Qualification (glossary)

qualification

> *Conducted to prove that the system design meets its requirements* ***with a predetermined margin*** *above expected operating conditions, for instance by using elevated environmental conditions for hardware.* (INCOSE 2011,128)

> *Proof that the design will survive in its intended environment* ***with margin****. The process includes testing and analyzing hardware and software configuration items to prove that the design will survive the anticipated accumulation of acceptance test environments, plus its expected handling, storage, and operational environments plus a* ***specified qualification margin****. Qualification testing usually includes temperature, vibration, shock, humidity, software stress testing, and other selected environments. Qualification by similarity may be used if the item in question is sufficiently similar to a qualified item and the planned use is also sufficiently similar so as to not invalidate the previous qualification evidence and decision.* (Mooz, Forsberg, Cotterman 2003, 270)

Sources

(1) INCOSE. 2011. Systems Engineering Handbook, version 3.2.1. INCOSE-TP-2003-002-03.2.1.

(2) Mooz, H., K. Forsberg, K., H. Cotterman. 2003. *Communicating Project Management.* Hoboken, NJ, USA: John Wiley and Sons.

Discussion

The term "qualification" is not well understood, and when asked "Where do the qualification limits come from?" people often say "From the specification." It is the systems engineer's responsibility to determine what the qualification margins should be, with concurrance from the project manager and customer, and then put them into the specification. Lack of understanding of the significance of "Qualification" lead to the death of seven astronauts in the Challenger accident. According to testimony presented in the 1986 Rogers Commission Report on the Space Shuttle disaster, the question was asked in the launch commit meeting the night before the flight, "Are the O-Rings qualified to operate between 40º F and 90ºF (+4ºC and 32ºC) or not?" There was no answer. Since the temperature was expected to be (and indeed was) 29ºF (-2ºC) at launch, no further discussion should have been needed and the launch should have been postponed. A rule: Never operate outside the qualified range.

SEBoK v. 2.6, released 20 May 2022