

AS9100C and SMS: GAP Comparison

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## AS9100C and SMS GAP

The FAA-AIR has tasked the Center for General Aviation Research (CGAR) to contrast the requirements of AS9100C with the Design and Manufacturing (D&M) SMS framework.

Table 1 in this document includes said comparison.

The comparison uses the December 21, 2010, *SMS FRAMEWORK: D&M Safety Management System (SMS) Pilot Project Participants and Voluntary Implementation of SMS Programs* for the SMS standard. The AS9100C source was from the SAE Aerospace Standard AS9100 Rev C.

The following columns exist in Table 1:

- **Item.** This is a summary of the relevant SMS area.
- **SMS.** The section(s) of the SMS being compared. There will always be an entry in this column.
- **AS9100C.** The section(s) of AS9100C similar to SMS. There will only be an entry in this column if a similarity exists.
  - **Rating.** A numerical rating as described by the rubric in Table 2.
  - **Rating Scale.** A graphical representation of the numerical rating using the same rubric in Table 2.
- **Notes.** A brief notation expanding on the nature of the similarity/differences.

The comparison was accomplished by examining each item in the SMS standard and then searching for a similar item in the AS9100C standard. Thereafter, all differences between SMS and AS9100C were tabulated. The GAP analysis of SMS and AS9100C was then reviewed to identify where AS9100C differences impacted the SMS to arrive at a AS9100C GAP analysis.

The inverse process—examining each item in the AS9100 standard and then searching the SMS standard—was not accomplished. The result of an inverse process would have been a complete enumeration in Table 1 of all AS9100 areas. However, with certain qualifications, any AS9100 area not shown in Table 1 is shown in Table 3.

### **Discussion**

The process of comparing SMS and AS9100C intends to represent an objective contrast of the two frameworks, however limitations of the approach inevitably introduce subjectivity. A group environment, involving three to five subject matter experts in SMS and AS9100C would help advance the present document to a more objective state.

### **Conclusions**

An inspection of the contrasts in Table 1 lead to helpful conclusions to transform an AS9100 organization to an SMS compliant organization. SMS Component 1.0, Safety Policy, is covered by AS9100 (4), Quality Management System, and (5), Management Responsibility. However, in many cases the scope of AS9100 is focused on quality and is silent to safety. Therefore, the transformation of an AS9100 environment to SMS requires attention to the safety scope aspects.

As for SMS Component 2.0, Safety Risk Management (SRM), and Component 3.0, Safety Assurance (SA), AS9100 is lacking. AS9100 does not specifically cover risk management and controls, and the safety assurance area lacks specific mention of an employee reporting and feedback system. AS9100C improves upon AS9100B, adding in mention of risk, configuration management, and process change controls. However, as Table 1 shows, many gaps still exist between AS9100C when compared to the SMS SRM guidance.

SMS Component 4.0, Safety Promotion, is also not covered with great depth by AS9100. The key area lacking in AS9100 is the concept of data sharing and the scope of AS9100 is limited to promotion of the QMS, being silent to safety.

In summary, and significantly, across all SMS components, AS9100 does not overtly manage safety; rather it manages quality. While this may be perceived as a semantical difference, it is a significant area that must be addressed by the AS9100 organization in its transformation to a SMS.

Table 1					
Item	SMS	AS9100C	Rating	Rating Scale	Notes
Define & Sign Organization Safety Policy	1.0, 1.1(1)	5.1	4	-----   ----4-	SMS requires a signature; AS9100 does not. Safety vs. Quality.
Implement, Maintain, Improve SMS	1.1, 1.1(2)(a)	4.1, 4.1(f), 5.1	2	-----   -2---	SMS safety, QMS quality
Identify & Comply with Legal/Regulatory Requirements	1.1(2)(b)	4.1(a), 5.1(a)	0	-----0-----	
Encourage employee report safety issues	1.1(2)(c)	6.2.2(d)	5	-----   ----5	AS9100 does not mention employee reporting of safety issues
Clear Standards Acceptable Employee Operational Behavior	1.1(2)(d)	6.2.1, 6.2.2(d), 6.2.2(a)	3	-----   --3--	Does not state "establish clear standards"
Management Guidance for Setting Safety Objectives	1.1(2)(e)	5.4.1, 5.4.2(a), 7.1.2, 7.2.2(d-e)	2	-----   -2---	SMS sets "safety" objectives; AS9100 sets "quality" objectives
Management Guidance for performance review in accord with safety objectives	1.1(2)(f)	5.1(d), 5.3(c)	2	-----   -2---	SMS safety, QMS quality
Safety Policy is Documented	1.1(2)(g)	4.2-4.2.1(b), 4.2.2	2	-----   -2---	SMS safety, QMS quality
Communicated with visible management endorsement to all employees/responsible parties	1.1(2)(h)	5.1, 5.1(a), 5.3(d), 5.5.3	0	-----0-----	

Table 1					
Item	SMS	AS9100C	Rating	Rating Scale	Notes
Safety Policy reviewed periodically to insure relevance/appropriate	1.1(2)(i)	4.1(c), 4.2.3(b), 5.1(d), 5.3(e), 5.6, 5.6.1, 8.1(c), 8.5, 8.5.1	2	-----   -2----	SMS safety, QMS quality
Identify responsibility/accountability of management and employees with respect to safety objectives	1.1(2)(j)	5.5-5.5.2, 5.5.2(d)	4	-----   ---4-	AS9100 does not mention "accountability" only "authority"; SMS safety, QMS quality
Safety Management applies to complete scope/life cycle of organizational system	1.1(2)(k)	4.1(a), 4.1 (Notes 1-3), 7.1.2, 7.2.2(d-e)	3	-----   --3--	AS9100 does not require "complete" scope; SMS safety, QMS quality
Processes and SMS outputs must be documented/recorded, monitored, measured, and analyzed	1.1(2)(l)	4.1(d)-4.1(f), 4.2.4, 5.6- 5.6.2, 8, 8.1, 8.2.2-8.2.3, 8.4, 7.1.2	2	-----   -2----	SMS safety, QMS quality
Establish and maintain procedures with measurable criteria to accomplish objectives of safety policy	1.1(3)	4.1(a)-4.1(c), 7.1.2	2	-----   -2----	SMS safety, QMS quality
Establish and maintain supervisory and operational controls to ensure safety-related operation/activities procedures followed	1.1(4)	4.1(c), 7.1.3	4	-----   ---4-	AS9100 lacks reference to: (1) supervisory controls; (2) as well as a distinction of safety-related operations; SMS safety, QMS quality

Table 1					
Item	SMS	AS9100C	Rating	Rating Scale	Notes
Establish and maintain current safety management plan to describe how safety objectives achieved	1.1(5)	4.2.1(a), 5.4.2(a)	4	-----   ----4-	AS9100 not specific to a "safety management" plan or "safety" objectives
Management Commitment and Safety Accountabilities (Generally)	1.2	5.5.1	2	-----   -2---	AS9100 does not mention "safety" or "roles"
Appoint Accountable Executive with ultimate accountability for SMS	1.2(1)	5.5.2, 5.5.2(d)	4	-----   ----4-	AS9100 does not use word (concep) "accountable"; SMS safety, QMS quality
Top management provides resources essential to implement/maintain SMS	1.2(2)	5.1(e), 6.1(a)	2	-----   -2---	SMS safety, QMS quality
Aviation safety-related positions, responsibilities, authorities defined, documented, communicated	1.2(3)- 1.2(3)(c)		5	-----   ----5	AS9100 silent to safety-related positions
Organization defines levels of management that can make safety risk acceptance decisions	1.2(4)		5	-----   ----5	AS9100, none
Top management ensures QMS consistent with SMS	1.2(5)		5	-----   ----5	AS9100 has no complementary, "SMS consistent with QMS"
Identify an Accountable Executive	1.3, 1.3(1)	5.5.2	3	-----   --3--	AS9100 does not use "accountable" term
Accountable Executive is final authority over operations associated with certificate/approvals	1.3(1)(a)		5	-----   ----5	none

Table 1					
Item	SMS	AS9100C	Rating	Rating Scale	Notes
Accountable Executive controls financial resources associated with certificate/approvals	1.3(1)(b)		5	-----   -----5	none
Accountable Executive controls human resources associated with certificate/approvals	1.3(1)(c)		5	-----   -----5	none
Accountable Executive retains ultimate responsibility for safety performance of operations associated with certificate/approvals	1.3(1)(d)	5.5.2(b)	4	-----   ----4-	only must report performance and needs of QMS; SMS safety, QMS quality
Accountable Executive must ensure SMS is properly implemented/performing throughout organization	1.3(2), 1.3(2)(a)	5.5.2(a)	2	-----   -2----	AS9100 not clear "throughout organization"; SMS safety, QMS quality
Accountable Executive develop and sign the organization safety policy	1.3(2)(b)		5	-----   -----5	AS9100 does not mention safety nor any signing requirement
Accountable Executive (AE) communicate safety policy throughout organization	1.3(2)(c)	5.5.2(c), 5.5.3	4	-----   ----4-	AS9100 emphasizes customer requirements, not policy; AS9100 no mention of safety and AE
Accountable Executive (AE) regularly review safety policy	1.3(2)(d)	5.5.2(b), 5.6.1	4	-----   ----4-	AS9100 regular review not specific to AE; SMS safety, QMS quality



Accountable Executive (AE) regularly review safety performance and direct actions to address substandard performance	1.3(2)(e)		5	-----   -----5	AS9100 does not assign this action to AE; SMS safety, QMS quality
Accountable Executive (AE) designation of management representative	1.3(3)		5	-----   -----5	AS9100 misses this layer * see AS9100, 5.5.2
Designate management representative establishes, implement, maintain SMS process/procedures	1.3(3)(a)	5.5.2(a)	4	-----   ----4-	AS9100 misses AE/designated rep layer; SMS safety, QMS quality
Designate management representative facilitate hazard identification/safety risk analysis	1.3(3)(b)		5	-----   -----5	none
Designate management representative monitoring effectiveness safety risk controls	1.3(3)(c)		5	-----   -----5	none
Designate management representative ensuring safety promotion throughout organization	1.3(3)(d)	5.5.2(c)	4	-----   ----4-	AS9100 AE/designated rep not separated; AS9100 not mention safety promotion (instead customer requirements)
Designate management representative regularly report to Accountable Executive (AE) on SMS performance and need for improvement	1.3(3)(e)	5.5.2(b)	4	-----   ----4-	AS9100 AE/designated rep not separated; SMS safety, QMS quality
Emergency preparedness and response	1.4		5	-----   -----5	none
SMS Documents and Records	1.5	4.2; 7.2.2	2	-----   -2---	SMS safety, QMS quality

Maintain records of outputs of SRM and SA processes as long as effected product remains in service	1.5(1)		5	-----   -----5	AS9100 no SRM/SA processes
Maintain training records for a minimum of 24 consecutive months after training completion	1.5(2)	4.2.4, 6.2.2	1	-----   1-----	AS9100 does not specify 24 months, but does say will conform to regulatory requirements
Retain records of all safety communication for 24 months minimum	1.5(3)		5	-----   -----5	none
Safety Risk Management (SRM)	2.0	3.1-3.4	4	-----   ---4-	AS9100 defines risk terms
Hazard identification and analysis	2.1	7.1.1; 7.1.2	4	-----   ---4-	AS9100 mentions risk in the sense of product realization risks rather than safety context
SRM applied to initial designs of systems, organizations, products; operation and maintenance of same	2.1(1), 2.1(1)(a)	7.2.2, 7.1.2, 7.2.2(d, e)	4	-----   ---4-	AS9100 recognizes special requirements; mentions risk in the sense of product realization risks rather than safety context
SRM applied to development of design and manufacturing processes and procedures	2.1(1)(b)	7.1.2, 7.2.2(d,e), 7.5.1.1(g-k), 7.5.1.2, 7.5.1.3	4	-----   ---4-	AS9100 has repeated first article inspection and control of production process changes
SRM applied to new or recurring hazards identified during SA	2.1(1)(c)	7.5.1.4	4	-----   ---4-	AS9100 collects in-service data for defect identification

SRM applied to planned changes to design and manufacturing processes, including product, component, part design changes, maintenance, instructions, assumptions	2.1(1)(d)	7.1.2, 7.2.2(d,e), 7.5.1.1(g-k), 7.5.1.2, 7.5.1.3	4	-----   ----4-	AS9100 has repeated first article inspection and control of production process changes
System Description and Analysis	2.1.1, 2.1.1(1)		5	-----   ----5	
Identify Hazards	2.1.2- 2.1.2(2)(b)	7.1.1, 7.1.2	4	-----   ----4-	AS9100 mentions risk but is absent system description context
Risk Assessment and Control	2.2-2.2(3)	7.1.1, 7.1.2	3	-----   ----3-	AS9100 makes mention of risk assessment
Analyze Safety Risk	2.2.1- 2.2.1(1)(d)(2)		5	-----   ----5	
Assess Safety Risk	2.2.2, 2.2.2(1)		5	-----   ----5	
Control/Mitigate Safety Risk	2.2.3-2.2.3(3)		5	-----   ----5	
Safety Assurance	3.0		5	-----   ----5	
Safety Performance Monitoring and Measurement	3.1-3.1(2)		5	-----   ----5	
Continuous Monitoring	3.1.1- 3.1.1(1)(d)	7.5.1.4	4	-----   ----4-	AS9100 has post-delivery support and in-service data collection
Internal Audit	3.1.2	8.2.2- 8.2.2(b)	0	-----0-----	
Audits conducted account for safety critical systems	3.1.2(1), 3.1.2(1)(a)		5	-----   ----5	

Audits conducted account for previous internal and external audits	3.1.2(1)(b)	8.2.2	0	-----0-----	
Scope will cover entire SMS within a specified timeframe	3.1.2(2)	8.2.2	2	-----  -2---	SMS safety, QMS quality
Internal audit analysis of data will include results of external assessments	3.1.2(3)		5	-----  -----5	
Internal Evaluation of risk controls	3.1.3-3.1.3(2)		5	-----  -----5	
Investigation	3.1.4	7.5.1.4(b)	1	-----  1-----	
Employee Reporting and Feedback System	3.1.5-3.1.5(5)		5	-----  -----5	
Analysis of risk control data	3.1.6- 3.1.6(1)(d)		5	-----  -----5	
System Assessment	3.1.7-3.1.7(7)		5	-----  -----5	
Management Review	3.1.8, 3.1.8(1)	5.6	1	-----  1-----	AS9100 is not specific to annually
Management Review of safety policy, SRM, SA, and Safety Promotion	3.1.8(1)(a)- 3.1.8(1)(d)		5	-----  -----5	
Management Review assessment of need for improvements	3.1.8(2)	5.6.1, 5.6.2(g), 5.6.3(a)	0	-----0-----	
Top management will distribute findings and actions to employees	3.1.8(3)		5	-----  -----5	
Top management will maintain records of reviews and findings	3.1.8(4)	4.2.4, 5.6.1	0	-----0-----	

Management of Safety Risk associated with Change	3.2-3.2(2)	7.1.3, 7.5.1.2, 7.5.1.3	4	-----   ----4-	AS9100 has configuration management and process change control
Safety Promotion (general)	4.0		5	-----   ----5	SMS safety, QMS quality
Competencies and Training: Personnel Competence	4.1-4.1.1(2)	6.2.2	0	-----0-----	
Competencies and Training: Personnel Training	4.1, 4.1.2-4.1.2(2)(b)		5	-----   ----5	
Communication and Awareness	4.2-4.2(1)(d)	5.5.3	3	-----   --3--	SMS much more specific than AS9100
Make SMS information available for safety-related roles	4.2(2)		5	-----   ----5	
Organization provides FAA access to SMS outputs	4.2(3)	4.2.4	4	-----   ----4-	AS9100 doesn't specify FAA access, rather nebulous regulatory agencies; SMS safety, QMS quality
SMS sharing of information with other organizations	4.2(4)		5	-----   ----5	
Periodically survey employee acceptance/involvement in SMS	4.2(5)		5	-----   ----5	
Promote Growth of positive safety culture	4.2(6)-4.2(6)(b)(6)		5	-----   ----5	

Table 2

*Rubric Describing Rating Scale*

<b>Rating</b>	<b>Rating Scale</b>	<b>Description</b>
5	-----   -----5	AS9100 has large omissions in both scope of safety and scale compared to SMS. While AS9100 may mention the area covered by SMS, it is nearly an empty comparison or complete gap.
4	-----   ---4-	AS9100 is lacking both in scope of safety and scale compared to SMS.
3	-----   --3--	SMS and AS9100 have equivalent scope of safety concepts. SMS scale exceeds that of AS9100.
2	-----   -2---	SMS and AS9100 have equivalent scale of concepts. SMS scope exceeds that of AS9100 in the area of safety or as otherwise stipulated in comparison comments.
1	-----   1-----	SMS and AS9100 safety scope and scale identical; SMS linguistic expression requires AS9100 linguistic adjustment.
0	-----0-----	SMS and AS9100 equivalent both in safety scope and scale.
-1	----1   -----	
-2	---2-   -----	
-3	--3--   -----	
-4	-4---   -----	
-5	5-----   -----	

*Note:* Ratings -1 through -5 are not yet defined, the future intent is to show where AS9100 exceeds SMS.

Table 3

*AS9100B\* Areas Not Used in Table 1*

4	5.3	6.2.2(b)	7.2.1(d)	7.3.3	7.4
4.2.1(c)	5.3(a)	6.2.2(c)	7.2.2(a)	7.3.3(a)	7.4.1
4.2.1(d)	5.3(b)	6.2.2(e)	7.2.2(b)	7.3.3(b)	7.4.1(a)
4.2.1(e)	5.4	6.3	7.2.2(c)	7.3.3(c)	7.4.1(b)
4.2.1(f)	5.4.2	6.3(a)	7.2.2(d)	7.3.3(d)	7.4.1(c)
4.2.2(a)	5.4.2(b)	6.3(b)	7.2.3	7.3.3(e)	7.4.1(d)
4.2.2(b)	5.6.2(a)	6.3(c)	7.2.3(a)	7.3.4	7.4.1(e)
4.2.2(c)	5.6.2(b)	6.4	7.2.3(b)	7.3.4(a)	7.4.2
4.2.3	5.6.2(c)	7	7.2.3(c)	7.3.4(b)	7.4.2(a)
4.2.3(a)	5.6.2(d)	7.1	7.3	7.3.4(c)	7.4.2(b)
4.2.3(c)	5.6.2(e)	7.1(a)	7.3.1	7.3.5	7.4.2(c)
4.2.3(d)	5.6.2(f)	7.1(b)	7.3.1(a)	7.3.6	7.4.2(d)
4.2.3(e)	5.6.3	7.1(c)	7.3.1(b)	7.3.6.1	7.4.2(e)
4.2.3(f)	5.6.3(b)	7.1(d)	7.3.1(c)	7.3.6.2	7.4.2(f)
4.2.3(g)	5.6.3(c)	7.1(e)	7.3.1(d)	7.3.6.2(a)	7.4.2(g)
4.3	6	7.2	7.3.2	7.3.6.2(b)	7.4.2(h)
5	6.1	7.2.1	7.3.2(a)	7.3.6.2(c)	7.4.2(i)
5.1(b)	6.1(b)	7.2.1(a)	7.3.2(b)	7.3.6.2(d)	7.4.2(j)
5.1(c)	6.2	7.2.1(b)	7.3.2(c)	7.3.6.2(e)	7.4.3
5.2	6.2.2(a)	7.2.1(c)	7.3.2(d)	7.3.7	7.4.3(a)

7.4.3(b)	7.5.1(j)	7.5.2(a)	7.5.5(d)	8.2.3(b)	8.5.2(b)
7.4.3(c)	7.5.1(k)	7.5.2(b)	7.5.5(e)	8.2.3(c)	8.5.2(c)
7.4.3(d)	7.5.1.1	7.5.2(c)	7.5.5(f)	8.2.4	8.5.2(d)
7.4.3(e)	7.5.1.1(a)	7.5.2(d)	7.6	8.2.4.1	8.5.2(e)
7.5	7.5.1.1(b)	7.5.2(e)	7.6(a)	8.2.4.2	8.5.2(f)
7.5.1	7.5.1.2	7.5.3	7.6(b)	8.3	8.5.2(g)
7.5.1(a)	7.5.1.3	7.5.3(a)	7.6(c)	8.3(a)	8.5.2(h)
7.5.1(b)	7.5.1.4	7.5.3(b)	7.6(d)	8.3(b)	8.5.3
7.5.1(c)	7.5.1.5	7.5.3(c)	7.6(e)	8.3(c)	8.5.3(a)
7.5.1(d)	7.5.1.5(a)	7.5.3(d)	7.6(f)	8.4(a)	8.5.3(b)
7.5.1(e)	7.5.1.5(b)	7.5.4	8.1(a)	8.4(b)	8.5.3(c)
7.5.1(f)	7.5.1.5(c)	7.5.5	8.1(b)	8.4(c)	8.5.3(d)
7.5.1(g)	7.5.1.5(d)	7.5.5(a)	8.2	8.4(d)	8.5.3(e)
7.5.1(h)	7.5.1.5(e)	7.5.5(b)	8.2.1	8.5.2	
7.5.1(i)	7.5.2	7.5.5(c)	8.2.3(a)	8.5.2(a)	

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*\*Note to Reader:* While the GAP analysis was accomplished for AS9100C, this table shows the unused process areas from an earlier analysis using AS9100B.