



Australian Government

Civil Aviation Safety Authority

ADVISORY CIRCULAR

AC 20-01

Software configuration management

Advisory Circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory Circulars should always be read in conjunction with the relevant regulations.

Audience

This Advisory Circular (AC) applies to:

- Part 42 organisations
- aircraft operating under regulation 30 of *the Civil Aviation regulations 1988 (CAR)*
- all aircraft operators who use electronic equipment.

Purpose

The purpose of this AC is to provide guidance for the management of software in aircraft systems.

For further information

For further information on this AC, contact Civil Aviation Safety Authority's (CASA's) Airworthiness and Engineering Standards Branch (telephone 131 757).

Status

This version of the AC is approved by the Manager, Airworthiness and Engineering Branch.

Version	Date	Details
v1.0	September 2016	This is the first AC on this topic

Unless specified otherwise, all subregulations, regulations, divisions, subparts and parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

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1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	Advisory Circular
AIRAC	aeronautical information regulation and control
ARC	authorised release certificate
CAMO	continuing airworthiness management organisation
CAO	Civil Aviation Order
CAR	<i>Civil Aviation Regulations 1988</i>
CASA	Civil Aviation Safety Authority
CASR	<i>Civil Aviation Safety Regulations 1998</i>
EUROCAE	European Organisation for Civil Aviation Equipment
GNSS	global navigation satellite system
HMI	human machine interface
IFE	inflight entertainment
LRU	line replaceable unit
LSAP	loadable software aircraft part
MOS	Manual of Standards
MSD	mass storage device
NAA	National Aviation Authority
OEM	original equipment manufacturer
OPC	operational program configuration
OSS	option selectable software
PBN	performance based navigation
TAWS	terrain awareness warning systems
UMS	user modifiable software

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Airline modifiable information	Software generated by the operator to customize system operations.
Approved design	Requirements in accordance with regulations 21.305 or 21.305A, which are the design specifications for the product and any changes to the design specification made in accordance with a Part 21 approval.
Authorised configuration	A list of aircraft and line replaceable units with loadable software aircraft part that is applicable to that aircraft and has been accepted and authorised by the operator for installation into the aircraft.
Compatibility	The ability of software to be used in a target hardware environment without the need for special modification or conversion.
Configuration management	The process of recording, evaluating, approving or disapproving, and coordinating changes to configuration items after formal establishment of their configuration identification or to baselines after their establishment.
Configuration verification	Configuration verification is the act of comparing the authorized aircraft software configuration to the actual aircraft configuration to ensure that the correct software is installed.
Cross load	The act or ability to load target hardware from an already loaded target hardware, generally of the same type.
Data loader	Equipment (hardware and software) used to upload or download software.
Electronic distribution of software	Processes whereby aircraft loadable software is moved from a supplier or repository to a remote user site without physical media (wired or wireless).
Field loadable software	Software that can be loaded without removal of the equipment from the installation.
Interchangeability	The ability of an entity (e.g. part, item, component) to replace another one without alteration and fulfil the same requirement. The form, fit, and function remains exactly the same.
Loadable software	A software data set (i.e. group of files) designed for transferring into its target hardware without physically altering the hardware.
Mixability	Compatibility between two or more different target hardware environments.
Mass-storage device	A large capacity non-volatile storage medium for software or data entities.
Media	Devices or material, which acts as a means of transferring or storage of software (e.g. programmable read-only memory, discs, USB memory sticks, PCMCIA, SD card, compact flash).
Navigational database	Database of navigation and route information used by the aircraft navigation system to accomplish navigation tasks. The navigation system may be a stand-alone system, flight management system (FMS) or the navigation function of an integrated avionics system.
Operational program software	Software that contains application software for the target hardware. This loadable software aircraft part is the program instructions for the target hardware

Term	Definition
Option selectable software	Software is that the operator can modify within some boundaries without re-certification.
Portable data loader	A portable tool able to perform loading of software on-wing the aircraft.
Reproduction	Creating an exact replica of the software by creating it from a software tool.
Software installation	Software loading and verification to ascertain the correct software is in the correct target hardware and location.
Target hardware	The subject hardware of an operation. For example: <ul style="list-style-type: none"> • the destination of the load • the hardware/ line replaceable unit/location selected by the maintenance person as the destination of the load • the hardware the software is designed to operate in.
Terrain database	Software used by the terrain awareness and warning system or by other ground proximity systems, which map the terrain around an aircraft during flight.
User certifiable software	Software that can be approved by a Subpart 21.J organisation, as long as it is within the scope of their exposition.
User modifiable software	Software that is intended for modification by the aircraft operator without review by CASA or the original equipment manufacturer. A tool is usually provided so the software can only be modified within given boundaries.

1.3 References

Regulations

Regulations are available on the Federal Register of Legislation <https://www.legislation.gov.au/>

Document	Title
Subpart 21.B	Type certificates and type acceptance certificates
Subpart 21.E	Supplemental type certificates
Subpart 21.J	Approved design organisations
Subpart 21.K	Approval of materials, parts, processes and appliances
Subpart 21.M	Designs of modifications of, and repairs to, aircraft, aircraft engines, propellers and appliances
Subpart 21.N	Approval of engines, propellers, materials, parts and appliances: imported
Subpart 21.O	Australian Technical Standard Order Authorisations
Part 42	Continuing airworthiness requirements for aircraft and aeronautical products Part 42 Manual of Standards (MOS)
Subpart 91.U MOS	Navigation authorisations
Part 175	Aeronautical information management
Regulation 42G of CAR	Flight control system: additional requirements

Document	Title
Regulation 42ZE of CAR	Certification of completion of maintenance on aircraft in Australian territory
Regulations 42ZN of CAR	Certification of maintenance outside Australian territory
Regulation 232A of CAR	Operational procedures in relations to computers
Regulation 233 of CAR	Responsibility of pilot in command before flight
Civil Aviation Order (CAO) 20.18	Aircraft equipment – basic operational requirements
CAO 20.91	Instructions and directions for performance-based navigation
CAO 82.0	Air operators' certificates – Applications for certificates and general requirements
CAO 100.5	General requirements in respect of maintenance of Australian aircraft
CAO 100.7	Weight control of aircraft

Advisory material

Advisory Circulars are available at <http://www.casa.gov.au/AC>

Civil Aviation Advisory Publications (CAAPs) are available at <http://www.casa.gov.au/CAAP>

Document	Title
AC 11-03	Electronically formatted certifications, records and management systems
AC 21-10	Experimental certificates
AC 21-50	Approval of software and electronic hardware parts
AC 171-04	Software and its use in aeronautical telecommunication and radio navigation services
CAAP 232A-1	Administration of Aircraft & Related Ground Support Network Security Programs
CAAP 233-1	Electronic Flight Bags
NZCAA AC 43-15	Aircraft Software Configuration Management
NZCAA AC 91-18	Aircraft Software Configuration Management

Other material

Document	Title
Annex 15 to the Convention on International Civil Aviation (the Chicago Convention)	Aeronautical Information Services
Airworthiness Bulletin (AWB) 02-049	Verification of software installation in critical control systems
ARINC Report 667-1	Guidance for the management of field loadable software
ARINC 827	Electronic distribution of software by crate
IATA Engineering and Maintenance Group publication	Best Practices for Loadable Software Management and Configuration Control
RTCA/DO-200A	Standards for processing aeronautical data
European Organisation for Civil Aviation Equipment (EUROCAE)/ED-202	Airworthiness security process specification
EUROCAE ED-203	Airworthiness security methods and considerations
EUROCAE ED-204	Information security guidance for continuing airworthiness

1.4 Forms

CASA's forms are available at <http://www.casa.gov.au/forms>

Form number	Title
Form 718	Application for issue of a special Certificate of Airworthiness

2 Background

2.1 Role of software

- 2.1.1 Software is data or code that defines controls or is used by aircraft systems to perform an intended function. The operator should consider all impacts of possible change to the software when updating it.
- 2.1.2 Loading of software into an aircraft system may change the human machine interface (HMI) or it can simply correct an anomaly. Changing software loaded into a system may not make any apparent visual changes, but may cause a change to the hardware part number or cause changes to an aircraft operational authorisation, for example, performance based navigation (PBN). Software that changes the HMI may require evaluation for possible further crew training and changes to the aircraft flight manuals. Changes that have no HMI will at least require configuration management in the same way as physical parts.
- 2.1.3 The individual component parts of aircraft systems often require specific software configurations and, in some cases, specific interface settings to allow an aircraft system to function correctly.
- 2.1.4 It is important that the software installed in aircraft systems is maintained in a configuration relevant to that particular aircraft. Software eligibility can differ depending on the aircraft configuration or serial number. This can mean that different configurations of software are required for aircraft in a fleet that are of the same make and model.

2.2 Relevance for general aviation

- 2.2.1 This advisory circular (AC) is relevant to aircraft that are equipped with modern avionics systems containing software. It is essential for operators to manage and understand the configuration of software installed on aircraft systems if it is field loadable. If an operator subcontracts maintenance of any software related systems, they are still responsible for maintaining configuration in accordance with regulation 232A of the *Civil Aviation Regulations 1988 (CAR)*.

3 Types of software

3.1 General

- 3.1.1 There are various types of software and data that are used in an aircraft with some requiring approval or acceptance and others that are operator convenience items such as inflight entertainment (IFE). See Figure 4 in Appendix A for the various types of software that are used in an aircraft and explained in this AC.
- 3.1.2 Software that changes the aircraft configuration is approved under Part 21 via the following subparts:
- Subpart 21.B
 - Subpart 21.E
 - Subpart 21.J
 - Subpart 21.K
 - Subpart 21.M
 - Subpart 21.N
 - Subpart 21.O.
- 3.1.3 Software is accepted or approved by one of the following:
- accepted under an agreement between the Civil Aviation Safety Authority (CASA) and the national aviation authority (NAA)
 - approved in a manner mentioned in Part 21
 - under a licence agreement, in accordance with Part 175.¹

3.2 Airborne support data

- 3.2.1 Airborne support data such as IFE, duty free shopping, hotel connections and airline correspondence is software that is considered non-required operator convenience items, providing it does not interface with required or operational aircraft systems.
- 3.2.2 Changing this data is not considered a maintenance action as it does not change the approved aircraft configuration. Depending on the design, some IFE equipment is classified as required due to interfaces with aircraft emergency lighting, passenger announcement and other required aircraft systems.

3.3 Resident software

- 3.3.1 Resident software that is installed in a line replaceable unit (LRU) is approved in accordance with Part 21. The resident software is usually installed by the original equipment manufacturer (OEM).
- 3.3.2 The software configuration of the resident software may require verification as detailed in the approved design. If software verification is required then reliance on physical part markings or placards as a sole means to determine software configuration is considered by CASA as unacceptable.

¹ ARINC Report 667-1 provides further information on the guidance for the management of field loadable software.

3.4 Loadable software parts

- 3.4.1 Loadable software parts are designed for transferring into target hardware without any physical alteration. The software refers to the code itself and not the medium.
- 3.4.2 The majority of avionics software is referred to as loadable software aircraft parts (LSAP). LSAPs are considered by CASA as part of the approved design.²
- 3.4.3 LSAPs require authorised release certificates (ARCs). The installation of LSAP must also be recorded.³

3.5 User modifiable software

- 3.5.1 User modifiable software (UMS) is intended for modification, as long as the modification remains within the approved design. The design of UMS is approved under Part 21. Subsequent changes within the approved design do not require further approval.
- 3.5.2 This type of software is subject to configuration management for production and distribution. Modifications by the operator or continuing airworthiness management organisation (CAMO) can include modifications to either data or code.
- 3.5.3 Service information provided by a foreign type certificate holder will have already been approved under regulation 21.470 and there is no need for subsequent Part 21 approvals (providing that additional modifications would not preclude the use of that data).
- 3.5.4 Airline modifiable information is an example of UMS. This information is typically data, rather than specific programs or executable code. An example of airline modifiable information is customisation of the control display unit screens that are displayed to the flight crew that are tailored content to suit airline specific operation.

Note: UMS should not affect the core software, which should remain inaccessible.

3.6 User certifiable software

- 3.6.1 An approval is required for user-certifiable software under Part 21.⁴ An example of this type of software is in cabin management systems, which can control the following:

- cabin lighting controls
- stream content to personal electronic devices (PED)
- passenger announcements
- passenger annunciations.

Note: In the case of IFE systems, the passenger announcements should continue to function if the whole IFE system is down.

- 3.6.2 User-certifiable software goes beyond the application of UMS and therefore is not in the scope of this AC.⁵

² For further information on approval of LSAPs see AC 21-50.

³ In accordance with regulation 42.395

⁴ For further information on development of user-certifiable software and UMS refer to section 3 of ARINC 667-1.

⁵ For acceptable methods of UMS refer to Chapter 5 of AC 21-50.

3.7 Operational program software

- 3.7.1 Operational program software can represent program instructions for an LRU and is approved under Part 21. Each version of operational program software has a unique software part number. It is an efficient approach in programming to create core generic software code. The core software may be used in a variety of applications using different databases specific to the installation.
- 3.7.2 Software that is used to represent information in the aircraft flight manual will require validation. For example, an algorithm that calculates an aircraft's weight and balance in an electronic flight bag will require validation by a weight control officer, as per Civil Aviation Order (CAO) 100.7. This is to ensure that it complies with the performance limitations set out in the aircraft flight manual.⁶

3.7.3 Option selectable software

- 3.7.3.1 Option selectable software (OSS) may be defined in the approved design. OSS reduces effort by allowing use of the software code across a wide variety of LRUs. Following the instructions detailed in the approved data will prevent a possible unsafe configuration or unintentional functions. OSS is one alternative to pin programming and is approved under Part 21.
- 3.7.3.2 Operational program configuration (OPC) is an example of OSS and is the configuration data that determines the function of a system. The OPC is a special purpose database that enables or disables optional functions of features of operational program software. The OPC can replace the need for program pins. These options are certified and included in the operational program software. Any changes to the OPC are controlled by the OEM under a commercial arrangement.

3.8 Aeronautical database

- 3.8.1 Aeronautical data is operational data controlled under [CAO 20.91](#). This data is revised every 28 days and becomes available approximately one week before it becomes effective. Each aeronautical information regulation and control (AIRAC) cycle is identified by a cycle number (year and sequence) with a specific effective date.

Note: CAO 20.91 allows 72 hours for an expired database.

- 3.8.2 Aeronautical information is accepted by a licence agreement under Part 175⁷ and is referenced under the AIRAC provisions, found in Annex 15, Aeronautical Information Services to the International Convention on Civil Aviation (the Chicago Convention).⁸
- 3.8.3 A pilot-in-command of an aircraft may update the navigation system database of the global navigation satellite system (GNSS) under [CAO 100.5](#).

⁶ For further information on software application validation refer to Clause 2 of Appendix 9 of CAO 82.0.

⁷ For further information on software required for aeronautical databases or other similar applications refer to AC 171-04.

⁸ For further information on AIRAC cycles refer to [ICAO AIRAC Adherence](#).

- 3.8.4 Any current aeronautical data or information is required to be readily accessible.⁹ The applicable maps and charts depend on either:
- the route or alternative route flown
 - information published in the aeronautical information package or by a data service provider.¹⁰
- 3.8.5 Terrain databases used in terrain awareness warning systems (TAWS) are classified as aeronautical data and are not subject to AIRAC revision cycles. The terrain data changes may be triggered by better surveys, higher resolution data, additional data availability and detected errors.¹¹
- 3.8.6 Updating the terrain database does not change the airworthiness of the aircraft and is therefore not a maintenance task. Software revisions that change the configuration of the TAWS are categorised as maintenance tasks.

3.9 Software used for instructions for continued airworthiness

- 3.9.1 Instructions for continued airworthiness that are part of the approved design are accepted by CASA under Part 21.

3.10 Aircraft production test software

- 3.10.1 Aircraft operating on an experimental certificate of airworthiness can utilise unapproved software under regulation 21.195A. An example is using unapproved software for showing compliance with regulations or for research and development purposes.
- 3.10.2 CASA Form 718 should detail the unapproved software used for any experimental purposes. Particulars of the software are then included as part of the operating conditions and limitations shown on the special certificate of airworthiness.¹²

⁹ In accordance with regulation 233 of CAR.

¹⁰ Refer to CAAP 233-1 for further information on control of software in relation to aircraft navigation charts, airport maps and in electronic flight bag.

¹¹ Standards for terrain data are specified in RTCA/DO-200A.

¹² Refer to AC 21-10 for further details on application for experimental certificate of airworthiness.

4 Software configuration management

4.1 Requirements

- 4.1.1 LSAPs require the same controls as physical aircraft parts in that they are serviceable, conform to design specifications and are eligible for fitment. Provisions should be established during any data retrieval processes to ensure that data corruption does not affect the software. A confirmed link must exist between the software and the applicable LRU (see paragraph 4.1.2).¹³
- 4.1.2 LSAPs loaded into the target LRU form part of the approved configuration of the aircraft. Regulation 42.125 requires that the person responsible for continuing airworthiness for the aircraft must ensure that:
- the aircraft is not modified unless the modification is approved or acceptable under Part 21
 - the modification is compatible with the configuration of the aircraft.
- 4.1.3 Operational requirements may require loading of specific software into a target LRU. If the software configuration does not reflect the amendment status, the aircraft may fail to meet the requirements for that particular operational authorisation (e.g. PBN).

4.1.4 Software security

- 4.1.4.1 Electronic distribution of software may require protection against unauthorised security breaches.¹⁴
- 4.1.4.2 European Organisation for Civil Aviation Equipment (EUROCAE) and RTCA Inc. published industry standards on:¹⁵
- security methods and considerations
 - information security guidance for continuing airworthiness.

4.2 Software status

4.2.1 Approved aircraft software configuration

- 4.2.1.1 The approved aircraft software configuration is in accordance with the illustrated parts catalogue, component maintenance manual, aircraft maintenance manual or other similar document. The approved software configuration may vary depending on the particular operator and eligibility of installation.

4.2.2 Authorised aircraft software configuration

- 4.2.2.1 The authorised aircraft software configuration defines the LSAPs accepted or authorised by the CAMO for installation into the aircraft. Not all changes are applicable

¹³ In accordance with regulation 42.125.

¹⁴ Refer to CAAP 232A-1 for guidance that can supplement instructions in the approved design.

¹⁵ For further information see EUROCAE/ED-202, 203 and 204.

to all aircraft and some are optional. Any modifications or repairs must be compatible with the configuration of the aircraft.¹⁶

- 4.2.2.2 A CAMO will need to assess possible software changes and determine:¹⁷
- whether or not it is effective to aircraft in the fleet
 - whether or not it will be applied unless it is required by an airworthiness directive.¹⁸
- 4.2.2.3 This assessment should be formally recorded with the decision and the reasons for the decision.
- 4.2.2.4 The CAMO is responsible at all times for maintaining the authorised software configuration.
- 4.2.2.5 When a CAMO sends LRUs for repair, the repair documentation must define the software configuration that the LRU is required to have on its return.¹⁷ Specifying the configuration is important as the approved maintenance organisations could automatically load the latest version, which may result in an unacceptable configuration compared to the requirements of the operator's fleet. UMS is not usually available to repair organisations. The authorised software configuration may also change between the time the LRU is sent for repair and the time it is returned.
- 4.2.2.6 Repair documentation must state the work to be accomplished, which includes any requests for particular versions of software.¹⁸ A clear correlation should exist between the ARC and the software part number. Verifying the software installation is done when fitting the LRU in accordance with the installation procedure.
- 4.2.2.7 The configuration that is authorised by the CAMO for installation is established by assessing the applicability, eligibility, validity and compliance requirements from approved data such as:
- service bulletins
 - engineering orders
 - service letters
 - vendor notifications
 - OEM specific communications.
- 4.2.2.8 Whenever software is revised or reinstalled, recording maintenance information is required.¹⁹ Personnel should be trained and aware of importance of authorised software configuration.
- 4.2.2.9 The authorised configuration does not necessarily reflect the latest version from the OEMs. The authorised configuration will often allow several different versions of software to be installed into a system. With modification programs, it is usual for the pre-modification and the post modification software to be authorised. Once the program is completed, the pre-modification software is removed from the authorised software configuration.

¹⁶ In accordance with regulation 42.125.

¹⁷ In accordance with paragraph 42.125 (4) (c).

¹⁸ In accordance with regulation 42.120.

¹⁹ In accordance with regulation 42.395.

4.2.2.10 The authorised software configuration documentation should be available to all relevant personnel. A typical software configuration document should contain the following information for each LRU that contains software:

- joint aircraft system/component code chapter reference
- component nomenclature
- LRU part number or software location identifier
- software part number and version for all software components
- software media part number for all software components (not applicable for digitally transferred LSAPs)
- reference to the technical data that provides the instructions for installation of the software.

4.2.3 Verifying software configuration

4.2.3.1 Installation verification is performed as part of the data load activity as per the instructions supplied by the OEM. Verification typically checks that the software within a system has been successfully loaded and that the proper part number or database is installed.

Note: Software may have limited applicability to a specific LRU and aircraft.

4.2.3.2 Depending on the complexity of the aircraft, the software part or database is verified by equipment, such as:

- a central maintenance computer
- data loaders
- laptops
- individual LRUs.

4.2.3.3 CASA recommends that the operator verifies pre-loaded resident software on all LRUs at the time of installation. Highly integrated and complex aircraft can use automated tools to perform verification checks due to the large number of LSAPs.

4.2.3.4 LSAPs will require inclusion in the periodical airworthiness review (in the same way as physical parts).²⁰

4.2.3.5 Flight control and other critical control software will require independent verification when carrying out maintenance in accordance with regulation 42.340 or regulation 42G of CAR. There is no difference in these requirements between physical hardware components and components that undertake these functions via software.²¹

4.3 Part numbers

4.3.1 LSAPs are identified by a unique part number or other identification means and this is the basis of aircraft software configuration control. The software part number is directly related to the software code, which will influence or control the operation of an LRU. Any variation to the software code will change the software part number or other identification means.

²⁰ In accordance with the procedures stated in regulation 42.900.

²¹ For further information see airworthiness bulletin (AWB) 02-049.

4.3.2 LSAPs are subject to the same configuration control as physical parts and will require an ARC²² or from any other NAAs²³. It is acceptable to have the ARC in an electronic format.²⁴

4.3.3 The media may only have a temporary identifier, such as an order number before the software installation in the LRU to facilitate with the loading process.

Note: Data transfer can occur without the need for a media set and can occur directly from the OEM using electronic means (see CAAP 232A-1 for further information).

4.4 Installing software

4.4.1 A completed planned system upgrade may require several hours to be completed and is best suited to hangar maintenance activities. Complete system upgrades should commence at the start of shifts to ensure the load process between shift changes is not disjointed or interferes with other higher priority tasks. The loading process may consist of several distinct elements see Figure 1.

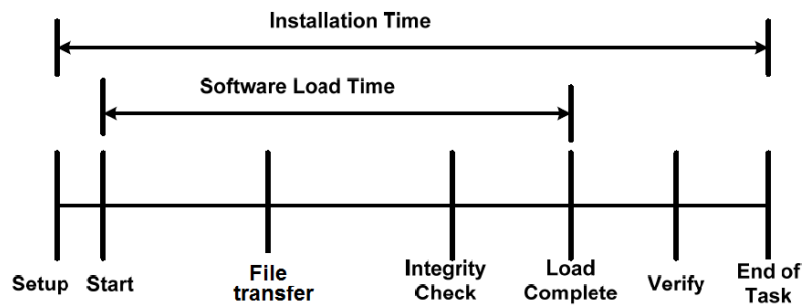


Figure 1: Software loading process

4.4.2 The setup time may involve all the preparations including necessary tooling (i.e. data loaders or a laptop) and software media necessary to undertake the software loading in accordance with the OEM instructions.

4.4.3 Software loading is either to the target LRU or to an on-board server repository, such as a mass storage device (MSD), which can electronically store the software before configuring onto possible multiple LRUs (see Figure 2). Staging of software to an MSD is not considered an action that requires maintenance certification.²⁵

4.4.4 Storage of software on the MSD should be unambiguous, traceable and secure. MSDs can have the advantage of storing an entire software library for the aircraft and can save loading time.

4.4.5 Once the software has been transferred, verification of integrity is required.²⁶ How this verification is achieved will depend on the equipment. Once the software has been verified in the target LRU, it may warrant further testing.

²² In accordance with subregulation 42.420 (5).

²³ In accordance with Chapter 12 of Part 42 the Manual of Standards (MOS).

²⁴ For further information on electronic records see AC 11-03.

²⁵ In accordance with regulation 42.715, or regulations 42ZE or 42ZN of CAR (if applicable).

²⁶ In accordance with subparagraph 42.310 (1) (a) (i).

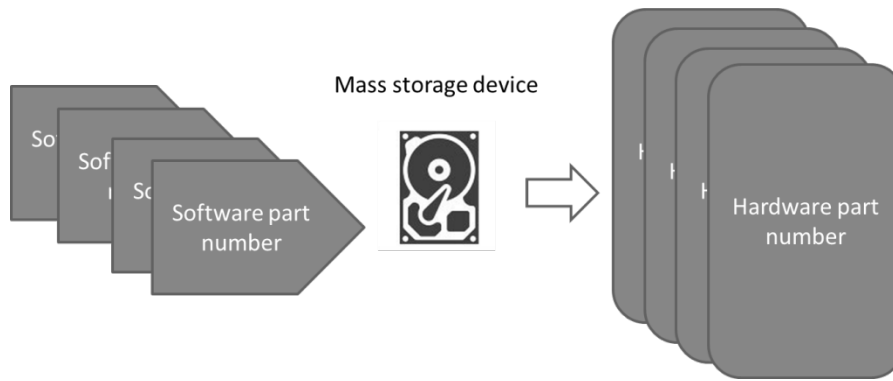


Figure 2: How a mass storage device works

4.5 Tracking of software part numbers

4.5.1 LSAPs and other related databases require recording of maintenance information in the same intent as physical parts under regulation 42.395. Recording maintenance on software installation by itself is meaningless without recording information on the location of the target LRU.

Note: How this is defined can vary depending on the OEM instructions (i.e. part number and functional identification number).

4.5.2 Computerised maintenance control software can assist in the tracking of part numbers. This may have issues regarding recording of the software part number and the relationship to target LRUs. Some of the maintenance control software have their origins prior to the introduction of LSAPs and may have difficulty tracking their relationship to the target LRU.

4.5.3 In the example shown in Figure 3, the database is linked with a particular LSAP, which is loaded into an LRU. CASA considers it unacceptable to attach software part numbers in an LRU note field in the maintenance control software or other supportive data field that is not readily accessible (i.e. data should be clearly apparent or searchable).

4.5.4 It may also cause effectivity issues based on software interchangeability, compatibility or mixability. An example of this is where software is incompatible with a specific LRU and the maintenance control software does not provide notification of ineligibility.

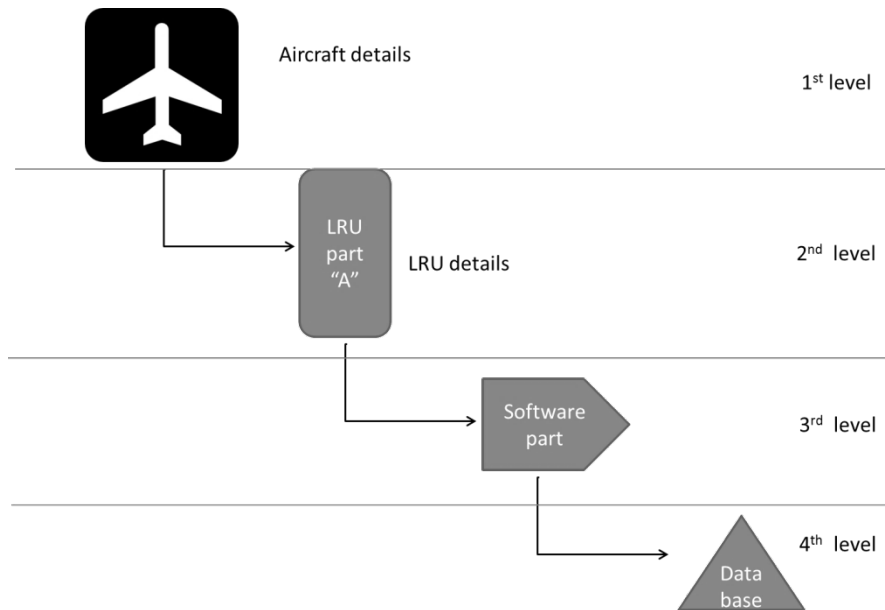


Figure 3: Tracking the relationship of software

4.5.5 CASA recommends the operator follows this approach of configuration management for operational related software and non-required software.

4.6 Software replication and reloading

4.6.1 CASA does not consider the replication of software from an original or a copy as manufacture.

Note: An OEM can impose conditions on replication as part of any service level agreements.

4.6.2 Provided no changes are made to the software and any digital signatures are visually verified, the software that has been developed, packaged and approved by OEM processes and does not require further approvals by the CAMO.²⁷

4.6.3 The CAMO requires suitable processes to ensure that:²⁸

- application and version of replicated software is identified
- suitable error checking methods in accordance with OEM instructions and no unintended variations occur as a result of viruses or other means
- individual copies are uniquely identified to facilitate the distribution and configuration management
- depending on the failure criticality of the software²⁹, security may also need to be addressed.³⁰

²⁷ Refer to CAAP 232A-1 for further details on digital signatures.

²⁸ In accordance with paragraph 42.125 (4) (c).

²⁹ Refer to AC 21-50.

³⁰ Refer to CAAP 232A-1.

4.6.4 Reloading

- 4.6.4.1 Reloading or refreshing software is the electronic equivalent of 're-racking' or re-installing LRUs. The aircraft configuration is not modified or altered but maintained to the authorised aircraft software configuration.

Appendix A

CASA approval process of software

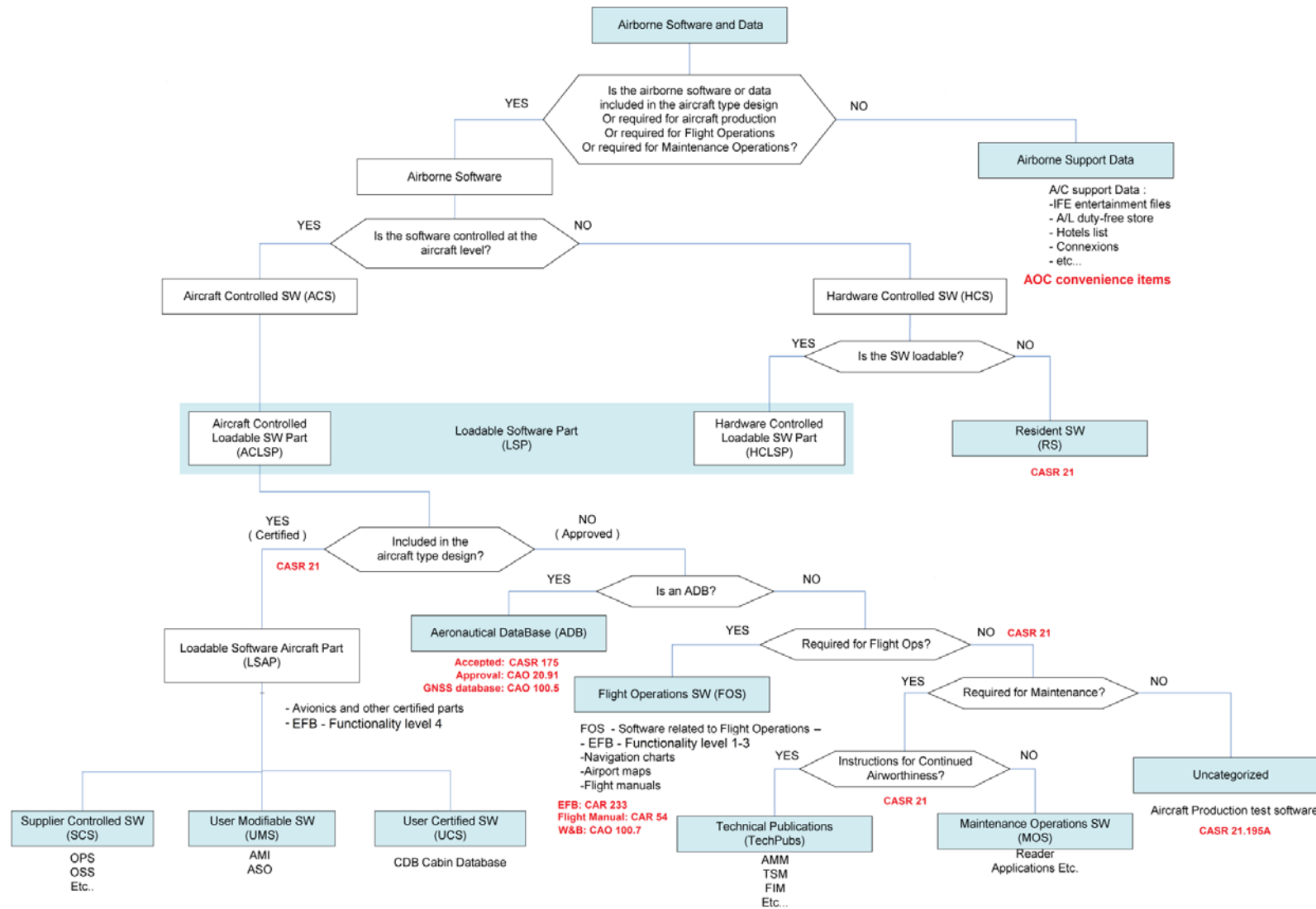


Figure 4: CASA approval process of software