Implementing the Global Aviation Safety Roadmap

A Strategic action plan for future aviation safety developed jointly by ACI, Airbus, Boeing, CANSO, FSF, IATA and IFALPA for ICAO, States and the Industry

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1. Introduction – A Global Strategy for Aviation Safety

In May 2005, the Air Navigation Commission of the International Civil Aviation Organization's (ICAO) held a consultation with the Industry on the improvement of aviation safety. One of the decisions of the meeting was the development of a common roadmap for aviation safety that would incorporate a process that would best prioritize initiatives and ensure that the safety initiatives throughout the world are coordinated so as to ensure consistency and reduced duplication of efforts. This led to the formation of the Industry Safety Strategy Group (ISSG). The ISSG members include:

- Airports Council International (ACI)
- Airbus
- Boeing
- the Civil Air Navigation Services Organization (CANSO)
- the Flight Safety Foundation
- the International Air Transport Association (IATA), and
- the International Federation of Air Line Pilots Associations (IFALPA).

(Appendix A includes a complete list of acronyms used in this document.)

The ISSG recognized that to achieve the desired level of leadership they needed to move beyond the traditional government/industry model and its often adversarial relationship between the Regulatory Authority and the industry it regulates, including the airlines and the manufacturers..

The ISSG worked with ICAO, the primary customer for their work, to produce the *Global Aviation Safety Roadmap Part 1 - A Strategic Action Plan for Future Aviation Safety*, which was handed over to ICAO in December 2005 and presented to the Directors General Civil Aviation (DGCA) Conference on a Global Strategy for Aviation Safety (DGCA/06) in March 2006. The conference welcomed the *Global Aviation Safety Roadmap* and recommended that:

> *"ICAO, in collaboration with all States & other stakeholders, continue development of an integrated approach to safety initiatives based on the Global Aviation Safety Roadmap - a global framework for the coordination of safety policies and initiatives."*

The DGCA/06 Recommendation was agreed to by ICAO Council on 15 June 2006

This document is the result of that recommendation and the continued industry-government collaboration that followed.

1.1 Objective of the Roadmap

The primary objective of the *Global Aviation Safety Roadmap Part 1* is to provide a common frame of reference for all stakeholders—States, Regulatory Authorities, airline operators, airport operators, aircraft manufacturers, pilot associations, safety organizations, and air traffic control service providers.

The *Global Aviation Roadmap Part 1* defines the 12 specific focus areas and related objectives that have been accepted by industry as vital to the enhancement of safety levels within global commercial aviation. (Figure 1.4 shows the focus areas and objectives.) Part 2 of the Roadmap builds upon these objectives by defining specific best or preferred practices which will enable the industry and States to address and correct the deficiencies outlined by the focus areas.

1.2 Overview of Part 2

In March 2006, the ISSG reconvened to develop Part 2 of the Global Aviation Safety Roadmap. The ISSG had three specific objectives:

- Define those activities necessary for the achievement of the Objectives identified in the Part 1 Roadmap, including both maturity guidance and metrics. These would be applied at the State, Regional, or industry organizational level to evaluate progress towards the achievement of those Objectives.
- Define a process for the development of Regional Action Plans which would enable the evaluation of the capabilities of the region and define prioritized actions necessary to improve safety within that region.
- Work with the ICAO to integrate the appropriate Roadmap components with ICAO's Strategic Objective on Safety and to incorporate suitable actions into the update of the Global Aviation Safety Plan (GASP).

1.3 Organization of the Report

Section 1 of this Report notes the Objective of the Roadmap and gives a short history of its development. It describes how the report is organized, and specifies its target audience. It also includes a short discussion of accident rates as a safety metric.

Section 2 is devoted to detailing those activities necessary for achieving the Objectives of the Roadmap. Each Focus Area and its related Objectives are described in detail, including why it is considered critical to enhancing aviation safety, and how the Objective addresses the enhancement of safety. For each Objective, one or more "Best Practices" are identified. (Implementing these Best Practices would achieve the intent of the Objective.) Finally, Metrics are identified for each Best Practice so that an evaluation of progress towards achievement of the Objectives can be made.

Section 3 addresses the development of a Regional Action Plan. Although the concepts identified in the Roadmap can be addressed at the individual State or Industry organization level, experience has shown that due to the complex interrelationships inherent in commercial aviation the most successful safety enhancement strategies

involve all segments of the Governments and Industry working together. As a team they are best qualified to identify potential enhancements to safety and to commit to the implementation plan necessary to achieve those enhancements.

Section 3 also defines a process for gathering the data necessary to accomplish such a regional assessment. It also describes the steps necessary to perform a "gap analysis" to identify safety enhancement activities. It is important that knowledgeable aviation system stakeholders of a particular region are involved in performing the regional analysis. The process defined herein also discusses those attributes which should be considered as the action plan is being developed.

Section 4 defines the next steps in enhancing and implementing the *Global Aviation Safety Roadmap* as committed to by the ISSG. Key among these next steps is ensuring a means by which the continued interaction with ICAO can be secured and making visible the commitment to work with Regional teams in an integrated fashion to develop regional action plans to implement the precepts of the *Roadmap*. (Regional teams include Regional Safety Teams, ICAO Cooperative Development of Operational Safety and Continuing Airworthiness Programmes [COSCAPs], etc.).

1.4 Target Audience

This document was written with several audiences in mind:

- ICAO – The ICAO is both a key customer of the Roadmap and a key partner in identifying and implementing State actions to achieve the *Roadmap* Objectives. As such, the need for ICAO to be closely involved in the follow-on development work was recognized by full ICAO participation in the ISSG development of the Part 2 Roadmap Implementation plan.
- Regional Safety Teams – The best practices presented in Section 2 and the action plan development process outlined in Section 3 can be used by regional teams to help them develop a safety enhancement plan.
- States and Industry – The best practices and maturity models outlined in Section 2 provide guidance to States and individual industry organizations on best practices that the ISSG recommend to be considered in evaluating their current status and identifying areas for safety enhancement.
- The ISSG – Section 4 of this document outlines the future actions that the Industry Safety Strategy Group has committed to and therefore provides a reference document for future ISSG activity.

1.5 Safety – A Performance Expectation – Measuring Risk

Part 1 of the Roadmap stated that Safety is a "Performance Expectation". With air travel already being the safest form of transportation, the challenge to industry and regulatory agencies is to make an already safe system safer. In the context of this Roadmap, the aviation industry is expected to deliver "A reduction in the global accident risk in commercial aviation". This raises the issue of the best way to measure this risk, together with any associated changes that are realized as a result of effective implementation of the *Roadmap*.

Accident rate data represents a reliable source for measuring safety performance. There are several excellent sources of accident rates which are maintained throughout the aviation industry, and should be considered a vital component to any risk measurement effort.

An example of this readily available data is the ICAO's report of the Council. These reports include tracking the fatal accident rate of aircraft employed on public air transport operations in scheduled operations. ICAO measures the worldwide safety performance in terms of a range of aviation safety statistics. Figure 1.1 shows an example of this data for fatal accidents by region involving scheduled commercial air transport operations for all fixed-wing aircraft over 5700 kg.

The International Air Transport Association (IATA) also publishes its annual Safety Report, which includes comprehensive accident statistics that reflect the performance of the industry as a whole over the past decade, updated by a detailed analysis of the accidents that occurred during the preceding year. Rather than measuring fatal accident rates, IATA tracks the rates of hull loss accidents of Western-built jets per million sectors for aircraft with a maximum certified take-off mass of more than 15,000 kg. For turboprop transport aircraft, IATA tracks those with a maximum take-off mass of more than 3900 kg (See Figure 1.2). By working with its industry safety stakeholders, IATA is aiming to reduce the current accident rate by an additional 25% by the end of 2008.

Boeing also publishes annual hull-loss based industry-wide accident statistics that reflect differences in regional accident rates, as shown in Figure 1.3. This will prove to be valuable information, since the overarching philosophy of the Roadmap emphasizes regional differences.

There is other publicly available and equally useful accident rate data and analysis that is useful in monitoring worldwide aviation safety. For example, traditionally difficult-to-access data needed to measure accident rates of Eastern-built aircraft is becoming more readily available. Soon, it will be possible to present accident rates for those fleets with the accuracy and comprehension on par with the data available for Western-built fleets.

Other global accident data capture and analysis programs exist. Some States endeavor to measure their own safety performance in order to shape their national programs. One such example is the Safety Plan 2006/2007 – 2010/11 prepared by the United Kingdom (UK) Safety Regulation Group.

All of these, as well as other sources, are rich in vital safety intelligence. Despite some slight variations in focus, they can be used as the basis for performance metrics and to prepare targets, not only in terms of the fatal accident or hull loss rates, but further across the safety metrics spectrum.

A most effective quantitative risk management program would be one in which information sharing is the norm. Currently, as a result of a memorandum of cooperation between ICAO and IATA, data collected from IOSA and USOAP programs, along with other forms of safety intelligence, can now be shared between these international organizations as appropriate. ICAO has entered similar cooperation and sharing

agreements with the European Civil Aviation Conference (ECAC), the European Aviation Safety Agency (EASA) and Eurocontrol.

As mentioned in the Part 1 document, the analysis of accidents is inherently reactive. Even so, it is absolutely essential that the lessons learned from these accidents remain at the forefront of safety enhancement activities. Analysis of recent accidents in regions with poorer safety records show that nearly all were caused by previously well-understood factors with equally well-understood mitigating actions. A primary benefit of the *Roadmap* will be assisting ISSG members and other organizations that are seeking means of establishing better regional environments that will be more conducive to implementing those safety enhancements known to eliminate accidents.

Currently, certain entities in industry are striving to take a more prognostic or predictive approach to risk assessment. This requires more innovative safety-related data collection and analysis approaches. An example is the formulation of safety strategies with the use of some existing programs, such as Flight Data Analysis (FDA) – Flight Data Monitoring (FDM) – Flight Operations Quality Assurance (FOQA) programs. Other examples include those from auditing programs such as the ICAO Universal Safety Oversight Audit Program (USOAP) and IATA's Operational Safety Audit (IOSA).

Information from these and other data sources, together with the collective wisdom of the ISSG stakeholders, proved essential in the identification of the 12 focus areas of the roadmap. Likewise, it will establish the quantitative cornerstone of measures to track the continuing safety performance of the aviation system.

A partner metric (along with Industry or regional safety risk improvements) measures the effective application of the various elements of the *Roadmap*. An essential element of each section that defines "Best Practices" is a corresponding metric that should prove useful in monitoring adherence to the specific improvement activities listed. Although these metrics are not directly transferable to safety risk measures discussed above, they will be essential in tracking improvements realized by the application of the Roadmap.

Figure 1.1 – Accident Rates by Region – 1995-2004 (Source: ICAO)

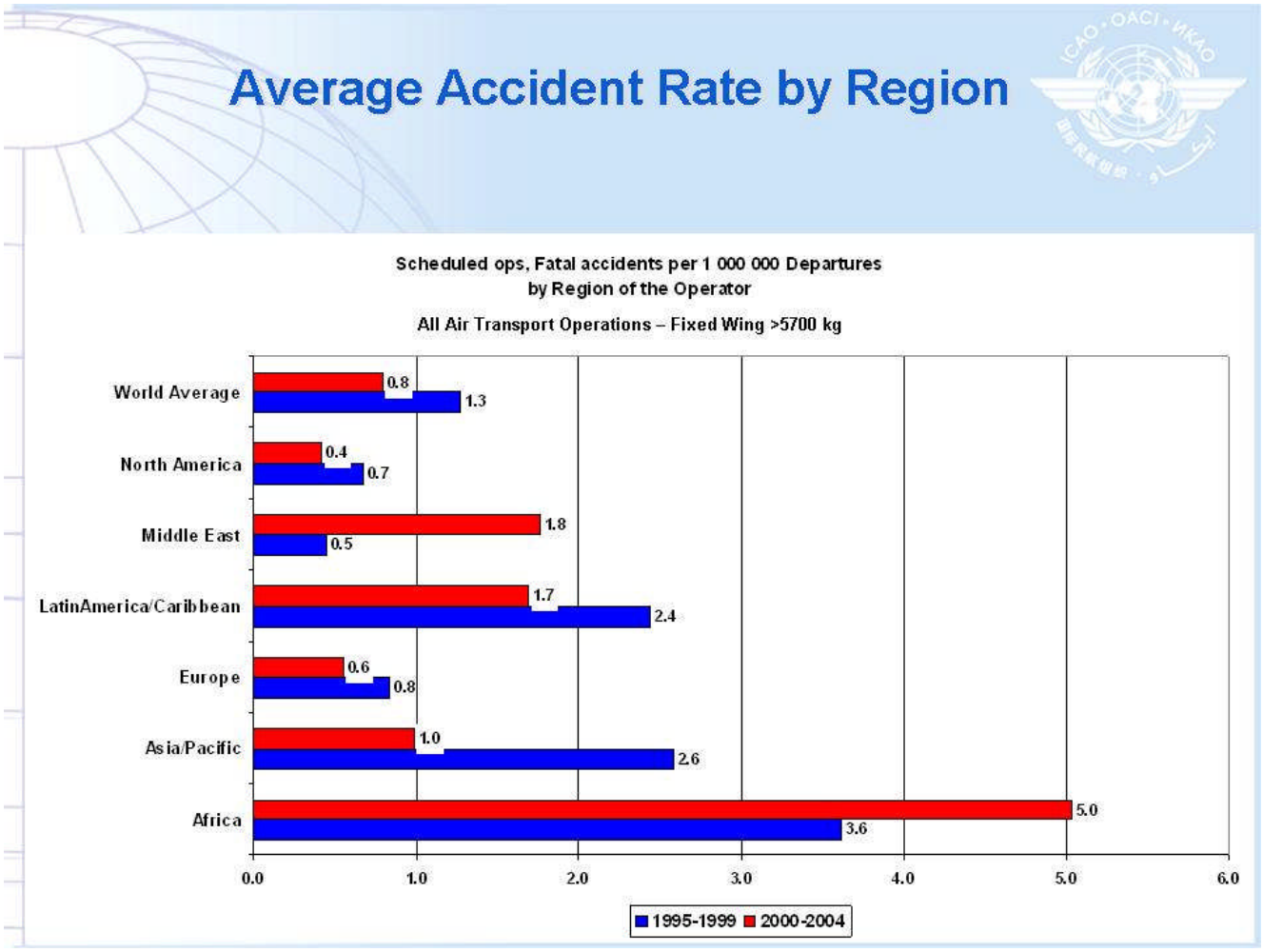


Figure 1.2 – Jet Transport Hull Loss Accident Rate (Source: IATA)

Figure 1.3 – Accident Rates by Region (Source: Boeing)

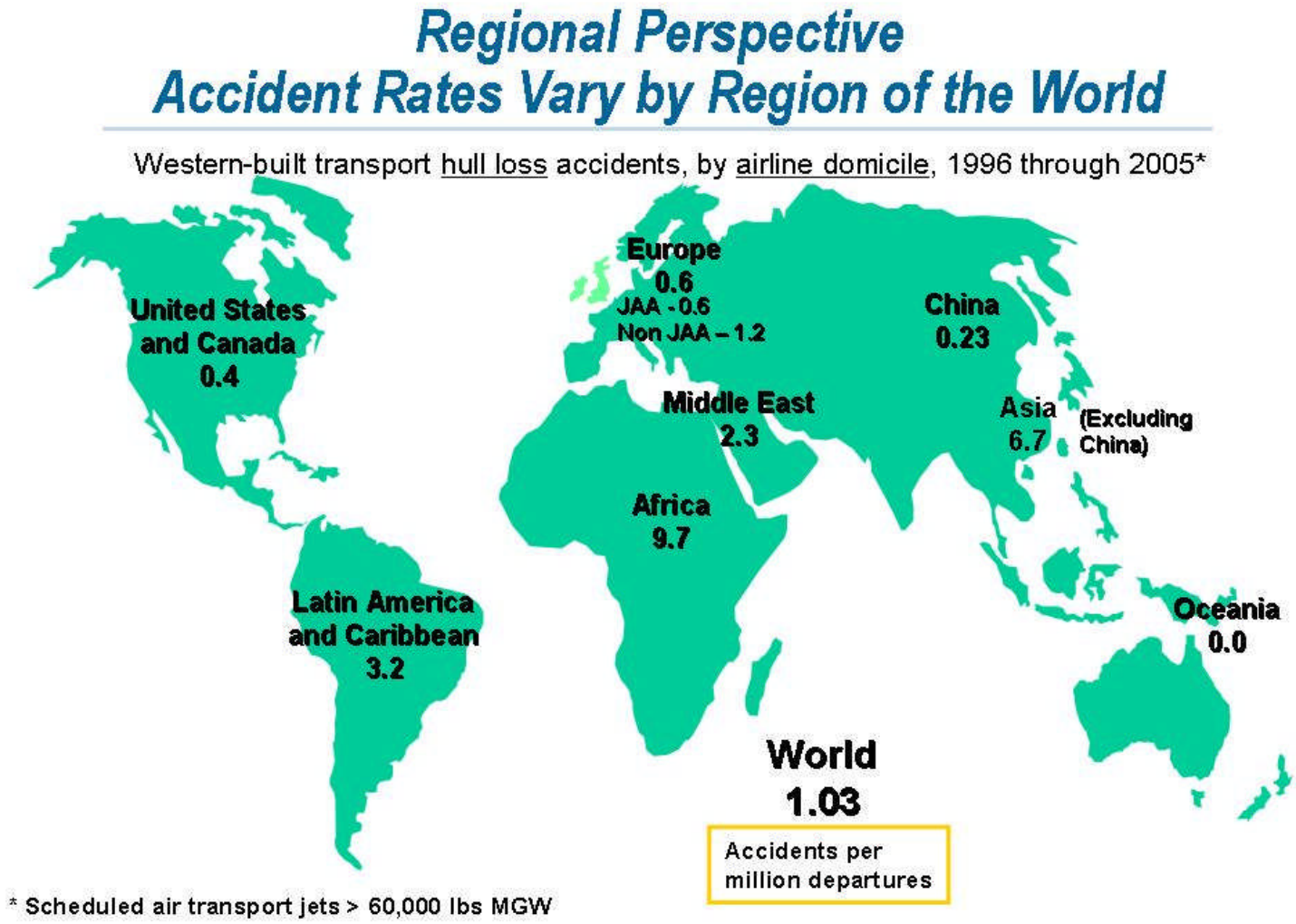
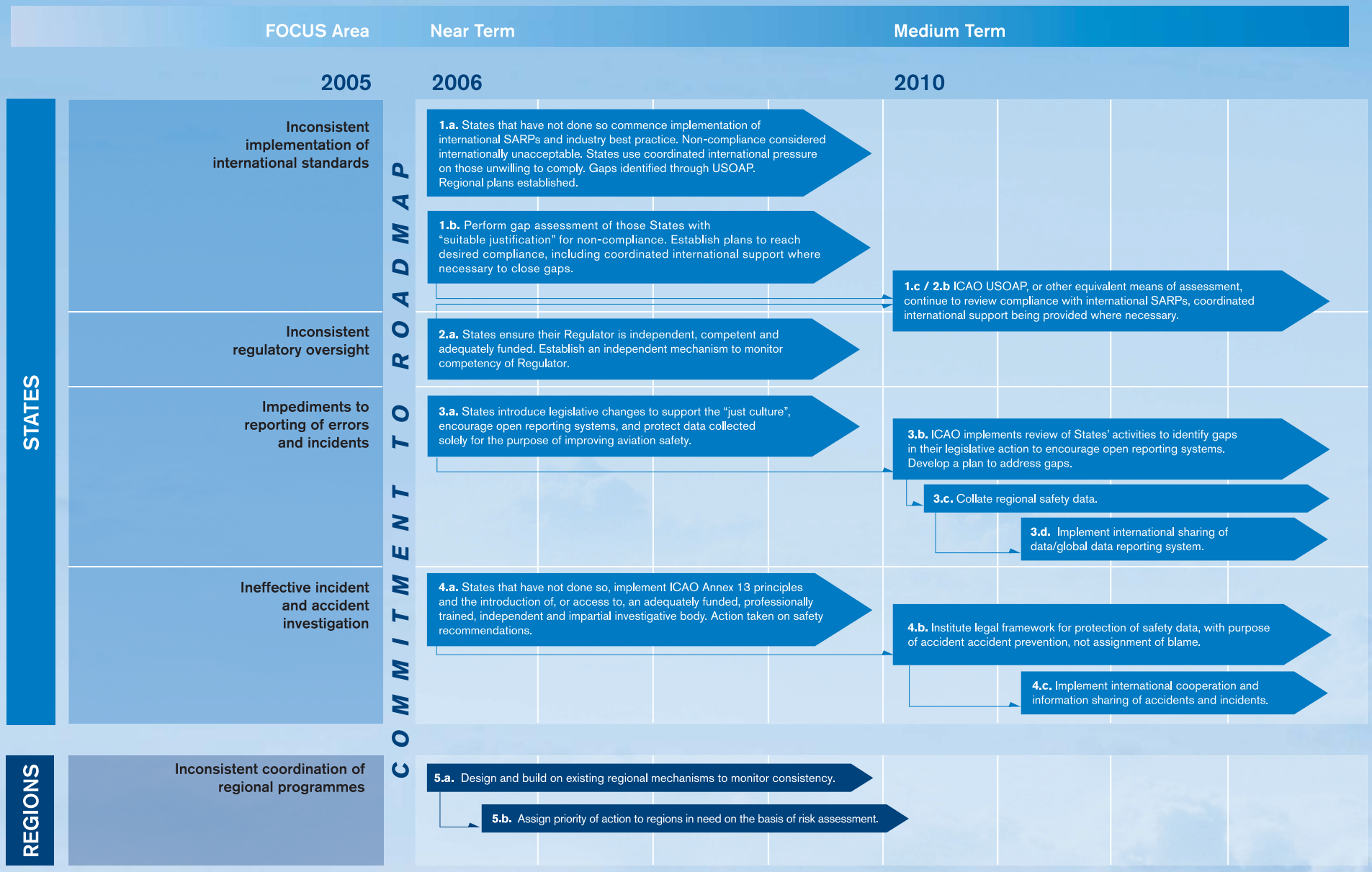


Figure 1.4 – Global Aviation Safety Roadmap [See Next Page]

Global Aviation Safety Roadmap




INDUSTRY
Airlines / Operators, Airports, ANSPs, MROs, Manufacturers
COMMITMENT TO ROADMAP
Impediments to reporting and analysing errors and incidents
6.a. Industry (management) commits to a "just culture" of reporting all safety related incidents and potential safety issues without fear of reprimand to involved parties.
6.b. Identify and implement common metrics and descriptors of precursor events needed to enable adoption of a proactive approach to managing risk.
6.c. Establish and integrate across the industry shared incident/error databases. Demonstrate and disseminate the benefits of open reporting.
Inconsistent use of safety management systems (SMS)
7.a. ICAO SMS standards published. Confirm need for formal (mandated) SMS across all sectors and disciplines of the industry.
7.b. Develop a plan for incorporation of SMS into audit process.
7.c. Develop audit processes to assess operation of SMS function.
7.d. Implement review of SMS during audits.
7.e. Define interface points between industry focus areas and develop a plan for SMS programme integration across all interfaces.
Inconsistent compliance with regulatory requirements
8.a. With full management support, execute independent assessment and GAP analyses within the industry of regulatory compliance to address areas of non-compliance.
8.b. Perform regular independent audits of operational safety to assess ongoing compliance across the industry.
Inconsistent adoption of industry best practice
9.a. Improve structures (through management commitment) for maintaining knowledge of best practice and identify future developments (e.g. ICAO best practices website, IATA and FSF publications).
9.b. With industry openly sharing information regarding the benefits of best practices, implement performance benchmarking of dissemination consistency.
Non-alignment of industry safety strategies
10.a. Design a mechanism for coordination and sharing of safety strategies.
10.b. Coordinate and share safety strategies, seeking to achieve alignment and minimise duplication.
Insufficient number of qualified personnel
11.a. Identify requirements for sustaining aviation safety against projected growth of commercial aviation (matching task and resources).
11.b. Implement plans to provide appropriate numbers of qualified people.
11.c. Establish audit processes to confirm that people resource plans will deliver the appropriate numbers.
11.d. Resource plans to deliver the appropriate numbers of qualified people.
Gaps in use of technology to enhance safety
12.a. Define proven technology gaps. Industry works together to identify areas where technology might provide significant safety benefits.
12.b. Deploy proven technologies that have been developed to enhance safety.
12.c. Integrate measures to close technology gap.

2. Addressing the Roadmap Focus Areas

In Part 1 of the *Roadmap* development activity, the ISSG identified key Focus Areas that need to be addressed by aviation system stakeholders in order to ensure the successful implementation of the plan. The Stakeholders have been divided into three basic groups: States, Regions, and Industry, with Focus Areas developed for each. In each Focus Area, Objectives are identified which, if adequately met, will address the Focus Area concerns. This section:

- Outlines these Focus Areas and Objectives.
- Defines those Best Practices which, if implemented, would ensure that each Objective is met.
- Presents metrics for each Best Practice that analysts may use in order to evaluate the implementation level of the Best Practice.
- Offers a Maturity Model that can be used to determine the level of overall implementation of a specific Focus Area.

It is important to recognize that, although specific Best Practices have been presented, there may be other practices that may be implemented that would equally well meet the intent of identified Objectives. The stakeholders evaluating a particular Focus area would be in the best position to evaluate which practices would be most appropriate to meet the Objective for a particular region.

A note on Metrics: Where possible, the metrics listed provide a link to the internationally accepted audit questions contained in either the ICAO Universal Safety Oversight Program (Reference: ICAO Document 97-35, Appendix F, Modules 1, 2, 4, 7 and 8) or to the IATA Operational Safety Audit (Reference: IATA IOSA Standards Manual, 1st Edition, 4th Revision, Temporary Revision February 2006, Effective February 2006). In the tables that follow, a reference to the ICAO program is identified by a "USOAP" reference and one to the IATA program is identified by an "IOSA" reference. As these audit questions are subject to change from time to time, Appendixes C (USOAP) and D (IOSA) contain the wording of the questions as they stood at the time the Roadmap Part 2 document was released. For more information on the specific audit questions, refer to the references listed above.

In some cases, the metrics refer to other documents. The document titles and a link to it (or to a location from which it may be obtained) are listed below:

- **ICAO Annex 13 (Aircraft Accident and Incident Investigation)**
- **FSIX -- ICAO Flight Safety Information Exchange**
- **ICAO Safety Oversight Manual (Doc 9734 – Part A The Establishment and Management of a State's Safety Oversight System)**
- **ICAO Safety Oversight Audit Manual (Doc 9735, Appendix F, Modules 1, 2, 4, 7 and 8) (See Appendix C)**
- **ICAO Safety Management Manual (Doc 9859)**
- **IATA IOSA Standard Manual 1st Edition, 4th Revision February 2006 (See Appendix D)**
- **IBAC IS-BAO – International Standard for Business Aircraft Operations**

2.1. Focus Areas – States

2.1.1. Focus Area 1 – Inconsistent Implementation of International Standards

ICAO Standards and Recommended Practices (SARPs) if fully implemented and enforced will constitute adherence with an internationally accepted minimum level of safety. USOAP audits and other sources indicate that a significant number of States still have difficulties in fully implementing ICAO SARPs for international or domestic operations. All references for individual metrics in this section are to USOAP protocols unless otherwise noted.

2.1.1.1. *Objective 1a – States that have not done so commence implementation of international SARPs and industry best practice. Non-compliance considered internationally unacceptable: states use coordinated international pressure on those unwilling to comply. Gaps identified through USOAP. Regional plans established.*

There are two reasons which typically underlie the inconsistent implementation of SARPs. The first involves the lack of a capability to properly implement SARPs. This may well be addressed by resource allocation by the international community. The second involves the lack of will to implement SARPs. This may ultimately have to be addressed by various initiatives of the international community to ensure compliance. The discussion does not include those situations where a particular SARP is inapplicable to operations within a particular State.

Table 1a –Best Practices	**Metrics**
BP 1a-1 – **ICAO SARPs are relevant, robust, timely and up to date.**	
a. ICAO creates and modifies SARPS by a process which involves the opportunity for States to comment on the content and utility of the proposed SARP. Additionally, processes exist to review the continuing applicability of individual SARPs and recommend modifications as a result.	a. Process is documented in the ANC Procedural Guidebook – A quality control system is in place.
b. ICAO establishes, implements and maintains an electronic system for reporting differences.	b. The electronic system for reporting of differences is publicly available – Clear guidelines on its use

Table 1a –Best Practices	Metrics
	are available – Percentage of States using the system to notify differences.
BP 1a-2 – **States takes all necessary action to ensure compliance with SARPs and industry best practice.**	
a. The State enacts enabling legislation which facilitates the creation and modification of a regulatory scheme giving SARPs the force of law.	a. USOAP LEG 1.001; LEG 1.005; LEG 1.009; ORG 2.009
b. State processes include an evaluation of their own compliance with SARPs.	b. USOAP OPS 4.003; 4.005; AGA 8.003
c. State implements USOAP recommendations.	c. ICAO Doc. 9735, Chapter 6
d. State secures necessary financial, human and technical resources to develop, update and implement regulations meant to enforce SARPS and to implement industry best practices. Resources are drawn as necessary from national, regional and international sources.	d. USOAP ORG 2.051; ORG 2.053
e. ICAO assistance activities are aligned with the Global Aviation Safety Plan (GASP) and the *Global Aviation Safety Roadmap.*	e. Percentage of assistance activities that can be linked to best practices or focus area - Results of assistance activities are assessed against metrics and other available benchmarks
f. State publishes notice of non compliance to all affected entities and notifies ICAO in accordance with Article 38 of the Convention until such time as the SARP is complied with.	f. Difference are notified to ICAO –Significant differences are listed in the State's AIP – USOAP LEG 1.025
BP 1a-3 **States use information obtained during implementation of SARPS and operational experience to recommend improvements to ICAO**	a. Documented evidence exists that proposals have been made to ICAO

Table 1a –Best Practices	Metrics
BP 1a-4 – **States apply coordinated initiatives to ensure that non compliant States do not engage in activity which could be seen as unacceptably increasing the risk of operation**	
a. Preventing operators certificated in non conforming States from operating internationally where the risk in doing so is evident or when the non conforming State has failed to carry out recommendations or determinations of the ICAO Council under Article 54j of the Chicago Convention.	a. States have regulations and procedure to ensure that foreign operators complies with international Standards and receive proper oversight - USOAP LEG 1.107; LEG 1.109; LEG 1.111
b. Preventing operators certificated in conforming States from operating in non conforming States where the risk in doing so is evident or when the non conforming States has failed to carry out recommendations or determinations of the ICAO Council under Article 54j of the Chicago Convention.	b. States have a process to assess the risk or require the operator to conduct such assessment – Measures are taken when risk is deemed unacceptable.
c. State releases USOAP audit information to the public.	c. FSIX

2.1.1.2. Objective 1b – Perform gap assessment of those States with 'suitable justification' for non-compliance. Establish plans to reach desired compliance, including coordinated international support where necessary to close gaps.

A gap assessment measures the current level of implementation of SARPS in a State against the level required to support the type of operations conducted by or within the State. Suitable justification for non compliance indicates a situation where the political motivation for compliance exists but satisfactory implementation has not been achieved. When the assessment is complete, a detailed plan including the strategy to be employed, resources which will be required and international support which will be available must be established and

agreed to by the State. ICAO USOAP Audits are one source of gap assessment.

Table 1b –Best Practices	Metrics
BP 1b-1 – **Gap assessment is conducted by a competent entity.**	
a. The competent entity has sufficient guarantees concerning performance, independence and reliability.	a. ICAO Doc 9735 Para. 5.12; 5.14; Appendix E
b. Timely remediation plan is developed in the context of the particular requirements of the State involved and the resources which may be available to assist in its execution.	b. ICAO Doc 9735 Para. 5.14; Appendix E

2.1.1.3. Objective 1c/2b – ICAO USOAP, or other equivalent means of assessment, continue to review compliance with international SARPs, coordinated international support being provided where necessary.

Periodic assessments of States, is essential for the on going monitoring of compliance with SARPs and industry best practice. This is best achieved by a combination of self assessment (internal audits and other quality control mechanisms) and external audits. In situations where repeated assessments reveal continuing problems, coordinated international support may be necessary to assist the State in achieving the necessary compliance.

Table 1c/2b –Best Practices	Metrics
BP 1c/2b-1 – **The standing management process of the Regulatory Authority ensures that self assessments are conducted whenever notified of change by ICAO and should be conducted at least annually.**	
a. The Regulatory Authority has sufficient staff, resources and appropriate procedures to conduct an effective self assessment.	a. USOAP ORG 2.051; ORG 2.053
b. Each self assessment makes full use of the results of other audits conducted on the industry that comes under the oversight of the Regulatory Authority.	b. USOAP OPS 4.409

Table 1c/2b –Best Practices	Metrics
BP 1c/2b-2 – **External audits are conducted at least every 3 years by ICAO USOAP or another competent entity, utilizing the USOAP methodology.**	
a. External audit programs are coordinated to avoid duplication and waste of resources.	a. ICAO Doc. 9735 Para. 5.2
BP 1c/2b-3 – **Periodic assessments are transparent to the aviation community.**	
a. Other States utilize the results of periodic assessments for the purpose of mutual recognition.	a. FSIX - ICAO Doc. 9735 Para 6.1.1e
b. Results are shared.	b. Structures exist and are utilized to facilitate the sharing of the results of periodic assessments
BP 1c/2b-4 – **Deficiencies identified during periodic assessments are addressed in a timely manner, utilizing coordinated international support where necessary.**	a. ICAO Doc 9735 Para. 2.1.1
BP 1c/2b-5 –**Periodic assessment methodology is reviewed and amended as required to ensure continuing relevance.**	a. Documented evidence that a review has been undertaken during the preceding 3 years

2.1.1.4. Focus Area Maturity Model – Table 1d contains the maturity model for focus area 1.

Table 1d – Maturity Model for Focus Area 1 – Implementation of International Standards

Maturity Level	Capability
Level 1 – Developing	• Low level of implementation of SARPs. State unable or unwilling to assess compliance with SARPs.
Level 2 – Areas Identified for Improvement	• State aware of level of compliance and attempting to comply, but has not completed a plan for implementation of the appropriate SARPS. • There is no certainty that the State is able to provide proper oversight for the existing level of activity.
Level 3 – Evolving – Changes in work	• State is aware of level of compliance and has implemented appropriate SARPs to support the existing activities. • State does have limited ability to oversee significant increases in activity and improvements in technology.
Level 4 – Highly Evolved	• State is aware of level of compliance and has implemented appropriate SARPs to support the existing activities. • State has a process in place and access to the necessary resources in order to continually reassess and maintain its level of compliance in light of changes to SARPS and changes in activity within its jurisdiction.

2.1.2. Focus Area 2 – Inconsistent Regulatory Oversight

The entire concept of safety regulation is based upon the fact that the Regulatory Authority is in a position to objectively evaluate any given safety critical aviation activity within its jurisdiction and require that the activity adhere to standards designed to ensure a minimum acceptable level of safety. USOAP audit results indicate that all States are not fully capable of exercising their regulatory oversight responsibilities. The limitation of activity imposed by some States against the operators of other States may also be an indicator of inadequate oversight.

2.1.2.1. *Objective 2a – States ensure their Regulatory Authority is independent, competent and adequately funded. Establish an independent mechanism to monitor competency of Regulatory Authority.*

To allow effective oversight, the State must have a robust legal and organizational framework in place to allow the Regulatory Authority to function. This framework must include provisions that ensure the independence of the Regulatory Authority on safety issues, the provision of sufficient resources to train, deploy and retain an effective oversight staff complement and to conduct the support functions which facilitate regulatory activities. Compliance with these goals needs to be evaluated by an effective periodic assessment.

Note: Focus Area 2b is discussed above in conjunction with 1c.

Table 2a –Best Practices	**Metrics**
BP 2a-1 – **State utilizes/implements the 8 critical elements of the safety oversight system.** a. Primary aviation legislation b. Specific operating regulations c. CAA structure and safety oversight functions d. Technical guidance e. Qualified technical personnel f. Licensing and certification obligations g. Continued surveillance obligations h. Resolution of safety issues	a. State implements in accordance with ICAO Doc 9734 Part A Chapter 3
BP 2a-2 – **State provides a mechanism for sufficient funding of safety oversight activities.**	a. USOAP ORG 2.051

Table 2a –Best Practices	Metrics
BP 2a-3 – **State applies the principles of risk management to its safety related activities.** a. Hazards and risks are assessed and prioritized on a regular basis. b. Risk mitigation strategies are developed and implemented. c. Results are assessed and corrective action taken as needed.	a. ICAO Doc. 9859 Para. 3.3 b. Attendance at ICAO SMS Training Course
BP 2a-4 – **The Regulatory Authority acts independently where safety issues are implicated in its actions** a. The individuals responsible for such action must be given appropriate authority to exercise their responsibilities. b. Accountability for the exercise of regulatory authority must be in accordance with the principles of a "just culture" *(see Objective 3a for a discussion of "just culture").*	a. USOAP LEG 1.109; USOAP 1.111 b. Annex 13 Attachment E; i.e. USOAP AIG 6.505
BP 2a-5 – **Regional oversight organizations or equivalent means are in place to perform those functions which cannot be performed by the State acting on its own.** a. States may also decide to use Regional oversight organization as a matter of convenience (e.g. Agencia Centroamericana de Seguridad Aeronáutica (ACSA)). b. Outsourcing the technical and administrative tasks associated with oversight to another Regulatory Authority or a private contractor is an example of a means equivalent to a regional oversight organization.	a. USOAP ORG 2.017
BP 2a-6 – **Periodic assessments are conducted.**	a. See BP 1c/2b-3

2.1.2.2. Focus Area Maturity Model – Table 2b contains the maturity model for focus area 2.

Table 2b – Maturity Model for Focus Area 2 – Regulatory Oversight

Maturity Level	Capability
Level 1 – Developing	• Low level of implementation of SARPs and little or no attempt to correct the situation is in progress • State unable or unwilling to exercise oversight. [Added significance if a large part of the aviation activity under the oversight of the State occurs in other States.]
Level 2 – Areas Identified for Improvement	• State aware of and attempting to correct deficiencies, but has not completed implementation of corrective action. • There is no certainty that the State is able to provide proper oversight for existing level of activity.
Level 3 – Evolving – Changes in work	• State has the capacity to exercise oversight on the type of operation for which it has responsibility. • State has limited ability to continue oversight if there are: o A significant increase in the volume or scope of activities; o Improvements in technology.
Level 4 – Highly Evolved	• State aware of its level of compliance, has implemented appropriate SARPs and has access to the resources necessary to support the existing activities. • State has process in place and access to the necessary resources to continually reassess and maintain its level of compliance in light of modifications to SARPs and changes in activity within its jurisdiction.

2.1.3. Focus Area 3 – Impediments to Reporting of Errors and Incidents

Error and incident reporting are essential elements of the free flow of data that is required to assess aviation system safety on a continuous basis and to correct deficiencies when warranted. The reporting typically comes from voluntary reports by aviation professionals that may be self incriminating or from recordings that are intended to be used only for safety purposes. It is essential to protect such safety information from inappropriate use in order to ensure its continued availability. The use of safety information for other than safety-related purposes can inhibit the future availability of such information, with an adverse effect on safety.

2.1.3.1. *Objective 3a – States introduce legislative changes to support the "just culture", encourage open reporting systems, and protect data collected solely for the purpose of improving aviation safety.*

A "Just Culture" is defined as an atmosphere of trust in which people are encouraged and even rewarded for providing essential safety-related information, even if self-incriminating, but in which all parties clearly understand which types of behaviors are acceptable or unacceptable.

In the Roadmap, the ISSG has chosen to use the term "open reporting" when referring to incident reporting. Such reporting is *open* in the sense that it encourages reporting and use beyond that which is mandated. It is also *confidential* in that the reporter's identity is protected.

Open Reporting systems are intended to:

- Clearly identify and understand the hazards or risks
- Protect the identity of persons reporting information

Table 3a –Best Practices	**Metrics**
BP 3a-1 – **<u>The State has a legislative framework that protects safety data.</u>** The State legislation must include provisions which protect privacy, prevent self incrimination and properly apportion criminal liability for actions. Without these basic features, full disclosure of safety related information will be extremely difficult.	a. ICAO Annex 13 Attachment E b. USOAP AIG 6.505

Table 3a –Best Practices	Metrics
BP 3a-2 – **The State implements mandatory reporting of accidents and incidents.**	a. ICAO Annex 13 chapter 8 b. USOAP AIG 6.501
BP 3a-3 – **The State encourages voluntary reporting.** a. Regulatory framework exists. b. "Just culture" exists. c. Data from reports are used in a timely and efficient manner to improve safety.	a. USOAP AIG 6.503; AIG 6.505 b. USOAP AIG 6.507; AIG 511
BP 3a-4 – **Each aviation professional who has an impact on safety has a clear understanding of what constitutes acceptable and unacceptable behavior.**	a. The State regulatory system provides clear guidance on the subject b. The operator /ANSP has clear explicit policy on the subject

2.1.3.2. ***Objective 3b – ICAO implements review of States' activities to identify gaps in their legislative action to encourage open reporting systems. Develop a plan to address gaps.***

The existence of the proper legal framework is a prerequisite to any open reporting system and an open reporting system is a prerequisite to the efficient and effective implementation of a Safety Management System (SMS).

Table 3b –Best Practices	Metrics
BP 3b-1 – **ICAO assesses the level of implementation of open reporting**. a. USOAP Audit. b. Assessment during visit to State by ICAO Officials. c. Regular questionnaires sent by ICAO. d. Other sources of information (IATA, IFALPA, FSF, CANSO, ACI).	a. USOAP AIG 6.503 b. ICAO has reliable data on the level of implementation of open reporting

Table 3b –Best Practices	Metrics
BP 3b-2 – **The State understands the need for open reporting systems and takes appropriate measures to implement them.** a. ICAO and industry actively promotes open reporting systems. b. Regulatory Authority and industry understanding. c, Public awareness/education.	a. USOAP AIG 6.505; AIG 6.507

2.1.3.3. *Objective 3c – Collate regional safety data.*

In many States, the level of activity is too low to permit reliable safety analysis. In addition, it is more difficult to establish an open reporting system in smaller States where the aviation community is made up of a small group of individuals who know each other personally. The collation of data at the regional level overcomes this problem. Moreover, many of the safety problems are regional in nature and are best addressed at the regional level.

Table 3c –Best Practices	Metrics
BP 3c-1 – **An entity is designated in each region as the focal point for collating safety data.** a. Use existing safety groups to collect, integrate and analyze safety data on a regional basis. b. Use of regional groups, such as the Planning and Implementation Regional Groups (PIRGs), to identify safety issues. c. Common methodologies for collection of safety data are utilized.	a. The designated entity is identified in each region
BP 3c-2 – **States and the industry stakeholders in the region contribute safety data.**	a. Percentage of States in the region that contributes safety data b. Percentage of Operators/Service providers that contributes safety data

Table 3c –Best Practices	Metrics
BP 3c-3 – **Safety data is analyzed and action is taken at the regional and State level to correct deficiencies.**	a. Analysis of data, together with information on corrective actions and their results, is available
BP 3c-4 – **Safety data are categorized on the ICAO based common taxonomy.**	a. CAST/ICAO Common Taxonomy is used

2.1.3.4. *Objective 3d – Implement international sharing of data/global data reporting system.*

Many international data reporting systems available, including ADREP, Accident Investigation Reports, STEADES, Notification of Differences, USOAP, IOSA, PIRG identified deficiencies, and the LOSA Archive. However, it is difficult to harness the full potential of the data they contain due to access limitation, lack of common taxonomy and other impediments. A first step in this direction has been taken by ICAO and IATA through a Memorandum of Co-operation which shares USOAP and IOSA data.

Table 3d –Best Practices	Metrics
BP 3d-1 – **The principle of "just culture" underpins the international sharing of data/global data reporting system**	a. ICAO Annex 13 Attachment E. b. USOAP AIG 6.509
BP 3d-2 – **A common taxonomy is in place.**	a. USOAP AIG 6.509
BP 3d-3 – **Each Data collection system is designed in such way that sharing of de-identified data is easy.** *Note: De-identified data is data that has had differentiating parameters such as names removed.*	a. Sharing of de-identified data is taking place
BP 3d-4 – **Safety data are analyzed in an objective and scientifically sound manner, independent of any non-safety considerations, and the result is shared with all stakeholders.**	a. Peer review b. Sharing system is in place and working

2.1.3.5. Focus Area Maturity Model – Table 3e contains the maturity model for focus area 3.

Table 3e – Maturity Model for Focus Area 3 – Reporting of Errors and Incidents

Maturity Level	Capability
Level 1 – Developing	• The information from safety data collecting and processing system is not protected. • No voluntary reporting system is in place. • Inappropriate* use or no use is made of the report. *as defined in ICAO Annex 13, Attachment E, paragraph 1.5.c
Level 2 – Areas Identified for Improvement	• The information from safety data collecting and processing system is not protected but use of safety data is appropriate in most cases. • No voluntary reports are submitted. • Safety data are not always analyzed. • Action is not taken in a systematic way to correct identified deficiencies.
Level 3 – Evolving – Changes in work	• The principles of a "just culture" are widely accepted, but not fully implemented at the national and/or corporate level. • The information from safety data collecting and processing system is protected. • Mandatory reporting is efficient but voluntary reporting is limited to specific group of professionals. • Safety data are analyzed, but action is not always taken.
Level 4 – Highly Evolved	• A "just culture" is implemented at the national and corporate level. • The information from safety data collecting and processing system is properly protected. • Safety data are actively collected at all levels of the industry. • The safety data are used to the fullest extent to feed safety management systems, and for other safety purposes.

2.1.4. Focus Area 4 – Ineffective Incident and Accident Investigation

An accident or incident provides the opportunity for an in depth examination of both the causal factors leading up to the particular event and the broader questions concerning the underlying safety of an entire operation. When the investigation is done in a timely, thorough and independent way and the results and conclusions published in interim and final reports, the entire aviation community benefits from the lessons to be learned.

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2.1.4.1. *Objective 4a – States that have not done so, implement ICAO Annex 13 principles and the introduction of, or access to, an adequately funded, professionally trained, independent and impartial investigative body. Action taken on safety recommendations.*

Independence, technical competence and sufficient resources to fully investigate events are necessary prerequisites to any successful investigation. Annex 13 principles apply to all aircraft investigations and, if followed, will generally result in an appropriate investigation.

Table 4a –Best Practices	**Metrics**
BP 4a-1 – **State Accident Investigators are independent.**	
a. The State's safety accident investigators are organizationally independent from its Transportation authorities (from the Civil Aviation Authority (CAA)) and any other potential party to the investigation.	a. USOAP AIG 6.005
b. Investigations are conducted functionally independent from political or other interference or pressure.	b. ICAO Annex 13 Paragraph 3.1; USOAP AIG 6.005

Table 4a –Best Practices	Metrics
BP 4a-2 – **State issues safety recommendations.** a. Following an investigation, States issue adequate safety recommendations and have established procedures to follow-up on the implementation of such recommendations. b. The recipients of safety recommendations have established a procedure to address the recommendations. c. The recipient of a safety recommendation informs the proposing State of the corrective action taken or under consideration or the reasons why no action is taken. d. Safety recommendations and action taken thereon are publicly available.	a. ICAO Annex 13, paragraph 6.8, and 6.9 USOAP AIG 6.421 and 6.423 b. USOAP AIG 6.425 c. ICAO Annex 13 paragraph 6.10 d. Information is available on public Website
BP 4a-3 – **States have access to trained accident investigators.** a. States have access to a set of trained accident investigators, either internal investigators or from a regional or international/global source. b. As applicable, procedures have been established for delegation of accident investigations to other States or regional bodies.	a. ICAO Doc 9756 Part I b. USOAP AIG 6.033; AIG 6.109 ; AIG 6.113
BP 4a-4 – **States have implemented clear guidance on what to investigate.** a. States have implemented clear guidance defining what to investigate and who it is to be notified – both internal to the State and internationally. b. The State investigates all accidents and serious incidents that occur in its territory and over the high seas as the State of Registry.	a. ICAO Annex 13, Paragraphs 4.1, 4.8, 5.1 and 5.3 b. Doc 9756, Part I. c. USOAP AIG 6.009, AIG 6.319, AIG 6.341

Table 4a –Best Practices	Metrics
BP 4a-5 – **State has a defined process for allowing involved Parties to participate in an accident investigation.**	a. ICAO Annex 13, Paragraphs 5.18, 5.19, 5.20, 5.23 and 5.27. b. USOAP AIG 6.033; AIG 6.109; AIG 6.365; AIG 6.367
BP 4a-6 – **State has defined a rigorous and complete process for conducting an accident/incident investigation.**	a. ICAO Doc 9756, Part I. b. USOAP AIG 6.301; AIG 6.303
BP 4a-7 – **State conducts its investigations and provides required reports in a timely manner.** a. Interim recommendations are provided whenever appropriate.	a. ICAO Annex 13, Paragraphs 6.5, 6.6 and 6.8. b. ICAO Doc 9756, Part IV. c. USOAP AIG 6.405 and 6.431
BP 4a-8 – **State has enacted appropriate legislation for the investigation of accidents and incidents.**	a. ICAO Annex 13, Paragraphs 5.1 and 5.1.1. b. ICAO Doc 9756, Part I. c. USOAP AIG 6.001
BP 4a-9 – **States provide funding for accident and incident investigations.**	a. ICAO Doc 9756, Part I. b. USOAP AIG 6.105; AIG 6.107

2.1.4.2. *Objective 4b – Institute legal framework for protection of safety data, with purpose of accident prevention, not assignment of blame.*

The principle of a "just culture" is inherent in the overall concept of safety best practices. At the most basic, it means that full cooperation is essential to a complete investigation. This cooperation will not be available if the sources of important data are not protected.

Table 4b –Best Practices	**Metrics**
BP 4b-1 – **States' accident investigations are conducted for safety and not to appropriate blame.**	a. ICAO Annex 13, – Paragraphs 3.1 and 5.4.1 b. ICAO Doc 9756, Part I c. USOAP AIG 6.013
BP 4b-2 – **States protect safety data used during the accident investigation**.	a. ICAO Annex 13, Paragraphs 5.12, 5.12.1 and Attachment E b. USOAP AIG 6.029; AIG 6.031
BP 4b-3 – **States have defined an interface between normal operations reporting and accident/ incident reporting & investigation.**	a. USOAP AIG 6.507; AIG 509

2.1.4.3. *Objective 4c – Implement international cooperation and information sharing of accidents and incidents.*

A high incidence of similar occurrences may be relevant to the safety initiatives of many organizations. Data must be compatible in format and freely available with appropriate protections from misuse, if it is to be useful in such safety initiatives.

Table 4c –Best Practices	**Metrics**
BP 4c-1 – **States share their accident and serious incident reports globally.**	a. USOAP AIG 6.415; AIG 6.421 b. Actions are recommended according to ICAO Annex 13, Paragraph 6.8
BP 4c-2 – **States and regional organizations establish Incident Review Meetings (IRM).**	a. Meetings are organized with active participation
BP 4c-3 – **States encourage sharing of best practices in investigation techniques, processes and technology.**	a. Accident investigation best practices shared; b. Membership and participation in ISASI
BP 4c-4 – **States maintain a mandatory incident reporting system to facilitate collection of information on actual or potential safety issues with common criteria for a given category of operator.** a. States mandate and facilitate implementation of a safety events reporting system. States mandate and facilitate employment of flight recorder monitoring systems. b. States encourage the implementation of ECCAIRS software or a compatible system aimed at facilitating the exchange of safety data between States and between States and ICAO.	a. ICAO Annex 13, - Paragraph 8.1, 8.2 b. ICAO Doc 9756, Part IV. c. USOAP AIG 405; AIG 6.501; AIG 6.503;

2.1.4.4. Focus Area Maturity Model – Table 4d contains the maturity model for focus area 4.

Table 4d – Maturity Model for Focus Area 4 – Incident and Accident Investigation

Maturity Level	Capability
Level 1 – Developing	• Investigators not identified. • No procedures for investigation and reporting exist. • Involved parties are not notified of investigations.
Level 2 – Areas Identified for Improvement	• Investigators are not organizationally separate from State's Transportation authorities. • Investigators Identified, but not trained. • Procedures for investigating and reporting accidents and incidents exist, but they are not in accordance with Annex 13. • Involved parties are notified of an investigation, but are not allowed to participate.
Level 3 – Evolving – Changes in work	• Investigators are not organizationally separate from the State's Transportation authorities, but specific steps have been taken to eliminate undue influence. • All Annex 13 reporting requirements are met for accidents, but not for incidents.
Level 4 – Highly Evolved	• Investigators are organizationally separate from the State's Transportation authorities. • Investigators are available and trained. • Rigorous and complete process for investigating events is in place. • Clear and complete guidance for what to investigate and who to notify is defined by the State. • All involved parties are notified and allowed to participate in event investigations. • All Annex 13 reporting requirements are met 100% of the time.

2.2. Focus Area – Regions

2.2.1. Focus Area 5 – Inconsistent Coordination of Regional Programs

Coordination of regional safety programs, both within and across various regions, is necessary if industry and government are to fulfill the goal of an integrated *Global Aviation Safety Roadmap.* While regional differences will dictate different implementations of best practices at different levels of maturity, there is much benefit that can be gained by sharing what works—and what doesn't—in various regions that share common challenges. The *Roadmap* provides a ready framework that can serve as the basis for such sharing.

2.2.1.1. *Objective 5a – Design and build on existing regional mechanisms in order to foster consistency.*

As a result of industry and government efforts, there are a variety of regional organizations that already exist which can be invoked to foster and monitor the consistency of regional safety programs designed to meet *Roadmap* goals.

Table 5a –Best Practices	**Metrics**
BP 5a-1 – **COSCAPS encourage implementation of best practices consistent with *Roadmap* Focus Areas for their region.**	a. Existing COSCAP's organize their regulatory efforts and safety-enhancement initiatives in accordance with the G*lobal Aviation Safety Roadmap* and track progress as a planned activity. b. COSCAPs share knowledge and best practices across regions.

Table 5a –Best Practices	Metrics
BP 5a-2 – **Existing regional airline, government, regulatory, and safety associations coordinate their safety-related efforts to reduce duplication and improve alignment in the region. Additional regional associations formed as needed.** a. Existing groups (e.g. PAAST, ASET, AAPA, IHST, ESSI, and FAST) identify safety issues and mitigating enhancements, and are coordinating safety efforts. b. Industry supports existing, and encourages the formation of new, joint industry-government associations within the States of a region to coordinate and implement safety-related efforts. c. Regions, with the assistance of the safety group, develop their own safety risk metrics and rationale, preferably based upon those already developed by regions with more mature programs.	a. Industry and government-sponsored associations organize and coordinate their efforts in accordance with the Global aviation safety *Roadmap*. b. Industry and government-sponsored associations share knowledge and best practices across regions. c. Number of effective joint industry-government associations formed at the state level.
BP 5a-3 – **The more advanced regions assist the less advanced regions in acquiring the necessary knowledge and experience.** a. Support and assistance group. b. State to State programs are established when indicated. c. Exchange of Staff.	a. Number of agreements

2.2.1.2. *Objective 5b – Assign priority of action to regions in need on the basis of risk assessment.*

Due to the scarcity of human and financial resources, any planned safety actions should be targeted at those threats which have the highest priority.

Table 5b –Best Practices	**Metrics**
BP 5b-1 – **Regional safety groups use qualitative and quantitative risk assessment techniques to determine levels of risk.** a. Risk assessments and development and prioritization of safety enhancements to address those risks developed by national and regional groups such as CAST, ESSI, and COSCAPs North Asia (NA), South Asia (SA), and Southeast Asia (SEA) are shared worldwide.	a. Risk assessment techniques are adopted by regional safety groups worldwide.
BP 5b-2 – **Industry and government use the risk assessment process to prioritize, guide and coordinate the allocation of resources among and within regions.** a. Allocation takes into account potential blockers and enablers that will affect the potential success of the safety enhancing activities.	a. Allocation of resources by regional safety organizations, industry, and ICAO is guided by risk assessments as well as unique local constraints and enablers.

2.2.1.3. Focus Area Maturity Model – Table 5c contains the maturity model for focus area 5.

Table 5c – Maturity Model for Focus Area 5 – Coordination of Regional Programs

Maturity Level	Capability
Level 1 – Developing	• Little or no knowledge by regional stakeholders of other safety activities within region. • No regional associations have been formed.
Level 2 – Areas Identified for Improvement	• Some awareness by stakeholders of other safety activities within region, but their own safety activities do not reflect this knowledge. • Regional associations formed, but are not effective.
Level 3 – Evolving – Changes in work	• Regional associations formed and processes developed for analyzing risk and evaluating the effectiveness of other regions' activities. • Mechanisms initiated to enable sharing of knowledge and best practices across different regions.
Level 4 – Highly Evolved	• There is consensus by regional and industry stakeholders on the allocation of resources. • Resources are shared in a manner best designed to attack key risk issues in a coordinated and effective fashion. • Appropriate attention is paid to significant risks and their mitigation. • Best practices of other regional associations are reviewed and accepted, as appropriate.

2.3. Focus Areas – Industry

2.3.1. Focus Area 6 – Impediments to Reporting and Analyzing Errors and Incidents

Safety is a performance goal of any top quality organization. Everyone in the organization from the chief executive through to the first-level managers and line employees should be accountable for establishing and maintaining an environment free from danger, risk and injury. To establish and maintain a safe organization, all managers must know what risks they are facing. The ability to understanding embedded hazards and the associated risks is dependent upon the removal of impediments to reporting and analyzing errors and incidents. Development and maintenance of a "Just Culture" is one of the primary means available to management to understand where the hazards and risks lie within an organization.

2.3.1.1. *Objective 6a – Industry (management) commits to a "Just Culture" of reporting all safety related and potential safety issues without fear of reprimand to involved parties.*

As explained in section 2.1.3.1, a "Just Culture" is one where:

- Employees are encouraged to report safety-related information so that hazards and risks may be more clearly understood, and
- Persons submitting reports need not fear reprisal.

The "Just Culture" concept includes a very clear definition of the differences between acceptable and unacceptable behavior on the part of management. Effective reporting depends on how management handles blame and punishment. A no-blame culture is neither desirable nor feasible, but in a "Just Culture", culpability is clearly defined.

Benefits of a "Just Culture" include:

- Increased reporting of safety events.
- Improved communication between the workers and management.
- Management's ability to understand the underlying causes of risk is improved, so future safety-risks based on the same underlying causes can be mitigated.

Understanding the safety-risks is only the first part of the "Just Culture". The second part is the feedback system whereby the information provided to the workforce will enhance their safety awareness through

the improved recognition of safety-related situations. The closed loop of the "Just Culture" thus becomes a collaborative environment.

Table 6a –Best Practices	Metrics
BP 6a-1 – **The State has empowered an open reporting system.** a. The regulatory authority implements regulations which foster open reporting, in close cooperation with the aviation stakeholders.	a. Existence of regulatory framework upon which an open reporting system is based b. ICAO Annex 13 – Attachment E c. USOAP AIG 6.505
BP 6a-2 – **Aviation organizations have implemented a "Just Culture" within their organizations.** a. Aviation organizations that have not yet implemented a "Just Culture" develop implementation strategies b. Corporate senior management demonstrates personal and organizational commitment to a "Just Culture.	a. "Just Culture" exists in each aviation organization. (Reference IOSA ORG 1.2.3 & IS-BAO AMC 3.2) b. The chief executive has signed a written "Just Culture" policy
BP 6a-3 – **Each organization has implemented an education and training program which addresses a "Just Culture", acceptable behavior and reporting protections.** a. Organizations have an education process within the workforce to explain the idea of a "Just Culture". b. Acceptable and non-acceptable behavior is clearly defined. c. Everyone is expected to report safety-related incidents without fear of reprisal. (*Reference: "A Roadmap to a Just Culture: Enhancing the Safety Environment", available at www.flightsafety.org/gain. This document provides useful guidance on defining acceptable and non-acceptable behavior.)*	a. A "Just Culture" training program designed and implemented with attendance mandatory for all organizational personnel. (Reference IOSA ORG 1.2.1 & IS-BAO 3.2.1.e)

Table 6a –Best Practices	Metrics
BP 6a-4 – **The organization has a system which reports safety-related information to the workforce on a timely basis**. a. The organization demonstrates willingness and competence to draw correct and meaningful conclusions from the reporting processes and to demonstrate the political will necessary to implement reforms when required. b. A "Plan, Do, Check, Act" cycle is part of a safety management system.	a. Existence of an established feedback system which demonstrates that open reporting information is being used to reduce risk. (Reference IOSA ORG 1.4.1& IS-BAO AMC 3.2 sec 2.5)
BP 6a-5 – **The organization is proactively identifying trends from safety information**. a. Analysis and interpretation of the data available within the aviation safety community are used to benchmark and identify trends. (*Examples of programs for the proactive identification of trends in safety information include voluntary and mandatory incident reporting systems and Flight Data Monitoring (FDM))*	a. Trend information is made available to personnel within the aviation organization. (Reference IS-BAO Risk Assessment Guidelines)

2.3.1.2. *Objective 6b – Identify and implement common metrics and descriptors of precursor events needed to enable adoption of a proactive approach to managing risk*

It is relatively easy to count the number of safety violations, but this is of minimal value if there is little or no understanding of the root causes of incidents or accidents. Employees make decisions which directly affect the safety outcome of their work programs on a daily basis. In some cases, their decisions will misinterpret management's guidance or, in the absence of specific guidance, employees will make an honest effort to "do the right thing." Nevertheless, people will still make mistakes. To effectively manage risk, management must know what mistakes or unsafe acts are occurring. To increase the ability of management to understand the risk, it is essential to have a system of common descriptors and metrics.

Table 6b –Best Practices	Metrics
BP 6b-1 – **The aviation organization has established a Flight Data Monitoring (FDM) program.** a. The FDM program is implemented in accordance with the principle of the "Just Culture". b. The FDM program is implemented in accordance with accepted best practice of the Industry.	a. Operate an FDM collection, analysis and feedback system. (IOSA ORG 3.1.2, ORG 3.3.1, ORG 3.3.13) b. ICAO Annex 13., Chapter 8 and Attachment E
BP 6b-2 – **The aviation organization has established a voluntary incident reporting system.** a. The voluntary incident reporting program is implemented in accordance with the principle of the "Just Culture". b. The voluntary incident reporting program is implemented in accordance with accepted best practice of the Industry.	a. Operate a voluntary incident collection, analysis and feedback system. (IOSA ORG 3.1.2, ORG 3.3.1, ORG 3.3.13) b. ICAO Annex 13., Chapter 8 and Attachment E
BP 6b-3 – **The Aviation Organization has a well-designed program to monitor safety in the day to day operation.** a. Programs to collect and analyze information on the effectiveness of current operational practices in terms of safety are in place. b. These programs monitor the effectiveness of safety nets as well as monitor normal operations by: • Deriving appropriate metrics / measures for identifying the precursors to safety incidents so that they can be managed in day to day operations. • Identifying and reinforcing those behaviors that have a positive effect on safety performance. d. Current operating personnel are involved in designing a data collection program as well as analyzing the collected data to ensure that the: • Operational perspective as to why certain events occur and whether or not they are occurring in the proper sequence is understood. Conclusions of the analysis are operationally relevant.	a. The effectiveness of the performance of safety nets is monitored by the organization. b. Measures for identifying the precursors to safety incidents have been identified through analysis and observation and are used to monitor operational performance. c. Behaviors that have a positive effect on safety performance have been identified and are reinforced through training programs and competency checks. d. Demonstrate that operational personnel are involved in all facets of the data collection and analysis programs. (IOSA ORG 3.3.2)

Table 6b –Best Practices	Metrics
BP 6b-4 – **Each aviation organization is embracing Industry Audit processes.** a. Each airline has become registered with the IATA Operational Safety Audit process or demonstrates an equivalent level of compliance with applicable requirements/best practices. b. Business aircraft operators have implemented IS-BAO and have become registered or have demonstrated an equivalent level of compliance with applicable requirements/best practices. c. Similar audit programs are developed and implemented for the other branches of the industry.	a. Audit programs are in place and are used by the industry.

2.3.1.3. ***Objective 6c – Establish and integrate across the industry shared incident/error databases. Demonstrate and disseminate the benefits of open reporting.***

Sharing database information can best be achieved by the use of common data collection taxonomies. Common taxonomies enable cross-references based on common collection strategies and assist in the integration of databases. Best practices for this objective are outlined in Table 6c.

Table 6c –Best Practices	Metrics
BP 6c-1 – **The organization has a system to protect proprietary information.** a. Confidentiality and the protection of proprietary information are ensured to allow the sharing of safety data.	a. A system is in place to protect the sources of safety information and the data collection organizations. b. IOSA Org 1.2.3
BP 6c-2 – **Each organization is participating in Regular Safety/Incident Review Meetings.** a. Term of reference should be developed in order to allow effective sharing of information and experience while protecting safety data. b. Each organization participates actively in such meetings by presenting its safety events. c. Lessons learned from others' experience are	a. Terms of reference for Safety Review meetings / Incident review meeting are in place. b. Regular Incident / safety review meetings are held with participation by appropriate organizations.

Table 6c –Best Practices	Metrics
proactively incorporated into the safety practices of the organization. *Note: IATA's Incident Review Meetings (IRM) and the Eurocontrol Safety Information Sub-group (SISG) are examples of best practices that organizations may wish to follow.*	(IOSA FLT 1.4.1)
BP 6c-3 – **Each organization is using jointly agreed upon common taxonomies.** *Note: Examples of common taxonomies include the STEADES incident descriptor system [developed by British Airways (BASIS) and IATA], the ground accident prevention data collection taxonomy [developed by a Flight Safety Foundation global task force], and the CAST/ICAO common taxonomy for accidents and incidents. Taxonomies for incident / accident Causal Factor Analysis include the Human Error Reduction in ATM (HERA) tool as well as the Janus model.* *(See www.hf.faa.gov/workbenchtools)*	a. Agreement reached upon use of common taxonomies between alliance members and other aviation organizations / sectors.
BP 6c-4 – **Each entity is sharing aviation safety data with interested parties.** a. A mechanism exists to share information/data among the membership of airline associations, between regional airlines, alliance partners, and other interested aviation organizations at local, regional and global levels b. Data may be collected and shared locally, regionally or globally. *Note: The establishment of local and regional safety teams or regional associations can greatly facilitate the establishment of common collection schemes and taxonomies. They can also function as a second level of protection against the undesired release of proprietary information. At this level, such organizations as AEA, ASET, PAAST, ATA, and AAPA as well as the IATA Regional Offices assist their members in protecting data.*	a. Evidence of sharing data exists.

2.3.1.4. Focus Area 6 Maturity Model – Table 6d contains the maturity model for this focus area.

Table 6d – Maturity Model for Focus Area 6 – Reporting and analyzing errors and incidents

Maturity Level	Capability
Level 1 – Developing	• Neither empowerment legislation nor "just culture" program exists.
Level 2 – Areas Identified for Improvement	• "Just culture" empowerment legislation is in place. • An organizational "just culture" is established: o A "just culture" policy statement has been signed by the chief executive. o Acceptable/non-acceptable behavior within the "just culture" has been defined in organizational documentation. o "Just culture" education and training programs are operational.
Level 3 – Evolving – Changes in work	• An open reporting system is operational within the organization. • A voluntary incident reporting system program has been developed or adapted for the aviation organization. • The aviation organization is vested in either regional or global IRM meetings. • Provisions are in place to protect the aviation organization's proprietary information during data collection. • Proactive trending of safety information is occurring. • Systems are in place to provide feedback to the organization's work force. • IOSA preparatory work has been completed and an audit scheduled.
Level 4 – Highly Evolved	• An FDM system is operational and being applied in conjunction with the voluntary incident reporting system. o Current operating personnel are involved in data analysis. • Common taxonomies have been developed and agreed upon. o Sharing of data with other organizations within the region and/or alliance partners is occurring. • Organization has successfully completed an IOSA / IS-BAO assessment or an equivalent audit process.

2.3.2. Focus Area 7 – Inconsistent use of Safety Management Systems (SMS)

A systematic management of the risks associated with flight operations, ground operations, Air Traffic Management and Aircraft Engineering or maintenance activities is essential to achieve high levels of safety performance.

A Safety Management System (SMS) is a systematic approach to managing safety, and includes the necessary organizational structure, responsibilities, accountabilities, policies and procedures to implement it. In order to maintain the safety of the whole aviation system, it is important to ensure consistency in the use of SMS across all sectors and disciplines of the aviation industry.

Guidance material on the implementation of SMS in the different sectors of the industry is available from many sources. This material is consistent at the highest level but is tailored to the particular requirements of the different sectors.

2.3.2.1. *Objective 7a – ICAO SMS standards published. Confirm need for formal (mandated) SMS across all sectors and disciplines of the industry.*

This objective addresses the need for all sectors and disciplines across the industry to implement a formal safety management system. ICAO Annexes 6, 11 and 14 require that Aircraft Maintenance, Flight Operators, Air Navigation Service Providers (ANSPs) and Airports implement formal SMS. This requirement does not yet extend to all sectors and disciplines of the industry such as, AIS and Meteorology. In order to improve the whole system, it is important to ensure the use of SMS across all sectors and disciplines of the aviation industry.

Table 7a –Best Practices	**Metrics**
BP 7a-1 – **Organizations within all sectors and disciplines of the aviation industry have their own formal SMS.** • The SMS of the Organization includes the suppliers of goods and services that impact upon aviation safety	a. Existence of organization's SMS as per ICAO requirement.

2.3.2.2. ***Objective 7b – Develop a plan for incorporation of SMS into audit processes.***

Objective 7c – Develop audit processes to assess operation of SMS function.

Objective 7d – Implement review of SMS during audits.

Objectives 7b, 7c and 7d are addressed together.

In order to test the implementation and application of SMS, it is preferable to use available audit mechanisms that are internationally recognized and accepted wherever possible.

Proactive auditing programs such as the ICAO USOAP and the IATA IOSA processes test the implementation of ICAO Standards and Recommended Practices and industry safety best practices.

Table 7b –Best Practices	**Metrics**
BP 7b-1 – **Audit processes drive consistency in use of SMS both within and across industry sectors and disciplines.**	
a. The ICAO USOAP audits implementation and application of SMS to drive consistency in application amongst states.	a. Modified USOAP.
b. The IOSA audits implementation and application of SMS to drive consistency within and across industry sectors and regions.	b. IOSA Standards Manual 2nd Edition, Effective March 2007.
c. Other recognized audit programs audit implementation and application of SMS and drive consistency in their use.	c. Tailored audit processes in place.

2.3.2.3. *Objective 7e – Define interface points between industry focus areas and develop a plan for SMS program integration across all interfaces.*

In practice, an SMS cannot operate in isolation. To be truly effective, the interface with other SMS must also be recognized and managed.

Table 7e –Best Practices	**Metrics**
BP 7e-1 – **<u>An organization's SMS recognizes external interfaces and contains the necessary procedures to manage them effectively.</u>**	
a. Processes should be established within the SMS to ensure that regular communications take place between the different sectors and disciplines to address safety issues across the interface.	a. Communication processes in place.
b. Procedures should be established within the SMS to ensure that risk assessment of change takes place in an integrated manner.	b. Procedures in place.

2.3.2.4. Focus Area 7 Maturity Model – Table 7d contains the maturity model for this focus area.

Table 7d – Maturity Model for Focus Area 7 – Use of Safety Management Systems (SMS)

Maturity Level	Capability
Level 1 – Developing	• **States** – Current ICAO SMS requirements are not implemented and are not communicated to industry. • **Industry** – SMS not implemented.
Level 2 – Areas Identified for Improvement	• **States** – Current ICAO SMS requirements are communicated to industry sectors / disciplines. • **Industry** – SMS implemented in those sectors and disciplines for which it is currently mandated.
Level 3 – Evolving – Changes in work	• **States** – National legislation / regulations require all sectors and disciplines to implement an SMS. • **Industry** – SMS implementation programs are developed for sectors and disciplines not previously covered by SMS requirements.
Level 4 – Highly Evolved	• **States** – o ICAO USOAP audit process covers the topic of SMS. o SMS is regulated according to ICAO provisions and industry best practices. o States and Regulatory Authorities facilitate the sharing of SMS best practice as it evolves. • **Industry** – o Organizations within all sectors and disciplines of the aviation industry, including suppliers of goods and services that impact upon aviation safety, have their own formal SMS. o Both internal and independent Audits of the SMS take place. o All sectors and disciplines work together effectively in an integrated manner to manage risk across boundaries. o SMS best practice is shared across sectors as it evolves.

2.3.3. Focus Area 8 – Inconsistent Compliance with Regulatory Requirements

The attainment of a safe system requires that the Industry complies with the regulations laid down by the State. The main responsibility for compliance rests with Industry, which has a legal, commercial and moral obligation to ensure that operations are conducted in accordance with the regulations. These regulations, which are a means of ensuring a baseline of safety within the Industry, are fundamentally based upon the ICAO Standards and Recommended Practices (SARPs). They have been developed over the last 60 years and reflect the collective experience of the aviation world. The IOSA program for airlines and similar programs for other branches of industry indicate that the level of compliance with regulatory requirements is not always satisfactory.

2.3.3.1. *Objective 8a – With full management support, execute independent assessment and gap analysis within the industry of regulatory compliance to address areas of non compliance.*

A gap analysis measures the current level of compliance with national regulations against the level that is legally required. When an assessment is complete, a detailed plan – including strategy to be employed and the resources which will be required – must be established and implemented. Management is accountable for the implementation of this whole process.

Table 8a –Best Practices	**Metrics**
BP 8a-1 – **Gap Analyses are conducted on a regular basis to assess regulatory compliance** a. Gap analyses are an integral part of the standing management process. b. Gap analyses are integrated within the Safety Management System. c. Gap analyses are conducted by appropriately qualified and authorized personnel.	a. ICAO Doc. 9859 Ch. 9
BP 8a-2 – **Appropriate industry initiatives are utilized, and unnecessary duplication is avoided (i.e. IOSA type audits, manufacturer audits, ground handling audits)**	a. IOSA ORG 1.2.2

Table 8a –Best Practices	Metrics
BP 8a-3 – **Non-compliance identified during gap analyses are addressed in a timely manner**	a. IOSA ORG 4.1.7
BP 8a-4 – **Methodology used for gap assessment is reviewed and amended as required to ensure continuing compliance.**	a. Documented evidence that a review has been undertaken during the last three years.
BP 8a-5 – **The industry uses information obtained during gap analysis and operational experience to recommend improvements to the regulatory framework**	a. Documented evidence exist that proposals have been made.

2.3.3.2. *Objective 8b – Perform regular independent audits of operational safety to assess ongoing compliance across the industry.*

Regular independent audits are essential for the on going monitoring of compliance with regulations. A harmonized system of audits should exist across the industry to ensure a consistent set of standards for assessing compliance. The results should be shared by industry to:

- Avoid duplication.
- Enable industry to learn from the safety information that will be gathered.
- Continually improve the system.

Table 8b –Best Practices	Metrics
BP 8b-1 – **Audits conducted by the industry includes the operational interfaces.** a. The audit process of each stakeholder addresses the operational interface with the other stakeholders. b. A process is in place to compare the results of audits covering common areas. c. Airports/operators committees. Formalized coordination between meteorological, airport, air traffic services, operators and aeronautical information services. d. Collaborative decision-making takes place.	a. Evidence exists of interfaces being audited. b. A coordination entity exists.

Table 8b –Best Practices	Metrics
BP 8b-2 – **Integration of industry audits/assessments results.**	a. A multidisciplinary safety entity comprised of Industry representatives exists which: • Analyses industry audits / assessments results; • Recommends appropriate action to their members.

2.3.3.3. Focus Area 8 Maturity Model – Table 8c contains the maturity model for this focus area.

Table 8c – Maturity Model for Focus Area 8 – Compliance with Regulatory Requirements

Maturity Level	Capability
Level 1 – Developing	• Major lapses in regulatory compliance exist. • Willful non-compliance with regulatory requirement is frequent.
Level 2 – Areas Identified for Improvement	• The operator/service provider does not have a system to ensure its regulatory compliance. • Lapses in compliance exist and may affect safety critical areas.
Level 3 – Evolving – Changes in work	• The operator/service provider complies with most applicable regulatory requirement and lapses in compliance do not affect safety critical areas. • The operator/service provider does not have an effective system to ensure its continuous compliance with regulatory requirements.
Level 4 – Highly Evolved	• The operator/service provider compliance is established through internal and external assessments/audits. • A system is in place to assess compliance on a continuous basis and corrective actions are taken promptly whenever appropriate. • All staff is aware of the regulatory requirements and is actively encouraged to comply.

2.3.4. Focus Area 9 – Inconsistent Adoption of Industry Best Practices

Best Practices, which represent the application of lessons learned by the international Industry, may relate to safety and/or efficiency. Adoption of Best Practices requires both detailed knowledge of current Best Practices and an organizational commitment to adopt them in a timely manner. Both requirements have preconditions which must be addressed.

2.3.4.1. ***Objective 9a – Improve the structures (through management commitment) for maintaining knowledge of Best Practice and identify future developments in Best Practices.***

If an organization is to incorporate international Best Practices into its operation effectively, it must have a methodology in place for obtaining, incorporating and adapting those practices. The organization also must have a repeatable process for continually refining and updating Best Practices that takes advantage of the knowledge and experience of all organization stakeholders.

Table 9a –Best Practices	**Metrics**
BP 9a-1 – **<u>The organization creates and maintains an organizational structure that facilitates adoption of industry Best Practice within the organization.</u>**	
a. The organization designates a specific individual within the organization or within each operating unit with responsibility for researching and disseminating existing best practice for that unit's activities. That individual is able to recommend specific points for adoption and has follow up responsibilities to ensure implementation of safety critical items.	a. IOSA ORG 1.3.3; 1.4.2; 1.7.1; 2.2.3
b. The organization adopts "Just Culture" principles to ensure that implementation of best practices are appropriate to the individual organization. These principles encourage an open dialog across all levels of the management structure to optimize information flow both up and down the chain.	b. IOSA ORG 1.2.3; 1.5.1; 2.1.1; 3.2.6

Table 9a –Best Practices	Metrics
c. The organization vests in line managers the ability to take action to implement safety best practices.	c. IOSA ORG 3.2.4; 3.1.1
d. Best Practice is independent of any cultural issues. Where cultural issues are presented, steps are taken to resolve them consistent with international best practice.	d. IOSA ORG 1.1.1; 1.5.1
BP 9a-2 – **The organization identifies sources of present and future Best Practice information:**	
a. Sources of agreed Best Practices include: • ICAO SARPS and supporting documentation • State Regulations and supporting documentation • ICAO Flight Safety Information Exchange (FSIX) • Flight Safety Foundation (FSF) materials • Manufacturers information; • Newsletters, bulletins and alerts from various industry groups (IATA; ACI; IFALPA; IFATCA etc.). • *Global Aviation Safety Roadmap* *Note: All of the above are available electronically. IOSA audit debrief materials are used by an individual operator.*	a. IOSA ORG 1.9.1; 2.1.8
b. Safety best practice is identified through investigation of accidents and incidents; flight data programs; voluntary reporting systems; continuous improvement processes of industry; input of operating personnel; continuous dialog within the industry. *Note: Comparison of the various sources when distributing an industry wide product such as, for example, information on runway incursions. The substance of the information provided should be functionally identical in all important particulars.*	b. Best practices appropriate for the operation are identified and clearly stated.

Table 9a –Best Practices	Metrics
BP 9a-3 – **Industry distributes and adopts training programs on safety Best Practice subjects**.	
a. Training in safety best practice includes both line operating and management personnel to ensure that all parts of the organization are aware of and conversant with the requirements of the best practice.	a. IOSA ORG 1.8.4; ORG 3.2.7; 4.1.9; FLT 3.2.1.i
b. Comparison of the published training aids with applicable ICAO and State requirements.	b. The aid is consistent and useful to the operational organizations for whom it was designed.
Note: The sources for training materials are the same as in BP 9a-2a with the note that some training materials may be of a size that prohibits electronic distribution. Training aids are of sufficient detail to allow adoption within an organization training program without significant additional work. The distribution process for the aid is uncomplicated.	
BP 9a-4 – **An organization incorporates Best Practice in its business case.**	
a. There is a formal and active commitment by the organization to a policy that designates safety and quality as a fundamental priority throughout the organization.	a. IOSA ORG 1.3.1
BP 9a-5 – **The organization utilizes regular internal and external audits of both itself and all subcontractors of safety operations to ensure Best Practice compliance.**	
a. Audits include IOSA, LOSA, Regulatory Authorities audits and internal audits. They also include the output of self disclosure reporting programs and flight data acquisition programs. They additionally include reviews of comparable audits of any external organization which performs a safety related function as a sub contractor of the organization, such as an independent maintenance and repair organization	a. IOSA ORG 4.1.2; ORG 3.3.2; ORG 3.3.4; ORG 1.4.4; ORG 1.2.2 IOSA Report; LOSA reports; reporting program analysis reports.
b. Deficiencies in best practice implementation are corrected. An organization seeks appropriate assistance in correcting any such deficiencies if necessary.	b. Evidence of corrective action

2.3.4.2. ***Objective 9b – With industry openly sharing information regarding the benefits of Best Practices, implement performance benchmarking of dissemination consistency***.

Dissemination consistency is another way of saying identification of those operators, States or Regions where international Best Practice is not being followed uniformly. In order to allocate remediation assets — both monetary and physical — most effectively, a system must be in place to identify such operators, States or Regions where work is needed in advance of the obvious metric of accident rates.

Table 9b –Best Practice	**Metrics**
BP 9b-1 – **The industry, States and ICAO utilize audit reports to identify areas where Best Practice implementation is problematic.**	
a. Each sector of the industry uses the audit and other safety information available to identify area where best practices are not followed uniformly.	a. IOSA ORG 1.3.3; 1.4.2; 1.7.1; 2.2.3; Areas are identified
b. Coordination exists between the various sectors of the industry to identify common latent causes and to implement remedial actions.	b. Evidence of coordination

2.3.4.3. **Focus Area 9 Maturity Model – Table 9c contains the maturity model for this focus area**.

Table 9c – Maturity Model for Focus Area 9 – Adoption of Industry Best Practices

Maturity Level	Capability
Level 1 – Developing	• Organizations learn their own lessons – Internal incident / accident investigation reports identify opportunities for improvement in current practices. • Internal recommendations for improvement are directed to those that can bring about change in the organization.
Level 2 – Areas Identified for Improvement	• Organizations apply Best Practices from external sources – An internal/external mechanism exists for ensuring the timely incorporation of best practice mandated by external sources. • Information on opportunities for improvement in current practices contained within published incident / accident investigation reports are picked up by responsible industry bodies and disseminated to members.
Level 3 – Evolving – Changes in work	• Organizations pass on their own lessons to others o An internal mechanism exists for ensuring the timely transmission of improvements identified in internal incident/accident reports to the wider industry. o Internal Audit processes test the timely response to internal/external recommendations/mandates. • Industry bodies promulgate Best Practices and exert pressure for compliance.
Level 4 – Highly Evolved	• The organization is committed to continuous improvement: o Recognized continuous Improvement techniques are applied o Self audits are a frequently used tool o The organization looks at other industries to identify transferable Best Practices that can be implemented or adapted.

2.3.5. Focus Area 10 – Non-alignment of Industry Safety Strategies

All industry stakeholders expend considerable effort to improve aviation safety at the local, state, and regional levels. These efforts, while helpful, could be more effective at a global level if they were well aligned and shared goals and methods. Further improvements in effectiveness could be gained by different members of industry working more closely together to implement improvements, particularly when integrated solutions would be more powerful across the aviation system.

2.3.5.1. *Objective 10a – Design a mechanism for coordination and sharing of safety strategies.*

The coordination and sharing of safety strategies can be facilitated most readily by having clearly defined mechanisms for doing so and by having consensus that industry stakeholders will utilize such mechanisms in a proactive manner. As stakeholders gain experience, they can modify the initial mechanisms to increase their effectiveness.

Table 10a –Best Practices	**Metrics**
BP 10a-1 – **ISSG continues coordination of activities including Part 3 process definition.** a. The mechanism enables and encourages open timely global communication regarding all ISSG related activities by participating stakeholders (ref: *Global Aviation Safety Roadmap Part 1*).	a. ISSG Part 3 process defined and coordination plan activated.
BP 10a-2 **– Industry establishes a timely mechanism for informing stakeholders about relevant safety forums.** a. A "clearing house" provides a central location for dissemination of all safety initiatives and activities that a region could utilize to improve its efforts to meet *Roadmap* goals and objectives.	a. Sharing mechanism is defined.
BP 10a-3 **– ISSG defines a sharing process that extends both to all industry stakeholders beyond its membership and to government organizations.** a. ISSG shares information and strategies with segments of the industry not directly represented in its membership.	a. Communication plan is established.

2.3.5.2. *Objective 10b – Coordinate and share safety strategies, seeking to achieve alignment and minimize duplication.*

Implementing use of the coordination mechanism developed in Objective 10a should be accomplished as soon as possible so that regions and organizations can capitalize on the *Roadmap* to better focus their safety improvement efforts.

Table 10b –Best Practices	**Metrics**
BP 10b-1 – **ISSG utilizes the mechanisms developed by its Part 3 process definition.**	a. ISSG Part 3 process mechanisms activated.
BP 10b-2 – **ISSG develops an outreach program to engage other organizations—cargo, on-demand, charter, business, etc.—to adopt a plan of action consistent with the *Global Roadmap.***	a. ISSG Outreach program is defined and implemented.
BP 10b-3 – **Industry continues to assure open access to safety forums by all interested parties.**	a. ISSG Sharing mechanism is defined.
BP 10b-4 – **Stakeholders, including Air Traffic Control (ATC), airport operations, ground handler operations, airlines, and Fixed Base Operators (FBOs), explicitly state and align their safety objectives and strategies in accordance with the *Roadmap* focus areas.**	a. Stakeholder's safety objectives and strategies align with the *Roadmap*.

2.3.5.3. Focus Area 10 Maturity Model – Table 10c contains the maturity model for this focus area.

Table 10c – Maturity Model for Focus Area 10 – Alignment of Industry Safety Strategies

Maturity Level	Capability
Level 1 – Developing	• Industry segments are unaware of others' safety strategies.
Level 2 – Areas Identified for Improvement	• Industry segments seek mechanism to better share and align some of their safety strategies. • Willingness expressed to improve cooperation.
Level 3 – Evolving – Changes in work	• Open access to safety forums by all interested parties is encouraged by sponsoring organizations in all regions. • Mechanism for sharing and aligning strategies is defined and agreed to, and implementation has begun.
Level 4 – Highly Evolved	• Safety of aerodromes; aligning of safety objectives and strategies of the stakeholders (ATC, airport operations, ground handler operations, airlines, FBOs, etc.) are transparent and available for comment and updating. • Outreach to developing regions is timely and effective. • Duplication of safety outreach efforts is reduced but not to the extent that various regions are not informed of key safety initiatives and concepts. • Clearing house list of all safety forums is maintained in a timely manner and is routinely accessed by stakeholders in developing regions as well as others. • Synergy across regions is noticeable and appreciated.

2.3.6. Focus Area 11 – Insufficient Number of Qualified Personnel

A major challenge faced by all sectors of the aviation industry concerns the recruitment, training and retention of technically qualified staff including those engaged in regulatory oversight functions. A properly resourced and appropriately trained workforce is a key element in maintaining safe operations. The failure to recruit and retain a core of well trained competent staff has considerable safety implications.

2.3.6.1. *Objective 11a – Identify requirements for sustaining aviation safety against projected growth of commercial aviation (matching tasks and resources).*

Each industry sector requires an action plan put in place to ensure a sufficient complement of appropriately trained staff to maintain safe operations and to keep pace with evolving technology. Even today, some sectors in some regions are experiencing significant shortages of suitable technical staff. As a result, the industry is witnessing significant migration of professional staff from one region to another to meet this need. This relocation is to the detriment of certain regions. In the long term, this challenge can only be addressed by developing comprehensive human resources plans.

Table 11a –Best Practices	**Metrics**
BP 11a-1 – **Stakeholders, collectively and individually, assess human resources requirements for the recruitment and training of personnel that includes growth projections, target levels and training standards.** a. The assessment projects the needs, expected shortfalls and required training based on: • Sound market-based assessment of operational projections across all operators; • Expected development of flight operations and related support requirements for all sectors of the industry; • Anticipated retirements and replacements.	a. Assessment exists for all industry sectors.

2.3.6.2. ***Objective 11b – Implement plans to provide appropriate numbers of qualified people.***

Objective 11d – Resource plans to deliver the appropriate numbers of qualified people

[*Objectives 11 b and 11d will be addressed together due to similar content*.]

Once the needs, anticipated shortfalls and required training are projected, the appropriate sources of personnel shall be identified. Qualified people can be sourced internally or outsourced, but in either case there needs to be a sufficient number of appropriately qualified, trained personnel available to the organization. The ultimate responsibility for ensuring that this requirement is met rests with the employer.

Table 11b –Best Practices	**Metrics**
BP 11b-1 **– <u>Stakeholders identify potential sources of appropriately qualified personnel and actively encourage a sufficient number of people to enter accredited training institutions.</u>** a. Promotion of the acceptance of licenses and qualifications issued by other regulatory authorities/civil aviation authorities. b. Development of incentives to attract potential candidates into the industry. c. Development of incentives to reduce the migration of professional staff from one region to another.	a. Source of qualified personnel identified, along with a recruitment strategy.
BP 11b-2 **– <u>Organizations develop and implement a rolling multi-year human resources plan that is regularly reviewed and updated.</u>** a. A flexible human resource plan is implemented as an integral part of the organization's business plan. b. The plan provides a basis upon which to make adjustments to reflect unanticipated changes in the industry and includes specific strategies for the retention of qualified staff.	a. Number of qualified personnel to meet the plan.

2.3.6.3. ***Objective 11c – Establish audit processes to confirm that people resource plans will deliver the appropriate numbers.***

Audit processes should be established with the objectives of tracking and regularly assessing that the organization has:

- An adequate number of personnel available;
- The right professional and competency mix in its staffing complement to ensure its continued viability.

There should be regular reviews of these personnel audits to ensure that its needs are addressed over a period of several years.

Table 11c –Best Practices	**Metrics**
BP 11c-1 **– <u>Stakeholders establish internal and independent audit processes and reviews.</u>** a. Internal audits are conducted as an integral part of the organization's business plan review. b. External independent auditing is conducted through the use of recognized and accepted audit processes such as USOAP and IOSA.	a. The audit process is integral to the organization's business plan.

2.3.6.4. **Focus Area 11 Maturity Model – Table 11d contains the maturity model for this focus area.**

Table 11d – Maturity Model for Focus Area 11 – Ensuring a sufficient number of qualified personnel

Maturity Level	Capability
Level 1 – Developing	• No human resources plan exists. • Few or no procedures for training of staff exist. • Ongoing staffing shortfalls occur.
Level 2 – Areas Identified for Improvement	• Human Resources recruitment procedures are in place. • An adequate level of actual training is not provided. • Access to training institutions limited.
Level 3 – Evolving – Changes in work	• Human Resource plan structured to meet future needs. • Access to training is available. • Appropriate level of training is provided.
Level 4 – Highly Evolved	• High Level of training exists that is matched to growth predictions and technology requirements. • Internationally recognized standards of training are incorporated in the organization's training programs. • Career planning programs have been implemented.

2.3.7. Focus Area 12 – Gaps in Use of Technology to Enhance Safety

Throughout the history of aviation, technological advances have contributed significantly to major improvements in safety. While modern flight deck technology is well recognized for its contribution to improved safety over the past two decades, there have also been technological advances that have improved the safety of maintenance practices, airport operations and air traffic management, as well as the processing and integration of safety information. These various technologies should be considered for adoption in the development of any plan to improve regional safety. The planned use of such technologies should recognize opportunities both within the established fleet as well as the potential addition of new facilities and aircraft, which offer technological advances to improve safety. A comprehensive listing of the technologies and training programs that have proven effective in reducing the operational safety risks that exist today appear in several appendices: Appendix E (Aircraft Operations), Appendix F (Air Traffic Management/Air Traffic Control), and Appendix G (Airport Operations). These appendices provide a wide range of tools with which to implement the strategies discussed in Focus Area 12.

2.3.7.1. *Objective 12a – Define proven technology gaps. Industry works together to identify areas where technology might provide significant safety benefits.*

The cost of purchasing, installing and maintaining technology can be substantial. Unless well planned and thought through, such acquisitions can also produce much less safety benefit than initially claimed. This is particularly true when unique regional requirements and obstacles are not thoroughly incorporated into the acquisition planning. Due to the relative scarcity of financial and human resources in developing regions, the *Roadmap* seeks to base such acquisitions on a well-considered understanding of what safety benefits can be gained over the life cycle of the acquired technology. This can best be accomplished through the use of proven risk assessment methods.

Table 12a –Best Practices	**Metrics**
BP 12a-1 – **All stakeholders and actors maintain continuous awareness of safety threats within their region.**	
a. Establish data-driven, prioritized list of known and highly likely regional aviation safety threats. b. Use consensus-based process to provide qualitative threat assessment as appropriate.	a. Data-driven current list of prioritized regional safety threats.

Table 12a –Best Practices	Metrics
BP 12a-2 – **All stakeholders and actors identify and understand the safety benefits of available technologies that can address threats.** a. Develop and continually update a listing of such technologies, for example: • Retrofitable and installed aircraft technologies • ATM technologies • Airport technologies • Operations related technologies (maintenance, flight, ground, etc.) • Safety data technologies	a. Availability of a safety awareness information summary regarding eligible technologies.
BP 12a-3 – **The organization conducts analysis to match integrated technology solutions to threats in most efficient, system-oriented manner.** a. Identify specific regional requirements and needs that will provide greatest safety benefit. b. Avoid piecemeal "solutions" that do not recognize system issues that must be addressed to achieve safety success. c. Consult industry consensus for what is the best technology to deploy (Refer to Appendices E, F, and G). d. Determine the safety value of technological solutions vs. other more traditional solutions such as training, procedure modifications and/or safety awareness information, which could accomplish much of the safety benefit at lower cost and faster/wider implementation.	a. Regionally agreed integrated analysis matching technology solutions to identified threats across all domains.

2.3.7.2. ***Objective 12b – Deploy proven technologies that have been developed to enhance safety.***

Deployment of technologies may be done in a stepwise manner that seeks to provide the most efficient, cost effective installation, including any required training. A balance should be sought between the most efficient installation and an installation timeline that will provide the greatest safety benefit in a reasonable term.

Table 12b –Best Practices	Metrics
BP 12b-1 – **The organization facilitates the ability to acquire technology.** a. Develop a safety business case for new technologies (i.e., identify the economic benefit of safety technology). b. Explore non-traditional methods for acquiring resources (i.e., outside aviation-specific industry). c. Identify deployment-enabling steps. d. Seek/develop innovative approaches to allow wide access to safety-enhancing technologies. e. Identify existing funding mechanisms for the acquisition of new technologies (e.g. Cape Town Convention/Treaty and the Abuja Resolutions).	a. Safety business cases for planned technology acquisition.
BP 12b-2 – **The organization identifies the obstacles/barriers to the deployment of such technologies (e.g., owned vs. leased aircraft, infrastructure environment, etc.).** a. Identify prerequisites for deployment of new safety enhancing technologies. b. Understand how to address and overcome the potentially significant barriers. c. Build measures into the deployment plan that address unique regional socio-economic and cultural issues.	a. Mitigation plan for addressing barriers included in technology deployment plans.

Table 12b –Best Practices	Metrics
BP 12b-3 – **The organization develops and implements a detailed plan for deploying proven technologies.** a. Understand successful implementation paths and methods. b. Develop reasonable milestones that address issues related to corporate approval, finance, installation, certification, and training as well as those barriers that must be overcome. c. Implement plan and manage as part of overall business plan, including specific safety metrics that should be affected (both for the current fleet and new acquisitions).	a. Technology acquisition and deployment plans approved as integral part of organizations' business plans. b. Introduction of new technology equipment to the fleet and/or infrastructures.

2.3.7.3. ***Objective 12c – Integrate measures to close technology gap.***

In order to gain the greatest safety benefit from the deployment of safety-related technologies the various regional stakeholders and actors from all sectors need to work in a cooperative strategic manner to integrate the utilization of new technologies across sector boundaries.

Table 12c –Best Practices	Metrics
BP 12c-1 – **Regional stakeholders communicate and promote information about valuable safety-related technology, e.g., Aviation Safety World article on Precision-like Approaches.** a. Seek information from knowledgeable sources both within and outside the region. b. Use high profile events to demonstrate how technology could prevent such accidents and incidents. c. Conduct meetings among stakeholders to discuss safety-enhancing technology.	a. Routine reliable communication plan developed by stakeholders in region. b. Meetings held among stakeholders

Table 12c –Best Practices	Metrics
BP 12c-2 – **Each stakeholder in the region shares their action plan for the development, evaluation, and deployment of new safety enhancing technologies.** a. Regulatory Authorities are involved in the deployment of new technologies to ensure that they understand the technology.	a. Agreed-upon process for sharing and updating information about action plans across region. b. Meetings held among stakeholders will include Regulatory Authorities.

2.3.7.4. **Focus Area 12 Maturity Model – Table 12d contains the maturity model for this focus area.**

Table 12d – Maturity Model for Focus Area 12 – Use of Technology to Enhance Safety

Maturity Level	Capability
Level 1 – Developing	• No identification of threats. • No identification/lack of understanding of safety-enabling technologies. • No plan for or deployment of safety-enabling technologies. • No integration efforts to communicate or share knowledge or planning.
Level 2 – Areas Identified for Improvement	• Threats are identified. • Safety-enabling technologies acknowledged and capabilities are understood. • Initial efforts to plan for deployment of technologies. • Initial deployment of technologies by limited numbers of operators/airports/air traffic control centers. • Initial efforts to integrate information and analyze how safety-enhancing technologies may have prevented regional/organizational accidents.
Level 3 – Evolving – Changes in work	• Safety-enhancing technologies deployed in at least 50% of the commercial fleet/airports/air traffic control centers. • Integration and sharing of information regarding the benefits safety-enhancing technologies. • Regulatory requirements being developed/implemented to mandate installation of safety-enhancing technologies.
Level 4 – Highly Evolved	• Safety-enhancing technologies deployed in a large majority of the commercial fleet/airports/air traffic control centers. • High degree of integration and information-sharing among organizations, including Regulatory Authority regarding safety-enhancing technologies. • Regulatory requirements exist regarding installation of safety-enhancing technologies.

3. Implementing the Roadmap – Developing a Regional Action Plan

In Part 1 of the *Roadmap* development, it was recognized that the most successful aviation safety initiatives have resulted from Industry, Regulatory Authorities, and other involved organizations working together to address common safety issues. Such regional approaches have resulted in several successful efforts, including:

- the US Commercial Aviation Safety Team (CAST).
- the European Safety Strategy Initiative (ESSI).
- the Pan American Aviation Safety Team (PAAST).
- the Africa and Indian Ocean Safety Enhancement Team (ASET).

It was also noted that ICAO had initiated a number of regional efforts under the title of Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAPs). The common result coming from these programs is that focused action, together with the introduction of new capabilities, can lead to a significant reduction in the accident rate. This section describes how such a regional activity can utilize the Roadmap to help them develop a regional action plan.

Implementation of the *Roadmap* concepts must proceed in a very deliberate manner. The aviation system is extremely safe in comparison to all other modes of transportation. Making changes to improve safety is our goal, but we must not inadvertently take backward steps. The Best Practices identified in the Roadmap vary from the very basic to the very sophisticated. When analyzing the current state of an entity, it must be recognized that achieving the highest level of Best Practice incorporation is a long-term process. The Regional Action Plans which are developed should consider this. The developers must identify a *step-wise approach* to achieving implementation. Otherwise, an attempt to advocate the immediate implementation of all Best Practices may detract from the basic obligations of States and Industry organizations to correct those infrastructure and other deficiencies that are already identified.

3.1 The Process – A Proposal for Developing an Action Plan

An Action Plan defines specific activities that should take place in order to improve safety. It begins with an analysis of what the situation is today, then compares it to where the organization would like to be. This "gap analysis" identifies specific steps that can be taken to reach the desired goal. The developer of the plan then decides what specific actions will be taken and in what order—in other words, generating a prioritized action list. From that list, the developer builds an Action Plan, which identifies what actions will be taken and who is responsible for them.

Implementing the Roadmap – Developing a Regional Action Plan

Although there are many ways to develop an action plan based upon the concepts identified in the *Roadmap,* the Industry Safety Steering Group (ISSG) has identified a recommended step-by-step process that may be of use to future analysis/implementation teams. This Section describes that process, and Appendix I provides an example of the results that could be generated when using the process.

Before the process is discussed, a word of caution is in order. Reviews of previous unsuccessful attempts at group efforts to improve safety have shown that Action Plans should be developed so that they define successive activities that are achievable. Thus, it may not be prudent to define actions that would take the region from a "Developing" condition directly to "Highly Evolved". This method of taking a series of "small steps" to get to the final goal is recommended by the ISSG. Figure 3-1 at the end of this Section illustrates the step-wise approach.

The following paragraphs describe the process in detail, and discuss each step that an organization would take. The process—and each step—is illustrated in Figure 3-2 at the end of this Section.

3.1.1. Step 1 –Select the Region for Analysis

A region may be as defined in the *Roadmap* (the World is separated into seven total regions), or as a subset of these regions (e.g. COSCAPs, of similar States within a region, or even an individual State). The Roadmap process can be equally applied regardless of the Region being assessed.

3.1.2. Step 2 – Identify Key Stakeholders

In order to assure that any plan will be able to instill changes intended to improve aviation safety, it is essential that the perspective of all key stakeholders be considered. Therefore, those stakeholders need to be identified early in the *Roadmap* process.

A stakeholder can be any party—Regulatory Authority, operator, or organization—that could be involved in implementing or influencing changes, or which is significantly affected by these changes.

Once the key stakeholders have been identified, review the list of participants on the regional action plan development team to ensure that all appropriate constituents are represented. Successful development and implementation of the Action Plan depends on having the appropriate stakeholders actively engaged in its development.

3.1.3. Step 3 – Outline the Safety Strengths and Enablers

A cornerstone of the *Roadmap* process is the need to develop an understanding of the general environment of the region targeted for safety enhancement efforts. Inherent to every region (and every state with the region) are a collection of factors that support the safety of aviation within that region. A key element of the Roadmap plan is to identify these strengths and enablers in order to find ways to build upon this safety foundation. The standard Regional Assessment template provides a useful structure in which to record this information in an organized

manner, which will better support the development of the Plan. (Appendix I is a completed version of a typical Regional Assessment.)

3.1.4. Step 4 – Identify the Existing and Emerging Risks

The Roadmap process requires the identification of those risks that can create an environment which will weaken overall aviation safety within that region, either currently or in the foreseeable future. (This is similar to Step 3, except that risks, rather than strengths, are isolated and identified.) Accurate and comprehensive listings of these risks are essential in performing a meaningful Gap Analysis in Step 5. It is recommended that the Regional Assessment template be used to record the risks, as noted in Step 3..

3.1.5. Step 5 – Perform a Gap Analysis

A Gap analysis is simply an evaluation that compares the existing situation to the desired one. There are a variety of methods that can be used to perform a gap analysis. Using data from a number of existing sources (ICAO's USOAP, IATA's IOSA, etc) or from the detailed knowledge derived from a group of knowledgeable experts, you can identify:

- the current maturity level for the majority of the parties in the region.
- the implementation level for each of the *Roadmap* Best Practices that are applicable to the members of the region.

In the context of the *Roadmap*, the results of the gap analysis will be descriptions of the difference (within the defined Region) between the *current situation* (utilizing information captured in Steps 3 and 4), and the *target*, the highly evolved situation in which Best Practices have been implemented.

For example, Best Practice 6a-1 (Focus Area 6, Section 2.4.1) states that "Organizations should Empower an Open Reporting System" by ensuring that:

- the State enacts enabling aviation law, and
- the regulatory authority develops and implements regulations which foster open reporting.

The metric to measure this Best Practice is the existence of this regulatory framework. If the framework is not in place, the region would be considered to be in a "Developing" state when you review the Maturity Model for Focus Area 6 (Table 6d in Section 2.4.1.4).. Best Practice 6a-1 would then be listed as a "gap".

Step 5 would be repeated for each the maturity model and/or applicable Best Practice for each focus area.

In many cases, there will not be a single gap applicable for an entire region. The gap analysis summary should identify the organizations or entities responsible for correcting the deficiency. An analysis which documents varying gaps might be useful for prioritizing recommended actions, and ultimately developing appropriate implementation plans for various areas / states within the region.

3.1.6. Step 6 – Develop Prioritized Recommended Actions

The gap analysis forms the basis of the action plan by identifying areas where the *Roadmap* Best Practices have not been adequately implemented. By reviewing the gaps and the associated Best Practices, a list of potential safety enhancement actions can be identified. However, it should be recognized that it is probably impractical to attempt to implement an Action Plan that addresses each and every deviation from the mature (highly evolved) level.

Each gap identified in the gap analysis should be reviewed in order to evaluate both its impact on improving safety as well as the ability of the region to effect the change.

- Safety Impact – Evaluate the safety enhancement that would result from the elimination of the gap. Ideally, a *quantitative* approach using various methodologies such as those developed by the United States' Commercial Aviation Safety Team (CAST) can be used. However, the nature of the Best Practices defined in the *Safety Roadmap* make this quantitative assessment difficult, as the very nature of most of the Best Practices address the key foundation of aviation safety. For example, the gap analysis in Step 5 indicates that it is very difficult to quantify the impact that implementing the regulatory framework for open reporting systems (Best Practice 6a-1) would have in isolation. However, it is possible to *qualitatively* evaluate this gap by noting that BP 6a-1 provides the necessary groundwork so that many of the more advanced non-punitive reporting systems can be implemented. (Refer to Best Practices 6b-1 and 6b-2).

  With the appropriate level of knowledge on the evaluation team, the analyst can order the list of potential actions in a manner that the assessment team believes will have the greatest impact on safety in the region being evaluated.

- Flexibility – Although the impact on safety should be the primary method to prioritize the list of potential actions, the ability of the members of the region to make the changes and adapt to a new situation should also be considered. The evaluation of the ability to effect a change should include both:

  - the existence of the political will to change, and
  - an evaluation of the availability of resources necessary to implement the change.

  Discretion should be used in deferring actions simply because it appears that the political will and / or resources are not available. There are, potentially, many ways to help generate the necessary political will. Likewise, implementations of many of the *Roadmap* Best Practices require a relatively small outlay of resources, especially when the implementation can be based on other successful implementations in other regions or areas.

3.1.7. Step 7 – Develop an Action Plan

Once a list of potential prioritized actions has been developed, the implementation Action Plan must be defined. Using the list of potential actions, specify which ones the assessment team believes should be implemented first. The list should include a manageable set of actions that represent those steps necessary to move the region to the next level of maturity for those safety focus areas that the team is addressing.

Once the list is finalized, the team must assign a responsible party or organization to lead the implementation of each action item. Ideally, this action leader should already be a party to the Action Plan development. Also, it should be recognized that there are already many regional activities and organizations working around the world that may be able to provide support. For example, in Sub-Saharan Africa (the region assessed in Appendix I), the Africa Aviation Safety Enhancement Team (ASET) may be available to help provide support in defining specific industry actions which will be necessary to implement the identified Best Practices in the Regional Action Plan. Similarly, the various ICAO COSCAPs forming in that area could be helpful in defining and coordinating State actions. The members of the ISSG are also available to provide support both in identifying which regional activities to support and to further define the detailed steps in implementing the Best Practices.

3.2 Continuous Improvement – What to do Next

The Regional Assessment Team's work is not complete, even after the plan has been defined and turned over to the organizations or individuals responsible for leading the implementation. The Team should continuously monitor the implementation activities on an ongoing basis to ensure both that action is being accomplished and that any roadblocks to implementation are removed.

When implementation is completed, the Team should repeat the gap analysis, initiating the development of the next implementation plan that will move the Region to the next level of maturity.. It has been noted several times that this safety enhancement process is best accomplished in a step-wise fashion: Once the initial Action Plan has been completed, repeat the process in order to identify the next safety enhancement actions to implement.

No region of the world has attained the highest level of focus area maturity by all of their States, airlines/operators, and other constituents. Continuous safety improvement is just that – Continuous.

3.3 Regional Definitions – An ISSG Proposal

Over time, a number of different proposals have been developed for combining groups of States into regions. The ISSG has reviewed a number of such regional breakdowns and their applicability to safety analyses. The conclusion drawn was that most of the current groupings reviewed were divided up based on reasons other than performing safety assessments. For the most part, the rationale was primarily historical or political in nature. The ISSG believes that for a successful safety evaluation and planning process to take place, it is important to group similar cultures and beliefs together,

because safety is fundamentally a human performance evaluation. When the Best Practices of Section 2 are reviewed, those beliefs and cultural imperatives that strongly influence human behavior are the key ingredients to their successful implementation.

A perfect regional breakdown is impossible to achieve. Of those groupings reviewed, the ISSG found one that in its evaluation provides the best balance of relevant factors. Appendix H provides a detailed listing of Regions and States, and a graphic defining the distribution of States within the regional areas.

Figure 3.1 – A Step-wise Model to Implement the Roadmap

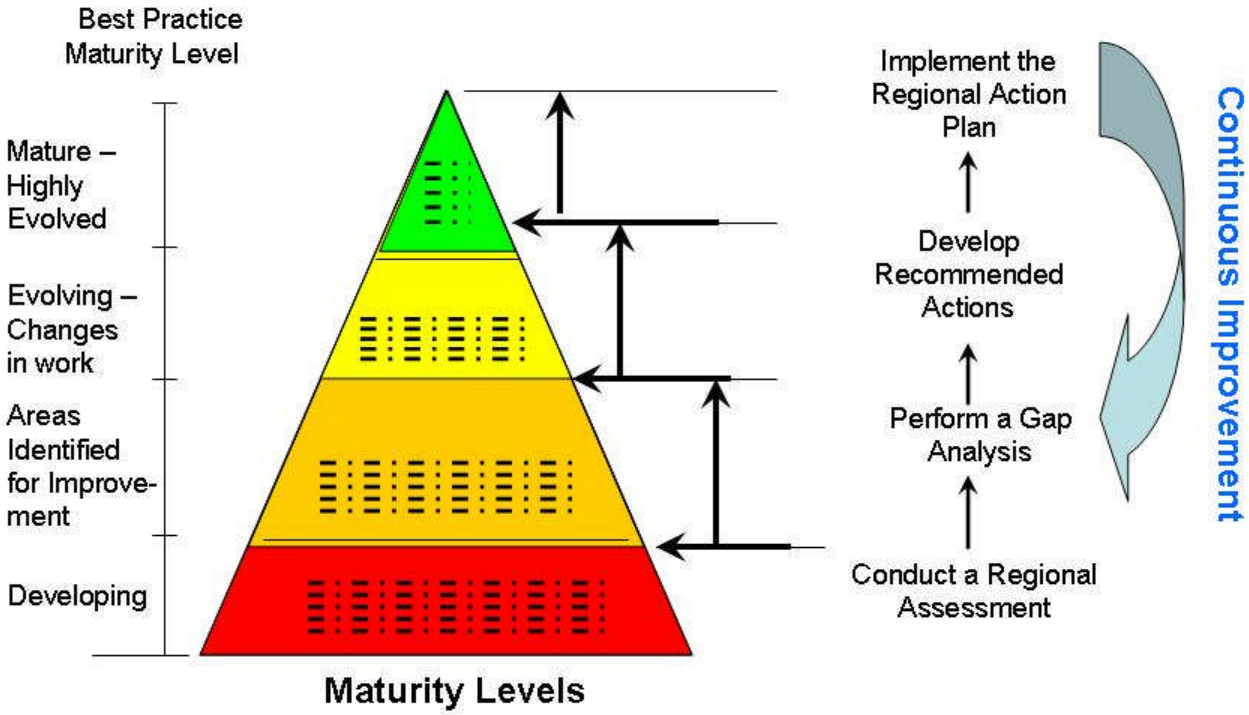
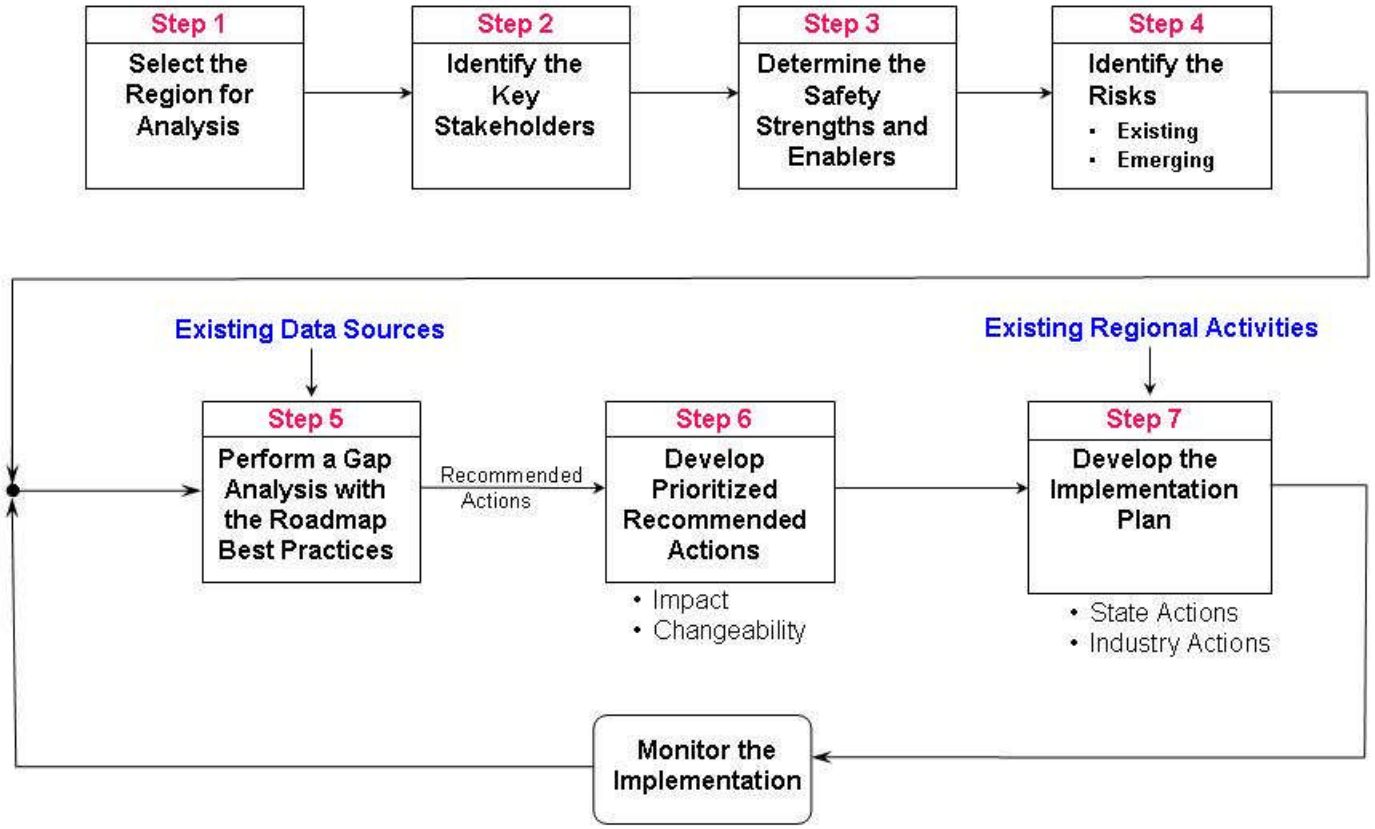


Figure 3.2 – Regional Safety Enhancement Plan Development Process



4. The Next Steps for the ISSG

Part 2 of the *Roadmap* activity has focused on expanding the Focus Areas and Objectives of Part 1 into Best Practices. It has also identified key metrics for each Best Practice, together with a maturity evaluation model for each Focus area. Each of these—Best Practices, metrics, and maturity model—will aid in the evaluation of an entity such as a State, a group of States, or an individual airline.

Another key deliverable from the *Roadmap* Part 2 work is the development of a Regional Assessment Process. Its primary uses are in the evaluation of a group of States and their aviation industry, together with the development of a Regional Action Plan based upon that evaluation. As was pointed out earlier, the expertise for conducting such an evaluation will rest with the State, Region, or industry sector being evaluated.

As the Industry Safety Steering Group (ISSG) ends this second part of its work, a number of tasks remain, as described below.

4.1 Coordination with ICAO ANC GASP Ad Hoc Working Group

During the entire *Roadmap* development process, the focus of the ISSG has been to identify a set of Best Practices for use by ICAO in its upcoming revision to the ICAO Global Aviation Safety Program (GASP). The Air Navigation Commission of ICAO has scheduled that the revision will be completed by December 2006, so much work remains for the ANC GASP Ad Hoc Working Group. The ISSG will continue to work with the Working Group in order to ensure that the appropriate content from the *Roadmap* development activity is incorporated into the new GASP. In addition to its present deliverables, future ISSG support to ICAO may also include updating and evolving the work developed during Part 2.

4.2 Coordination with other ICAO Organizations

In addition to working with the GASP Working Group, the ISSG will coordinate with other ICAO entities (e.g., Technical Cooperation Bureau, Regional Offices and COSCAPS) that may request Industry support and cooperation at some later time, in accordance with the *Roadmap*. This coordination will ensure that the objectives defined by the *Roadmap* are appropriately considered as planning proceeds for those activities.

4.3 Support to Regional Action Groups

As discussed previously, the ISSG recognizes the importance of regional action groups in the identification and implementation of targeted solutions to regional issues. The members of the ISSG will continue to work with such regional action groups, providing support to their analysis efforts as well as to their *Roadmap* implementation efforts.

4.4 Coordination of Safety Support

As part of its ongoing activity, ISSG member organizations will coordinate support requests that are presented to various members. This coordination effort is designed to address two key points:

- Supporting the request with the most efficient and appropriate resources without duplication of effort.
- Ensuring that the request and the proposed support are consistent with the Safety *Roadmap*.

The support that is identified may come from one or more of the ISSG member organizations. However, the ISSG also recognizes that many other organizations and efforts exist world-wide whose key focus is on improving safety in the Air Transportation System. As such, the ISSG will help to link organizations or agencies seeking safety support to ongoing safety activities that could assist them in building and implementing their safety improvement plans.

4.5 Support for *Roadmap* Implementation

In addition to the commitments listed above, the ISSG will seek to provide support to other industry organizations that are committed to implementing the Best Practices outlined in the *Roadmap*. This support would include help in understanding the *Roadmap* objectives and the Best Practices, as well as the rapid dissemination of information about related activities across regions.

4.6 Updating Focus Areas, Objectives, and Best Practice Information

The *Roadmap* is a living document. As new data is received or as new practices are developed, the ISSG will continue to review the contents of the *Roadmap* and update it as appropriate.

Appendix A – List of Acronyms

AAPA – Association of Asia Pacific Airlines
ACI – Airports Council International
ACSA – Agencia Centroamericana de Seguridad Aeronáutica
ADREP – ICAO Accident/Incident Data Reporting System
AHWG – Ad Hoc Working Group
AEA – Association of European Airlines
AIS – Aeronautical Information Services
AMC – Acceptable Means of Compliance
ANC -- ICAO Air Navigation Commission
ANSP – Air Navigation Service Provider
ASAP – Aviation Safety Action Program
ASET – African and Indian Ocean Safety Enhancement Team
ATA – Air Transport Association (U.S.)
ATC – Air Traffic Control
ATM – Air Traffic Management
BASIS – British Airways Safety Information System
CAA – Civil Aviation Authority
CAAC – Civil Aviation Administration of China
CANSO – Civil Air Navigation Services Organization
CAST – Commercial Aviation Safety Team (U.S.)
CIS – Commonwealth of Independent States
COSCAP – Cooperative Development of Operational Safety and Continuing Airworthiness
DGCA – Director General Civil Aviation
EASA – European Aviation Safety Agency
ECAC – European Civil Aviation Conference
ECCAIRS – European Co-ordination Centre for Aviation Incident Reporting Systems
ESSI – European Safety Strategy Initiative
FAST – Future Aviation Safety Team (Europe)
FBO – Fixed Base Operator
FDA – Flight Data Analysis
FDM – Flight Data Monitoring
FOQA – Flight Operations Quality Assurance
FSF – Flight Safety Foundation
FSIX – ICAO Flight Safety Information Exchange
GAIN – Global Aviation Information Network
GASP – Global Aviation Safety Plan
HERA – Human Error Reduction in ATM
IATA – International Air Transport Association
IBAC – International Business Aviation Council
ICAO – International Civil Aviation Organization
IFALPA – International Federation of Airline Pilots Associations
IFATCA – International Federation of Air Traffic Controller Associations

Appendix A – List of Acronyms

IHST – International Helicopter Safety Team
IOSA – IATA Operational Safety Audit
IRM – Incident Review Meetings
ISASI – International Society of Air Safety Investigators
IS-BAO – International Standard for Business Aircraft Operation
ISM – IOSA Standards Manual
ISSG – Industry Safety Strategy Group
LOSA – Line Oriented Safety Audit
MET – Meteorological Office
MRO – Maintenance Repair Organization
MTOGW – Maximum Takeoff Gross Weight
PAAST – Pan American Aviation Safety Team
PIRG – Planning and Implementation Regional Group
SAAQ – State Aviation Activities Questionnaire
SARPs – ICAO Standards and Recommended Practices
SISG – Safety Information Sub-group (Eurocontrol)
SMS – Safety Management System
STEADES – IATA Safety Trend Evaluation Analysis and Data Exchange System
USOAP – ICAO Universal Safety Oversight Audit Program

Appendix B – Best Practice Applicability Matrix

Best Practice	States	Industry	ICAO	ISSG
1a-1			X	
1a-2	X			
1a-3	X			
1b-1	X			
1c/2b-1	X			
1c/2b-2			X	
1c/2b-3	X		X	
1c/2b-4	X			
1c/2b-5			X	
2a-1	X			
2a-2	X			
2a-3	X			
2a-4	X			
2a-5	X		X	
2a-6	X		X	
3a-1	X			
3a-2	X			
3a-3	X			
3a-4	X	X		
3b-1			X	
3b-2	X			
3c-1			X	
3c-2	X	X		
3c-3	X			
3c-4	X	X	X	
3d-1	X	X	X	
3d-2			X	
3d-3	X	X	X	
3d-4			X	
4a-1	X			
4a-2	X			
4a-3	X			
4a-4	X			
4a-5	X			
4a-6	X			
4a-7	X			
4a-8	X			
4a-9	X			
4b-1	X			
4b-2	X			
4b-3	X			
4c-1	X		X	
4c-2	X		X	
4c-3	X			
4c-4	X			
5a-1	X	X		
5a-2	X	X		
5a-3		X		
5b-1	X	X	X	
5b-2	X	X	X	

Best Practice	States	Industry	ICAO	ISSG
6a-1	X			
6a-2		X		
6a-3		X		
6a-4		X		
6a-5		X		
6b-1		X		
6b-2		X		
6b-3		X		
6b-4		X		
6c-1		X		
6c-2		X		
6c-3		X		
6c-4		X		
7a-1		X		
7b-1		X		X
7e-1		X		
8a-1		X		
8a-2		X		
8a-3		X		
8a-4		X		
8a-5		X		
8b-1		X		
8b-2		X		
9a-1		X		
9a-2		X	X	X
9a-3		X		
9a-4		X		
9a-5		X		
9b-1	X	X	X	
10a-1				X
10a-2				X
10a-3				X
10b-1				X
10b-2				X
10b-3				X
10b-4		X		
11a-1	X	X		
11b-1	X	X		
11b-2	X	X		
11c-1		X		
12a-1		X		
12a-2		X		
12a-3		X		
12b-1		X		
12b-2		X		
12b-3		X		
12c-1		X		
12c-2		X		

Appendix C – ICAO USOAP Audit Question Reference

(Reference ICAO Document 97-35, Appendix F, Module 1, 2, 4, 7, and 8)

USOAP Reference	USOAP Question	Examples of Evidence
AGA 8.003	Has the State established procedures for the amendment of its enabling regulations and national standards?	➢ Documented evidence of procedures developed for the amendment of regulations ➢ Amendments effected in a timely manner whenever an Annex amendment is received
AIG 6.001	Does the State's legislation enable the State to institute an investigation into the circumstances of aircraft accidents and incidents in accordance with the provisions of Article 26 of the Chicago Convention and Annex 13?	➢ Review of applicable legislation ➢ Review how the investigation authority is empowered to investigate
AIG 6.005	Does the legislation or regulations provide for the independence of the accident investigation authority in charge of conducting aircraft accident and incident investigations?	➢ Review applicable legislation or regulations ➢ If not established by the legislation or regulations, verify whether the independence of the accident investigation organization, commission, board or other body in the conduct of the investigation is assured by any other means.
AIG 6.009	Does the legislation or regulations require the designated investigation authority to comply with ICAO Annex 13 provisions in conducting the investigation?	➢ Review applicable legislation or regulations
AIG 6.013	If there are in the State any judicial or administrative proceedings which apportion blame or liability, are they separate from any investigation conducted under the provisions of Annex 13?	➢ Review applicable legislation, regulations, instructions or practices
AIG 6.029	Has the State established legislation or regulations for the non-disclosure of cockpit voice recorder (CVR) recordings?	➢ Review applicable legislation or regulations

Appendix C – ICAO USOAP Audit Question Reference

USOAP Reference	USOAP Question	Examples of Evidence
AIG 6.031	Has the State established legislation or regulations for the non-disclosure of certain records for purposes other than accident or incident investigation?	➢ Review applicable legislation or regulations ➢ > Records not to be disclosed include: 1. Statements taken from persons by the investigation authorities in the course of the investigation 2. Communications between persons having been involved in the operation of the aircraft 3. Medical or private information regarding persons involved in the accident or incident 4. Opinions expressed in the analysis of information, including flight recorder information 5. Any record not relevant to the analysis of the accident or incident
AIG 6.033	Does the State, as the State conducting the investigation, permit the participation of accredited representatives from other States involved?	➢ Review applicable legislation, regulations or procedures manual ➢ Verify that the participation of accredited representatives from the following States is allowed: 1. State of Registry 2. State of Operator 3. State Design 4. State of Manufacture 5. Any other State which, on request, provides information, facilities or experts
AIG 6.105	Has the State established a process for funding the accident investigation authority to investigate accidents which fall into its area of responsibility?	➢ Review applicable process
AIG 6.107	Has the State established a process for supplementary funding of accident investigations when required (major accidents)?	➢ Review applicable process

Appendix C – ICAO USOAP Audit Question Reference

USOAP Reference	USOAP Question	Examples of Evidence
AIG 6.109	Do the State's legislation and procedures allow the accident investigation organization, commission, board or other body to call on the best technical expertise from any source?	➢ Review applicable legislation, regulations or procedures manual
AIG 6.113	If the State does not have its own appropriately qualified personnel, does the State have arrangements (i.e. memoranda of understanding [MOUs]) with other States or other bodies, regional or ICAO, to obtain the necessary personnel in an expeditious manner in the event of an accident?	➢ Review arrangements
AIG 6.301	Has the State established a plan to manage the various types of investigation, including a major aircraft accident investigation?	➢ Verify the existence of plans for the conduct and management of an investigation
AIG 6.303	Has the State developed an investigation procedures manual or equivalent guidance material to be used by investigators during an accident/incident investigation?	➢ Review procedures manual or equivalent guidance material ➢ Verify whether the manual is a draft or a finalized/approved document ➢ Verify if there is a process to manage amendments to the procedures manual
AIG 6.319	Has the State established procedures for forwarding accident/serious incident notifications to the States involved and, when applicable, ICAO in the following situations where it is not the State of Occurrence: 1. As State of Registry, in the case of an occurrence in a non-Contracting State or outside the territory of any State? 2. As State of Registry or State of the Operator, when the State of Occurrence is not aware of a serious incident?	➢ Review procedures manual
AIG 6.341	Has the State adopted the definitions listed in Chapter 1 of Annex 13?	➢ Review applicable legislation, regulations or procedures manual

Appendix C – ICAO USOAP Audit Question Reference

USOAP Reference	USOAP Question	Examples of Evidence
AIG 6.365	Has the State established procedures to entitle accredited representatives to participate, under the control of the IIC, in all aspects of the investigation?	➢ Review applicable legislation, regulations or procedures manual ➢ Accredited representatives must be entitled to: 1. Visit the scene of the accident 2. Examine the wreckage 3. Obtain witness information and suggest areas of questioning 4. Have full access to all relevant evidence as soon as possible 5. Receive copies of all pertinent documents 6. Participate in read-outs of recorded media 7. Participate in off-scene investigative activities such as component examinations, technical briefings, tests and simulations 8. Participate in investigation progress meetings including deliberations related to analyses, findings, causes and safety recommendations 9. Make submissions in respect of the various elements of the investigation
AIG 6.367	Does the State, as the State conducting the investigation, allow advisers assisting accredited representatives to participate in an investigation to the extent necessary to make the representatives' participation effective?	➢ Review applicable legislation, regulations or procedures manual
AIG 6.405	Has the State, as the State conducting the investigation of an accident or incident, established procedures for the release of the final report as soon as possible?	➢ Verify if there is a time frame for the release of the final report ➢ Verify if target dates are met ➢ Verify if there is a monitoring system to ensure that target dates are met
AIG 6.415	Has the State, as the State conducting the investigation, established procedures for sending the final report to ICAO for all investigated accidents and incidents when the aircraft is of a mass of over 5 700 kg?	➢ Review procedures manual and practices

Appendix C – ICAO USOAP Audit Question Reference

USOAP Reference	USOAP Question	Examples of Evidence
AIG 6.421	Has the State, as the State conducting the investigation, established procedures for recommending to the appropriate authorities, including those in other States, any preventive action which it considers necessary to be taken promptly to enhance aviation safety at any stage of an accident or incident investigation?	➢ Review procedures manual
AIG 6.423	Does the State, as the State conducting the investigation of accidents or incidents, address, when appropriate, any safety recommendations arising from its investigations to accident investigation authorities in other State(s) concerned and, when ICAO documents are involved, to ICAO?	➢ Review procedures manual
AIG 6.425	Does the State, as the State receiving safety recommendations from other States, inform the proposing State of the preventive action taken or under consideration or the reasons why no action will be taken?	➢ Review correspondence sent/received
AIG 6.431	Does the State prepare and send preliminary reports, when the aircraft involved in an accident is of a maximum mass of over 2 250 kg, to all involved States and ICAO?	➢ Review copies of submitted reports and distribution list
AIG 6.501	Has the State established a mandatory incident reporting system to facilitate the collection of information on actual or potential safety deficiencies?	➢ Review applicable legislation, regulations or procedures manual and reports received
AIG 6.503	Has the State established a voluntary incident reporting system to facilitate the collection of information that may not be captured by a mandatory incident reporting system?	➢ Review applicable legislation, regulations or procedures manual and reports received
AIG 6.505	If there is a voluntary incident reporting system, has the State established legislation and procedures for ensuring that the system is non-punitive and for ensuring protection to the sources of the information?	➢ Review applicable legislation, regulations or procedures manual

Appendix C – ICAO USOAP Audit Question Reference

USOAP Reference	USOAP Question	Examples of Evidence
AIG 6.507	Has the State established an accident and incident database for facilitating the effective analysis of information obtained, including that from its accident and incident reporting systems?	➢ Review database information
AIG 6.509	If yes (to AIG 6.507), is the database created in a standardized format to facilitate data exchange?	➢ Review the database format ➢ Verify if the taxonomy is compatible with ADREP/European Co-ordination Centre for Aviation Incident Reporting Systems (ECCAIRS)
AIG 6.511	Does the State analyze the information contained in its accident/ incident reports and the database to determine any preventative actions required?	➢ Review relevant information
LEG 1.001	Has the State promulgated primary aviation legislation (civil aviation act, code of civil aviation, aeronautics code, etc.)?	➢ Title and content ➢ Date of promulgation and last amendment
LEG 1.005	Does the primary aviation legislation provide for the introduction/adoption of air navigation regulations and the promulgation thereof?	➢ Review primary aviation legislation
LEG 1.009	Has the State established procedures for the amendment of its specific regulations taking into consideration existing ICAO provisions and future amendments to ICAO Annexes?	➢ Relevant procedures used for implementing and updating regulations ➢ Verify that current regulations repeal previous regulations, if any
LEG 1.025	Has the State established and implemented procedures for identifying and notifying differences, if any, to ICAO?	➢ Relevant procedures used for notification of differences
LEG 1.107	Has the State established clear delegation of authority to its inspectors to access and inspect aircraft, aviation facilities and aviation documents?	➢ Relevant law or regulations
LEG 1.109	Does an inspector have the right to detain aircraft for just cause?	➢ Relevant law or regulations
LEG 1.111	Does an inspector have the right to prohibit any person from exercising the privileges of any aviation license, certificate or document for just cause?	➢ Relevant law or regulations

Appendix C – ICAO USOAP Audit Question Reference

USOAP Reference	USOAP Question	Examples of Evidence
OPS 4.003	Has the State developed procedures for the amendment of its enabling regulations and national standards?	➢ Documented evidence of procedures developed for the amendment of regulations ➢ Amendments effected in a timely manner whenever an Annex amendment is received
OPS 4.005	Has the State established and implemented a procedure to amend its regulations subsequent to an Annex amendment and for listing and notifying differences, if any, to ICAO?	➢ Documented evidence of the process and effective implementation
OPS 4.409	Are amended and up-to-date copies of enabling regulations (including directives, orders, circulars, publications, etc.) applicable in the State readily available to the public?	➢ Review the means available to access the regulations
ORG 2.009	What legal basis has been promulgated for the establishment of the civil aviation system in the State?	➢ Relevant legislation and regulations establishing the civil aviation system 1. Primary aviation legislation 2. Other (specify)
ORG 2.017	If the State has delegated or transferred safety oversight-related tasks to a regional or sub-regional entity, which procedures are established to ensure that the State's obligation for safety oversight in the delegated areas is being met?	➢ Review coordination procedures and sample activities
ORG 2.051	Do CAAs have sufficient resources to implement the State's responsibility for safety oversight?	➢ SAAQ ➢ CAA financial resources, charges and budget allocated for equipment, staff training and inspections
ORG 2.053	Has the State established a mechanism to ensure that it has and keeps sufficient human resources to meet its national and international obligations related to civil aviation safety oversight?	➢ Review process to determine staffing needs

Appendix D – IOSA Audit Question Reference

(Reference IATA IOSA Standards Manual, 1st Edition, 4th Revision, Temporary Revision February 2006, Effective February 2006, except as noted)

IOSA Reference	IOSA Question
FLT 1.4.1	The Operator shall have operational documentation for Flight Operations that consists of: i) regulatory documents; ii) manufacturers manuals and documents; iii) an Operations Manual and flight crew bulletins (directives).
FLT 3.2.1.i	The Operator shall have a State-approved Training Manual which includes training programs and syllabi, as applicable, for initial, recurrent, transition (conversion), re-qualification, upgrade to Commander, recency, familiarization, differences or other specialized training: i) the content of the Training Manual shall be updated to reflect current procedures;
ORG 1.1.1	The Operator shall have a functioning management system that has continuity throughout the organization, and provides positive control of the operation.
ORG 1.2.1	Where the Operator chooses to outsource any function that affects safety or quality outcomes, including wet lease operations, the Operator shall ensure effective safety and quality oversight over such functions. Control of outsourced functions, and the means by which this is achieved, shall be identified within the management system.
ORG 1.2.2	The Operator should include operational audits as one means of achieving effective management of safety and quality of outsourced functions.
ORG 1.2.3	The Operator should have a clear policy statement that supports a non-punitive reporting system within the organization. Such a policy should be included in appropriate operations manuals, and state that the reporting of unpremeditated or inadvertent errors will not result in disciplinary or punitive action being taken against the reporter or other individuals unless it can otherwise be proven that such errors were the result of illegal activity, gross negligence or willful misconduct
ORG 1.3.1	The Operator shall formally and actively commit to a corporate policy that designates safety and quality as a fundamental priority throughout the operation.
ORG 1.3.3	The Operator shall continually monitor and strive to improve the organization safety and quality culture by: i) communicating to personnel the importance of meeting statutory and regulatory requirements; ii) conducting periodic management safety and quality reviews; iii) continually reviewing the suitability of policies and procedures.

Appendix D – IOSA Audit Question Reference

IOSA Reference	IOSA Question
ORG 1.4.1	The Operator shall ensure that authorities and responsibilities are defined, documented and communicated throughout the organization, including all areas critical to the operation.
ORG 1.4.2	The Operator shall ensure that for every operational function there is a member of management who, irrespective of other responsibilities, has the responsibility and authority to ensure that processes and procedures are established, implemented and maintained, and is required to report to senior management on the performance and need for improvement of the management system.
ORG 1.4.4	The Operator shall have a system that requires operational managers to be responsible for safety and quality outcomes, which includes implementation and monitoring of safety and quality activities and processes, and for ensuring ongoing conformity with all regulatory requirements, organization standards and local procedures. This responsibility includes implementation of corrective and preventative actions identified by quality audits or safety investigations or other internal reporting mechanisms.
ORG 1.5.1	The Operator shall have communication processes within the organization that permit the management system to function effectively.
ORG 1.7.1	The Operator shall have a process to review the management system at regular intervals not exceeding one year, to ensure its continuing suitability, adequacy and effectiveness. A review shall include assessing effectiveness, identifying opportunities for improvement and determining the need for changes to the system, including, but not limited to, organizational structure, reporting lines, authorities, responsibilities, policies, processes and procedures.
ORG 1.8.4	The Operator shall have a programme to ensure that personnel who perform work affecting the safety and quality of the operation maintain their competence on the basis of continued education and training, and, if applicable for a particular position, continue to meet specific regulatory requirements.
ORG 1.9.1	The Operator shall have processes to ensure that planning and decisions relevant to the operation take into account safety requirements originating from applicable external sources, including, but not limited to, regulatory agencies and original equipment manufacturers.
ORG 2.1.1	The Operator shall have a system of documentation that provides for the dissemination of published information that is accurately represented and written in a language that can be understood by all personnel relevant to the operation, and is in accordance with applicable Regulatory requirements.
ORG 2.1.8	The Operator shall ensure effective control of externally derived information and documents, including a process of prompt distribution to relevant and interested parties.
ORG 2.2.3	The Operator shall have a system that ensures expeditious dissemination of safety critical operational information to appropriate personnel.
ORG 3.1.1	The Operator shall appoint a manager who has appropriate qualifications, significant authority and independence from operational and line management activities, to be responsible for the flight safety programme.

Appendix D – IOSA Audit Question Reference

IOSA Reference	IOSA Question
ORG 3.1.2	The Operator shall have a flight safety management plan that describes the philosophy, structure, responsibilities, resources and processes in place to prevent accidents and achieve safe operations.
ORG 3.2.4	The Operator shall have a process to ensure the implementation of action by appropriate operational managers to correct and prevent nonconformities that affect flight operations.
ORG 3.2.6	The Operator shall have a safety reporting system that permits feedback from personnel regarding hazards and safety related concerns, and includes analysis and action by management as appropriate to identify and address safety deficiencies.
ORG 3.2.7	The Operator shall have a process to ensure dissemination of flight safety information to appropriate operational and other personnel to promote continuing education and interest.
ORG 3.3.1	The Operator should have a formal programme for hazard analysis and risk assessment that has the flexibility to focus on aspects of unacceptable risk specific to flight safety.
ORG 3.3.2	The Operator shall have a flight data analysis programme that is non-punitive and contains adequate safeguards to protect data sources, and includes **either**: i) a systematic download and analysis of electronically recorded aircraft flight data, **or** ii) a systematic acquisition, correlation and analysis of flight information derived from a combination of, as a minimum, the following sources: a) aircraft FDR readouts produced after accidents, incidents and any other irregular events; b) flight and cabin crew confidential operational safety reports; c) flight and cabin crew interviews; d) internal evaluation findings; e) flight and cabin crew evaluation reports; f) aircraft engineering and maintenance reports. *(Note: this is a Parallel Conformity Option effective until 1 January 2007.*)
ORG 3.3.4	The Operator should have a system of confidential human factors reporting and feedback for flight and cabin crew.

Appendix D – IOSA Audit Question Reference

IOSA Reference	IOSA Question
ORG 3.3.13 [NOTE: This reference is from the IOSA ISM 2nd Edition Effective March 2007]	The Operator shall have a flight data analysis programme that is non-punitive and contains adequate safeguards to protect data sources. The programme shall include **either**: i) a systematic download and analysis of electronically recorded aircraft flight data, **or** ii) a systematic acquisition, correlation and analysis of flight information derived from a combination of some or all of the following sources: a) aircraft FDR readouts; b) confidential flight and cabin crew operational safety reports; c) flight and cabin crew interviews; d) quality assurance findings; e) flight and cabin crew evaluation reports; f) aircraft engineering and maintenance reports. *(Note: this is a Parallel Conformity Option effective until 31 December 2008.)*
ORG 4.1.2	The Operator shall have an internal evaluation programme that ensures the conduct of organization-wide internal audits encompassing all safety and quality critical operations, and includes planned auditing of processes, procedures, documentation, training and records. Results of previous audits, including implementation and effectiveness of corrective action, shall be included within the scope of the programme.
ORG 4.1.7	The programme of the Operator shall ensure that management with appropriate authority in the relevant operational area is designated to be responsible for implementation of corrective action to eliminate detected non-conformities and causes in accordance with an approved corrective action plan.
ORG 4.1.9	The programme of the Operator should ensure periodic dissemination of quality related information to appropriate operational and other personnel to promote continuing education and interest.

Appendix E – Use of Technology to Enhance Safety – Aircraft Operations

This appendix provides a comprehensive listing of the technologies and training programs that have proven effective in preventing the most frequently observed threats, incidents, and accidents in the *Aircraft Operations* domain.

If these technologies are already installed, the organizations should ensure that they are used to their full advantage. If they are not installed, the organizations should consider their retrofit on the existing fleet, or their selection when acquiring new aircraft (assuming they are available for the aircraft type / model).

In addition, the ISSG recommends that all organizations obtain and widely disseminate industry-developed or manufacturer-developed safety awareness and training material to further foster the prevention of these threats / incidents / accidents.

I – Approach and Landing Accidents

Approach-and-landing accidents often are the result of unstabilized approaches. The following technologies should be considered to facilitate the conduct of constant-angle / constant-slope stabilized approaches:

- Aircraft capability to fly constant-angle / constant-slope final approaches :
  - Flight path target or flight path director
  - Other vertical FMS / autopilot / flight director modes.
  - Both
- Aircraft capability to fly RNAV and RNP RNAV approaches.
- Head-up display (HUD), for enhanced situational awareness during visual approaches at night or in marginal day-time VMC conditions.,
- Auto-Land capability.

Runway excursions and overruns can be further prevented by an optimum use of braking devices such as:

- Anti-skid system (normally a basic feature of all high-performance aircraft models).
- Auto-brake system.,
- Thrust reversers.

Safety awareness information and material for the development of training programs on the prevention of approach-and-landing accidents is available from the ALAR Tool Kit developed by the Flight Safety Foundation (FSF).

Appendix E – Use of Technology to Enhance Safety – Aircraft Operations

II – Loss of Control In Flight

Loss of control in flight often is the result of inappropriate flight control inputs and / or loss of attitude awareness (i.e., in pitch and / or roll). The following technologies should be considered to prevent departure from controlled flight:

- Stall warning system (normally a basic feature of all high-performance aircraft models).
- Excessive pitch attitude warning.
- Excessive bank-angle warning (e.g., as provided by certain models of Terrain Awareness and Warning Systems – TAWS).
- Low speed protection or warning (recommended by CAST under reference SE 32).
- Flight envelope warning.
- Primary Flight Display (PFD) with speed, attitude, etc. warning symbols (recommended by CAST under reference SE 34).

Note:

The technologies listed above primarily apply to aircraft models that do not feature a full flight envelop protection. (These aircraft types / models are usually referred to as "unprotected" aircraft).

Full flight envelop protection is one of the Safety Enhancements (SE) recommended by the Commercial Aviation Safety Team (CAST) under reference SE 40.

Safety awareness information and material is available for the development of training programs on the prevention of loss-of-control events. Contact the Airplane Upset Recovery Education and Training Aid, developed by the industry and available from aircraft manufacturers.

III – Controlled Flight Into Terrain - CFIT

Controlled Flight Into Terrain (CFIT) often is the result of one–or a combination of—the following causes:

- Loss of situational awareness.
- Loss of terrain awareness.
- Unstabilized approach.

Appendix E – Use of Technology to Enhance Safety – Aircraft Operations

The following technologies should be considered in order to enhance the flight crew's situational awareness and terrain awareness, and to minimize the potential for unstabilized approaches:

- Horizontal Situation Display / Navigation Display (ND).
- Terrain Awareness and Warning System (TAWS), in association with GPS navigation.
- Radio-altimeter or TAWS automatic altitude callouts, with standardization across the fleet to maximize effectiveness (recommended by CAST under reference SE 21).
- Primary Flight Display (PFD) with Vertical Situation Display (VSD) for enhanced terrain awareness and enhanced awareness of applicable Minimum Safe Altitude (MSA) (recommended by CAST under reference SE 85).
- Aircraft capability and operating policy for the conduct of constant angle / slope final approaches for all types of approaches (recommended by CAST under reference SE 2 and SE 3).
- Aircraft capability and operating policy for the conduct of RNP RNAV approaches (recommended by CAST under reference SE 6 and SE 7).
- Aircraft capability for the conduct of approaches with FMS-based or GPS-based vertical guidance (e.g., FLS and GLS approaches, recommended by CAST under reference SE 8).

Safety awareness information and material for the development of training programs, on the prevention of CFIT events, is available from the following sources:

- FSF / FAA – CFIT Education and Training Aid.
- FSF – ALAR Tool Kit.

IV - Rejected Takeoff Accidents

Rejected takeoff accidents primarily involve runway overrun events.

Until takeoff monitoring and alerting technology is mature and deployed, takeoff safety must rely on robust operating and training philosophies. However, the following technology should be considered, as available for the aircraft type / model:

- V1 auto-callout.

Safety awareness information and material for the development of training programs, on the prevention of rejected takeoff accidents, is available from the following sources:

- FAA / Industry Takeoff Safety Training Aid (2006 Issue); and,
- Manufacturers' Annexes to above Training Aid.

V – Forced Landing Events

Forced landing events often are the result of fuel starvation due to inappropriate fuel management by ground or flight crew.

To prevent ground crew and flight crew errors, the following should be considered:

- Adopting weight units consistent across the fleet and in line with the operator's country practices, This should include:
  - Flight planning software suites (e.g., weight & balance, load sheet, etc.);
  - Documentation (e.g., Weight & Balance Manual, Aircraft Operating Manual, etc.);
  - Refueling bowsers' meters; and,
  - Aircraft gauges (cockpit gauges and fuel tank dip sticks).
- Aircraft capability for automatic fuel leak detection (as available for the aircraft type / model).

Safety awareness information and training should be based on robust Standard Operating Procedures (SOPs), fostering the periodic check of fuel used versus fuel remaining throughout the entire flight.

VI – Midair Collisions

Midair collisions usually are the result of one—or a combination of—the following causes:

- Altitude deviation.
- Lateral navigation deviation.
- Breakdown in pilot / controller communication.

The following technologies should be considered to prevent midair collisions:

- Altitude deviation alerting system (known as "altitude alert system").
- Airborne Collision Avoidance System (ACAS), including associated company policies and crew procedures. This was formerly known as Traffic Collision Avoidance System (TCAS).
- Horizontal Situation Display / Navigation Display (ND), with overlaid ACAS information.
- Aircraft capability for lateral and vertical navigation (L NAV / V NAV).
- Adopting a strategic lateral offset from airway centerline (ATM permitting).
- VHF anti-blocking devices.
- VHF prolonged communication warning. and,
- ADS-B (Automatic Dependent Surveillance – Broadcast [when it becomes available]).

Safety awareness information and material for the development of training programs on the prevention of midair collisions is available from the following sources:

- FSF—ALAR Tool Kit.
- Eurocontrol:
  - ACAS Bulletins and Training Program.
  - Level Bust Prevention Bulletins and Tool Kit
  - Air / Ground Communications Tool Kit.
  - Airspace Infringement Initiative.

VII – Ground Collisions

Ground collisions often are the result of taxiway or runway incursions.

The following technologies should be considered to enhance the flight crew situational awareness on the ground (in addition to the use of updated and accurate airport charts and diagrams):

- Ground horizontal situation display / On-board airport navigation system (technology known as airport moving maps), including (as available for aircraft type / model):
  - Overlay of other aircraft positions.
  - Runway proximity advisory.
- Runway Awareness and Advisory System (RAAS), as an alternative or complement to above technology; and,
- ASMGCS (Advanced Surface Movement Guidance and Control Systems) :
  - Switchable “stop bars”.
  - Taxiway centerline lighting.
  - Runway Status Lights (RWSLs), including Runway Entrance Lights (RELs) and Takeoff Hold Lights (THLs).

Safety awareness information and material for the development of training programs, on the prevention of runway incursions is available from the following sources:

- ICAO – Runway Safety Tool Kit.
- FAA – Runway and Surface Safety program.
- IATA - PAAST – Runway Incursion Prevention Program.
- Eurocontrol:
  - European Action Plan for the Reduction of Runway Incursions.
  - Airport Operations Programme.

VIII – In-flight Cabin or Cargo Compartment Fire

In-flight cabin or cargo compartment fires are rare occurrences but often result in fatal accidents if they occur.

Organizations should consider all technologies available for the aircraft type and model, including—but not necessarily limited to—technologies such as:

- Upgrade of cargo compartments to Class C containment standard (as available for the aircraft type / model); and / or,
- Installation of dual-loop smoke and fire detection systems.

Safety awareness information and material for the development of training programs for the prevention and management of cabin / cockpit smoke and fire events is available from the following sources:

- GAIN – Cabin Safety Compendium;
- IATA – Cabin Safety Tool Kit; and,
- Manufacturers' cabin safety awareness and training material.

IX – Turbulence Encounters

Although some turbulence encounters are due to clear air turbulence (CAT) or wake vortices, turbulence or, more globally, adverse weather encounters often are the result of an incorrect use of the airborne weather radar and /or an incorrect decision made by the flight crew, air traffic control, and others.

The following technologies should be considered for providing flight crews with more capability to detect and avoid severe weather areas:

- Pre-flight and in-flight forecasting tools.
- Onboard weather radars with "turbulence" mode.
- Onboard "multi-scan" weather radars for horizontal and vertical scanning of weather.

Enhancing technology for the detection of turbulence is part of the CAST Safety Enhancement recommendations, under SE 78.

Safety awareness information and material for the development of training programs on the optimum use of on-board weather radar and weather avoidance is available from the following sources:

- Industry-developed Turbulence Education and Training Aid.
- Manufacturers' safety awareness and training material.

X – Windshear Encounters

Windshear avoidance always is a collaborative effort by pilots and controllers.

Onboard technologies available to the pilots include:

- Reactive windshear systems (RWS), providing warning and pitch guidance for maintaining or recovering a safe flight path, when encountering a windshear condition.
- Predictive windshear systems (PWS), providing advance detection and alert of a windshear condition located ahead or the aircraft flight path.

Ground technologies available to the air traffic controllers are listed in Appendix F of this document.

Safety awareness information and material for the development of training programs on the optimum use of on-board weather radar and windshear avoidance is available from the following sources:

- Industry-developed Windshear Education and Training Aids :
  - Training aids dedicated to large commercial jets.
  - Training aids dedicated to corporate jets and turboprop aircraft.
- Manufacturers' safety awareness and training publications.

XI – Flight Data Monitoring

Flight data monitoring and associated lessons-learned programs are recognized as an important enabler for safety enhancement.

Organizations should consider the following onboard and ground technologies in order to develop and maintain a full capability for capturing, processing and analyzing flight data collected as per ICAO recommendations:

- Aircraft capability, such as Optical Quick Access Recorder (O-QAR).
- Ground capability, such as flight data analysis / monitoring software suite.

Aircraft manufacturers as well as the IATA should be consulted to facilitate the deployment of a flight data monitoring program within an organization.

XII – Aircraft and Engine Condition Monitoring

The early detection of deviations from the normal operating range of aircraft and engine systems is an important factor in the continued safe and profitable operation of an aircraft.

Organizations should consider available on-board and on-ground technologies that support the deployment of an aircraft and engine condition monitoring program. This includes–but is not limited to—the following technologies:

- Onboard centralized maintenance system;
- Real-time maintenance information broadcast to operator's Maintenance Control Center (MCC); and,
- On-ground health / condition monitoring software suites.

Aircraft and engine manufacturers should be consulted to facilitate the deployment of an aircraft and engine health / condition monitoring program within an organization.

Appendix F – Use of Technology to Enhance Safety – Air Traffic Management/Air Traffic Control

This appendix provides a comprehensive listing of the technologies and training programs that have proven effective in preventing the most frequently observed threats, incidents, and accidents in the Air Traffic Management / Air Traffic Control (ATM / ATC) domains.

If these technologies are already installed, the organizations should ensure that they are used to their full advantage.

If they are not installed, the organizations should consider their retrofit on the existing equipment or their selection when acquiring new equipment.

In addition, the ISSG recommends that all organizations obtain and widely disseminate industry-developed or manufacturer-developed safety awareness and training material to further foster the prevention of these threats / incidents / accidents.

I – Approach and Landing Accidents

Approach-and-landing accidents often are the result of unstabilized approaches.

There is no ATM / ATC technology that directly addresses unstabilized approaches.

However, air traffic controllers can contribute to preventing unstabilized approaches by gaining an enhanced understanding of modern aircraft performance characteristics (e.g., deceleration characteristics), flight management system re-programming requirements and standards operating procedures (SOPs).

Approach-and-landing accidents involving a collision with terrain or sea can be prevented by a wider dissemination and use of the Minimum Safe Altitude Warning (MSAW) capability for terminal / approach radars. (Refer to **Section III [CFIT]** of this Appendix.)

Safety awareness information and material for the development of training programs on the prevention of approach-and-landing accidents by air traffic controllers is available from the following sources:

- ALAR Tool Kit developed by the Flight Safety Foundation (FSF).
- Global Aviation Information Network (GAIN), Working Group E—Final Report (available on the Flight Safety Foundation website at http://www.flightsafety.org/gain).

II – Loss of Control in Flight

Loss of control in flight often is the result of inappropriate flight control inputs and / or loss of attitude awareness (i.e., in pitch and / or roll).

There is no ATM/ATC technology that directly addresses loss of control in flight. However, air traffic controllers can contribute to preventing loss of control in flight by gaining an enhanced understanding of performance characteristics of modern aircraft (e.g., maneuvering and go-around characteristics), systems reconfiguration requirements and standard operating procedures (SOPs).

Safety awareness information and material for the development of training programs on the prevention of loss-of-control events is available from the Airplane Upset Recovery Education and Training Aid, developed by the industry and available from aircraft manufacturers.

III – Controlled Flight Into Terrain - CFIT

Controlled Flight Into Terrain (CFIT) often is the result of one–or a combination of—the following causes:

- Loss of situational awareness.
- Loss of terrain awareness.
- Unstabilized approach.

The following technology should be considered in order to enhance the controller and flight crew's situational awareness and terrain awareness, and to minimize the potential for a collision with terrain or water:

- Minimum Safe Altitude Warning (MSAW) capability.

Note:

Air Navigation Agencies and Air Navigation Service Providers (ANSPs) should be made aware that most terminal / approach radars worldwide have already the capability to host the MSAW function.

Safety awareness information and material for the development of training programs on the prevention of CFIT events is available from the following sources:

- FSF / FAA—CFIT Education and Training Aid.
- FSF—ALAR Tool Kit.

IV – Rejected Takeoff Accidents

Rejected takeoff accidents primarily involve runway overrun events.

Until takeoff monitoring and alerting technology is mature and deployed, takeoff safety must rely on robust operating and training philosophies by aircraft operators.

However, air traffic controllers can contribute to preventing rejected takeoff accidents by gaining an enhanced understanding of modern aircraft performance characteristics (acceleration-stop capability, flight management system reprogramming requirements in case of last-minute runway change or intersection takeoff, etc.) and standard operating procedures (SOPs).

Safety awareness information and material for the development of training programs on the prevention of rejected takeoff accidents is available from the following sources:

- *FAA / Industry Takeoff Safety Training Aid* (2006 Issue). and,
- Manufacturers' Annexes to above Training Aid.

V – Forced Landing Events

Forced landing events often are the result of fuel starvation due to inappropriate fuel management by ground or flight crew.

No ATM / ATC technology directly addresses fuel management matters.

However, air traffic controllers can contribute to preventing or mitigating "low-on-fuel" situations by strict adherence to pilots and controller phraseology and procedures for the management of fuel emergency conditions.

VI – Midair Collisions

Midair collisions usually are the result of one–or a combination of—the following causes:

- Altitude deviation.
- Lateral navigation deviation.
- Breakdown in pilot / controller communication.

The following technologies should be considered to prevent midair collisions:

- Cleared Level Adherence Monitor (CLAM).
- Route Adherence Monitor (RAM).
- Short Term Conflict Alert (STCA).
- Display of Mode S selected altitude on controller's ATC label.
- Display of ACAS RA (Resolution Advisory) orders on controller's screen.
- ADS-C Route Conformance Warning (ARCW), in association with ARCI.
- VHF anti-blocking devices.
- VHF prolonged communication warning.
- ADS-B (Automatic Dependent Surveillance – Broadcast, when it becomes available).
- Dangerous Area Infringement Warning (DAIW).

In addition, controllers should be aware of the benefits of and provided with instructions for granting aircraft a "strategic lateral offset" from airway centerline (ATM permitting).

Safety awareness information and material for the development of training programs on the prevention of midair collisions is available from the following sources:

- FSF—ALAR Tool Kit.
- Eurocontrol:
  - ACAS Bulletins and Training Program.
  - Level Bust Prevention Bulletins and Tool Kit
  - Air / Ground Communications Tool Kit.
  - Airspace Infringement Initiative.

Appendix F – Use of Technology to Enhance Safety – ATM/ATC

VII – Ground Collisions

Ground collisions often are the result of taxiway or runway incursions.

The following technologies should be considered to enhance the controller and flight crew situational awareness on the ground (in addition to the use of updated and accurate airport charts and diagrams):

- ASDE (Airport Surface Detection System) (This Safety Enhancement is recommended by the Commercial Aviation Safety Team [CAST] under reference SE 53.)
  - ASDE-3, with prediction capability.
  - ASDE-X, without prediction capability.
  - ASDE with AMASS (Airport Movement Area Safety System), an add-on feature to the ASDE that provides automatic alerts and warnings.
- ASMGCS (Advanced Surface Movement Guidance and Control Systems):
  - Switchable “stop bars”.
  - Taxiway centerline lighting.
  - Runway Status Lights (RWSLs), including Runway Entrance Lights (RELs) and Takeoff Hold Lines (THLs).
- Multi-lateration (MLAT) radar, based on ACAS Mode S or ADS-B, with a dedicated display for air traffic controller.

Safety awareness information and material for the development of training programs on the prevention of runway incursions is available from the following sources:

- ICAO—Runway Safety Tool Kit.
- FAA—Runway and Surface Safety program.
- Eurocontrol—European Action Plan for the Reduction of Runway Incursions.
- Eurocontrol—Airport Operation Programme.
- IATA - PAAST —Runway Incursion Prevention Program.

VIII – Turbulence Encounters

Although some turbulence encounters are due to clear air turbulence (CAT) or wake vortices, turbulence or, more globally, adverse weather encounters often are the result of an incorrect use of the airborne weather radar and /or an incorrect decision making by the flight crew, air traffic control, and others.

The following technology should be considered for providing dispatchers and flight crews with more capability to detect and avoid severe weather areas:

- Pre-flight and in-flight forecasting tools.

Enhancing technology for the detection of turbulence is part of the CAST Safety Enhancement recommendations, under SE 78.

Appendix F – Use of Technology to Enhance Safety – ATM/ATC

Safety awareness information and material for the development of training programs on the optimum use of on-board weather radar and weather avoidance is available from the following sources:

- Industry-developed Turbulence Education and Training Aid. and,
- Manufacturers' safety awareness and training material.

IX – Windshear Encounters

Windshear avoidance always is a collaborative effort by pilots and controllers.

The following ground technologies should be considered to assist air traffic controllers in providing flight crews with timely and accurate windshear advisories:

- Terminal Doppler Weather Radars (TDWR). and,
- Low Level Windshear Alerting Systems (LLWAS).

Onboard technologies available to the pilots are listed in Appendix E of this document.

Safety awareness information and material for the development of training programs, on the optimum use of on-board weather radar and windshear avoidance, is available from the following sources:

- Industry-developed Windshear Education and Training Aids :
  - Training aids dedicated to large commercial jets.
  - Training aids dedicated to corporate jets and turboprop aircraft.
- Manufacturers' safety awareness and training publications.

Appendix G – Use of Technology to Enhance Safety – Airport Operations

This appendix provides a comprehensive listing of the technologies and training programs that have proven effective in preventing the most frequently observed threats, incidents, and accidents in the *Airport Operations* domain.

If these technologies are already installed, the organizations should ensure that they are used to their full advantage. If they are not installed, the organizations should consider their deployment at the earliest opportunity.

In addition, the ISSG recommends that all organizations obtain and widely disseminate industry-developed or manufacturer-developed safety awareness and training material to further foster the management/mitigation of these threats and the prevention of these incidents/accidents.

I – Approach and Landing Accidents

Approach-and-landing accidents often are the result of unstabilized approaches. The following technologies should be considered to prevent approach-and-landing incidents/accidents, including those resulting in a collision with terrain or sea (Controlled Flight Into Terrain – CFIT), landing short of the runway or a runway overrun:

- Minimum Safe Altitude Warning (MSAW) capability for terminal / approach radars. (Refer to Section II - CFIT of this Appendix).
- DME approach at each selected airport (as recommended by the Commercial Aviation Safety Team - CAST – Safety Enhancement reference SE 5).
- VASI / PAPI, at each runway-end, as described in *ICAO, Annex 14, Volume 1, Chapter 5, Section 5.3.5 – Visual Approach Slopes Indicators Systems*. The installation of a visual glide slope indicator (VGSI) at each runway-end is one of the Safety Enhancements (SE) recommended by the Commercial Aviation Safety Team (CAST) under reference SE 4.
- Runways and approach markings, lighting and signs, in accordance with *ICAO, Annex 14, Volume 1, Chapter 5 (Visual Aids for Navigation).* This includes centerline / runway-edge lighting with changing patterns, to enhance the flight crew's situational awareness of the runway length remaining to bring the aircraft to a complete stop following landing.
- EMAS (Engineered Material Arresting System) arresting bed at each runway-end where the terrain configuration does not allow for the provision of a Runway End Safety Area, as recommended by *ICAO, Annex 14, Chapter 3, Section 3.5*.

Safety awareness information and material for the development of training programs on the prevention of approach-and-landing accidents is available from the following sources:

- ALAR Tool Kit developed by the Flight Safety Foundation (FSF).
- Global Aviation Information Network (GAIN), Working Group E, Final Report (available at the Flight Safety Foundation website at http://www.flightsafety.org/gain).

II – Controlled Flight Into Terrain - CFIT

Controlled Flight Into Terrain (CFIT) often is the result of one, or a combination of, the following causes:

- Loss of situational awareness,
- Loss of terrain awareness,
- Unstabilized approach.

The following technology should be considered in order to enhance the controller and flight crew's situational awareness and terrain awareness, and to minimize the potential for a collision with terrain or sea:

- Minimum Safe Altitude Warning (MSAW) capability.

  Note: Air Navigation Agencies and Air Navigation Service Providers (ANSPs) should be made aware that most terminal / approach radars worldwide have already the capability to host the MSAW function.

Safety awareness information and material for the development of training programs on the prevention of CFIT events is available from the following sources:

- FSF / FAA – CFIT Education and Training Aid.
- FSF – ALAR Tool Kit.

III – Rejected Takeoff Accidents

Rejected takeoff accidents primarily involve runway overrun events.

Until aircraft takeoff monitoring and alerting technology is mature and deployed, takeoff safety must rely on robust operating and training philosophies by aircraft operators. However, the following airport technologies should be considered:

- Distance available signs, at any intersection from which an intersection-takeoff is possible, as described in *ICAO, Annex 14, Volume 1, Chapter 5, Section 5.4.3.20.*
- Centerline / runway-edge lighting with changing patterns, to enhance the flight crew's situational awareness of the runway length remaining to bring the aircraft to a complete stop following a rejected takeoff - *ICAO, Annex 14, Volume 1, Chapter 5 (Visual Aids for Navigation).*
- EMAS (Engineered Material Arresting System) arresting bed at each runway-end where the terrain configuration does not allow for the provision of a runway safety area, as recommended by *ICAO, Annex* 14, *Volume 1, Chapter 3, Section 3.5.*

Safety awareness information and material for the development of training programs, on the prevention of rejected takeoff accidents, is available from the following source:

- FAA / Industry Takeoff Safety Training Aid (2006 Issue),
- Manufacturers' Annexes to the above Training Aid,
- Airports Council International (ACI) website (http://www.aci-safetynetwork.aero).

IV – Midair Collisions

Refer to Appendices E and F, as the installation of new ATM / ATC equipment involves both air navigation agencies and airports.

V – Ground Collisions

Ground collisions often are the result of taxiway or runway incursions.

The following technologies should be considered to enhance the controller and flight crew situational awareness on the ground:

- Taxiway and runway markings, lighting and signs in accordance with *ICAO, Annex 14, Volume 1, Chapter 5*.
- ASDE (Airport Surface Detection System):
  - ASDE-3, with prediction capability; or
  - ASDE-X, without prediction capability; or
  - ASDE with AMASS (Airport Movement Area Safety System), an add-on feature to the ASDE that provides automatic alerts and warnings. This Safety Enhancement is recommended by the Commercial Aviation Safety Team – CAST – under reference SE 53.
- ASMGCS (Advanced Surface Movement Guidance and Control Systems):
  - Switchable "stop bars",
  - Taxiway centerline lighting, and / or,
  - Runway Status Lights (RWSLs), including Runway Entrance Lights (RELs) and Takeoff Hold Lines (THLs).
- Multi-lateration systems (based on ACAS Mode S or ADS-B), with a dedicated display for air traffic controller.

Safety awareness information and material for the development of training programs on the prevention of runway incursions is available from the following sources:

- ICAO – Runway Safety Tool Kit.
- FAA – Runway and Surface Safety program.

- IATA - PAAST – Runway Incursion Prevention Program.
- Airports Council International (ACI) website (http://www.aci-safetynetwork.aero)
- Eurocontrol:
    - European Action Plan for the Reduction of Runway Incursions.
    - Airport Operations Programme.

VI – Turbulence Encounters

Refer to Appendices E and F, as the installation of a Terminal Doppler Weather Radar (TDWR), for the enhanced detection of turbulence, involves both air navigation agencies and airports.

Enhancing technology for the detection of turbulence is part of the CAST Safety Enhancement recommendations, under reference SE 78.

VII – Windshear Encounters

Refer to Appendices E and F, as the installation of a Terminal Doppler Weather Radar (TDWR) and a Low Level Windshear Alerting System (LLWAS), for the enhanced detection of turbulent and windshear conditions, involves both air navigation agencies and airports.

VIII – Foreign Object Debris Ingestion / Damage

Foreign object debris ingestion or impact during taxi operations, takeoff or landing rolls may result in significant engine/aircraft damage, a rejected takeoff or a takeoff incident or accident; regular inspection of the Movement Area is therefore necessary.

The following technology (based on millimetric-wave radar technology) may be deployed to enable the automatic and real-time detection of any debris that could cause a safety hazard:

- Runway Foreign Object Debris (FOD) Detection Radar(s).

Safety awareness information and material for the development of training programs, on the detection of foreign object debris, is available from the following source:

- Airports Council International (ACI) website (http://www.aci-safetynetwork.aero) :
    - Airside Safety Handbook.

IX – Bird/Wildlife Strike

Bird/wildlife strike during takeoff roll may result in significant engine/aircraft damage, a rejected takeoff or a takeoff incident or accident.

A bird/wildlife control program should be implemented, including the deployment of selected bird / wildlife control techniques / technologies and associated personnel training programs.

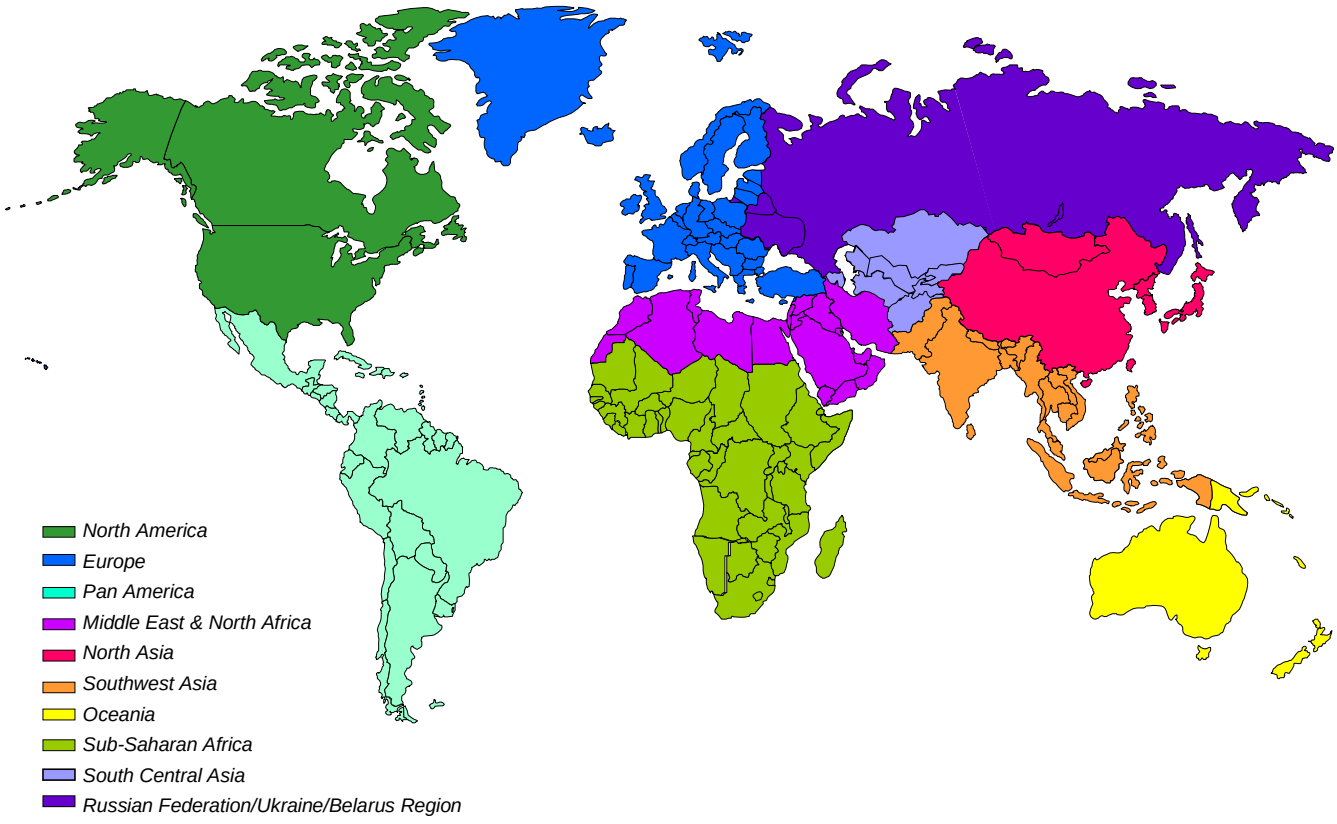
Appendix G – Use of Technology to Enhance Safety – Airport Operations

Safety awareness information and material for the development of a bird/wildlife control program is available from the following sources:

- ICAO – Annex 14 – Chapter 9 – Section 9.4 – Bird Hazard Reduction,
- ICAO – Airport Services Manual (Doc. 9137) – Part 3 – Bird Control,
- Federal Aviation Administration (US FAA):
    - Wildlife Hazard Management at Airports,
- Transport Canada:
    - Sharing the Skies – An Aviation Industry Guide to the Management of Wildlife Hazards (reference TP 13549 E),
- Airports Council International (ACI) website (http://www.aci-safetynetwork.aero):
    - Aerodrome Bird Hazard Prevention and Wildlife Management Handbook.

Appendix H – ISSG Regional Definition

ISSG Regional Definition



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ISSG Regional Definition – Countries by Region

Europe

Albania, Andorra, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Germany, Greece, Greenland, Finland, France, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, FYR Macedonia, Malta, Moldova, Monaco, Netherlands, Norway, Poland, Portugal, United Kingdom, Romania, San Marino, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Vatican City

Middle East & North Africa

Afghanistan, Oman, U.A.E, Saudi Arabia, Egypt, Israel, Iraq, Iran, Kuwait, Western Sahara, Morocco, Algeria, Tunisia, Libya, Egypt, Yemen, Jordan, Syria

North America

United States, Canada

North Asia

China, Mongolia, North Korea, South Korea, Taiwan, Hong Kong, Japan

Oceania

Australia, Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, New Zealand, Niue, Palau, Papua, New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

Pan America

Argentina, Bolivia, Brazil, Chile, Cuba, Ecuador, Panama, Paraguay, Peru, Uruguay, Venezuela, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Mexico, Caribbean, Guyana, French Guiana, Surinam

Russian Federation/Ukraine/Belarus Region

Russia, Ukraine, Belarus

Southeast Asia

Brunei, Cambodia, Laos, Hong Kong, Indonesia, Macao, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, East Timor

Southwest Asia

Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

South Central Asia

Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan

Sub-Saharan Africa

Benin, Burkina Faso, Cote d'Ivorie, Guinea-Bissau, Mali, Niger, Senegal and Togo (Mauritania), Cape Verde, Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, Cameroon, Congo, Gabon, Equatorial Guinea, Central African Republic, Sao Tome e Principe, Chad, Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe, Ethiopia, Senegal, Sudan, Kenya, Somalia, Madagascar

Appendix I – ISSG Roadmap Regional Assessment – Sub-Saharan Africa

1.0 Regional Scope

The Sub-Saharan Africa region includes the following countries:

> Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo (Mauritania), Cape Verde, Ethiopia, Gambia, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, Cameroon, Congo, Gabon, Equatorial Guinea, Central African Republic, Sao Tome e Principe, Chad, Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Zambia and Zimbabwe

1.1 ISSG Regional Safety Goal

Reduce the number of accidents and fatalities in Sub-Sahara African states or airlines where these remain high irrespective of air traffic volumes.

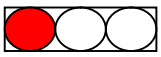
1.2 Purpose

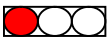
This document captures and summarizes many of the underlying influences of the overall safety of this region's aviation industry. Since influential factors are not limited to the aviation system proper (e.g., operators, ATM / ATC, airport, etc.), but also includes political, socio-economic, and cultural variables, these are captured here as well. If appropriate, the influences and recommended actions can be broken down by country.

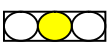
This document is intended to assist the Regional Safety Assessment team as they seek out and work to identify and implement changes intended to improve the region's overall safety environment.

Sub-Sahara Africa

Initial Focus Rating



 There are issues that must be addressed, and actions are required to reach and maintain industry standards.

 If the current ongoing support continues, the improvements will continue.

 No action required at this time. The country or region meets or exceeds the current industry standards.

2 – Key Stakeholders

The following authorities, organizations and initiatives constitute the key stakeholders for the enhancement of aviation safety in the Sub-Saharan Africa region.

2.1. – International State Authorities / Organizations

- **ICAO**
- Aviation authorities / safety agencies (US FAA, French DGAC, Dutch CAA, etc.)
- **World Bank**
- **African Development Bank**
- **European Union**

2.2 – Regional State Authorities / Organizations

- African Union (AU)
- **ECOWAS** – Economic Community of West African States
- **SDAC** – Southern Africa Development Community
- **UEMOA** – Union Economique et Monetaire Ouest Africaine
- **UNECA** – United Nations Economic Commission for Africa

2.3 – Regional Safety Organizations

- **AAMAC**—African and Malagasy Civil Aviation Authorities
- **AFCAC** – African Civil Aviation Commission (AFCAC is the civil aviation commission of the African Union)
- AFRASCO – African Airlines Safety Council
- **ASET** – Africa and Indian Ocean Safety Enhancement Team
- **ASECNA** – Agence pour la Securite de la Navigation Aerienne en Afrique et Madagascar
- **BAGASO** – Banjul Accord Group Aviation Safety Organization
- **Flight Safety Foundation – West Africa**

2.4 – Industry Organizations

- **IATA** – International Air Transport Association
- **IFALPA** – International Federation of Airline Pilots Associations
- **ERAA** – European Regions Airlines Association
- Aircraft manufacturers: **Airbus**, **Boeing**, **Bombardier**, **Embraer**, **ATR**, etc.

- **AFRAA** – African Airlines Association
- **ACI-Africa** – Airports Council International – Africa

3 – Safety Strengths / Enablers

The following programs and initiative should be considered as enablers for the deployment of future regional efforts.

3.1 – International Enablers

- ICAO—**African COSCAPs**
- **US Safe Skies for Africa** initiative
- **World Bank** support for:
  - Harmonization of civil aviation codes and regulations.
  - Improvement of infrastructures.
  - Training of civil aviation personnel.

3.2—Regional Enablers

- Regional Conventions and Treaties:
  - Capetown Convention / Treaty [**US** , **EU**], for the financing of "mobile equipment" (i.e., replacement of aging aircraft fleets)
  - **Yamoussoukro Decision**
  - **New Partnership for Africa Development** (NEPAD) initiative
- Regional action plans:
  - Lome action plan
- **African Development Bank**
  - Capacity-building program for the supervision of aviation safety in West and Central Africa
  - Creation of new mechanisms for the financing of new infrastructures / equipment
- AAMAC (African and Malagasy Civil Aviation Authorities) protocols signed with US FAA, French DGAC and African COSCAPs
- IFFAS (International Financial Facility for Aviation Safety)
- AFRAA proposal for setting-up an independent pan-African AAIB
- BAGASO initiative for a pan-African Aviation Safety Oversight Agency
- **Key To Africa** (KTA) initiative

3.3 – Industry Enablers

- IATA – **Partnership-for-Safety** initiative
- Manufacturers' support to their respective operators
- Manufacturers' coordinated support to their common operators (e.g., through IATA Partnership-for-Safety initiative)

3.4 – Regional Strengths

- Implementation of proven change-management models for future initiatives
- Acknowledgement that "novel hazards" require "novel defenses"
- A few strong legacy carriers (“pockets of strength”)
- Near-universal agreement among international safety organizations to support improvements in Africa
- Region motivated to improve aviation to overcome roads/rail systems for commerce
- Western interest in aiding region’s growth (World Bank, EU, ICAO, etc.)
- Considerable English-speaking capability
- Colonial powers sometimes coach and work in industry
- Continued increase in the number of glass cockpit airplanes
- Public trusts external authorities more than local government
- Relative lack of traffic as compared to other regions.
- Desire to expand international operations provides motivation to improve
- Continually increasing focus on safety concerns in Africa as a result of recent accidents

4—Issues / Challenges / Weaknesses

4.1 – States

4.1.1 – Regulatory Environment—Governments, Aviation Laws and Regulations

4.1.1.1 – Existing Risks

- Lack of trust in government / lack of unifying government
- Financial misconducts
- Lack of well-established and regulated national aviation sectors
- Lack of independent CAAs and AAIBs

4.1.1.2 – Emerging Risks

- None identified

4.1.2 – Regulatory Oversight

4.1.2.1 – Existing Risks

- Low level of regulatory oversight / low level of compliance with USOAP
- Shortage of qualified CAA personnel for safety oversight
- Insufficient regulatory oversight in certification of operators (AOC)
- Insufficient regulatory oversight in continued airworthiness of aircraft (CoA)
- Low level of aviation activity (difficulty to maintain skills due to lack of exposure)

4.1.2.2 – Emerging Risks

- National CAAs' maturity level (risk of swinging from under-regulation to over-regulation)

4.1.3 – Unique States Considerations

4.1.3.1 – Existing Risks

- Extreme poverty in some areas / sub-regions
- Relative low perception of aviation risk relative to other regional risks
- Reluctance to accept truth about accident causes / contributing factors
- Impact of culture on decision-making
- Impact of culture (fatalistic / at-risk behavior, blame culture, etc.)

4.1.3.2 – Emerging Risks

- No realistic alternative to the establishment of an operator that may not be sufficiently competent

4.2 – Region

4.2.1—Unique Regional Considerations

The Sub-Saharan African region / countries present unique considerations in terms of:

- Geographical spread
- Diversity (national wealth, operating environment, infrastructure, growth, etc.)
- Regional variations (e.g., Eastern / Southern Africa vs. Western / Central Africa)
- Multitude of existing development and safety-enhancement programs and initiatives
- Coping with regional weather in the regional context
- Regional "at-risk" behavior / cultural relation to risk (fatalistic culture)
- Language proficiency (particularly English)

4.2.1.1 – Existing Risks

4.2.2.1.1 – Operating Environment

- Environment (ITCZ, sandstorms, etc.)
- Obsolescence of airports
- Obsolescence of navigation aids (navaids) infrastructure
- Inadequate ATM / ATC
- Security

4.2.2.1.2 – Most Frequent Types of Events:

- Approach-and-landing accidents
- CFIT accidents
- Runway incidents/accidents
- Ramp incidents/accidents

4.2.2.2—Emerging Risks

- Unaccommodated traffic growth:
  - — Lack of quality—and quantity—in pilots
  - — Lack of mechanics and certifying staff
  - — Lack of civil aviation personnel
  - — Lack of operators' initial and continued competence with AOC

4.3—Industry

4.3.1 – Operators' Organization / Business Practices

4.3.1.1 – Existing Risks

- Lack of strong safety leadership / management by operators
- Fleet Obsolescence
- Security

4.3.1.2 – Emerging Risks

- Lack of operators' initial and continued competence with AOC
- Unaccommodated traffic growth :
- Management of aircraft transfers (e.g., tracking of maintenance records)
- Management / standardization of fleets made up of leased aircraft from different origins with various standards

4.3.2 – Operators' Fleets / Equipment

4.3.2.1 – Existing Risks

- Obsolescence of fleet (eastern-built + first generation jets)
- Definition, resolution and accuracy of FMS and TAWS navigation / terrain databases

4.3.2.2 – Emerging Risks

- Aging of legacy fleet

4.3.3 – Flight Operations / Crew Training

4.3.3.1 – Existing Risks

- Low skill level of working population
- Uneven skill levels in pilot community
- Lack of adherence to HF / CRM / TEM principles
- Non adherence to respective SOPs by flight crews and controllers
- Flight crew training and proficiency
- History of following types of accidents :
  - Approach-and-landing accidents
  - CFIT accidents
  - Runway incidents/accidents
- Level and capacity of ab-initio pilots' training schools

4.3.3.2 - Emerging Risks

- Lack of qualified pilots to face traffic growth
  - — Erosion of experienced-pilots community due to poaching
- Integration of expatriate pilots in operators' traditionally national crew community
- Level of experience of new captains and first officers (resulting crew pairing rules)

4.3.4—Maintenance / Training

4.3.4.1 – Existing Risks

- Low skill level of working population
- Low skill level of maintenance mechanics
- Absence / inadequate training of maintenance certifying staff
- Low quality of maintenance records
- Ramp safety / ground handling

4.3.4.2 – Emerging Risks

- Lack of qualified maintenance mechanics to face traffic growth

4.3.5 – Infrastructures—Airports, Navaids, ATC

4.3.5.1 – Existing Risks

4.3.5.1.1—Airport Infrastructures

- Airport infrastructure non-compliance with ICAO standards
- Airports' fire-fighting capability
- States' search-and-rescue capability

4.3.5.1.2 – Navaids / ATM / ATC Infrastructures

- Availability and reliability of navaids infrastructure
- Limited radar coverage
- Limited VHF coverage, reliability of VHF communications
- Unreliable ground / land-lines communication between ATCCs
- English proficiency of ATCOs
- High number of NDB approaches
- Availability and reliability of NOTAMs
- Use of French language at international airports
- Non-mandatory use of transponders
- Management of airspace (e.g., slots, flight levels, sectors, ...)

4.3.5.2 – Emerging Risks

- [Not yet specified]

4.3.6 – Unique Industry Considerations

4.3.6.1 – Existing Risks

- Significant security risks

4.3.6.2 – Emerging Risks

- [Not yet identified]

5 –Identification of Gaps between Best Practices and Current State

- Gaps between objectives and current state should be assessed using the observations resulting from the following assessment / audit programs:
  - ICAO USOAP program
  - IATA IOSA program
  - Regional assessment by :
    - Aircraft manufacturers
    - IFALPA
    - Other organizations as appropriate

6 – Recommended / Prioritized Actions

To be developed by regional implementation team based upon gap analysis and an assessment of the impact and potential changeability of each proposed action – Some examples of items to consider for Sub-Saharan Africa may include:

- Adaptation of national aviation laws to allow full implementation of international standards
- Support to states for compliance with ICAO USOAP
- Support to operators for compliance with IATA IOSA
- Deployment of SMS concept in all domains
- Adaptation of basic education and initial training systems to face demand in terms of:
  - Pilots
  - Cabin attendants
  - Maintenance mechanics

- Evaluation of ASECNA-like entities to favor development of sub-regional infrastructure / ATM / ATC
- Implementation of satellite-based navigation and communication systems
- Development of GPS approaches (at selected airports)
- Build on lessons-learned:
  - Identify and replicate success stories (e.g. ATC evolution in Angola, South Africa)
- Federate efforts of various regional and sub-regional safety-enhancement initiatives:
  - Perform further mapping of "initiatives" and respective "scope of action"
- Perform further regional analysis (mapping) of "areas of change" that may generate emerging risks:
  - Environment
  - Authorities
  - Organizations / Enterprises
  - Personnel
  - Passengers
  - Technology
  - Airspace (Air navigation systems, ATM / ATC)
  - Airports
  - Operations
  - Maintenance

  … in order to assess the following aspects:
  - Users' adaptation to new technologies
  - Pilots' adaptation to new ATM concepts (e.g., shift of responsibility for aircraft separation)
  - Supervision of outsourced work (i.e., maintenance)
  - Access to and processing of an ever-increasing information load

7—Regional Action Plan Definition

7.1 Current Regional Activities

- ICAO—Regional COSCAPs
- IATA – Partnership-for-Safety Initiative

- ASET—Africa and Indian Ocean Safety Enhancement Team
- AFRASCO (scope of field initiatives to be confirmed)
- FSF regional ALAR workshops
- IFALPA—Airspace and Airport Deficiencies—Regional programs
- ASECNA—Infrastructure / ATM / ATC modernization program
- BAGASO—EASA-like agency for member of Banjul Accord Group
- NEPAD—New Partnership for Africa Development (Aviation scope to be confirmed)
- Nigeria CAA initiatives (possible role model / template for other states)
- World Bank support program for safety-enhancement in Africa

7.2—Element of Safety Plans / Initiatives to be developed to Fill-the-Gaps

To be assessed by regional implementation team using, where possible, existing safety initiatives and organizations in order to efficiently utilize resources.

8 – Regional Action Plan Implementation

To be monitored by regional implementation team.

Further Information: **International Civil Aviation Organization (ICAO)**
fls@icao.int