

NPR 7150.2D/LPR 7150.2B Compliance Matrix		Class: ABC		Project:				
Req #	Requirement Text	Technical Authority	Responsible Party	Applicability	Compliance	Tailoring Description	Tailoring Rationale	Compliance Guidance
SWE-033	The project manager shall assess options for software acquisition versus development.	EngTA	NASA Software Lead	X	FC			The NA marking cannot be used in the Compliance column.
SWE-013	The project manager shall develop, maintain, and execute software plans, including security plans, that cover the entire software life cycle and, as a minimum, address the requirements of this directive with approved tailoring	EngTA		X				The NA marking cannot be used in the Compliance column. The project can use the FC marking if plans cover all life cycle phases funded under the project.
SWE-024	The project manager shall track the actual results and performance of software activities against the software plans. a. Corrective actions are taken, recorded, and managed to closure. b. Changes to commitments (e.g., software plans) that have been agreed to by the affected groups and individuals are taken, recorded, and managed	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-034	The project manager shall define and document the acceptance criteria for the software.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-036	The project manager shall establish and maintain the software processes, software documentation plans, list of developed electronic products, deliverables, and list of tasks for the software development that are required for the project’s software developers, as well as the action required (e.g., approval, review) of the Government upon receipt of each of the deliverables	EngTA		X				The NA marking cannot be used in the Compliance column. This guidance overrides LPR 7150.2B because NPR 7150.2C modified this requirement to apply to both in-house and contracted software development.
SWE-037	The project manager shall define and document the milestones at which the software developer(s) progress will be reviewed and audited.	EngTA		X				The NA marking cannot be used in the Compliance column. This guidance overrides LPR 7150.2B because NPR 7150.2C modified this requirement to apply to both in-house and contracted software development.
SWE-039	The project manager shall require the software developer(s) to periodically report status and provide insight into software development and test activities; at a minimum, the software developer(s) will be required to allow the project manager and software assurance personnel to: a. Monitor product integration. b. Review the verification activities to ensure adequacy. c. Review trades studies and source data. d. Audit the software development processes and practices.e. Participate in software reviews and technical interchange meetings.	EngTA		X				The NA marking cannot be used in the Compliance column. This guidance overrides LPR 7150.2B because NPR 7150.2C modified this requirement to apply to both in-house and contracted software development.
SWE-040	The project manager shall require the software developer(s) to provide NASA with software products, traceability, software change tracking information and nonconformances in electronic format, including software development and management metrics	EngTA		X				The NA marking cannot be used in the Compliance column. This guidance overrides LPR 7150.2B because NPR 7150.2C modified this requirement to apply to both in-house and contracted software development.
SWE-042	The project manager shall require the software developer(s) to provide NASA with electronic access to the source code developed for the project in a modifiable format.	EngTA		X				The NA marking cannot be used in the Compliance column. This guidance overrides LPR 7150.2B because NPR 7150.2C modified this requirement to apply to both in-house and contracted software development.
SWE-139	The project manager shall comply with the requirements in this NPR that are marked with an “X” in [NPR 7150.2] Appendix C consistent with their software classification.	LMS Waiver	Project Manager	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.
SWE-121	Where approved, the project manager shall document and reflect the tailored requirement in the plans or procedures controlling the development, acquisition, and deployment of the affected software.	EngTA		X				The NA marking cannot be used in the Compliance column.

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SWE-125	Each project manager with software components shall maintain a requirements mapping matrix or multiple requirements mapping matrices against requirements in this NPR, including those delegated to other parties or accomplished by contract vehicles or Space Act Agreements.	LMS Waiver	NASA Software Lead	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.
SWE-027	The project manager shall satisfy the following conditions when a COTS, GOTS, MOTS, OSS, or reused software component is acquired or used: a. The requirements to be met by the software component are identified. b. The software component includes documentation to fulfill its intended purpose (e.g., usage instructions). c. Proprietary rights, usage rights, ownership, warranty, licensing rights, transfer rights, and conditions of use (e.g., required copyright, author, and applicable license notices within the software code, or a requirement to redistribute the licensed software only under the same license (e.g., GNU GPL, ver. 3, license)) have been addressed and coordinated with Center Intellectual Property Counsel. d. Future support for the software product is planned and adequate for project needs. e. The software component is verified and validated to the same level required to accept a similar developed software component for its intended use. f. The project has a plan to perform periodic assessments of vendor reported defects to ensure the defects do not impact the selected software components.	EngTA		X				The NA marking can be used in the Compliance column if the project will not integrate or reuse any off-the-shelf, open source, or pre-existing software. In this circumstance, enter "No use of non-developed software" in the Tailoring Rationale column.
SWE-015	To better estimate the cost of development, the project manager shall establish, document, and maintain: a. Two cost estimate models and associated cost parameters for all Class A and B software projects that have an estimated project cost of \$2 million or more. b. One software cost estimate model and associated cost parameter(s) for all Class A and Class B software projects that have an estimated project cost of less than \$2 million. c. One software cost estimate model and associated cost parameter(s) for all Class C and Class D software projects. d. One software cost estimate model and associated cost parameter(s)	EngTA		X				The NA marking cannot be used in the Compliance column.

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SWE-151	The project manager’s software cost estimate(s) shall satisfy the following conditions: a. Covers the entire software life cycle. b. Is based on selected project attributes (e.g., programmatic assumptions/constraints, assessment of the size, functionality, complexity, criticality, reuse code, modified code, and risk of the software processes and products). c. Is based on the cost implications of the technology to be used and the required maturation of that technology. d. Incorporates risk and uncertainty, including end state risk and threat assessments for cybersecurity. e. Includes the cost of the required software assurance support.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-174/ LSWE-031	The project manager shall submit software planning parameters, including size and effort estimates, milestones, and characteristics, to the Center measurement repository at the conclusion of major milestones. [SWE-174] The NASA Software Lead shall enter the project data for the LaRC Software Metrics Repository as described in [LPR 7150.2B] Appendix F. [LSWE-031]	LMS Waiver	NASA Software Lead	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.
SWE-016	The project manager shall document and maintain a software schedule that satisfies the following conditions: a. Coordinates with the overall project schedule. b. Documents the interactions of milestones and deliverables between software, hardware, operations, and the rest of the system. c. Reflects the critical dependencies for software development activities. d. Identifies and accounts for dependencies with other projects and cross-program dependencies.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-018	The project manager shall regularly hold reviews of software schedule activities, status, performance metrics, and assessment/analysis results with the project stakeholders and track issues to resolution.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-046	The project manager shall require the software developer(s) to provide a software schedule for the project’s review and schedule updates as requested.	EngTA		X				The NA marking cannot be used in the Compliance column. This guidance overrides LPR 7150.2B because NPR 7150.2C modified this requirement to apply to both in-house and contracted software development.
SWE-017	The project manager shall plan, track, and ensure project specific software training for project personnel.	EngTA		X				The NA marking cannot be used in the Compliance column. Compliance can be marked FC as long as the project performs an honest assessment of training, even if that assessment identifies no training needs for the staff.
SWE-020	The project manager shall classify each system and subsystem containing software in accordance with the highest applicable software classification definitions for Classes A, B, C, D, E, and F software in Appendix D.	LMS Waiver	NASA Software Lead	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.
SWE-176	The project manager shall maintain records of each software classification determination, each software Requirements Mapping Matrix, and the results of each software independent classification assessments for the life of the project	LMS Waiver	Project Manager	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.

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SWE-022	The project manager shall plan and implement software assurance, software safety, and IV&V (if required) per NASA-STD-8739.8, Software Assurance and Software Safety Standard.	EngTA and SMA TA		X				The NA marking cannot be used in the Compliance column.
SWE-141	For projects reaching Key Decision Point A, the program manager shall ensure that software IV&V is performed on the following categories of projects: a. Category 1 projects as defined in NPR 7120.5. b. Category 2 projects as defined in NPR 7120.5 that have Class A or Class B payload risk classification per NPR 8705.4. c. Projects selected explicitly by the NASA Chief, Safety and Mission Assurance.	LMS Waiver		A, B				Use the NA marking in the compliance column if the project is class C or if the project does not fall in one of the categories. Enter the reason for NA in the Tailoring Rationale column. Using the T marking requires an LMS waiver since a waiver from headquarters is required to tailor this requirement.
SWE-131	If software IV&V is performed on a project, the project manager shall ensure an IPEP is developed, approved, maintained, and executed in accordance with the IV&V criteria defined in NASA-STD-8739.8.	EngTA		A or B and per SWE-131 criteria				Use the NA marking in the Compliance column if the project is not selected for IV&V or is class C. Enter the reason for NA in the Tailoring Rationale column.
SWE-178	If software IV&V is performed on a project, the project manager shall ensure that IV&V is provided access to development artifacts, products, source code, and data required to perform the IV&V analysis efficiently and effectively.	EngTA		A or B and per SWE-131 criteria				Use the NA marking in the Compliance column if the project is not selected for IV&V or is class C. Enter the reason for NA in the Tailoring Rationale column.
SWE-179	If software IV&V is performed on a project, the project manager shall provide responses to IV&V submitted issues and risks, and track these issues and risks to closure.	EngTA		A or B and per SWE-131 criteria				Use the NA marking in the Compliance column if the project is not selected for IV&V or is class C. Enter the reason for NA in the Tailoring Rationale column.
SWE-205	The project manager, in conjunction with the SMA organization, shall determine if each software component is considered to be safety-critical per the criteria defined in NASA-STD-8739.8.	LMS Waiver	Project Manager	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.
SWE-023	If a project has safety-critical software, the project manager shall implement the safety-critical software requirements contained in NASA-STD-8739.8.	EngTA and SMA TA		Safety-Critical				The NA marking can be used in the Compliance column when the software is not safety-critical. In this case, enter "The software is not safety-critical" in the Tailoring Rationale column.

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SWE-134	If a project has safety-critical software or mission-critical software, the project manager shall implement the following items in the software: a. The software is initialized, at first start and restarts, to a known safe state. b. The software safely transitions between all predefined known states. c. Termination performed by software functions is performed to a known safe state. d. Operator overrides of software functions require at least two independent actions by an operator. e. Software rejects commands received out of sequence when execution of those commands out of sequence can cause a hazard. f. The software detects inadvertent memory modification and recovers to a known safe state. g. The software performs integrity checks on inputs and outputs to/from the software system. h. The software performs prerequisite checks prior to the execution of safety-critical software commands. i. No single software event or action is allowed to initiate an identified hazard. j. The software responds to an off-nominal condition within the time needed to prevent a hazardous event. k. The software provides error handling. l. The software can place the system into a safe state.	EngTA and SMA TA		Safety-Critical				The NA marking can be used in the Compliance column when the software is not safety-critical. In this case, enter "The software is not safety-critical" in the Tailoring Rationale column.
SWE-219	If a project has safety-critical software, the project manager shall ensure that there is 100 percent code test coverage using the Modified Condition/Decision Coverage (MC/DC) criterion for all identified safety-critical software components	EngTA and SMA TA		Safety-Critical				The NA marking can be used in the Compliance column when the software is not safety-critical. In this case, enter "The software is not safety-critical" in the Tailoring Rationale column.
SWE-220	If a project has safety-critical software, the project manager shall ensure all identified safety-critical software components have a cyclomatic complexity value of 15 or lower. Any exceedance shall be reviewed and waived with rationale by the project manager or technical approval authority	EngTA and SMA TA		Safety-Critical				The NA marking can be used in the Compliance column when the software is not safety-critical. In this case, enter "The software is not safety-critical" in the Tailoring Rationale column.

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SWE-146	The project manager shall define the approach to the automatic generation of software source code including: a. Validation and verification of auto-generation tools. b. Configuration management of the auto-generation tools and associated data. c. Description of the limits and the allowable scope for the use of the auto-generated software. d. Verification and validation of auto-generated source code using the same software standards and processes as hand-generated code. e. Monitoring the actual use of auto-generated source code compared to the planned use. f. Policies and procedures for making manual changes to auto-generated source code. g. Configuration management of the input to the auto-generation tool, the output of the auto-generation tool, and modifications made to the <u>output of the auto-generation tools</u> .	EngTA		X				The NA marking can be used in the compliance column if the project is not auto-generating software. In this case, enter "No software will be auto generated" in the Tailoring Rationale column.
SWE-206	The project manager shall require the software developers and custom software suppliers to provide NASA with electronic access to the models, simulations, and associated data used as inputs for auto-generation of <u>software</u>	EngTA		X				The NA marking can be used in the compliance column if the project is not auto-generating software. In this case, enter "No software will be auto generated" in the Tailoring Rationale column.
SWE-032	The project manager shall acquire, develop, and maintain software from an organization with a non-expired CMMI®-DEV rating as measured by a CMMI® Institute Certified Lead Appraiser as follows: a. For Class A software: CMMI®-DEV Maturity Level 3 Rating or higher for software. b. For Class B software (except Class B software on NASA Class D payloads, as defined in NPR 8705.4): CMMI®-DEV Maturity Level 2 Rating or higher for software.	LMS Waiver		A, B				You can use the NA marking in the Compliance column if the project is Class C. For Class A or Class B projects, tailoring requires an LMS Waiver since Headquarters approval is required to tailor the requirement.
SWE-147	The project manager shall specify reusability requirements that apply to its software development activities to enable future reuse of the software, including the models, simulations, and associated data used as inputs for auto-generation of software, for U.S. Government purposes.	EngTA		X				The NA marking cannot be used in the Compliance column. The FC compliance marking may still be used as long as the project makes an honest attempt to assess reusability, even if that assessment results in no candidates for reuse.

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SWE-148	The project manager shall evaluate software for potential reuse by other projects across NASA and contribute reuse candidates to the appropriate NASA internal sharing and reuse software system. However, if the project manager is not a civil servant, then a civil servant will pre-approve all such software contributions; all software contributions should include, at a minimum, the following information: a. Software Title. b. Software Description. c. The Civil Servant Software Technical POC for the software product. d. The language or languages used to develop the software. e. Any third party code contained therein and the record of the requisite license or permission received from the third party permitting the Government’s use and any required markings (e.g., required copyright, author, applicable license notices within the software code, and the source of each third-party software component (e.g., software URL & license URL)), if applicable. f. Release notes.	EngTA		X				The NA marking cannot be used in the Compliance column. The FC compliance marking may still be used as long as the project makes an honest attempt to assess reusability, even if that assessment results in no candidates for reuse.
SWE-156	The project manager shall perform a software cybersecurity assessment on the software components per the Agency security policies and the project requirements, including risks posed by the use of COTS, GOTS, MOTS, OSS, or reused software components.	EngTA and CIO TA		X				The NA marking cannot be used in the Compliance column.
SWE-154	The project manager shall identify cybersecurity risks, along with their mitigations, in flight and ground software systems and plan the mitigations for these systems.	EngTA and CIO TA		X				The NA marking may be used in the Compliance column if the software is not used in a space flight or ground system (e.g., mission operations, launch operations). Enter "Not for use in a flight or ground system" in the Tailoring Rationale column.
SWE-157	The project manager shall implement protections for software systems with communications capabilities against unauthorized access per the requirements contained in the Space System Protection Standard, NASA-STD-1006.	EngTA and CIO TA		X				The NA marking may be used in the Compliance column if the software does utilize communications (e.g., internet, radio frequency). Enter "Does not use communications capabilities" in the Tailoring Rationale column.
SWE-159	The project manager shall test the software and record test results for the required software cybersecurity mitigation implementations identified from the security vulnerabilities and security weaknesses analysis.	EngTA and CIO TA		X				The NA marking cannot be used in the Compliance column.
SWE-207	The project manager shall identify, record, and implement secure coding practices.	EngTA and CIO TA		X				The NA marking cannot be used in the Compliance column.
SWE-185	The project manager shall verify that the software code meets the project’s secure coding standard by using the results from static analysis tool(s).	EngTA and CIO TA		X				The NA marking cannot be used in the Compliance column. Use the "T" marking if a static analysis tool does not exist for the software development technology used. The Engineering TA verifies that no static analysis tool exists and can suggest alternative practices.
SWE-210	The project manager shall identify software requirements for the collection, reporting, and storage of data relating to the detection of adversarial actions.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-052	The project manager shall perform, record, and maintain bi-directional traceability between the following software elements: (See Table in 3.12.1)	EngTA		X				The NA marking cannot be used in the Compliance column.

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SWE-050	The project manager shall establish, capture, record, approve, and maintain software requirements, including requirements for COTS, GOTS, MOTS, OSS, or reused software components, as part of the technical specification	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-051	The project manager shall perform software requirements analysis based on flowed-down and derived requirements from the top-level systems engineering requirements, safety and reliability analyses, and the hardware specifications and design	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-184	The project manager shall include software related safety constraints, controls, mitigations and assumptions between the hardware, operator, and software in the software requirements documentation.	EngTA		Safety-Critical				The NA marking can be used in the Compliance column when the software is not safety-critical. In this case, enter "The software is not safety-critical" in the Tailoring Rationale column.
SWE-053	The project manager shall track and manage changes to the software requirements.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-054	The project manager shall identify, initiate corrective actions, and track until closure inconsistencies among requirements, project plans, and software products.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-055	The project manager shall perform requirements validation to ensure that the software will perform as intended in the customer environment.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-057	The project manager shall transform the requirements for the software into a recorded software architecture.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-143	The project manager shall perform a software architecture review on the following categories of projects: a. Category 1 Projects as defined in NPR 7120.5. b. Category 2 Projects as defined in NPR 7120.5 that have Class A or Class B payload risk classification per NPR 8705.4	EngTA		Per SWE-143 criteria				The NA marking can be used in the compliance marking when the software does not meet the criteria in the requirement Present the reason for NA in the Tailoring Rationale column.
SWE-058	The project manager shall develop, record, and maintain a software design based on the software architectural design that describes the lower-level units so that they can be coded, compiled, and tested.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-060	The project manager shall implement the software design into software code.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-061	The project manager shall select, define, and adhere to software coding methods, standards, and criteria.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-135	The project manager shall use static analysis tools to analyze the code during the development and testing phases to, at a minimum, detect defects, software security, code coverage, and software complexity.	EngTA		X				The NA marking cannot be used in the Compliance column. Use the "T" marking if a static analysis tool does not exist for the software development technology used. The Engineering TA verifies that no static analysis tool exists and can suggest alternative practices
SWE-062	The project manager shall unit test the software code.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-186	The project manager shall assure that the unit test results are repeatable.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-063	The project manager shall provide a software version description for each software release.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-136	The project manager shall validate and accredit the software tool(s) required to develop or maintain software.	EngTA		X				The NA marking cannot be used in the Compliance column.



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SWE-065	The project manager shall establish and maintain: a. Software test plan(s). b. Software test procedure(s). c. Software test(s), including any code specifically written to perform test procedures. <del>d. Software test report(s).</del>	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-066	The project manager shall test the software against its requirements..	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-187	The project manager shall place software items under configuration management prior to testing.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-068	The project manager shall evaluate test results and record the evaluation.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-070	The project manager shall use validated and accredited software models, simulations, and analysis tools required to perform qualification of flight software or flight equipment.	EngTA		X				The NA marking can be used in the Compliance column when the project is not developing flight software or flight equipment (e.g. data loaders). Enter "Not flight software or flight equipment software" in the Tailoring Rationale column
SWE-071	The project manager shall update the software test and verification plan(s) and procedure(s) to be consistent with software requirements.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-073	The project manager shall validate the software system on the targeted platform or high-fidelity simulation.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-189	The project manager shall ensure that the code coverage measurements for the software are selected, implemented, tracked, recorded, and reported.	EngTA		X				The NA marking cannot be used in the Compliance column. If a method of measuring test coverage does not exist for the software development technology, use 'T' in the compliance column. The Engineering TA will verify that code coverage technology does not exist and may require an alternate practice
SWE-190	The project manager shall verify code coverage is measured by analysis of the results of the execution of tests.	EngTA		X				The NA marking cannot be used in the Compliance column. If a method of measuring test coverage does not exist for the software development technology, use 'T' in the compliance column. The Engineering TA will verify that test coverage technology does not exist and may require an alternate practice
SWE-191	The project manager shall plan and conduct software regression testing to demonstrate that defects have not been introduced into previously integrated or tested software and have not produced a security vulnerability	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-192	The project manager shall verify through test the software requirements that trace to a hazardous event, cause, or mitigation technique.	EngTA		Safety-Critical				The NA marking can be used in the Compliance column when the software is not safety-critical. In this case, enter "The software is not safety-critical" in the Tailoring Rationale column.
SWE-193	The project manager shall develop acceptance tests for loaded or uplinked data, rules, and code that affects software and software system behavior.	EngTA		A, B				You can use the NA marking in the Compliance column when the software is Class C.
SWE-211	The project manager shall test embedded COTS, GOTS, MOTS, OSS, or reused software components to the same level required to accept a custom developed software component for its intended use.	EngTA		X				The NA marking can be used in the Compliance column if the project will not include non-developed software components. Enter "No use of non-developed software" in the Tailoring Rationale column.

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SWE-075	The project manager shall plan and implement software operations, maintenance, and retirement activities.	EngTA		X				The NA marking cannot be used in the Compliance column. For single use software in a Research & Technology project (NPR 7120.8), software operations and maintenance are condensed into the execution of the software for the analysis, demonstration, ground test, or flight test that produces the project's results; software retirement is performed as part of project closeout.
SWE-077	The project manager shall complete and deliver the software product to the customer with appropriate records, including as-built records, to support the operations and maintenance phase of the software's life cycle.	EngTA		X				The NA marking cannot be used in the Compliance column. For single use software in a Research & Technology project (NPR 7120.8), software operations and maintenance are condensed into the execution of the software for the analysis, demonstration, ground test, or flight test that produces the project's results; software retirement is performed as part of project closeout.
SWE-194	The project manager shall complete, prior to delivery, verification that all software requirements identified for this delivery have been met or dispositioned, that all approved changes have been implemented and that all defects designated for resolution prior to delivery have been resolved.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-195	The project manager shall maintain the software using standards and processes per the applicable software classification throughout the maintenance phase.	EngTA		X				The NA marking cannot be used in the Compliance column. For single use software in a Research & Technology project (NPR 7120.8), software maintenance covers software changes made during the execution of the software for the analysis, demonstration, ground test, or flight test that produces the project's results; it is sufficient to extend the development process into this execution phase.
SWE-196	The project manager shall identify the records and software tools to be archived, the location of the archive, and procedures for access to the products for software retirement or disposal.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-079	The project manager shall develop a software configuration management plan that describes the functions, responsibilities, and authority for the implementation of software configuration management for the project.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-080	The project manager shall track and evaluate changes to software products.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-081	The project manager shall identify the software configuration items (e.g., software records, code, data, tools, models, scripts) and their versions to be controlled for the project.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-082	The project manager shall establish and implement procedures to: a. Designate the levels of control through which each identified software configuration item is required to pass. b. Identify the persons or groups with authority to authorize changes. c. Identify the persons or groups to make changes at each level.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-083	The project manager shall prepare and maintain records of the configuration status of software configuration items.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-084	The project manager shall perform software configuration audits to determine the correct version of the software configuration items and verify that they conform to the records that define them.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-085	The project manager shall establish and implement procedures for the storage, handling, delivery, release, and maintenance of deliverable software products.	EngTA		X				The NA marking cannot be used in the Compliance column.

NPR 7150.2D/LPR 7150.2B Compliance Matrix		Class: ABC		Project:				
Req #	Requirement Text	Technical Authority	Responsible Party	Applicability	Compliance	Tailoring Description	Tailoring Rationale	Compliance Guidance
SWE-045	The project manager shall participate in any joint NASA/developer audits.	EngTA		X				The NA marking cannot be used in the Compliance column. For in-house development, you can mark this requirement as FC if the only software audits are internal to the project.
SWE-086	The project manager shall record, analyze, plan, track, control, and communicate all of the software risks and mitigation plans.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-087	The project manager shall perform and report the results of software peer reviews or software inspections for: a. Software requirements. b. Software plans, including cybersecurity. c. Any design items that the project identified for software peer review or software inspections according to the software development plans. d. Software code as defined in the software and or project plans. e. Software test procedures.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-088	The project manager shall, for each planned software peer review or software inspection: a. Use a checklist or formal reading technique (e.g., perspective based reading) to evaluate the work products. b. Use established readiness and completion criteria. c. Track actions identified in the reviews until they are resolved. <del>d. Identify the required participants.</del>	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-089	The project manager shall, for each planned software peer review or software inspection, record necessary measurements.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-090	The project manager shall establish, record, maintain, report, and utilize software management and technical measurements.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-093	The project manager shall analyze software measurement data collected using documented project-specified and Center/organizational analysis procedures.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-094	The project manager shall provide access to the software measurement data, measurement analyses, and software development status as requested to the sponsoring Mission Directorate, the NASA Chief Engineer, the Center TAs, HQ SMA, and other organizations as appropriate.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-199	The project manager shall monitor measures to ensure the software will meet or exceed performance and functionality requirements, including satisfving constraints.	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-200	The project manager shall collect, track, and report software requirements volatility metrics.	EngTA		A, B				You can use the NA marking in the Compliance column when the software is Class C.
SWE-201	The project manager shall track and maintain software non-conformances (including defects in tools and appropriate ground software).	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-202	The project manager shall define and implement clear software severity levels for all software non-conformances (including tools, COTS, GOTS, MOTS, OSS, reused software components, and applicable ground systems).	EngTA		X				The NA marking cannot be used in the Compliance column.
SWE-203	The project manager shall implement mandatory assessments of reported non-conformances for all COTS, GOTS, MOTS, OSS, and/or reused software components.	EngTA		X				The NA marking can be used in the Compliance column if the project will not include non-developed software components. Enter "No use of non-developed software" in the Tailoring Rationale column.

NPR 7150.2D/LPR 7150.2B Compliance Matrix		Class: ABC		Project:				
Req #	Requirement Text	Technical Authority	Responsible Party	Applicability	Compliance	Tailoring Description	Tailoring Rationale	Compliance Guidance
SWE-204	The project manager shall implement process assessments for all high severity software non-conformances (closed loop process).	EngTA		A,B				You can use the NA marking in the Compliance column when the software is Class C.
LSWE-030	The NASA Software Lead shall provide the following project data to the NASA Software Working Group Representative on project startup: a. Name of project b. Work breakdown structure (WBS) number c. Name and contact information for the NASA Software Lead d. Name of the development organization(s) e. Name of the software assurance organization(s), if applicable. f. Primary lifecycle methodology g. Current lifecycle phase h. For each software item, provide the following information: 1) Name of item 2) Estimate of software size as KSLOC 3) Software class and safety-critical determination 4) The primary programming language	LMS Waiver	NASA Software Lead	X	FC			Do not change the compliance marker of FC. An LMS Waiver is required for relief from this requirement.

Signatories

NASA Software Lead

Supervisor of NASA Software Lead

Tailoring Approvals

Engineering Technical Authority (EngTA)

SMA Technical Authority (SMA TA)

Center CIO Tailoring Authority (CIO TA)

Software Assurance Review

Center Software Assurance Manager

## NPR 7150.2D/LPR 7150.2B Requirements Mapping Matrix for Class A, B, or C

### Introduction

Projects developing, acquiring, maintaining, or operating software are required to complete a requirements mapping matrix per NPR 7150.2D SWE-125.

### Roles and Responsibilities

The NASA Software Lead, as defined in LPR 7150.2B Section 2.1.2, is responsible for the content of the requirements mapping matrix and for obtaining signatures. However, the NASA Software Lead may rely on the software team (including contractors) to populate the template.

### File Naming

Before entering data, save this file using the name RMM\_<project\_name>.xlsx where <project\_name> is the name of the project or other unique description of the software activity.

### Matrix Columns

The requirements mapping matrix displays the following content in each column:

Req #	The requirements number given to the requirement by its source document. Numbers beginning with SWE are found in NPR 7150.2D; those beginning with LSWE are found in LPR 7150.2B. Do not modify this column.								
Requirements Text	The full text of the software engineering requirement taken from the source document. Do not modify this column.								
Technical Authority	<p>The level of technical authority that can approve the tailoring of each requirement. This column contains one of or more of the following entries:</p> <table><tr><td>LMS Waiver</td><td>This requirement cannot be tailored. To modify adherence to this requirement, the project manager must first submit an LMS Waiver. For some requirements, the modification must be approved by Headquarters.</td></tr><tr><td>EngTA</td><td>The Engineering Technical Authority for the project.</td></tr><tr><td>SMA TA</td><td>The Center's Safety &amp; Mission Assurance Technical Authority.</td></tr><tr><td>CIO TA</td><td>The Center's Chief Information Officer Tailoring Authority.</td></tr></table> <p>See LPR 7150.2D Section 3 for more information on tailoring. Do not modify this column.</p>	LMS Waiver	This requirement cannot be tailored. To modify adherence to this requirement, the project manager must first submit an LMS Waiver. For some requirements, the modification must be approved by Headquarters.	EngTA	The Engineering Technical Authority for the project.	SMA TA	The Center's Safety & Mission Assurance Technical Authority.	CIO TA	The Center's Chief Information Officer Tailoring Authority.
LMS Waiver	This requirement cannot be tailored. To modify adherence to this requirement, the project manager must first submit an LMS Waiver. For some requirements, the modification must be approved by Headquarters.								
EngTA	The Engineering Technical Authority for the project.								
SMA TA	The Center's Safety & Mission Assurance Technical Authority.								
CIO TA	The Center's Chief Information Officer Tailoring Authority.								
Responsible Party	Enter the name of the individual or organization responsible for addressing the requirement.								
Applicability	The applicability of the requirement to the software class as defined in the source document. An 'X' indicates fully applicable. Other markings are plain text. Do not modify this column.								
Compliance	Declare to what level the project will comply with the requirement. Selectable markings are 'FC' (full compliance), 'T' (tailored), and 'NA' (not applicable). See <i>Levels of Compliance</i> for an explanation of each marking. Also see the <i>Compliance Guidance</i> column for guidance and restrictions on compliance markings for a given requirements.								
Tailoring Description	If selecting 'T' for compliance, describe how the project is tailoring the requirement. If partially implementing the requirement, identify what portions of the requirement will be implemented. If replacing the requirement with an alternate practice, describe the alternate practice. If tailoring out the requirement, simply write 'tailor out' or similar language.								
Tailoring Rationale	<p>If selecting 'T' for compliance, provide an engineering justification for tailoring the requirement. The justification should identify how the tailoring impacts technical risk or opportunities. If the tailoring increases risk on the project, the justification should present mitigation for the added risk or argue for acceptance of the added risk.</p> <p>If selecting 'NA' for compliance, identify what applicability category of LPR 7150.2B Appendix D.2 does not apply. The Compliance Guidance column provides a quick reference for whether 'NA' is permitted and what applicability category(ies) restrict applicability of the requirement.</p>								

Compliance Guidance	This column provides guidance and restrictions on entries for the requirement in the <i>Compliance</i> column. For example, the 'NA' marking cannot be used for most requirements. The compliance entry in the Compliance column must adhere to the guidance in this column. Do not modify this column.
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#### Entering Data and Routing

1. Enter a name for the project in cell 'requirements mapping matrix!' (E1)
2. For each requirement,
  - a. Enter the individual or organization responsible for the requirement in column D
  - b. Use the drop down list in column F to select the level of compliance (see *Levels of Compliance*). This entry must conform to the guidance and restrictions in column I.
  - c. If the level of compliance is 'T' (tailor), describe the tailoring in column G and justify the tailoring in column H.
  - d. If the level of compliance is 'NA' (not applicable), identify the non-applicable restriction in column H.  
 Note: Only requirements in LPR 7150.2B Appendix D.2 can be marked 'NA' and only if the listed applicability restriction does not apply. For example, a project that is not developing safety-critical software can mark requirement SWE-023 as 'NA' in column F and enter 'not safety-critical' in column H.  
 Note: For requirements implemented directly in LPR 7150.2B, columns D and F are already populated in the template. Modifying
3. The NASA Software Lead and the Software Lead's Supervisor sign and date the requirements mapping matrix on rows 105 and 106.
4. If 'T' appears in column H for any requirement,
  - a. the Engineering Technical Authority for the project signs on row 109 to approve the tailoring for any requirement
  - b. the Center Safety & Mission Assurance Technical Authority signs on row 109 as determined by LPR 7150.2B section 3.2.2; this
  - c. the Center CIO Tailoring Authority signs on row 111 only if tailoring a requirement whose entry in column C includes CIO TA.  
 Note: If the software impacts human health and medical activities, then the Center Health and Medical Authority must also approve tailoring. Since this is rare, a signature line is not included in the template and must be added.  
 Note: Tailoring of SWE-032 or SWE-141 requires the Engineering Technical Authority to route the approval to Headquarters.
5. The NASA Software Lead submits the requirements mapping matrix to the Center Software Assurance Manager. The Center Software Assurance Manager signs on row 114 to concur that the matrix is correct and complete per NPR 7150.2D and LPR 7150.2B requirements and guidance.

#### Levels of Compliance

The project may select one of three compliance levels for each requirement. The compliance levels are defined below:

FC	Full Compliance - The responsible party plans to meet the requirement as stated.
T	Tailored - The responsible party plans to either a) partly meet the requirement as stated, b) use an alternative practice, or c) not address the requirement for a reason that does not qualify as an 'NA' designation.
NA	Not Applicable - The requirement does not apply to the project per LPR 7150.2B Appendix D.2. This designation does not require technical authority approval. However, this designation can only be used for requirements with restricted applicability per LPR 7150.2B Appendix D.2. The Compliance Guidance column provides a quick reference on whether NA can be used and the applicability category(ies) that restrict the requirement. To use NA, the project must not meet the applicability category(ies). Otherwise, the project can still use 'T' to tailor down or tailor out the requirement. For example, SWE-134 applies only to safety-critical software. If the project is not developing safety-critical software, the NASA Software Lead can enter 'NA' for compliance. However, if the project is developing safety-critical software but wants to tailor out the requirement, the NASA Software Lead must enter a 'T' for compliance.

#### Signatures

It is not required that projects have physical signatures for the requirements mapping matrix. Approvals and concurrences can be obtained via correspondence or meetings. However, such approvals or concurrences must be recorded in an electronic or paper record. Then, the NASA Software Lead can identify the record in the signature line and the date of the record on the date line for each signatory.

#### Printing The requirements mapping matrix

The printing area for the requirements mapping matrix tab is configured for legal size paper in a landscape orientation.

#### Reporting Issues with Workbook

Report any issue with this workbook to the LaRC Software Engineering Process Group (SEPG) via e-mail to [larc-dl-sepg@mail.nasa.gov](mailto:larc-dl-sepg@mail.nasa.gov).

Version	Date	Description
1.0	2/28/2020	Initial Version
1.1	3/30/2020	Fixed omissions in replacing 'compliance matrix' with 'requirements mapping matrix' and replaced any references to classes D or E with classes A, B, and C.
		Changed entries in Technical Authority column to clarify approval authority for tailoring and to provide traceability to the signatories section.
		Added Compliance Guidance column (I) to provide guidance and restrictions on filling out the Compliance column (F)
		Added a new Help section in the Instructions worksheet
		Added the 'safety-critical' as the Applicability (Column E) marking for SWE-184 and SWE-192
1.2	6/11/2020	Corrected misspellings in column I
1.3	12/10/2020	Corrected compliance guidance for SWE-206. Project can mark requirement as NA if there is no auto-generated software.
1.4	4/12/2022	Updated for NPR 7150.2D. Corrected spacing in Instructions sheet.