Improve Your Knowledge (IYK)

THE WORLD OF RANDOMNESS

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We live immersed in randomness. Everything is random. In general, we think deterministically, but this unfortunately is not true . We design an aircraft very carefully, knowing, however, that the events along the life cycle of the same are random, reason why we employ probabilistic methods, trying to reduce the occurrence or the consequences of the randomness, in relation to the possible failures that are manifested in the operational phase. It's what we do when we perform the activity of Safety Assessment, in the case of an aircraft design.

In this MSC, we intend to talk about the random. We believe that with the experience we already have, we can pass some useful prints to those who are still treading its path. Our goal is to awaken readers to the reality of randomness, not only for the events of the aeronautical world, but also for the events of our entire existence.

In 1983, when we began our participation in the program AM-X, in Italy, we came across the concept of reliability and the safety aspects of such aircraft. It was the first time that we deal with random events. Since then, we live immersed in this world of the randomness. In an almost philosophical analysis, we realized that everything is random. However, in general we always make our planning considering everything as deterministic events, ie, considering that it is what really should happen, in the face of our present knowledge; however, when we come to practice, we realized that things did not happen exactly as we had planned. We know today that this seems to be worth to everything in life.

Because of this randomness, it is not difficult to understand why, for example, large governmental projects, initially planned to have a certain cost, can reach exorbitant costs at the end. It is clear that these variations are not generally due just to randomness, that is, we are well aware that also contribute to this the illicit practices in the use of public money, but this speech does not fit here.

In 1814, already reaching the pinnacle of success of Newtonian physics, Pierre-Simon Laplace, a great scientist, mathematician and astronomer, wrote the following:

If an intelligence at any given moment could know all the forces that govern the natural world and the positions of each individual who composes this world; moreover, if such intelligence were sufficiently large to analyze this information, she would cover in a single formula the movements of the greatest bodies and the smaller atoms of the universe . For this intelligence, nothing would be uncertain and the future, as the past, would be present facing her eyes.

In this romantic and philosophical text, Laplace outlined the doctrine of determinism, ie, the conditions to say what will happen in the future based on past and present information. Easy to see that such intelligence could not be human.

Many plans have been made based on determinism, but they were almost always wrong plans. When someone is planning for life or for business, he needs to take seriously the randomness in the various activities or steps that make up these plans. It is absolutely necessary to ask the following question: "What can go wrong in this activity (step)"? Also it is necessary to identify the severity level if a particular failure occurs. We do this also on the Safety Assessment, when we try to identify what are the failure conditions that can lead to the loss of one function of the aircraft or the loss of functions of its systems. We can also call this Risk Analysis, as in the military area.
Some authors or professional entities, which deal with project management, adopt a similar procedure, though, in our opinion, no

adequately, and we believe that we can and should adopt it, all the time, also in our day to day. However, it should not be just another activity of these management professionals and of life, but a high priority activity, and we have to utilize the necessary time (long or short) to identify the vast majority of the possibilities of failures, thereby reducing the attack of randomness.

There are, In the professional life, some techniques which include in his processes the randomness. It is the case of the tool known as PERT (Program Evaluation and Review Technique) which uses the probability density function β (β Distribution). It may, on the basis on optimistic and pessimistic times intervals to perform an activity, determine the average time or expected time for an activity. It is undoubtedly an ingenious way to include the randomness in planning. The results that can be obtained with such a tool are great, but the difficulty of achieving such level of optimization is to get the identification of the optimistic and pessimistic times. Such identification requires people with experience in similar activities. Once having these people, we have excellent results.

But let's consider the randomness of our daily life. You who already have a life path marked for some time, has stopped , at some point, to think, in good conscience, on the correctness of your plans of life? If you have did that, did you always has obtained the expected results? We believe the answer is "no" or, at best, "more or less".

Based on the statement of Laplace and observing the day to day of our life, we could say that we will never be able to predict the future, based on what happened in the past and what happens to us now. We do not consider here the aspects related to fatalism or destiny or the religious aspects of the merits to the point of saying that what have to be will be and nothing happens by chance, and that chance does not exist. If we had done this, we would have entered a land of personal beliefs, and there, each with his own belief.

Because of these ideas, many people believe that it is useless to make plans. We disagree. We believe it is important to plan life, since we do it very carefully, to not give much room for randomness. However, there will always be random events, ie events that we cannot control, some beneficial and others not so much, or even bearers of sorrow.

Many personalities have studied and developed ideas about randomness, and your thoughts about it are there in the books dealing with the subject. These things are taught in universities, but only with the passage of time those who came into contact with this matter come to think about it. It was our case.

Well, we believe that we have left readers with at least something to think about or, perhaps, with nothing to think about.

We expect that everyone remain in peace with the randomness.

Thank you for your patience.

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