Type A	Type B	Type C	Type D	Type E	Type F	Type G	Type H	Type I	Type J	Type K	Type L	Type M
X										X		

QRS-116

Qualification and Quality Assurance Software Requirements for Suppliers of Equipment during Design and Development Phases

Issue Date: April 2015 **Issue:** 02

CHANGES LOG

Issue	Approval Date	Main changes	Interested Paragraphs
01	December 2013		
02	April 2015	Clerical Errors and layout	All

APPLICABLE DOCUMENTS

Documents Code	Document title
EN/AS/JISQ9100	Quality Management Systems – Requirements for Aviation, Space and Defense Organisations *§* 6.2, 6.2.1 and 6.2.2
EASA Part 21	Certification procedure for Aircraft and related Products and Parts" § 21A.145(c) (1), 21A.145(c) (2), 21A.145 (d) (1).
EASA Part 145	§ M.A. 606, M.A. 607, M.A. 707,145.A.35
ISO 9001	Quality management systems - Requirements *§* 6.2, 6.2.1 and 6.2.2
RTCA DO-178B	Software Considerations in Airborne Systems and Equipment Certification
AQAP 2210	NATO Supplementary Software Quality Assurance Requirements to AQAP 2110
AS9006	Quality Management Systems - Aerospace - Requirements for Software

REFERENCE DOCUMENTS

Documents Code	Document title

CONTENTS

1 PURPOSE

This document provides guidelines for the AgustaWestland Suppliers of Software for airborne systems and equipment, in order to achieve a level of confidence in safety that complies with airworthiness requirements.

This document contains the AgustaWestland engineering requirements for the Suppliers in terms of compliance to the applicable standards and documentation to be provided in order to ensure that the delivered product is in accordance with the applicable specifications.

It defines Quality and Qualification requirements to be met during the development phase by Software Suppliers both for singular deliverable items (stand alone SW) and for Software specifically devoted to a deliverable equipment (embedded SW).

2 APPLICABILITY

This document is applicable to new development of Software for airborne systems and equipment installed on AgustaWestland aircrafts.

In particular, the following Software are included:

- SW stand alone (Field Loadable Software included)
- SW embedded with AgustaWestland Part Number
- SW embedded without AgustaWestland Part Number

Not airborne Software shall be managed according to the requirements of this document, assuming that an equivalent RTCA DO-178B Level D or E is applied, according to specific contract requirements.

In case of COTS Software this document is not applicable, but the Supplier shall attest the Software validation status in accordance with the criticality level estimated for it. Records of such activity shall be forwarded to AgustaWestland for acceptance.

In case of Software derived from a modified COTS, the Supplier shall meet the requirements of this document for the newly developed part, evaluating acceptability of the records related to the originator COTS.

In case programme specific requirements are present, this procedure shall be used to integrate not foreseen activities. In any case, whenever a conflict arises, programme requirements prevail on this document.

3 APPLICABLE DOCUMENTS

3.1 AgustaWestland Documents

- QRS01 – Quality Requirements for Suppliers

4 ACRONYMS

ABL Allocated Baseline
AW AgustaWestland
CDR Critical Design Review
CO Concession
CoC Certificate of Conformity
COTS Commercial Off The Shelf
CSC Computer Software Component
CSCI Computer Software Configuration Item
CSU Computer Software Unit
DDP Declaration of Design and Performance
DR Delivery Review
ECR Engineering Change Requests
FBL Functional Baseline
FCA Functional Configuration Audit
FQR Formal Qualification Review
MoM Minute of Meeting
N.A. Not Applicable
P/N Part Number
PCA Physical Configuration Audit
PDR Preliminary Design Review
PLR Planning Review
PP Production Permit
PR Problem Reports
PSAC Plan for Software Aspects of Certification
S/N Serial Number
SAS Software Accomplishment Summary
SCR Software Conformity Review
SECI Software Environment Configuration Index
SSR Software Specification Review
SW Software
TRR Test Readiness Review

5 GENERAL REQUIREMENTS

5.1 Supplier Approval

AgustaWestland Suppliers are classified and approved in accordance with what established by AW internal procedures.
The classification is reported in the Certificate delivered to the Supplier.

Any Supplier responsible for a Software design and development activity shall be included in the AgustaWestland approved Suppliers database and its product range shall include the capability to supply ***Software***.

5.2 Subcontractors

Whenever the Supplier transfers the design and/or qualification of the Software product to some Subcontractor (completely, or in part), the Supplier remains responsible toward AgustaWestland of both the Software design and its qualification.

The Supplier shall produce to AgustaWestland all the required evidences and work products issued by the Subcontractor, adding its approval as a key element of the supply.

The Supplier shall:

- assure that its Subcontractors are able, on their turn, to satisfy the requirements of this document.
- warrant and produce evidence to AgustaWestland about Subcontractors qualification, including facilities they intend to utilise (the laboratories, for instance).

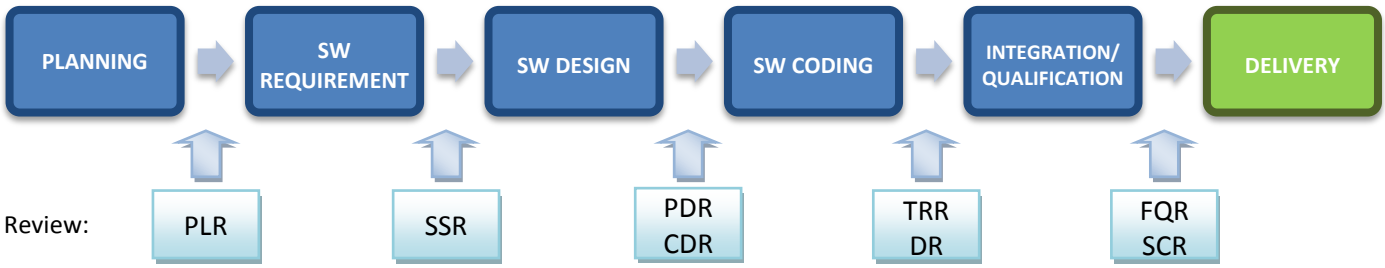
5.3 Access

The Supplier shall permit the access to all AgustaWestland representatives and Civil or Military Authorities accompanied by AgustaWestland; furthermore, the Supplier shall guarantee the access to Subcontractors facilities.

6 INTRODUCTION

6.1 Software Development Life Cycle

For the scope of this document, the Software development process is outlined as follow:



Established transition criteria shall be satisfied to access from a phase to the following one.
The phase outputs shall be verified in formal reviews (see next paragraph), whose positive results confirm the completion of all anticipated activities and the due conformity to the applicable standards of the produced documentation.

In the following chapters, for each phase main goals and activities are described, including documents (work products) to be issued.

6.2 Work Products and Verification

For each phase, this document lists the typical expected work products (having as a reference the RTCA DO-178B and the AQAP 2210) and verification events (Design Reviews).
The Submission Criteria listed for the work products verified during Design Review shall be understood as follows:

According to the contract	The level of AgustaWestland approval is defined in each contract
Approval	Work product shall be formally approved by AgustaWestland deputed people
Available	Work product shall be available and verifiable during AgustaWestland audits
Review	No AgustaWestland formal approval required, but comments can be raised
Information	No AgustaWestland formal approval required

Unless differently specified, each work product shall be submitted to the Engineering AW focal point.

The Supplier shall tailor the list according to contractual requirements, applicable Standards and Software criticality level, justifying if a work product or a verification event will be not considered.

The Supplier Design Review procedures shall be defined within the Plans (usually the Software Quality Assurance Plan). In particular, as a minimum, the following aspects shall be described:

- Involved personnel and respective responsibility;
- Applicable documentation;
- Quality Assurance role and activity.

Before each formal Design Review, the Supplier through its Quality Assurance shall guarantee (for instance using a purposely prepared check list) that:

- all the necessary products are ready and available
- all the activities pertinent to the phase to be verified have been done in accordance with the applicable procedures.

A Review MoM shall be prepared, including an action list to trace all the possible sources of problems, proposing the corresponding corrective actions. For each action item a Responsible and a due date shall be defined.

If the presence of AgustaWestland is required, the Review scheduling shall be anticipated.
Anyway, the work products related to the Review and requiring AW Approval/Review shall be delivered to AW at least 15 working days before.

The MoM shall be delivered to AgustaWestland (Quality and Design focal points) for information.

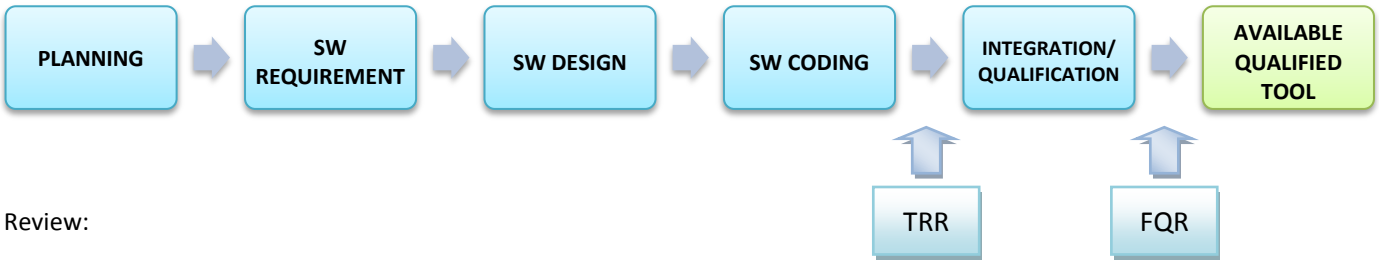
6.3 Tools Qualification

Software tools may be classified as follows:

- SW development tools
  Tools whose output is part of the airborne Software and thus can introduce errors (e.g. a tool which generates source code directly from low-level requirements).
- SW verification tools
  Tools that cannot introduce errors by their own, but may fail to detect them (e.g. test tools, syntax controllers, emulators/simulators).

If the Supplier intends to use one or more of the above described tools and their outputs are not verified manually or by other qualified tools, these shall be qualified.

Tool qualification life cycle and data have the same characteristics and content as those for airborne Software described in this document:



The Supplier shall list the development and verification tools, specifying how their qualification will be demonstrated. For each tool at least two verification events are required:

- TRR – Test Readiness Review

where tool configuration, architecture and test procedures are verified

- FQR – Formal Qualification Review
  where test results are approved

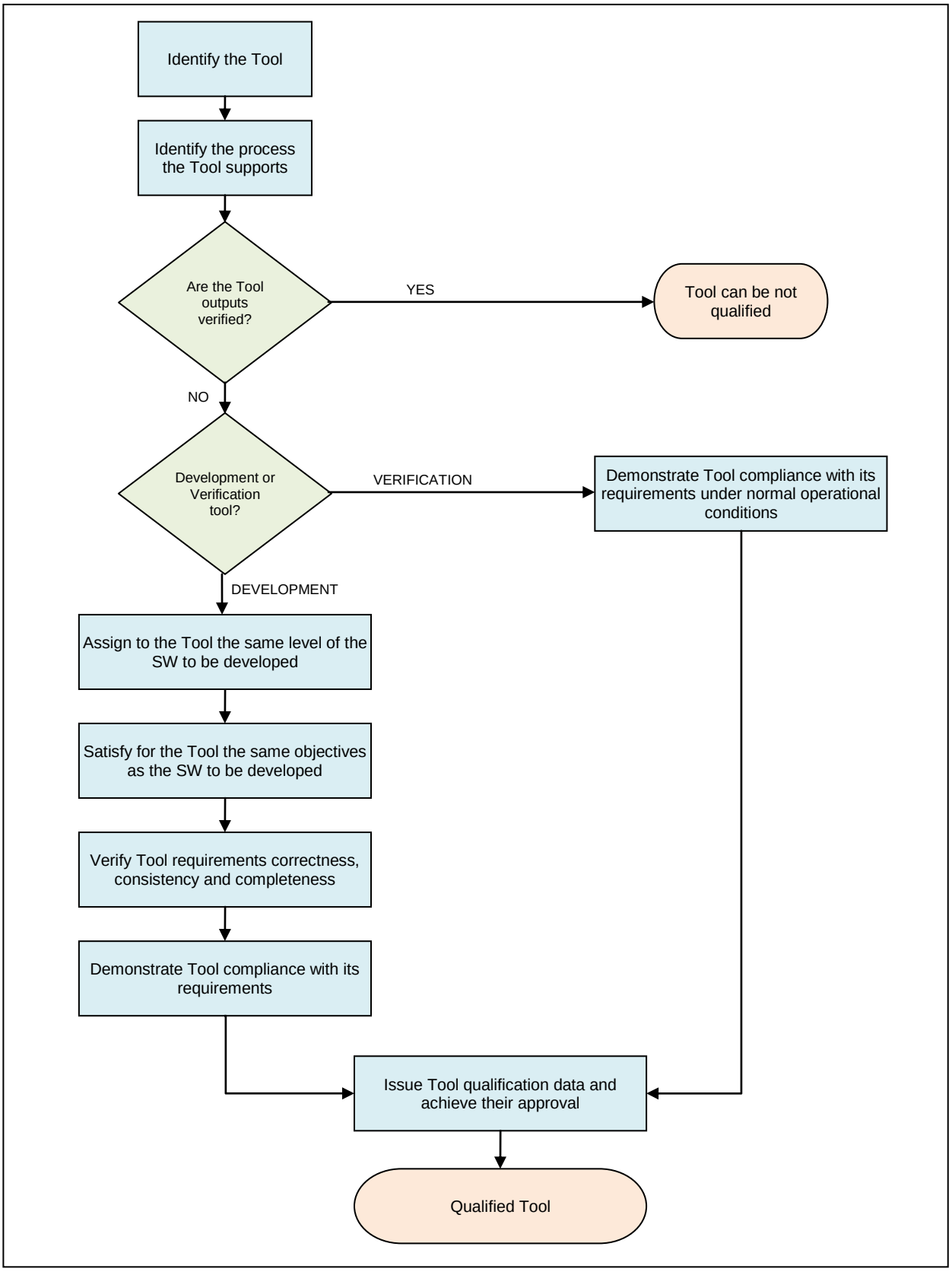
The following documents shall be verified during the TRR:

Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Tool Qualification Plan *(civil and certifiable programs)*	12.2.3.1	N.A.	Approval (CVE)
	Tool Qualification Plan	-	-	Approval
2	Tool Operational Requirements *(civil and certifiable programs)*	12.2.3.2	-	Approval
	Tool Requirements Specification	-	-	Approval
3	Tool Design Document	-	-	Approval
4	Tool Test Procedure	-	-	Approval
5	Configuration Index (initial)	-	-	Approval

The following documents shall be verified during the FQR:

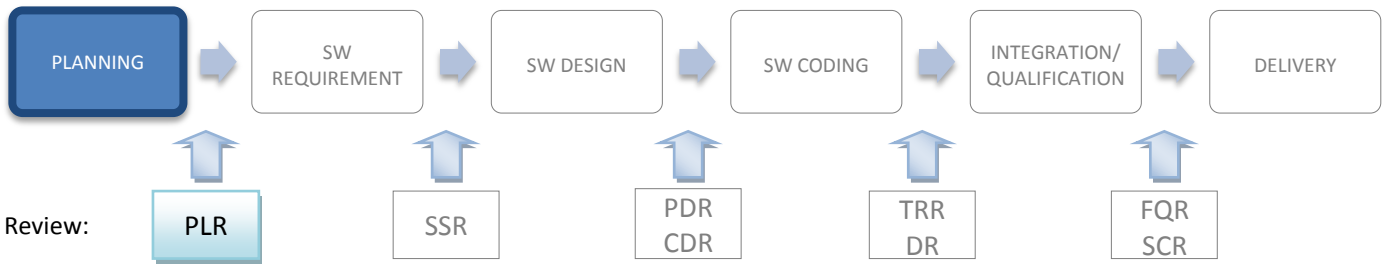
Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Tool Test Results	-	-	Approval
2	Configuration Index (final)	-	-	Approval
3	Tool Accomplishment Summary	12.2.3.c(3)	N.A.	Approval (CVE)

The tool qualification process is summarized in the flow chart of the following page.



Tool Assessment and Qualification steps

7 PHASE 1 – PLANNING



The purpose of the Software planning phase is to define the means of producing Software which will satisfy the system requirements and provide the level of confidence which is consistent with airworthiness requirements.

The main output of this phase is the issuing of the Software Plans (typically: *SW Quality Assurance Plan*, *SW Development Plan*, *SW Configuration Management Plan* and *SW Verification Plan*); if a civil certification is required, this is the phase where the *Plan for Software Aspects of Certification* is prepared. A contractual obligation for a PSAC shall be honoured also for programs not subjected to civil certification.
Coordination of development and revision of the Software Plans shall be established.

The Standards required for SW development are also defined (*Requirements*, *Design* and *Code Standards*).

7.1 Main Goals and Activities

7.1.1 Environment Definition

The Software life cycle environment, including the methods and tools to be used for the activities of each Software life cycle process (requirements management, design and coding, configuration management, verification and validation) shall be defined and included in the Plans.

The Supplier shall identify (usually in Software Quality Assurance Plan) people in charge and thus responsible for:

- Declaring the Software Airworthiness, by signing the technical documents of the Design Data Set;
- Declaring released Software conformity, by signing the Certificate of Conformity and the relative documentation (Concession, etc...).

In addition, the Supplier shall list one or more reference people ("Focal Points") for Software Quality and Design activities.

The Supplier shall include in the Software Quality Assurance Plan a "Compliance Matrix" against the paragraphs from 5 to 12 of this document (summarised in Annex B), tailoring these requirements to the contractual ones (reference to contractual documents shall be included).

If RTCA DO-178B applies, a "Compliance Matrix" against RTCA DO-178B sections 8 and 11.5 shall be also included.

The Plan shall list all the main Subcontractors (if any) and the relative responsibilities establishing the different activities between Supplier and Subcontractor.

The Supplier shall describe configuration management activities in terms of:

- rules of Software P/N definition
- changes and non conformities management

Software Quality Assurance Plan shall include or refer to the above configuration management activities.

7.1.2 Development Process Definition

Definition of the activities of the Software development processes and integral processes of the Software lifecycle shall be defined and included in the Plans.
Standards consistent with the system safety objectives for the Software to be produced shall be defined and issued.

7.1.3 Transition Criteria, interrelationship and sequence among life cycle definition

The inter-relationships between the phases, their sequencing, feedback mechanisms and transition criteria shall be described in the Plans.

7.2 Work Products

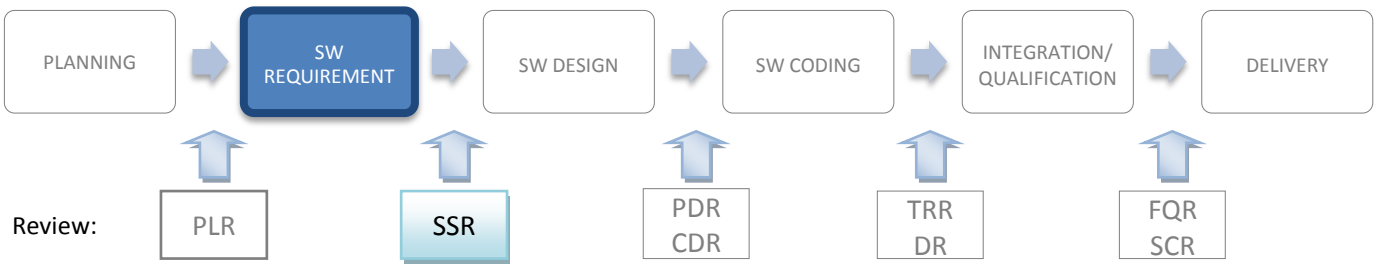
According to the applicable Standard, the following documents represent the output of the Planning Phase.

Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Software Quality Assurance Plan	11.5	2.2.2	Approval (Quality)
2	Software Development Plan	11.2	2.2.4.1	Approval
3	Software Verification Plan	11.3	2.2.6	Approval
4	Software Configuration Management Plan	11.4	2.2.4.6	Approval Review (Quality)
5	Plan for Software Aspects of Certification (PSAC)	11.1	N.A.	Approval (CVE)
6	SW Requirement Standards	11.6	-	Review
7	SW Design Standards	11.7	-	Review
8	SW Code Standards	11.8	-	Review

7.3 Verification

Work products originated during this phase shall be verified in a *PLR - Planning Review*.
The Planning review can be combined with the SSR (Software Specification Review, see paragraph 8.3).

8 PHASE 2 – SOFTWARE REQUIREMENTS



The Software requirements phase uses the outputs of the system life cycle process to develop the Software high-level requirements. These high-level requirements include functional, performance, interface and safety-related requirements.

Inputs to the Software requirements phase include the system requirements, the Hardware interface and system architecture (if not included in the requirements) from the system life cycle process, and the Software Development Plan and the Software Requirements Standards from the Software planning phase. When the planned transition criteria have been satisfied, these inputs are used to develop the Software high-level requirements.

The main output of this phase is a document where the high-level requirements (including the derived requirements) are defined.

8.1 Main Goals and Activities

8.1.1 High-level Requirements Development

Each system requirement allocated to Software shall be traceable to one or more Software high level requirements.
The high-level requirements shall conform to the Software Requirements Standards and be verifiable and consistent. They shall be stated in quantitative terms with tolerances, where applicable.

8.1.2 Derived High-level Requirements Definition

Derived high-level requirements shall be indicated to the system safety assessment process.

8.2 Work Products

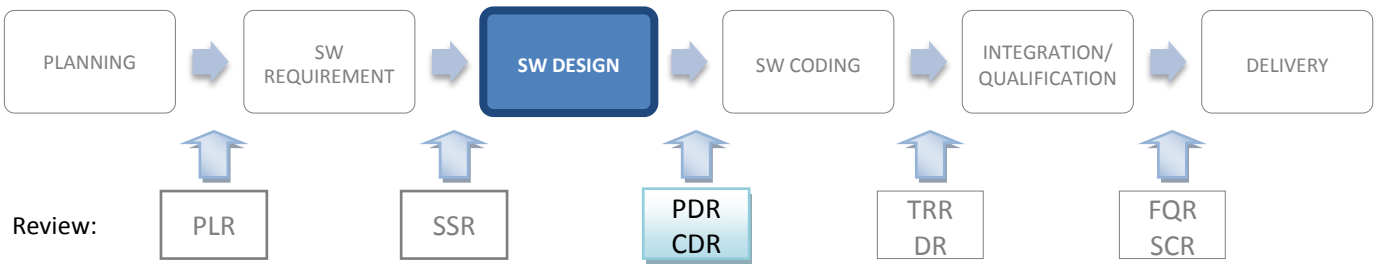
According to the applicable Standard, the following document represent the output of the Software Requirement Phase.

Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Software Requirement Specification	-	2.2.3	Approval
	Software Requirements Data	11.9	-	

8.3 Verification

Work products originated during this phase shall be verified in a *SSR - Software Specification Review*.

9 PHASE 3 – SOFTWARE DESIGN



During this phase the Software high-level requirements are refined through one or more iterations in the Software design phase to develop the Software architecture and the low-level requirements that can be used to implement Source Code.

The Software design phase inputs are the Software Requirements, the Software Development Plan and the Software Design Standards. When the planned transition criteria have been satisfied, the high-level requirements are used in the design phase to develop Software architecture and low-level requirements. This may involve one or more lower levels of requirements.

The primary output of the phase is a document that includes the Software architecture and the low-level requirements that will satisfy the Software high-level requirements.

9.1 Main Goals and Activities

9.1.1 SW Architecture and Low-level Requirements Development

Low-level requirements and Software architecture developed during the Software design phase shall conform to the Software Design Standards and be traceable, verifiable and consistent.

9.1.2 Derived Low-level Requirements Definition

Derived requirements shall be defined and analyzed to ensure that the higher level requirements are not compromised.

9.2 Work Products

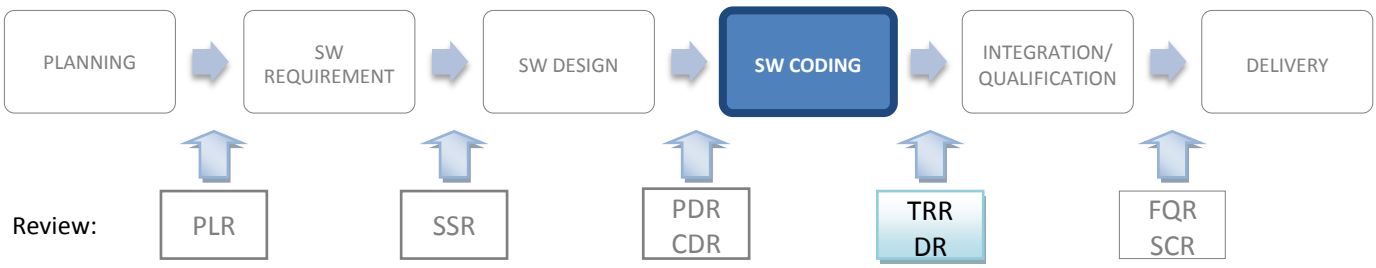
According to the applicable Standard, the following document represent the output of the Software Design Phase.

Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Software Requirement Specification	-	2.2.3	Approval
	Software Design Description	11.10	-	

9.3 Verification

Work products originated during this phase shall be verified in a *PDR - Preliminary Design Review* and a *CDR - Critical Design Review*.
The PDR, depending on the complexity of the design, can be joined with the CDR.

10 PHASE 4 – SOFTWARE CODING



In the Software coding phase, the Source Code is implemented from the Software architecture and the low-level requirements and the Object Code generated.

The coding phase inputs are the low-level requirements and the Software architecture from the Software Design phase, and the Software Development Plan and the Software Code Standards.
The Software coding phase may be entered or re-entered when the planned transition criteria are satisfied.
The Source Code is produced by this phase based upon the Software architecture and the low-level requirements

In order to prepare the next phase activities (Integration Test), Verification Procedures shall be established.

The main outputs of this phase are the *Source Code*, the *Object Code* and the document(s) detailing test procedures. At the end of this phase, a draft of the document that freezes the configuration at engineering level before formal testing shall be also available.

10.1 Main Goals and Activities

10.1.1 Source Code Development

Source code is developed that is traceable, verifiable, consistent, and correctly implements low-level requirements according to Software architecture.

10.1.2 Test Procedures Definition

Test specifications shall be prepared which define test cases, required test data and expected results.

10.2 Work Products

According to the applicable Standard, the following documents represent the output of the Software Coding Phase.

Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Source Code	11.11	-	According to the contract
2	Object Code	11.12	-	According to the contract
3	Software Verification Cases and Procedures	11.13	-	Approval
	Test Specifications	-	2.2.6.1	
4	Software Configuration Index (draft)	11.16	-	Information
	Version Description Document (draft) *	-	-	

*DID MIL-STD-498 for reference

10.3 Verification

The codes and the documents originated during this phase shall be verified during one or more *TRR - Test Readiness Review*.
According to what established by the contract, during the TRRs can be presented also the results from suitable Code verification methods.

If the Supplier needs to freeze an intermediate SW development configuration delivered for Avionics integration RIG test, or subsystem test, or flight test before conclusion of the whole integration test phase, a *DR – Delivery Review* shall be done. In this case, an agreed subsystem of the work products listed for the FQR (see the following table) shall be also presented and delivered.

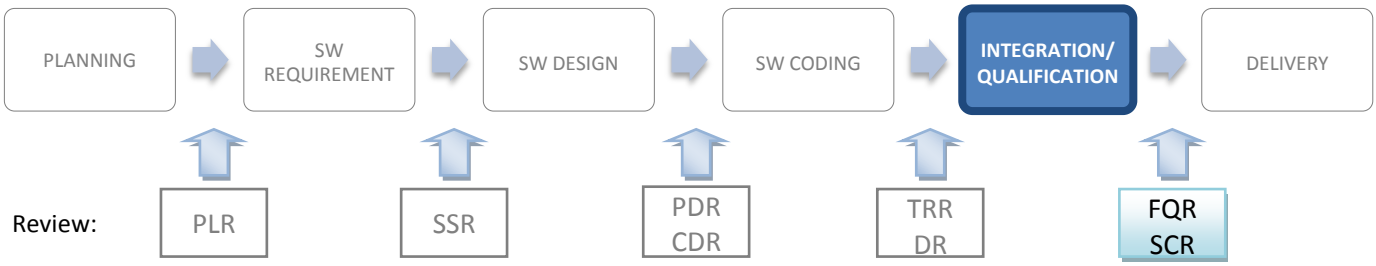
Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Software Verification Results	11.14	-	Approval
2	Software Configuration Index	11.16	-	Approval
	Version Description Document	-	-	
4	DDP – Declaration of Design and Performance	-	-	Approval

The subsystem of the work products shall be agreed with AgustaWestland in advance and included in the Delivery Review MoM.

For further intermediate deliveries related to the same Software Part Number is acceptable that the Supplier formally informs AgustaWestland (i.e. with a Coordination Memo) about the work products “delta”, without an updating of the documents; only the DDP shall be always re-issued when the delivery is for flight test.

NOTE - Once the Integration/Qualification activities are positively concluded, the work products shall be re-issued, incorporating all the “delta” occurred during intermediate deliveries.

11 PHASE 5 – INTEGRATION/QUALIFICATION



The Integration/Qualification phase determines the Software qualification, performing test for Software integration and, when applicable, for Hardware/Software integration on the target computer.

The phase may be entered or re-entered when the planned transition criteria have been satisfied. The inputs are the Software architecture from the Software design phase and the Source Code and Object Code from the Software coding phase.

The main outputs of the integration phase are the documents containing test results, conformity evidences and configuration freezing.

11.1 Main Goals and Activities

11.1.1 Completion of All Life Cycle Activities

Each activities described in the Software Plans shall be completed and verified.

11.1.2 Demonstration of Software conformity

Test, inspections or analytical processes shall be able to demonstrate that each Software configuration item meets the specific contractual performance requirements.

11.2 Work Products

According to the applicable Standard, the following documents represent the output of the Integration/ Qualification Phase.

Document		RTCA DO-178B	AQAP 2210	Submission Criteria
1	Software Verification Results	11.14	-	Approval
2	Software Configuration Index	11.16	-	Approval
	Version Description Document	-	-	
3	Software Environment Configuration Index[1]	11.15	-	Approval
4	PCA – FCA Results	-	-	Review
5	DDP – Declaration of Design and Performance	-	-	Approval
6	Software Accomplishment Summary (SAS)	11.20	N.A.	Approval

In case of Software with AgustaWestland Part Number, the Software Configuration Index (or the Version Description Document) represents the Design Data Set according to AgustaWestland rules.

The Supplier shall submit for approval to AW Engineering focal point (and CVE when RTCA DO-178B applies) the complete list of known problems and limitations before their inclusion in relevant documentation (SCI/VDD/SAS) for the Review.

11.3 Verification

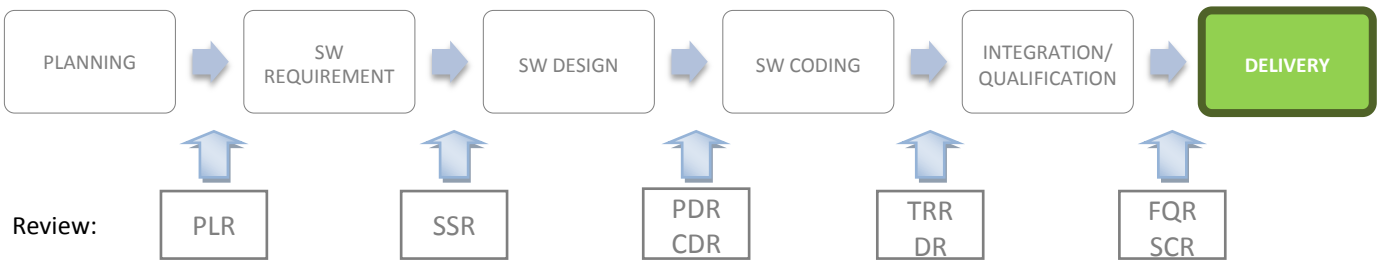
The outputs originated during this phase shall be verified according to the following:

- Software not submitted to Civil Airworthiness Certification
  FQR – Formal Qualification Review, including PCA and FCA verification[2].

- Software submitted to Civil Airworthiness Certification (or considered "certifiable")
  SCR – Software Conformity Review according to RTCA DO-178B requirements applies; contents of FQR shall be in any case verified before or contextually the SCR.

[1] The Software Environment Configuration Index can be included in the SCI/VDD
[2] A guideline for PCA and FCA verification is provided in Annex 1.

12 DELIVERY



12.1 Before Delivery

The Supplier shall ensure conformity of new or modified Software before delivery, providing a process for the inspection, verification and documentation of the Software item.
This shall apply to the documentation, Software and procedures to ensure that the end item configuration is defined, meets AgustaWestland requirements and can be consistently reproduced. A successful process results in acceptance of the product baseline and allows the delivery of Software to AgustaWestland.

The Supplier shall demonstrate that:

- All life cycle data and documents are complete and records retained
- All problem reports and changes are identified and dispositioned
- The deliverable object code can be recreated from the source code
- Software requirement deviations are recorded and approved
- The software can be loaded into the target computer and initialised
- The software item was tested and accepted in accordance with the governing requirements
- Traceability exists of the end item documentation to the governing requirements
- The software item is correctly identified, virus checked, and corruption free
- The source code is identified and under configuration control

These objectives may be met through verifications throughout the Software life cycle and evidences contained in the work products accepted during Design Reviews.

12.2 Documentation

Each Software (“stand alone” or embedded) with AgustaWestland Part Number shall be delivered with the following documentation:

- Certificate of Conformity (CoC), including, if any, the number of approved Concession, Waiver or Production Permit
- EASA Form 1 or Tag FAA 8130-3 or -9 or national equivalent document or military reassurance certificate (when contractually required)
- Declaration of Design and Performance (DDP)
- Version Description Document or Software Configuration Index or equivalent document

For embedded Software without AgustaWestland Part Number the above documentation is combined with the system one.
Version Description Document or Software Configuration Index or equivalent document shall be anyway delivered.

12.3 Identification

Each Software ("stand alone" or embedded) with AgustaWestland Part Number shall be delivered in a suitable media.
The kind of media shall be agreed during the Planning phase.
When applicable, the media shall be marked with the following information:

- Supplier Name
- Supplier Software Part Number
- AgustaWestland Software P/N
- Software Description
- Release Date
- Supplier Quality Stamp (if available), or reference to the related Certificate of Conformity
- Number of approved Concession, Waiver or Production Permit (if any)

If not applicable, the above information shall be provided to AgustaWestland.

If not differently specified in the contract, the embedded Software without AgustaWestland Part Number is delivered loaded in the system.

12.4 After Delivery

12.4.1 Defects Revealed by the Supplier

If the Supplier reveals a non conformity on a Software already delivered, the Supplier shall inform AgustaWestland by a dedicated Problem Report within 24 hours for defects involving airworthiness and/or safety, 1 week for defect involving qualification or product characteristics, 1 month for the other cases.

At the conclusion of the required investigation, the Supplier shall deliver to AgustaWestland the updated Problem Report including the investigation results and the proposed corrective actions.

Once AgustaWestland has approved the corrective actions, the Supplier shall implement them.

12.4.2 Defects Revealed by AgustaWestland

If AgustaWestland reveals a non conformity on a Software already delivered, AgustaWestland inform the Supplier by a Problem Report.

The Supplier shall trace the AgustaWestland Problem Report in a dedicated one, performing the investigation. At the conclusion of the required investigation, the Supplier shall deliver to AgustaWestland its Problem Report including the investigation results and the proposed corrective actions.

Once AgustaWestland has approved the corrective actions, the Supplier shall implement them.

ANNEX A

TITLE **Guideline for PCA and FCA Verification**

The following Check Lists represent a guideline in order to conduct Physical and Functional Configuration Audits (PCA and FCA).

They are not to be considered as a mandatory constraint, but a guideline for the Supplier to verify Software configuration; nevertheless, their accomplishment assures the compliance with AgustaWestland requirements.

[Square brackets contain, when applicable, the reference to the paragraph of this document where the work product/activity is described]

PCA (Physical Configuration Audit)

1. Are the Software Plans *[7.2]* up to date, approved and under configuration control according to the Software Configuration Management Plan *[7.2]*?
2. Are the Software Requirement Specifications/Data *[8.2]* up to date, evaluated according to the Plans, approved and under configuration control according to the Software Configuration Management Plan?
3. Are the Software Design Descriptions *[9.2]* up to date, evaluated according to the Plans, approved and under configuration control according to the Software Configuration Management Plan?
4. Is the Source Code *[10.2]* up to date, evaluated according to the Plans, approved and under configuration control according to the Software Configuration Management Plan?
5. Have the CSC tests *[11.2]* been performed on the version to be delivered? Are they evaluated according to the Plans and under configuration control according to the Software Configuration Management Plan?
6. Have the CSU test data *[11.2]* been updated according to remarks raised during evaluations?
7. Have the integration tests *[11.2]* been performed on the version to be delivered? Are they evaluated according to the Plans and under configuration control according to the Software Configuration Management Plan?
8. Have the integration test data *[11.2]* been updated according to remarks raised during evaluations?
9. Have the CSCI tests *[11.2]* been performed on the version to be delivered? Are they evaluated according to the Plans and under configuration control according to the Software Configuration Management Plan?
10. Have the Software Test Description *[10.2]*/Software Test Results *[11.2]* been updated according to remarks raised during evaluations and approved?
11. Have the link activities [11.1.2] been verified to ensure that :
    - there is no dead CSU linked ?
    - the good versions of CSUs have been used ?
12. Can the executable object code *[10.2]* be generated from the stored source code with the dedicated procedures for executable code production?
13. If the compiler and/or linker has been changed since the previous Software version *[6.3]*, what was the strategy for :
    - generating the executable code (reused object codes re-generated or not)
    - testing (exhaustive validation or not, replay of all CSU tests or not ...)
14. Can the executable object code be successfully loaded on target with a dedicated procedure?

15. Does the Software Configuration Item/Version Description Document *[11.2]* identify the correct Software Part Number?
16. Does the Software Configuration Item/Version Description Document identify the Functional Baseline (FBL) (references and issues)?
17. Does the Software Configuration Item/Version Description Document identify the Software Plans *[7.2]*, the Software Standards *[7.2]* and the tool qualification plans *[6.3]* (references and issues)?
18. Does the Software Configuration Item/Version Description Document identify the Allocated Baseline (ABL) (Software Requirement Specifications/Data references and issues)?
19. Does the Software Configuration Item/Version Description Document identify Design Data, source code, and executable files?
20. Does the Software Configuration Item/Version Description Document identify the used software libraries?
21. Does the Software Configuration Item/Version Description Document list all the Problem Reports (PR)/Engineering Change Requests (ECR) which are still open and classify these PR/ECR according to criteria defined in the Software Configuration Management Plan?
22. Does the Software Configuration Item/Version Description Document identify the compatibility of the Software with :
    - the hardware (equipments P/N)
    - the other CSCIs of the system (software P/N)
23. Does the Software Configuration Item/Version Description Document identify the used versions of Software and Hardware tools & means *[6.3]*?
24. Is the Software Configuration Item/Version Description Document up to date, evaluated according to the Plans, approved and under configuration control according to the Software Configuration Management Plan?
25. Is the Software Accomplishment Summary *[11.2]* up to date, evaluated according to the Plans and under configuration control according to the Software Configuration Management Plan?

FCA (Functional Configuration Audit)

1. Are all required documents updated and approved? Has any modification been correctly taken into account?
2. Are the Software requirements data *[9.2]* consistent and traceable with system requirements?
3. Have all the requirements been implemented and tested?
4. Do CSC and CSC testing procedures take into account any change incorporated during the Software life cycle?
5. Have CSU and integration tests been successfully performed *[11]*?
6. Is the functional coverage achieved for CSU and integration test?
7. Is the structural coverage achieved for CSU and integration test (according to the required software criticality level)?
8. Is the data coupling coverage verified (e.g. each global variable initialised before being used) and the results presented in a Coverage Analysis Document?
9. Is the control coupling coverage verified (e.g. CSU activated at least once) and the results presented in a Coverage Analysis Document?

10. Have the performance requirements allocated to CSCs been verified during integration testing (timing, memory measurements, ...)? Are the results compliant?
11. Are the global performance achieved?
12. Does the Software Verification Results identify the Software executable object code, the tests RIG and tools (Hardware and Software), the equipments used (P/N and S/N)?
13. Are the Software Verification Cases and Procedures/ Test Specifications *[10.2]* consistent with the applicable Plans and Standards *[7.2]*?
14. Are the Software Verification Cases and Procedures/ Test Specifications traceable with the specification requirements?
15. Are the Software Verification Cases and Procedures/ Test Specifications adequate?
16. Are the test RIG and tools (Hardware and Software) used for the testing activities identified in the Software Configuration Index/ Version Description Document and validated?
17. Is the Software which has been tested identified?
18. Have the Software modifications performed during CSCI testing been identified in the Software Verification Results with the corresponding tests?
19. Does a non-regression analysis define accurately the whole tests (CSCI testing) replayed to check these software modifications?
20. Is the non-regression analysis compliant with the non regression strategy defined in the Plans (i.e. Software Verification Plan)?
21. Has every CSCI test been executed in compliance with procedures? Or are deviations justified, if exist?
22. Have CSCI tests been successfully performed? Is the functional coverage achieved?
23. Have the variation ranges of each input data been verified during CSCI testing (minimum, mean and maximum values as well as out of range values)?
24. Are corrective actions related to software test limitations (requirements not fully covered) performed?
25. Are the Software Verification Results complete, updated and recorded?
26. Is the coverage matrix (Software Verification Cases and Procedures/Test Specifications / Software Verification Results vs. ABL) complete, updated and approved?
27. Is the simulation environment representative of the Software functional environment?
28. Is the development of the Software products supplied by Subcontractors (if any) correctly achieved (acceptance formally approved)?
29. Is the Subcontractor’s documentation available, complete, up to date and approved?
30. Are all CO/PP cleared or accepted by AgustaWestland?
31. Has an SCR been performed?

ANNEX B

TITLE **Compliance Matrix**

The following table summarise the requirements listed in this document for which the Supplier shall demonstrate compliance (or give a reference) in its Software Quality Assurance Plan.

Paragraph	Requirement
5.1	The Supplier shall be included in the AgustaWestland approved Suppliers database.
5.1	The Supplier product range shall include the capability to supply Software.
5.2	Whenever the Supplier transfers the design and/or qualification of the Software product to some Subcontractor (completely, or in part), the Supplier remains responsible toward AgustaWestland of both the Software design and its qualification.
5.2	The Supplier shall produce to AgustaWestland all the required evidences and work products issued by the Subcontractor, adding its approval.
5.2	The Supplier shall assure that its Subcontractors are able to satisfy the requirements of this document.
5.2	The Supplier shall warrant and produce evidence to AgustaWestland about Subcontractors qualification, including facilities they intend to utilise.
5.3	The Supplier shall permit the access to all AgustaWestland representatives and Civil or Military Authorities accompanied by AgustaWestland.
5.3	The Supplier shall guarantee the access to Subcontractors facilities.
6.1, 7.1.3	The Supplier shall establish transition criteria that are to be satisfied to access from a life cycle phase to the following one. The inter-relationships between the phases, their sequencing, feedback mechanisms and transition criteria shall be described in the Plans.
6.1, 6.2	The Supplier shall verify phase outputs in formal reviews. The list of reviews to be performed along the Software life cycle is required.
6.2	The Supplier Design Review procedures shall be defined within the Plans.
6.2	The following aspects shall be described:
	a) Involved personnel and respective responsibility
	b) Applicable documentation
	c) Quality Assurance activity
6.2	Before each formal Design Review, The Quality Assurance of the Supplier shall guarantee that:
	a) all the necessary products are ready and available
	b) all the activities pertinent to the phase to be verified have been done in accordance with the applicable procedures
6.2	A Review MoM shall be prepared, including an action list to trace all the possible sources of problems, proposing the corresponding corrective actions. For each action item a Responsible and a due date shall be defined.
6.2	If the presence of AgustaWestland is required, the Review scheduling shall be anticipated.
6.2	The work products related to each Review and requiring AW Approval/Review shall be delivered to AW at least 15 working days before the Review itself.
6.2	The MoM shall be delivered to AgustaWestland (Quality and Design focal points) for information.
6.3	Software tools for which the outputs are not verified manually or by other qualified tools shall be qualified.
6.3	The Supplier shall list the development and verification tools, specifying how their qualification will be demonstrated.
6.3	For each tool at least two verification events are required. The list of verification events and relative work products is required.
7	List of work products that the Supplier will issue during the Planning phase shall be provided.
7.1.1	The Software life cycle environment, including the methods and tools to be used for the activities of each Software life cycle process (requirements management, design and coding, configuration management, verification and validation) shall be defined and included in the Plans.

Paragraph	Requirement
7.1.1	The Supplier shall identify people in charge and thus responsible for:
	a) Declaring the Software Airworthiness, by signing the technical documents of the Design Data Set
	b) Declaring released Software conformity, by signing the Certificate of Conformity and the relative documentation (Concession, etc...)
7.1.1	The Supplier shall list one or more "Focal Points" for Software Quality and Design activities.
7.1.1	The Supplier shall include a "Compliance Matrix" against this document.
7.1.1	If RTCA DO-178B applies, a "Compliance Matrix" against RTCA DO-178B sections 8 and 11.5 shall be included.
7.1.1	The Plan shall list all the main Subcontractors (if any) and the relative responsibilities establishing the different activities between Supplier and Subcontractor.
7.1.1	The Supplier shall describe configuration management activities in terms of:
	a) rules of Software P/N definition
	b) changes and non conformities management
7.1.1	Software Quality Assurance Plan shall include or refer to the configuration management activities.
7.1.2	Definition of the activities of the Software development processes and integral processes of the Software lifecycle shall be defined and included in the Plans.
7.1.2	Standards consistent with the system safety objectives for the Software to be produced shall be defined and issued.
8	List of work products that the Supplier will issue during the Software Requirements phase shall be provided.
8.1.1	Each system requirement allocated to Software shall be traceable to one or more Software high level requirements.
8.1.1	The high-level requirements shall conform to the Software Requirements Standards and be verifiable and consistent. They shall be stated in quantitative terms with tolerances, where applicable.
8.1.2	Derived high-level requirements shall be indicated to the system safety assessment process.
9	List of work products that the Supplier will issue during the Software Design phase shall be provided.
9.1.1	Low-level requirements and Software architecture developed during the Software design phase shall conform to the Software Design Standards and be traceable, verifiable and consistent.
9.1.2	Derived requirements shall be defined and analyzed to ensure that the higher level requirements are not compromised.
10	List of work products that the Supplier will issue during the Software Coding phase shall be provided.
10.1.1	Source code is developed that is traceable, verifiable, consistent, and correctly implements low-level requirements according to Software architecture.
10.1.2	Test specifications shall be prepared which define test cases, required test data and expected results.
10.3	Reference to suitable Code verification methods (if any) shall be included in the Plans.
11	List of work products that the Supplier will issue during the Integration/Qualification phase shall be provided.
11.1.1	Each activities described in the Software Plans shall be completed and verified.
11.1.2	Test, inspections or analytical processes shall be able to demonstrate that each Software configuration item meets the specific contractual performance requirements.
11.2	The Supplier shall submit for approval to AW Engineering focal point (and CVE when RTCA DO-178B applies) the complete list of known problems and limitations before their inclusion in relevant documentation (SCI/VDD/SAS).
12.1	The Supplier shall include in the Software Quality Assurance Plan where the objectives are met.
12.2	The Supplier shall list the documentation delivered with each Software.
12.3	The Supplier shall describe the media and the information that will be marked/supplied.
12.4.1	The Supplier shall describe how the defects revealed by the Supplier itself shall be managed.
12.4.2	The Supplier shall describe how the defects revealed by AgustaWestland shall be managed.