legislation does not cover the safety oversight requirements, and is not in line with the level of complexity of the national aviation system.	All of Initiating plus: A gap analysis of the existing legislative framework has been performed and an Implementation Plan for the safety oversight system has been prepared and has been initiated.	All of Planning/Initial Implementation plus: Aviation legislation and requirements covering safety oversight, have been published and implemented.	All of Implementation plus: The legislation and associated regulations on safety oversight requirements are applied in a consistent manner. Comprehensive guidance material is being adapted and adopted from ATM industry best practices.	All of Managing & Measuring plus: The legislation, guidance material and associated regulations on safety oversight are periodically reviewed and amended with the aim of continuous improvement. These are incorporated within the overall aviation safety system.
S1-7 The State's regulatory process takes into account the need to implement and comply with national requirements and international obligations in a timely and consistent manner.	There is awareness of the international obligations and requirements and the necessity to comply with them in a timely manner. However, compliance is on an ad hoc basis (e.g. due to limited resources).	There is awareness of the international obligations and plans are in place to comply with them in a timely manner. Work has started in some areas.	International obligations related to safety are known and the minimum level has been implemented in a timely manner to satisfy national requirements and international obligations.	There is a process in place to proactively ensure, timely and consistent conformity with national requirements and international obligations.	There is a systematic process in place, recognised by the ATM industry, to regularly review and amend the safety standards and to ensure ongoing consistent compliance with national requirements and international obligations.

S2 - Safety Resources

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
S2-1 There are adequate financial and competent resources in place to carry out all phases of the safety regulatory processes.	Resources for safety regulatory functions are provided on an 'as and when needed' ad-hoc basis.	<i>All of Initiating plus:</i> Resources only allow for a limited number of safety regulatory activities. A plan is in place to increase resource levels.	<i>All of Planning/Initial Implementation plus:</i> Resource allocations (either internal or through the means of recognised organisations) are sufficient to cover, at least at minimum level, safety regulatory functions. A periodic review of the resources needed to perform the safety oversight function is in place.	<i>All of Implementation plus:</i> There is a resource plan in place to ensure continued allocation of adequate resources to all safety regulatory functions. A multi-annual resource planning process is in place for all phases of the safety regulatory processes.	<i>All of Managing & Measuring plus:</i> Safety has a high priority during resource allocation and all safety regulatory functions are well resourced. Safety authorities, responsibilities and accountabilities are reviewed after any significant organisational change. The Regulator has sufficient resources to ensure that the safety regulatory functions provided are effective and the State is setting regulatory best practices which are recognised by the ATM industry.
	S2-2 Staff are qualified and trained. Technical and administrative staff are competent for the tasks required of them and are certified/licensed where required.	Staff have little knowledge of ATM; however there is a growing understanding of the requirements against which ATM is regulated.	Individuals understand the requirements for the ATM safety regulatory functions but have yet to develop the skills required to apply them.	There are adequate and trained staff, who are certified/licensed where required, according to the requirements of their role. There is a training plan in place to ensure ongoing competency and qualification of staff.	There is a proactive process in place to review and amend the competency and qualification schemes.

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
S2-3 There is sufficient guidance material and safety information provided for staff to enable them to perform their functions effectively and in a standardised manner.	Guidance material and safety information is being provided to staff in an ad hoc manner. Standardisation of the execution of safety regulatory functions is not yet in place.	<i>All of Initiating plus:</i> Staff have access to relevant guidance material provided by international organisations without being customised for the national regulatory framework. There is a formal plan to standardise performance of the safety regulatory functions and to provide staff with guidance material and safety information on a regular basis. There is evidence that the formal plan has been initiated.	<i>All of Planning/Initial Implementation plus:</i> Appropriate guidance material and safety information is provided according to the national regulatory requirements. Staff have full access to relevant guidance material and safety information provided by international organisations.	<i>All of Implementation plus:</i> The national regulator is actively involved in the adoption of appropriate international guidance material and safety information used by other States. Relevant safety information is proactively exchanged with national stakeholders.	<i>All of Managing & Measuring plus:</i> The national regulator is actively involved in the development of technical guidance material, tools and safety information. The resulting products are recognised as international 'best practices' within the ATM industry.
	There is no formal designation of responsibilities and accountabilities covering safety regulatory functions (e.g. safety oversight, rulemaking). Not all roles and responsibilities have been communicated to staff.	There is a generic division of roles and responsibilities and ad hoc actions taken in order to make staff aware of their responsibilities. There is a plan in place to ensure all staff are aware of their roles and responsibilities.	Documented responsibilities and accountabilities for regulatory staff are in place and are derived from national requirements. Individuals are aware of their roles and responsibilities with regard to safety regulatory functions (e.g. safety oversight, rulemaking).	Safety responsibilities and accountabilities of appropriate staff are proactively assessed for their fitness for purpose. Staff is consulted with regard to improve and review their responsibilities and accountabilities.	Safety responsibilities and accountabilities are periodically reviewed and modified with the aim of continuous improvement (including after any significant organisational change). Individuals take proactive action to have the rules and procedures changed where a safety benefit is identified.
S2-4 The State regulator has documented responsibilities and accountabilities of their staff. In addition, it has delegated sufficient legal authority to staff to allow them to execute their duties. Staff within the Regulatory Organisation understand and accept their responsibilities.	There is no formal designation of responsibilities and accountabilities covering safety regulatory functions (e.g. safety oversight, rulemaking). Not all roles and responsibilities have been communicated to staff.	There is a generic division of roles and responsibilities and ad hoc actions taken in order to make staff aware of their responsibilities. There is a plan in place to ensure all staff are aware of their roles and responsibilities.	Documented responsibilities and accountabilities for regulatory staff are in place and are derived from national requirements. Individuals are aware of their roles and responsibilities with regard to safety regulatory functions (e.g. safety oversight, rulemaking).	Safety responsibilities and accountabilities of appropriate staff are proactively assessed for their fitness for purpose. Staff is consulted with regard to improve and review their responsibilities and accountabilities.	Safety responsibilities and accountabilities are periodically reviewed and modified with the aim of continuous improvement (including after any significant organisational change). Individuals take proactive action to have the rules and procedures changed where a safety benefit is identified.

S3 - Safety Interfaces

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S3-1 All safety related internal interfaces are effectively and proactively managed.</p>	<p>The Regulatory Organisation is aware of its internal safety related interfaces but manages them on an informal basis.</p>	<p>All of Initiating plus: Internal safety related interfaces are identified. Processes and procedures planned to manage them in a formalised way have been initiated.</p>	<p>All of Planning/Initial Implementation plus: All safety related internal interfaces are managed in a formal manner. Safety requirements are specified and documented in appropriate managerial arrangements (e.g. Service Level Agreements – SLAs, a common Regulatory Management System etc).</p>	<p>All of Implementation plus: All internal safety related interfaces are managed and measured to assess their effectiveness. Regulatory Organisation processes ensure that a consistent corporate approach is applied to safety related activities across the organisation.</p>	<p>All of Managing & Measuring plus: Surveys are conducted on a regular basis to identify weaknesses in the internal interface processes. The safety regulatory functions are incorporated within the organisation. All internal safety related interfaces are managed effectively and are measured systematically with the aim of continuous improvement.</p>
<p>S3-2 Related internal regulatory management systems (e.g. Safety Programme and QMS) have been coordinated.</p>	<p>There is un-coordinated ad hoc integration of internal regulatory management systems. Processes and procedures across the organisation are conducted in isolation.</p>	<p>A formal plan exists for further alignment of internal regulatory management systems, which has been initiated. Processes and procedures across the organisation have been mapped and potential synergies identified.</p>	<p>The integration of the alignment of the internal regulatory management systems is ongoing. Processes and procedures to ensure a coherent approach amongst internal regulatory management systems are still in place, even following organisational changes.</p>	<p>Where appropriate, there is full integration of all management systems across the organisation. Relationships between departments are being proactively built. Regulatory Organisation processes and procedures ensure that a consistent corporate approach is applied to safety related activities across the organisation.</p>	<p>Working practices ensure that the organisation works as a coherent system and not as a group of individual or fragmented units. There is a review process in place to ensure that the Regulatory Organisation can adapt proactively to organisational changes and continuously improve the internal regulatory management systems. Processes and procedures are incorporated within the overall internal management system.</p>

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
S3-3 All external interfaces with a safety impact (other Regulators, ANSPs, MIL, Airspace Users, Airports, etc.) are coherent, effective and proactively managed.	The Regulatory Organisation is aware of external safety related interfaces, but manages them on an informal basis.	<i>All of Initiating plus:</i> External safety related interfaces are identified and processes and procedures are planned to manage them in a formalised way. Implementation activities have commenced.	<i>All of Planning/Initial Implementation plus:</i> All safety related external interfaces are managed in a formal manner. Safety requirements are specified and documented in appropriate managerial arrangements (e.g. where appropriate, Letters of Agreement – LOAs; Service Level Agreements – SLAs, MoUs etc). The Regulatory Organisation plans to be the subject of peer review type activities.	<i>All of Implementation plus:</i> All external safety related interfaces are managed and measured to determine their effectiveness. Regulatory Organisation processes ensure that a consistent corporate approach is applied to external safety related interfaces. The Regulatory Organisation participates in peer review type activities with other Regulators and act on the results.	<i>All of Managing & Measuring plus:</i> Internal surveys are conducted on a regular basis to identify and fix weaknesses in the external interface process. The Regulatory Organisation leads peer review type activities with other Regulators, and is recognised as best in class within the ATM industry. There is a systemic view of ATM which correlates the safety regulatory functions for all industry elements, ANSPs, Airports, Airspace Users, Military and other regulatory organisations.
	The relationship (e.g. communication and consultation) with ANSPs is informal and ad-hoc.	The relationship (e.g. communication and consultation) with ANSPs is being formalised and procedures have been developed and implementation activities have started.	The relationship (e.g. communication and consultation) with ANSPs is formalised and procedures have been implemented.	The relationship (e.g. communication and consultation) with ANSPs is not only formalised but also collaborative (e.g. through joint policy boards with defined terms of reference). Historic data is shared when appropriate.	The relationship with ANSPs is systemically and proactively reviewed for continuous improvement. Real-time sharing of safety related data is in place with respect to the management of safety. Formalised sharing of staff (i.e. secondments) is systematically practiced. Support and guidance is provided on the basis of mutual respect and trust.
S3-4 Working relationships with ANSPs are based on formalised processes and procedures in accordance with their safety significance.	The relationship (e.g. communication and consultation) with ANSPs is informal and ad-hoc.	The relationship (e.g. communication and consultation) with ANSPs is being formalised and procedures have been developed and implementation activities have started.	The relationship (e.g. communication and consultation) with ANSPs is formalised and procedures have been implemented.	The relationship (e.g. communication and consultation) with ANSPs is not only formalised but also collaborative (e.g. through joint policy boards with defined terms of reference). Historic data is shared when appropriate.	The relationship with ANSPs is systemically and proactively reviewed for continuous improvement. Real-time sharing of safety related data is in place with respect to the management of safety. Formalised sharing of staff (i.e. secondments) is systematically practiced. Support and guidance is provided on the basis of mutual respect and trust.

S4 - Safety Reporting, Investigation and Improvement

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
S4-1 Institutional arrangements are in place for the supervisory and regulatory tasks as regards collection, investigation, evaluation and dissemination of occurrence data.	There is an informal structure in place for the collection, investigation, evaluation and dissemination of safety occurrence data.	<p>All of Initiating plus:</p> <p>There is an approved plan to formalise the existing structure for the collection, investigation, evaluation and dissemination of safety occurrence data.</p> <p>There is State commitment from management to allocate resources so that independent activities for the investigation and evaluation of accidents and serious incidents can be implemented.</p>	<p>All of Planning/Initial Implementation plus:</p> <p>The Regulatory function has a formal independent system in place that provides for the collection, investigation, evaluation and dissemination of safety occurrence data.</p>	<p>All of Implementation plus:</p> <p>The State has a formal and robust system in place that provides for the capture of internal- and external-wide information on ATM occurrences.</p> <p>The system is enhanced through the adoption of regulatory best practices.</p>	<p>All of Managing & Measuring plus:</p> <p>The State system for the collection, investigation, evaluation and dissemination of safety occurrence data is regularly reviewed to ensure continuous improvement.</p> <p>The system is considered to be amongst the best in class within the ATM industry, and is adopted and adapted by other States.</p>
S4-2 The State is implementing a just culture climate.	There is an awareness of the need to implement just culture, but no formal steps have been implemented yet.	<p>All of Initiating plus:</p> <p>Formal steps to implement a just culture have been initiated with various stakeholders.</p>	<p>All of Planning/Initial Implementation plus:</p> <p>Just culture is perceived to be in place. However, the system has yet to be tested to fully validate the application of the just culture principles and policies implemented.</p>	<p>All of Implementation plus:</p> <p>The State(s) within which the Organisation operates has made clear, agreed, structural arrangements about who gets to draw the line between the acceptable and non-acceptable behaviour.</p> <p>Dialogue with Stakeholders on Just Culture issues is established and followed.</p> <p>The system has been tested and validated in a number of cases.</p>	<p>All of Managing & Measuring plus:</p> <p>The involvement of the domain expertise in support of drawing the line jointly with judicial system is ensured.</p> <p>A continuous dialogue with Judicial Authorities and all other stakeholders on just Culture issues is maintained.</p> <p>The system is considered to be robust and is being adopted and adapted by other States.</p>

S5 - Safety Performance Monitoring

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S5-1 Acceptable safety levels, both for the State and operators/service providers, are commonly established through the ATM safety regulatory framework.</p>	<p>Safety levels are established through the ATM safety regulatory framework in a limited number of areas and in an ad hoc manner.</p>	<p>There is a plan in place to establish and formalise acceptable safety levels for the ATM system through the ATM safety regulatory framework. Implementation activities have commenced.</p>	<p>All of Planning/Initial Implementation plus: Formalised acceptable safety levels have been established for the ATM system through the ATM safety regulatory framework.</p>	<p>All of Implementation plus: An evaluation of the acceptable safety levels is carried out on a regular basis and changes are introduced when necessary.</p>	<p>All of Managing & Measuring plus: The acceptable safety level review process is proactively incorporated within the overall aviation safety system. Based on proactive recommendations, acceptable safety levels are linked to potential safety-critical hazards and events.</p>
<p>S5-2 The levels of safety achieved are regularly monitored and assessed in order to determine their compliance with safety regulatory requirements.</p>	<p>Ad hoc monitoring is carried out but there is limited assessment and determination of compliance with the safety regulatory requirements.</p>	<p>An approved plan is in place to formalise the safety monitoring and assessment of safety levels against safety targets and thresholds. Implementation activities have commenced.</p>	<p>There is a formalised and effective system in place for safety level monitoring and assessment. Some initial safety targets and thresholds have been established and internal benchmarking activities to determine their compliance with safety regulatory requirements have started.</p>	<p>Assessments of safety levels are carried out using validated safety targets and thresholds on a regular basis, and safety recommendations/ directives are issued when necessary. External benchmarking activities have started with the aim of incorporating best practices from other regulatory organisations.</p>	<p>The results of the monitoring and assessment of acceptable safety levels are used for improvements of the regulatory and oversight aspects of ATM. Internal and external benchmarking activities are well established and aim to continuously improve the levels of safety, and set new standards of safety regulatory requirements within the ATM industry.</p>

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S5-3 The public have knowledge of the overall ATM safety related performance through routine publication of achieved safety levels and trends.</p>	<p>All ATM safety related performance information is deemed as confidential and is not made available to the public.</p>	<p>All of Initiating plus: A limited amount of ATM safety related performance information is made available to the public.</p>	<p>All of Planning/Initial Implementation plus: Appropriate ATM safety related performance information is made available to the public.</p>	<p>All of Implementation plus: The ATM safety related performance information is systematically reviewed with the aim to present the public with a comprehensive view on achieved safety levels and trends.</p>	<p>All of Managing & Measuring plus: The State proactively provides access to appropriate ATM safety related performance information. Achieved and projected levels of safety are transparent to the public. There is a feedback process in place that enables those receiving/ accessing information to comment on its relevance, and corrective measures are put in place to rectify any communication deficiencies.</p>

S6 - Implementation of Safety Oversight

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S6-1 The State's safety oversight system is implemented in accordance with national regulatory requirements and international obligations (i.e. processes and procedures for the oversight of the safety regulatory requirements (e.g. granting, revocation, limitation or suspension of license/certificate; authority to conduct inspections/audits, make recommendations, monitoring activity to ensure that objectives and requirements are met; planning, conducting oversight activities)) are effectively implemented.</p>	<p>The safety oversight system is based on ad hoc arrangements. Deviations from the national safety regulatory requirements and international obligations exist.</p>	<p>All of Initiating plus: The safety oversight system is partially implemented. However, there is a plan in place to ensure it will meet the minimum standards established through national regulatory requirements and international obligations.</p>	<p>All of Planning/Initial Implementation plus: The safety oversight system has been implemented and meets national regulatory requirements and international obligations.</p>	<p>All of Implementation plus: The safety oversight system is systematically managed and measured for its effectiveness. There is a process in place to adapt and implement industry best practices concerning the safety oversight system.</p>	<p>All of Managing & Measuring plus: The safety oversight system is reviewed and amended with the aim of continuous improvement. It is recognised in the ATM industry as being amongst the best in class.</p>

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
S6-2 Audits are conducted by qualified auditors to ensure that all applicable ATM safety regulatory requirements and implementing arrangements by ANSPs are being met.	Audits are conducted on an ad hoc basis but are not consistent with national regulatory and international obligations.	All of Initiating plus: Implementation activities in respect of oversight audits have started but they are not yet completed. There are insufficient trained auditors to effectively monitor the implementation of ATM safety regulatory requirements.	All of Planning/Initial Implementation plus: Regular audits are performed by qualified staff who are independent of the ANSPs.	All of Implementation plus: There is a systematic approach to auditing. The safety regulatory process is used to ensure that there are consistent auditing rules and processes across the State's ATM safety framework.	All of Managing & Measuring plus: The safety regulatory framework in respect of auditing processes is incorporated within the overall safety system and is periodically reviewed to ensure continuous improvement.
S6-3 Processes and methods are in place to ensure that the safety regulatory requirements in respect to changes to the ATM system are being met.	The Regulatory Organisation reviews of safety arguments in respect of changes to the ATM system are performed on an ad hoc basis. There are limited regulatory safety review methods in place.	The process for the Regulatory Organisation reviews of proposed changes to the ATM system has started to be formalised, but there are insufficient staff to perform all reviews. Initial implementation has started.	There is a systematic approach to approval of changes to the ATM system. Reviews of changes to the ATM system are performed by qualified staff who are independent of the ANSPs. A formal regulatory safety review mechanism is in place. However, risk assessment regulatory reviews are conducted only on changes that are safety critical.	The safety regulatory process is used to ensure that there is a consistent approach to changes to the ATM system and reviews are conducted commensurate with the level of risk posed. Where appropriate, quantified safety levels are used. The regulatory safety review mechanism and its associated methodologies are	The safety regulatory framework in respect of changes to the ATM system is incorporated within the overall safety system and is periodically reviewed to ensure continuous improvement. The national regulatory safety review mechanism is recognised amongst ATM industry best practice.

S7 - Adoption and Sharing of Best Practices

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S7-1 The State has an established system that gathers information on regulatory best practices and lessons learned from the industry (such as regional/local operational safety improvement action plans, TOOLKITS).</p>	<p>Information gathering on regulatory best practices and lessons learned is done on an ad hoc basis. Evaluation of the applicability of best practices and lessons learned is done on an ad hoc basis.</p>	<p>All of Initiating plus: A formal plan is in place to gather regulatory best practices and lessons learned. Initial implementation has started. Some formal evaluation of the applicability of best practices and lessons learned is undertaken.</p>	<p>All of Planning/Initial Implementation plus: There is a robust and effective mechanism in place for the collection of regulatory best practices and lessons learned. Their applicability to different situations is evaluated, and information disseminated / best practice adopted where appropriate. Formal evaluation of the applicability of best practices and lessons learned is undertaken.</p>	<p>All of Implementation plus: The information gathering mechanism is periodically reviewed. The regulatory organisation actively participates in developing regulatory best practices and shares these with other regulatory organisations.</p>	<p>All of Managing & Measuring plus: There is a systematic process in place to proactively review and improve the information gathering mechanism. The State is establishing regulatory best practices which are recognised within the ATM industry.</p>
<p>S7-2 There is a process in place to share regulatory best practices and safety lessons learned. All information is shared internally, nationally, regionally and with international bodies.</p>	<p>Sharing of regulatory best practices and safety lessons learned is done on an ad hoc basis. Information is shared internally but there are no plans to release it to external stakeholders in any way, as these matters are considered to be confidential.</p>	<p>The benefits of sharing regulatory best practices and safety lessons learned with other parties is recognised. A plan is in place to identify and develop a network to enable this sharing and implementation activities have commenced. Information has started to be shared externally, but it is considered that there are insufficient safeguards to sharing information more widely.</p>	<p>A national policy has been published with regard to sharing safety related regulatory best practices and safety lessons learned with other parties. A documented process is in place to enable the sharing of regulatory best practices and safety lessons learned internally and also with national and regional organisations and international bodies.</p>	<p>Regulatory best practices and safety lessons learned are systematically shared internally, nationally, regionally and with international bodies with the aim of establishing remedial actions, as appropriate.</p>	<p>The process is reviewed on a regular basis and is incorporated within the organisation at all levels with the aim of continuous improvement. Remedial actions arising and lessons learned are used in national and/or regional safety improvement initiatives.</p>

S8 - Safety Culture

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S8-1 There is a proactive regulatory safety culture that is led by the management in ensuring that relevant staff are aware of and support the regulatory organisation's shared safety beliefs, assumptions and values.</p>	<p>There are few shared safety beliefs, assumptions and values across the regulatory organisation.</p> <p>There are differences between what is done, what is said and what is understood.</p> <p>Staff may not have a harmonized understanding of what "safety" means for their activities.</p>	<p>All of Initiating plus:</p> <p>There is growing commitment towards establishing a proactive regulatory safety culture across all levels of the organisation.</p> <p>Staff within the regulatory organisation have a good level of safety awareness. The regulatory organisation is starting to cater for and put processes in place to facilitate the consideration of safety throughout its activities.</p>	<p>All of Planning/Initial Implementation plus:</p> <p>There is a regulatory safety culture in place, but this is not yet mature.</p> <p>Further work is needed to ensure that staff engage in a proactive manner.</p> <p>Staff across the regulatory organisation are involved in safety activities (passively).</p>	<p>All of Implementation plus:</p> <p>Safety related experiences are openly exchanged internally and externally.</p> <p>The Regulatory function operates informed, learning and reporting cultures as well as a just culture with respect to oversight errors.</p>	<p>All of Managing & Measuring plus:</p> <p>Activities include the identification and sharing of best practices related to regulatory safety culture.</p> <p>Regulatory safety culture is led by the senior management and the organisation's safety culture is well recognized by the ATM industry.</p>
<p>S8-2 Safety culture is measured on a regular basis and there is an improvement programme in place.</p>	<p>The need to have regulatory safety culture measurement in place is not yet recognised.</p> <p>The regulatory organisation is determining what safety means for them and is generating some awareness of this throughout the organisation.</p>	<p>Senior management is aware of the need to have periodic measurements of regulatory safety culture in place as well as an improvement plan, but what and when will be measured is still being defined.</p>	<p>Regulatory safety culture has been measured and results are available within the regulatory organisation.</p> <p>An improvement plan has been agreed by the senior management.</p>	<p>Regulatory safety culture enablers and disablers are identified and the improvement initiative is sharing those with other regulatory organisations.</p> <p>There are incentives for being pro-active and committed to improving safety culture (due to their internalised belief that safety oversight and safety management are important).</p> <p>The Regulatory function assesses its safety culture on a systematic basis and implements plans to improve any identified weaknesses.</p>	<p>Improvement plans are set to ensure that staff are aware of and support the regulatory organisation's shared beliefs, assumptions and values regarding safety across the Regulatory function.</p> <p>Senior management and staff are proactively and jointly participating in continuously improving the regulatory safety culture within the regulatory organisation. Their approach is widely recognised within the ATM industry.</p>

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S8-3 Staff are motivated to ensure that the safety regulatory functions provide a quality service to its stakeholders.</p>	<p>The quality of service of regulatory functions to stakeholders is measured on an ad hoc basis.</p> <p>There is some motivation towards better quality services.</p>	<p>All of Initiating plus:</p> <p>There is a formal plan to implement a motivation scheme for safety regulatory functions in order to provide a quality service to stakeholders.</p>	<p>All of Planning/Initial Implementation plus:</p> <p>There is an appropriate motivation scheme in place that ensures the provision of adequate quality services to stakeholders.</p>	<p>All of Implementation plus:</p> <p>There is an ad hoc system of collection of stakeholder feedback in order to verify the quality of safety regulatory functions.</p> <p>The results of the feedback are used for upgrading the quality of service and motivation of staff.</p> <p>Safety regulatory functions are measured in means of quality service to stakeholders.</p>	<p>All of Managing & Measuring plus:</p> <p>There is a continuous monitoring of both the motivation scheme and quality of services provided to stakeholder by safety regulatory functions.</p> <p>Results are regularly reviewed and changes are implemented when necessary.</p>

S9 – Resolution of Safety Deficiencies

Objective	Initiating	Planning/ Initial Implementation	Implementating	Managing & Measuring	Continuous Improvement
<p>S9-1 The results of occurrence reporting system and investigation activities are used in the identification of deficiencies and safety concerns and their resolution.</p>	<p>Results from occurrence reporting system and investigation activities are used for identification and analysis of safety deficiencies and concerns on an ad hoc basis.</p> <p>A plan to formalise the analysis of the results from the occurrence reporting system and investigation activities is being developed.</p>	<p>All of Initiating plus:</p> <p>There is an approved plan in place to formalise the analysis of the results from the occurrence reporting system and investigation activities in order to provide safety recommendations.</p> <p>There is evidence that some areas of the plan have been initiated.</p>	<p>All of Planning/Initial Implementation plus:</p> <p>There is a formal system for identification and analysis of deficiencies and safety concerns resulting from the investigation of safety occurrence reporting.</p> <p>Safety recommendations/directives are issued based on identified safety deficiencies, and concerns.</p>	<p>All of Implementation plus:</p> <p>Follow-up actions resulting from safety recommendation/directives are monitored to ensure corrective and mitigation actions are implemented.</p> <p>There are documented cases where operating restrictions have been imposed, where appropriate, based on the systematic identification of deficiencies and concerns resulted from the occurrence reporting system.</p>	<p>All of Managing & Measuring plus:</p> <p>Best practices with regard to the identification of safety deficiencies and concerns and their resolution are shared with safety regulatory organisations.</p> <p>The process of resolving identified safety concerns is monitored to ensure continuous improvement.</p> <p>The safety deficiency, identification and analysis approach is recognised as best in class within the ATM industry.</p>
	<p>The results of the safety oversight activities are used in the identification of safety deficiencies and concerns on an ad hoc basis.</p> <p>A plan to formalise the analysis of the results from the safety oversight activities is being developed.</p>	<p>A formal plan has been developed to use the results of the safety oversight activities for the issuance of safety recommendations and for the resolution of safety deficiencies and concerns.</p> <p>There is evidence that some areas of the plan have been initiated.</p>	<p>There is a formal system in place for the identification and analysis of deficiencies and safety concerns resulting from safety oversight activities.</p> <p>Safety recommendations/directives are issued based on identified safety deficiencies, and concerns.</p>	<p>Follow-up actions resulting from safety recommendation/directives are monitored to ensure corrective and mitigation actions are implemented.</p> <p>There are documented cases where operating restrictions have been imposed, where appropriate, based on the systematic identification of deficiencies and concerns resulted from the safety oversight activities.</p>	<p>Best practices with regard to the identification of safety deficiencies and concerns and their resolution are shared with safety regulatory organisations.</p> <p>The process of resolving identified safety concerns is monitored to ensure continuous improvement.</p> <p>The safety deficiency, identification and analysis approach is recognised as best in class within the ATM industry.</p>
<p>S9-2 The results of the safety oversight activities (e.g. audits, inspections, certification, oversight of changes, oversight of ATM staff etc) are used in the identification of deficiencies and safety concerns and their resolution.</p>	<p>The results of the safety oversight activities are used in the identification and analysis of safety deficiencies and concerns on an ad hoc basis.</p> <p>A plan to formalise the analysis of the results from the safety oversight activities is being developed.</p>	<p>A formal plan has been developed to use the results of the safety oversight activities for the issuance of safety recommendations and for the resolution of safety deficiencies and concerns.</p> <p>There is evidence that some areas of the plan have been initiated.</p>	<p>There is a formal system in place for the identification and analysis of deficiencies and safety concerns resulting from safety oversight activities.</p> <p>Safety recommendations/directives are issued based on identified safety deficiencies, and concerns.</p>	<p>Follow-up actions resulting from safety recommendation/directives are monitored to ensure corrective and mitigation actions are implemented.</p> <p>There are documented cases where operating restrictions have been imposed, where appropriate, based on the systematic identification of deficiencies and concerns resulted from the safety oversight activities.</p>	<p>Best practices with regard to the identification of safety deficiencies and concerns and their resolution are shared with safety regulatory organisations.</p> <p>The process of resolving identified safety concerns is monitored to ensure continuous improvement.</p> <p>The safety deficiency, identification and analysis approach is recognised as best in class within the ATM industry.</p>

The following additional study areas are also used, but not to quantify the safety maturity, they are rather seeking "safety intelligence" on the enablers and disablers and on additional local/national/regional safety programmes.

S10	Are there any issues that are delaying your State's implementation plans for aviation safety requirements of international regulations, directives or standards (Yes/No)?		If Yes please specify.	
S11	Are there any issues (organisational, resources, training etc.) that are negatively influencing your safety oversight capabilities (other than those mentioned in S10)? (Yes/No)		If Yes please specify.	
S12	Are there any issues related to safety regulation and/or safety oversight that have not been addressed by ICAO and/or EUROCONTROL? (Yes/No)		If Yes please specify.	
S13	Are there any issues related to the hampering of effective implementation of safety reporting, investigation and/or safety monitoring (other than mentioned in earlier questions)? (Yes/No)		If Yes please specify.	

APPENDIX 2 - GLOSSARY

Acronym or Term	Meaning
ANSP	Air Navigation Services Provider. This is the operational organisation delivering service to airspace users.
ATM	Air Traffic Management
Best Practice	A method, initiative, process, approach, technique or activity that is believed to be more effective at delivering a particular outcome than any other means. It implies accumulating and applying knowledge about what is working and not working, including lessons learned and the continuing process of learning, feedback, reflection and analysis (what works, how and why) It is recognised within the ATM industry as something that, when applied, improves safety levels or operations.
CANSO	Civil Air Navigation Services Organisation
CMMI	Capability Maturity Model Integration
EANPG	European Air Navigation Planning Group
ECAC	European Civil Aviation Conference
ESARR	EUROCONTROL Safety Regulatory Requirement
ESIMS	ESARR Implementation Monitoring and Support (ESIMS) Programme.
ESP	European Safety Programme for ATM
ICAO	International Civil Aviation Organisation, a special United Nations division tasked with fostering safe and efficient international civil air transport.
ISO	International Organisation for Standardisation
IUSOAP	ICAO Universal Safety Oversight Audit Programme
Just Culture	<p>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. (SAFREP Task Force definition).</p> <p>An atmosphere of trust in which people are encouraged for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour. (CANSO definition).</p>
KPI	Key Performance Indicator
LCIP	Local Convergence Implementation Plan
LSSIP	Local Single Sky Implementation
Operational Safety Surveys	Programmes which provide organisations with an understanding of the threats or opportunities which exist to improve safety performance or compliance with domestic or international safety regulations.
PC	Provisional Council
Regulator	Regulator, often the National Civil Aviation Authority.
Risk Management	A systematic, explicit, and comprehensive analytical approach for managing safety risk at all levels and throughout the entire scope of an operation or the lifecycle of a system in ATM.
Safety	Freedom from unacceptable risk of harm.

Safety Audit	Testing of process, product, people, organisation or system to assure that safety requirements embedded in domestic and international regulations are complied with.
Safety Culture	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.
Safety Management Function	<p>A business unit within an organisation which is dedicated to the oversight of safety and its management. (CANSO definition)</p> <p>A managerial function with organisational responsibility for development and maintenance of an effective safety management system> (EUROCONTROL ESARR3 definition).</p>
Safety Management System (SMS)	<p>An organised approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures. (CANSO definition).</p> <p>A systematic and explicit approach defining the activities by which safety management is undertaken by an organisation in order to achieve acceptable or tolerable safety. (EUROCONTROL ESARR3 definition)</p>
SMS Audit	Testing of process, product and people to assure that standards and requirements as documented in the organisation's SMS are complied with.
SAFREPTF	Safety Data Reporting and Data Flow Task Force
SMS	Safety Management System

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