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Methodologies for treat identification and risk management in the flight safety management systems

Methodologies for threat identification and risk assessment in the flight safety management systems in the context of ICAO requirements are proposed.

According to the flight safety statistics, in the last 20 years, approximately 85% of aviation accidents have been caused by "human error." The key element of risk decision-making is determining if the risk is justified. The risks involved with flying are quite different from those experienced in daily activities. Managing these risks requires a conscious effort and established standards (or a max risk threshold). The goal is to reduce the general aviation accident rate involving poor risk management.

It must be remembered that:

It will not be possible to completely avoid incidents (and serious incidents);

Failures will occur even with the most advanced preventive measures in place;

No system, managed or created by human hands, is immune from risks and failures.

So, the Flight Safety Management System allows to control risks and human errors.

Any Safety Management System is composed of four functional (key) components: Safety Policy; Safety Risk Management; Safety Assurance and Safety Promotion (Figure 1).

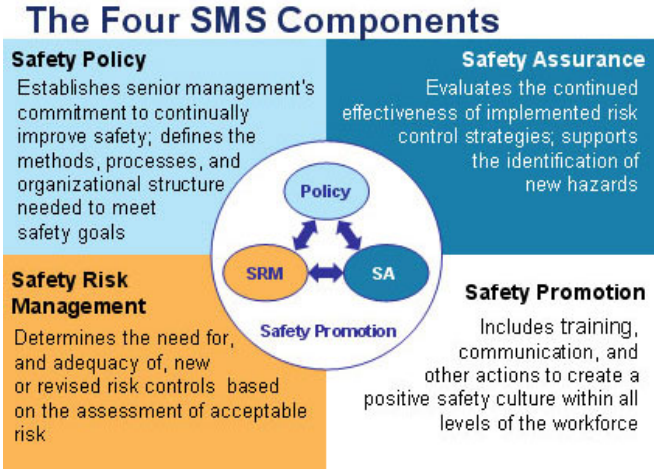

Figure 1. SMS functional components

The essential idea of any Safety Management System (SMS) – be it a product/service provider's SMS or the SMS of the regulator responsible for safety oversight – is to provide for a systematic approach to achieving acceptable levels of safety risk. SMS is comprised of four functional components, including an intangible, but always critical, aspect called safety culture.

These four components of a SMS are:

1. **Safety Policy** — Establishes senior management's commitment to continually improve safety; defines the methods, processes, and organizational structure needed to meet safety goals.

The Safety Policy:

Establishes management commitment to safety performance through SMS;

Establishes clear safety objectives and commitment to manage to those objectives;

Defines methods, processes, and organizational structure needed to meet safety goals;

Establishes transparency in management of safety (Fully documented policy and processes; Employee reporting and resolution system; Accountability of management and employees);

Builds upon the processes and procedures that already exist;

Facilitates cross-organizational communication and cooperation.

2. **Safety Risk Management (SRM)** – Determines the need for, and adequacy of, new or revised risk controls based on the assessment of acceptable risk.

A formal process within the SMS composed of:

Describing the system;

Identifying the hazards;

Assessing the risk;

Analyzing the risk;

Controlling the risk.

The SRM process may be embedded in the processes used to provide the product/service.

3. **Safety Assurance (SA)** – Evaluates the continued effectiveness of implemented risk control strategies; supports the identification of new hazards, that means:

SMS process management functions that systematically provide confidence that organizational outputs meet or exceed safety requirements;

AVS SMS has a dual safety assurance focus: AVS organizations and Product/service providers;

Ensures compliance with SMS requirements and FAA orders, standards, policies, and directives (Information Acquisition – Audits and evaluations, Employee reporting); Data Analysis; System Assessment;

Provides insight and analysis regarding methods/opportunities for improving safety and minimizing risk;

Existing assurance functions will continue to evaluate and improve service.

4. **Safety Promotion** – Includes training, communication, and other actions to create a positive safety culture within all levels of the workforce, that means:

Safety promotion activities within the SMS framework include: Providing SMS training; Advocating/strengthening a positive safety culture; System and safety communication and awareness; Matching competency requirements to system requirements; Disseminating safety lessons learned.

Everyone has a role in promoting safety.

Safety Risk Management (SRM) and Safety Assurance (SA) are the key processes of the SMS. They are also highly interactive (Figure 2).

Two vertical flow charts displayed next to one another. On the left, a flow diagram displaying five steps of SRM, from top to bottom: System Analysis, Identify Hazards, Analyze Safety Risk, Assess Safety Risk, and Control Safety Risk. Process flow shows an arrow loop from Control Safety Risk to System Analysis that reads "Evaluate proposed controls." On the right, a flow diagram displaying five steps of Safety Assurance, from top to bottom: System Operation, Data Acquisition and Process, Data Analysis, System Assessment, and Corrective Action. The System Assessment box on the Safety Assurance side is connected to System Analysis on the SRM side to show that potential hazards or ineffective controls go through the SRM process. The Assess Safety Risk and System Assessment boxes are connected to System Operation at the top of Safety Assurance to show that the risks accepted and conformances are monitored through routine Safety Assurance. When risk is not accepted, the Control Safety Risk step is reached on the SRM side. When a nonconformance is identified, the Corrective Action step is reached on the Safety Assurance side.

The flowchart below may be useful to help visualize these components and their interactions. The interface attribute concerns the input-output relationships between the activities in the processes. This is especially important where interfaces between processes involve interactions between different departments, contractors, etc. Assessments of these relationships should pay special attention to flow of authority, responsibility and communication, as well as procedures and documentation.

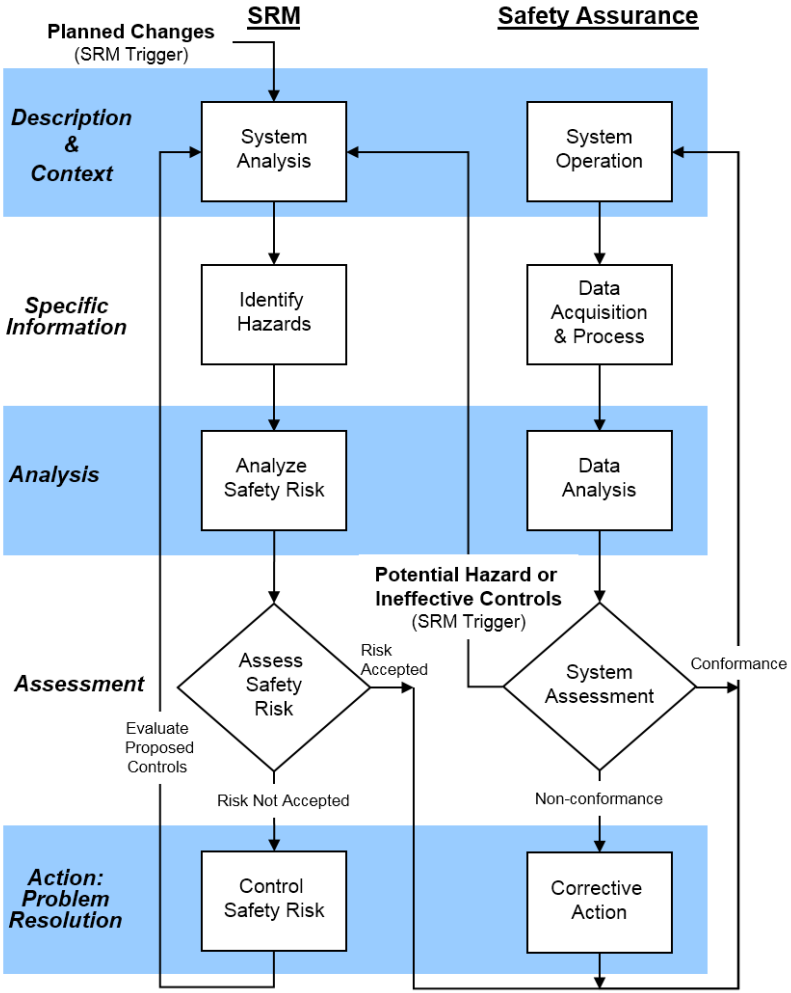

Figure 2. Interfaces between SRM and SA

Consideration of the human factor is of particular importance in risk management because people can be both the source and the solution to safety issues by:

Contributing to an aviation accident or incident because variable performance due to human limitations;

Anticipating and taking appropriate actions to prevent a hazardous situation and Problem solving, decision making and risk mitigation measures.

There are some strategies for safety risk management and mitigation (Measures to reduce the realization of a potential threat or to reduce probability or severity of a risk):

Avoidance – operation or other activities are canceled because the risks exceed the reasonableness of continuing flights and other operations (Eg.: Flights at an aerodrome with a difficult geographical location or a lack of navigational aids are cancelled during night time);

Mitigation – the frequency of flights or other operations is reduced, or measures are taken that reduce the magnitude of the effects of existing risks (Eg.: Flights at an aerodrome with difficult geographical conditions or without the necessary navigational aids continue due to the fact that there are some navigational aids and special procedures have been developed);

Isolation – action is taken to isolate the risk or to provide internal redundancy to protect and/or reduce the severity of the risk (Eg.: Flights at an airfield with a difficult geographical location are limited by daylight hours, visual flight conditions; Aircraft that are not equipped with instruments for vertical leveling are not permitted to fly in the airspace where such leveling is applied).

Conclusions

If the Flight Safety procedures and techniques are taught and employed, we have tools to identify potential hazards of a flight and successfully mitigate the risks associated with the identified hazards.

The goal is to reduce the general aviation accident rate involving poor Risk Management.

This appropriate Risk Management makes available recommended tools for identifying hazards & assessing risk in order to conduct the safest flight possible with the least amount of risk (checklists and scenarios to aid in risk management consideration, flight planning, and training etc.).

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