



Safety Management System Introduction and Regulatory Framework

Podgorica, 29 May 2014

Safety 'Myths'

- Absence of accident is an indicator of good safety performance.
- We can't afford SMS.
- SMS is just for the 'big guys'.
- If it's not broke, don't fix it!
- I'm OK, it's the other guy you need to worry about.
- Safety management is for Managers.
- We already practice risk management.

SMS basic

- A SMS provides a systematic way to identify hazards and control risks while maintaining assurance that these risk controls are effective.
- ICAO Doc 9859-” A **hazard** is generically defined by safety practitioners as a condition or an object with the potential to cause death, injuries to personnel, damage to equipment or structures, loss of material, or reduction of the ability to perform a prescribed function.
- 10 things about SMS.
- SMS Terminology.

History Lesson

- Chernobyl - 26. April 1986.
- King's Cross -18. November 1987.
- Herald of Free Enterprise – 6. March 1987.
- Piper Alpha platforma – 6. July 1988.
- Air Ontario, Dryden – 10. March 1989.

- Things that never happened before happen all the time.
(Sagan, 1993)

History Lesson



- Piper alpha 1988
 - Gas explosion and subsequent oil fire
 - 167 killed
 - Maintenance and operational errors
 - Poor evacuation capability
 - Cullen report findings 1990

History Lesson



- In the case of King's Cross prior to the fire in November 1987 the Official Enquiry discovered the following:
- The regulator did not pursue an aggressive fire protection policy.
- The escalators were known to be a fire risk. The statistics for fire on the escalators show over 400 incidents between 1958 and 1987.
- The number of safety officers was inadequate and scattered over a wide area.

History Lesson



- Fire and emergency training was completely inadequate with only 4 of the 21 staff on duty having been trained in evacuation drills.
- There was no evacuation plan for King's Cross station.
- No joint exercise with the emergency services had ever been carried out.

Traditional approach – Preventing accidents

Focus on outcomes (causes)

Unsafe acts by operational personnel

Attach blame/punish for failures to “perform safely”

Address identified safety concern exclusively

Identifies:

WHAT?

WHO?

WHEN?

But not always

discloses:

WHY?

HOW?

History Lesson

- The processes for identifying hazards were primarily reactive and informal, rather than proactive and systematic.
- The processes to assess the risks associated with identified hazards were deficient.
- The processes to manage the development, introduction and evaluation of changes to operations were deficient.
- The design of operational procedures and training was over-reliant on the decision-making ability of company flight crew and cabin crew and did not place adequate emphasis on structured processes.
- The management culture was over-reliant on personal experience and did not place adequate emphasis on structured processes, available expertise, management training, and research and development when making strategic decisions.

Australian government review on aviation safety-1995

“For almost every aviation accident or incident the subsequent systematic investigation has shown that:

- The main contributing factors were present before it happened.
- In most cases they were common knowledge, had been reported, and formally documented.
- In all cases, they could have, and should have, been identified and rectified before the accident or incident.”

The evolution of safety

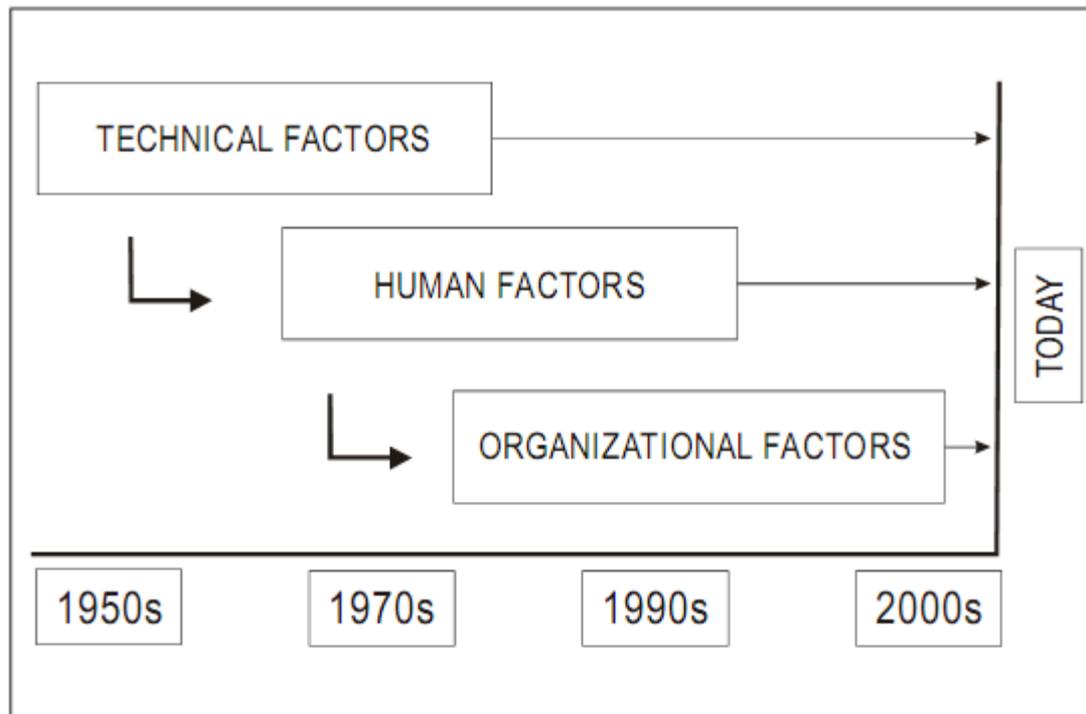


Figure 2-1. The evolution of safety

Accidents and Incidents Cost!

Direct costs

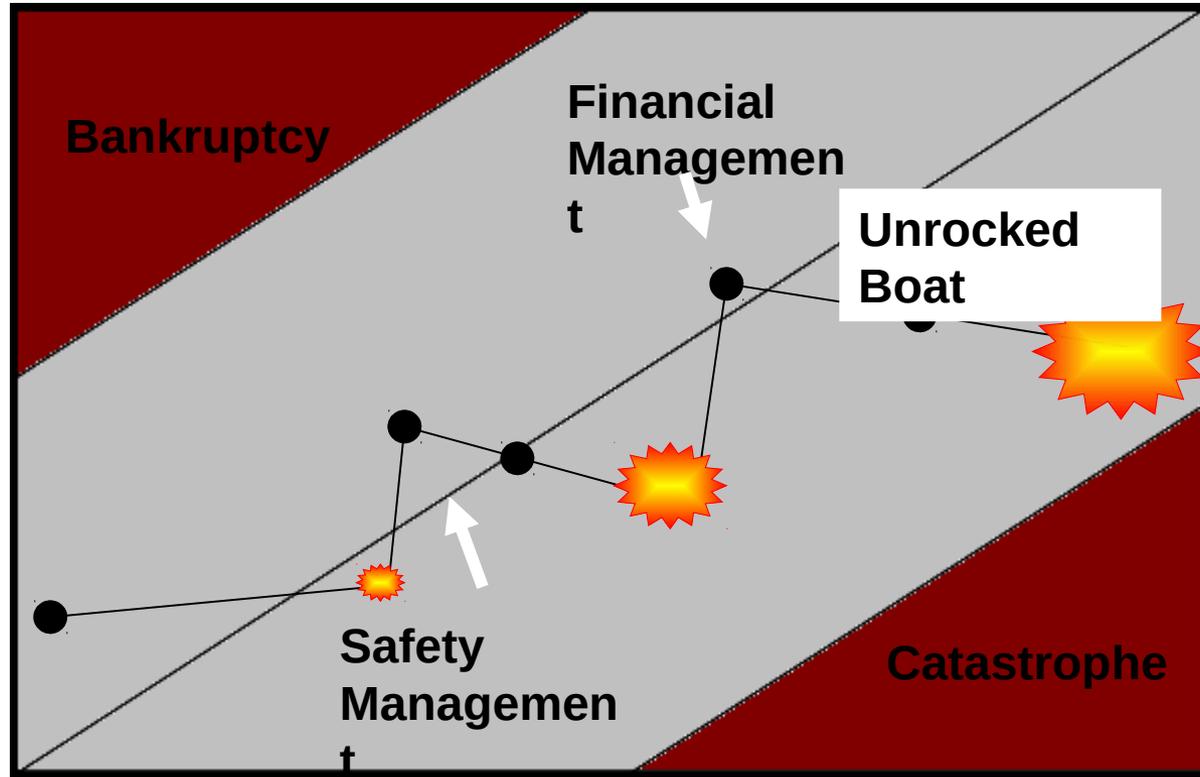
- Loss of aircraft
- Injuries to or death of flight crewmembers, passengers
- Insurance deductibles
- Costs not covered by insurance

Indirect costs

- Loss of use of equipment
- Loss of staff
 - Involved in accident issues
 - Lower productivity
- Investigation & clean-up
- Legal claims
- Fines
- Misplaced/stranded passengers
- Negative media exposure

Safety Space

Protection

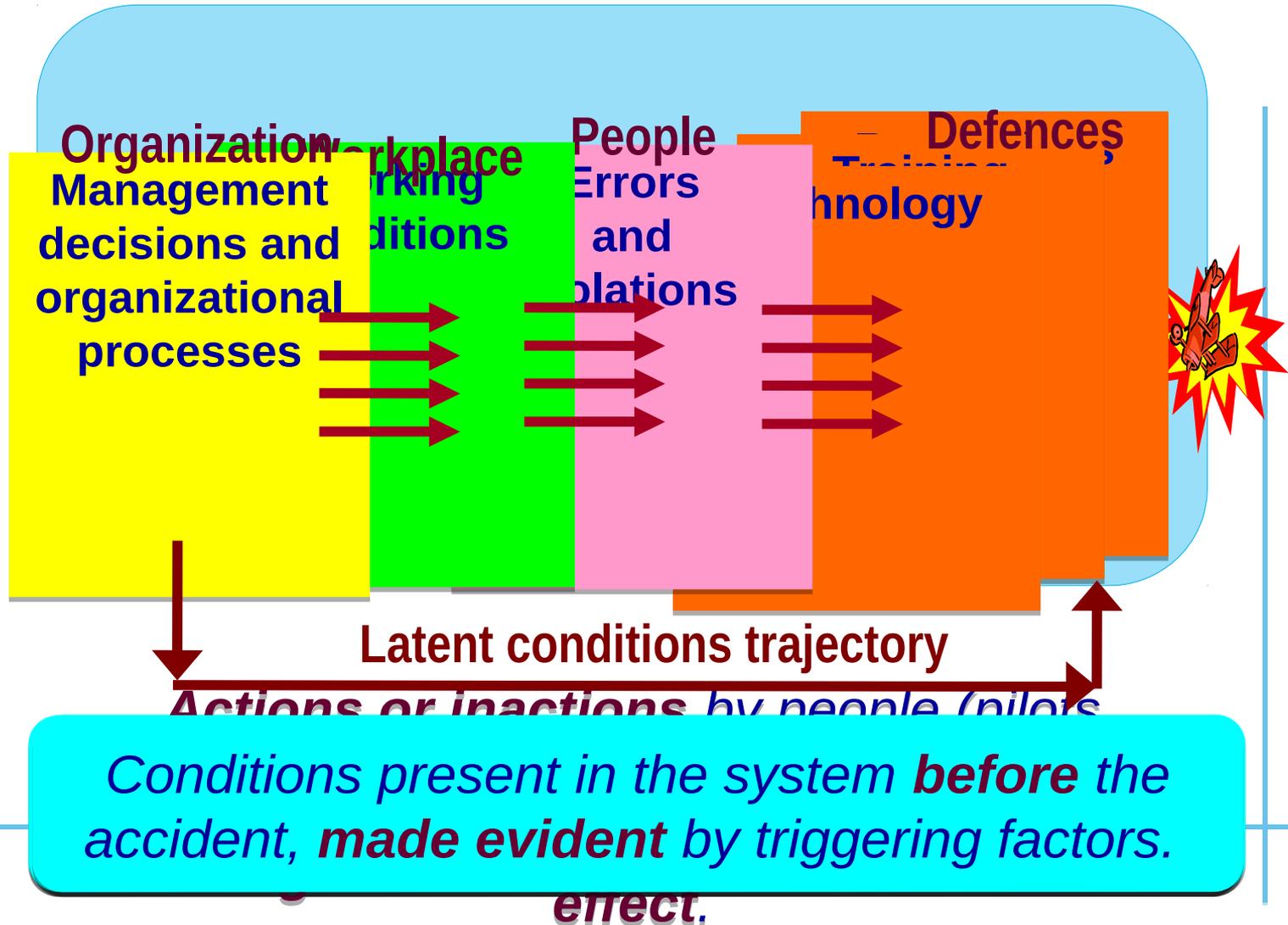


Production

Life of the system



The concept of accident causation



The organizational accident



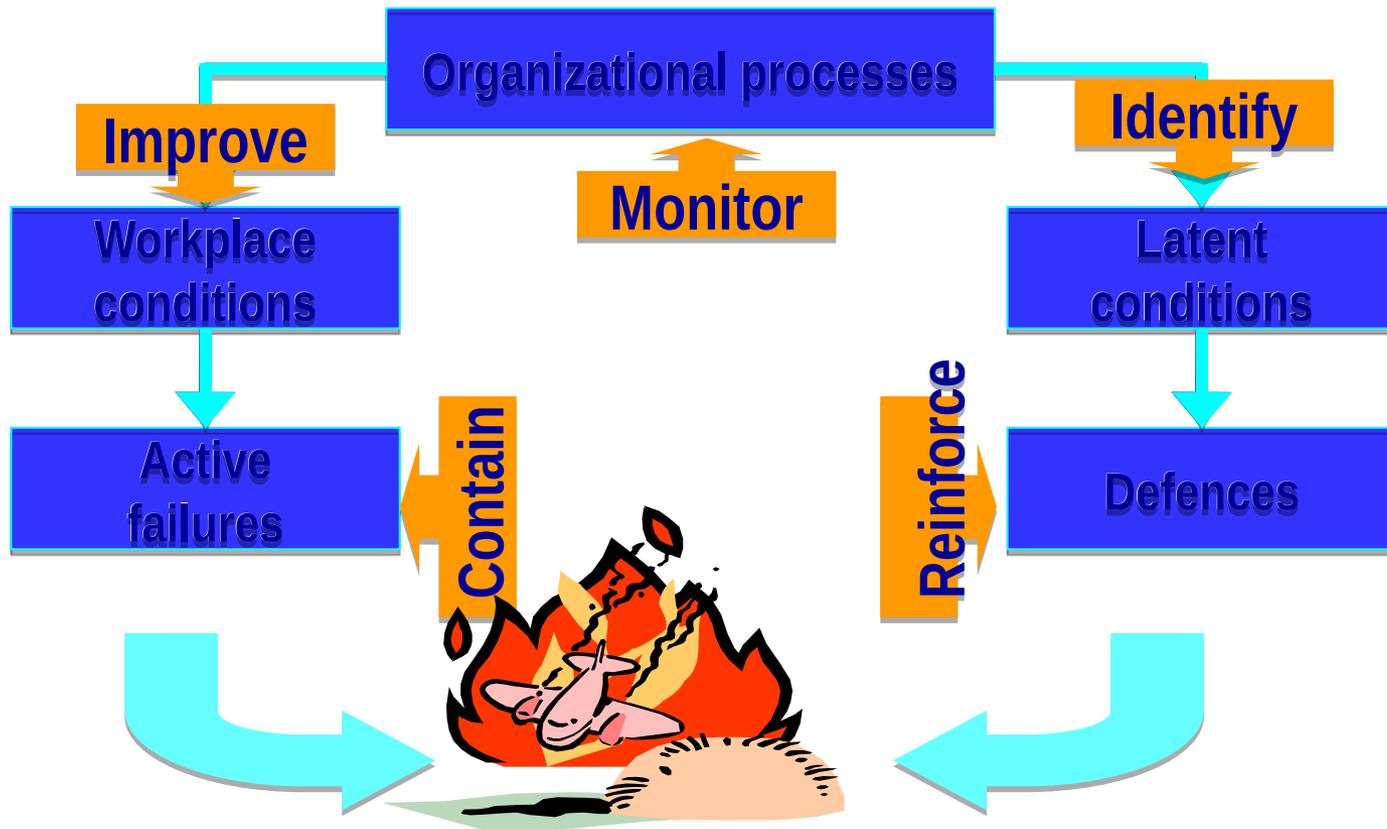
Resources to protect against the **risks** that organizations involved in production activities **generate** and **must control**.

The organizational accident

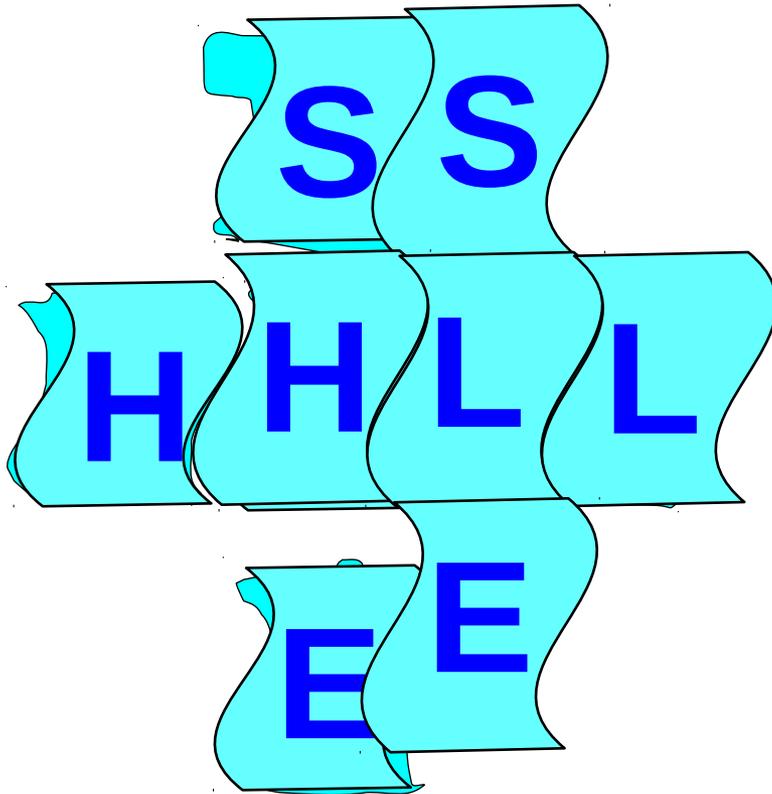


Actions or inactions by people (pilots, controllers, maintenance engineers, aerodrome staff, etc.) that have an ***immediate adverse effect***.

The organizational accident

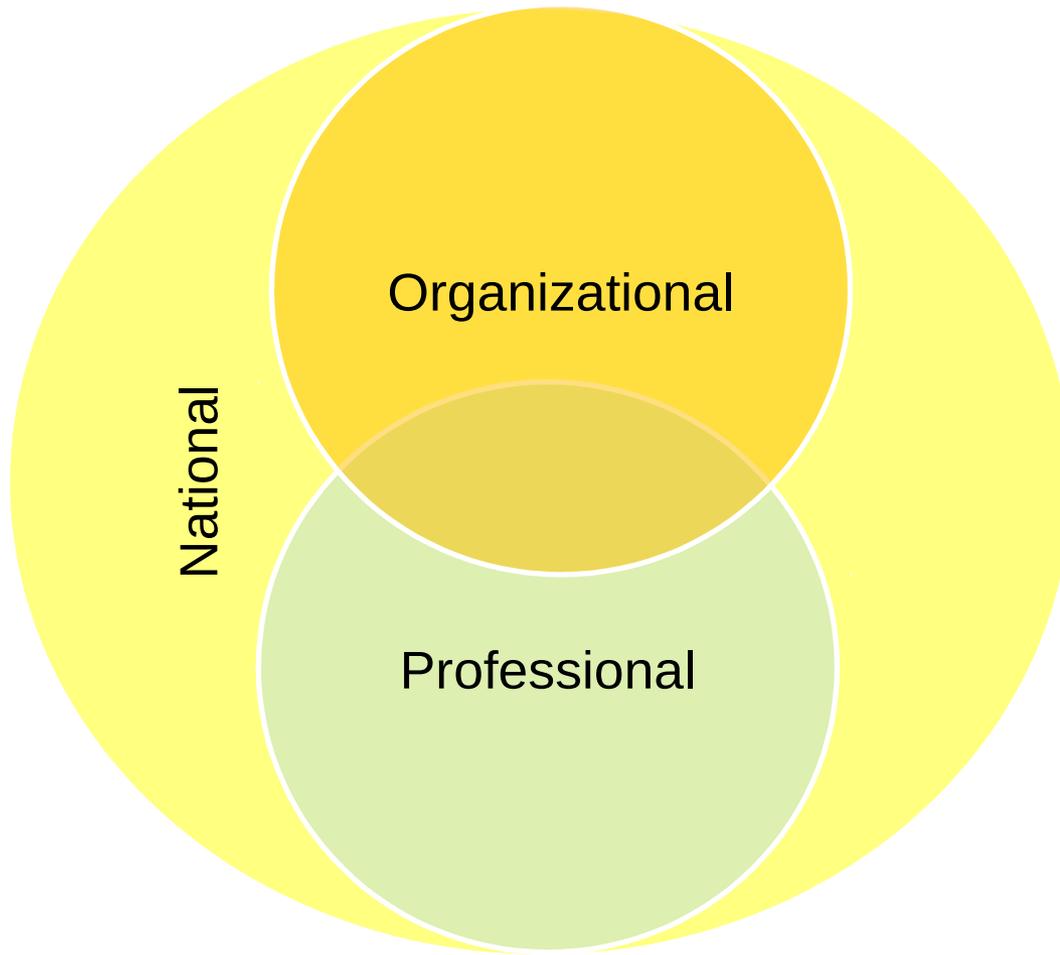


People, context and safety – SHEL(L) model



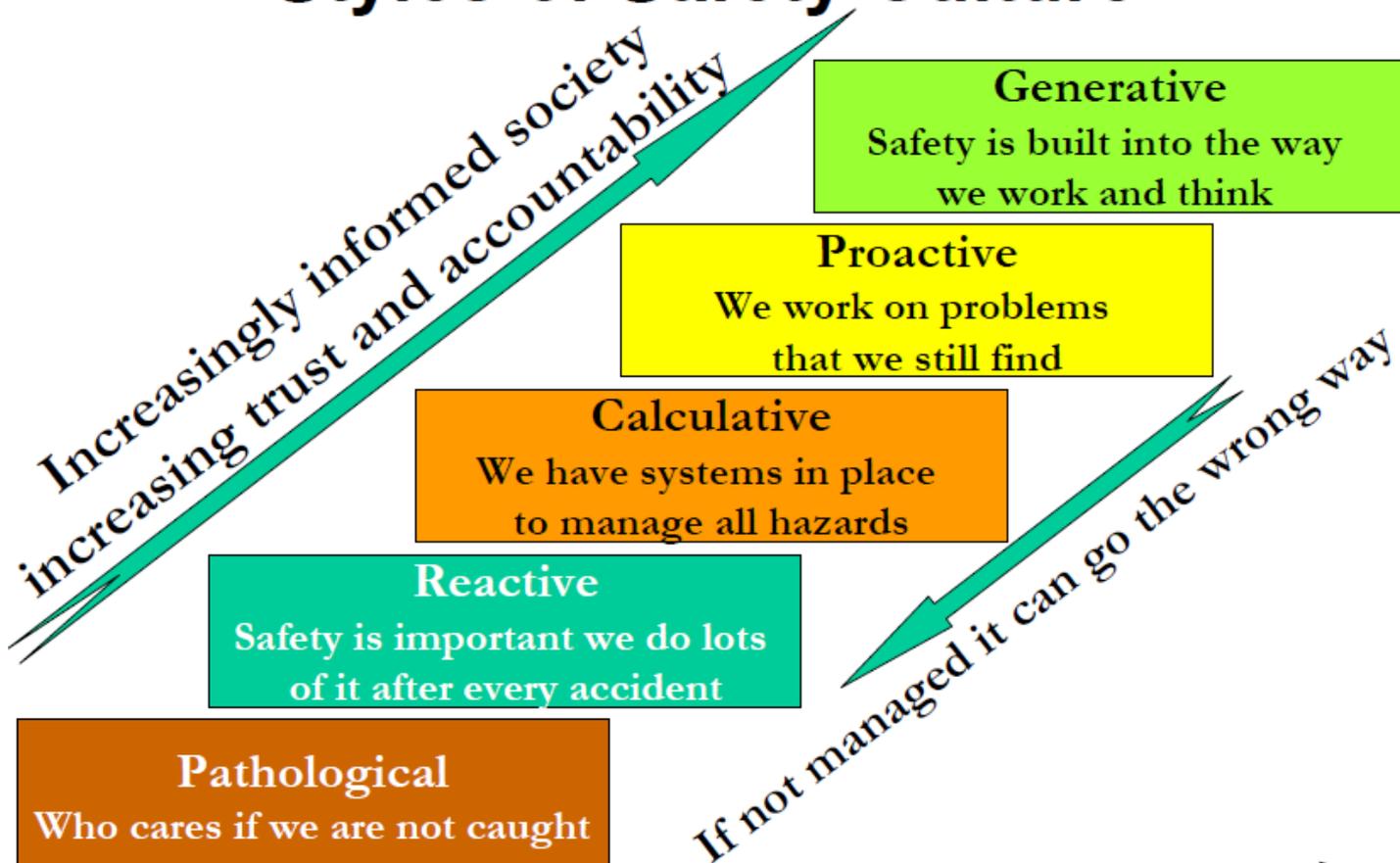
- ❖ Software
- ❖ Hardware
- ❖ Environment
- ❖ Liveware
- ❖ Liveware, other persons

Safety Culture, Just culture Reporting

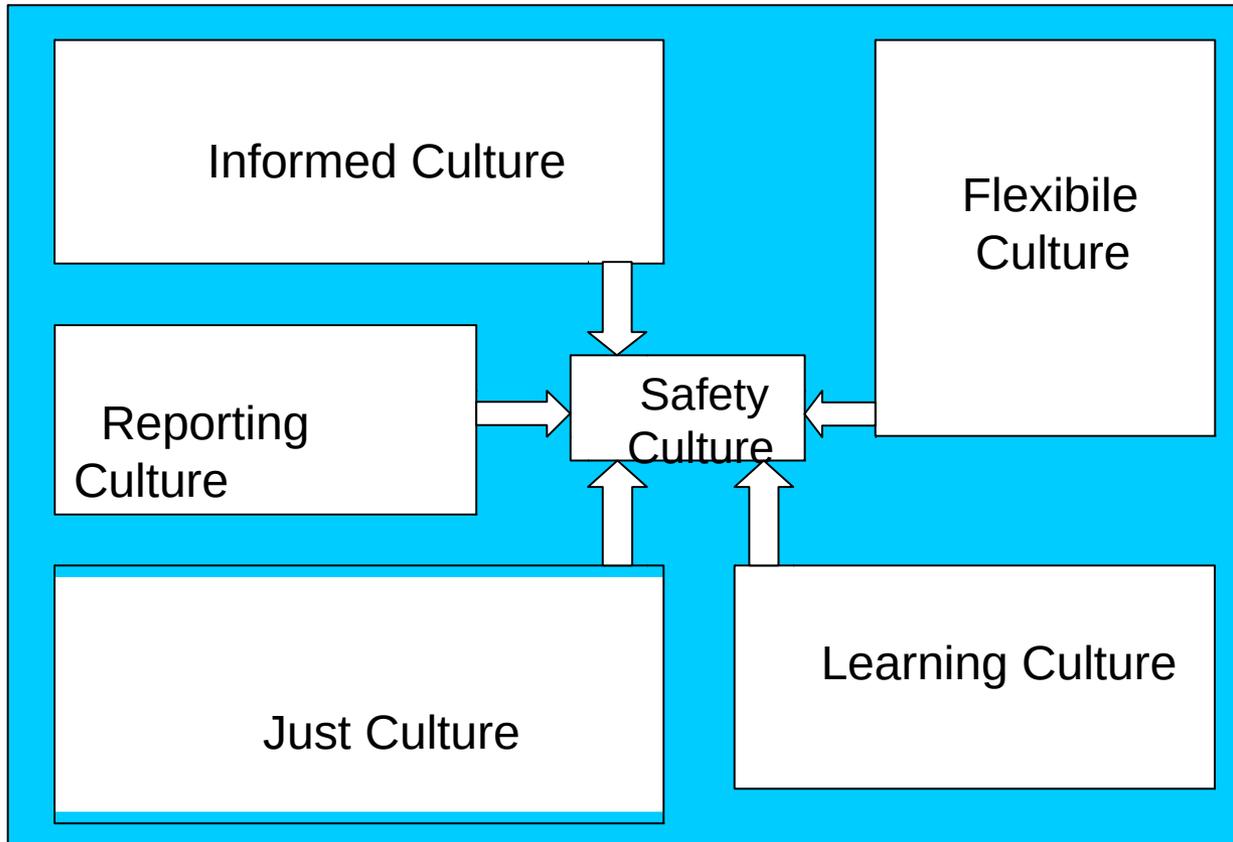


- Safety culture is the ways in which safety is managed in the workplace. There are different types of culture

Styles of Safety Culture



Safety Culture, Just culture Reporting



Reason describes a “Just Culture” as an atmosphere of trust in which people are encouraged (even rewarded) for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behavior .

Safety Culture, Just culture Reporting

Flexible: Organisational preparedness to accept changes.

Informed: People understand the hazards & risks.

Learning: The company learns from mistakes. Staff are updated on safety issues by management.

Just: Employees know what is acceptable & unacceptable behavior.

Reporting: All personnel freely share critical safety information.

AC 120-92

Safety Culture, Just culture Reporting

Safety culture and Just culture as part of it, are the basis for one of the primary sources for Safety Risk Management and Safety Assurance...Reporting



Safety Culture, Just culture Reporting

Reporting: Mandatory (accidents and certain types of incidents), and voluntary system

Reporting stages

1st – whistle-blowers

2nd – Somebody else did something

3rd – I / We did something

Culture Reporting



What gets communicated upward?

4%

Problems known to
top management

9%

Problems known to middle
management

74%

Problems known to supervisors

100%

Problems known to rank and file
MX personnel

Source: Yoshida, Shuichi,
2nd Intl Quality Symposium,
1989

The need for safety management

- Traditional – Accident/serious incident investigation
 - Aviation system performs most of the time as per design specifications (base line performance)
 - Compliance based
 - Outcome oriented
- Evolving – Safety management
 - Aviation system does not perform most of the time as per design specifications (practical drift)
 - Performance based
 - Process oriented
 - Compliance on its own does not assure safety

The need for safety management

Fast pace of technological change - Changing nature of accidents



Reduced ability to learn from experience
time to market for new products has greatly decreased



Increasing complexity and coupling
cause and effect are not related in a direct/linear way



Difficulty in selecting priorities and making trade-offs
cost/productivity, short-/long-term



More complex relationships between humans and automation



Changing regulatory and public views on safety

Nancy G. Leveson, Engineering a safer world – Systems thinking applied to safety, MIT press 2011

Main components and elements of SMS

Safety policy and objectives

- 1.1 Management commitment and responsibility
- 1.2 Safety accountabilities
- 1.3 Appointment of key safety personnel
- 1.4 Coordination of emergency response planning
- 1.5 SMS documentation

Safety risk management

- 2.1 Hazard identification
- 2.2 Safety risk assessment and mitigation

Safety assurance

- 3.1 Safety performance monitoring and measurement
- 3.2 The management of change
- 3.3 Continuous improvement of the SMS

Safety promotion

- 4.1 Training and education
- 4.2 Safety communication



Basis of Annex 19, 1st edition

1. The transfer of overarching safety management provisions from the following Annexes:

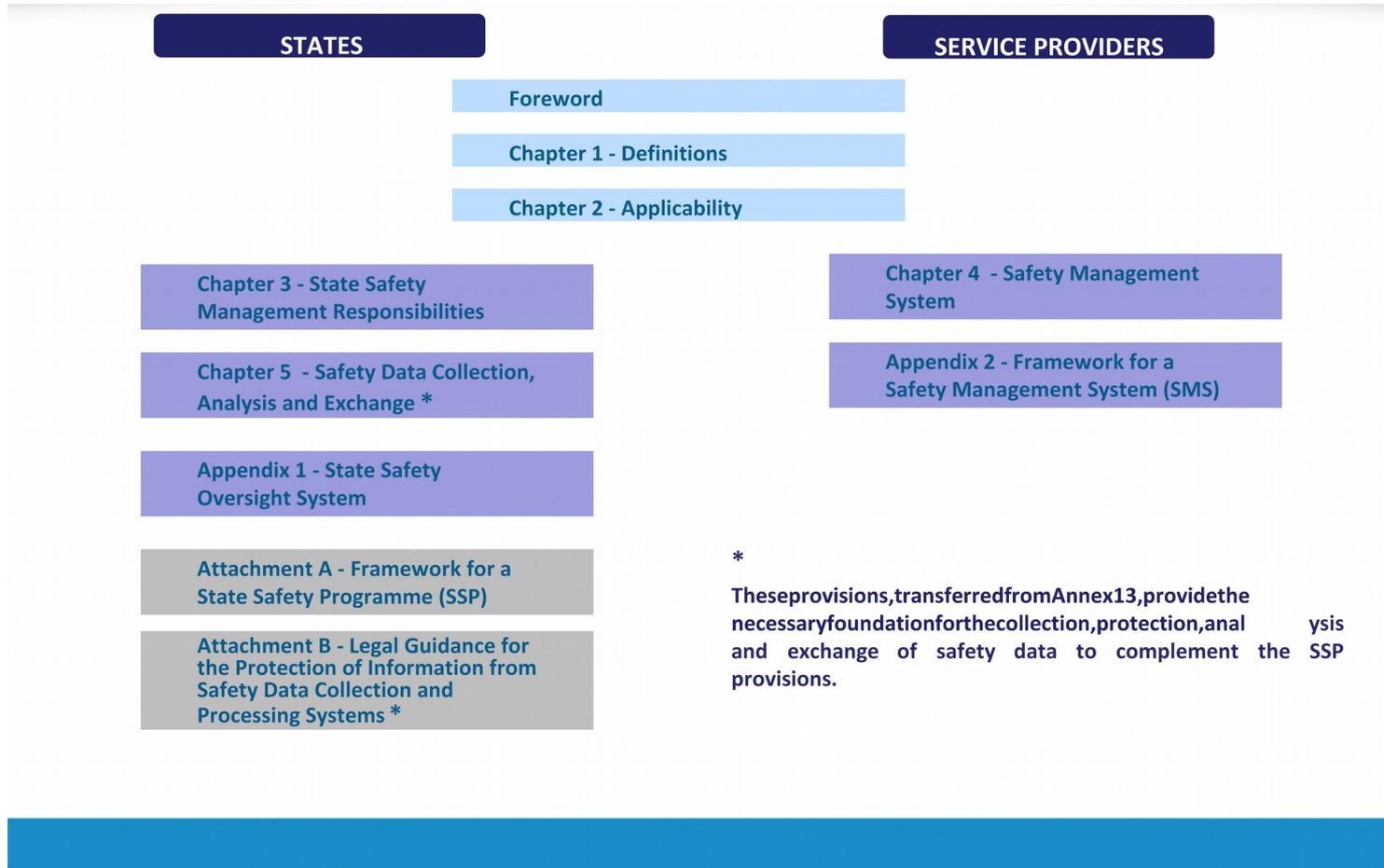
- **Annex 1 — Personnel Licensing;**
- **Annex 6 — Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes, Part II — International General Aviation — Aeroplanes and Part III — International Operations — Helicopters;**
- **Annex 8 — Airworthiness of Aircraft;**
- **Annex 11 — Air Traffic Services;**
- **Annex 13 — Aircraft Accident and Incident Investigation; and**
- **Annex 14 — Aerodromes, Volume I — Aerodrome Design and Operations**

Note: Independently of the applicability date of Annex 19, these SARPS retain their original applicability, dating from 2001 onwards.

Basis of Annex 19, 1st edition (cont.)

2. The adaptation of Annex 6, Part I, Appendix 5 and Annex 6, Part III, Appendix 1, Safety oversight of Air Operators.
3. The duplication of Annex 13, Attachment E, Legal guidance for the protection of information from safety data collection and processing systems.
 - Sector-specific safety management provisions were retained in their appropriate Annexes.
 - Examples include:
 - Annex 1 (1.2.4.2) - basic safety management principles applicable to the medical assessment process of license holders; and
 - Annex 6, Part I and III - the flight data analysis programme is part of the aeroplane or helicopter operator's SMS.

STATES-SERVICE PROVIDERS



Q & A

Whom is Annex 19 applicable to?

- Approved training organizations;
- Operators of aeroplanes or helicopters authorized to conduct international commercial air transport;
- Approved maintenance organizations providing services to operators as described in bullet 2;
- Organizations responsible for the type design or manufacture of aircraft;
- Air traffic services (ATS) providers, and;
- Operators of certified aerodromes.

International general aviation operators, conducting operations of large or turbojet aeroplanes are also requested to implement an SMS.

SMM 1st & 2nd editions in 2006 & 2009.

SMM 3rd edition (advance version) posted on 28 May 2012.

SMM 3rd edition final (en) version posted on 8 May 2013.

ICAO Annex 19 and EU rules

Reference	Applies to	Subject
AMC1-ORX.GEN.200(a) (1)(2)(3)(5)	non-complex	<ul style="list-style-type: none"> - Responsibility and accountability - Safety policy - Hazard identification, risk management - Documentation of management system key processes - Safety manager - Emergency response plan
AMC1-ORX.GEN.200(a) (1)	complex	Organisation and accountabilities: <ul style="list-style-type: none"> - Safety manager - Safety review board (SRB)
GM1-ORX.GEN.200(a)(1)	complex	Safety action group (to assist the SRB)
AMC1-ORX.GEN.200(a) (2)	complex	Safety policy and management commitment
GM1-ORX.GEN.200(a)(2)	all	Definition of safety policy
AMC1-ORX.GEN.200(a) (3)	complex	Safety risk management: <ul style="list-style-type: none"> - Hazard identification - Risk management system - Internal Safety Investigation - Management of change - Continuous improvement - Safety Performance and Monitoring - Emergency response plan

ICAO Annex 19 and EU rules

Reference	Applies to	Subject
GM1-ORX.GEN.200(a)(3)	all	Internal occurrence reporting scheme
AMC1-ORX.GEN.200(a)(4)	all	Training and communication on safety
AMC1-ORX.GEN.200(a)(5)	all	Organisation management system documentation
GM1-ORX.GEN.200(a)(5)	all	Organisation management system documentation
AMC1-ORX.GEN.200(a)(5)	complex	Organisation management system documentation - Safety management manual (SMM)
AMC1-ORX.GEN.200(a)(6)	all	Compliance monitoring - general <ul style="list-style-type: none"> - Designation of a compliance monitoring manager - Compliance monitoring documentation - Training
AMC1-ORX.GEN.200(b)	all	Size, nature and complexity of the activity

SMS Proportionality

:

- Definition of organisational complexity - three criteria
 - Size, in terms of staffing
 - Complexity of the activities
 - extent and scope of contracted activities
 - Risks involved
 - operations requiring specific approvals (LVO / ETOPS) type of operations, e.g. specialised operations (helicopter hoist)
 - different types of aircraft used,
 - operating environment (mountainous areas, offshore)
- Some organisations are non-complex by default
 - ATOs training for private licences only
 - Aero-Medical Centres

SMS for non complex organizations

- Still need an Accountable Manager.
- Still need a SMS Manual (or be part of Ops Manual).
- Individual as focal point for SMS.
 - This could be the Accountable Manager.-Who can be the Safety Manager?
- Simplified Hazard Analysis and Risk Assessment Process.
- Safety training still required but focus on your policies, principles and philosophies.
- Safety communication through informal discussions
- Working in partnerships.

Brief review of the content of the document:

UK Guidance for non-complex (small) organizations

FAA training material – FAA small operator SMS):

FAA Safety Management System (SMS) for Small Operators.mp4

SMS for non complex organizations

Management system NON-COMPLEX OPERATORS - GENERAL

- (a) Safety risk management may be performed using hazard checklists or similar risk management tools or processes, which are integrated into the activities of the operator.

HAZARD CHECKLISTS ([link](#) to an example)

- Checklist
- Checklists are lists of known hazards or hazard causes that have been derived from past experience. The past experience could be previous risk assessments of similar systems or operations or from actual incidents that have occurred in the past. This technique involves the systematic use of an appropriate checklist and the consideration of each item on the checklist for possible applicability to a particular system. Checklists should always be validated for applicability prior to use.

SMS for non complex organizations

Advantages:

- They can be used by non-system experts.
- They capture a wide range of previous knowledge and experience.
- They ensure that common and more obvious problems are not overlooked.

Disadvantages:

- They are of limited use when dealing with novel systems or non-complex systems.
- They can inhibit imagination in the hazard identification process.
- They would miss hazards that have not been previously seen.

International and Montenegrin standards and regulations

Vazduhoplovni subjekti <i>Aviation entities</i>	Primjenjivi međunarodni i crnogorski standardi i propisi <i>Applicable international and montenegrin standards and regulations</i>			
	Referentni ICAO standard koji sadrži zahtjev za SMS <i>Relevant ICAO standard that includes a request for SMS</i>	Datum primjene ICAO standarda u dijelu koji se odnosi na SMS <i>Date of application of ICAO standard in part related to SMS</i>	Referentni EU/EASA-MNE zahtjevi <i>Relevant EU/EASA-MNE requirements</i>	Datum primjene zahtjeva <i>Date of application of requirements</i>
ANSP	Annex 11-Annex 19	Nov 2001	Reg. 1035/2011 SI CG broj 65/2012	04.01.2013
Operatori aerodroma <i>Airport operators</i>	Annex 14-Annex 19	Nov 2001	Reg. 139/2014 SI.I. CG broj 12/2014	01.10.2014
Operatori aviona i helikoptera koji se koriste u CAT operacijama <i>Operators of airplanes and helicopters used in CAT operations</i>	Annex 6, Part I & III Annex 19	01.01.2009	Reg. 965/2012 SI.I. CG broj 31/2013	28.10.2014
Operatori složenih vazduhoplova na motorni pogon koji nisu CAT i operatori vazduhoplova u komercijalnim operacijama koje nisu CAT <i>Operators of complex motor-powered aircraft not used in CAT and operators of aircrafts used in commercial operations that are not CAT</i>	Annex 6, Part II & III Annex 19	18.11.2010	Reg. 800/2013	tbd
Operatori državnih vazduhoplova <i>State aircraft operators</i>	n/a	n/a	n/a	n/a
Dio M odjeljak G organizacije u sklopu CAT operatora <i>Part M G organizations within the CAT operator</i>	Annex 6, Part I & III Annex 19	01.01.2009	Reg. 965/2012 SI.I. CG broj 31/2013	28.10.2014
Dio M odjeljak G organizacije koje nisu u sklopu CAT operatora <i>Part M G organizations not within the CAT operator</i>	Annex 6, Part II & III	18.11.2010	NPA 2013-01	tbd

International and Montenegrin standards and regulations

Vazduhoplovni subjekti <i>Aviation entities</i>		Primjenjivi međunarodni i crnogorski standardi i propisi <i>Applicable international and montenegrin standards and regulations</i>			
		Referentni ICAO standard koji sadrži zahtjev za SMS <i>Relevant ICAO standard that includes a request for SMS</i>	Datum primjene ICAO standarda u dijelu koji se odnosi na SMS <i>Date of application of ICAO standard in part related to SMS</i>	Referentni EU/EASA-MNE zahtjevi <i>Relevant EU/EASA-MNE requirements</i>	Datum primjene zahtjeva <i>Date of application requirements</i>
Organizacije za održavanje odobrene u skladu sa dijelom M odjeljak F i dijelom 145 <i>Maintenance organizations approved in accordance with Part M F and Part 145</i>		Annex 6 Annex 19	01.01.2009	NPA 2013-01	tbd
Organizacije za održavanje i vođenje kontinuirane plovidbenosti vazduhoplova koji nisu u nadležnosti EASA-e, certifikovane u skladu sa nacionalnim zahtjevima <i>Maintenance organizations and Continuing Airworthiness Management Organization, not certified in accordance with EASA requirements, but under national requirements</i>		n/a	n/a	n/a	n/a
Vazduhoplovni medicinski centar (AeMC) <i>Aeronautical medical centre</i>		n/a	n/a	Reg 1178/2011 Reg 290/2011 SI CG broj 8/2013	08.04.2012
Organizacije za osposobljavanje <i>Training organizations</i>	Pilota aviona Pilota helikoptera <i>Airplane pilots Helicopter pilots</i>	Annex 1-Annex 19	18.11.2010	Reg 1178/2011 Reg 290/2011 SI CG broj 8/2013	TRTO i FTO do 8.4.2014 ili do isteka važećeg JAR odobrenja, što nastupi ranije, a za PPL RF do 08.04.2015 .
	Pilota balona Pilota jedrilica <i>Balloon pilots Sailplane pilots</i>				TRTO i FTO by 8.4.2014 or until expiration of current JAR approval, whichever occurs first, and for PPL RF by 08.04.2015

International and Montenegrin standards and regulations

Vazduhoplovni subjekti <i>Aviation entities</i>	Primjenjivi međunarodni i crnogorski standardi i propisi <i>Applicable international and montenegrin standards and regulations</i>			
	Referentni ICAO standard koji sadrži zahtjev za SMS <i>Relevant ICAO standard that includes a request for SMS</i>	Datum primjene ICAO standarda u dijelu koji se odnosi na SMS <i>Date of application of ICAO standard in part related to SMS</i>	Referentni EU/EASA-MNE zahtjevi <i>Relevant EU/EASA-MNE requirements</i>	Datum primjene zahtjeva <i>Date of application of requirements</i>
Organizacije za osposobljavanje pilota vazduhoplova na koje se ne primjenjuju ICAO zahtjevi (npr. ultraraki, istorijske jedrilice,paragladjeri) <i>Pilot training organizations for aircrafts not certified in accordance with ICAO requirements (for example, ultra light, historic gliders, paragliders)</i>	n/a	n/a	n/a	n/a
Organizacije za osposobljavanje kontrolora leta <i>Training Organization for air traffic controllers</i>	Annex 1-Annex 19	18.11.2010	Reg. 805/2011 Sl.l. CG broj 44/2013	28.09.2013
Dio 147 organizacije <i>Part 147 organizations</i>	Annex 1-Annex 19	18.11.2010	NPA 2013-19	tbd
Organizacije za projektovanje i proizvodnju odobrene u skladu sa Dijelom 21 <i>Part 21 DOA & POA</i>	Annex 8-Annex 19	14.11.2013	tbd EASA MDM.060	tbd



QMS versus SMS

- Both QMS and SMS promote systems approach and continual improvement.
- QMS and SMS may use the same tools and techniques:
 - e.g. performance monitoring – Key Performance Indicators (KPIs),
 - management of business risks,
 - process mapping / system and process analysis,
 - auditing, surveys.
- An effective QMS will support the implementation of effective safety management processes.

BUT

- Quality management systems (QMS) are geared towards customer expectations and contractual/regulatory obligations.
- SMS is about identifying hazards and managing risks.
- Processes designed to produce a quality product/service alone will not guarantee safety (safety is a systems property, not a component property).

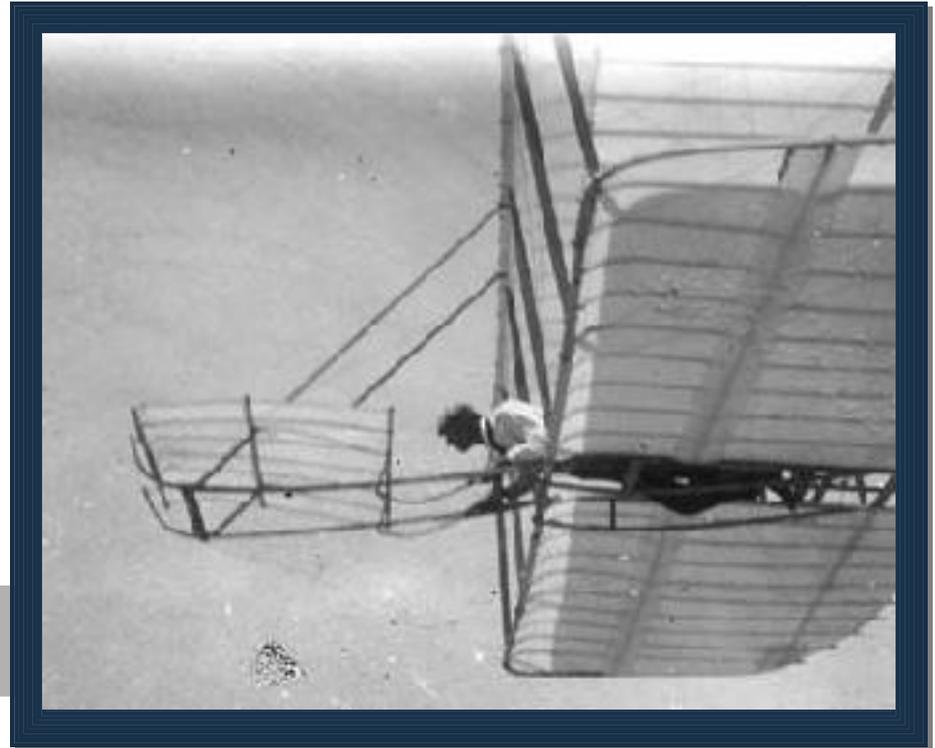
Useful SMS web links, available publications

- <http://cfapp.icao.int/tools/SMikit/story.html>
- <http://www.icao.int/safety/SafetyManagement/Pages/default.aspx>
- <http://www.icao.int/safety/SafetyManagement/Pages/Guidance-Material.aspx>
- <https://www.easa.europa.eu/sms/>
- <http://www.faa.gov/about/initiatives/sms/>
- <http://www.eurocontrol.int/articles/src-publications>
- [http://www.skybrary.aero/index.php/Safety_Management_International_Collaboration_Group_\(SM_ICG\)](http://www.skybrary.aero/index.php/Safety_Management_International_Collaboration_Group_(SM_ICG))
- <http://www.caa.co.uk/default.aspx?catid=872&pagetype=90&pageid=9953>
- http://www.youtube.com/results?search_query=Safety+Management+Systems+%28SMS%29+Fundamentals&sm=3

*“Carelessness and
overconfidence are more
dangerous than
deliberately accepted risk”*
Wilbur Wright, 1901



Wilbur Wright gliding, 1901
Photographs: Library of Congress



Thank you for your attention

Questions?