



EASA
European Aviation Safety Agency

Management System Effectiveness

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Your safety is our mission.

An agency of the European Union 

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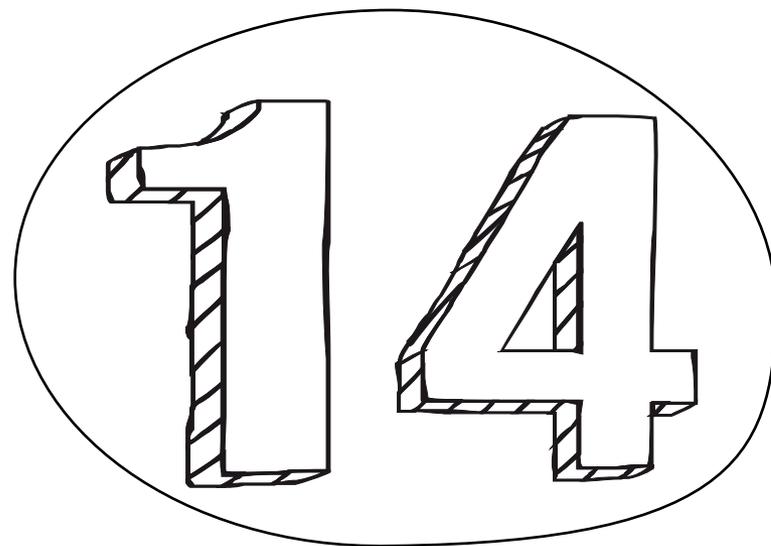


Concept of Effectiveness





The ability to be successful and
produce the intended results





...
for what is thought
to be best in any relation
point of view.

Competence

being competent; fit
adequateness: as, the
competence for the ta
for what is thought
... any rel



Inspector competence

- Understanding risk management principles and technique
- Understanding the relevance of hazard logs developed by the organizations
- Develop skills in understanding the adequacy of safety risk assessment performed by the organization



Organization / Safety Manager Competence

- Understanding of risk management principles and techniques
- Experience in implementing a SMS
- Experience and qualification in aviation accident investigation
- Experience and qualification in conducting safety/compliance audits
- Sound knowledge of aviation regulatory frameworks
- Analytical skills



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FINDINGS





Risk management

Risk management

prioritization of risks for
economical application
and control the probability
to maximize



Complex Management System setup





Typical Finding

- ❑ SMS Manual copied and not reflecting the specificities of the operators
- ❑ Risk only reactive based on ASR and not proactive
- ❑ No risk analysis at all
- ❑ No Change management
- ❑ No mitigating measures
- ❑ No real SRB



Example of a finding

When reviewing the operator's safety management system it was found that:

- ❑ The hazard identification does not reflect the actual operator's operation
- ❑ The hazard identification is not pro-active
- ❑ The operator could not demonstrate how it ensured control of identified risks (mitigation)
- ❑ The operator could not demonstrate how it managed safety risks related to changes



Classic Matrix

Risk probability	Risk severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

Suggested criteria	Assessment risk index	Suggested criteria
Intolerable region	5A, 5B, 5C, 4A, 4B, 3A	Unacceptable under the existing circumstances
Tolerable region	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C	Acceptable based on risk mitigation. It may require management decision.
Acceptable region	3E, 2D, 2E, 1A, 1B, 1C, 1D, 1E	Acceptable



IDEA
LOADING ...





Different Risk Matrix

	Severity Level					
Probability Level	S5 Extreme	S4 High	S3 Medium	S2 Low	S1 Minor	S0 None
P5 Frequent	A	A	B	C	D	E
P4 Likely	A	A	B	C	D	E
P3 Possible	A	B	C	D	E	E
P2 Low	A	B	C	D	E	E
P1 Unlikely	B	C	D	E	E	E
P0 Remote		C	D	E	E	E
Pe Extr. Remote	C	D	E	E	E	E

Risk Level	Risk	Risk Mitigation
A	Extreme	Immediate mitigation required
B	High	Short term improvement required
C	Acceptable with mitigation	Long term improvement desired
D	Low	Monitor
E	Negligible	Collect data



Different approach

Probability LEVEL	Occurrences in XYZ			One out of ___ flights	Probability	Description
	Upper Boundary	Mean	Lower Boundary			
P5	Always	10 per day	3,5 per day	140	7,3E-03	Probability: Almost certain, very high History: Significant past history, has occurred many times and is considered most likely to happen in these circumstances Context: Has occurred innumerable times at XYZ
P4	3,5 per day	Once per day	2,9 per week	1.100	9,0E-04	Probability: Likely, high History: Past history and will probably occur in most circumstances Context: Has occurred many times at XYZ
P3	2,9 per week	Once per week	1,3 per month	10.000	1,0E-04	Probability: Possible, medium History: Some past history, has occurred occasional and is considered quite likely to happen in these circumstances Context: Has occurred several times at XYZ
P2	1,3 per month	Every two months	2,2 per year	100.000	1,0E-05	Probability: Low, possible under certain circumstances History: Some past history and considered possible in these circumstances Context: Has occurred at XYZ
P1	2,2 per year	Every year	Every 3,2 years	3.2500.000	2,0E-06	Probability: Very low, unlikely History: Has occurred rarely, has happened, but a credible statistic frequency is hard to establish Context: Has occurred sporadic at XYZ
P0	Every 3,2 years	Every 10 years	Every 32 years	325.000.000	2,0E-07	Probability: Quite unlikely, rare History: In most circumstances no past history, but possible in exceptional circumstances Context: Has occurred in the aviation industry
Pe	Every 32 years	Every 100 years	Every 320 years	32050.000.000	2,0E-08	Probability: Extremely unlikely, mishap basically impossible History: No past history and considered very unlikely to occur Context: Not yet heard of in the aviation industry

Severity LEVEL	S5	S4	S3	S2	S1
NATURE	Catastrophic/Extreme	Hazardous/High	Major	Minor	Negligible
PROPERTY OR A/C DAMAGE	> 10 Mio EUR	200.000 EUR to 10 Mio EUR	10.000 EUR to 200.000 EUR	1.000 EUR to 10.000 EUR	< 1.000 EUR
OPERATIONAL IMPACT	Fleet grounded for more than 1 week	> 20% of fleet grounded more than to 2 days	Up to 20% of fleet grounded less than 2 days or 10% grounded for 1 day	Aircraft grounded less than 24 hours	None
CUSTOMER IMPACT	Extensive flight cancellation for an extended period.	More than 8 hrs of delay	<8 hrs and >2 hrs of delay	<2 hrs of delay	Up to 20 minutes of delay
MAINTENANCE	Both engine change or major structural damage	1 engine change	Major component change	Minor component change	None
ICAO INCIDENT DEFINITION	Accident	Serious incident	Occurrence with minor injuries and minor damage to aircraft	Occurrence with discomfort	None

Severity LEVEL	S5	S4	S3	S2	S1
NATURE	Extreme	High	Medium	Low	Minor
INJURY	Multiple fatalities and/or permanent disabilities	Fatalities and/or permanent disabilities	Serious but not permanent injuries	Injuries requiring first aid treatment only	No or minor injuries
NON ROUTINE INCIDENT (modified ICAO definition)	Total loss or hull loss	Accident with serious injuries or fatalities, or significant damage to aircraft	Serious incident with injuries and or substantial damage to aircraft	Incident with minor injury and or minor aircraft damage	Incident with discomfort and/or less than minor system damage
A/C DAMAGE	> 20 Mio EUR	400.000 EUR to 20 Mio EUR	10.000 EUR to 400.000 EUR	300 EUR to 10.000 EUR	< 300 EUR
REPUTATION AND PUBLIC CONFIDENCE	Fundamental change in public perception of EN as a quality airline	Extended nationwide negative media coverage or international negative media coverage	Short term nationwide negative media coverage	Negative local media coverage	None
CUSTOMER IMPACT	Extensive shut down of services for an extensive period. All customers affected	More than 40 flights cancelled, rescheduled or delayed. Thousands of customers affected	Between 1 and 40 flights cancelled, rescheduled or delayed. Hundreds of customers affected	Between 2 and 5 flights rescheduled or delayed. Dozen of customer affected	1 flight rescheduled or delayed. Small number of customers affected
OPERATIONAL IMPACT	Fleet grounding for extended period	Brief fleet grounding up to 2 days	Aircraft grounding more than 2 days	Aircraft grounding 4 to 48 hours	Aircraft delay less than 4 hours
EQUIPMENT	Loss of critical equipment, shut down of organization	Major damage results in major slowdown and/or downtime	Minor damage leads to organizational slowdown	Minor damage potential organizational slowdown	No adverse consequences
COMPLIANCE	Significant disruption to scheduled services over an extended period of time	Substantial fine and disruption to scheduled services	Substantial fine but no disruption to scheduled services	No fine and no disruption to scheduled services	Minor breaches by individual staff members
PROCESS BREACH	Several steps of flight critical process not followed or flight critical process non-existent	No steps of documented process followed or process non-existent	Majority of steps of documented process not followed or process unknown	Contiguous steps of documented process not followed or process partly unclear	Some single steps of documented process not followed
KNOW-HOW LOSS	Dramatic loss resulting in fully new build-up requiring more than 2 years	Heavy loss resulting in substantial build-up and/or renewal requiring 1-2 years	Worrying loss resulting in substantial build-up and/or renewal requiring up to 1 year	Loss resulting in noticeable build-up and/or renewal requiring 3/6 months	Slight loss that can be easily absorbed within the existing organization within 3 months
SAFETY AWARENESS IGNORANCE	Intolerable total absence of safety awareness demanding immediate dismissal	Unusually high level of safety awareness ignorance needing immediate correction or dismissal	Unacceptable attitude toward safety awareness needing immediate correction or dismissal warning	Generally acceptable attitude toward safety awareness with occasional blackout needing pronounced and lasting correction	Sound attitude toward safety awareness with occasional and isolated misjudgment needing clarification and lasting educational influence

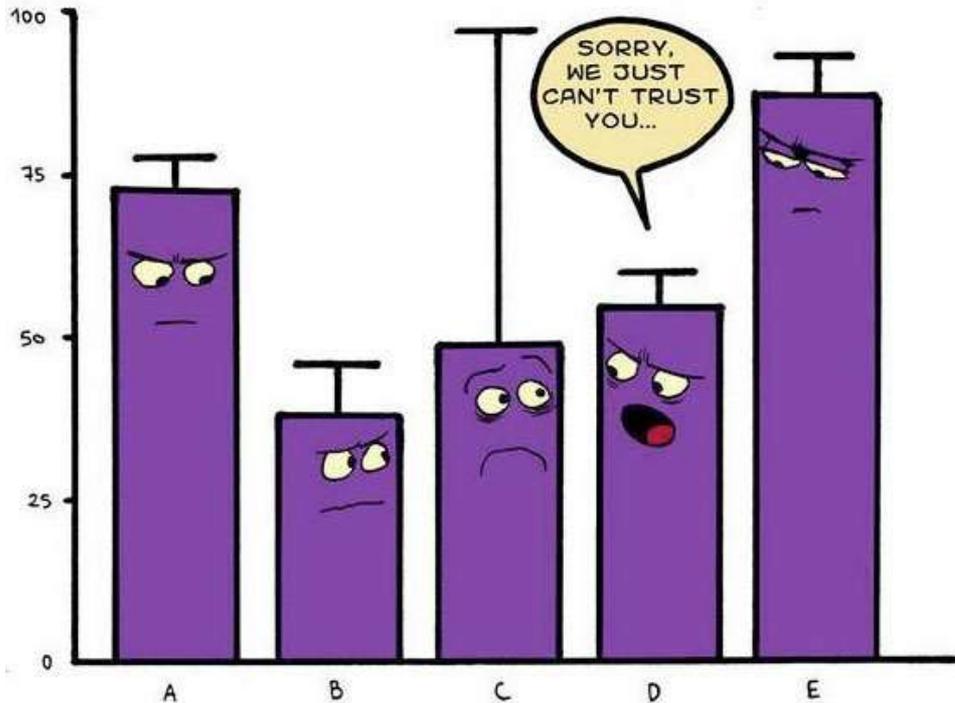


Data should be: valid, complete, consistent and accurate

Be pragmatic.

Be mindful of the limitations of your data, but make the most of what you have available!

Intercept the precursors rather than measuring the events.



- What do we want to know and why?
- What should a good SPI deliver?
- What are the determinants of a good SPI?
- Which SPI are required?
- How will the information gained be used?

SPI SHOULD REFLECT YOUR RISKS





Fast pace of technological change – new business models





Safety risks related to ageing

EASA Opinion 12/2016 addresses safety risks related to ageing phenomena





Changing nature of accident



- less 'common causes' – more 'random causes': causes becoming more unique to given operators, aircraft, events, regions, etc.
- fewer accidents are related to broadly distributed exposure factors.



Learn from experience

Reduced ability to learn from experience

- 'time to market' for new products has greatly decreased
- the number of accidents to learn from continues to decrease



EASA

EXPECTATIONS





Authority able to challenge operator Management System

Mutual trust based on information exchange

Operator that invites the authority at their SRB



Regulators

Evolve towards performance based oversight

- Integrate and harmonize SMS oversight across the regulatory oversight departments,
- Develop methodologies for performance based oversight , including ability to assess SMS effectiveness
- Develop methodologies for risk-based resource targeting /planning.

Ensure the right inspector skills and competencies are available:

- understanding of how to analyze systemic failures rather than individual non-compliances
- Ensure buy-in from inspectors to get them to accept that change is needed

Develop inspector skills and competence to assess

- different degrees of maturity,
- 'intangibles' such as safety culture,
- the pertinence of safety risk assessment performed by organisations
- the relevance of safety performance indicators (SPIs) developed by organisations.



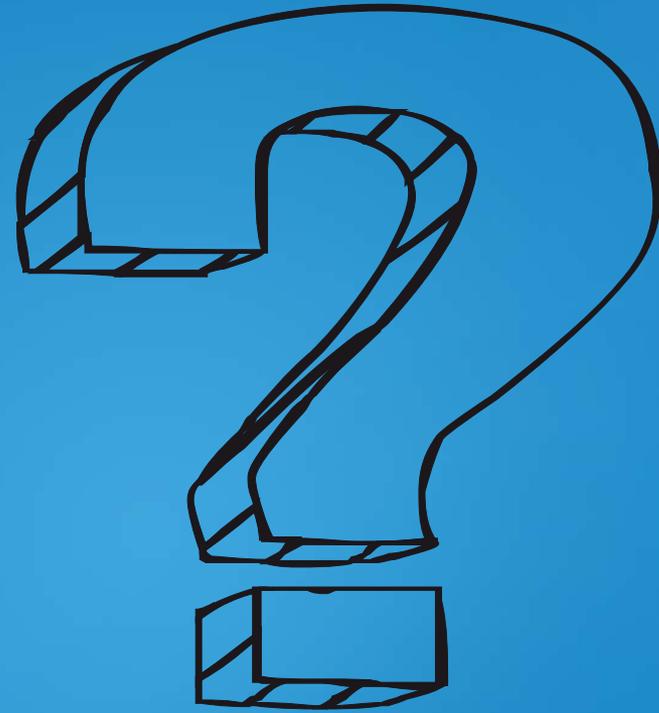
Operators

- ❑ Nominated persons role within Management System
- ❑ Prioritization of risks
- ❑ Accountable Manager awareness
- ❑ Organization involvement in Management System activities



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