

## Physical & Mathematical and Reality of Reliability

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The existing body of knowledge of mathematics enabled the developed probabilistic measures of reliability, like: failure function, reliability function, expected time to failure, hazard function, mission success and so forth. All of these measures of reliability are uniquely defined by the probability distribution of a random variable, known as the time to failure (TTF). However, it is necessary to stress that the concepts of: probability, probability distribution, and random variable exist only in mathematics, not in the real physical world. However, mathematics has neither intention nor ability to decide what is a physical reality of human created and managed systems. The above-deduced “reality” of the reliability measures of systems is just a clear statement of the mathematical truth that says, “In my reality my predictions are correct.”

Physical reality of reliability is fundamentally different from its mathematical reality. It is related to the universe in which we exist and its laws. To understand the physical reality of reliability the author has systematically studied the reliability performance of defence, aerospace, and nuclear power industries as examples of physical reality of reliability. Thus, in this presentation physically observed mechanisms and phenomena that drive reliability performance of systems will be cited and contrasted to their mathematical reality.

Having exposed the reliability community to the mathematical and physical realities of the reliability function the presentation will raised the following question

*“What is the body of knowledge on which reliability modelling should be based, in order for the predictions made to be confirmed by reliability measures obtained in operationally defined physical reality?”*