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## Hazards: A Constant Threat (I) -

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Many people, families, entities of all kinds, companies with their systems, do not realize the dangers to which they are constantly exposed to. But the fact is that there is no way to escape this threat. Day and night, wherever we are, whatever we do, the danger does his round around us.

The best that we can and must do is identify these hazards and try to assess their consequences, trying as much as possible and economically supportable, avoid them or minimize their effects. By doing so, we are doing what we call "Risk Management".

The dangers are invisible, as are the electromagnetic waves. "Blow" on us with greater or lesser intensity, but are always "blowing".

But before continuing, let's examine, in formal terms, the meaning of "Danger," "Accident or Mishap<sup>1</sup>" and "Risk". The accredited MIL-STD-882E provides the following definitions:

**Hazard** - Any actual or potential condition that can cause injury, illness or death to persons, damage to or loss of a system, equipment or property, or damage to the environment.

**Accident or Mishap** - It is an event or series of unplanned events resulting in injury, illness or death to persons, damage to or loss of a system, equipment or property, or damage to the environment.

**Risk** - It is a measure of the effects of an accident or a mishap. It is expressed in terms of accident or mishap severity and probability of occurrence.

In this way, the danger is a state or condition that can lead to an accident or a mishap, and

risk is the measure or the assessment of the effects of the mishap.

We have noticed that the common sense of the people follows intuitively this sequence of cause / effect. When, for example, we think of crossing a busy highway without traffic lights, we know that there is there some danger, or there is there a precondition for an accident or a mishap, and comes to our mind a greater or lesser chance (probability) of occurring (risk) an accident or a mishap, but evidently we do not have any condition to visualize a measure for that chance.

The fact is that there are dangers in everything we do. There are dangers when traveling, but there are also dangers in staying at home. The United States Statistics, for example, show that 40% of fatal accidents occur in the home. So, perhaps we have to reconsider the expression "Home, sweet home".

Eat, this act so delicious, also has dangers. Perhaps the biggest cause of cancers and other diseases is in the food we eat, judging from what we have had the opportunity to read in books and in the media. Unfortunately, the people, besides does not choose well your food, eat more than necessary.

There are dangers in breathing. Air pollution probably kill more than 10,000 Americans a year, inhaling radioactivity and germs.

There are dangers on the job. About 12,000 Americans die in work-related accidents, over a year, and others 12,000 get sick. Here in Brazil, we do not know any statistics about that. Maybe there is, but, if so, they are not divulgated efficiently.

There are dangers when doing exercises and there is also when we do not do it.

In other words: "living is dangerous".

Well, if there's no way to totally eliminate the dangers, so we have to live with it, but even a tolerable point. To do this, we must know them

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<sup>1</sup> Rigorously, Accident is an unpleasant event, especially in a vehicle, that happens unexpectedly and cause death, injury or damage. Mishap is a small accident or piece of bad luck that does not have serious results. (Oxford Advanced Learner's Dictionary.

(list them in all our activities) and use some criteria to eliminate them or minimize their effects, to reduce the risk associated with.

Zero risk? Forget it. It Does not exist. There will always be a residual risk. There, we enter on the question of the acceptability of the risk, from techniques to assess the risk, that is, to assess the extent of the effects of an accident or a mishap arising from a hazard and adopt criteria to accept or not the risk.

In this evaluation, it seems reasonable to consider the types of risks shown in Figure 1.

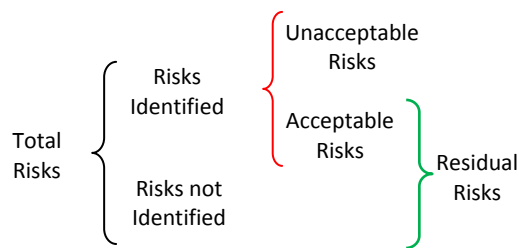


Fig. 1 – Types of Risks

Let's understand them.

**Total risks** – is the set of all risks identified and not identified.

**Identified Risks** - are those risks that have been identified through risk analysis techniques.

**Risks Not Identified** – Are those that were not identified in the analysis. Some will never be identified, even after the operational phase. They will just identified if an accident occurs.

**Unacceptable Risks** - Are the risks that cannot be tolerated and should be eliminated or controlled.

**Acceptable risks** – part of the identified risks considered acceptable.

**Residual risks** – risks that are passed to the users. These risks will remain with users during the entire operational phase of the system. They are the set of the unidentified risks and the acceptable risks.

Of course, the acceptability or not of a risk is a decision of the authority established to adopt such a decision, according to criteria established by her (him).

In the sense that we are giving to the risk management, we would have to consider the entire system that we are dealing with, trying to

list the dangers in all segments contributing to the activity order, that is, its mission.

In the case of an aircraft, we have to consider the operational subsystem (crew and operating manuals) and the logistic support subsystem with its factors (maintenance, training, ground support equipment, manuals, maintenance, storage and transport). It is, indeed, a complex task.

Today, in Brazil, there is a lot of concern about the risks in the development phase of the system. In the operational phase, namely the Continued Airworthiness, maintenance is the focus, both in Civil Aviation and military aviation.

But only recently civil aviation began taking an approach to the operational phase, by means of the so-called Safety Management System (SMS). However, the deployment of this system in commercial enterprises is just beginning.

On the other hand, we have no news of any systematic program of its kind in the military area, to the operational phase, in the segment focused on the fulfilment of the Mission of the Brazilian air force, unlike the USAF who develops an intense program, in this segment, at all stages of the life cycle of their aircraft as we can see in the REF. (1).

Because it is an endless subject, we will talk about it in a next MSC.

See You.

References:

- (1) MIL-STD-882E, 2012. *System Safety*. USA, DoD.
- (2) MIL-HDBK-764 (MI), 1990. *System Safety Engineering Design Guide for Army Materiel*, USA, DoD.