EASA
European Union Aviation Safety Agency

SMS implementation in Part-145 AMOs

EASA views
as Regulator, Competent Authority and Standardisation

FS1 Maintenance & Production department

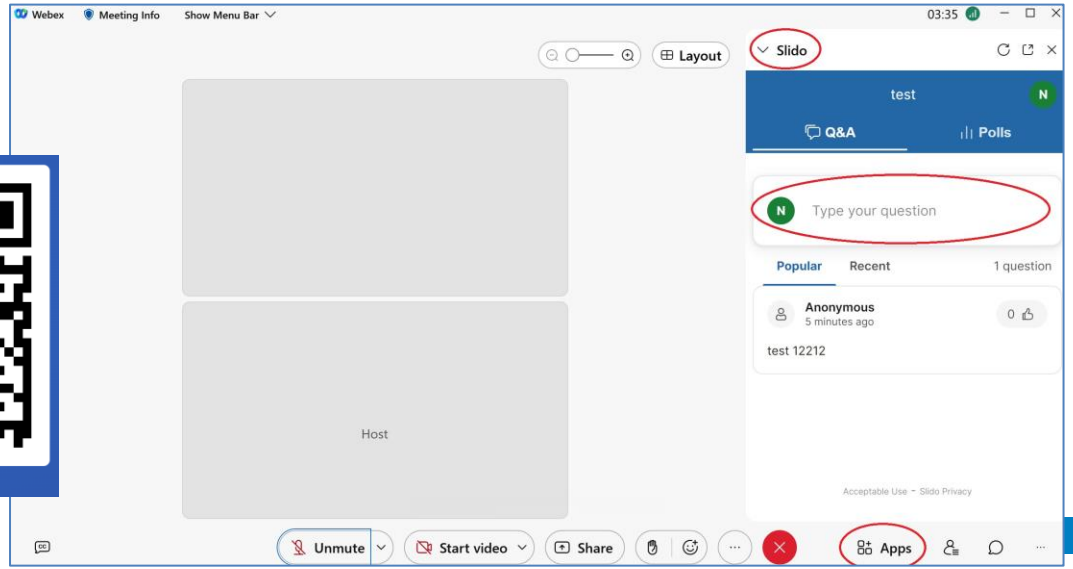
24 November 2023

Your safety is our mission.

An Agency of the European Union

Agenda

- Opening
- Part 1: Overview of SMS transition in Maintenance (& Production)
- Part 2: Sharing practice - conducting MS assessment
- Part 3: Standardisation feedback on SMS in CAMO
- Part 4: Transition status in Foreign Part-145 AMOs
- Q&A - **Slido**



EASA

EASA
European Union Aviation Safety Agency

PART 1

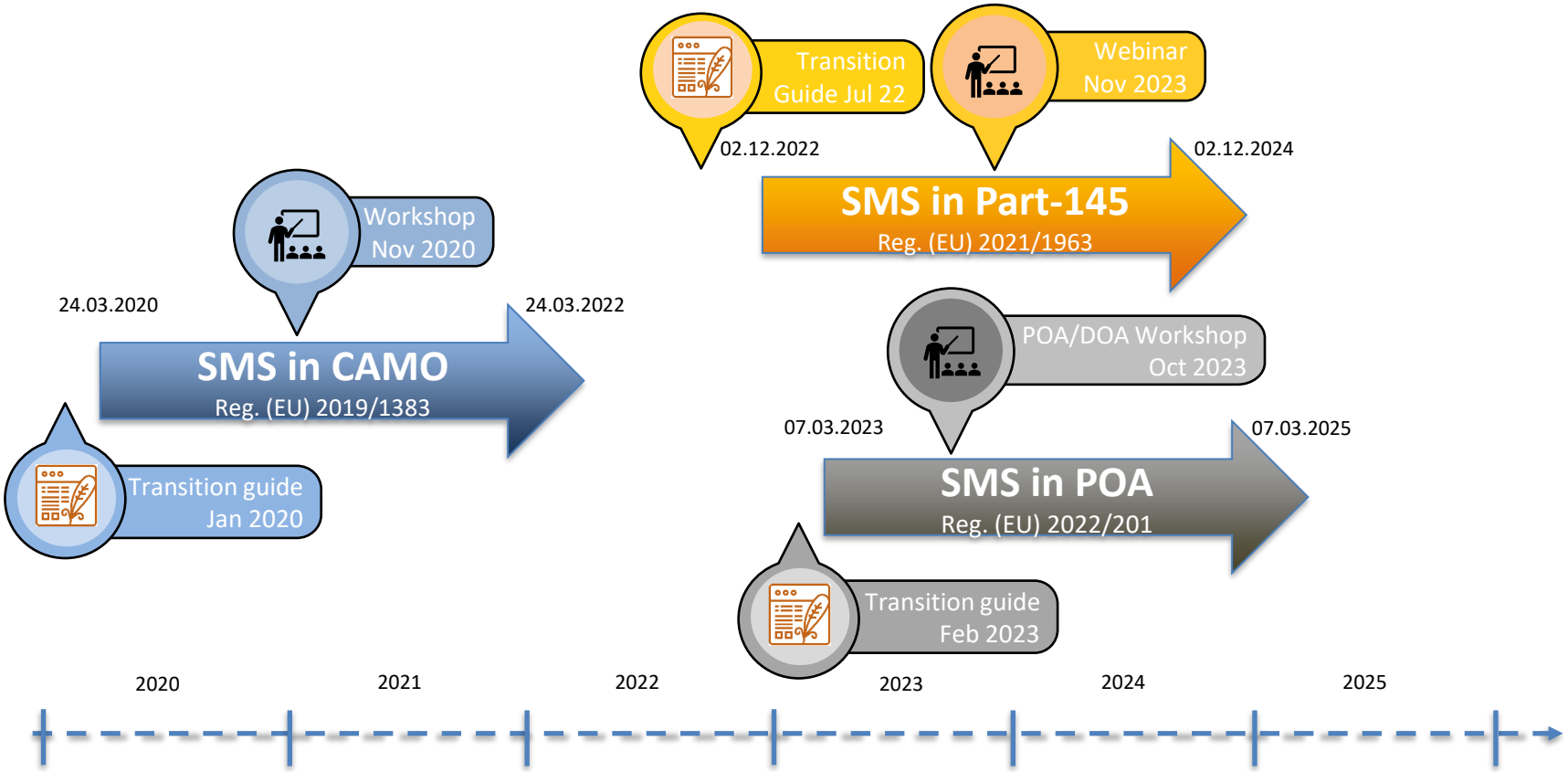
Overview of SMS transition in Maintenance (& Production)

Jeremie Neveux
Section manager – Airworthiness standard and implementation

Your safety is our mission.

An Agency of the European Union

SMS transition in Maintenance & Production



Key terminology

- **Valid approval:** An approval that is not revoked nor suspended.

- **Transition phase:** It is the period from 2 December 2022 until 2 December 2024.

- **Transition finding:** address the *new requirements* of Reg (EU) 2021/1963.

  The transition finding has the objective to identify that the implementation of Reg (EU) 2021/1963 is not yet completed in that organisation

  - Generic transition finding
  - Specific transition finding

- **PSOE:** Present – Suitable – Operating – Effective : the SMS assessment dimensions

  For initial implementation of SMS, only 'P' and 'S' are required

Implementation process for VALID Part-145 approvals

N — CA checking compliance to Part-145 **N**ovelty

C — CA checking compliance to **C**lassic Part-145 provision

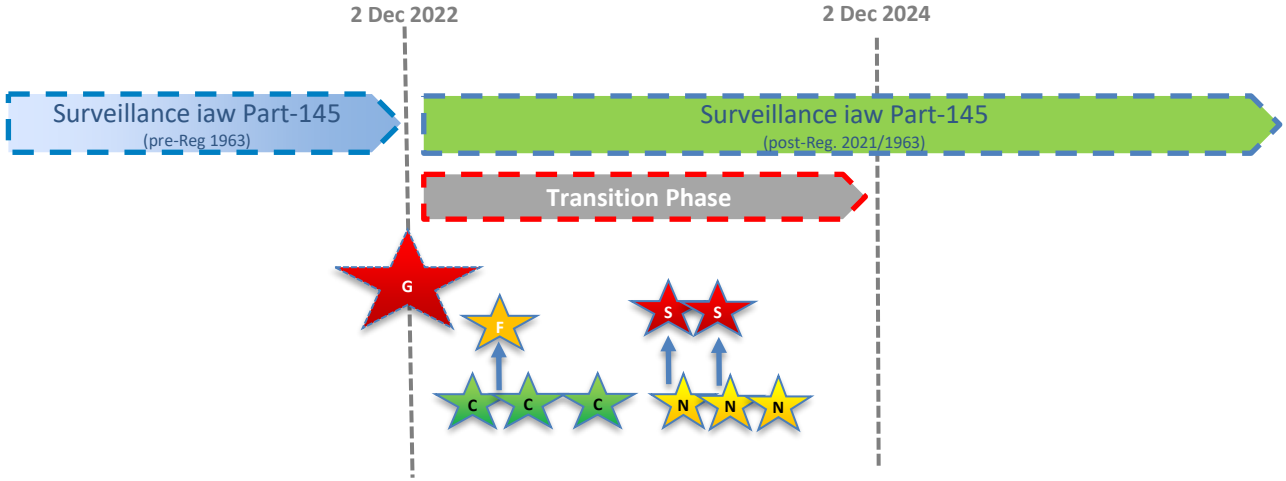
G — **G**eneric transition finding on Part-145 novelty

S — **S**pecific transition finding on Part-145 novelty

To be closed before 2-Dec-2024

F — **F**inding to classic Part-145 provision

To be closed normal manner



EASA
European Union Aviation Safety Agency

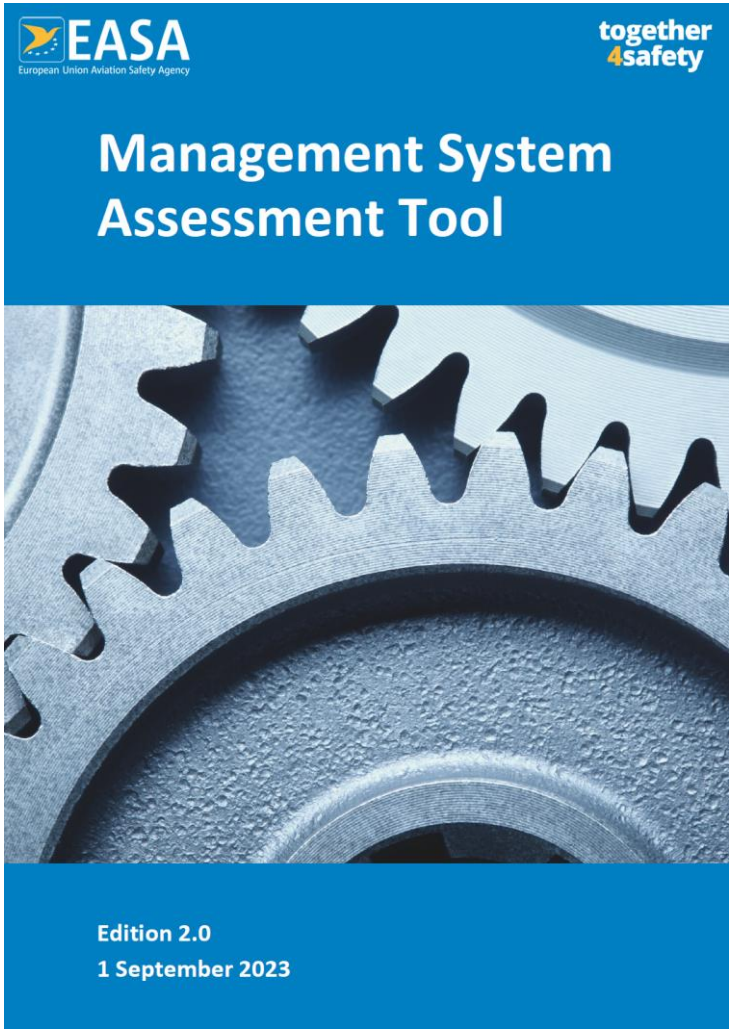
PART 2

Sharing practice - conducting MS assessment

Alberto Nozal
CAMO/MOA Expert

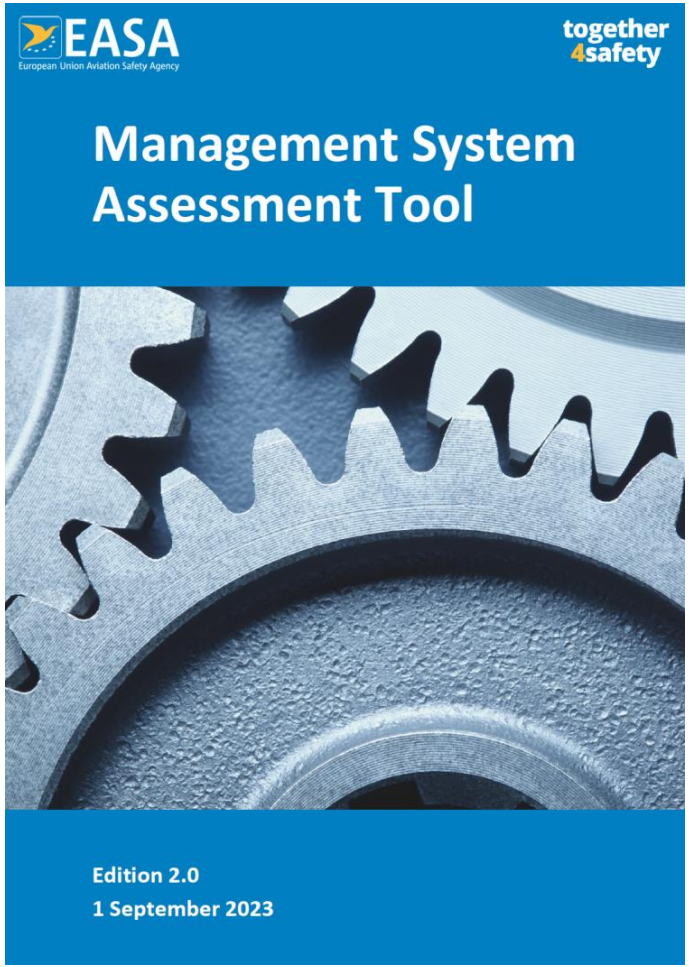
Your safety is our mission.

An Agency of the European Union



SMS ASSESSMENT METHODOLOGY

EASA



To support authorities on the management systems assessment.

It focuses on both elements of a Management System:

- ❑ the **SMS** elements (ICAO Annex 19 and framework - sections 1 to 4), with the traditional four pillars;
  - safety policy and objectives;
  - safety risk management;
  - safety assurance;
  - safety promotion;
- ❑ the **compliance monitoring** system (section 5).

Complemented by the evaluation of the **interface management** (providers).

Is designed to be used by Competent Authorities, but it could also be used by organisations.

EASA
European Union Aviation Safety Agency

together 4safety

Management System Assessment Tool

Edition 2.0

1 September 2023

2.2 Safety risk assessment and mitigation

Annex 19 reference & text

2.2.1 The service provider shall develop and maintain a process that ensures analysis, assessment [and control] of the safety risks associated with identified hazards.

Note: The process may include predictive methods of safety data analysis.

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.
Assessment results			

What to look for

- Review risk classification scheme and procedures.
- Check the methodology used to assess the risks; how this is documented, accurately defined, and used; check how the staff using that methodology is trained.
- Check any assumptions made and whether they are reviewed.
- Check that the process defines who can accept what level of risk.
- Check that the level of risk that the organisation is willing to accept is defined.
- Severity and likelihood definitions and criteria are sufficiently defined (or that an alternative methodology is described) and adapted to the activities. Severity 'of what' ('possible worst scenario' and consequence) is also described. Differentiation between 'likelihood' and 'frequency' is understood.
- Review whether risk assessments are carried out consistently and coherently across the organisation (e.g. consideration of various safety perspectives and views to make the relevant decision).
- Review how issues are classified when there is insufficient quantitative data available. When expert judgement is used, a collaborative risk assessment process is used (e.g. various expert judgement through cross-functional disciplines such as Flight operations, Design, Production, Human Performance experts), taking into account different safety perspectives and views to make the relevant decision, to ensure the reproducibility of the assessment.
- Consider how human performance is evaluated through the safety risk management and mitigation process (refer to ICAO Doc.10151)
- Check whether the outcome of the safety reporting system, including the mandatory and voluntary occurrence reporting systems, is used to test the robustness the risk assessment, including when the expert judgement was used (see section 3.1). Is the network of stakeholders involved in the collection of data and safety information informing the risk assessments, notably for the risk at the interfaces? (See also Section 5.1 of this tool).
- Verify whether the risk assessments are updated when new data from the safety reporting system are available. Review what triggers a risk assessment and its review over time. Check that the risk register is being reviewed and monitored by the appropriate safety committee(s), where appropriate. Verify how experience, feedback and monitoring of recently published safety information serves that regular update.
- Review layout of risk register e.g. initial assessment, residual risk, mitigation actions, ownership, associated safety performance and follow-up.
- Sample identified hazards and how these are processed and documented.
- Check which safety committee(s) or person(s) oversee the 'acceptability'. Check the availability of instructions about implementation of 'As Low As Reasonably Practical' (ALARP). Check the right level of authority for decision-making.
- Evidence of risk reduction, evaluation of residual risk and risk acceptability, when appropriate, being applied in the data-driven decision-making.
- Evidence that risks, including those that are not generated by the organisation itself, are analysed and mitigated, without further transfer of risks.
- Check how trends and emerging issues are identified and managed.

Corresponding EU/EASA regulatory references

Air Operations	Aircrew	Aerodromes	ATM/ANS	ATC Training Org.

EASA
European Union Aviation Safety Agency

together 4safety

Management System Assessment Tool

Edition 2.0

1 September 2023

2.2 Safety risk assessment and mitigation

Annex 19 reference & text

2.2.1 The service provider shall develop and maintain a process that ensures analysis, assessment [and control] of the safety risks associated with identified hazards.

Note: The process may include predictive methods of safety data analysis.

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.
Assessment results			

What to look for

- Review risk classification scheme and procedures.
- Check the methodology used to assess the risks; how this is documented, accurately defined, and used; check how the staff using that methodology is trained.
- Check any assumptions made and whether they are reviewed.
- Check that the process defines who can accept what level of risk.
- Check that the level of risk that the organisation is willing to accept is defined.
- Severity and likelihood definitions and criteria are sufficiently defined (or that an alternative methodology is described) and adapted to the activities. Severity 'of what' ('possible worst scenario' and consequence) is also described. Differentiation between 'likelihood' and 'frequency' is understood.
- Review whether risk assessments are carried out consistently and coherently across the organisation (e.g. consideration of various safety perspectives and views to make the relevant decision).
- Review how issues are classified when there is insufficient quantitative data available. When expert judgement is used, a collaborative risk assessment process is used (e.g. various expert judgement through cross-functional disciplines such as Flight operations, Design, Production, Human Performance experts), taking into account different safety perspectives and views to make the relevant decision, to ensure the reproducibility of the assessment.
- Consider how human performance is evaluated through the safety risk management and mitigation process (refer to ICAO Doc.10151)
- Check whether the outcome of the safety reporting system, including the mandatory and voluntary occurrence reporting systems, is used to test the robustness the risk assessment, including when the expert judgement was used (see section 3.1). Is the network of stakeholders involved in the collection of data and safety information informing the risk assessments, notably for the risk at the interfaces? (See also Section 5.1 of this tool).
- Verify whether the risk assessments are updated when new data from the safety reporting system are available. Review what triggers a risk assessment and its review over time. Check that the risk register is being reviewed and monitored by the appropriate safety committee(s), where appropriate. Verify how experience, feedback and monitoring of recently published safety information serves that regular update.
- Review layout of risk register e.g. initial assessment, residual risk, mitigation actions, ownership, associated safety performance and follow-up.
- Sample identified hazards and how these are processed and documented.
- Check which safety committee(s) or person(s) oversee the 'acceptability'. Check the availability of instructions about implementation of 'As Low As Reasonably Practical' (ALARP). Check the right level of authority for decision-making.
- Evidence of risk reduction, evaluation of residual risk and risk acceptability, when appropriate, being applied in the data-driven decision-making.
- Evidence that risks, including those that are not generated by the organisation itself, are analysed and mitigated, without further transfer of risks.
- Check how trends and emerging issues are identified and managed.

Corresponding EU/EASA regulatory references

Air Operations	Aircrew	Aerodromes	ATM/ANS	ATC Training Org.

EASA

maturity levels

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.

Present	There is evidence that the relevant item is documented within the organisation's Management System Documentation.
Suitable[18]	The relevant item is suitable based on the size, nature, complexity of the organisation and the inherent risk in the activity.
Operating	There is evidence that the relevant item is in use and an output is being produced.
Effective	There is evidence that the relevant item is achieving the desired outcome and has a positive safety impact.

maturity levels

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including severity and likelihood usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.

Present	There is evidence that the relevant item is documented within the organisation's Management System Documentation.
Suitable[18]	The relevant item is suitable based on the size, nature, complexity of the organisation and the inherent risk in the activity.
Operating	There is evidence that the relevant item is in use and an output is being produced.
Effective	There is evidence that the relevant item is achieving the desired outcome and has a positive safety impact.

maturity levels

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.

Present	There is evidence that the relevant item is documented within the organisation's Management System Documentation.
Suitable[18]	The relevant item is suitable based on the size, nature, complexity of the organisation and the inherent risk in the activity.
Operating	There is evidence that the relevant item is in use and an output is being produced.
Effective	There is evidence that the relevant item is achieving the desired outcome and has a positive safety impact.

maturity levels

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.

Present	There is evidence that the relevant item is documented within the organisation's Management System Documentation.
Suitable[18]	The relevant item is suitable based on the size, nature, complexity of the organisation and the inherent risk in the activity.
Operating	There is evidence that the relevant item is in use and an output is being produced.
Effective	There is evidence that the relevant item is achieving the desired outcome and has a positive safety impact.

EASA
European Union Aviation Safety Agency

together 4safety

Management System Assessment Tool

Edition 2.0

1 September 2023

2.2 Safety risk assessment and mitigation

Annex 19 reference & text

2.2.1 The service provider shall develop and maintain a process that ensures analysis, assessment [and control] of the safety risks associated with identified hazards.

Note: The process may include predictive methods of safety data analysis.

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed. For the acceptance of the risk's level, the right level of organisation's authority within the organisation (responsibilities) in cooperation with the stakeholders is clearly defined.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders. Operational, technical, human and organisational factors are considered as part of the development of risks controls. Senior management is actively involved in medium and high risks and their mitigation and controls. Understanding of external inputs and outputs of safety risk management that should be addressed.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current. Risk acceptability criteria are used routinely, consistently applied in management decision making processes, and are regularly reviewed.
Assessment results			

What to look for

- Review risk classification scheme and procedures.
- Check the methodology used to assess the risks; how this is documented, accurately defined, and used; check how the staff using that methodology is trained.
- Check that the process defines who can accept what level of risk.
- Check that the level of risk that the organisation is willing to accept is defined.
- Severity and likelihood definitions and criteria are sufficiently defined (or that an alternative methodology is described) and adapted to the activities. Severity 'of what' ('possible worst scenario' and consequence) is also described. Differentiation between 'likelihood' and 'frequency' is understood.
- Review whether risk assessments are carried out consistently and coherently across the organisation (e.g. consideration of various safety perspectives and views to make the relevant decision).
- Review how issues are classified when there is insufficient quantitative data available. When expert judgement is used, a collaborative risk assessment process is used (e.g. various expert judgement through cross-functional disciplines such as Flight operations, Design, Production, Human Performance experts), taking into account different safety perspectives and views to make the relevant decision, to ensure the reproducibility of the assessment.
- Consider how human performance is evaluated through the safety risk management and mitigation process (refer to ICAO Doc.10151)
- Check whether the outcome of the safety reporting system, including the mandatory and voluntary occurrence reporting systems, is used to test the robustness the risk assessment, including when the expert judgement was used (see section 3.1). Is the network of stakeholders involved in the collection of data and safety information informing the risk assessments, notably for the risk at the interfaces? (See also Section 5.1 of this tool).
- Verify whether the risk assessments are updated when new data from the safety reporting system are available. Review what triggers a risk assessment and its review over time. Check that the risk register is being reviewed and monitored by the appropriate safety committee(s), where appropriate. Verify how experience, feedback and monitoring of recently published safety information serves that regular update.
- Review layout of risk register e.g. initial assessment, residual risk, mitigation actions, ownership, associated safety performance and follow-up.
- Sample identified hazards and how these are processed and documented.
- Check which safety committee(s) or person(s) oversee the 'acceptability'. Check the availability of instructions about implementation of 'As Low As Reasonably Practical' (ALARP). Check the right level of authority for decision-making.
- Evidence of risk reduction, evaluation of residual risk and risk acceptability, when appropriate, being applied in the data-driven decision-making.
- Evidence that risks, including those that are not generated by the organisation itself, are analysed and mitigated, without further transfer of risks.
- Check how trends and emerging issues are identified and managed.

Corresponding EU/EASA regulatory references

Air Operations	Aircrew	Aerodromes	ATM/ANS	ATC Training Org.

EASA

EASA
European Union Aviation Safety Agency

together 4safety

Management System Assessment Tool

Edition 2.0
1 September 2023

2.2 Safety risk assessment and mitigation

Annex 19 reference & text

2.2.1 The service provider shall develop and maintain a process that ensures analysis, assessment [and control] of the safety risks associated with identified hazards.

Note: The process may include predictive methods of safety data analysis.

Present	Suitable	Operating	Effective
There is a process for the analysis and assessment of safety risks.	The risk assessment methodology, including 'severity' and 'likelihood' usable criteria are defined and fit the service provider's actual environment, including consideration to the expert judgement when data are not available. The used definitions are sufficiently explicit or detailed.	Risk analysis and assessments are carried out in a consistent manner based on the defined process. Appropriate risks controls are being applied to reduce safety risks to an acceptable level, including timelines and allocation of responsibilities agreed with the stakeholders.	Risk analysis and assessments are reviewed for consistency and to identify improvements in the processes. Risk assessments are regularly reviewed to ensure they remain current.

What to look for

This column in the matrix guides the inspector when looking at each individual item and is not meant to be a checklist. The items listed are not specific to an individual PSOE level but remind the inspector of areas they may want to consider. Some items in this column may not be relevant depending on the type or nature of the organisation.

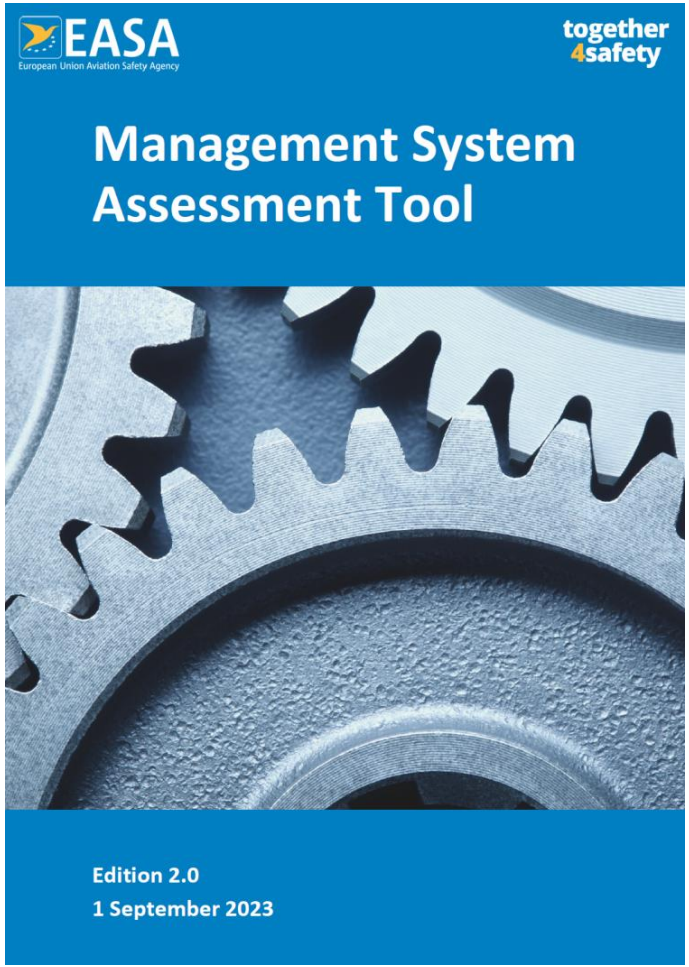
What to look for

- Review risk classification scheme and procedures.
- Check the methodology used to assess the risks; how this is documented, accurately defined, and used; check how the staff using that methodology is trained.
- Check that the process defines who can accept what level of risk.
- Check that the level of risk that the organisation is willing to accept is defined.
- Severity and likelihood definitions and criteria are sufficiently defined (or that an alternative methodology is described) and adapted to the activities. Severity 'of what' ('possible worst scenario' and consequence) is also described. Differentiation between 'likelihood' and 'frequency' is understood.
- Review whether risk assessments are carried out consistently and coherently across the organisation (e.g. consideration of various safety perspectives and views to make the relevant decision).
- Review how issues are classified when there is insufficient quantitative data available. When expert judgement is used, a collaborative risk assessment process is used (e.g. various expert judgement through cross-functional disciplines such as Flight operations, Design, Production, Human Performance experts), taking into account different safety perspectives and views to make the relevant decision, to ensure the reproducibility of the assessment.
- Consider how human performance is evaluated through the safety risk management and mitigation process (refer to ICAO Doc.10151)
- Check whether the outcome of the safety reporting system, including the mandatory and voluntary occurrence reporting systems, is used to test the robustness the risk assessment, including when the expert judgement was used (see section 3.1). Is the network of stakeholders involved in the collection of data and safety information informing the risk assessments, notably for the risk at the interfaces? (See also Section 5.1 of this tool).
- Verify whether the risk assessments are updated when new data from the safety reporting system are available. Review what triggers a risk assessment and its review over time. Check that the risk register is being reviewed and monitored by the appropriate safety committee(s), where appropriate. Verify how experience, feedback and monitoring of recently published safety information serves that regular update.
- Review layout of risk register e.g. initial assessment, residual risk, mitigation actions, ownership, associated safety performance and follow-up.
- Sample identified hazards and how these are processed and documented.
- Check which safety committee(s) or person(s) oversee the 'acceptability'. Check the availability of instructions about implementation of 'As Low As Reasonably Practical' (ALARP). Check the right level of authority for decision-making.
- Evidence of risk reduction, evaluation of residual risk and risk acceptability, when appropriate, being applied in the data-driven decision-making.
- Evidence that risks, including those that are not generated by the organisation itself, are analysed and mitigated, without further transfer of risks.
- Check how trends and emerging issues are identified and managed.

Corresponding EU/EASA regulatory references

Air Operations	Aircrew	Aerodromes	ATM/ANS	ATC Training Org.

EASA



- The tool should be used **ONLY as a guide**, not as a checklist.
  Assessing an SMS is not a ticking box exercise to verify that each and every line of the tool are complied with.

- The tool has been designed to capture the **generic** MS **requirements** so it is valid for **all domains.** However, it may also be customized.

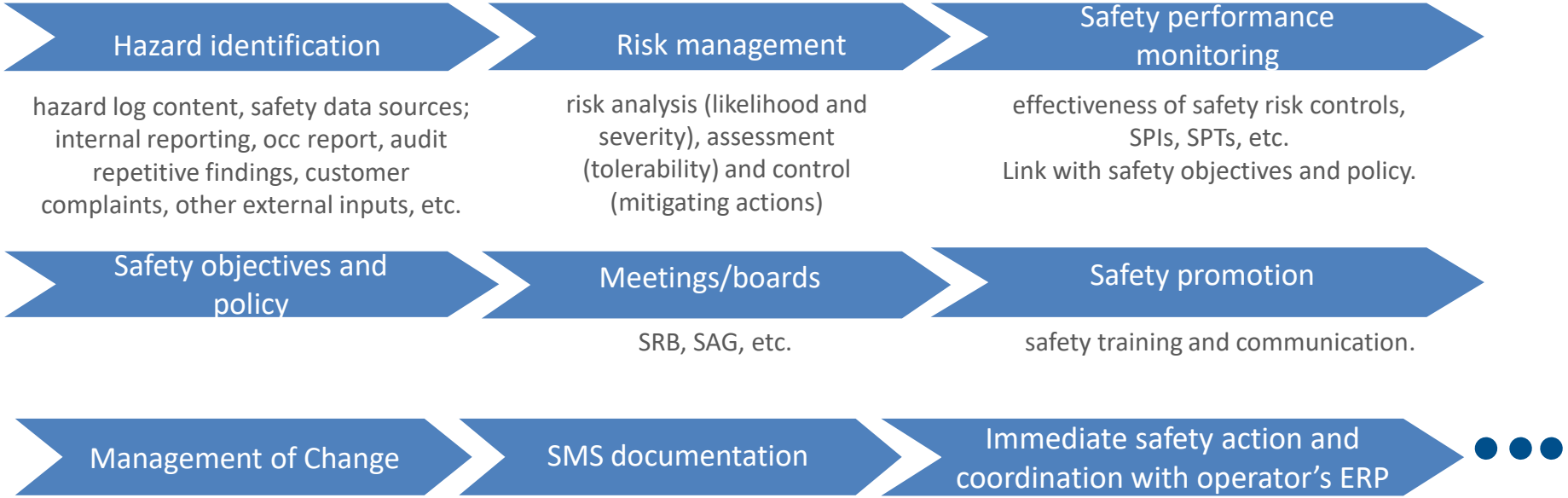
- May be used for **initial evaluation** and **continuing oversight**.
  - ❑ Present / Suitable / Operating / Effective
  - ❑ Desktop review + interviews + remote/on-site audit
    - ❖ Desktop review only is not sufficient.

- Can be used to assess **any size of organization**.
  Consideration should be given to the size/nature/complexity of organization/activities; Annex 2 ‘scalability’ and ‘suitability’.

- No particular order/**sequence** preference for the assessment.

EASA

Example of SMS assessment sequence



‘scalability’ and ‘suitability’

- All organisations, regardless of their size, are exposed to risks, some of them being potentially significant, even for a limited business. Therefore, all elements of a MS should apply.
- It is not just the size of the organization that matters but also the nature/complexity/potential risks of the activity; small AMO providing only on-call line maintenance services ➡ maintenance errors probability
- Is about adapting a MS with all its elements to the specific operational context of the organisation.
- An SMS does not need to be complex to be effective.
- Examples;
  - Roles: AM exercising SM and CMM roles Vs three nominated Managers
  - Safety committees: SRB (and where applicable SAG) and frequency of meetings
  - safety communication: safety bulletins and safety recurrent training Vs board publication
  - Hazard log and risk management: Paper form Vs dedicated software. Simple/Complex process

‘scalability’ and ‘suitability’

Hazard Log for a *Small* Organization

Issue *(hazard)*	What is the result *(consequence)*	How bad is the result	How likely is it to occur	What action are we taking (Who and when)	Follow-up (if applicable)

Severity and Likelihood Definitions

Severity of Consequences		
Definition	**Meaning**	**Value**
Fatal Accident	Results in a serious accident or incident with fatalities	5
Serious Incident	Results in a Serious Incident (without fatalities) that would be reportable to the NAA	3
Negligible	Results in minor incident that would not be reportable to the NAA	1

Likelihood of Occurrence		
Qualitative Definition	**Meaning**	**Value**
Likely	Likely to reoccur or to occur several times in a year	3
Possible	Possibly reoccur or to occur at least once a year	2
Unlikely	Very unlikely to reoccur or occur	1

Risk Acceptability Matrix

		Likelihood		
		Unlikely (1)	Possible (2)	Likely (3)
Severity	Fatal Accident (5)	REVIEW (5)	UNACCEPTABLE (10)	UNACCEPTABLE (15)
	Serious Incident (3)	REVIEW (3)	REVIEW (6)	UNACCEPTABLE (9)
	Negligible (1)	ACCEPTABLE (1)	ACCEPTABLE (2)	REVIEW (3)

Risk Acceptance Actions

Actions will be prioritized by the score from the Risk Acceptability Matrix but the following table will determine the appropriate action to be taken.

Unacceptable	Risk Intolerable, Accountable Executive immediately informed and action must be taken to reduce the risk to a tolerable level.
Review	Risk reduction / mitigation must be considered. Where risk reduction / mitigation is not practical or viable acceptance by Accountable Executive is required.
Acceptable	Risk is considered acceptable but would be reviewed if reoccurs.

‘scalability’ and ‘suitability’

Generic Hazard	Unsafe Event	Location	Risk Remarks	Initial Defences to Control Safety Risks, and Safety Risk Index			Priority	Root Cause	Mitigating actions	Due date	Reponsible Department	New Defences to Control Safety Risks, and Safety Risk Index			SPI	Follow-up	Status
				Severity	Probability	Risk Index						Severity	Probability	Risk Index			

‘scalability’ and ‘suitability’

Figure 10 : Risk Severity Classifications

SEVERITY OF CONSEQUENCES		
Definition	**Meaning**	**Value**
Catastrophic	The following situations, but are not limited to, may have a potential to result in catastrophic consequences: • Quality escape on a critical part (level 4 may be also considered according to the extent of the nonconformity, type of part (rotating or non-rotating), etc.) • Release of a component to service without implementing ADs • Deviation from the mandatory maintenance practices defined by the TCH. (The mandatory maintenance practices must be done as written in the engine manual. No changes to the specified operations, sequence of operations, limits, or tooling are permitted.)	5
Hazardous	The following situations, but are not limited to, may have a potential to result in hazardous consequences: • Quality escape on a critical part (level 5 may be also considered according to the extent of the nonconformity, type of part (rotating or non-rotating), etc.) • Quality escape on a non-critical part • Irreversible nonconformity on a critical part or an LLP-influencing part entailed by maintenance organisation activities.	4
Major	The following situations, but are not limited to, may have a potential to result in major consequences: • Irreversible nonconformity on non-critical or non-LLP influencing parts entailed by maintenance organisation activities. • Nonconformity entailed by maintenance organisation and beyond the limits or outside the scope of the maintenance data (restored to serviceable condition only by approval of TCH or DOA holder).	3
Minor	The following situations, but are not limited to, may have a potential to result in minor consequences: • Reversible nonconformity entailed by maintenance organisation activities (restored to serviceable condition with rework and/or repair).	2
Negligible	• Any case that does not induce any safety effect on the components.	1

Figure 11 : Risk Likelihood Classifications

LIKELIHOOD OF OCCURRENCE		
Definition	**Meaning**	**Value**
Frequent	Likely to occur many times (has occured frequently, e.g. 1/25)	5
Occasional	Likely to occur sometimes (has occurred infrequently, e.g. 1/100)	4
Remote	Unlikely to occur but possible (has occurred rarely, e.g. 1/250)	3
Improbable	Very unlikely to occur (not known to have occurred, e.g. 1/500)	2
Extremely improbable	Almost inconceivable that the event will occur (e.g. 1/1000)	1

Root Cause	Mitigating actions	Due date	Reponsible Department	New Defences to Control Safety Risks, and Safety Risk Index			SPI	Follow-up	Status
				Severity	Probability	Risk Index			

‘scalability’ and ‘suitability’

Figure 10 : Risk Severity Classifications

SEVERITY OF CONSEQUENCES		
Definition	**Meaning**	**Value**
Catastrophic	The following situations, but are not limited to, may have a potential to result in catastrophic consequences: • Quality escape on a critical part (level 4 may be also considered according to the extent of the nonconformity, type of part (rotating or non-rotating), etc.) • Release of a component to service without implementing ADs • Deviation from the mandatory maintenance practices defined by the TCH. (The mandatory maintenance practices must be done as written in the engine manual. No changes to the specified operations, sequence of operations, limits, or tooling are permitted.)	5
Hazardous	The following situations, but are not limited to, may have a potential to result in hazardous consequences: • Quality escape on a critical part (level 5 may be also considered according to the extent of the nonconformity, type of part (rotating or non-rotating), etc.) • Quality escape on a non-critical part • Irreversible nonconformity on a critical part or an LLP-influencing part entailed by maintenance organisation activities.	4
Major	The following situations, but are not limited to, may have a potential to result in major consequences: • Irreversible nonconformity on non-critical or non-LLP influencing parts entailed by maintenance organisation activities. • Nonconformity entailed by maintenance organisation and beyond the limits or outside the scope of the maintenance data (restored to serviceable condition only by approval of TCH or DOA holder).	3
Minor	The following situations, but are not limited to, may have a potential to result in minor consequences: • Reversible nonconformity entailed by maintenance organisation activities (restored to serviceable condition with rework and/or repair).	2
Negligible	• Any case that does not induce any safety effect on the components.	1

Figure 11 : Risk Likelihood Classifications

LIKELIHOOD OF OCCURRENCE		
Definition	**Meaning**	**Value**
Frequent	Likely to occur many times (has occured frequently, e.g. 1/25)	5
Occasional	Likely to occur sometimes (has occurred infrequently, e.g. 1/100)	4
Remote	Unlikely to occur but possible (has occurred rarely, e.g. 1/250)	3
Improbable	Very unlikely to occur (not known to have occurred, e.g. 1/500)	2
Extremely improbable	Almost inconceivable that the event will occur (e.g. 1/1000)	1

Root Cause	Mitigating actions	Due date	Reponsible Department	New Defences to Control Safety Risks, and Safety Risk Index			SPI	Follow-up	Status
				Severity	Probability	Risk Index			

Figure 12 : Risk Tolerability Matrix

			Risk Severity				
			Catastrophic	Hazardous	Major	Minor	Negligible
			5	4	3	2	1
Risk Likelihood	Frequent	5	Unacceptable	Unacceptable	Unacceptable	Review	Acceptable
	Occasional	4	Unacceptable	Unacceptable	Review	Review	Acceptable
	Remote	3	Unacceptable	Review	Review	Acceptable	Acceptable
	Improbable	2	Review	Review	Acceptable	Acceptable	Acceptable
	Extremely improbable	1	Review	Acceptable	Acceptable	Acceptable	Acceptable

- **UNACCEPTABLE:** The risk is unacceptable and major mitigation measures are required to reduce the level of risk to as low as reasonably practicable.
- **REVIEW:** The level of risk is of concern and mitigation measures are required to reduce the level of risk to as low as reasonably practicable. Where further risk reduction/mitigation is not practical or viable, the risk may be accepted, provided that the risk is understood and has the endorsement of the Accountable Manager.
- **ACCEPTABLE:** Risk is considered acceptable but should be reviewed if it reoccurs.

‘scalability’ and ‘suitability’

TABLE 1: PROBABILITY TABLE		
Value	**Meaning**	**Likelihood**
5	Frequent	Likely to occur many times (has occurred frequently)
4	Occasional	Likely to occur sometimes (has occurred infrequently)
3	Remote	Unlikely to occur, but possible (has occurred rarely)
2	Improbable	Very unlikely to occur (not known to have occurred)
1	Extremely improbable	Almost inconceivable that the event will occur

TABLE 2: SEVERITY TABLE		
Value	Severity	Meaning
A	Catastrophic	• Aircraft / equipment destroyed • Multiple deaths
B	Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely • Serious injury • Major equipment damage
C	Major	• A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons
D	Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident
E	Negligible	• Few consequences. No significance to operational safety

TABLE 3: SAFETY RISK INDEX					
Probability	Severity				
	A (Catastrophic)	B (Hazardous)	C (Major)	D (Minor)	E (Negligible)
5 (Frequent)	5A	5B	5C	5D	5E
4 (Occasional)	4A	4B	4C	4D	4E
3 (Remote)	3A	3B	3C	3D	3E
2 (Improbable)	2A	2B	2C	2D	2E
1 (Extremely improbable)	1A	1B	1C	1D	1E

‘scalability’ and ‘suitability’

TABLE 1: PROBABILITY TABLE

Value	Meaning	Likelihood
5	Frequent	Likely to occur many times (has occurred frequently)
4	Occasional	Likely to occur sometimes (has occurred infrequently)
3	Remote	Unlikely to occur, but possible (has occurred rarely)
2	Improbable	Very unlikely to occur (not known to have occurred)
1	Extremely improbable	Almost inconceivable that the event will occur

TABLE 2: SEVERITY TABLE

Value	Severity	Meaning
A	Catastrophic	• Aircraft / equipment destroyed • Multiple deaths
B	Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely • Serious injury • Major equipment damage
C	Major	• A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons
D	Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident
E	Negligible	• Few consequences. No significance to operational safety

TABLE 3: SAFETY RISK INDEX

Probability	Severity				
	A (Catastrophic)	B (Hazardous)	C (Major)	D (Minor)	E (Negligible)
5 (Frequent)	5A	5B	5C	5D	5E
4 (Occasional)	4A	4B	4C	4D	4E
3 (Remote)	3A	3B	3C	3D	3E
2 (Improbable)	2A	2B	2C	2D	2E
1 (Extremely improbable)	1A	1B	1C	1D	1E

TABLE 4: SAFETY RISK TOLERABILITY

Safety Risk Index Range	Risk Description	Recommended Actions
5A, 5B, 5C, 4A, 4B, 3A	INTOLERABLE	Take immediate action to mitigate the risk or stop the activity. Perform priority safety risk mitigation to ensure additional or enhanced preventative controls are in place to bring down the safety risk index to tolerable.
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	TOLERABLE	Can be tolerated based on the safety risk mitigation. It may require management decision to accept the risk.
3E, 2D, 2E, 1B, 1C, 1D, 1E	ACCEPTABLE	Acceptable as is. No further safety risk mitigation required.

TABLE 5: DEFINITIONS

Barrier	A generic term, referring to a PC or RM, or a set thereof.
Barrier Strength Value (BSV)	The Value of a specific Barrier's (PC/ RM) quality or strength.
Consolidated Barrier Strength Value (CBSV)	The Consolidated (SUM) Value of a set (line) of Barrier's (PCs/ RMs) pertaining to a given UE/ UC.
Escalation Control (EC)	A mitigating action or defence to block or prevent an Escalation Factor from compromising or weakening a Preventive Control (or Recovery Measure). Use where applicable only.
Escalation Factor (EF)	Possible deficiency or latent factor/ condition which may weaken the effectiveness of a Preventive Control (or Recovery measure). Use where applicable only.
Preventive Control (PC)	A mitigating action or defence to block or prevent a hazard from escalating into an Unsafe Event or Ultimate Consequence. Existing PCs refer to current/ known/ established PCs which have been in place before the current HIRM exercise. New PCs refer to new/ additional/ modified PCs being recommended, proposed or which have been put in place as a result of the current HIRM exercise.
Recovery Measure (RM)	A mitigating action, barrier or defence to block or prevent an Unsafe Event from escalating into an Ultimate Consequence or Accident. Existing RMs refer to current/ known/ established RMs which have been in place before the current HIRM exercise. New RMs refer to new/ additional/ modified RMs being recommended, proposed or which have been put in place as a result of the current HIRM exercise.
Ultimate Consequence (UC)	Ultimate event or accident; most credible ultimate outcome.
Unsafe Event (UE)	Most credible unsafe situation, not yet amounting to an Ultimate Consequence or Accident. Usually an intermediate event/ situation before an Ultimate Consequence/ Accident. Identification of an Unsafe Event is applicable only where there is a need to distinguish and establish mitigating actions upstream and downstream of such an intermediate event (before the Ultimate Consequence/ Accident). If this intermediate UE state is not applicable for a particular operation, then it may be bypassed as appropriate.

‘scalability’ and ‘suitability’

TABLE 1: PROBABILITY TABLE

Value	Meaning	Likelihood
5	Frequent	Likely to occur many times (has occurred frequently)
4	Occasional	Likely to occur sometimes (has occurred infrequently)
3	Remote	Unlikely to occur, but possible (has occurred rarely)
2	Improbable	Very unlikely to occur (not known to have occurred)
1	Extremely improbable	Almost inconceivable that the event will occur

TABLE 2: SEVERITY TABLE

Value	Severity	Meaning
A	Catastrophic	• Aircraft / equipment destroyed • Multiple deaths
B	Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely • Serious injury • Major equipment damage
C	Major	• A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons
D	Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident
E	Negligible	• Few consequences. No significance to operational safety

TABLE 3: SAFETY RISK INDEX

Probability	Severity				
	A (Catastrophic)	B (Hazardous)	C (Major)	D (Minor)	E (Negligible)
5 (Frequent)	5A	5B	5C	5D	5E
4 (Occasional)	4A	4B	4C	4D	4E
3 (Remote)	3A	3B	3C	3D	3E
2 (Improbable)	2A	2B	2C	2D	2E
1 (Extremely improbable)	1A	1B	1C	1D	1E

TABLE 4: SAFETY R

Safety Risk Index Range
5A, 5B, 5C, 4A, 4B, 3A
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A
3E, 2D, 2E, 1B, 1C, 1D, 1E

TABLE 5: DEFINITIO

Barrier	A
Barrier Strength Value (BSV)	T
Consolidated Barrier Strength Value (CBSV)	T U
Escalation Control (EC)	A o
Escalation Factor (EF)	P P
Preventive Control (PC)	A mitigating action or defence to block or prevent a hazard from escalating into an Unsafe Event or Ultimate Consequence. Existing PCs refer to current/ known/ established PCs which have been in place before the current HIRM exercise. New PCs refer to new/ additional/ modified PCs being recommended, proposed or which have been put in place as a result of the current HIRM exercise.
Recovery Measure (RM)	A mitigating action, barrier or defence to block or prevent an Unsafe Event from escalating into an Ultimate Consequence or Accident. Existing RMs refer to current/ known/ established RMs which have been in place before the current HIRM exercise. New RMs refer to new/ additional/ modified RMs being recommended, proposed or which have been put in place as a result of the current HIRM exercise.
Ultimate Consequence (UC)	Ultimate event or accident; most credible ultimate outcome.
Unsafe Event (UE)	Most credible unsafe situation, not yet amounting to an Ultimate Consequence or Accident. Usually an intermediate event/ situation before an Ultimate Consequence/ Accident. Identification of an Unsafe Event is applicable only where there is a need to distinguish and establish mitigating actions upstream and downstream of such an intermediate event (before the Ultimate Consequence/ Accident). If this intermediate UE state is not applicable for a particular operation, then it may be bypassed as appropriate.

TABLE 6: HAZARD IDENTIFICATION & RISK MITIGATION (HIRM) REGISTER

Category:	HUM - Hazard ID 020/22- Investigation Report LM/QA/AIR/22-02																					
Hazard	E-PC	EF	EC	RI	RT	N-PC	EF	EC	RI	RT	**Unsafe Event**	E-RM	EF	EC	RI	RT	N-RM	EF	EC	RI	RT	**Ultimate Consequence**
1. The towing personnel proceed with the towing without carrying out a pre-tow briefing first 2. The towing team is not familiar with this type of towing equipment	E-PC1	EF1	Nil	3D	TOLERABLE	N-PC1	Nil	Nil	1D	ACCEPTABLE	AW109 trekker RH FWD towing equipment (safety pin) found damaged.											Potential damage to aircraft (low probability) and the tow equipment itself.
	E-PC2	EF2	Nil			N-PC2	Nil	Nil														

TABLE 7: DESCRIPTION OF EXISTING PREVENTIVE CONTROLS (E-PC)

E-PC1	There is a procedure in EDM Chapter 04.02 outline towing of aircraft procedure and precautions to be undertaken by the towing personnel including carrying out pre-tow briefings.	BSV:3
EF>E-PC1	There is a possibility that this procedure is not being read by the towing personnel.	
EC>EF>E-PC1		
E-PC2	There is a towing procedure stated in IETP Chapter 09-10 for A109.	BSV:3
EF>E-PC2	There is a possibility that this procedure is not being read by the towing personnel.	
EC>EF>E-PC2		
E-PC3		BSV:
EF>E-PC3		
EC>EF>E-PC3		

EASA

‘scalability’ and ‘suitability’

TABLE 1: PROBABILITY TABLE

Value	Meaning	Likelihood
5	Frequent	Likely to occur many times (has occurred frequently)
4	Occasional	Likely to occur sometimes (has occurred infrequently)
3	Remote	Unlikely to occur, but possible (has occurred rarely)
2	Improbable	Very unlikely to occur (not known to have occurred)
1	Extremely improbable	Almost inconceivable that the event will occur

TABLE 2: SEVERITY TABLE

Value	Severity	Meaning
A	Catastrophic	• Aircraft / equipment destroyed • Multiple deaths
B	Hazardous	• A large reduction in safety margins, physical distress or a workload such that operational personnel cannot be relied upon to perform their tasks accurately or completely • Serious injury • Major equipment damage
C	Major	• A significant reduction in safety margins, a reduction in the ability of operational personnel to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency • Serious incident • Injury to persons
D	Minor	• Nuisance • Operating limitations • Use of emergency procedures • Minor incident
E	Negligible	• Few consequences. No significance to operational safety

TABLE 3: SAFETY RISK INDEX

Probability	Severity				
	A (Catastrophic)	B (Hazardous)	C (Major)	D (Minor)	E (Negligible)
5 (Frequent)	5A	5B	5C	5D	5E
4 (Occasional)	4A	4B	4C	4D	4E
3 (Remote)	3A	3B	3C	3D	3E
2 (Improbable)	2A	2B	2C	2D	2E
1 (Extremely improbable)	1A	1B	1C	1D	1E

TABLE 4: SAFETY R

Safety Risk Index Range
5A, 5B, 5C, 4A, 4B, 3A
5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A
3E, 2D, 2E, 1B, 1C, 1D, 1E

TABLE 5: DEFINITIC

Barrier	A
Barrier Strength Value (BSV)	T
Consolidated Barrier Strength Value (CBSV)	T U
Escalation Control (EC)	A o
Escalation Factor (EF)	F F

TABLE 6: HAZARD IDENTIFICATION & RISK MITIGATION (HIRM) REGISTER

Category:	HUM - Hazard ID 020/22- Investigation Report LM/QA/AIR/22-02																				
Hazard	E-PC	EF	EC	RI	RT	N-PC	EF	EC	RI	RT	**Unsafe Event**	E-RM	EF	EC	RI	RT	N-RM	EF	EC	RI	RT	**Ultimate Consequence**
1. The towing personnel proceed with the towing without carrying out a pre-tow briefing first 2. The towing team is not familiar with this type of towing equipment	E-PC1	EF1	Nil	3D	TOLERABLE	N-PC1	Nil	Nil	1D	ACCEPTABLE	AW109 trekker RH FWD towing equipment (safety pin) found damaged.											Potential damage to aircraft (low probability) and the tow equipment itself.
	E-PC2	EF2	Nil			N-PC2	Nil	Nil														

TABLE 7: DESCRIPTION OF EXISTING PREVENTIVE CONTROLS (E-PC)

E-PC1	There is a procedure in EDM Chapter 04.02 outline towing of aircraft procedure and precautions to be undertaken by the towing personnel including carrying out pre-tow briefings.	BSV:3
EF>E-PC1	There is a possibility that this procedure is not being read by the towing personnel.	
EC>EF>E-PC1		
E-PC2	There is a towing procedure stated in IETP Chapter 09-10 for A109.	BSV:3
EF>E-PC2	There is a possibility that this procedure is not being read by the towing personnel.	
EC>EF>E-PC2		
E-PC3		BSV:
EF>E-PC3		
EC>EF>E-PC3		

TABLE 8: DESCRIPTION OF NEW PREVENTIVE CONTROLS (N-PC)

N-PC1	Alert Sticker to be locally fabricated to be placed near the pin holes so that the person who handles the equipment is aware that certain action (pin removal) is required.	BSV:4
EF>N-PC1		
EC>EF>N-PC1		
N-PC2	Once off briefing shall be carried out by Maintenance Manager for that specific type of towing equipment to all towing personnel. This is to ensure that the towing crew is familiar with all the types of towing equipment available in LM.	BSV:4
EF>N-PC2		
EC>EF>N-PC2		
N-PC3		BSV:
EF>N-PC3		
EC>EF>N-PC3		

‘scalability’ and ‘suitability’

EXISTING RISK INDEX (HAZARD > UNSAFE EVENT)

1)	Assessed Existing Severity level of the Unsafe Event (UE)	D
2)	Therefore, UE's Optimum No of Barriers (ONB) [Table 16]:	3
3)	Applicable CBSV-Probability Table for this severity level [Table 16]:	Table 17D
4)	Assessed BSV of individual E-PCs [Table 14]:	
	E-PC1	3
	E-PC2	3
	E-PC3	
	E-PC4	
	E-PC5	
5)	Therefore, CBSV (SUM) of all E-PCs [Table 15]:	6
6)	Assess CBSV of ONB (NA if number of E-PCs < ONB): (Choose barriers with highest BSVs for this ONB-CBSV calculation)	NA
7)	Existing CBSV of UE (item 5 or 6, whichever is lesser):	6
8)	Existing **Probability** of the UE (CBSV-Probability) [Table 17]:	3
9)	Existing Risk Index of the UE (Probability x Severity):	3D

NEW RISK INDEX (HAZARD > UNSAFE EVENT)

1)	Assessed Existing Severity level of the Unsafe Event (UE)			D
2)	Therefore, UE's Optimum No of Barriers (ONB) [Table 16]:			3
3)	Applicable CBSV-Probability Table for this severity level [Table 16]:			Table 17D
4)	Assessed BSV of individual Existing PCs & New PCs [Table 14]:			
	E-PC1	3	N-PC1	4
	E-PC2	3	N-PC2	4
	E-PC3		N-PC2	
	E-PC4		N-PC4	
	E-PC5		N-PC5	
5)	Therefore total (SUM) BSV of all E-PCs plus N-PCs [Table 15]:			14
6)	Assess total BSV of ONB (NA if number of E-PCs + N-PCs < ONB): (Choose barriers with highest BSVs for this ONB-CBSV calculation)			15
7)	Resultant CBSV of UE (item 5 or 6, whichever is lesser):			14
8)	Resultant **Probability** of UE (CBSV-Probability) [Table 17]:			1
9)	Resultant Risk Index of the UE (Probability x Severity):			1D

TABLE 6: HAZARD IDENTIFICATION & RISK MITIGATION (HIRM) REGISTER

Category:	*HUM - Hazard ID 020/22- Investigation Report LM/QA/AIR/22-02*																				
Hazard	E-PC	EF	EC	RI	RT	N-PC	EF	EC	RI	RT	**Unsafe Event**	E-RM	EF	EC	RI	RT	N-RM	EF	EC	RI	RT	**Ultimate Consequence**
1. The towing personnel proceed with the towing without carrying out a pre-tow briefing first 2. The towing team is not familiar with this type of towing equipment	E-PC1	EF1	Nil	3D	TOLERABLE	N-PC1	Nil	Nil	1D	ACCEPTABLE	AW109 trekker RH FWD towing equipment (safety pin) found damaged.											Potential damage to aircraft (low probability) and the tow equipment itself.
	E-PC2	EF2	Nil			N-PC2	Nil	Nil													

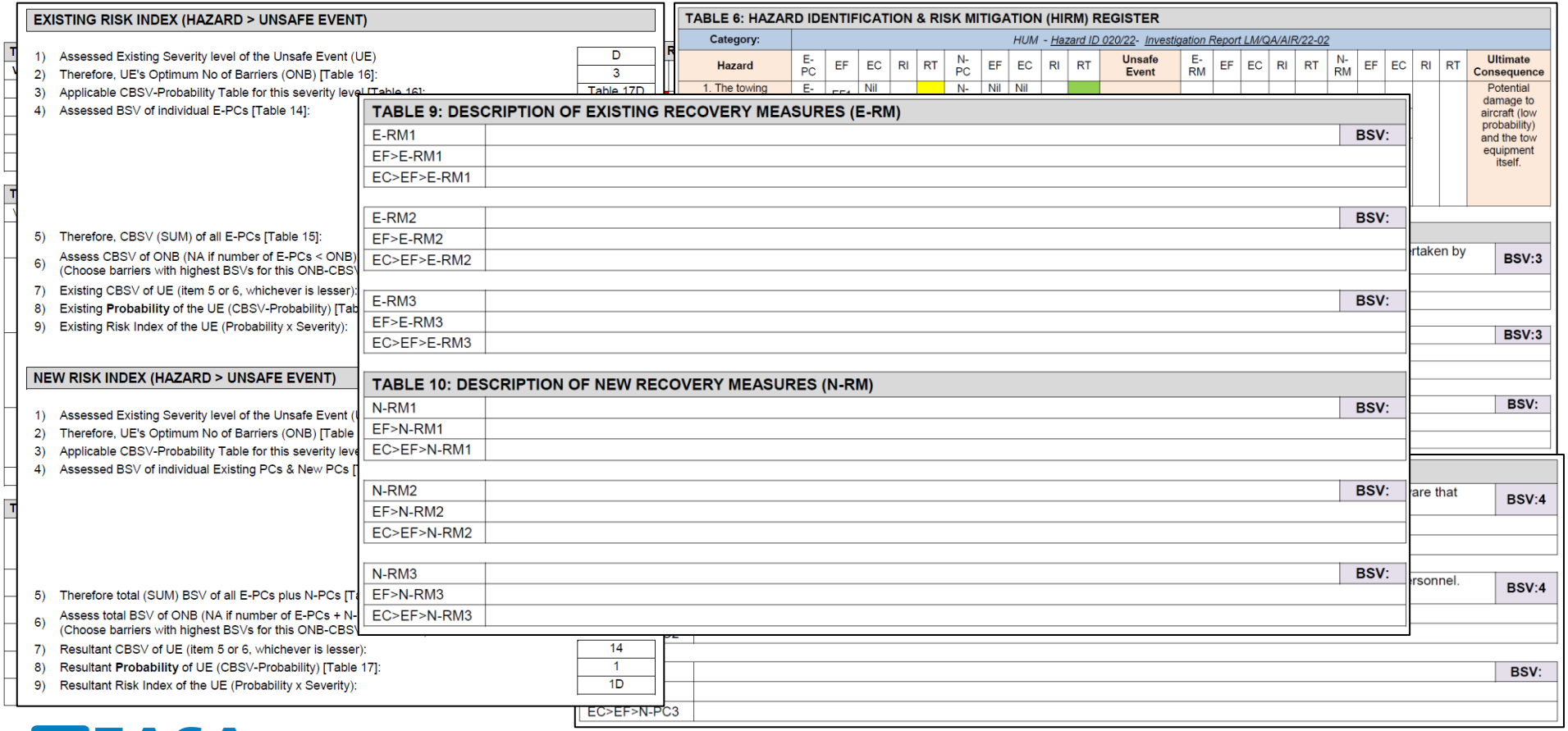
TABLE 7: DESCRIPTION OF EXISTING PREVENTIVE CONTROLS (E-PC)

E-PC1	There is a procedure in EDM Chapter 04.02 outline towing of aircraft procedure and precautions to be undertaken by the towing personnel including carrying out pre-tow briefings.	**BSV:3**
EF>E-PC1	There is a possibility that this procedure is not being read by the towing personnel.	
EC>EF>E-PC1		
E-PC2	There is a towing procedure stated in IETP Chapter 09-10 for A109.	**BSV:3**
EF>E-PC2	There is a possibility that this procedure is not being read by the towing personnel.	
EC>EF>E-PC2		
E-PC3		**BSV:**
EF>E-PC3		
EC>EF>E-PC3		

DESCRIPTION OF NEW PREVENTIVE CONTROLS (N-PC)

	Alert Sticker to be locally fabricated to be placed near the pin holes so that the person who handles the equipment is aware that certain action (pin removal) is required.	**BSV:4**
C1		
	Once off briefing shall be carried out by Maintenance Manager for that specific type of towing equipment to all towing personnel. This is to ensure that the towing crew is familiar with all the types of towing equipment available in LM.	**BSV:4**
C2		
		BSV:
EC>EF>N-PC3		

‘scalability’ and ‘suitability’



EXISTING RISK INDEX (HAZARD > UNSAFE EVENT)

1)	Assessed Existing Severity level of the Unsafe Event (UE)	D
2)	Therefore, UE's Optimum No of Barriers (ONB) [Table 16]:	3
3)	Applicable CBSV-Probability Table for this severity level [Table 16]:	Table 17D
4)	Assessed BSV of individual E-PCs [Table 14]:	
5)	Therefore, CBSV (SUM) of all E-PCs [Table 15]:	
6)	Assess CBSV of ONB (NA if number of E-PCs < ONB) (Choose barriers with highest BSVs for this ONB-CBSV	
7)	Existing CBSV of UE (item 5 or 6, whichever is lesser):	
8)	Existing **Probability** of the UE (CBSV-Probability) [Tab	
9)	Existing Risk Index of the UE (Probability x Severity):	

NEW RISK INDEX (HAZARD > UNSAFE EVENT)

1)	Assessed Existing Severity level of the Unsafe Event (	
2)	Therefore, UE's Optimum No of Barriers (ONB) [Table	
3)	Applicable CBSV-Probability Table for this severity leve	
4)	Assessed BSV of individual Existing PCs & New PCs [	
5)	Therefore total (SUM) BSV of all E-PCs plus N-PCs [T	
6)	Assess total BSV of ONB (NA if number of E-PCs + N- (Choose barriers with highest BSVs for this ONB-CBSV	
7)	Resultant CBSV of UE (item 5 or 6, whichever is lesser):	14
8)	Resultant **Probability** of UE (CBSV-Probability) [Table 17]:	1
9)	Resultant Risk Index of the UE (Probability x Severity):	1D

TABLE 6: HAZARD IDENTIFICATION & RISK MITIGATION (HIRM) REGISTER

Category:	HUM - Hazard ID 020/22- Investigation Report LM/QA/AIR/22-02																				
Hazard	E-PC	EF	EC	RI	RT	N-PC	EF	EC	RI	RT	**Unsafe Event**	E-RM	EF	EC	RI	RT	N-RM	EF	EC	RI	RT	**Ultimate Consequence**
1. The towing	E-		Nil			N-	Nil	Nil														Potential damage to aircraft (low probability) and the tow equipment itself.

TABLE 9: DESCRIPTION OF EXISTING RECOVERY MEASURES (E-RM)

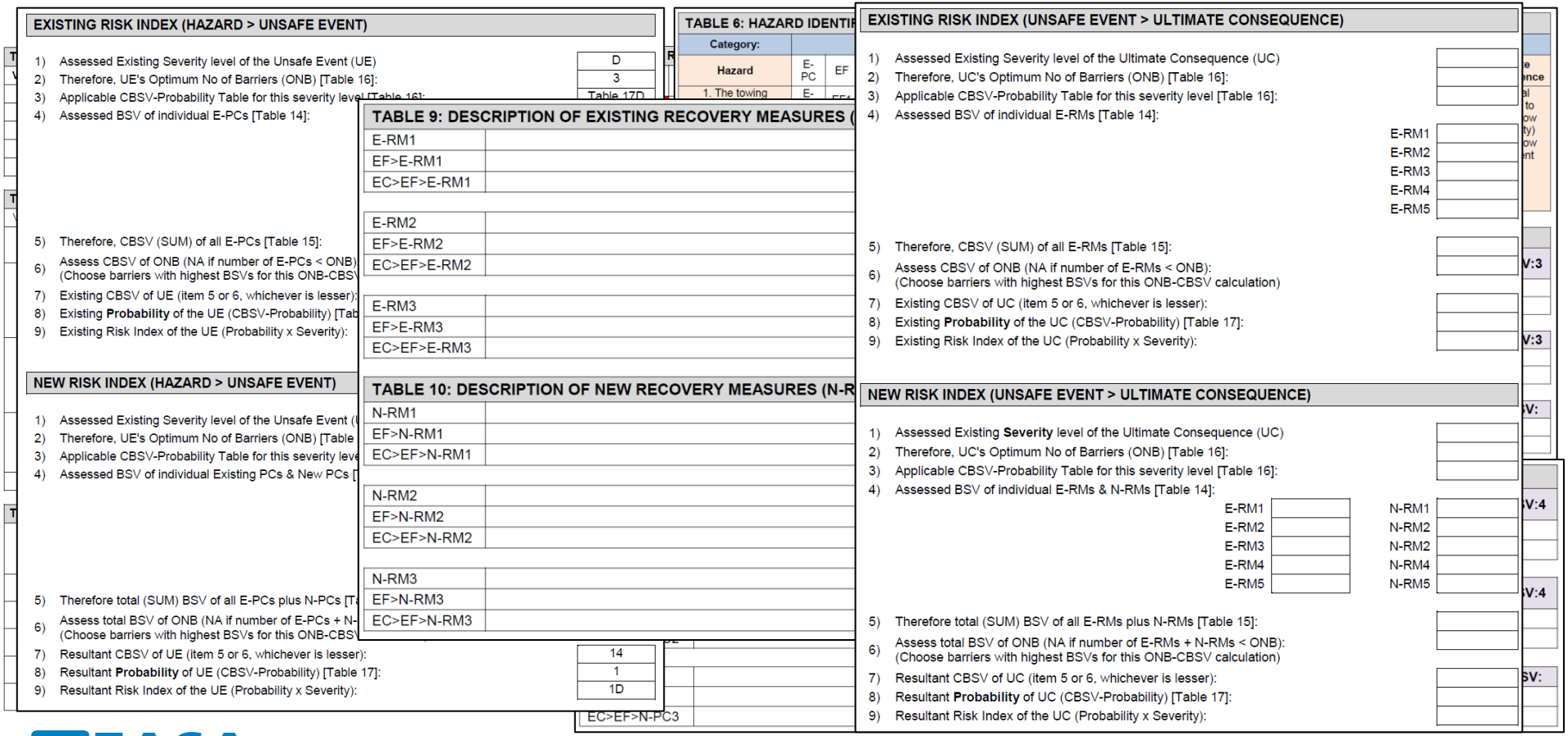
E-RM1		BSV:
EF>E-RM1		
EC>EF>E-RM1		
E-RM2		BSV:
EF>E-RM2		
EC>EF>E-RM2		
E-RM3		BSV:
EF>E-RM3		
EC>EF>E-RM3		

TABLE 10: DESCRIPTION OF NEW RECOVERY MEASURES (N-RM)

N-RM1		BSV:
EF>N-RM1		
EC>EF>N-RM1		
N-RM2		BSV:
EF>N-RM2		
EC>EF>N-RM2		
N-RM3		BSV:
EF>N-RM3		
EC>EF>N-RM3		

	BSV:
EC>EF>N-PC3	

‘scalability’ and ‘suitability’



EXISTING RISK INDEX (HAZARD > UNSAFE EVENT)

1) Assessed Existing Severity level of the Unsafe Event (UE): D
2) Therefore, UE's Optimum No of Barriers (ONB) [Table 16]: 3
3) Applicable CBSV-Probability Table for this severity level [Table 16]: Table 17D
4) Assessed BSV of individual E-PCs [Table 14]:
5) Therefore, CBSV (SUM) of all E-PCs [Table 15]:
6) Assess CBSV of ONB (NA if number of E-PCs < ONB) (Choose barriers with highest BSVs for this ONB-CBSV
7) Existing CBSV of UE (item 5 or 6, whichever is lesser):
8) Existing **Probability** of the UE (CBSV-Probability) [Tab
9) Existing Risk Index of the UE (Probability x Severity):

NEW RISK INDEX (HAZARD > UNSAFE EVENT)

1) Assessed Existing Severity level of the Unsafe Event (
2) Therefore, UE's Optimum No of Barriers (ONB) [Table
3) Applicable CBSV-Probability Table for this severity leve
4) Assessed BSV of individual Existing PCs & New PCs [
5) Therefore total (SUM) BSV of all E-PCs plus N-PCs [T
6) Assess total BSV of ONB (NA if number of E-PCs + N- (Choose barriers with highest BSVs for this ONB-CBSV
7) Resultant CBSV of UE (item 5 or 6, whichever is lesser): 14
8) Resultant **Probability** of UE (CBSV-Probability) [Table 17]: 1
9) Resultant Risk Index of the UE (Probability x Severity): 1D

TABLE 9: DESCRIPTION OF EXISTING RECOVERY MEASURES (

E-RM1	
EF>E-RM1	
EC>EF>E-RM1	
E-RM2	
EF>E-RM2	
EC>EF>E-RM2	
E-RM3	
EF>E-RM3	
EC>EF>E-RM3	

TABLE 10: DESCRIPTION OF NEW RECOVERY MEASURES (N-R

N-RM1	
EF>N-RM1	
EC>EF>N-RM1	
N-RM2	
EF>N-RM2	
EC>EF>N-RM2	
N-RM3	
EF>N-RM3	
EC>EF>N-RM3	

TABLE 6: HAZARD IDENTIF

Category:		
Hazard	E-PC	EF
1. The towing	E-	

EC>EF>N-PC3

EXISTING RISK INDEX (UNSAFE EVENT > ULTIMATE CONSEQUENCE)

1) Assessed Existing Severity level of the Ultimate Consequence (UC):
2) Therefore, UC's Optimum No of Barriers (ONB) [Table 16]:
3) Applicable CBSV-Probability Table for this severity level [Table 16]:
4) Assessed BSV of individual E-RMs [Table 14]:

E-RM1
E-RM2
E-RM3
E-RM4
E-RM5

5) Therefore, CBSV (SUM) of all E-RMs [Table 15]:
6) Assess CBSV of ONB (NA if number of E-RMs < ONB): (Choose barriers with highest BSVs for this ONB-CBSV calculation)
7) Existing CBSV of UC (item 5 or 6, whichever is lesser):
8) Existing **Probability** of the UC (CBSV-Probability) [Table 17]:
9) Existing Risk Index of the UC (Probability x Severity):

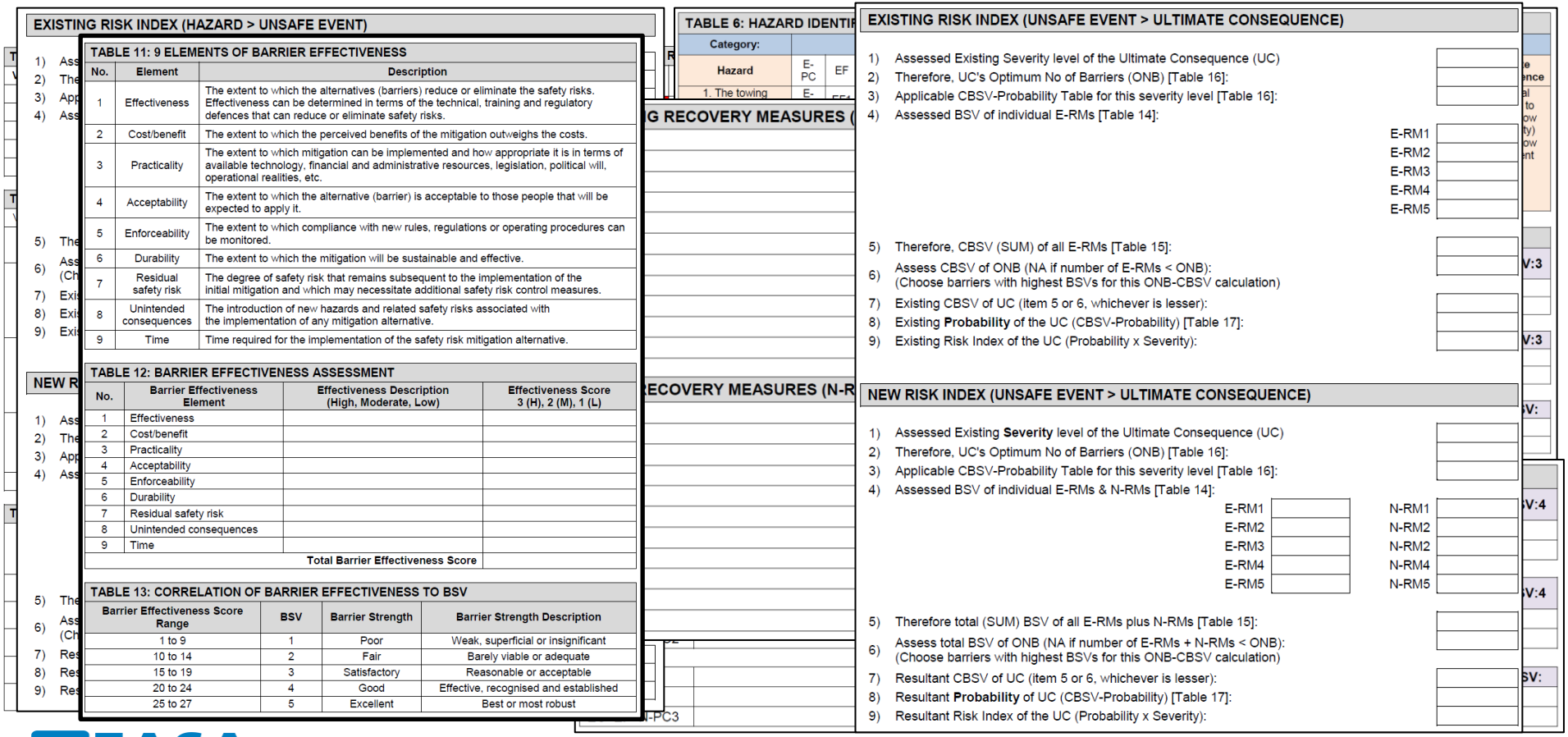
NEW RISK INDEX (UNSAFE EVENT > ULTIMATE CONSEQUENCE)

1) Assessed Existing **Severity** level of the Ultimate Consequence (UC)
2) Therefore, UC's Optimum No of Barriers (ONB) [Table 16]:
3) Applicable CBSV-Probability Table for this severity level [Table 16]:
4) Assessed BSV of individual E-RMs & N-RMs [Table 14]:

E-RM1	N-RM1
E-RM2	N-RM2
E-RM3	N-RM2
E-RM4	N-RM4
E-RM5	N-RM5

5) Therefore total (SUM) BSV of all E-RMs plus N-RMs [Table 15]:
6) Assess total BSV of ONB (NA if number of E-RMs + N-RMs < ONB): (Choose barriers with highest BSVs for this ONB-CBSV calculation)
7) Resultant CBSV of UC (item 5 or 6, whichever is lesser):
8) Resultant **Probability** of UC (CBSV-Probability) [Table 17]:
9) Resultant Risk Index of the UC (Probability x Severity):

‘scalability’ and ‘suitability’



EXISTING RISK INDEX (HAZARD > UNSAFE EVENT)

TABLE 11: 9 ELEMENTS OF BARRIER EFFECTIVENESS

No.	Element	Description
1	Effectiveness	The extent to which the alternatives (barriers) reduce or eliminate the safety risks. Effectiveness can be determined in terms of the technical, training and regulatory defences that can reduce or eliminate safety risks.
2	Cost/benefit	The extent to which the perceived benefits of the mitigation outweighs the costs.
3	Practicality	The extent to which mitigation can be implemented and how appropriate it is in terms of available technology, financial and administrative resources, legislation, political will, operational realities, etc.
4	Acceptability	The extent to which the alternative (barrier) is acceptable to those people that will be expected to apply it.
5	Enforceability	The extent to which compliance with new rules, regulations or operating procedures can be monitored.
6	Durability	The extent to which the mitigation will be sustainable and effective.
7	Residual safety risk	The degree of safety risk that remains subsequent to the implementation of the initial mitigation and which may necessitate additional safety risk control measures.
8	Unintended consequences	The introduction of new hazards and related safety risks associated with the implementation of any mitigation alternative.
9	Time	Time required for the implementation of the safety risk mitigation alternative.

TABLE 12: BARRIER EFFECTIVENESS ASSESSMENT

No.	Barrier Effectiveness Element	Effectiveness Description (High, Moderate, Low)	Effectiveness Score 3 (H), 2 (M), 1 (L)
1	Effectiveness		
2	Cost/benefit		
3	Practicality		
4	Acceptability		
5	Enforceability		
6	Durability		
7	Residual safety risk		
8	Unintended consequences		
9	Time		
		Total Barrier Effectiveness Score	

TABLE 13: CORRELATION OF BARRIER EFFECTIVENESS TO BSV

Barrier Effectiveness Score Range	BSV	Barrier Strength	Barrier Strength Description
1 to 9	1	Poor	Weak, superficial or insignificant
10 to 14	2	Fair	Barely viable or adequate
15 to 19	3	Satisfactory	Reasonable or acceptable
20 to 24	4	Good	Effective, recognised and established
25 to 27	5	Excellent	Best or most robust

TABLE 6: HAZARD IDENTIF

Category:		
Hazard	E-PC	EF
1. The towing	E-	

G RECOVERY MEASURES (

ECOVERY MEASURES (N-R

EXISTING RISK INDEX (UNSAFE EVENT > ULTIMATE CONSEQUENCE)

1) Assessed Existing Severity level of the Ultimate Consequence (UC)
2) Therefore, UC's Optimum No of Barriers (ONB) [Table 16]:
3) Applicable CBSV-Probability Table for this severity level [Table 16]:
4) Assessed BSV of individual E-RMs [Table 14]:

E-RM1
E-RM2
E-RM3
E-RM4
E-RM5

5) Therefore, CBSV (SUM) of all E-RMs [Table 15]:
6) Assess CBSV of ONB (NA if number of E-RMs < ONB): (Choose barriers with highest BSVs for this ONB-CBSV calculation)
7) Existing CBSV of UC (item 5 or 6, whichever is lesser):
8) Existing **Probability** of the UC (CBSV-Probability) [Table 17]:
9) Existing Risk Index of the UC (Probability x Severity):

NEW RISK INDEX (UNSAFE EVENT > ULTIMATE CONSEQUENCE)

1) Assessed Existing **Severity** level of the Ultimate Consequence (UC)
2) Therefore, UC's Optimum No of Barriers (ONB) [Table 16]:
3) Applicable CBSV-Probability Table for this severity level [Table 16]:
4) Assessed BSV of individual E-RMs & N-RMs [Table 14]:

E-RM1 N-RM1
E-RM2 N-RM2
E-RM3 N-RM2
E-RM4 N-RM4
E-RM5 N-RM5

5) Therefore total (SUM) BSV of all E-RMs plus N-RMs [Table 15]:
6) Assess total BSV of ONB (NA if number of E-RMs + N-RMs < ONB): (Choose barriers with highest BSVs for this ONB-CBSV calculation)
7) Resultant CBSV of UC (item 5 or 6, whichever is lesser):
8) Resultant **Probability** of UC (CBSV-Probability) [Table 17]:
9) Resultant Risk Index of the UC (Probability x Severity):

‘scalability’ and ‘suitability’

EXISTING RISK INDEX (HAZARD > UNSAFE EVENT)

TABLE 11: 9 ELEMENTS OF BARRIER EFFECTIVENESS

No.	Element	
1	Effectiveness	The extent to which the alte Effectiveness can be deterr defences that can reduce o
2	Cost/benefit	The extent to which the per
3	Practicality	The extent to which mitigati available technology, financ operational realities, etc.
4	Acceptability	The extent to which the alte expected to apply it.
5	Enforceability	The extent to which compli be monitored.
6	Durability	The extent to which the mit
7	Residual safety risk	The degree of safety risk th initial mitigation and which r
8	Unintended consequences	The introduction of new haz the implementation of any r
9	Time	Time required for the imple

TABLE 12: BARRIER EFFECTIVENESS ASS

No.	Barrier Effectiveness Element	Effe (H
1	Effectiveness	
2	Cost/benefit	
3	Practicality	
4	Acceptability	
5	Enforceability	
6	Durability	
7	Residual safety risk	
8	Unintended consequences	
9	Time	
		Total

TABLE 13: CORRELATION OF BARRIER EF

Barrier Effectiveness Score Range	BSV		
1 to 9	1		
10 to 14	2		
15 to 19	3	Satisfactory	Reasonable or acceptable
20 to 24	4	Good	Effective, recognised and established
25 to 27	5	Excellent	Best or most robust

TABLE 14: EQUIVALENT BSV FOR EACH PREVENTIVE CONTROLS AND RECOVERY MEASURES (EXPANDED FROM TABLE 12 & 13)

Elements 3 (H), 2 (M), 1 (L)	E-PC1	E-PC2	E-PC3	N-PC1	N-PC2	N-PC3	N-PC4	N-PC5	E-RM1	E-RM2	E-RM3	N-RM1	N-RM2	N-RM3	N-RM4	N-RM5
Effectiveness	1	1		3	3											
Cost/benefit	3	3		2	1											
Practicality	2	2		3	3											
Acceptability	3	3		3	3											
Enforceability	1	1		3	3											
Durability	2	2		2	2											
Residual safety risk	2	2		1	1											
Unintended consequences	1	1		1	1											
Time	2	2		3	3											
Total Score	17	17		21	21											
BSV	3	3		4	4											

TABLE 15: ANALYSIS OF CONSOLIDATED BARRIER STRENGTH VALUE (CBSV)

All E-PCs	Equivalent BSV
E-PC1	3
E-PC2	3
E-PC3	
E-PC4	
E-PC5	
CBSV (SUM)	6
Max CBSV	15

All N-PCs	Equivalent BSV
N-PC1	4
N-PC2	4
N-PC3	
N-PC4	
N-PC5	
CBSV (SUM)	8
Max CBSV	15

All E-RMs	Equivalent BSV
E-RM1	
E-RM2	
E-RM3	
E-RM4	
E-RM5	
CBSV (SUM)	
Max CBSV	

All N-RMs	
N-RM1	
N-RM2	
N-RM3	
N-RM4	
N-RM5	
CBSV (SUM)	
Max CBSV	

EXISTING RISK INDEX (UNSAFE EVENT > ULTIMATE CONSEQUENCE)

1) Assessed Existing Severity level of the Ultimate Consequence (UC)

7) Resultant CBSV of UC (item 5 or 6, whichever is lesser):
8) Resultant **Probability** of UC (CBSV-Probability) [Table 17]:
9) Resultant Risk Index of the UC (Probability x Severity):

‘scalability’ and ‘suitability’

EXISTING RISK INDEX (HAZARD > UNSAFE EVENT)

TABLE 11: 9 ELEMENTS OF BARRIER EFFECTIVENESS

No.	Element	
1	Effectiveness	The extent to which the alte… Effectiveness can be deter… defences that can reduce o…
2	Cost/benefit	The extent to which the per…
3	Practicality	The extent to which mitigati… available technology, financ… operational realities, etc.
4	Acceptability	The extent to which the alte… expected to apply it.
5	Enforceability	The extent to which compli… be monitored.
6	Durability	The extent to which the mit…
7	Residual safety risk	The degree of safety risk th… initial mitigation and which …
8	Unintended consequences	The introduction of new haz… the implementation of any …
9	Time	Time required for the imple…

TABLE 12: BARRIER EFFECTIVENESS ASS…

No.	Barrier Effectiveness Element	Effe… (H…
1	Effectiveness	
2	Cost/benefit	
3	Practicality	
4	Acceptability	
5	Enforceability	
6	Durability	
7	Residual safety risk	
8	Unintended consequences	
9	Time	
		Total

TABLE 13: CORRELATION OF BARRIER EF…

Barrier Effectiveness Score Range	BSV		
1 to 9	1		
10 to 14	2		
15 to 19	3	Satisfactory	Reasonable or acceptable
20 to 24	4	Good	Effective, recognised and established
25 to 27	5	Excellent	Best or most robust

TABLE 14: EQUIVALENT BSV FOR EACH PREVENTIVE…

Elements 3 (H), 2 (M), 1 (L)	E-PC1	E-PC2	E-PC3	N-PC1
Effectiveness	1	1		3
Cost/benefit	3	3		2
Practicality	2	2		3
Acceptability	3	3		3
Enforceability	1	1		3
Durability	2	2		2
Residual safety risk	2	2		1
Unintended consequences	1	1		1
Time	2	2		3
Total Score	17	17		21
BSV	3	3		4

TABLE 15: ANALYSIS OF CONSOLIDATED BARRIER S…

All E-PCs	Equivalent BSV
E-PC1	3
E-PC2	3
E-PC3	
E-PC4	
E-PC5	
CBSV (SUM)	6
Max CBSV	15

All N-PCs	Ec…
N-PC1	
N-PC2	
N-PC3	
N-PC4	
N-PC5	
CBSV (SUM)	
Max CBSV	

TABLE 16: OPTIMUM NUMBER OF BARRIERS (ONB) & APPLICABLE CBSV - PROBABILITY TABLE

Severity Value of UE / UC	Severity Description	Optimum Number of Barriers (ONB)	CBSV Range [ONB x 5 (Max BSV)]	Applicable CBSV-Probability Table
A	Catastrophic	8	40	Table 17A
B	Hazardous	6	30	Table 17B
C	Major	4	20	Table 17C
D	Minor	3	15	Table 17D
E	Negligible	2	10	Table 17E

TABLE 17: CORRELATION OF BARRIER EFFECTIVENESS TO BSV

Table 17A

CBSV Range	Probability Value	Description
0-7	5	Frequent
8-15	4	Occasional
16-23	3	Remote
24-31	2	Improbable
32-40	1	Extremely improbable

Table 17B

CBSV Range	Probability Value	Description
0-5	5	Frequent
6-11	4	Occasional
12-17	3	Remote
18-23	2	Improbable
24-30	1	Extremely improbable

Table 17C

CBSV Range	Probability Value	Description
0-3	5	Frequent
4-7	4	Occasional
8-11	3	Remote
12-15	2	Improbable
16-20	1	Extremely improbable

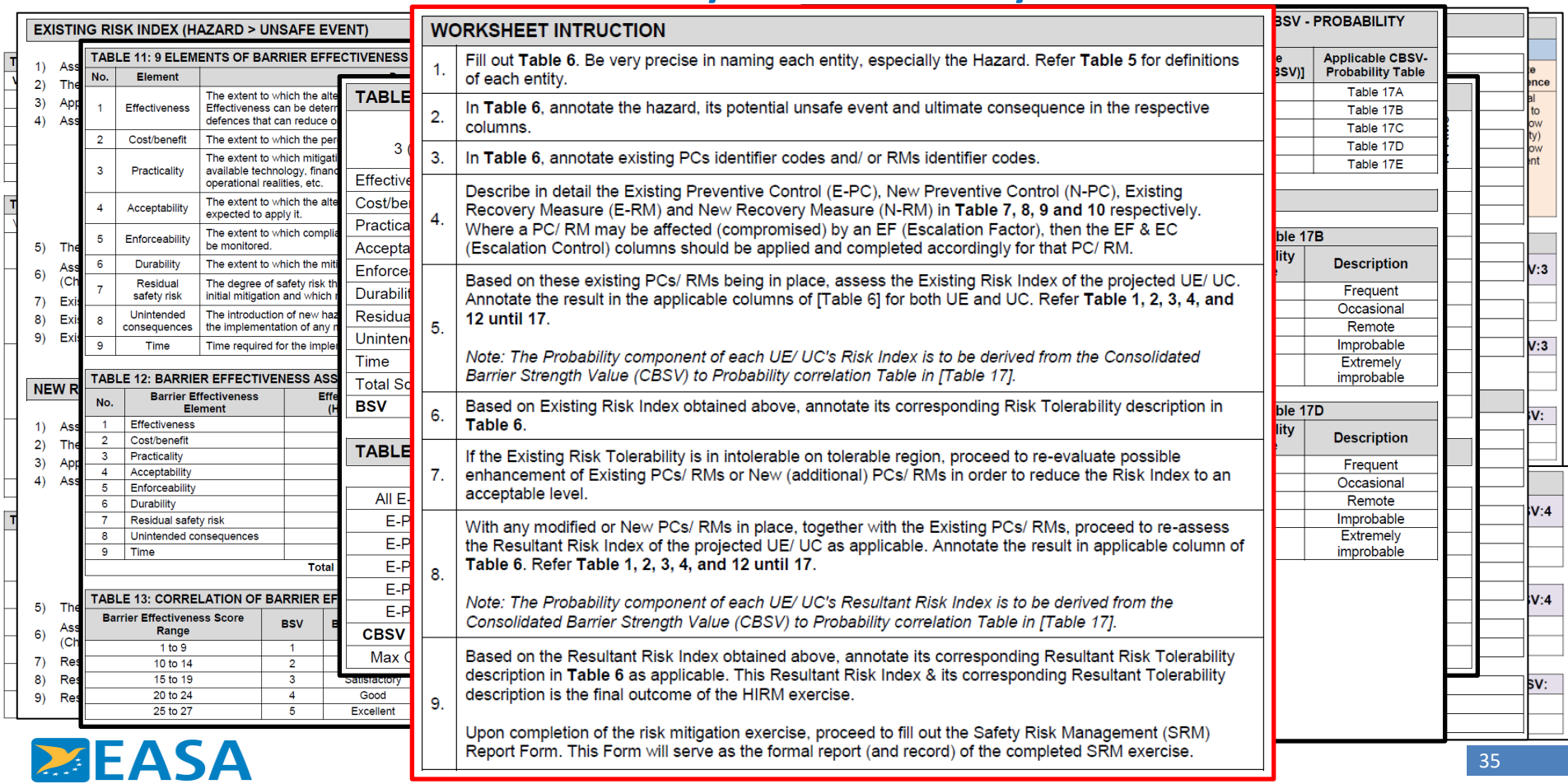
Table 17D

CBSV Range	Probability Value	Description
0-2	5	Frequent
3-5	4	Occasional
6-8	3	Remote
9-11	2	Improbable
12-15	1	Extremely improbable

Table 17E

CBSV Range	Probability Value	Description
0-1	5	Frequent
2-3	4	Occasional
4-5	3	Remote
6-7	2	Improbable
8-10	1	Extremely improbable

‘scalability’ and ‘suitability’



WORKSHEET INTRUCTION	
1.	Fill out **Table 6**. Be very precise in naming each entity, especially the Hazard. Refer **Table 5** for definitions of each entity.
2.	In **Table 6**, annotate the hazard, its potential unsafe event and ultimate consequence in the respective columns.
3.	In **Table 6**, annotate existing PCs identifier codes and/ or RMs identifier codes.
4.	Describe in detail the Existing Preventive Control (E-PC), New Preventive Control (N-PC), Existing Recovery Measure (E-RM) and New Recovery Measure (N-RM) in **Table 7, 8, 9 and 10** respectively. Where a PC/ RM may be affected (compromised) by an EF (Escalation Factor), then the EF & EC (Escalation Control) columns should be applied and completed accordingly for that PC/ RM.
5.	Based on these existing PCs/ RMs being in place, assess the Existing Risk Index of the projected UE/ UC. Annotate the result in the applicable columns of [Table 6] for both UE and UC. Refer **Table 1, 2, 3, 4, and 12 until 17**. *Note: The Probability component of each UE/ UC's Risk Index is to be derived from the Consolidated Barrier Strength Value (CBSV) to Probability correlation Table in [Table 17].*
6.	Based on Existing Risk Index obtained above, annotate its corresponding Risk Tolerability description in **Table 6**.
7.	If the Existing Risk Tolerability is in intolerable on tolerable region, proceed to re-evaluate possible enhancement of Existing PCs/ RMs or New (additional) PCs/ RMs in order to reduce the Risk Index to an acceptable level.
8.	With any modified or New PCs/ RMs in place, together with the Existing PCs/ RMs, proceed to re-assess the Resultant Risk Index of the projected UE/ UC as applicable. Annotate the result in applicable column of **Table 6**. Refer **Table 1, 2, 3, 4, and 12 until 17**. *Note: The Probability component of each UE/ UC's Resultant Risk Index is to be derived from the Consolidated Barrier Strength Value (CBSV) to Probability correlation Table in [Table 17].*
9.	Based on the Resultant Risk Index obtained above, annotate its corresponding Resultant Risk Tolerability description in **Table 6** as applicable. This Resultant Risk Index & its corresponding Resultant Tolerability description is the final outcome of the HIRM exercise. Upon completion of the risk mitigation exercise, proceed to fill out the Safety Risk Management (SRM) Report Form. This Form will serve as the formal report (and record) of the completed SRM exercise.

Safety policy and objectives

→ **Safety policy** content in line with AMC1 145.A.200(a)(2)

- Comply with legislation, meet requirements, and continuously improve safety standards.
- Provide necessary resources for the implementation of the safety policy.
- Organisational commitment regarding safety, including promotion of a positive safety culture.
- internal safety reporting and just culture.

→ **Safety objectives** in line with safety policy, plus additional ones relevant to organisation/activity (customised).

→ Pay attention on safety objectives suitability;

✗ "improvement of the current SPI's from the previous year by at least 3%".

A general number may not be appropriate (reducing 3% number of mandatory occurrence reports where only 1 was reported last year).

✗ "Reduce the number of occurrence reports".

Reporting culture improvement or maintenance performance deterioration? Alternative ones:

✓ - Increasing safety and reporting culture (number of reports per year).

✓ - Reduction of the annual number of maintenance errors (or customer complaints).

Hazard identification / Risk management

- During the first SMS evaluations, it is better to have less hazards but relevant to the Organisation (can be properly risk assessed) rather than many general ones requiring too many assumptions for the risk assessment.
- Non-aviation safety hazards; Health and safety or environmental related hazards not under aviation safety domain. They may be included but falls under national Regulation.
- Likelihood and severity definitions.
  - ICAO definitions general → may not be useful for objective classification when not further customized.
  - Check whether likelihood definitions are properly used (frequency vs probability).

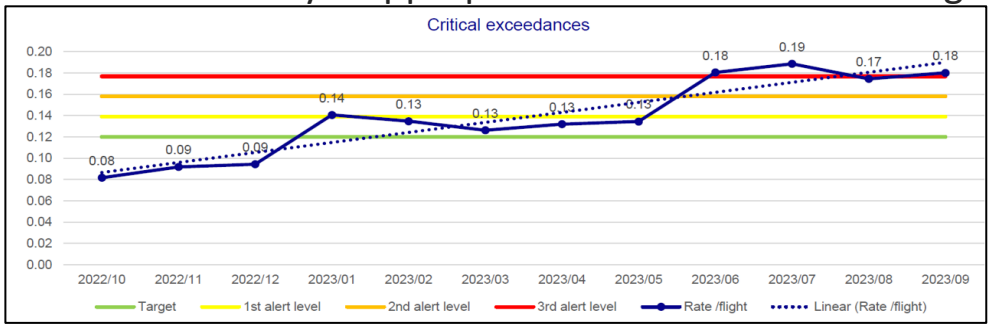
    E.g. use of new tool (occurrence) classified as remote as it happened only once (first time used). ✗
  - Check that severity levels definition minimize the possibility for a consequence to be classified in more than one grade.
- Complex risk assessment method does not ensure a better result.
- Risk controls/mitigations reduce risk ONLY AFTER EFFECTIVE IMPLEMENTATION

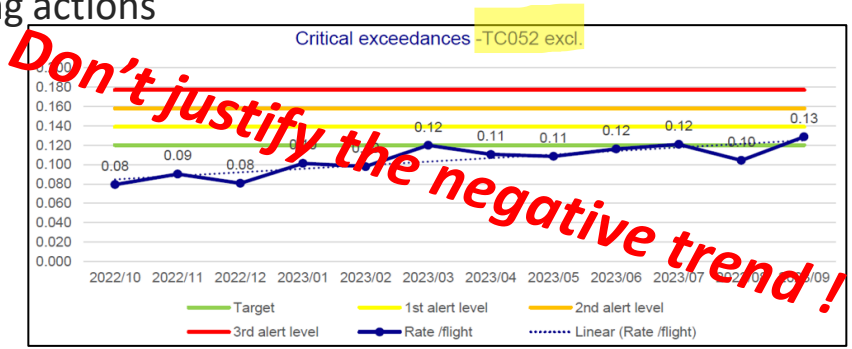
Safety performance monitoring

- In many cases, effectiveness of mitigating actions is not assessed. Whenever possible, precursors should be used (when possible, don't wait till the occurrence happens again).
  E.g. wrong aircraft damage assessment; interviews/surveys/audits Vs waiting customer complains.

- SPIs focused on what is important rather than what is easy to measure. For example, an overall number (maintenance errors) may be easy to measure, but may not allow to assess which mitigating action was effective. The number of maintenance errors may have decreased in one area and increased in another one.

- Risk management should be reviewed when SPI shows a negative trend.
  → to identify inappropriate SPI or ineffective mitigating actions





Don't justify the negative trend !

Interfaces

- AMO undesired situation: CRS after maintenance not properly carried out
- CAMO undesired situation: non-airworthy aircraft ready for take-off
- Operator undesired situation; unsafe aircraft operation

AMO undesired situation becomes a CAMO hazard, and a CAMO undesired situation becomes an operator hazard. External interface.

- Internal interfaces with other departments may have a significant contribution to safety (component going through different workshops during the maintenance process).

- It is not about replacing/duplicating the provider/customer quality system/SMS (if available), it is about considering the main hazards/consequences coming from those interfaces and managing those risks with them (safety information/promotion, reporting system, mitigating actions, etc.).

Typical hazards/undesired state for AMO

- Facilities not meeting the requirements specified in maintenance data (e.g. CMM)
- Storage conditions not in line with the manufacturer's instructions (temperature, humidity, shelf life, etc.)
- Insufficient competent staff
- Line maintenance time pressure
- Tool/equipment calibration/servicing not controlled/overdue.
- Use of incorrect tool
- Installation of non-effective parts (wrong P/N, outdated software, etc)
- Use of outdated maintenance data
- Deviation from maintenance instructions → **Top risk**
- Errors and missing of information in maintenance records
- Maintenance data no readily available for use by maintenance personnel
- Control of providers (suppliers, contractors and subcontractors)
- Change of nominated staff
- Internal reporting system not functioning
- Incorrect defect/damage assessment → **Safety Issue (EPAS) inadequate management of repetitive defects**
- Undesired situation: CRS after maintenance not properly carried out

EASA
European Union Aviation Safety Agency

PART 3

Standardisation feedback on SMS in CAMO

Erik Roozen
Airworthiness expert

Your safety is our mission.

An Agency of the European Union

Standardisation feedback

- ECMA SMS CAMO
  - To monitor SMS level implementation in Part-CAMO across the EASA Member States (ECMA SMS CAMO)
  - February – June 2023
  - 18 Member State authorities
- Standardisation Inspections

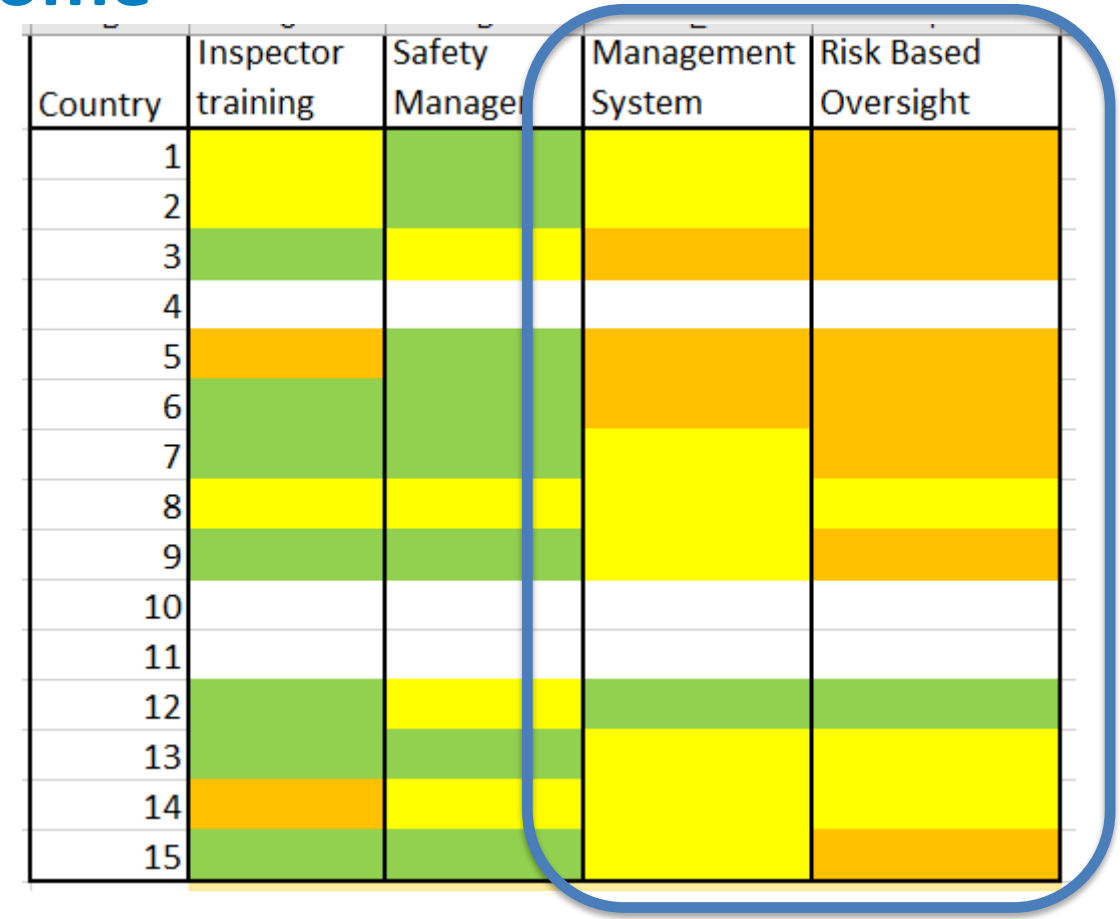
ECMA SMS CAMO - Main subjects

- → Training of NCA inspectors on assessment of management systems
  - → Authority procedures for training on Theoretical & Practical element
  - → Sampling of actual trainings followed
- → Safety Manager acceptance
  - → Assessment process
  - → Practical assessments
- → Management System assessments
  - → Authority procedures
  - → Practical assessments
- → Oversight program based on size, complexity and performance (RBO)
  - → Authority procedures
  - → Sampling of CAMOs which differ in size/complexity

Possible outcome of ECMA

Possible outcomes	Colour
Good/best practices identified	
The information reviewed did not show non-compliances with the applicable rules. However, areas for improvement identified	
Difficulties in the implementation of regulatory changes identified, however without being a non-compliance. To be discussed with the Competent Authorities.	
Non-compliances detected. Notification of off-site findings.	
Immediate safety concern detected. Notification of off-site ‘class G’ finding.	

Main outcome



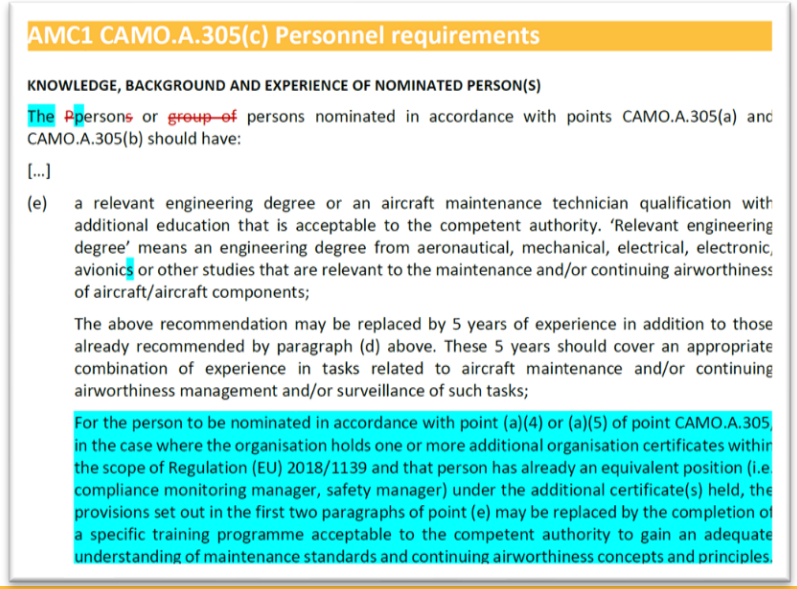
Country	Inspector training	Safety Manager	Management System	Risk Based Oversight
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Main outcome – Inspector training

- → In general appropriate
  - → theoretical training provided
  - → In some cases, CAMO inspector already performing MS assessments for AOC/CAMO
- → Improvement opportunities
  - → Use of external training organisations on theoretical knowledge of SMS [observation] → Meeting NCA needs and procedures?
  - → Not evident that practical training of a management system assessment was part of 'initial' training program before authorisation

Main outcome – Safety Manager acceptance

- → In general appropriate
- → Improvement opportunity
  - → Not clear if assessment was limited to desktop review or also interview of person (which is expected)
- → Note: use of AltMoC and/or amended AMC



AMC1 CAMO.A.305(c) Personnel requirements

KNOWLEDGE, BACKGROUND AND EXPERIENCE OF NOMINATED PERSON(S)

The ~~P~~persons ~~group of~~ persons nominated in accordance with points CAMO.A.305(a) and CAMO.A.305(b) should have:

[...]

(e) a relevant engineering degree or an aircraft maintenance technician qualification with additional education that is acceptable to the competent authority. 'Relevant engineering degree' means an engineering degree from aeronautical, mechanical, electrical, electronic, avionics or other studies that are relevant to the maintenance and/or continuing airworthiness of aircraft/aircraft components;

The above recommendation may be replaced by 5 years of experience in addition to those already recommended by paragraph (d) above. These 5 years should cover an appropriate combination of experience in tasks related to aircraft maintenance and/or continuing airworthiness management and/or surveillance of such tasks;

For the person to be nominated in accordance with point (a)(4) or (a)(5) of point CAMO.A.305, in the case where the organisation holds one or more additional organisation certificates within the scope of Regulation (EU) 2018/1139 and that person has already an equivalent position (i.e. compliance monitoring manager, safety manager) under the additional certificate(s) held, the provisions set out in the first two paragraphs of point (e) may be replaced by the completion of a specific training programme acceptable to the competent authority to gain an adequate understanding of maintenance standards and continuing airworthiness concepts and principles.

Main outcome – Management System assessment

- Improvement opportunities
  - Several cases of ‘ticked checklists’ with regulation and/or CAME
    - Present (‘P’)
    - no assessment (e.g. suitable ‘S’)
  - Inconsistencies between NCA documented procedure and records of sampled organisation Management System assessment
  - ‘O’ & ‘E’ assessed without documenting / substantiating the evidence
    - E.g. referring to CAME/SMM procedure instead of outcome of process such as risk register dated xxx, SRB meeting dated yy, etc.

Main outcome – Risk Based Oversight

- Good practices
  - Often Management System assessment as separate audit, sometimes together with OPS
  - Several cases of ‘organisation risk profile’

- Improvement opportunities
  - Link between ‘risk profile’ and oversight program
  - Size and complexity and performance as input for Nr. of audits/inspections
  - (Sufficient) samples of product audits and airworthiness reviews
  - Duration and scope of planned audit not included

Conclusion & recommendation

- → Training of inspectors and acceptance of Safety Managers reasonable
  - → Recommend practical training for MS assessment
- → Weaknesses in management system assessments and RBO principles
  - → CAMO lessons learned to be used in Part-145 and POA
- → Uniform application of the rules by the NCA ? → not fully uniformly applied but being worked on

EASA
European Union Aviation Safety Agency

PART 4

Transition status in Foreign Part-145 AMOs

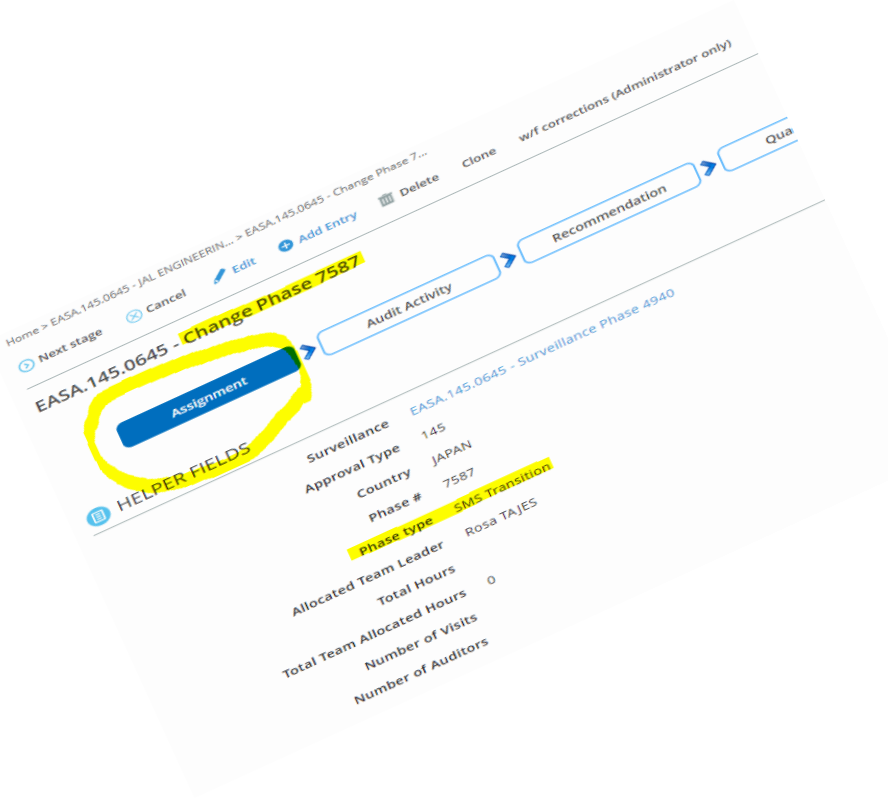
Lorenzo Pellegrini
Section Manager - Maintenance Organisation Oversight

Your safety is our mission.

An Agency of the European Union

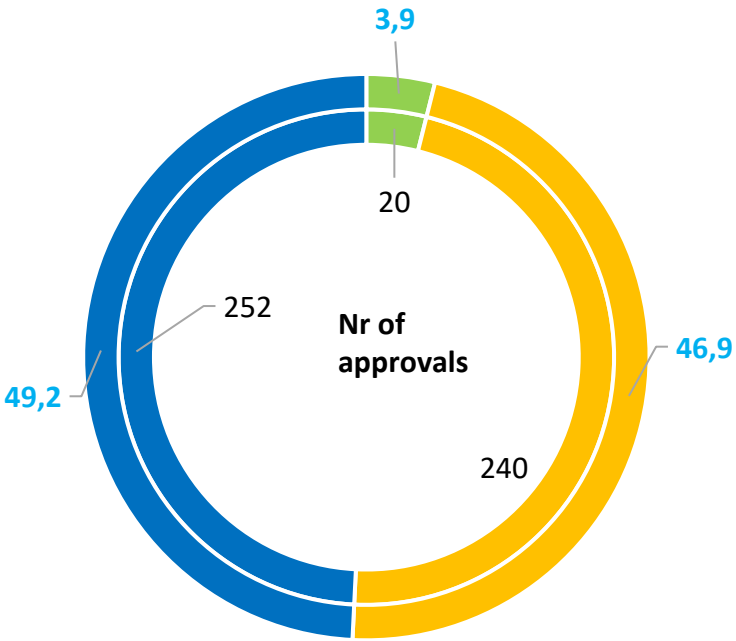
SMS Implementation for VALID approvals (“SMS Change”)

- **SMS implementation is managed as a “change” for each valid Part-145 approval**
  - assigned to Inspector when the SMS application is received
  - When the SMS change is approved the AMO is considered “SMS compliant”
  - The approval of the SMS change requires the SMS to be at least **Present and Suitable**



Status of SMS implementation Foreign Part-145 approvals

SMS change created in IT tool allows real time tracking status of SMS implementation during transition



% of total

KPI
in progress ≥ 80% by 2 Dec 2023
approved ≥ 80% by 2 June 2024

EASA CA - SMS implementation milestones

- SMS info letter published on EASA website in June 22 (Foreign Part-145 page)
- Revised EASA Guidance material published in Nov. 2022 (i.e. MOE UG)

- By assumption any valid Part-145 approval shall comply with SMS at applicability date of Regulation (EU) 2021/1963, on 2 Dec. 2022
  - Case of suspended approval (reinstatement shall be with SMS compliance)

- In absence of evidence of compliance, transition finding was issued on 2 Dec. 2022 to all valid Foreign AMOs (due date **2 June 2024- intentionally anticipated by 6 months to the end of transition date of 2 December 2024**)

- for all cases where SMS is not yet approved on 2 June 2024, EASA will start to send pre-consultation letters anticipating suspension/limitation on 2 December 2024

- **On 2 December 2024, EASA will limit/suspend all Part-145 approvals where SMS in not approved.**

EASA
European Union Aviation Safety Agency

Any Questions in **Slido**?

Join at
slido.com
#1650 960
Passcode: **d4jqxx**

Your safety is our mission.

An Agency of the European Union

EASA
European Union Aviation Safety Agency

Thank you!

Your safety is our mission.

An Agency of the European Union