Glossary of Reliability Terms and Definitions for maintenance of in-service assets

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Contents

1 Executive Summary

This document contains a glossary of reliability terms and definitions developed as part of a CRC Mining funded research project into the reliability of assets. The project was executed at the University of Western Australia in 2010 and the results published in 2013. The aim of this edition is to review and update the glossary.

To develop this glossary the first step was to conduct a review of national, international and industry standards and guidelines and develop a database from these sources specifically related to reliability, failure and time definitions. Following this a focus group was formed consisting of people involved with reliability in the mining. Focus group members brought a wide range of experience from within mining but also defence, oil and gas and infrastructure. A two stage process was used in which focus group members were first consulted individually in order to determine their preference for a specific definition from the database, the need for an alternate definition and the need for definitions for terms not covered. A number of definitions were developed for words commonly used in mining but not covered by formal definitions in the Standards referenced. Workshops were then held with all members of the focus group to resolve areas of differing preferences. The outcome of the workshops representing the preferred definition for each term are captured in Chapters 3, 4 and 5 of this glossary. The database of all the terms is in Chapters 6, 7 and 8.

Since the initial publication of this glossary in 2010, there has been the development of a new ISO Standard for Asset Management (ISO 55000). The database in this glossary has therefore been updated to include these new terms and where there has been a new definition from ISO 55000 FDIS that, in the judgement of the authors, will likely replace the definition selected by the focus group in 2010, the ISO 55000 definition has been used. This means that important terms like “asset” reflect the new definition in the ISO 55000 standard which is “something that has potential or actual value to an organisation” rather than a previous definition.

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2 Reference Sources

Table 1 lists the sources used to collect terms and definitions related to reliability, failure and time.

Standard Designation	Standard Description
ISO 55000 FDIS	Asset Management – Overview, principles and terminology
AS/NZS ISO 31000:2009	Risk Management – Principles and Guidelines
ISO 14224:2006	Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment
AS IEC 60300.2	Dependability Management Part 2. Guidance for Dependability Programme Management

AS IEC 60812-2008	Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA)
MIL-STD-721C	Definitions of Terms for Reliability and Maintainability
MIL-STD-1629A	Procedures for Performing a Failure Modes and Effects Criticality Analysis
ISO 13372:2004(E)	Condition monitoring and diagnostics of machines - Vocabulary
IIMM V3.0	International Infrastructure Management Manual Version 3.0, 2006
PAS 55-1:2008	PAS 55 Asset Management
AS IEC 60300.3.11	Dependability management Part 3.11: Application guide—Reliability centred maintenance
AS IEC 60300.3.14—2005	Dependability management Part 3.14: Application guide—Maintenance and maintenance support
SAE JA 1012	A Guide to the Reliability-Centered Maintenance (RCM) Standard
SAE JA 1011	Evaluation Criteria for Reliability Centered Maintenance Processes
Elasayed, E	Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.
BS4778	British Standard: Glossary of terms used in quality assurance including reliability and maintainability terms
NASA 2002	Fault Tree Handbook with Aerospace Applications
IEC 61508 Part 4	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 4
MIL-STD 2173	Reliability Centered Maintenance Requirements for Naval Aircraft, Weapon Systems and Support Equipment
IEC 50(191)	International Electrotechnical Vocabulary (IEVJ, Chapter 191: Dependability and quality of service.
AS/NZS 4536:1999	Life Cycle Costing - An Application Guide

Table 1: List of sources used in developing the terms and definitions.

3 General Definitions

3.1 asset

something that has potential or actual value to an organization.
Source: ISO 55000 FDIS

3.2 asset, critical

asset having the potential to significantly impact on the achievement of the organization's objectives
Source: ISO 55000 FDIS

3.3 asset hierarchy

a framework for segmenting an asset base into appropriate classifications. The asset hierarchy can be based on asset function; asset type or a combination of the two.
Source: New definition

3.4 asset management

coordinated activity of an organization to realize value from assets.
Source: ISO 55000 FDIS

3.5 (asset management) objective

result to be achieved.
Source: ISO 55000 FDIS

3.6 (asset management) plan

formulation of a programme of achieve an objective. An asset management plan can be for an asset, asset type, asset system or asset portfolio, service or product.
Source: ISO 55000 FDIS

3.7 (asset management) policy

intentions and direction of an organization as formally expressed by its top management.
Source: ISO 55000 FDIS

3.8 asset management strategy

long term optimised approach to management of the assets, derived from, and consistent with, the organisational strategic plan and the asset management policy.
Source: PAS 55 Asset Management

3.9 asset management system

management system for asset management that is there to establish the asset management policy and asset management objectives.
Source: ISO 55000 FDIS

3.10 components

specific parts of an asset having independent physical or functional identity.
Source: New definition

3.11 condition monitoring

continuous or periodic inspection, assessment, measurement and interpretation of the resultant data, to indicate the need for maintenance action.
Source: New definition

3.12 corrective action

action to eliminate the cause of a nonconformity and to prevent recurrence.
Source: ISO 55000 FDIS

3.13 demand

activation of the function (includes functional, operational and test activation).
Source: ISO 14224:2006

3.14 Dependability

The collective term used to describe the availability performance and its influencing factors: reliability performance, maintainability performance, and maintenance support performance.
Source: AS IEC 60300.2

3.15 desired performance

the level of performance desired by the owner or user of a physical asset or system.
Source: SAE JA 1012

3.16 discard

removal from service of an item at a specified life limit.
Not applicable for Reliability Centred Maintenance.
Source: AS IEC 60300.3.11

3.17 disposal

activities necessary to dispose of decommissioned assets.
Not applicable for Reliability Centred Maintenance
Source: PAS 55 Asset Management

3.18 environment

the aggregate of all external and internal conditions (such as temperature, humidity, radiation, magnetic and electrical fields, shock vibration) either natural or manmade, or self induced, that influences the form, performance, reliability or survival of an item.
Source: MIL-STD-721C

3.19 equipment class

class of similar type of equipment units (e.g. all pumps).
Source: ISO 14224:2006

3.20 equipment data

technical, operational and environmental parameters characterizing the design and use of an equipment unit.
Source: ISO 14224:2006

3.21 equipment unit

specific equipment unit within an equipment class as defined by its boundary (e.g. one pump).
Source: ISO 14224:2006

3.22 error

discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition.
Source: ISO 14224:2006

3.23 failure data

data characterizing the occurrence of a failure event and conditions leading up to the event.
Source: New definition

3.24 function

what the owner or user of a physical asset or system wants it to do.
Source: SAE JA 1012

3.24.1 function, primary

the function(s) which constitute the main reason(s) why a physical asset or system is acquired by its owner or user.
Source: SAE JA 1012

3.24.2 function, secondary

functions which a physical asset or system has to fulfil apart from its primary function(s), such as those needed to fulfil regulatory requirements and those which concern issues such as protection, control, containment, comfort, appearance, energy efficiency and structural integrity.
Source: SAE JA 1012

3.25 functional failure

a state in which a physical asset or system is unable to perform a specific function to a desired level of performance.
Source: SAE JA 1012

3.26 inspection

Examination of an item against a specific standard.
Source: AS IEC 60300.3.11

3.27 item

any part, component, device, subsystem, functional unit, equipment or system that can be individually considered.
Source: ISO 14224:2006

3.28 level of service

the defined service quality for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.
Source: IIMM V3.0

3.29 life profile

a time-phased description of the events and environments an item experiences from manufacture to final expenditures or removal from the operational inventory, to include one or more mission profiles.
Source: MIL-STD-721C

3.30 life units

a measure of use duration applicable to the item (e.g., operating hours, cycles, distance, rounds fired, attempts to operate etc.).
Source: MIL-STD-721C

3.31 life cycle

the stages involved in the management of an asset.
Source: ISO 55000 FDIS

3.32 life cycle cost

the sum of acquisition cost and ownership cost of a product over its life cycle.
Source: AS/NZS 4536:1999

3.33 acquisition cost

the initial cost to gain possession of the completed product. Includes any research, development, testing, evaluation costs, as well as the investment and installation cost.
Source: AS/NZS 4536:1999

3.34 ownership cost

summation of all operating expenses, maintenance, support and disposal costs

borne by the owner or user of a complete product during its life cycle.
Source: AS/NZS 4536:1999

3.35 maintainability

the measure of the ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair.
Source: MIL-STD-721C

3.36 maintainable item

item that constitutes a part or an assembly of parts that is normally the lowest level in the equipment hierarchy during maintenance.
Source: ISO 14224:2006

3.37 maintenance

all actions necessary for retaining an item in or restoring it to a specified condition.
Source: MIL-STD-721C

3.37.1 maintenance, breakdown

maintenance performed after a machine has failed.
Source: ISO 13372:2004(E)

3.37.2 maintenance, condition based

maintenance actions triggered by the condition or performance of a function.
Source: New definition

3.37.3 maintenance, corrective

maintenance carried out after fault recognition and intended to put an item into a state in which it can perform a required function.
Source: ISO 14224:2006

3.37.4 maintenance, opportunity

maintenance of an item that is deferred or advanced in time when an unplanned opportunity becomes available.
Source: ISO 14224:2006

3.37.5 maintenance, predictive

maintenance emphasising prediction of failure and taking action based on the condition of the equipment to prevent failure or degradation.
Source: ISO 13372:2004(E)

3.37.6 maintenance, preventive

maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item.
Source: AS IEC 60300.3.14—2005

3.37.7 maintenance, proactive

Term that encompasses condition based maintenance, fixed interval maintenance and run to failure
Source: ISO 13372:2004(E)

3.37.8 maintenance, scheduled

all maintenance carried out in accordance with an established schedule.
Source: New definition

3.37.9 maintenance, unplanned

all maintenance not carried out in accordance with an established schedule
Does not include breakdown maintenance.
Source: New definition

3.37.10 maintenance, unscheduled

see maintenance, unplanned

3.38 maintenance action

an element of a maintenance event. One of more tasks (i.e., fault localization, fault isolation, servicing and inspection) necessary to retain an item in or restore it to a specified condition.
Source: MIL-STD-721C

3.39 maintenance data

data characterizing the maintenance action planned or done.
Source: ISO 14224:2006

3.40 maintenance impact

impact of the maintenance on the plant or equipment's function(s).
Equipment function includes organisational impact.
Source: ISO 14224:2006

3.41 maintenance plan

collated information, policies and procedures for the optimum maintenance of an asset, or group of assets.
Source: IIMM V3.0

3.42 maintenance policy

general approach to the provision of maintenance and maintenance support based on the objectives and policies of owners, users and customers.
Source: AS IEC 60300.3.14—2005

3.43 maintenance programme

methods, procedures and resources required for sustaining the support of an item throughout its lifecycle.
Source: AS IEC 60300.3.11

3.44 maintenance record

all documentation related to a maintenance activity.
Source: New definition

3.45 maintenance support

resources required to maintain an item.
Source: New definition proposed by CMERD

3.46 maintenance support performance

ability of a maintenance organisation, under given conditions, to provide upon demand, the resources required to maintain an item, under a given maintenance concept and guided by a maintenance policy.
Source: AS IEC 60300.3.14—2005

3.47 maintenance task

action or set of actions required to achieve a desired outcome which restores an item to (or maintains an item in) serviceable condition, including inspection and determination of condition.
Source: AS IEC 60300.3.11

3.48 modification

combination of all technical and administrative actions intended to change an item.
Source: ISO 14224:2006

3.49 not operating

the state wherein an item is able to function but is not required to function.
Not to be confused with downtime
Source: MIL-STD-721C

3.50 operable

the state of being able to perform the intended function.
Source: MIL-STD-721C

3.51 operating context

the circumstances in which a physical asset or system is expected to operate.
Source: SAE JA 1012

3.52 operating state

state when an item is performing a required function.
Source: ISO 14224:2006

3.53 operation

the active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials. Operation costs are part of the lifecycle costs of an asset.
Source: IIMM V3.0

3.54 organisation strategic plan

overall long term plan for the organisation that is derived from, and embodies, its vision, mission, values, business policies, stakeholder requirements, objectives and the management of its risks.
Source: PAS 55 Asset Management

3.55 owner

a person or organisation that may either suffer or be held accountable for the consequences of a failure mode by virtue of ownership of the asset or system.
Source: SAE JA 1012

3.56 predicted

that which is expected at some future time, postulated on analysis of past experience and tests.
Source: MIL-STD-721C

3.57 predictive action

action to monitor the condition of an asset and predict the need for preventative action or corrective action.
Source: ISO 55000 FDIS

3.58 preventative action

action to eliminate the cause of a potential non-conformity or other undesirable potential situation.
Source: ISO 55000 FDIS

3.59 procedure

specified way of carrying out an activity or a process.
Source: PAS 55 Asset Management

3.60 process

set of interrelated or interacting activities which transforms inputs into outputs.
Source: ISO 55000 FDIS

3.61 reassembly

assembling the items that were removed during disassembly and closing the reassembled items.
Source: MIL-STD-721C

3.62 record

Document stating results achieved or providing evidence of activities performed.
Source: PAS 55 Asset Management

3.63 redundancy

the existence of more than one means for accomplishing a given function. Each means of accomplishing the function need not necessarily be identical.
Source: MIL-STD-721C

3.64 redundancy, active

that redundancy wherein redundant items are operating simultaneously.
Source: New definition

3.65 redundancy, standby

that redundancy wherein the alternative means of performing the function is not operating until it is activated upon failure of the primary means of performing the function.
Source: MIL-STD-721C

3.66 reliability

the probability that an item can perform its intended function for a specified interval under stated conditions.
Source: MIL-STD-721C

3.67 reliability centred maintenance

systematic approach for identifying effective and efficient maintenance tasks for items in accordance with a specific set of procedures and for establishing intervals between maintenance tasks.
Source: New definition

3.68 reliability growth

the improvement in a reliability parameter caused by the successful correction of deficiencies in item design or manufacture.
Source: MIL-STD-721C

3.69 reliability, generic data

reliability data covering families of similar equipment.
Source: ISO 14224:2006

3.70 repair

see maintenance, corrective.

3.71 repairable item

an item which can be restored to perform all of its required functions by corrective maintenance.
Source: MIL-STD-721C

3.72 required function

function or combination of functions of an item that is considered necessary to provide a given service.
Source: ISO 14224:2006

3.73 run to failure

maintenance approach that permits a specific failure mode to occur.
Source: New definition

3.74 scheduled discard

a scheduled task that entails discarding an item at or before a specified age limit regardless of its condition at the time.
Source: SAE JA 1012

3.75 scheduled restoration

a scheduled task that restores the capability of an item at or before a specified interval (age limit), regardless of its condition at the time, to

a level that provides a tolerable probability of survival to the end of another specified interval.
Source: SAE JA 1012

3.76 servicing

the performance of any act needed to keep an item in operating condition, (i.e. Lubricating, fuelling, oiling, cleaning, etc.).
Source: New definition

3.77 subsystem

a combination of sets, groups etc. Which performs an operational function within a system. (Example: Data processing subsystem, guidance subsystem).
Source: MIL-STD-721C

3.78 subunit

item or assembly of items within a system hierarchy that provides a specific function required for the system unit to achieve its intended performance.
Source: New definition

3.79 subsystem

a combination of sets or groups which perform an operational function within a system.
Source: MIL-STD-721C

3.80 system

set of assets that interact or are interrelated.
Source: ISO 55000 FDIS

3.81 tag number

number that can identify the physical location of equipment or an individual asset.
Source: New definition

3.82 taxonomy

systematic classification of items into generic groups based on factors possibly common to several of the items.
Source: ISO 14224:2006

3.83 test

experiment carried out in order to measure, quantify or classify a characteristic or a property of an item.
Source: AS IEC 60300.3.11

4 Failure Definitions

4.1 criticality

a relative measure of the consequence of a failure mode and its frequency of occurrences.
Source: MIL-STD-721C

4.2 criticality analysis

a procedure by which each potential failure mode is ranked accordingly to the combined influence of severity and probability of occurrence.
Source: MIL-STD-1629A

4.3 damage, accidental

physical deterioration of an item caused by contact or impact with an object or equipment, or maintenance.
Source: AS IEC 60300.3.11

4.4 damage, secondary effects

the result(s) or consequence(s) indirectly caused by the interaction of a damage mode with a system, subsystem or component thereof.
Source: MIL-STD-1629A

4.5 degradation

a gradual impairment of ability to perform.
Source: MIL-STD-721C

4.6 failure

termination of the ability of an item to perform a required function.
Source: ISO 14224:2006

4.6.1 failure, catastrophic

sudden unexpected failure of a machine resulting in considerable damage to the machine and/or associated machines or components.
Source: ISO 13372:2004(E)

4.6.2 failure, common cause

failures of different items resulting from the same direct cause, occurring within a relatively short time, where these failures are not consequences of another.
Source: ISO 14224:2006

4.6.3 failure, critical

failure of an equipment unit that causes an immediate cessation of the ability to perform a required function.
Source: ISO 14224:2006

4.6.4 failure, degraded

failure that does not cease the fundamental function(s), but compromises one or several functions.
Source: ISO 14224:2006

4.6.5 failure, dependant

failure which is caused by the failure of an associated item(s).
Source: MIL-STD-721C

4.6.6 failure, evident

a failure mode whose effects become apparent to the operating crew under normal circumstances if the failure mode occurs on its own.
Source: SAE JA 1012

4.6.7 failure, evident progression

The deterioration profile of an evident failure.

Source: New definition

4.6.8 failure, hidden

a failure mode whose effects are not readily apparent.
Source: New definition

4.6.9 failure, hidden progression

The assumed deterioration profile of a hidden failure

Source: New definition

4.6.10 failure, incipient

imperfection in the state or condition of an item so that a degraded or critical failure might (or might not) eventually be the expected result if corrective actions are not taken.
Source: ISO 14224:2006

4.6.11 failure, independent

failure which occurs without being caused by the failure of any other item.
Source: MIL-STD-721C

4.6.12 failure, intermittent

failure for a limited period of time, followed by the item's recovery of its ability to-perform within specified limits without any remedial action.
Source: MIL-STD-721C

4.6.13 failure, non-critical

failure of an equipment unit that does not cause an immediate cessation of the ability to perform its required function.
Source: ISO 14224:2006

4.6.14 failure, potential

an identifiable condition that indicates that a functional failure is either about to occur or is in the process of occurring.

Source: SAE JA 1012

4.6.15 failure, single point

the failure of an item which would result in failure of the system and is not compensated for by redundancy or alternative operational procedure.
Source: MIL-STD-721C

4.6.16 failure, undetectable

see hidden failure.

4.7 failure analysis

the logical systematic examination of an item, its construction, application, and documentation to identify the failure mode and determine the failure mechanism and its basic course.
Source: New definition

4.8 failure cause

Circumstances associated with design, manufacture, installation, use and maintenance that have led to a failure.
Source: ISO 14224:2006

4.9 failure consequence

the way(s) in which the effects of a failure mode or a multiple failure matter (evidence of failure, impact on safety, the environment, operational capability, direct and indirect repair costs).
Source: SAE JA 1012

4.10 failure data

data characterizing the occurrence of a failure event.
Source: ISO 14224:2006

4.11 failure effect

what is observed when a failure mode occurs.
Source: New definition

4.12 failure impact

see failure consequence.

4.13 failure mechanism

the physical, chemical, electrical, thermal or other process which results in failure.
Source: ISO 14224:2006

4.14 failure mode

the consequence of the mechanism through which the failure occurs. I.e. short, open, fracture, excessive wear.
Source: MIL-STD-721C

4.15 failure mode and effects analysis

a procedure by which each potential failure mode in a system is analysed to determine the results or effects thereof on the system and to classify each potential failure mode according to its severity.
Source: MIL-STD-721C

4.16 failure on demand

failure occurring unexpectedly when the item is required (e.g. stand-by emergency equipment).
Source: New definition

4.17 failure rate

The rate at which failures occur as a function of usage.
Source: New definition

4.18 fault

state of an item characterized by inability to perform a required function, excluding the inability during preventative maintenance or other planned actions, or due to lack of external resources.
Source: ISO 14224:2006

4.19 fault isolation

the process of determining the location of a fault to the extent necessary to effect repair.
Source: MIL-STD-721C

4.20 fault localization

the process of determining the approximate location of the fault.
Source: MIL-STD-721C

4.21 infant mortality

the relatively high conditional probability of failure during the period immediately after an item enters service. Such failures are due to defects in manufacturing not detected by quality control.
Source: MIL-STD 2173

4.22 interchange

removing the item to be replaced, and installing the replacement item.
Source: MIL-STD-721C

4.23 local effect

the consequence a failure mode has on the operation, function or status of the specific item being analysed.
Source: MIL-STD-1629A

4.24 nonconformity

non-fulfilment of a requirement.
Source: ISO 55000 FDIS

4.25 severity

the consequences of a failure mode. Severity considers the worst potential consequence of a failure, determined by the degree of injury, property damage, or system damage that could ultimately occur.
Source: MIL-STD-1629A

5 Time Related Definitions.

5.1 achieved

obtained as the result of measurement.
Source: MIL-STD-721C

5.2 availability

ability of an item to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided.
Source: ISO 14224:2006

5.2.1 availability, instantaneous

pointwise or instantaneous availability, A(t), is the probability that an item is in a state to perform a required function under given conditions at a given instant of time, assuming that the required external resources are provided.
Source: Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.

5.2.2 availability, point

see availability, instantaneous

5.2.3 availability, mean

the mean availability is the proportion of time during a mission or time period that the system is available for use.
Source: Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.

5.2.4 availability, average up time

see availability, mean

5.2.5 availability, steady state

the steady state availability of the system is the limit of the availability function as time tends to infinity.
Source: Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.

5.2.6 availability, inherent

inherent availability is the steady state availability when considering only the corrective maintenance (CM) downtime of the system.
Source: Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.

5.2.7 availability, achieved

achieved availability is very similar to inherent availability with the exception that preventive maintenance (PM) downtimes are also included.
Source: Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.

5.2.8 availability, operational

operational availability is a measure of the "real" average availability over a period of time and includes all experienced sources of downtime, such as administrative downtime, logistic downtime, etc.
Source: Elsayed, E., Reliability Engineering, Addison Wesley, Reading, MA, 1996.

5.3 age

a measure of exposure to stress computed from the moment an item or component enters service when new or re-enters service after a task designed to restore its initial capability, and can be measured in terms of calendar time, running time, distance travelled, duty cycles or units of output or throughput.
Source: SAE JA 1012

5.4 demonstrated

that which has been measured by the use of objective evidence gathered under specified conditions.
Source: MIL-STD-721C

5.5 direct man hours per maintenance action

a measure of the maintainability parameter related to item demand for maintenance manpower: The sum of direct maintenance man hours, divided by the total number of maintenance actions during a stated period of time.
Source: MIL-STD-721C

5.6 direct man hours per maintenance event

a measure of the maintainability parameter related to item demand for maintenance manpower: The sum of direct maintenance man hours, divided by the total number of maintenance events during a stated period of time.
Source: MIL-STD-721C

5.7 life

a measure of anticipated life of an asset of component, such as time, number of cycles, distance intervals, etc.
Source: IIMM V3.0

5.8 logistic delay

that accumulated time during which maintenance cannot be carried out due to the necessity to acquire maintenance resources, excluding any administrative delay.
Source: ISO 14224:2006

5.9 maintenance man hours

accumulated duration of the individual maintenance times used by all maintenance personnel for a given type of maintenance action or over a given time interval.
Source: ISO 14224:2006

5.10 maintenance time

an element of down time which excludes modification and delay time.
Source: MIL-STD-721C

5.11 mean maintenance time

the measure of item maintainability taking into account maintenance policy. The sum of preventative and corrective maintenance times, divided by the sum of scheduled and unscheduled maintenance events, during a stated period of time
Source: MIL-STD-721C

5.12 surveillance period

interval of time (calendar time) between the start date and end date of RM data collection.
Source: ISO 14224:2006

5.13 Time

the universal measurement of duration.
Source: MIL-STD-721C

5.13.1 time, active

that time during which an item is in operational inventory.
Source: MIL-STD-721C

5.13.2 time, active maintenance

that part of the maintenance time during which a maintenance action is performed on

an item, either automatically or manually, excluding logistic delays.
Source: ISO 14224:2006

5.13.3 time, administrative

that element of delay time, not included in the supply delay time.
Source: MIL-STD-721C

5.13.4 time, alert

that element of up time during which an item is assumed to be in specified operating condition and is awaiting a command to perform its intended mission.
Source: MIL-STD-721C

5.13.5 time, checkout

that element of maintenance time during which performance of an item is B10verified to be of a specified condition.
Source: MIL-STD-721C

5.13.6 time, delay

that element of down time during which no maintenance is being accomplished because of either supply or administrative delay.
Source: MIL-STD-721C

5.13.7 time, down

time interval during which an item is in a down state.
Source: ISO 14224:2006

5.13.8 time, idle

part of the up time that an item is not operating.
Source: ISO 14224:2006

5.13.9 time, inactive

that time during which an item is in reserve.
Source: MIL-STD-721C

5.13.10 time, mission

that element of up time required to perform a stated mission profile.
Source: MIL-STD-721C

5.13.11 time, not operating

that element of uptime during which the item is not required to operate.
Source: MIL-STD-721C

5.13.12 time, operating

time interval during which an item is in operating state.
Source: ISO 14224:2006

5.13.13 time, reaction

that element of uptime needed to initiate a mission, measured from the time command is received.
Source: MIL-STD-721C

5.13.14 time, supply delay

that element of delay time during which a needed replacement item is being obtained.
Source: MIL-STD-721C

5.13.15 time, turn around

that element of maintenance time needed to replenish consumables and check out an item for recommitment.
Source: MIL-STD-721C

5.14 uptime

time interval during which an item is in an up state.
Source: ISO 14224:2006

5.15 useful life

the number of life units from manufacture to when the item has an unrepairable failure or unacceptable failure rate.
Source: MIL-STD-721C

5.16 utilization rate

the planned or actual number of life units expended, or missions attempted during a stated interval of calendar time.
Source: MIL-STD-721C

5.17 wearout

the process which results in an increase of the failure rate or probability of failure with increasing number of life units.
Source: MIL-STD-721C

6 General Definitions – Sources

This table lists definitions for each terms from all sources listed in Table 1. The preferred choice as determined by the focus group is indicated with bold text. Relevant terms from ISO 55000 FDIS 2013 have been added to this table.

General Definitions

Term	Definition	Source
action, corrective	Action to eliminate the cause of a detected nonconformity or other undesirable situation.	PAS 55-1:2008
	A documented design, process, procedure, or materials change implemented and validated to correct the cause of failure or design deficiency	MIL-STD-721C
asset	**Something that has potential or actual value to an organization**	ISO 55000 FDIS
	Plant, machinery, property, buildings, vehicles and other items that have a distinct value to the organisation.	PAS 55-1:2008
asset, critical	**asset having the potential to significantly impact on the achievement of the organization's objectives**	ISO 55000 FDIS
asset hierarchy	A framework for segmenting an asset base into appropriate classifications. The asset hierarchy can be based on asset function; asset type or a combination of the two.	IIMM V3.0
	A hierarchical representation of the asset base with associated classifications.	New
asset management	Systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their lifecycles for the purpose of achieving its organisational strategic plan.	PAS 55-1:2008
	Coordinated activity of an organization to realize value from assets	ISO 55000 FDIS
	The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner.	IIMM V3.0
asset management objective	Result to be achieved	ISO 55000 FDIS

asset management plan	Document specifying activities and resources, responsibilities and timescales for implementing the asset management strategy and delivering the asset management objectives.	PAS 55-1:2008
	Formulation of a programme to achieve an objective. An asset management plan can be for an asset, asset type, asset system or asset portfolio, service or product	ISO 55000 FDIS
	A plan developed for the management of one or more infrastructure assets that combines multi-disciplinary management techniques over the lifecycle of the asset in the most cost-effective manner to provide a specified level of service. A significant component of the plan is a long term cashflow projection for the activities.	IIMM V3.0
asset management policy	**intentions and direction of an organization as formally expressed by its top management**	ISO 55000 FDIS
	Principles and mandated requirements derived from, and consistent with the organisational strategic plan, providing a framework for the development and implementation of the asset management strategy and the setting of the asset management objectives.	PAS 55-1:2008
asset management strategy	**Long term optimised approach to management of the assets, derived from, and consistent with, the organisational strategic plan and the asset management policy.**	PAS 55-1:2008
asset management system	**Management system for asset management that is there to establish the asset management policy and asset management objectives.**	ISO 55000 FDIS
components	Specific parts of an asset having independent physical or functional identity and having specific attributes such as different life expectancy, maintenance regimes, risk or criticality.	IIMM V3.0
	Specific parts of an asset having independent physical or functional identity.	New
condition monitoring	Detection and collection of information and data that indicate the state of a machine.	ISO 13372:2004(E)
	Continuous or periodic inspection, assessment, measurement and interpretation of the resultant data, to indicate the condition of a specific component so as to determine the need for some preventative or remedial action.	IIMM V3.0
	Continuous or periodic inspection, assessment, measurement and interpretation of the resultant data, to indicate the need for maintenance Action	New
Corrective action	**action to eliminate the cause of a nonconformity and to prevent recurrence**	ISO 55000 FDIS

	a documented design, process, procedure, or materials change implemented and validated to correct the cause of failure or design deficiency	MIL-STD-721C
demand	**Activation of the function (includes functional, operational and test activation).**	ISO 14224:2006
dependability	A measure of the degree to which an item is operable and capable of performing its' required function at any (random) time during a specified mission profile, given item availability at the start of the mission.	MIL-STD-721C
	The collective term used to describe the availability performance and its influencing factors: reliability performance, maintainability performance, and maintenance support performance.	AS IEC 60300.2
desired performance	**The level of performance desired by the owner or user of a physical asset or system.**	SAE JA 1012
discard	**Removal from service of an item at a specified life limit.**	AS IEC 60300.3.11
disposal	**Activities necessary to dispose of decommissioned assets.**	PAS 55-1:2008
environment	**The aggregate of all external and internal conditions (such as temperature, humidity, radiation, magnetic and electrical fields, shock vibration) either natural or man made, or self induced, that influences the form, performance, reliability or survival of an item.**	MIL-STD-721C
equipment class	**Class of similar type of equipment units (e.g. all pumps).**	ISO 14224:2006
equipment data	**Technical, operational and environmental parameters characterizing the design and use of an equipment unit.**	ISO 14224:2006
equipment unit	**Specific equipment unit within an equipment class as defined by its boundary (e.g. one pump).**	ISO 14224:2006
error	**Discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition.**	ISO 14224:2006
failure data	Data characterizing the occurrence of a failure event.	ISO 14224:2006
	Data characterizing the occurrence of a failure event and conditions leading up to the event.	New
function	Normal characteristic actions of an item	AS IEC 60300.3.11
	What the owner or user of a physical asset or system wants it to do.	SAE JA 1011 / SAE JA 1012
function, primary	**The function(s) which constitute the main reason(s) why a physical asset or system is acquired by its owner or user.**	SAE JA 1011 / SAE JA 1012

function, secondary	**Functions which a physical asset or system has to fulfil apart from its primary function(s), such as those needed to fulfil regulatory requirements and those which concern issues such as protection, control, containment, comfort, appearance, energy efficiency and structural integrity.**	SAE JA 1012
functional failure	Failure, the effect of which is that an entity fails to perform one or more of its required functions.	AS IEC 60300.3.11
	A state in which a physical asset or system is unable to perform a specific function to a desired level of performance.	SAE JA 1011 / SAE JA 1012
inspection	**Examination of an item against a specific standard.**	AS IEC 60300.3.11
item	**Any part, component, device, subsystem, functional unit, equipment or system that can be individually considered.**	ISO 14224:2006 / AS IEC 60300.3.14-2005
	A non-specific term used to denote any product, including systems, material parts, subassemblies, sets, accessories, etc.	MIL-STD-721C
level of service	**The defined service quality for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost.**	IIMM V3.0
life profile	**A time-phased description of the events and environments an item experiences from manufacture to final expenditures or removal from the operational inventory, to include one or more mission profiles.**	MIL-STD-721C
life units	**A measure of use duration applicable to the item (e.g., operating hours, cycles, distance, rounds fired, attempts to operate etc.).**	MIL-STD-721C
Life cycle	Time interval that commences with the identification of the need for an asset and terminates with the decommissioning of the asset or any associated liabilities.	PAS 55-1:2008
	The stages involved in the management of an asset	ISO 55000 FDIS
	The cycle of activities that an asset (or facility) goes through while it retains an identity as a particular asset, i.e. From planning and design to decommissioning or disposal.	IIMM V3.0
lifecycle cost	The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.	IIMM V3.0
	The cost of acquisition and ownership of a product over a defined period of its lifecycle. It may include the cost of development, acquisition, operation, support and disposal of the product.	AS IEC 60300.2

	The sum of acquisition cost and ownership cost of a product over its life cycle	AS/NZS 4536:1999
acquisition cost	**The initial cost to gain possession of the completed product. Includes any research, development, testing, evaluation costs, as well as the investment and installation cost.**	AS/NZS 4536:1999
ownership cost	**summation of all operating expenses, maintenance, support and disposal costs borne by the owner or user of a complete product during its life cycle**	AS/NZS 4536:1999
maintainability	⟨General⟩ Ability of an item under given conditions of use, to be retained in, or restored to, a state in which it can perform a required function, when maintenance is performed under given conditions and using stated procedures and resources.	ISO 14224:2006 / AS IEC 60300.3.14-2005
	The measure of the ability of an item to be retained in or restored to specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair.	MIL-STD-721C
	The ability of an item , under stated conditions of use, to be retained in, or restored to, a state where it can perform its required functions, when maintenance is performed under stated conditions and using prescribed procedures and resources.	BS4778
maintainable item	**Item that constitutes a part or an assembly of parts that is normally the lowest level in the equipment hierarchy during maintenance.**	ISO 14224:2006
maintenance	Combination of all technical and administrative actions, including supervisory actions, intended to retain an item in, or restore it to, a state in which it can perform a required function.	ISO 14224:2006 / AS IEC 60300.3.14-2005
	All actions necessary for retaining an item in or restoring it to a specified condition	MIL-STD-721C
maintenance action	Sequence of elementary maintenance activities carried out for a given purpose.	AS IEC 60300.3.14—2005
	An element of a maintenance event. One of more tasks (i.e., fault localization, fault isolation, servicing and inspection) necessary to retain an item in or restore it to a specified condition.	MIL-STD-721C
maintenance data	**Data characterizing the maintenance action planned or done.**	ISO 14224:2006
maintenance impact	**Impact of the maintenance on the plant or equipment's function(s).**	ISO 14224:2006

maintenance plan	**Collated information, policies and procedures for the optimum maintenance of an asset, or group of assets.**	IIMM V3.0
maintenance policy	**` General approach to the provision of maintenance and maintenance support based on the objectives and policies of owners, users and customers.**	AS IEC 60300.3.14—2005
maintenance programme	**Methods, procedures and resources required for sustaining the support of an item throughout its lifecycle.**	AS IEC 60300.3.11
maintenance record	Part of maintenance documentation that contains all failures, faults and maintenance information relating to an item.	ISO 14224:2006
	All documentation related to a maintenance activity	New
maintenance support	Resources required to maintain an item under a given maintenance concept and guided by a maintenance policy.	AS IEC 60300.3.14—2005
	Resources required to maintain an item	New
maintenance support performance	**Ability of a maintenance organisation, under given conditions, to provide upon demand, the resources required to maintain an item, under a given maintenance concept and guided by a maintenance policy.**	AS IEC 60300.3.14—2005
maintenance task	**Action or set of actions required to achieve a desired outcome which restores an item to (or maintains an item in) serviceable condition, including inspection and determination of condition.**	AS IEC 60300.3.11
maintenance, breakdown	**Maintenance performed after a machine has failed**	ISO 13372:2004(E)
maintenance, condition based	Maintenance performed as governed by condition monitoring programmes.	ISO 13372:2004(E)
	Maintenance actions triggered by the condition or performance of a function	New
maintenance, corrective	**Maintenance carried out after fault recognition and intended to put an item into a state in which it can perform a required function.**	ISO 14224:2006
	The remedial actions performed as a result of failure, to restore an item to a specified condition. Corrective maintenance may or may not be programmed.	IIMM V3.0
	The actions performed, as a result of failure, to restore an item to a specified condition	MIL-STD 2173
	All actions performed as a result of failure, to restore an item to a specified condition. Corrective maintenance can include any or all of the following steps: Localization, Isolation, Disassembly, Interchange, Reassembly, Alignment and Checkout.	MIL-STD-721C
	The maintenance carried out after failure has occurred and intended to restore an item to a state in which it can perform its required function	BS4778

	The actions performed, as a result of failure, to restore an item to a specified condition	MIL-STD 2173
maintenance, opportunity	Maintenance of an item that is deferred or advanced in time when an unplanned opportunity becomes available.	ISO 14224:2006
maintenance, predictive	Maintenance emphasising prediction of failure and taking action based on the condition of the equipment to prevent failure or degradation	ISO 13372:2004(E)
maintenance, preventive	Maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item.	ISO 14224:2006
	Maintenance performed according to a fixed schedule, or according to a prescribed criterion that detects or prevents degradation of a functional structure, system, or component, in order to sustain or extend its useful life.	ISO 13372:2004(E)
	Maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item.	AS IEC 60300.3.14—2005
	Predictive planned maintenance - condition monitoring activities used to predict failure.	IIMM V3.0
	All actions performed in an attempt to retain an item in specified condition by providing systematic inspection, detection, and prevention of incipient failures .	MIL-STD-721C
	Preventative planned maintenance - maintenance that can be initiated without routine or continuous checking and is not condition based.	IIMM V3.0
	The maintenance carried out at predetermined intervals or corresponding to prescribed criteria and intended to reduce the probability of failure or the performance degradation of an item.	BS4778
maintenance, proactive	Type of maintenance emphasising the routine detection and correction of root cause conditions that would otherwise lead to failure.	ISO 13372:2004(E)
	Maintenance undertaken before a failure occurs, in order to prevent the item from getting into a failed state (scheduled restoration, scheduled discard, and on-condition maintenance).	SAE JA 1012
	Term that encompasses condition based maintenance, fixed interval maintenance and run to failure	New
maintenance, scheduled	Preventive maintenance carried out in accordance with an established time schedule.	AS IEC 60300.3.14—2005

	Preventative maintenance performed at prescribed points in the items life.	MIL-STD-721C
	All maintenance carried out in accordance with an established schedule	New
maintenance, unplanned	Corrective work required in the short term to restore an asset to working condition so it can continue to deliver the required service or maintain its level of security and integrity.	IIMM V3.0
	All maintenance not carried out in accordance with an established schedule (need to add clarifying note that this is NOT breakdown maintenance)	New
maintenance, unscheduled	Maintenance carried out, not in accordance with an established time schedule, but after reception of an indication regarding the state of an item.	AS IEC 60300.3.14—2005
	An element of down time which excludes modification and delay time.	MIL-STD-721C
	See maintenance, unplanned	New
modification	**Combination of all technical and administrative actions intended to change an item.**	ISO 14224:2006
not operating	**The state wherein an item is able to function but is not required to function.**	MIL-STD-721C
operable	**The state of being able to perform the intended function**	MIL-STD-721C
operating context	**The circumstances in which a physical asset or system is expected to operate.**	SAE JA 1012
operating state	**State when an item is performing a required function.**	ISO 14224:2006
operation	**The active process of utilising an asset which will consume resources such as manpower, energy, chemicals and materials. Operation costs are part of the lifecycle costs of an asset.**	IIMM V3.0
organisation strategic plan	**Overall long term plan for the organisation that is derived from, and embodies, its vision, mission, values, business policies, stakeholder requirements, objectives and the management of its risks.**	PAS 55-1:2008
owner	**A person or organisation that may either suffer or be held accountable for the consequences of a failure mode by virtue of ownership of the asset or system.**	SAE JA 1012
predicted	**That which is expected at some future time, postulated on analysis of past experience and tests.**	MIL-STD-721C
predictive action	**Action to monitor the condition of an asset and predict the need for preventative action or corrective action**	ISO 55000 FDIS
preventative action	**action to eliminate the cause of a potential non-conformity or other undesirable potential situation**	ISO 55000 FDIS
procedure	**Specified way of carrying out an activity or a process.**	PAS 55-1:2008

process	**Set of interrelated or interacting activities which transforms inputs into outputs.**	ISO 55000 FDIS
reassembly	**Assembling the items that were removed during disassembly and closing the reassembled items.**	MIL-STD-721C
record	**Document stating results achieved or providing evidence of activities performed.**	PAS 55-1:2008
redundancy	Existence of more than one means for performing a required function of an item.	ISO 14224:2006
	The existence of more than one means for accomplishing a given function. Each means of accomplishing the function need not necessarily be identical.	MIL-STD-721C
	Existence of means, in addition to the means which would be sufficient for a functional unit to perform a required function or for data to represent information.	IEC 61508 Part 4
redundancy, active	That redundancy wherein all redundant items are operating simultaneously.	MIL-STD-721C
	That redundancy wherein redundant items are operating simultaneously.	New
redundancy, standby	**That redundancy wherein the alternative means of performing the function is not operating until it is activated upon failure of the primary means of performing the function.**	MIL-STD-721C
reliability	Ability of an item to perform a required function under given conditions for a given time interval.	ISO 14224:2006
	The probability that an item can perform its intended function for a specified interval under stated conditions.	MIL-STD-721C
	The duration or probability of failure-free performance under stated conditions.	MIL-STD-721C
	Probability that a machine will perform its required functions without failure for a specified time period when used under specified conditions.	ISO 13372:2004(E)
reliability centred maintenance	**Systematic approach for identifying effective and efficient maintenance tasks for items in accordance with a specific set of procedures and for establishing intervals between maintenance tasks.**	new
reliability growth	**The improvement in a reliability parameter caused by the successful correction of deficiencies in item design or manufacture.**	MIL-STD-721C
reliability, generic data	**Reliability data covering families of similar equipment.**	ISO 14224:2006
repair	**See maintenance, corrective.**	
repairable item	**An item which can be restored to perform all of its required functions by corrective maintenance.**	MIL-STD-721C

required function	**Function or combination of functions of an item that is considered necessary to provide a given service.**	ISO 14224:2006
	AS IEC ISO 13372:2004(E)0AS IEC 60812-200800.AS IEC 60300.2 Appropriate action of any machine or part of a system.	ISO 13372:2004(E)
requirement	Need or expectation that is stated, generally implied or obligatory	ISO 55000 FDIS
run to failure	A failure management policy that permits a specific failure mode to occur without any attempt to anticipate or prevent it.	SAE JA 1012
	Maintenance approach that permits a specific failure mode to occur	new
scheduled discard	**A scheduled task that entails discarding an item at or before a specified age limit regardless of its condition at the time.**	SAE JA 1011 / SAE JA 1012
scheduled restoration	**A scheduled task that restores the capability of an item at or before a specified interval (age limit), regardless of its condition at the time, to a level that provides a tolerable probability of survival to the end of another specified interval.**	SAE JA 1011 / SAE JA 1012
servicing	The performance of any act needed to keep an item in operating condition, (i.e. Lubricating, fuelling, oiling, cleaning, etc.) but not including preventative maintenance of parts of corrective maintenance tasks.	MIL-STD-721C
	The performance of any act needed to keep an item in operating condition, (i.e. Lubricating, fuelling, oiling, cleaning, etc.)	new
subunit	Assembly of items that provides a specific function that is required for the equipment unit within the main boundary to achieve its intended performance.	ISO 14224:2006
	Item or assembly of items within a system hierarchy that provides a specific function required for the system unit to achieve its intended performance	new
subsystem	**A combination of sets or groups which performs an operational function within a system.**	MIL-STD-721C
system	Grouping of associated entities, which is characterised by a mental construct.	ISO 13372:2004(E)
	Set of assets that interact or are interrelated	ISO 55000 FDIS
	Set of interrelated or interacting elements.	AS IEC 60300.3.14—2005
	Set of elements that interact according to a design, there an element of a system can be another system, called subsystem,	IEC 61508 Part 4

	which may be a controlling system or a controlled system and may include hardware, software and human interaction.	
tag number	Number that identifies the physical location of equipment.	ISO 14224:2006
	Number that can identify the physical location of equipment or an individual asset	new
taxonomy	**Systematic classification of items into generic groups based on factors possibly common to several of the items.**	ISO 14224:2006
test	**Experiment carried out in order to measure, quantify or classify a characteristic or a property of an item.**	AS IEC 60300.3.11
user	A person or organisation that operates an asset or system and may either suffer or be held accountable for the consequences of a failure mode of that system.	SAE JA 1011 / SAE JA 1012
wearout	**The process which results in an increase of the failure rate or probability of failure with increasing number of life units.**	MIL-STD-721C

7 Failure Definitions – Sources

This table lists all given choices for the term. The agreed choice for the term is indicated with bold text.

Failure Definitions

Term	Definition	Definition
criticality	Numerical index of the severity of an effect combined with the probability or expected frequency of its occurrence.	AS IEC 60300.3.11
	A relative measure of the consequence of a failure mode and its frequency of occurrences.	MIL-STD-721C
criticality analysis	**A procedure by which each potential failure mode is ranked accordingly to the combined influence of severity and probability of occurrence**	MIL-STD-1629A
damage, accidental	**Physical deterioration of an item caused by contact or impact with an object or equipment, or maintenance.**	AS IEC 60300.3.11
damage, secondary effects	**The result(s) or consequence(s) indirectly caused by the interaction of a damage mode with a system, subsystem or component thereof.**	MIL-STD-1629A
degradation	**A gradual impairment of ability to perform.**	MIL-STD-721C
failure	**Termination of the ability of an item to perform a required function.**	ISO 14224:2006 /ISO 13372 / AS IEC 60300.2 / AS IEC 60300.3.11 / AS IEC 60812
	The event or inoperable state in which an item or part of an item does not, or would not , perform as previously specified.	MIL-STD-721C
	An unacceptable deviation from the design tolerance; inability to meet a standard; non performance of what is requested or expected.	NASA 2002
failure analysis	Subsequent to a failure, the logical systematic examination of an item, its construction, application, and documentation to identify the failure mode and determine the failure mechanism and its basic course.	MIL-STD-721C
	The logical systematic examination of an item, its construction, application, and documentation to identify the failure mode and determine the failure mechanism and its basic course.	new
failure cause	Circumstances associated with design, manufacture, installation, use and maintenance that have led to a failure.	ISO 14224:2006

	The circumstances during design, manufacture or use which have led to a failure.	AS IEC 60300.3.11
	The physical or chemical processes, design defects, quality defects, part misapplication, or other processes which are the basic reason for failure or which initiate the physical process which by deterioration proceeds to failure	MIL-STD-1629A
failure consequences	**The way(s) in which the effects of a failure mode or a multiple failure matter (evidence of failure, impact on safety, the environment, operational capability, direct and indirect repair costs).**	SAE JA 1012
	A classification of the failure effects of failure modes into categories based on evidence of failure, impact on safety, the environment, operational capability and cost.	SAE JA 1011SAE JA 1011
failure data	**Data characterizing the occurrence of a failure event.**	ISO 14224:2006
failure effect	Consequence of a failure mode in terms of the operation, function or status of the item.	AS IEC 60812-2008
	The consequence(s) a failure mode has on the operation, function, or status of an item. Failure efforts are classified as local effect, next higher level, and end effect.	MIL-STD-721C
	What happens when a failure mode occurs.	SAE JA 1011 / SAE JA 1012
	What is observed when a failure mode occurs	new
failure impact	**Impact of a failure on an equipment's function(s) or on the plant.**	ISO 14224:2006
failure mechanism	**The physical, chemical, electrical, thermal or other process which results in failure.**	ISO 14224:2006
failure mode	Effect by which a failure is observed on the failed item.	ISO 14224:2006
	Effect by which a failure is observed.	ISO 13372:2004(E)
	One of the possible states of a failed item, for a given required function.	AS IEC 60300.3.11
	Manner in which an item fails.	AS IEC 60812-2008
	The consequence of the mechanism through which the failure occurs. I.e. short, open, fracture, excessive wear.	MIL-STD-721C
	A single event, which causes a functional failure.	SAE JA 1011 / SAE JA 1012
failure mode and effects analysis	**A procedure by which each potential failure mode in a system is analysed to determine the results or effects thereof on the system and to classify each potential failure mode according to its severity.**	MIL-STD-721C

failure on demand	Failure occurring immediately when the item is solicited to start (e.g. stand-by emergency equipment).	ISO 14224:2006
	Failure occurring unexpectedly when the item is required (e.g. stand-by emergency equipment).	new
failure, catastrophic	**Sudden unexpected failure of a machine resulting in considerable damage to the machine and/or associated machines or components.**	ISO 13372:2004(E)
	A failure that can cause item loss.	MIL-STD-721C
failure, common cause	**Failures of different items resulting from the same direct cause, occurring within a relatively short time, where these failures are not consequences of another.**	ISO 14224:2006
failure, critical	**Failure of an equipment unit that causes an immediate cessation of the ability to perform a required function.**	ISO 14224:2006
	A failure, or combination of failures, that prevents an item from performing a specified mission.	MIL-STD-721C
failure, degraded	**Failure that does not cease the fundamental function(s), but compromises one or several functions.**	ISO 14224:2006
failure, dependant	**Failure which is caused by the failure of an associated item(s).**	MIL-STD-721C
failure, evident	**A failure mode whose effects become apparent to the operating crew under normal circumstances if the failure mode occurs on its own.**	SAE JA 1011 / SAE JA 1012
failure, evident progression	**The deterioration profile of an evident failure**	New
failure, hidden	Failure that is not immediately evident to operations and maintenance personnel.	ISO 14224:2006
	A failure mode whose effects do not become apparent to the operating crew under normal circumstances if the failure mode occurs on its own.	SAE JA 1011 / SAE JA 1012
	A failure mode whose effects are not readily apparent	new
failure, hidden progression	**The assumed deterioration profile of a hidden failure**	new
failure, incipient	**Imperfection in the state or condition of an item so that a degraded or critical failure might (or might not) eventually be the expected result if corrective actions are not taken**	ISO 14224:2006
failure, independent	**Failure which occurs without being caused by the failure of any other item.**	MIL-STD-721C
failure, intermittent	**Failure for a limited period of time, followed by the item's recovery of its ability to-perform within specified limits without any remedial action.**	MIL-STD-721C
	Failure of an item for a limited period of time, following which the item restores its required function without being subjected to any external corrective action.	BS4778

failure, non-critical	**Failure of an equipment unit that does not cause an immediate cessation of the ability to perform its required function.**	ISO 14224:2006
failure, potential	**An identifiable condition that indicates that a functional failure is either about to occur or is in the process of occurring.**	SAE JA 1011 / SAE JA 1012
failure, single point	**The failure of an item which would result in failure of the system and is not compensated for by redundancy or alternative operational procedure.**	MIL-STD-721C
failure, undetectable	**A postulated failure mode in the FMEA for which there is no failure detection method by which the operator is made aware of the failure.**	MIL-STD-1629A
fault	**State of an item characterized by inability to perform a required function, excluding the inability during preventative maintenance or other planned actions, or due to lack of external resources.**	ISO 14224:2006 / AS IEC 60300.2 / AS IEC 60812-2008
	Condition of a component that occurs when one of its components or assemblies degrades or exhibits abnormal behaviour, which may lead to failure of the machine.	ISO 13372:2004(E)
	Abnormal condition that may cause a reduction in, or loss of the capability of a functional unit to perform the required function.	IEC 61508 Part 4
	The immediate cause of failure (e.g. Maladjustment, misalignment, defect etc).	MIL-STD-721C
	A defect, imperfection, mistake or flaw of varying severity that occurs within some hardware or software component of a system. "Fault" is a general term and can range from a minor defect to a failure	NASA 2002
fault isolation	**The process of determining the location of a fault to the extent necessary to effect repair.**	MIL-STD-721C
fault localization	**The process of determining the approximate location of the fault.**	MIL-STD-721C
infant mortality	**The relatively high conditional probability of failure during the period immediately after an item enters service. Such failures are due to defects in manufacturing not detected by quality control**	MIL-STD 2173
interchange	**Removing the item to be replaced, and installing the replacement item.**	MIL-STD-721C
local effect	**The consequence a failure mode has on the operation, function or status of the specific item being analysed.**	MIL-STD-1629A
nonconformity	**Non-fulfilment of a requirement**	ISO 55000 FDIS
risk	**Effect of uncertainty on objectives**	ISO 31000

severity	**The consequences of a failure mode. Severity considers the worst potential consequence of a failure, determined by the degree of injury, property damage, or system damage that could ultimately occur**	MIL-STD-1629A

8 Time Definitions – Sources

This table lists all given choices for the term. The agreed choice for the term is indicated with bold text.

Time Definitions

Term	Definition	Definition
achieved	**Obtained as the result of measurement.**	MIL-STD-721C
age	**A measure of exposure to stress computed from the moment an item or component enters service when new or re-enters service after a task designed to restore its initial capability, and can be measured in terms of calendar time, running time, distance travelled, duty cycles or units of output or throughput.**	SAE JA 1011 / SAE JA 1012
availability	**Ability of an item to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval, assuming that the required external resources are provided.**	ISO 14224:2006
	Probability that a machine will, when used under specified conditions, operate satisfactorily and effectively.	ISO 13372:2004(E)
	A measure of the degree to which an item is in an operable and committable state at the start of a mission when the mission is called for at an unknown (random time). (Item state at start of a mission includes the combined effects of the readiness-related system R & M parameters, but excludes mission time.	MIL-STD-721C
	The ability of the item (under combined aspects of its reliability, maintainability, and maintenance support) to perform its required function at a stated instant of time or over a stated period of time	BS4778
availability, instantaneous availability, point	**Pointwise or instantaneous availability, A(t), is the probability that an item is in a state to perform a required function under given conditions at a given instant of time, assuming that the required external resources are provided.**	Reliability Engineering, Addison Wesley, Reading, MA, 1996.
availability, mean availability, average up time	**The mean availability is the proportion of time during a mission or time period that the system is available for use.**	Reliability Engineering, Addison Wesley, Reading, MA, 1996.
availability, steady state	**The steady state availability of the system is the limit of the availability function as time tends to infinity.**	Reliability Engineering, Addison

		Wesley, Reading, MA, 1996.
availability, inherent	**Inherent availability is the steady state availability when considering only the corrective maintenance (CM) downtime of the system.**	Reliability Engineering, Addison Wesley, Reading, MA, 1996.
availability, achieved	**Achieved availability is very similar to inherent availability with the exception that preventive maintenance (PM) downtimes are also included.**	Reliability Engineering, Addison Wesley, Reading, MA, 1996.
availability, operational	**AS IEC ISO 13372:2004(E)0AS IEC 60812-200800.AS IEC 60300.2AS IEC 60300.3.11AOperational availability is a measure of the "real" average availability over a period of time and includes all experienced sources of downtime, such as administrative downtime, logistic downtime, etc.**	Reliability Engineering, Addison Wesley, Reading, MA, 1996.
demonstrated	**That which has been measured by the use of objective evidence gathered under specified conditions.**	MIL-STD-721C
direct man hours per maintenance action	**A measure of the maintainability parameter related to item demand for maintenance manpower: The sum of direct maintenance man hours, divided by the total number of maintenance actions during a stated period of time.**	MIL-STD-721C
direct man hours per maintenance event	**A measure of the maintainability parameter related to item demand for maintenance manpower: The sum of direct maintenance man hours, divided by the total number of maintenance events during a stated period of time.**	MIL-STD-721C
failure rate	The total number of failures, within an item population, divided by the total number of life units expended by that population ,during a particular measurement interval under stated conditions.	MIL-STD-721C
	The failure rate is an average frequency, λ, of failure (i.e. a number of failures per unit of time).	ISO 14224:2006
	The rate at which failures occur as a function of usage.	new
(asset) life	**A measure of anticipated life of an asset of component, such as time, number of cycles, distance intervals, etc.**	IIMM V3.0
	Period from asset creation to asset end of life	ISO 55000 FDIS
logistic delay	**That accumulated time during which maintenance cannot be carried out due to the necessity to acquire**	ISO 14224:2006

	maintenance resources, excluding any administrative delay.	
maintenance man hours	**Accumulated duration of the individual maintenance times used by all maintenance personnel for a given type of maintenance action or over a given time interval.**	ISO 14224:2006
maintenance time	**An element of down time which excludes modification and delay time.**	MIL-STD-721C
mean maintenance time	**The measure of item maintainability taking into account maintenance policy. The sum of preventative and corrective maintenance times, divided by the sum of scheduled and unscheduled maintenance events, during a stated period of time**	MIL-STD-721C
surveillance period	**Interval of time (calendar time) between the start date and end date of RM data collection.**	ISO 14224:2006
Time	**The universal measurement of duration.**	MIL-STD-721C
Time, active	**That time during which an item is in operational inventory.**	MIL-STD-721C
time, active maintenance	**That part of the maintenance time during which a maintenance action is performed on an item, either automatically or manually, excluding logistic delays.**	ISO 14224:2006
time, administrative	**That element of delay time, not included in the supply delay time.**	MIL-STD-721C
time, alert	**That element of up time during which an item is assumed to be in specified operating condition and is awaiting a command to perform its intended mission.**	MIL-STD-721C
time, checkout	**That element of maintenance time during which performance of an item is verified to be of a specified condition.**	MIL-STD-721C
time, delay	**That element of down time during which no maintenance is being accomplished because of either supply or administrative delay**	MIL-STD-721C
time, down	**Time interval during which an item is in a down state.**	ISO 14224:2006
	The period of time during which an item is not in a condition to perform its required function	BS4778
time, down	**That element of active time during which an item is not in condition to perform its required function. (reduces availability and dependability).**	MIL-STD-721C
time, idle	**Part of the up time that an item is not operating.**	ISO 14224:2006
time, inactive	**That time during which an item is in reserve.**	MIL-STD-721C

time, mission	**That element of up time required to perform a stated mission profile.**	MIL-STD-721C
time, not operating	**That element of uptime during which the item is not required to operate.**	MIL-STD-721C
time, operating	**Time interval during which an item is in operating state.**	ISO 14224:2006
time, reaction	**That element of uptime needed to initiate a mission, measured from the time command is received.**	MIL-STD-721C
time, supply delay	**That element of delay time during which a needed replacement item is being obtained.**	MIL-STD-721C
time, turn around	**That element of maintenance time needed to replenish consumables and check out an item for recommitment.**	MIL-STD-721C
time, uptime	**Time interval during which an item is in an up state.**	ISO 14224:2006
	That element of active time during which an item is in condition to perform its required functions.	MIL-STD-721C
up time	**Time interval during which an item is in an up state.**	ISO 14224:2006
useful life	Period over which a depreciable asset is expected to be used.	IIMM V3.0
	The number of production or similar units that is expected to be obtained from the asset.	IIMM V3.0
	The number of life units from manufacture to when the item has an unrepairable failure or unacceptable failure rate.	MIL-STD-721C
utilization rate	**The planned or actual number of life units expended, or missions attempted during a stated interval of calendar time.**	MIL-STD-721C