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SMS "System Description"

It is necessary to fully understand your organization, and the interfaces with your own system. The essence of an SMS is "hazard ID, risk assessment, mitigation and trend analyses," which the System Description is meant to help in that regard. The System Description is the key element in any quality risk management activity. [1]Without a detailed System Description, too many unknowns go undiscovered. With a detailed System Description, there are still "unknowns"...there will always be unknowns...but there should be fewer of them. Keep it simple but keep it detailed...sort of an oxymoron. The detail must be there to identify system hazards. A good place is to consider the elements of the "SHELL" model...or the people, environment, hardware, software/documentation, and how each of these interacts within the system.

In a mature SMS, you can go to any part of the operation, ask any staff member: "what are your top risks, what do you/the company do about them, and what's your part in the controls/mitigations." You'll get an answer that will demonstrate the health of your SMS.

[2]It is often disregarded by organizations that feel they know all that already (usually informally), those who think it's too much trouble, and those who don't understand the value. Like an Emergency Response Plan, you need to understand all the players - who does what and when. The System Description formalizes what each department does, who's responsible/accountable for what (including 3rd parties), and what are their key elements of risk. From there, you can look at each piece, determine your hazards and risks for each area (and interfaces) and put together the mitigations considering all the interfaces and change management.

Think of the System Description as map or flow chart of your organization: Break it first down to departments of operation, add in the functions, and then link where there is overlap. Example is a fuel provider: delivery; storage; testing; records; training; fueling; defueling... etc. When you look at that list, you get a very good picture of where your interfaces are, and then you can document and assess your risks, hazards, threats, mitigations, and so on. It also helps in change management, emergency response planning and training - you have created a checklist of where you have to go, who you have to talk to, and where the risks are when you're making a change (let's say storage facilities).

The function of a system description is to identify all functional areas of an organization and the interfaces with others. Answer only: "What does your entire organization do, and how do they do it".

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[1] *Larry Farris – Linedin profile - http://www.linkedin.com/groups?viewMemberFeed=&gid=1394797&memberID=43717663*
[2] Sonya Tietjen: *LinkedIn discussion*

Airports/Aerodrome

The system description is arguably the second-most important task to do in Phase One of the ICAO's SMS Implementation Plan. The reason the system it is needed for an aerodrome SMM is twofold: firstly, the SMM needs to show how effective each part of the system is in mitigating pre-existing risks (for Rescue and firefighting, this would be the risk of death / serious injury following, for example, an aircraft accident); and secondly because there is a risk that failure within, say, the Rescue and firefighting system would either fail to prevent preventable death or serious injury OR would actually cause death or serious injury that would otherwise not have occurred.

Take a look at the (ICAO 9859 – 2nd Ed) Appendix 1 to Chpt 7, para 1.7 , "Apron Safety Management". This starts getting into what I'm trying to describe. If there was a department called "Apron Management", then here's a list of the things that this department does. Then take a point like (e) push-back and break it down even further.to processes and finally procedures. Describe where other departments interject (ie. vehicle maintenance, training, Flight Ops, ATC).

Below is an excerpt from ICAO SMM 9859, 2nd Edition, Appendix 1 to Chapter 7; GUIDANCE ON SYSTEM DESCRIPTION:

2. System Description of an Aerodrome

A system description of an aerodrome should include facilities, equipment, personnel, processes and procedures necessary for the operation of the aerodrome. The different functions may include:

1. Operational Management
    - 1.1 Movement area access control
        - a) Air
        - b) Land
        - c) Sea
    - 1.2 Aerodrome emergency planning
        - a) Emergency procedures manual
        - b) Emergency simulation practices
    - 1.3 Rescue and fire fighting
        - a) Capability
        - b) Facility maintenance
        - c) Staff training and experience
        - d) Equipment mobilization plan
        - e) Reduction of capability (notice)
        - f) Water hydrant system
    - 1.4 Movement area inspection and maintenance
        - a) Aerodrome manual
        - b) Inspection forms
        - c) Maintenance
    - 1.5 Visual aids maintenance
        - a) Inspections
        - b) Schedule
    - 1.6 Construction management
        - a) Control of works
        - b) Site management
    - 1.7 Apron safety management, including vehicle traffic
        - a) Rules and regulation for airside operations
        - b) Airside management
            - 1) Airside vehicle management
            - 2) Airside vehicle license
            - 3) Vehicle examination
            - 4) Safety specification
            - 5) Aircraft servicing coordination
        - c) Equipment parking
        - d) Apron discipline
        - e) Push-back operations
        - f) Traffic signs and markings
        - g) Stand allocation
        - h) Aircraft damage control
        - i) Fuel spillage control
        - j) Vehicle and equipment damage control
        - k) Apron safety checklists including ramp activity audit

l) Contracted and subcontracted activities

1.8 Wildlife hazard management
- a) Bird control management
- b) Observation
- c) Bird strike report management

1.9 Obstacle control
- a) Airport boundary
- b) Outside the airport
- c) Runway strip
- d) Regulation and survey
- e) Approval of building construction under the flight path

1.10 Disabled aircraft removal
- a) Equipment compatible with aircraft type
- b) Maintenance for readiness
- c) Deployment scheme
- d) Establishment of outsourcing procedures/contact

1.11 Dangerous goods handling
- a) Limitation of dangerous goods on aircraft
- b) Storage and loading
- c) Establishment of training programmes
- d) Acceptance of dangerous goods by operators
- e) Emergency response guidance for aircraft incidents involving dangerous goods

1.12 Low visibility and adverse weather operations
- a) Procedures
- b) Coordination with air traffic services
- c) Responsibility of organizations involved

1.13 Radio navigation aids installations and maintenance
- a) NOTAMS

Air Carriers

FAA's AC 120-92A, page 9, does discuss elements of a system description for an air carrier and offers some helpful ideas to create an air carrier system description. An Air Carrier system is the complete, operational aircraft (including crew and passengers / payload) for the entire duration of each flight from initial flight planning to eventual disembarkation of the passengers / off-loading of cargo.

FAA AC120-92A Appendix 1 - (8/12/10)
Process 2.1.1 System Description and Task Analysis

a. Performance Objective. The organization will analyze its systems, operations, and operational environment to gain an understanding of critical design and performance factors, processes, and activities to identify hazards.
b. Design Expectations.
   (1) System descriptions and task analysis will be developed to the level of detail necessary to:
      (a) Identify hazards,
      (b) Develop operational procedures, and
      (c) Develop and implement risk controls.

FAA ATOS

FAA Order 8900.1, Flight Standards Information Management System (FSIMS) ATOS (Air Transportation Oversight Systems)

If you are trying to establish a definition for an air carrier these SAIs (Safety Attribute Inspection) now called Design Attributes or DAs could be used for a system description for a (14CFRPart 121) air carrier, keeping in mind that ATOS is not applicable for a charter operator (14CFRPart135). Eventually that will change as the FAA transitions from ATOS to SAS[3] in 2013-2014.

An excerpt from that site is below and could be a very basic start to writing a system description on a "clean sheet of paper". The FAA uses the six ATOS safety attributes to evaluate the design of air carrier operating systems:

C. [4]Safety Attributes. The key to safety lies in managing the quality of safety critical processes. This is a primary responsibility of an air carrier in meeting its regulatory obligations. ATOS employs six safety attributes to evaluate the design of air carrier operating systems:

1) **Procedures**—Documented methods to accomplish a process.
2) **Controls**—Checks and restraints designed into a process to ensure a desired result.
3) **Process Measures**—Used to validate a process and identify problems or potential problems in order to correct them.
4) **Interfaces**—Interactions between processes that must be managed in order to ensure desired outcomes.
5) **Responsibility**—A clearly identifiable, qualified, and knowledgeable person who is accountable for the quality of a process.
6) **Authority**—A clearly identifiable, qualified, and knowledgeable person who has the authority to set up and change a process.
7) The attributes are not standards in and of themselves, but provide a structure for the tools used to collect data for principal inspectors so that they can make informed judgments about the design of an air carrier's operating systems (1) before approving or accepting them when required to do so by the regulations, and (2) during recurring assessments for continued operational safety.

Regulations and policy define the acceptable level of safety. System description begins with the Air Carrier Oversight Profile.

System Description

(Jeff Whitman, President of Air Safety Group in LinkedIn. The system description seems to be the "elephant in the living room," i.e., you know it is there but you are not sure what to do about it. You, numerous others, and I have asked this question without receiving examples or explanations, of the system description.

In my opinion, the system description is:
1. One of the most important steps;
2. The least understood; and
3. The most frequently skipped step.

In support of 1 above, the reason documenting the system description is the most important step is that it facilitates discovery of the sources of safety vulnerabilities especially the hidden or latent organizational issues.

The system descriptions should completely explain the interactions found in the organization's systems (facilities, hardware, software, people, etc.) and the environment in which they operate, in sufficient detail to identify hazards and perform risk analyses. How do you do this?

While systems should be documented, no particular format is required.

Again, in my opinion, documenting your system description and supporting number 2 from above, should start with drawing simple flowcharts of all your business/operational processes. The person who should draw the flowcharts should be the process owner, since they have the best high-level understanding of the process requirements.

After your process flowcharts are completed, identify the owners (position not person) of each of the processes/sub-process. Have the process owners look at the individual steps and see where they can be further broken down into sub-process flowcharts. For example; in operational control, dispatch would be a process, which includes processes, such as checking the weather, maintenance release, etc.

Each of the aforementioned processes and sub-processes may actually be systems and/or subsystems. How a person defines a system or subsystem is dependent upon where they interact with the overall system requirements. One person's system may be

[3] *SASO System Approach for Safety Oversight*
[4] *Page 7, FAA 8900.1 ATOS*

another person's subsystem. This is why it is important to involve as many stakeholders as you can when describing your system.

To what level you dissect each process/sub-process is up to you. My advice would be starting small. As your safety management system matures, you can further dissect each of the lower-level processes.

So, all we have here is a bunch of flow charts. Is that a system description? You bet it is! Are you finished? That is up to you. Do you need to add a bunch of text to help others understand your system and its potential vulnerabilities? Maybe. Again, that is up to you.

So, what is the point of this level of detail? Now you have diagrams to look for those hidden vulnerabilities I mentioned earlier. To do this, look at all the points in your flow charts where process (systems) touch other process. There is your vulnerability. Get all the applicable stakeholders involved in discussion. Find the weak points. Where do processes normally break? Ask why?

Jeff Whitman - President
Air Safety Group - www.AirSafetyGroup.com & www.ProAirman.com

Grow your system description

You need to improve your system description step by step. However, it's not a totally new thing, either. You don't need to creat anything, just collect and organize them.

First, you should define every aspect of the operation, such as flight, cargo handling, and dispatch. Then you define what are involved in each aspect, such as whose responsibilities, according to which manuals or regulations, how they communicate with each other if there are more than one organization involving in the aspect.

Second, about the manuals, who will revise them and how, who will manage them and how, how are they going to be understood. You don't specify the procedure, just tell us do you have such a procedure, and where it is.

Finally, the specified operation procedures in each aspect, that's not your job. Just ask the organization which is responsible for the aspect to do this. Then you work together to evaluate the compliance and complement.

In addition, there is a checklist for it:

- How many aspects are there in your operation? How are they connect with each other?
- Which organizations are responsible for each aspect? How are they communicate with each other? What regulations or manuals are they according to?
- How are the manuals revised, accessed to, managed, trained? How to make sure the procedures in the manuals are appropriate?