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CONFERENCE OF NATIONAL ARMAMENTS DIRECTORS

NAC TASKING ON AIR COMMAND AND CONTROL IN SERVICE SUPPORT SUSTAINABILITY

Note by Vice-Chair

References: A. PO(2021) 0503
B. AC/259-D(2022)0006 dated 7 February 2022
C. AC/327-D(2022)0004-AS1 (PFP) dated 21 June 2022

1. In response to reference A, the Conference of National Armaments Directors (CNAD) tasked the LCMG to develop a common terminology for changes for Hardware and Software (such as corrective maintenance, preventive maintenance, adaptive maintenance, evolution, adaptation, modernization etc.) applicable to Air C2 In-Service Support (ISS) and to report progress at its earliest opportunity (reference B).

2. The report at Annex 1 was developed by the NIAG Interface Group (NIIG), composed of experts from Industry, and in consultation and coordination with LCMG Working Groups. It was subsequently approved by the LCMG per reference C. The LCMG will further recommend the NATO Standardization Office to include the common terminology into the NATO Terminology Database.

4. Unless I hear to the contrary by 17h30 on 12 July 2022, I shall take it that the CNAD has noted the report at Annex 1. The report will be shared with the Integrated Air and Missile Defence Policy Committee to inform their work in response to the same NAC Tasking.

Signed Robert Weaver

Annex 1: NIIG report on ACCS ISS

Action Officer: J-S Vautier

Original: English

NIIG REPORT ON ACCS ISS:

TERMINOLOGY IN THE FIELD OF MAINTENANCE

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1. Introduction

The objective of this annex is to identify a common maintenance terminology for the sake of simplicity and standardization.

In accordance with ALP-10 [18], the term “maintenance” refers to the identification of the requirements to enable maintenance services for the product/system and its support throughout the entire life cycle. These requirements shall be considered including hardware, software, network, communication, security, materiel, facilities, personnel, procedures, processes, documentation, and data.

Maintenance is mainly twofold: (1) corrective, and (2) preventive maintenance. Corrective maintenance refers to actions taken to restore assets after an unplanned failure. Preventive maintenance can be “scheduled” or “condition based” which includes “on condition” and “predictive” maintenance. Predictive maintenance relies on specific signs, i.e., prognostics, and interacts with continuous improvement, as it evolves from prognostic to proactive maintenance. From the proactive side of view, predictive maintenance activities can be linked to continuous improvement as illustrated in Figure 1.

Another concept that should be considered in maintenance terminology is change management. The term “Change Management” refers to a broad concept that encompasses all types of change, and it is defined as “a systematic way to handle changes within an organization to effectively deal with the change and to capitalize on possible opportunities” (ISO 9001 [6]). It should be noted that ISO also proposed a global standard for IT Service Management Systems (ISO 20000-1 [7]). In this aspect, change control is defined in NATO Terminology Database [24] as: "the activities for control of the product after formal approval of its product configuration information". Additionally, a note adds: “change control includes management of configuration changes and management of concessions”.

When considering changes in the configuration of a product/system (refers to configuration change management), these changes may or may not affect maintenance activities. This decision depends on the nature of the approved configuration change, e.g., design changes, procedure changes, budget changes etc., so it should be analyzed whether the change in question has an impact on maintenance activities, or not. Therefore, it should be ensured that the as-realised instance of the product/system and the as-maintained instance of the item are traceable through the lifecycle using unique identification of items [21].

The organization of this annex is as follows. In the second chapter, some NATO Standards related to maintenance are introduced. In the third chapter, the recommended maintenance terminology with regard to both hardware maintenance and software maintenance is explained.

References are listed in fourth chapter according to AAP-77 [19]. In the appendixes, Table 1 presents the NATO Maintenance Terminology, Table 2 identifies the Software Maintenance Terminology proposed by ISO 14764 [8], Table 3 provides a broad terminology in relation with maintenance proposed by IEC 60050 [4], and finally the List of Abbreviations is provided.

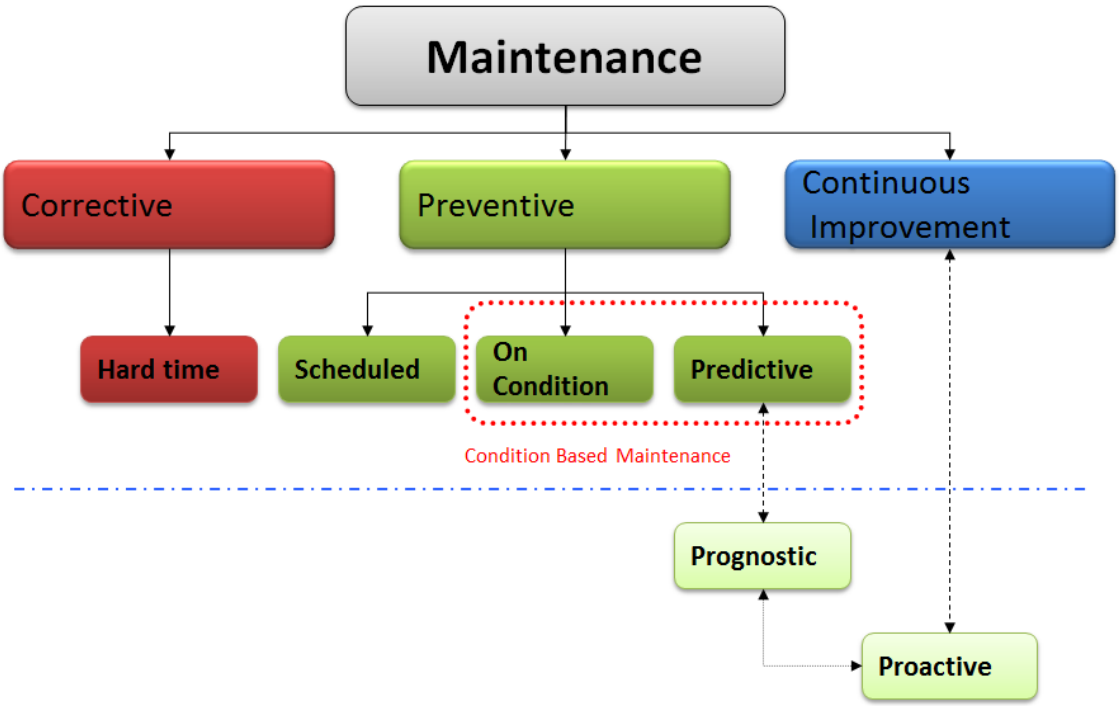

Figure 1. Different Maintenance Activities
(Note: This figure is sourced from AAP-48 [15], page 159)

2. NATO Standards

The AAP-20, "NATO Programme Management Framework (NATO Life Cycle Model)", is a generic guidance document that provides the standardized and tailorable approach for managing programmes by NATO, Agencies, Groups of Nations and Nation(s). It delivers a structured approach to describe the stages and to aid decision-making at these decision points for all management levels involved in cooperative programmes.

It states in particular that, during the development stage of a programme, a maintenance strategy/plan should be developed.

During the utilization stage, once the system is activated and is being used, its performance should be monitored and anomalies, deficiencies, and failures should be properly recorded, identified, and resolved. Resolutions come in the forms of maintenance, minor modification (low cost/temporary), major modification (permanent), and system life extensions. The utilization stage includes milestones related to major planned maintenance events.

Concurrently with the Utilization Stage, the Support Stage is executed to provide logistics, maintenance and support services that enable continued system operation and sustainable service. The Support Stage includes monitoring of the performance of the enabling system and services, identification, classification, reporting of anomalies, deficiencies and failures of the enabling systems and services, and the resolution of those anomalies, deficiencies, and failures. Resolutions come in the form of maintenance, minor system or services modification, major system or services modification, or end-of-life retirement. The maintenance strategy/plan is implemented [14].

The AAP-48, “NATO System Life Cycle Processes”, establishes a generic, comprehensive and informative process model that shall be used on NATO and Multinational Programmes. This model can also be applied to National Programmes.

In this document, as part of the Technical Processes, the Logistic Support and Maintenance Process is defined. Based on feedback from monitoring of the operational environment, use profiles and problems, corrective, remedial or preventive actions can be taken to restore full system availability. This process includes the production of a maintenance plan. This maintenance plan can include different maintenance actions as described in Figure 1 [15].

Other documents address this subject. Concerning Software Quality Requirements (AQAP 2210: Contractual Quality Requirements for Quality), maintenance is defined as “a combination of all technical, administrative, and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function” [2; 22]. Concerning Aerospace Maintenance Quality Requirements (LCMG ST2020/01: Quality Management Requirements for Maintenance Organizations), maintenance is defined as “the performance of tasks required to ensure the continuing airworthiness of a product or article, including any one or combination of overhaul, disassembling, cleaning, inspection, testing, replacement, defect rectification and the embodiment of a modification or repair” [3].

3. Recommended Maintenance Terminology

Maintenance is an activity that retains or restores a physical item to a specified condition or level of performance. In other words, maintenance is the combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function.

Maintenance supports operation, i.e., any action required to restore the operation of a system or to ensure operational status can be maintained over time is a maintenance task; a maintenance task becomes a support task when it is associated to an organizational element of the support organization in charge of that task at the defined level.

In this chapter, recommended maintenance terminology is considered as (1) Hardware Maintenance Terminology, and (2) Software Maintenance Terminology, and these different dimensions of maintenance activities are distinguished by given examples [18].

3.1 Recommended Hardware Maintenance Terminology

Hardware maintenance is generally categorized as in Figure 1.

1. Preventive:

   i. On-condition: maintenance carried out to mitigate degradation and reduce the probability of failure after analysis of system conditions through defined indicators assessed on a periodic basis or via active monitoring.
   ii. Scheduled (planned): maintenance carried out on a periodic basis (time-related or number-of-occurrences-related).

2. Corrective:

i. Deferred: maintenance carried out to perform a Remove & Replace (R&R) action of a faulty item not immediately affecting system operation. It is done in a time slot that does not further impact the operational availability (e.g., during a scheduled maintenance downtime period) or on live equipment if this is possible (e.g., when active redundancy or hot stand-by are implemented).
ii. Run-to-failure: maintenance carried out to perform a R&R action of a faulty item immediately affecting system operation (critical failure). The action is done as soon as all the resources (skills, tools, and spares) are available to minimize the system downtime.

3.2 Recommended Software Maintenance Terminology

The software maintenance is a modification for the purposes of software fault removal, adaptation to a new environment, or improvement of performance. Software maintenance can also be grouped as in Figure 1.

1. Preventive/Scheduled: it refers to tasks necessitated for detecting potential errors in a software product or anticipate and avoid potential failures (daily checks, database cleanup/integrity checks, cache cleaning, rebooting/restarting etc.). The task can lead, if latent failures are discovered, to a modification of a software product (might cause an Engineering Change Proposal - ECP) after delivery to detect and correct latent faults in the software product before they become effective faults (leading to a deferred corrective action).

2. Corrective/Unscheduled: it refers to tasks necessitated by actual errors in a software product. If the software product does not meet its requirements, corrective maintenance is performed. It is a reactive modification of a software product performed after a new version is made available (patch/update) to correct the discovered problem. This activity is linked to configuration management, change management, new software release, and/or Product Baseline (PBL) change.

3. Adaptive Maintenance: software maintenance for the purposes of adaptation to a new environment (e.g., a new environment could be a new type of hardware or a new operating system). Adaptive refers to a change necessary to accommodate a changing environment. Adaptive changes include changes to implement new system interface requirements, new system requirements, or new hardware requirements. This is a modification of a software product performed after delivery to keep a software product usable in a changed or changing environment.

4. Perfective Maintenance: software maintenance performed to improve the performance, maintainability, or other attributes of a computer program (e.g., maintenance that adds new required functions is often referred to as enhancement). Perfective refers to a change that improves the software product's performance. A perfective change might entail providing new functionality improvements for users or reverse engineering to create maintenance documentation that did not exist previously or to change existing documentation. This is a modification of a software product after delivery to improve performance or maintainability.

3.3 Hardware and Software Changes

The Life Cycle Management Group recommends these terms for describing (1) Hardware and (2) Software Changes for Air C2 that are implemented under maintenance conditions:

- Maintenance
- Corrective Maintenance
- Software Maintenance
- Adaptive Maintenance (for software)
- Perfective Maintenance (for software)

Maintenance: the term "maintenance" can be used for hardware and software changes. Four entries for "maintenance" are given in NATO Terminology Database [24], records: 7587, 7647, 18150, 31173. The 7587 record defines maintenance as: "all actions taken to retain equipment in or to restore it to specified conditions until the end of its use, including inspection, testing, servicing, modification, classification as to serviceability, repair, recovery, rebuilding, reclamation, salvage and cannibalization". This definition is considered accurate and appropriate.

Corrective Maintenance: the term "corrective maintenance" can be used for hardware and software. Corrective maintenance is record 12447 in NATO Terminology Database [24] and is defined as "maintenance carried out after fault recognition and intended to restore equipment to a state in which it can perform a required function". This definition is considered accurate and appropriate.

Software Maintenance: the term "software maintenance" can be used for software. Software maintenance is record 31233 in NATO Terminology Database [24] and is defined as "the activity intended to retain software in, or restore it to, a state in which it can perform its required function". A note adds: "it comprises corrective, adaptive, and perfective software maintenance".

Adaptive Maintenance: the term "adaptive maintenance" has no definition in NATO Terminology Database [24] or ISO 2382 [5]. The term is used in [17], but not defined. A definition is provided in [4] for adaptive maintenance, <of software> as "software maintenance for the purposes of adaptation to a new environment". A note adds: “an example of a new environment could be a new type of hardware on which the software is to be run”. This report recommends the NSO consider this definition is added to the Official NATO Terminology Database [24].

Perfective Maintenance: the term "perfective maintenance" has no definition in NATO Terminology Database [24] or ISO 2382 [5]. A definition is provided in IEC 60050 [4] for perfective maintenance, <of software> as "software maintenance performed to improve the performance, maintainability, or other attributes of a computer program". A note adds: “perfective maintenance that adds new required functions is often referred to as enhancement”. This report recommends the NSO consider this definition is added to the Official NATO Terminology Database [24].

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Appendixes

Appendix A: Table 1. NATO Maintenance Terminology

Domains	Science & Technology – Information technology Defence – Logistics – Maintenance
Term	**Maintenance**
Definition	A set of activities intended to keep a functional unit in, or to restore it to, a state in which it can perform a required function. (Note: Maintenance includes activities such as monitoring tests, measurements, replacements, adjustments, repairs, and in some cases administrative actions.)
Approval Status	NATO Adopted

Domain	Defence - Logistics - Life cycle management
Term	**Change control**
Definition	The activities for control of the product after formal approval of its product configuration information. (Note: Change control includes management of configuration changes and management of concessions.)
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology
Term	**Software maintenance**
Definition	The activity intended to retain software in, or restore it to, a state in which it can perform its required function. (Note: It comprises corrective, adaptive, and perfective software maintenance.)
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology
Term	**Controlled maintenance**
Definition	Maintenance based on a control scheme according to which a desired quality of service can be sustained with minimal or reduced maintenance efforts.
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology
Term	**Corrective maintenance (1)**
Definition	Maintenance carried out after occurrence of a failure, or detection of a fault, in order to restore a functional unit to a state in which it can perform a required function.
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology

Term	**Deferred maintenance**
Definition	Corrective maintenance that is not immediately initiated after occurrence of a failure or detection of a fault but is delayed in accordance with given maintenance rules.
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology
Term	**Remote maintenance / Telemaintenance / Online maintenance**
Definition	Maintenance of a functional unit provided through telecommunications with the assistance of, or under the control of, a maintenance facility at a remote location.
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology
Term	**Preventive maintenance**
Definition	Maintenance performed at predetermined intervals or according to prescribed criteria in order to reduce the probability of failure or the degradation of the functioning of a functional unit.
Approval Status	NATO Adopted

Domain	Science & Technology – Information technology
Term	**Scheduled maintenance**
Definition	Preventive maintenance carried out in accordance with an established time schedule.
Approval Status	NATO Adopted

Domain	Defence – Logistics - Maintenance
Term	**Maintenance**
Definition (1)	All actions taken to retain equipment in or to restore it to specified conditions until the end of its use, including inspection, testing, servicing, modification(s), classification as to serviceability, repair, recovery, rebuilding, reclamation, salvage, and cannibalization.
Definition (2)	All supply and repair action taken to keep a force in condition to carry out its mission.
Definition (3)	The routine recurring work required to keep a facility (plant, building, structure, ground facility, utility system, or other real property) in such condition that it may be continuously utilized, at its original or designed capacity and efficiency, for its intended purpose.
Approval Status	NATO Agreed

Domain	Defence – Logistics - Maintenance
Term	**Corrective maintenance (2)**

Definition	Maintenance carried out after fault recognition and intended to restore equipment to a state in which it can perform a required function.
Approval Status	NATO Agreed

Domain	Defence – Logistics - Maintenance
Term	**Preventive maintenance**
Definition	Systematic and/or prescribed maintenance intended to reduce the probability of failure.
Approval Status	NATO Agreed

Domain	Defence – Logistics - Maintenance
Term	**Planned maintenance**
Definition	Preventive maintenance carried out systematically according to the degree of use of the equipment.
Approval Status	NATO Agreed

Appendix B: Table 2. Software Maintenance Terminology by ISO 14764

Domains	Software engineering — Software life cycle processes — Maintenance
Term	**Adaptive maintenance**
Definition	Modification of a software product, performed after delivery, to keep a software product usable in a changed or changing environment.
Approval Status	ISO 14764:2022

Domains	Software engineering — Software life cycle processes — Maintenance
Term	**Additive maintenance**
Definition	Modification of a software product performed after delivery to add functionality or features to enhance the usage of the product.
Approval Status	ISO 14764:2022
Domains	Software engineering — Software life cycle processes — Maintenance
Term	**Corrective maintenance**
Definition	Modification of a software product performed after delivery to correct discovered problems The modification repairs the software product to satisfy defined system requirements.
Approval Status	ISO 14764:2022
Domains	Software engineering — Software life cycle processes — Maintenance
Term	**Perfective maintenance**
Definition	Modification of a software product to provide **enhancements** for users, improvements of information for users, and recording to improve software performance, maintainability, or other software attributes.
Approval Status	ISO 14764:2022

Domains	Software engineering — Software life cycle processes — Maintenance
Term	**Preventive maintenance**
Definition	Modification of a software product to provide **enhancements** for users, improvements of information for users, and recording to improve software performance, maintainability, or other software attributes.
Approval Status	ISO 14764:2022

Note: The AAP-77 [19] recommends ISO for definitions following the use of NATO sources. This table is sourced from ISO 14764 [8] accordingly.

Appendix C: Table 3. IEC 60050 IEV: Maintenance Terminology Under the Area 192: “Dependability”

Ref.	ID	Term	Definition
001	**192**	**Dependability**	
002	**192-01**	**Basic concepts**	
003	**192-01-01**	item	Subject being considered. Note 1 to entry: The item may be an individual part, component, device, functional unit, equipment, subsystem, or system. Note 2 to entry: The item may consist of hardware, software, people, or any combination thereof. Note 3 to entry: The item is often comprised of elements that may each be individually considered. See sub item (192-01-02) and indenture level (192-01-05). Note 4 to entry: IEC 60050-191:1990 (now withdrawn; replaced by IEC 60050-192:2015) identified the term "entity" as an English synonym, which is not true for all applications. Note 5 to entry: The definition for item in IEC 60050-191:1990 (now withdrawn; replaced by IEC 60050-192:2015) is a description rather than a definition. This new definition provides meaningful substitution throughout this document. The words of the former definition form new note 1.
004	**192-01-02**	sub item	Part of the subject being considered. Note 1 to entry: A sub item becomes the item, when individually considered.
005	**192-01-05**	indenture level	Level of sub-division within a system hierarchy. EXAMPLE System, subsystem, assembly, and component. Note 1 to entry: From the maintenance perspective, the indenture level depends upon various factors, including the complexity of the item's construction, the accessibility of sub items, skill level of maintenance personnel, test equipment facilities, and safety considerations.
006	**192.01.22**	Dependability <of an item>	Ability to perform as and when required. Note 1 to entry: Dependability includes availability (192-01-23), reliability (192-01-24), recoverability (192-01-25), maintainability (192-01-27), and maintenance support performance (192-01-29), and, in some cases, other characteristics such as durability (192-01-21), safety and security. Note 2 to entry: Dependability is used as a collective term for the time-related quality characteristics of an item.
007	**192-01-23**	availability, <of an item>	Ability to be in a state to perform as required. Note 1 to entry: Availability depends upon the

Ref.	ID	Term	Definition
			combined characteristics of the reliability (192-01-24), recoverability (192-01-25), and maintainability (192-01-27) of the item, and the maintenance support performance (192-01-29). Note 2 to entry: Availability may be quantified using measures defined in Section 192-08, Availability related measures.
008	**192-01-24**	reliability, <of an item>	Ability to perform as required, without failure, for a given time interval, under given conditions. Note 1 to entry: The time interval duration can be expressed in units appropriate to the item concerned, e.g., calendar time, operating cycles, distance run, etc., and the units should always be clearly stated. Note 2 to entry: Given conditions include aspects that affect reliability, such as: mode of operation, stress levels, environmental conditions, and maintenance. Note 3 to entry: Reliability can be quantified using measures defined in Section 192-05, Reliability related concepts: measures.
009	**192-01-25**	recoverability, <of an item>	Ability to recover from a failure, without corrective maintenance. Note 1 to entry: The ability to recover may or may not require external actions. For recovery where no external actions are required, see self-recoverability (192-01-26). Note 2 to entry: Recoverability may be quantified using measures such as the probability of recovery within a specified time interval.
010	**192-01-26**	self-recoverability, <of an item>	Ability to recover from a failure, without external action. Note 1 to entry: Self-recoverability is a special case of recoverability (192-01-25).
011	**192-01-29**	maintenance support performance	Effectiveness of an organization in respect of maintenance support. Note 1 to entry: Maintenance support performance may be quantified using measures defined in Section 192-07, Maintainability, and maintenance support: measures.
012	**192-06**	**Maintenance and maintenance support related concepts**	
013	**192-06-01**	maintenance	Combination of all technical and management actions intended to retain an item in, or restore it to, a state in which it can perform as required. Note 1 to entry: Management is assumed to include supervision activities.
014	**192-06-02**	maintenance policy	Maintenance policy/maintenance concept. Definition of the maintenance objectives, line of maintenance, indenture levels, maintenance levels, maintenance support, and their

Ref.	ID	Term	Definition
			interrelationships. Note 1 to entry: The maintenance policy provides the basis for maintenance planning, determining supportability requirements, and developing logistic support.
015	**192-06-03**	line of maintenance	Line of maintenance/maintenance echelon. Position in an organization where specified levels of maintenance are to be carried out. EXAMPLE 1st line – field; 2nd line – repair shop; and 3rd line – manufacturer's facility. Note 1 to entry: The line of maintenance is characterized by the level of skill of the personnel, the facilities provided, the location, etc.
016	**192-06-04**	level of maintenance	Level of maintenance/maintenance echelon. Position in an organization where specified levels of maintenance are to be carried out. EXAMPLE 1st line – field; 2nd line – repair shop; and 3rd line – manufacturer's facility. Note 1 to entry: The line of maintenance is characterized by the level of skill of the personnel, the facilities provided, the location, etc.
017	**192-06-05**	preventive maintenance	Preventive maintenance/maintenance echelon. Position in an organization where specified levels of maintenance are to be carried out. EXAMPLE 1st line – field; 2nd line – repair shop; and 3rd line – manufacturer's facility. Note 1 to entry: The line of maintenance is characterized by the level of skill of the personnel, the facilities provided, the location, etc.
018	**192-06-06**	corrective maintenance	Maintenance carried out after fault detection to effect restoration. Note 1 to entry: Corrective maintenance of software invariably involves some modification.
019	**192-06-07**	condition-based maintenance	Preventive maintenance based on the assessment of physical condition. Note 1 to entry: The condition assessment may be by operator observation, conducted according to a schedule, or by condition monitoring (192-06-28) of system parameters.
020	**192-06-08**	reliability-centred maintenance	Preventive maintenance based on the assessment of physical condition. Note 1 to entry: The condition assessment may be by operator observation, conducted according to a schedule, or by condition monitoring (192-06-28) of system parameters.
021	**192-06-09**	automatic maintenance	Maintenance conducted without human intervention.

Ref.	ID	Term	Definition
022	**192-06-10**	deferred maintenance	Maintenance postponed after identification of its need, in accordance with given maintenance rules. Note 1 to entry: Deferred maintenance can apply to preventive and corrective maintenance. Note 2 to entry: Maintenance may be deferred for availability, logistic, economic, or other reasons.
023	**192-06-11**	maintenance action	Maintenance action/maintenance task. Sequence of elementary maintenance activities. EXAMPLE Fault localization, fault diagnosis, repair, and function checkout.
024	**192-06-12**	scheduled maintenance	Maintenance carried out in accordance with a specified time schedule. Note 1 to entry: Scheduled maintenance may identify the need for some corrective maintenance action.
025	**192-06-13**	unscheduled maintenance	Corrective maintenance that cannot be deferred.
026	**192-06-14**	repair	Direct action taken to effect restoration. Note 1 to entry: Repair includes fault localization (192-06-19), fault diagnosis (192-06-20); fault correction (192-06-21); and function checkout (192-06-22).
027	**192-06-15**	software maintenance	Modification for the purposes of software fault removal, adaptation to a new environment, or improvement of performance. Note 1 to entry: Software maintenance activities carried out for these three purposes are referred to as: corrective maintenance (192-06-06); adaptive maintenance (192-06-16); and perfective maintenance (192-06-17), respectively. Note 2 to entry: Following maintenance, the state of a software item is different than its previous state.
028	**192-06-16**	adaptive maintenance, <of software>	Software maintenance for the purposes of adaptation to a new environment. Note 1 to entry: An example of a new environment could be a new type of hardware on which the software is to be run.
029	**192-06-17**	perfective maintenance, <of software>	Software maintenance performed to improve the performance, maintainability, or other attributes of a computer program. Note 1 to entry: Perfective maintenance that adds new required functions is often referred to as enhancement.
030	**192-06-18**	fault detection	Event by which the presence of a fault becomes apparent. Note 1 to entry: The term "fault recognition" used in IEC 60050-191:1990 (now withdrawn; replaced by IEC 60050-192:2015) is not in general usage.

Ref.	ID	Term	Definition
031	**192-06-19**	fault localization	Action to identify the faulty sub item at the appropriate indenture level for maintenance.
032	**192-06-20**	fault diagnosis	Action to identify and characterize the fault. Note 1 to entry: Fault diagnosis may also localize the fault and/or indicate its cause.
033	**192-06-21**	fault correction	Action to correct the fault, after fault localization.
034	**192-06-22**	function checkout	Maintenance action intended to verify that the corrective action taken has been successful, without inducing new faults.
035	**192-06-23**	restoration	Event at which the up state is re-established after failure.
036	**192-06-24**	recovery	Proportion of faults that can be detected, under given conditions.
037	**192-06-25**	self-recovery	Recovery without external intervention.
038	**192-06-26**	on-site maintenance	Maintenance performed at the place of use or storage. Note 1 to entry: On-site maintenance is sometimes referred to as “in situ maintenance” or “field maintenance”, although they are not strictly synonyms.
039	**192-06-27**	off-site maintenance	Maintenance performed away from the location where the item is used. EXAMPLE Repair carried out at a maintenance centre. Note 1 to entry: Off-site maintenance may apply to items in storage.
040	**192-06-28**	condition monitoring, <of an item>	Obtaining information about physical state or operational parameters. Note 1 to entry: Condition monitoring is used to determine when preventive maintenance may be required. Note 2 to entry: Condition monitoring may be conducted automatically during operation or at planned intervals. Note 3 to entry: Condition monitoring methods include: vibration analysis, tribology, and thermography.
041	**192-06-29**	remote maintenance	Maintenance performed without direct personnel access to the item. EXAMPLE Maintenance carried out using remote controlled equipment; software maintenance conducted via a communications network.

Note: The subject of "maintenance" is extensive and has many dependent and independent interfaces. Maintenance is an activity, a measure, and a cost. The IEC is a recommended source in AAP-77 [19]. The IEC 60050 [4] treats maintenance as a sub-set of dependability with an extensive coverage on the subject. This table provides an overview of the main dependability definitions.

Appendix D: List of Abbreviations

AAP	Allied Assurance Publication
ALP	Allied Logistics Publication
AQAP	Allied Quality Assurance Publication
C2	Command and Control
C2CS	Command and Control Communication System
C2G	Command and Control Guard
C2IS	Command and Control Information System
ECP	Engineering Change Proposal
EN	European Norm
ICAO	International Civil Aviation Organization
IEC	International Electrotechnical Commission
IEV	International Electrotechnical Vocabulary (IEC 60050)
ISO	International Standard Organization
ISS	In Service Support
LCMG	Life Cycle Management Group
M	Maintainability
NATO	North Atlantic Treaty Organization
NSO	NATO Standardization Office
PBL	Product Baseline
R&R	Remove & Replace
STANAG	Standardization Agreement