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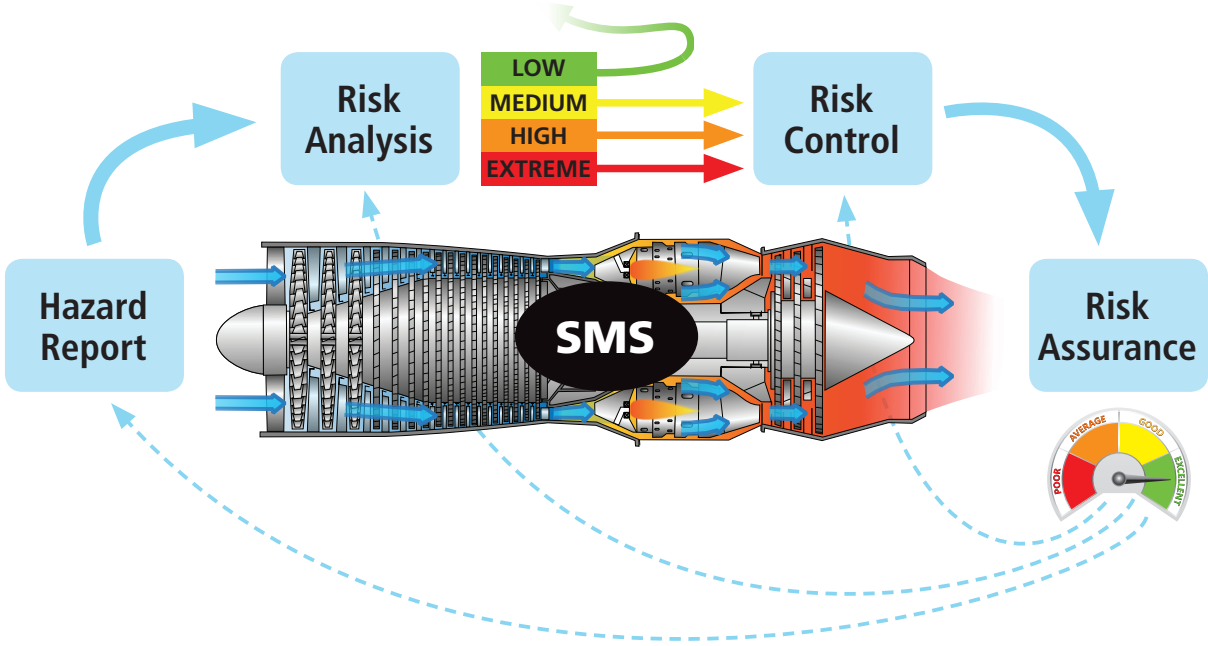


PHYLLIS UTTER/HAI

Figure 1. The SMS "engine" keeps the entire organization moving forward on safety.



# Real-World SMS: Risk Control

By Bryan Smith and the USHST SMS Workgroup

The issue of aviation safety spurs no end of debate, but we can all agree that we need to have the best safety program possible. A modern safety management system (SMS) is one way to achieve that.

Still, use of SMS generates substantial debate. Does it work? Is it worth it? There are even those who argue it makes matters worse. Although operators may engage in this debate, for those of us on the International Helicopter Safety Team, there is no confusion: organizations using an SMS reap significant safety benefits.

To effectively improve operational safety, though, an SMS must be properly implemented. We often see organizations build a great SMS "engine" but fail to start it up or properly maintain it.

In addition, most experts believe full implementation of an SMS takes one to three years, even when done correctly. Implementing SMS is a marathon, not a sprint, and conclusions about SMS performance are often made too soon in the process to be valid.

This is the third in a series of ROTOR articles aimed at helping operators effectively implement an SMS in the real world. In our first article (Summer 2015, p. 58), we introduced an SMS model based on an engine (figure 1) and discussed how hazard reporting "feeds" the SMS process. In the second (Winter 2015, p. 88), we showed how to use a risk assessment to prioritize the identified hazards, "bleeding off" the low-risk items so higher-risk hazards can be targeted for action.

Now it is time to create specific, measureable controls to manage those risks.

## Systemic Problems, Systemic Solutions

While there are many hazard analysis models, they are all based on the idea that safety issues involve both direct and latent factors.

A hazard's direct factors are the obvious, final acts or omissions that connect (or can potentially connect) the hazard to the undesirable outcome. Some examples are a pilot's failure to put in the correct control

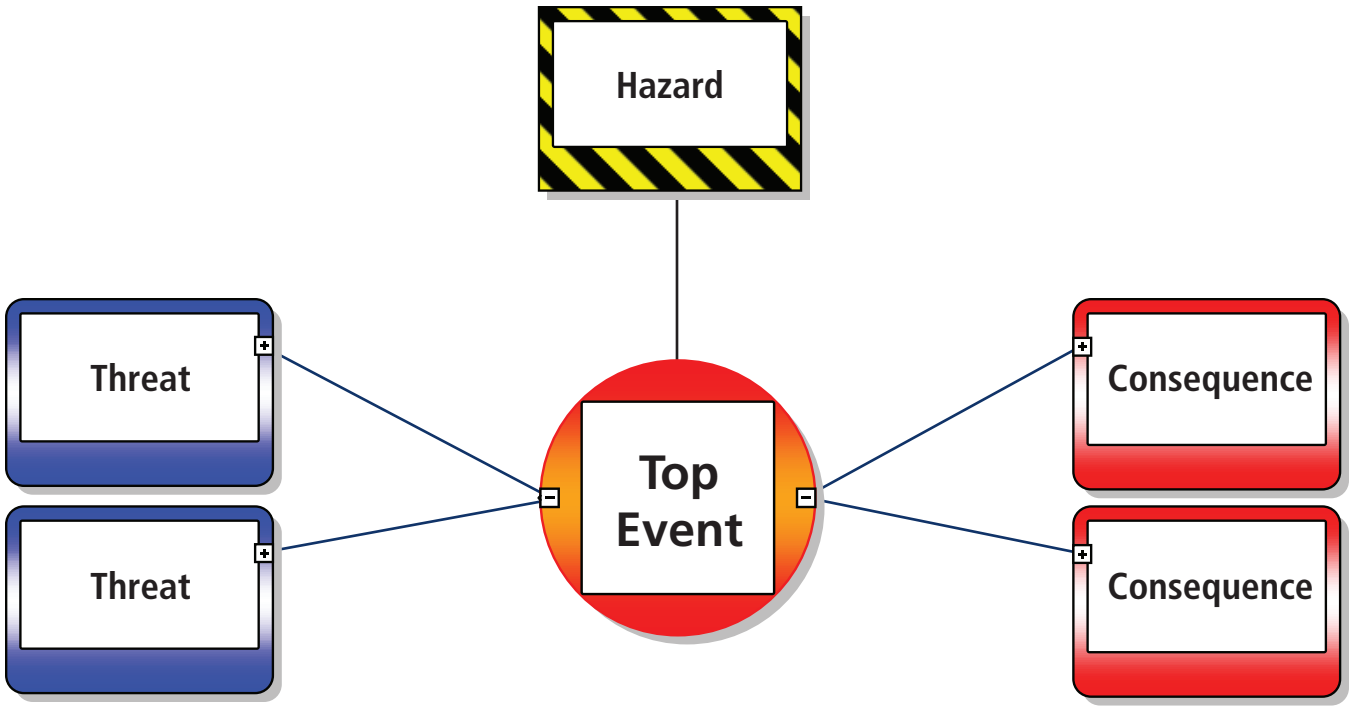


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Figure 2. The Bowtie Model provides a visual map of the sometimes complex interactions of hazards and your efforts to control them.

input or a mechanic's overtightening of a bolt. Unfortunately, these are often the only elements we look at, which limits the potential to prevent future accidents.

Does a hard landing by a 5,000-hour pilot mean he does not know how to land? Probably not. So making that pilot execute 100 landings with the chief pilot or FAA inspector does not really attack the root cause. Are we missing something in our effort to control the risk of future hard landings?

Usually, the answer is yes.

When we review safety incidents, we see that 80 to 90 percent of them are related to not just the direct factor — the mistake, action, or omission that directly led to the incident — but also to latent factors present in the system, such as the organization's policies, procedures, or safety culture. When you only address the direct factor, you are missing the opportunity to treat the latent systemic factors that are just as complicit in creating the incident.

Looking for latent factors requires brainstorming — the very fact that they are latent means they aren't immediately obvious or connected to the incident — and this is definitely a case where you see better results when working in a group. While no safety officer has all the answers, a well-structured safety committee usually does.

## Building a Better Safety Committee

Creating a safety committee for your organization is an essential element of an SMS but, as is the case with other aspects of SMS, there is often debate about the committee's structure and purpose.

There is no single best safety committee structure. However, your committee should be configured to accomplish two main purposes.

First, the safety committee must include people with knowledge and experience in every major aspect of your organization, not just pilots. You should include, for example, maintenance staff, other aircrew members, and office staff members. They provide the committee with the knowledge and perspective of what is really happening in day-to-day operations. These folks often understand nuances of communication, hierarchy, and process that are not spelled out in policy manuals.

Second, the safety committee's proposals must produce real change. The committee may recommend revisions to policies or procedures or ask for additional equipment, personnel, or training — all areas of responsibility that fall outside of the safety officer's domain. This means that the people with these job responsibilities should be on your safety committee. At the least, the committee needs direct access to them.

Without the power to make the changes needed to reduce risk, the safety program will merely identify safety problems and maybe pass on a bit of information — and your SMS program will fail.

Part of what makes SMS such an effective approach to improving safety is that it takes a systematic approach to your organization's safety. To make effective changes to a system, you need the help of both the people who work in the system (the day-to-day folks) and the people who have the ability to change the system (the managers and accountable executives).

In small organizations, the whole company can be the safety committee. Rather than seeing this as a disadvantage, it is actually the ideal — to have every single person in the company actively thinking about building a safer operational

environment. Single-person owner/operators can use other local operators, contract maintenance personnel, flying friends, or anyone they regularly work with to make up their committee.

## Finding Latent Hazards

Now that we've cleared up who should be on your safety committee and why, let's go back to looking at how the committee contributes to risk control: by looking for latent hazards, the ones that are often overlooked because they stem from issues with the operating environment, such as policies, procedures, or culture. There are numerous models available to do this, but some are quite complex. Let's look at a few that, while simple, can be quite effective.

The PAVE method separates factors that could be associated with a hazard into those related to the Pilot, Aircraft, enVironment, and External pressures:

- Pilot (Persons): experience, training, fatigue, illness, the I'M SAFE checklist. Please note that some refer to this category as Persons and extend the assessment to all people involved with the flight, such as crew members and dispatch and maintenance personnel.
- Aircraft: known maintenance issues, performance limitations, fuel status, avionics updates.
- enVironment: both present and forecasted weather, flight or mission type, air traffic control, obstructions, time of day, other air traffic.
- External pressures: recent changes in personnel, management insistence, difficult customers, consequences of cancelling flight.

One of the best things this model does is remind us to consider the entire operating environment — and not just the obvious mistake that was made — when reviewing an accident or incident. By reviewing how these four areas contribute to hazards, you'll be quickly reminded of factors that were not immediately obvious.

Another method is called the Rule of Five Whys. This method consists of just asking why an incident occurred, or why a hazard could lead to an accident, until you arrive at its root cause or causes (you could also call it the Toddler Method).

Although it's called the Rule of Five Whys, don't stop there. Ask as many whys as you need to get to the underlying causes of a hazard. Then, whether you have uncovered one, five, or 15 causes, take a look at how you can mitigate some of those factors.

For example, one agency had a hazard report filed that the first-aid kit needed to be restocked. Instead of just restocking the kit and moving on, they did a quick five-whys analysis, which took five minutes. They realized that the kit had not been restocked because it was not listed on the facility safety inspection form.

The real issue was that the kit was not on the list of items to be regularly inspected and thus regularly restocked. During this process, they found a few other things that had also been omitted from the form. By adding the first-aid kit and these other items to that list, the issue is resolved not for just this one occurrence but on a regular basis.

This is an example of treating a "system" problem with a "system" answer to obtain better results than the more conventional answer — "the kit is empty, so restock it" — would have offered. The Rule of Five Whys prompts you to think beyond the simple fact of a hazard to why that hazard occurred in the first place. The hazard or incident does not need to be a major problem; this process works just as well for smaller problems.

If you are ready to take on a more complex method of hazard analysis, you can try the Bowtie Model. This model is a method of visually mapping a hazard and the relationships among the threats or risks that it poses, the consequences, the different methods of controlling that risk, escalation factors that reduce the effectiveness of risk controls, and methods to control those escalation factors. The resulting diagram resembles a bow-tie (figure 2).

Besides its ability to visually show incident or accident sequences, the Bowtie Model also illustrates a broad spectrum of risks and helps users to assess and prioritize the risk controls used. A recent European Helicopter Safety Team toolkit called MARIA (My Assessment of Risks for Incidents and Hazards) is based on the Bowtie Model; visit http://bit.ly/EHEST-maria to download this free safety tool.

## Addressing the Risk

Once you uncover the direct and latent factors, the next step is to develop a proposal to control the risk. Some safety solutions are simple, easy, inexpensive fixes. But many times the safety committee's proposal must address a combination of policies, procedures, equipment, staffing, and training.

Remember, because of the risk analysis you performed earlier in the SMS process, you were able to "bleed off" any low-risk hazards. At this point, you are dealing with hazards that pose sufficient risk to your organization that they warrant such steps as policy or procedure revisions, additional training or staff, or the purchase of equipment.

However, just publishing a new policy or procedure or buying a new piece of equipment will not on its own spur operational change. This is especially true for emergency procedures that must be enacted by personnel under stress. Sometimes we issue a new safety rule and just walk away, assuming that 100 percent of the staff will use or follow it 100 percent of the time. That's not a realistic view of how humans accept change.

If you are asking people to change how they do things, then you must conduct some training. This is also why your safety committee must include an administrator and training manager. The training may be as simple as a quick morning briefing on the new change, how to do it, and why.

Besides training, you should engage in ongoing promotion of your safety program. One of the foundations of SMS is safety promotion, but it is frequently poorly integrated with the other three, which are safety policies, safety risk management, and safety assurance. Too often, an organization's efforts at safety promotion fall flat.

The information broadcast in

emails, posted on bulletin boards, or provided in safety presentations often seems to be picked at random or as a knee-jerk response to the latest major event in the industry. Employees often just ignore these materials or half-heartedly participate in training and the use of new procedures.

Safety promotion, though, is part of effective risk control. You want your co-workers to change and adopt the new policy or procedure or use the new equipment.

Again, this is why you should involve representatives from each department or operational area in your safety committee. Because each department was involved in creating a solution, you will have more buy-in when you implement it. The safety committee members should act as ambassadors for your SMS program within their department.

Tying together unit training, information from a safety program, and hazards that have been identified and targeted for action will increase the relevance of your safety promotion efforts. Employees will more readily give their time and effort to control the risks of real-life hazards that are a demonstrated threat to them, their co-workers, or their livelihood.

## Setting Measurable Goals

When developing risk controls, your committee should set a specific, measurable target of reducing the probability or severity of the hazard. This is the only way to gauge if the change you are proposing was effective in lowering the amount of risk faced by your organization.

If a negative event is happening a certain number of times a year, set a goal for that number to be reduced or eliminated in the next 12 months. If you are proposing an increase in a particular kind of training, you may decide to have all of the training completed in six months or a certain percentage of staff trained in four months. If a certain piece of protective equipment or clothing is only being used 20 percent of the time, your goal could be to have it used 80 percent of the time within six months or 100 percent in a year.

Why all the numbers? We want to be able to know if a risk control is effective, instead of just putting it in place and assuming that it worked. You can't control what you don't measure.

For an example, let's look at an effort to reduce the hazard of bird strikes. Remember, the overall risk of any hazard is a combination of its likelihood, or the probability that the hazard will occur, and its severity, or the significance of the resulting problem.

Changing a route to avoid an area with lots of birds, such as a garbage landfill, can lower the likelihood of strikes. The committee can monitor how many times pilots fly by the landfill before the proposed route change and how many times they fly by it over the next several months.

The committee can also work to lower the severity of a bird strike. Wearing a helmet with the visor down or installing polycarbonate windshields are two ways to protect the pilot's face and eyes and thus lower the risk of him or her losing control of the aircraft in the event of a bird strike. The committee can determine whether the organization has the proposed equipment and how often is it being used, as well as propose changes to policies and procedures and conduct training on using the new equipment and routes.

## Next Steps in SMS

Up to this point, through our SMS process, we have gathered information about hazards, analyzed them to determine actual risk levels, and evaluated higher risk items for direct and latent factors so as to create realistic, effective risk control. We have also set goals for controlling these hazards, goals that can then be used to track the organization's safety performance.

The next step is this: how do we evaluate the safety performance of our organization, and how do we respond to the results? The next article in the Real-World SMS series will focus on risk assurance, the process by which we ensure that our SMS engine is meeting our safety objectives.


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