

GLOSSARY

ACTIVE REDUNDANCY: Two or more components in a parallel combination where all are powered and active simultaneously. Only one component needs to function for the system (or next higher assembly) to function.

ASSESSMENT: Current evaluation of a component's or system's reliability. A prediction.

AVAILABILITY: A measure of the percentage of time that an equipment or system is operationally ready. Usually defined in terms of MTTR and MTBF (MTTF) as:

$$A(t) = [\text{MTBF (MTTF)}] / [\text{MTTR} + \text{MTBF (MTTF)}]$$

BURN-IN: Eliminating early failures by operating the product (100% sampling). Ideally done in an environment similar to the operational environment.

CONFIDENCE LEVEL/INTERVAL: A statistical measure of the uncertainty associated with an estimate. For example, an estimate of MTBF is 103 hours. Using statistical techniques (such as the chi-square method) we obtain a 95% confidence interval of 100.1 to 105.9. That is, 95% of the time, the actual MTBF will be between 100.1 and 105.9 hours. The confidence interval depends on sample size and variance.

FAILURE RATE: Defined as the number of failures per unit time. Mathematically, the failure rate (also called the hazard function) is

$$z(t) = f(t) / R(t)$$

Where $R(t)$ is the reliability function and $f(t)$ is the underlying probability distribution. For the exponential distribution

$$z(t) = \lambda e^{-\lambda t} / e^{-\lambda t} = \lambda$$

Thus the failure rate, when the exponential distribution describes the time to failure, is constant.

FMEA: Failure Modes and Effects Analysis. An analysis to determine the ways in which failure can occur and the effect of the failure on the system and/or other equipment.

FOT&E: Follow-On Operational Test and Evaluation. Operational testing of a system conducted in an operational environment. Generally occurs after IOT&E is completed and is done on production items.

HARDWARE RELIABILITY: The inherent reliability of an individual piece of equipment, usually an LRU. Measured in terms of MTBF or MTTF. System hardware reliability is the overall hardware reliability, also measured in terms of MTBF or MTTF.

HI-REL: High Reliability. Usually used to describe piece parts that have been produced to an extremely demanding specification.

IOT&E: Initial Operational Test and Evaluation. Early operational testing of a system conducted prior to a production decision. Normally conducted on pre-production items in a less than perfectly realistic environment.

ITEM: Used interchangeably in this document with product or equipment. Usually refers to the individual article rather than the inclusive class or kind of product.

LAPLACE STATISTIC: A statistic used to determine if a data set indicates a positive or negative trend, at a given level of confidence.

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LCC: Life Cycle Cost. The total cost of a system from its inception to its retirement. Usually defined as including four major cost categories: development, production, operation, and support.

LRU: Line Replaceable Unit. An equipment usually removable as an entity at the aircraft or operating site. Includes items such as a radio receiver, hydraulic pump, or inertial platform.

LSC: Logistic Support Cost. The cost of a support category such as spares, maintenance, or ground support equipment.

MEAN: Also called the expected value of a random variable, the mean is defined as follows: Let X be a continuous random variable with a probability density function = f. The expected value of X is:

$$E(X) = \int_x xf(x)dx$$

The mean, or expected value, is analogous to the concept of center of mass in mechanics.

MISSION RELIABILITY: The probability that a system will complete its intended mission. Hardware failures that do not hinder the success of the mission (e.g., due to redundancy) are not counted against mission reliability.

MTBF: Mean Time Between Failures. The expected value, or mean, of the time between failures of an item. For the case where the exponential distribution is used, the MTBF is the inverse of the failure rate. MTBF is used only for repairable equipment/systems and can also be used to describe the overall system hardware reliability.

MTTF: Mean Time to Failure. Has the same meaning as MTBF except it is used for equipment/systems where renewal (repair or replacement) does not occur. It is numerically equal to the MTBF only for a single parameter distribution.

MTTR: Mean Time to Repair. The expected value, or mean, of the time required to repair an equipment/system.

OPERATIONAL RELIABILITY: The reliability of a system or equipment after it is put in operation.

PAG: Parts Advisory Group. A group of managers and specialists who advise on the selection of parts for a program.

PARALLEL COMBINATION: The combining of two or more items in such a way that only one is required for operation – thus, the parallel combination is characterized by alternate paths of operation.

PCB: Parts Control Board. A board of managers and specialists who control the selection of parts for a program.

PPL: Preferred Parts List. A list of parts that have proved themselves and are approved for use.

PROBABILITY DISTRIBUTION: A formula that describes the probabilities associated with the values of a discrete random variable.

PRODUCT: An equipment, item, or hardware contracted for by a customer. Usually used to describe the inclusive class or kind of item, equipment, etc., rather than each individual entity.

QA: Quality Assurance. A program that provides for the integrity of a design through inspection and control of drawings, manufacturing, shipping, handling, and materials.

REDUNDANCY: A design technique that provides alternate paths of operation through parallel combination of equipment.

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RELIABILITY PREDICTION: An estimate of reliability based on information that includes historical data, piece parts count, complexity, and piece part failure rates.

RIW: Reliability Improvement Warranty. A contractual provision that incentivizes the contractor to reduce support costs by improving reliability.

SCREENING: A series of tests intended to weed out items that are not within certain limits of performance.

SERIES COMBINATION: The combining of two or more items in such a way that all must operate for the system to operate -there is only one path of operation.

STANDBY REDUNDANCY: Two or more components in a parallel combination where only one is functioning at any time. The other components are disconnected and power is applied prior to or simultaneously with switching.

SUCCESS: Achievement of an objective or completion of a function or set of functions.

SWITCH: A device that selects one component in a parallel or redundant configuration as the functioning component. Used for standby redundancy. Incorporates such provisions as logic circuits and fault detection.