Folding SMS into Military Aerospace Programs

A Little Merge Work

Folding SMS into Military Aerospace Programs
Agenda

Introduction

Background

The Guts of the Presentation

Folding SMS into Military Aerospace Programs
Quick Acronyms & References

ASI	**Air Safety Investigator**
ASO	**Aviation Safety Official**
DCMA	**Defense Contract Management Agency**
8210.1	**DCMA Instruction – "Contractor's Flight and Ground Operations"** (8210.1C, 21 August 2013, used)

Folding SMS into Military Aerospace Programs
Introduction – The Players

So, who did the work?

- Primary contributors
  - John Karstens and Alex “Sid” Sidlowski
    - Both at the Patuxent River Naval Air Station, Maryland, at the time
    - Aviation safety for defense, commercial and commercial derivative programs
- And we work for
  - The Boeing Company
    - Engineering, Test & Technology

      Mission – Innovate, test and deliver solutions that create a competitive advantage for Boeing and its customers

      - Made up of Boeing Research & Technology and Boeing Test & Evaluation
    - Boeing Test & Evaluation (BT&E)

      Mission – Validate that products and services meet the highest Boeing standards of safety, quality and reliability

Folding SMS into Military Aerospace Programs
Background – "Why the Effort?"

Mandates

- ICAO Annex 19
  Safety Management (applicable – November 2013)
- FAA Advisory Circular (AC) 120-92B (January 8, 2015)
  Safety Management Systems for Aviation Service Providers
  - Applicable to 14 CFR part 121 air carriers
- BT&E Program Directive 2500004D0000 (June 7, 2013)
  BT&E Safety Management System Implementation
  - Handwriting on the wall for OEM, so get out ahead of the game

Folding SMS into Military Aerospace Programs
Background – "Why the Effort?"

US Military Documents

- ***ARMY REGULATION 385–10***
  27 NOVEMBER 2013
  THE ARMY SAFETY PROGRAM

  SUMMARY OF CHANGES

  This major revision --

  o Introduces Army Safety Management System (paras 2-3 and 2-7).

- ***OPNAVINST 3750.6S***
  13 MAY 2014
  NAVAL AVIATION SAFETY MANAGEMENT SYSTEM

  1. Purpose. To issue policies and provisions of the Naval Aviation Safety Management System (SMS). The format, scope and content of this revision differ significantly from the superseded instruction. Changes include compliance with reference (a), the establishment of the SMS, removal of message traffic format and the data collection appendices, which were replaced with data collection in the on-line environment, and clarification of mishap exception rules. This instruction is a complete revision and should be reviewed in its entirety.

Folding SMS into Military Aerospace Programs
Background – "Why the Effort?"

US Military Documents (continued)

- ***AIR FORCE INSTRUCTION 91-202***
  24 JUNE 2015
  THE US AIR FORCE MISHAP PREVENTION PROGRAM

  SUMMARY OF CHANGES

  This document is substantially revised and must be completely reviewed. This revision establishes the Air Force Safety Management System (AFSMS) as the framework for the mishap prevention program. **Chapter 1,** *Program Overview,* introduces and provides the interface of the AFSMS within the mishap prevention program. **Chapter 3,** *Safety Assurance,* has been rewritten to ensure cohesion of the Air Force Inspection System and the required safety oversight process as it relates to Air Force safety assurance. **Attachment 17,** *Annual AFSMS Review Plan,* has been added identifying the annual review requirements for the AFSMS.

- ***AP8000***
  March 2016
  Royal Air Force Safety Management Plan

  1. Purpose. The Safety Management System (SMS) model adopted by the RAF meets the Defence Safety Authority (DSA) requirement that all Defence aviation organizations establish a SMS that is consistent with the requirements laid down in MAA Regulatory Article (RA) 1200 and incorporates wider Health & Safety and Environmental Protection requirements articulated within JSP815. The RAF Safety Management Plan (SMP) describes the organization, processes and procedures by which the RAF manages all aspects of Safety.

Folding SMS into Military Aerospace Programs
Background – "Why the Effort?"

Why SMS . . . ?

- Contributions to a safer enterprise
  - Emphasizes safety management as a *fundamental business process* to be considered in the same manner as other aspects of business management
  - Implement a framework and integrate methodologies *to more effectively manage safety*
  - *Commonality* across BT&E, the enterprise, and customers (including military)

The safety of the aviation industry is of critical importance both in terms of accident / incident prevention and the financial performance of the industry. The development of Safety Management Systems (SMS) and their endorsement by the International Civil Aviation Organisation (ICAO) facilitates a more coordinated approach of the various elements that **create a safe operation**.

Cranfield University SMS in Aviation Web Site

Folding SMS into Military Aerospace Programs
Background – "Why the Effort?"

. . . and why Pax River?

- Demonstrate value sooner – realize opportunity to accelerate implementation
  - Take advantage of mature, highly-compliant flight test programs to create SMS-compliant / replicable model
  - PAX programs more in line with ICAO/FAA SMS requirements through compliance with USG Ground/Flight Risk Clause (DCMAI 8210.1)

Without a firm understanding of the procedures necessary at the lowest levels, an organization cannot create an effective, efficient process flow for all levels

Folding SMS into Military Aerospace Programs
Background -

SMS - FTVS PAX SMS Pilot Project
Project Plan Elements/Phasing

PAX SMS Pilot Project 4x **Plan Elements**

- Improvements to achievements of previous gap analyses
- Mapping of supporting documentation
- Develop the Model
- Transition Model to Template

Straight-forward 2-Phase Execution

	Phase	Effort	Begin	End	Exit Criterion (Deliverable)
Pilot	I **Concept**	Prepare Dev & Test Plan	ASAP	11/18/2015	Plan Approval (Approved 11/18/2015)
	II **Dev & Test** (FTVS)				
	Pax River	Build/Complete Model	01/04/2016	09/09/2016	FTVS C-Level Pkg – Model Complete
	Palmdale	Beta Test Model (V&V)	09/12/2016	12/16/2016	FTVS C-Level Pkg – Model to Template

Exit Criteria

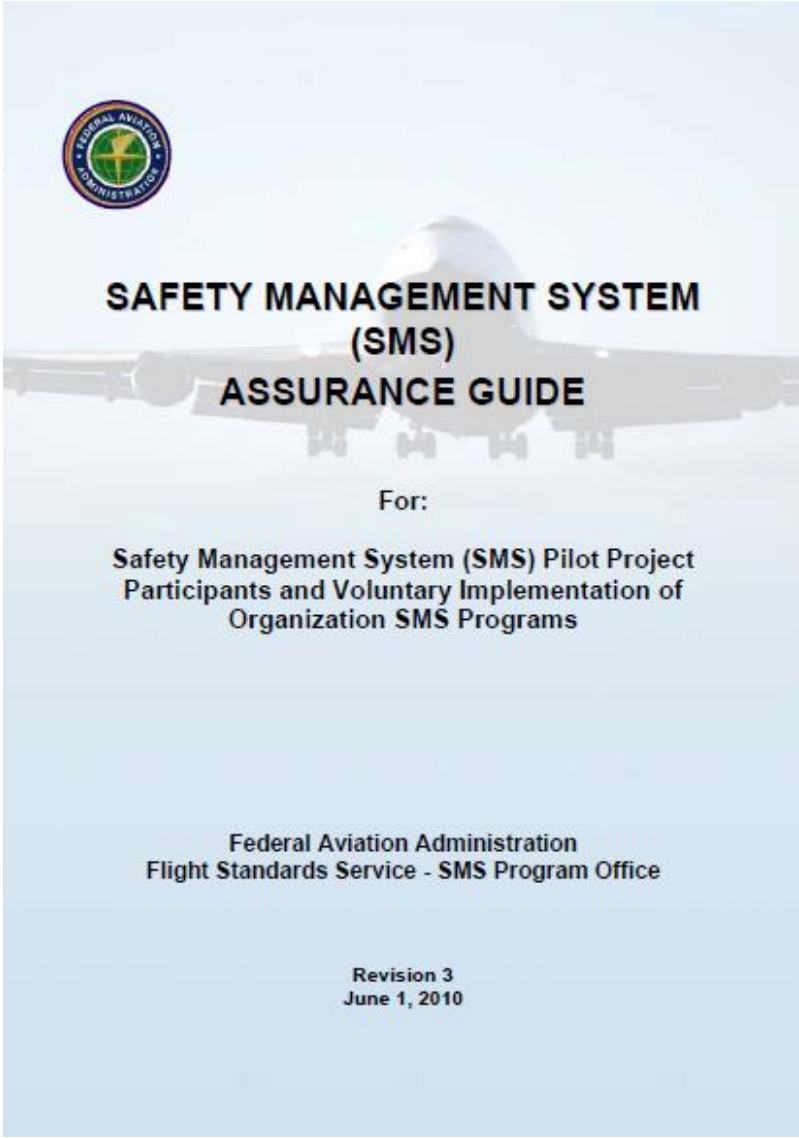
C-Level Package Components:
- Requirements Mapping
- Implementation Checklist
- Hybrid Implementation Tool

Folding SMS into Military Aerospace Programs
Element 1 – Improvements to . . . gap analyses

Two previous gap analyses

- Provided a general path forward within scope of each
  - Preliminary gap analysis – ____ questions
  - Detailed gap analysis – 75 questions
- Still left a “gap” to comprehensive SMS implementation

Folding SMS into Military Aerospace Programs
Element 2 – Mapping . . . documentation



Folding SMS into Military Aerospace Programs
Element 2 – Mapping . . . documentation

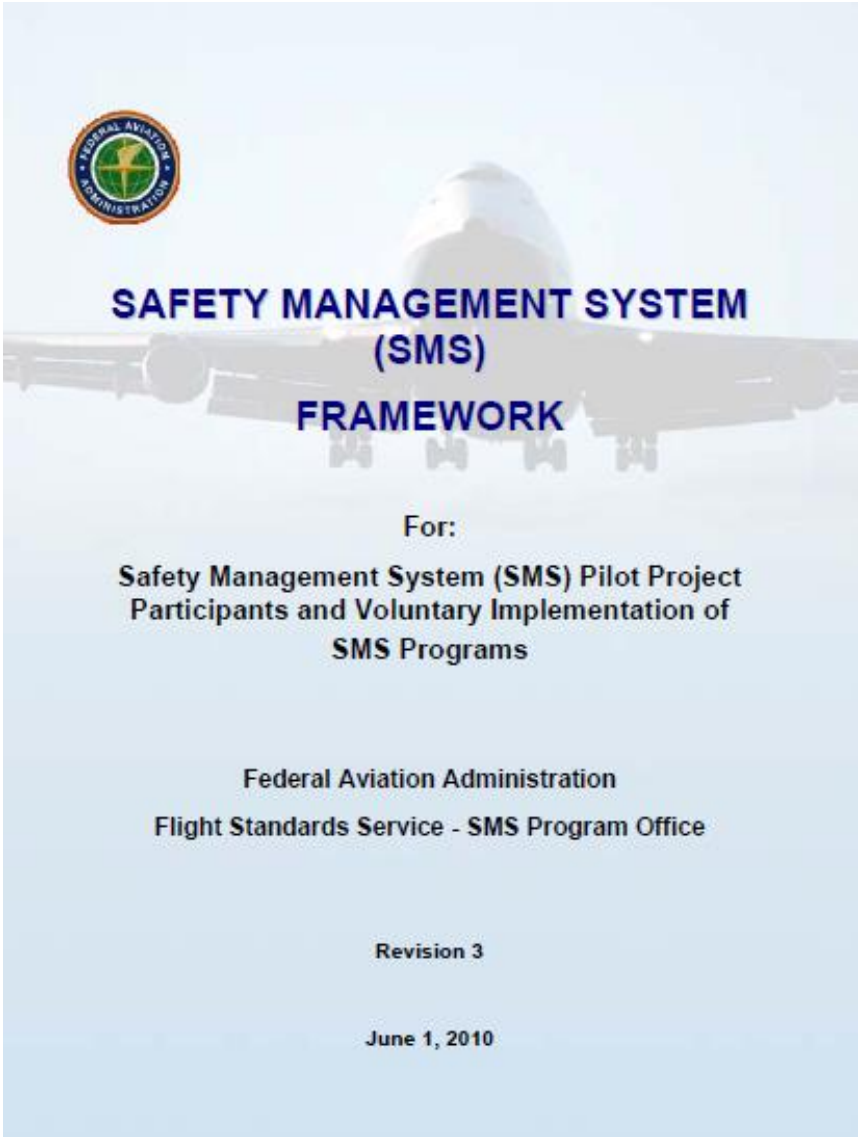
Component 2.0 Safety Risk Management

General Expectations

Performance Objective
The organization will develop processes to understand the critical characteristics of its systems and operational environment and apply this knowledge to identify hazards, analyze and assess risk and design risk controls.

Design Expectations
Input
The organization will identify inputs (interfaces) for this Component obtained from the critical expectations of its systems and operational environment. Reference: *SMS Framework 1.5 b, (1) (f)* (I)
Management Responsibility
The organization will clearly identify who is responsible for the quality of the Safety Risk Management Process. Procedures will also define who is responsible for accomplishing the process. Reference: *SMS Framework 1.2 b, (3)* (R/A)
Procedure
Does the organization's SMS, at a minimum, include the following processes -
System description and task analysis? *Reference: SMS Framework 2.0 b, (1) (a)* (P)
Hazard Identification? *Reference: SMS Framework 2.0 b, (1) (b)* (P)
Safety Risk Analysis? *Reference: SMS Framework 2.0 b, (1) (c)* (P)
Safety Risk Assessment? *Reference: SMS Framework 2.0 b, (1) (d)* (P)
Safety Risk Control and Mitigation? *Reference: SMS Framework 2.0 b, (1) (e)* (P)
Does the organization's SMS processes apply to -
Initial designs of systems, organizations, and/or products? *Reference: SMS Framework 2.0 b, (2) (a)* (P)
The development of operational procedures? *Reference: SMS Framework 2.0 b, (2) (b)* (P)

Folding SMS into Military Aerospace Programs
Element 2 – Mapping . . . documentation



Folding SMS into Military Aerospace Programs
Element 2 – Mapping . . . documentation

COMPONENT 2.0 SAFETY RISK MANAGEMENT (SRM).

a. Performance Objective: The organization will develop processes to understand the critical characteristics of its systems and operational environment and apply this knowledge to identify hazards, analyze and assess risk and design risk controls.

b. General Design Expectations:

(1) SRM will, at a minimum, include the following processes:

(a) System description and task analysis,

(b) Hazard identification,

(c) Safety risk analysis,

(d) Safety risk assessment, and

(e) Safety risk control and mitigation.

(2) The SRM process will be applied to:

(a) Initial designs of systems, organizations, and/or products;

(b) The development of operational procedures;

Folding SMS into Military Aerospace Programs
Element 2 – Mapping . . . documentation

Developing our organizational model

- Both a detailed gap analysis and the FAA SMS Assurance Guide indicated that compliance required effort at different levels of the organization.
- Being ex-US Air Force flightcrew, Sid and I fell back on an organizational concept (for modeling our effort) that made sense to us:

AF Structure:	BT&E Equivalent:	Level:
Major Command	BT&E	"A"
Numbered Air Force	Flight Test / Lab Test	"B"
Wing	Capability / Site / Program	"C"

Folding SMS into Military Aerospace Programs

Element 3 – Develop the Model "Implementation Checklist"

	Section	Framework Component / Element / Process #		Performance Objective	Design Expectations	Rev 3 / 1 Jun 10 SMS Framework Reference	Core Level of Applicability	Flowdown Level B	Flowdown Level C	Applicability to DGA Questions	Notes
9	POL	Element 1.1	Safety Policy	Top management will define and document the organization's safety policy and convey its expectations and objectives to its employees.		1.1 a.	A	X	X		
10					Top management has defined and signed the organization's safety policy.	1.1 b. (1)	A				
11					Safety policy will:	1.1 b. (2)					
12					include a commitment to implement and maintain the SMS.	1.1 b. (2) (a)	A	X			
13					include a commitment to continuously improve the level of safety.	1.1 b. (2) (b)	A	X	X		
14					include a commitment to the management of safety risk through a risk-based, data-driven decision making processes.	1.1 b. (2) (c)	A	X	X	**DGA Q72**	
15					include a commitment to comply with applicable regulatory requirements.	1.1 b. (2) (d)	A	X			
16					include a commitment to encourage employees to report safety issues without reprisal. (see Framework Process 3.1.6)	1.1 b. (2) (e)	A	X	X	See also 3.1.6 b. (2) (e) and **DGA Q38 & Q39** (plus **DGA Q70**)	
17					establish clear standards for acceptable operational behavior for all employees.	1.1 b. (2) (f)	A	X	X		
18					provide management guidance for setting safety objectives.	1.1 b. (2) (g)	A	X		**DGA Q03** (see also **DGA Q62**)	
19					provide management guidance for reviewing safety objectives.	1.1 b. (2) (h)	A	X		**DGA Q03** (see also **DGA Q62**)	
20					be documented.	1.1 b. (2) (i)	A	X	X		
21					be communicated, with visible management endorsements, to all employees and responsible parties.	1.1 b. (2) (j)	A	X	X	**DGA Q01** (see also **DGA Q68**)	
22					be reviewed periodically to ensure it remains relevant and appropriate to the organization.	1.1 b. (2) (k)	A	X	X	Addition from DGA: Re-communicate if changed - **DGA Q02**.	
23					identify responsibility and accountability of management and employees with respect to safety performance.	1.1 b. (2) (l)	A	X			

Implementation Checklist | DGA X-Ref | X-Ref_8210 | Notes & Stuff

286 total lines
85 "blank" lines (81) and moved items (4)
201 actionable items

Folding SMS into Military Aerospace Programs

Element 3 – Develop the Model "Implementation Checklist"

					Rev 3 / 1 Jun 10		Flowdown			
Section	Framework Component / Element / Process #		Performance Objective	Design Expectations	SMS Framework Reference	Core Level of Applicability	Level B	Level C	Applicability to DGA Questions	Notes
POL	**Element 1.2**	**Management Commitment and Safety Accountabilities**	The organization will define, document, and communicate the safety roles, responsibilities, and authorities throughout its organization.		1.2 a.	**A / B / C**				
				Top management will have the ultimate responsibility for the SMS.	1.2 b. (1)	**A**				
				Top management will provide resources essential to implement and maintain the SMS.	1.2 b. (2)	**A**			**DGA Q07** (see also **DGA Q73**)	
				~~Aviation~~ Safety-related positions, responsibilities, and authorities will be:	1.2 b. (3)					
				Defined.	1.2 b. (3) (a)	**A / B / C**				
				Documented.	1.2 b. (3) (b)	**A / B / C**			**DGA Q08**	
				Communicated throughout the organization.	1.2 b. (3) (c)	**A / B / C**			**DGA Q09**	
				The organization will define levels of management that can make safety risk acceptance decisions. (as described in Component 2.0, b (4)(c))	1.2 b. (4)	**A / B**			**DGA Q10**	

Folding SMS into Military Aerospace Programs

Element 3 – Develop the Model "Implementation Checklist"

					Rev 3 / 1 Jun 10		Flowdown			
Section	Framework Component / Element / Process #		Performance Objective	Design Expectations	SMS Framework Reference	Core Level of Applicability	Level B	Level C	Applicability to DGA Questions	Notes
SA	**Process 3.1.5**	**Investigation**	The organization will establish procedures to collect data and investigate incidents, accidents, and instances of potential regulatory non-compliance to identify potential new hazards or risk control failures.		3.1.5 a.	**A / B / C**				
				To identify potential new hazards or risk control failures, the organization will collect data on:	3.1.5 b. (1)				**DGA Q37** (Part b)	
				Incidents.	3.1.5 b. (1) (a)	**A / B / C**				
				Accidents.	3.1.5 b. (1) (b)	**A / B / C**				
				Potential regulatory non-compliance.	3.1.5 b. (1) (c)	**A / B / C**			**DGA Q37** (Part a)	
				To identify potential new hazards or risk control failures, the organization will establish procedures to investigate:	3.1.5 b. (2)				**DGA Q37** (Part b)	
				Accidents.	3.1.5 b. (2) (a)	**A / B / C**				
				Incidents.	3.1.5 b. (2) (b)	**A / B / C**				
				Instances of potential regulatory non-compliance.	3.1.5 b. (2) (c)	**A / B / C**			**DGA Q37** (Part a)	

A little Air Safety Investigation motivation . . .

> The organization will establish procedures to collect data and investigate incidents, accidents, and instances of potential regulatory non-compliance to identify potential new hazards or risk control failures.

Folding SMS into Military Aerospace Programs
Element 3 – Develop the Model "Implementation Checklist"

Cross-references

- DGA

		Implementation Checklist		
DGA Q#	**Question Text**	**Paragraph**	**Line #**	**Notes**
1	Is the BT&E safety policy communicated with visible endorsement by LTVS leadership or FTVS leadership to management and employees and responsible parties?	1.1 b. (2) (j)	21	
2	When revised, is the BT&E safety policy re-communicated with visible endorsement by LTVS leadership or FTVS leadership to management and employees?	1.1 b. (2) (k)	22	
3	Does LTVS / FTVS Leadership visibly communicate responsibilities and accountabilities regarding safety objectives to management and employees?	1.1 b. (2) (g) 1.1 b. (2) (h)	18 19	
4	Does LTVS / FTVS Leadership ensure procedures with measurable criteria to accomplish safety objectives are implemented?	1.5 b. (1) (b)	45	
5	Does LTVS / FTVS Leadership ensure establishment and maintenance of operational controls to ensure procedures are followed for safety-related operaions and activities?	2.1.1 b. (1) (b) 3.1.2 b. (4) (a) 1. 3.1.2 b. (1)	107 151 160	
6	Does LTVS / FTVS Leadership establish and maintain a safety management plan describing how they will achieve their safety objectives?	1.5 b. (1) (b)	45	
7	Does LTVS / FTVS Leadership provide resources required to implement and maintain the SMS?	1.2 b. (2) 4.0 b. (1) (g)	26 267	
8	Are LTVS and FTVS safety-related positions, responsibilities, accountabilities and authorities documented?	1.2 b. (3) (b)	29	
9	Are LTVS and FTVS safety-related positions, responsibilities, accountabilities and authorities communicated throughout the organization?	1.2 b. (3) (c)	30	
10	Does LTVS / FTVS Leadership define levels of management that can make safety risk acceptance decisions as described in Element 2.2(2).	1.2 b. (4)	31	
11	Has LTVS / FTVS Leadership ensured development and implementation of procedures, as necessary, that it will follow in the event of an accident and incident?	1.4 b. (2)	40	
12	Does LTVS / FTVS Leadership maintain records of outputs of safety risk management and safety assurance processes in accordance with the Master Records Retention Schedule?	1.5 a. 1.5 b. (1) (g)	42 50	
13	Are hazards identified and risks mitigated during the initial designs of systems, organizations, and/or products and the operation and maintenance of these systems, organizations, and/or products?	2.0 b. (2) (a)	91	
14	Are hazards identified and risks mitigated during the development of design and test processes and procedures?	2.0 b. (2) (b)	92	

Folding SMS into Military Aerospace Programs
Element 3 – Develop the Model "Implementation Checklist"

Cross-references

- DCMA 8210.1

		Implementation Checklist		
Para #	**Question Text**	**Paragraph**	**Line #**	**Notes**
6.1	Mishap Prevention Program	1.5 b. (1) (d)	47	
6.1.1	Designation of an Aviation Safety Official	1.2 b. (3) (b) 1.5 b. (1) (e)	29 48	
6.1.2	Risk Management	2.0 b. (1) 2.2.3 b. (1)-(2) 3.0 b. (1)	84 127-128 134	
6.1.3	Establish hazard identification and elimination procedures	1.4 b. (1) 2.0 b. (1) (b)-(e)	39 86-89	
6.1.4	Establish a contractor aviation safety council (AKA consolidated safety council)			
6.1.5	Conduct monthly flight safety meetings			
6.1.6	Conduct regular safety audits or assessments	3.1.2 a.	150	
6.1.7	Bird/Animal Avoidance and Strike Hazard (BASH) Program	1.4 b. (1) 2.0 b. (1) (b)-(e)	39 86-89	
6.1.8	Mid-Air Collision Avoidance (MACA) Program	1.4 b. (1) 2.0 b. (1) (b)-(e)	39 86-89	
6.1.9	Make safety publications readily available to all aircrew members			
6.1.10	Aircraft Damage Reporting Procedures			
6.1.11	Aircraft Mishap Reporting Procedures			
6.1.12	Establish procedures for the handling of "privileged" data			
6.1.13	Mishap Response Plan (MRP) (or Premishap Plan)	1.4 b. (2)-(3) 3.1.5 b. (2) (a)-(b)	40-41 202-203	

Folding SMS into Military Aerospace Programs

Element 3 – Develop the Model "Implementation Tool" ("Workbook")

1.0 SAFETY POLICY

1.1 Policy Elements

BT&E top-level management shall define and sign the organization's safety policy.

At the P/C-level, leadership shall reiterate some of the upper-level elements to provide definition for local implementation. P/C-level management shall:			
1.1.1 Include a commitment to continuously improve the level of safety [Ref 2: 1.1 b. (2) (b)]			
See – P/C-level "Management Safety Policy"			
Status:	Choose an item.	**As of:**	Click here to enter a date.

1.1.2 Include a commitment to the management of safety risk through risk-based, data-driven decision-making processes. [Ref 2: 1.1 b. (2) (c); Ref 5: DGA Question 72]			
See – P/C-level "Management Safety Policy"			
Status:	Choose an item.	**As of:**	Click here to enter a date.

1.1.3 Include a commitment to encourage employees to report safety issues, including safety improvements and solutions (either confidentially or anonymously – if desired) without fear of reprisal. [Ref 2: 1.1 b. (2) (e); Ref 5: DGA Questions 38, 39 & 70] (See also 3.1.6)			
See – P/C-level "Management Safety Policy"			
Status:	Choose an item.	**As of:**	Click here to enter a date.

1.1.3.1 Implement an effective employee reporting and feedback system. [Ref 5: DGA Question 70]			
See – P/C-level "Management Safety Policy"			
Status:	Choose an item.	**As of:**	Click here to enter a date.

Folding SMS into Military Aerospace Programs

Element 3 – Develop the Model "Implementation Tool" ("Workbook")

1.5.4 Dated (with original dates and dates of revisions). **[Ref 2: 1.5 b. (3) (a) 2]**			
☒ *Insert compliance methodology*			
Status:	Choose an item.	**As of:**	Click here to enter a date.

1.5.5 Maintained in an orderly manner. [Ref 2: 1.5 b. (3) (a) 4]			
☒ *Insert compliance methodology*			
Status:	Choose an item.	**As of:**	Click here to enter a date.

1.5.6 Retained for a specified period of time (as determined by the organization). **[Ref 2: 1.5 b. (3) (a) 5]**			
☒ *Insert compliance methodology*			
Status:	Choose an item.	**As of:**	Click here to enter a date.

During this time, these documents must be periodically:

1.5.6.1 Reviewed. [Ref 2: 1.5 b. (3) (b) 2 (a)]			
☒ *Insert compliance methodology*			
Status:	Choose an item.	**As of:**	Click here to enter a date.

Workbook provides implementation tracking for SMS for the organization.

Once completed by the user, the workbook feeds the development of the corresponding SMS supplement (template).

Folding SMS into Military Aerospace Programs
Element 4 – Transition Model to Template

Overview

This document details the safety pr
Boeing Test and Evaluation (BT&E),
management system. These eleme

- Reducing or eliminating the
(e.g., aircraft, equipment, s
- Complying with regulatory

The following sections, evolved fro
and 2) and corresponding to the fo

- Safety Policy
- Safety Risk Management
- Safety Assurance
- Safety Promotion (*including*

Additional sections pertinent to SM

- Employee Duties and Respo
- Defense Contract Manage
Instruction 8210.1 Respons

Applicable attachments pertinent t

- Hazard Identification, Asses
- Hazard Tracking
- CAPA
- Communications Plan
-
- Sample "Management Safe

Appendix __ to the FTVS SMS Supplement **Location, ST**

References

1. Safety Management System (SMS) Assurance Guide – For: . . . Voluntary Implementation of Organization SMS Programs, Federal Aviation Administration, Revision 3, June 1, 2010
2. Safety Management System (SMS) Framework – For: . . . Voluntary Implementation of Organization SMS Programs, Federal Aviation Administration, Revision 3, June 1, 2010
3. Defense Contract Management Agency Instruction 8210.1C, dated 21 August 2013
4. Boeing Test and Evaluation Safety Management System Manual (Doc #: D6-85134, 11 April 2013)
5. Boeing Test and Evaluation Safety Management System Detailed Gap Analysis Questionnaire

Overview

This document details the safety program elements of the _____ [program / capability] in Boeing Test and Evaluation (BT&E), as applicable to implementation and sustainment of a viable safety management system. These elements aim to preserve assets and continuing operations by:

- Reducing or eliminating the risk of injury to personnel or damage to or loss of assets (e.g., aircraft, equipment, supplies)
- Complying with regulatory requirements, the BT&E SMS, and Boeing policies and procedures

The following sections, evolved from the BT&E Implementation Spreadsheet (built using References 1 and 2) and corresponding to the four pillars of a SMS, are addressed in this document: